In cooperation with:

JOINT VENTURE OF NIPPON KOEI CO., LTD.,
KATAHIRA & ENGINEERS INTERNATIONAL,
NIPPON ENGINEERING CONSULTANTS CO., LTD. &
CENTRAL NIPPON EXPRESSWAY CO., LTD.

Final Report

ENVIRONMENTAL IMPACT STATEMENT

DALTON PASS EAST ALIGNMENT ROAD PROJECT

Provinces of Nueva Vizcaya & Nueva Ecija

Submitted to:

Environmental Management Bureau
Central Office

May 2023

ENVIRONMENTAL IMPACT STATEMENT (EIS)

DALTON PASS EAST ALIGNMENT ROAD PROJECT

An environmental report prepared by:

**JOINT VENTURE OF NIPPON KOEI CO., LTD.,
KATAHIRA & ENGINEERS INTERNATIONAL,
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List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AD	Ancestral Domain
BOM	Bureau of Maintenance
CADT	Certificate of Ancestral Domain Title
CARP	Comprehensive Agrarian Reform Program
CCA	Climate Change Adaptation
CCTV	Closed-Circuit Televisions
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CENRO	Community Environment and Natural Resources Office
CHED	Commission on Higher Education
CLUP	Comprehensive Land Use Plan
CMCI	Cities & Municipalities Competitive Index
COMREL	Community Relations Officer
COVID-19	Coronavirus Disease
CP	Certification of Precondition
CR	Critically Endangered
DA	Department of Agriculture
DAO	DENR Administrative Order
DAR	Department of Agrarian Reform
dB	Decibel
dbh	Diameter at Breast-Height
DBM	Department of Budget and Management
DD	Data Deficient
DED	Detailed Engineering Design
DENR	Department of Environment and Natural Resources
DEO	District Engineering Offices
DepEd	Department of Education
DFL	Design Flood Level
DGCS	Design Guidelines, Criteria and Standards
DIA	Direct Impact Area
DILG	Department of the Interior and Local Government
DOH	Department of Health
DOLE	Department of Labor and Employment
DOTr	Department of Transportation
DPEAR	Dalton Pass East Alignment Road
DPWH	Department of Public Works and Highways
DRR	Disaster Risk Reduction
DSWD	Department of Social Welfare and Development
DTI	Department of Trade and Industry

ECA	Environmentally Critical Area
ECC	Environmental Compliance Certificate
EGF	Environmental Guarantee Fund
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMB	Environmental Management Bureau
EMF	Environmental Monitoring Fund
EMP	Environmental Management Plan
EMoP	Environmental Monitoring Plan
EN	Endangered
EO	Executive Order
EQPL	Environmental Quality Performance Level
ERA	Environmental Risk Assessment
FDA	Food and Drug Administration
FMB	Forest Management Bureau
FPIC	Free and Prior Informed Consent
FS	Feasibility Study
GAD	Gender and Development
GFPS	GAD Focal Point System
GPB	GAD Plan and Budget
GRM	Grievance Redress Mechanism
IATF	Inter-Agency Task Force for the Management of Emerging Infectious Diseases
ICC	Indigenous Cultural Communities
IEC	Information, Education and Communication
IIA	Indirect Impact Area
IP	Indigenous People
IPMR	Indigenous Peoples Mandatory Representative
IPP	Indigenous Peoples Plan
IRR	Implementing Rules and Regulations
IUCN	International Union for Conservation of Nature
IV	Importance Value
JCOSHA	Japan Construction Occupational Safety and Health Association
JICA	Japan International Cooperation Agency
JMGT	Joint Monitoring and Grievance Team
KATAWASA	Kalaw-Tactac Water System Association
KII	Key Informant Interview
LC	Least Concern
LGU	Local Government Unit
LRFD	Load and Resistance Factor Design
MENRO	Municipal Environment and Natural Resources Office
MET	Monitoring and Evaluation Team
MGB	Mines and Geosciences Bureau
MHO	Municipal Health Officer
MMT	Multi-Partite Monitoring Team
MOA	Memorandum of Agreement
MRIC	Municipal Resettlement Implementation Committee
MSE	Mechanically Stabilized Earth
NAAQS	National Ambient Air Quality Standards
NATM	New Austrian Tunneling Method
NCR	National Capital Region
NCCA	National Commission for Culture and the Arts
NEDA	National Economic and Development Authority
NEECO	Nueva Ecija Electric Cooperative, Inc.
NEXCO	Nippon Expressway Company
NGO	Non-governmental organization
NGP	National Greening Program
NIA	National Irrigation Administration

NIPAS	National Integrated Protected Areas System
NLEX	North Luzon Expressway
NT	Near Threatened
NUVELCO	Nueva Vizcaya Electric Cooperative
NWMC	National Wildlife Management Committee
NWRB	National Water Resources Board
OCC	Operation Control Center
ODA	Official Development Assistance
O&M	Operation and Maintenance
OSH	Occupational Safety and Health
OSHP	Occupational Safety and Health Plan
OTS	Other Threatened Species
OWS	Other Wildlife Species
PAGASA	Philippine Atmospheric, Geophysical, and Astronomical Services Administration
PAF	Project-Affected Families
PAMB	Protected Area Management Board
PAP	Project-Affected Person
PCO	Pollution Control Officer
PCW	Philippine Commission on Women
PCWFR	Pantabangan-Carranglan Watershed Forest Reserve
PEIS	Philippine Earthquake Intensity Scale
PEISS	Philippine Environmental Impact Statement System
PEMAPS	Project Environmental Monitoring & Audit Prioritization Scheme
PHIVOLCS	Philippine Institute of Volcanology and Seismology
pH	Potential of Hydrogen
PHP	Philippine Peso
PM	Particulate Matter (in microns)
PNP	Philippine National Police
PPE	Personal Protective Equipment
PPH	Pan-Philippine Highway
PRECUP	Philippine Registry of Cultural Property
PRLC	Philippine Red List Committee
PSA	Philippine Statistics Authority
PSCG	Prestressed Concrete Girder
PUJ	Public Utility Vehicle
RAP	Right-of-Way Acquisition Plan
RDP	Regional Development Plan
RHU	Rural Health Unit
RO	Regional Office
ROW	Right-of-Way
RRoW	Road-Right-of-Way
SCTEX	Subic-Clark-Tarlac Expressway
SDP	Social Development Framework
SMR	Self- Monitoring Report
SPL	Sound Pressure Level
SWMP	Solid Waste Management Program
TACM	Time Area Count Method
TCT	Transfer Certificate of Title
TD	Tax Declaration
TESDA	Technical Education and Skills Development Authority
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
UDHR	Universal Declaration of Human Rights
UPRIIS	Upper Pampanga River Integrated Irrigation Systems
USGS	United States Geologic Survey
VU	Vulnerable

Currency Equivalents

Currency unit	-	Philippine Peso (PHP)
PHP 1.00	=	¥ 2.42
¥ 1.00	=	PHP 0.41

List of Annexes

ANNEX A **Proof of Authority over the Project Site**
- PAMB Resolution No. 13 Series of 2020, *"Isang Kapasyahang Nagbibigay Pahintulot sa Department of Public Works and Highways (DPWH) Road Management Cluster I na Magsagawa ng Feasibility Study sa Kanilang Proyektong Dalton Pass East Alignment Road Project sa Loob ng Pinangangalagaang Pook ng PCWFR"*
- Certification Precondition (CP-R-II-18-19-117) for Region II
- Memorandum of Agreement between DPWH and Kalanguya IPs of Region III

ANNEX B **Accountability Statements**
- Notarized Sworn Statement of Accountability of the Project Proponent (EIS)
- Notarized Sworn Statement of Accountability of the Project Proponent (PEMAPS)
- Notarized Accountability of EIS Preparer

ANNEX C **Project Environmental Monitoring & Audit Prioritization Scheme (PEMAPS)**

ANNEX D **Laboratory Results**
- Soil Quality Laboratory Results
- Groundwater Quality Laboratory Results
- Surface Water Quality Laboratory Results
- Air & Noise Quality Laboratory Results

ANNEX E **Annexes of the Terrestrial & Freshwater Ecology Assessment Reports**
- Summary List of Flora and Fauna Species
- Photo-Documentation of Flora and Fauna Species
- Freshwater Macroinvertebrates Specimen Observed/Collected at the Proposed Project Site in Nueva Ecija and Nueva Vizcaya
- Photo-Documentation of Freshwater Ecology Activities

ANNEX F **Public Participation**
- IEC Documentation Report and Annexes
- Public Scoping Report and Annexes
- Public Consultation Meeting Documentation and Annexes
- Public Hearing Report and Annexes

ANNEX G **Duly Accomplished EIA Technical Screening Form**

ANNEX H **Result of the Environmental and Social Considerations of the JICA Study**

EXECUTIVE SUMMARY

PROJECT FACT SHEET

Project Name	**Dalton Pass East Alignment Road Project**		
Project Location	**Province**	**Municipality**	**Barangay**
	Nueva Vizcaya (Region II)	Santa Fe	Canabuan
		Aritao	Canabuan Canarem
	Nueva Ecija (Region III)	Carranglan	Bunga Burgos Salazar
	Component	**Municipality**	**Barangay**
	Road (Highway)	All Municipalities	All Barangays
	North Tunnel	Santa Fe Carranglan	Canabuan Salazar
	South Tunnel	Carranglan	Burgos
	Bridge	Aritao Santa Fe Carranglan	Canabuan Canabuan Salazar Burgos
Project Type *(According to DENR MC 2014-15)*	3.4.1 Roads New Construction & 3.4.7 Tunnel and Sub-grade Roads and Railways		
Project Size/Capacity	**Road (Highway)**	**Total Length: ~23 km** Lane: 4 lanes Design Speed: 60 km/hr. Width: 60 m ROW	
	Tunnel	**Total Length: ~6.1 km** Length of the North Tunnel: 4.5 km Length of the South Tunnel: 1.6 km Construction of lighting, ventilation, and emergency facilities	
	Bridge	**Total Number: 14** Passage for rivers and creeks Slope protection is included	
Project Proponent	**Department of Public Works and Highways** **Roads Management Cluster I (Bilateral)** **Unified Project Management Office** Office Address: PJHL Building, NCR Compound-DPWH, 2nd Street, Port Area, Manila Tel. No.: (02) 8304-3901 Authorized Representative: **Emil K. Sadain** Senior Undersecretary		
EIA Preparer	**LCI Envi Corporation** Office Address: Unit 8L-M, Future Point Plaza 3, 111 Panay Avenue, South Triangle, Quezon City Tel. No.: (02) 8652-5890 / Fax No.: (02) 8961-9226 Authorized Representative: **Engr. Jose Marie U. Lim** EIA Team Leader		

PROCESS DOCUMENTATION

Terms and Reference for the EIA Study

The Philippine Environmental Impact Statement System (PEISS), under Presidential Decree No. 1586, is a key planning tool for any major project that needs the incorporation of sustainable development. The main purpose of sustainable development activities is to support the project's intended business interest, while preserving or minimizing its negative effects to its surrounding environment and host communities.

The Department of Public Works and Highways (DPWH), through its Unified Project Management Office Roads Management Cluster 1 (Bilateral) (UPMO-RMC-I(B)), intends to construct a bypass road that includes but not limited to roads, bridges, tunnels, and slope protection works, that will serve as an alternate route bypassing the existing Dalton Pass Section along Pan-Philippine Highway (PPH) in the event of road closure brought about by calamities/natural disasters such as typhoons and earthquakes, thereby directly connecting the Cagayan Valley Region (Region II) and eastern part of Central Luzon Region (Region III) to the National Capital Region (NCR).

The Proponent is required to secure an Environmental Compliance Certificate (ECC) from the DENR-EMB Central Office prior to any development on the project site. Pre-requisite to the acquisition of an ECC for a project of this scale is the preparation of an Environmental Impact Statement (EIS), as stated in Annex A, Item No. 3.4.1 (Roads New Construction) and Item No. 3.4.7 (Tunnels and Sub-Grade Roads and Railways) of the EMB Memorandum Circular 005-2014 (Revised Guidelines for Coverage Screening and Standardized Requirements under the Philippine EIS System).

The Proposed Dalton Pass East Alignment Road Project (DPEARP) will be assisted by the Japan International Cooperation Agency (JICA) as part of its Official Development Assistance (ODA). As a matter of policy, the proposed project must also adhere to the Guidelines for Environment and Social Considerations (2010) with regards to environmental and social impact assessment.

JICA's Guidelines for Social and Environmental Considerations also provided screening for various projects based on the following: a) project scale, b) nature, c) degree of impact on the natural and social environment, d) the site or location, e) mitigation measures required, among others. The proposed project falls under "roads, bridges, and highways" which is categorized as **Category A:**

> **Category A:** Proposed projects are classified as Category A if these are likely to have significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts, are also classified as Category A. These impacts may affect areas broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors, projects with characteristics that are likely to cause adverse impacts, and projects located in or near sensitive areas.

The DPEARP was classified as "Category A" by JICA. The reason of the categorization is that the project falls under the category of vulnerable areas listed in the "Japan International Cooperation Agency Guidelines for Environmental and Social Considerations" (published in April 2010).

Compliance to the principles and procedures as contained in the abovementioned guidelines by a thorough review of the environmental reports and ensure that all project impacts on the natural and social environment are identified and proper mitigating measures are discussed. In addition, the proposed project should conform to the environmental laws and standards of the Philippines or such other international financial intermediaries (i.e., World Bank's Safeguard Policies, Asian Development Bank's (ADB's) Safeguard Policy Statement (SPS)), whenever applicable.

As such, this Environmental Impact Assessment (EIA) Study was based on the agreed-upon EIS Scoping and Screening Form during the project's technical scoping last 11th of January 2022. Further, DPWH has endeavored to fulfill the requirements for social and environmental considerations of JICA.

Scope of the EIA Study

This EIA Report documents the baseline environmental conditions in the proposed project site in relation to the various stages of development of the proposed project. This report also presents how **DPWH** plans to manage the environmental impacts associated with the proposed project through a comprehensive environmental management and monitoring plan during pre-construction, construction, and operation and maintenance. This document shall be submitted to the Environmental Management Bureau (EMB) Central Office for review and evaluation.

EIA Team

LCI Envi Corporation (LCI) was commissioned by **DPWH** to conduct the EIA study for the proposed project. LCI was tasked to prepare, document, and, on behalf of the Proponent, submit to the DENR-EMB all the necessary information related to the proposed Project.

The following table presents the EIA Study Team composition.

CONSULTANT	EXPERTISE	EMB EIA REGISTRATION NO.
Engr. Jose Marie U. Lim, MSc.	Team Leader/ Air and Water Quality Assessment	IPCO-029
Carolyn P. Barrias, MSc.	Forester/Flora and Fauna Specialist	IPCO-481
Dr. Bonifacio O. Pasion	Terrestrial Ecology	-
Dr. Mark M. Jun Alcantara	Biologist/Freshwater Ecology	-
Mr. Jerome B. Leaño	Anthropologist/ Social Development Specialist	IPCO-059
Engr. Bryan M. Magante	Civil Engineer/ Environmental Management Specialist	IPCO-030
EnP. Krisha L. Santos	Environmental Planner/ Environmental Management Specialist	IPCO-413
Engr. Lester M. Abando	Civil Engineer/ Environmental Management Specialist	-

EIA Study Schedule

The timetable for the EIA study is shown in the following table.

PROCESS	EIA STUDY MILESTONES	DATE
PRE-SCOPING	Information and Education Campaign (IEC) ▪ Municipality of Aritao ▪ Municipality of Santa Fe ▪ Municipality of Carranglan	 30 June 2021 1 July 2021 2 July 2021
SCOPING	Public Scoping	16 November 2021
	Submission of Public Scoping Report (PSR) to EMB Central Office	17 December 2021
	Technical Scoping at EMB Central Office	11 January 2022
ENVIRONMENTAL IMPACT ASSESSMENT	Terrestrial Ecology Assessment	Month of June 2021
	Aquatic Ecology Assessment	Month of January 2022
	Soil Sampling	9 February 2022
	Surface Water Sampling	22 June 2021 24 January to 11 February 2022
	Groundwater Sampling	9-10 February 2022
	Ambient Air Quality Monitoring	21 June to 7 July 2021
	Noise and Vibration Monitoring	24 January to 10 February 2022
	Socio-Economic and Perception Survey	Month of November 2021
	Focus Group Discussions	30 June to 2 July 2021 16 to 17 February 2022
PUBLIC HEARING	Public Hearing ▪ Province of Nueva Vizcaya ▪ Province of Nueva Ecija	 3 May 2023 4 May 2023

EIS Study Area

As stated in the DENR guidelines, the direct impact area (DIA) is defined as the area where all the project facilities are proposed to be situated and where all operations are proposed to be undertaken. For this project, the DIA is initially delimited to consist of the 23-kilometer road length (project footprints).

In contrast, the indirect impact area (IIA) covers the extent of the potential project impacts on biophysical (land, water, and air quality) and socio-economic aspects. The IIA of this project covers the areas in the immediate vicinity of the project site. The host local government units (LGUs) of the Municipality of Santa Fe and the Barangay LGU of Canabuan; Municipality of Aritao and Barangay LGUs of Canabuan and Canarem in the Province of Nueva Vizcaya; and the Municipality of Carranglan and the Barangay LGUs of Bunga, Burgos and Salazar in the Province of Nueva Ecija.

Also included are the 2 Ancestral Domains (ADs) of the Kalanguya Ikalahan Indigenous Cultural Communities (ICCs) in Nueva Vizcaya and Kalanguya ICCs in Nueva Ecija. It can be noted that the proposed project has already secured the Certification Precondition (CP) from NCIP.

Further, the proposed project will also traverse the Pantabangan-Carangglan Watershed Forest Reserve (PCWFR). The PCWFR was declared a watershed by virtue of Presidential Proclamation No. 561 series of 1969.

- For the Land component, the DIA pertains to the areas that will be cleared and developed for the construction of Dalton Pass East Alignment Road Project. This will also include the disposal sites the excavated soil from the tunneling activities.

- For the Water component, the DIA refers to the portions of Carranglan (Wahig) River and Marang River where there will be bridge development. Further, this also includes the unnamed rivers and creeks that the project alignment will pass through, which may generate short-term impacts on the water quality during construction phase.

- For the Air Quality, Noise and Vibration components, the DIA includes the barangays where the proposed project will be located. Impact will only be limited during construction activities.

- For the People component, the DIA comprises the structures and households that will be affected by the construction of the proposed project. The households will be affected includes the Kalanguya Ikalahan and Kalanguya Indigenous Cultural Communities (ICCs), as well as agricultural and residential areas that might be affected by the vibration and noise during construction phase. The IIA includes the nearby barangays within the municipalities of Aritao, Santa Fe and Carranglan.

EIA Methodologies

The methods employed in each of the four modules of the EIA study are summarized as follows.

EIA MODULE	METHODS	PURPOSE
LAND	▪ Review of land use plan in the host municipalities (Aritao, Santa Fe and Carranglan) ▪ Soil quality sampling and analysis ▪ Review of relevant geologic maps covering the study area ▪ Review of government hazard assessment ▪ Review of available data from the Forestland Management Project Community Environment and Natural Resources (CENRO) Muñoz ▪ Assessment of terrestrial ecology in the Pantabangan-Carranglan Watershed Forest Reserve (PCWFR)	▪ To assess land use/zoning compatibility of the proposed project ▪ To establish baseline information on soil quality in the proposed project site ▪ To assess possible impacts of geologic hazards on the proposed development ▪ To establish baseline information on terrestrial flora and fauna in the proposed project sites
AIR	▪ Climatological data from the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) ▪ Ambient air quality, noise and ground vibration level monitoring and analysis	▪ To assess possible impacts of meteorology on the proposed development ▪ To establish baseline information on ambient air quality, noise and ground vibration levels in the project area with considerations on relevant national standards ▪ To assess possible impacts of proposed project activities on air quality, noise, and ground vibrations in the impact areas

EIA MODULE	METHODS	PURPOSE
WATER	▪ Groundwater and surface water sampling and quality analysis to establish the baseline ▪ Aquatic ecological assessment ▪ Review of available water quality monitoring data covering the study area	▪ To establish baseline information on water quality along the project area with considerations on relevant national standards ▪ To assess possible impacts of the project to groundwater and marine quality and ecosystem
PEOPLE	▪ Socio-economic and perception survey in the project impact areas ▪ Review of socio-economic profile of the barangay-affected communities, Stakeholder consultations (focused group discussion, key informant interview with various stakeholders)	▪ To establish baseline information on the socio-economic conditions in the impact areas and general perception on the proposed project ▪ To involve stakeholders in the EIA process and address issues and concerns on the proposed project

Sampling and Measurement Plan

The following are the number of stations implemented to determine the baseline conditions/quality for (i) soil, (ii) groundwater, (iii) surface water, and (iv) ambient air, noise, and vibration in the project area.

ENVIRONMENTAL QUALITY	NO. OF STATIONS	REFERENCE/ STANDARDS
Soil	6	▪ Dutch Soil Remediation Circular 2013
Groundwater	4	▪ Philippine National Standards for Drinking Water (PNSDW) of 2017 ▪ DAO 2016-08: Water Quality Guidelines for Class A Water Body
Surface Water	10	▪ DAO 2016-08: Water Quality Guidelines and General Effluent Standards Class C Waters
Air, Noise, and Vibration	13	▪ DAO 2000-81: National Ambient Air Quality Standards (NAAQS) as per the Implementing Rules and Regulations (IRR) of the Philippine Clean Air Act of 1999 or Republic Act 8749 ▪ National Pollution Control Commission (NPCC) Memorandum Circular No. 002, Series of 1980 ▪ BS-6472-1992: British standard: Guide to evaluation of human exposure to vibration in buildings

SCOPING AND STAKEHOLDERS' ENGAGEMENT

Information and Education Campaign

As stipulated in the DENR Administrative Order No. 2017-15 (Guidelines on Public Participation under the Philippine Environmental Impact Statement System), at the onset of the environmental impact assessment (EIA) process, early involvement of stakeholders must

be initiated before the scoping through the conduct of information and education campaign (IEC). The activities used both Filipino and English languages.

The schedule of IEC meetings conducted to the stakeholders is summarized in the table below.

LGU	DATE & TIME	MALE PARTICIPANTS	FEMALE PARTICIPANTS	TOTAL PARTICIPANTS
Aritao, Nueva Vizcaya	30 June 2021 9:00-11:00AM	8	4	12
Santa Fe, Nueva Vizcaya	1 July 2021 9:00-11:00AM	8	4	12
Carranglan, Nueva Ecija	2 July 2021 9:00-11:00AM	11	6	17
	TOTAL	**27**	**14**	**41**

The issues and concerns raised by the participants during the open forum per LGU and the corresponding responses of DPWH-UPMO-RMC-I(B) and EIA consultant, were summarized in the table below:

ISSUES/CONCERNS/QUERIES	RESPONSIBLE PERSON	ACTION/RESPONSE
A. IEC FOR ARITAO, NUEVA VIZCAYA		
Which of the four alternatives has been chosen for the project?	**Municipal Planning and Development Coordinator**	**EIA Study Team:** Alternative D was chosen based on the Route Analysis conducted by JICA Study Team.
The Indigenous Peoples' (IPs') Memorandum of Agreement (MOA) should be updated to consider change from 2-lanes to 4-lanes.	**Indigenous Peoples Mandatory Representative**	**Engr. Ronel Bulan (DPWH):** No need to amend MOA since 4 lanes will be constructed within the agreed road right-of-way (RROW) of 60 meters.
In your study, kindly put emphasis on mitigation and effects to the indigenous peoples.	**Municipal Planning and Development Coordinator**	The EIA study team noted the comments from the Municipal Planning and Development Coordinator.
Kindly consider the fault line near Dalton and check if it will affect the project.	**Municipal Planning and Development Coordinator**	The EIA study team noted the comments from the Municipal Planning and Development Coordinator. The study team will investigate the said fault line and include discussions in the Environmental Impact Assessment (EIA) Report
Where will the drilled materials from tunneling be disposed?	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** Spoils disposal areas have been identified near the portals of the tunnels, subject for finalization and approval. Some of the spoils may be used as fill materials for the project.
Should there be hindrances against the construction of the tunnel, will there be a chance for the tunnel alignment to change?	**Indigenous Peoples Mandatory Representative**	**Engr. Ronel Bulan (DPWH):** This is the reason why we are conducting feasibility studies and detailed engineering design (DED) to

ISSUES/CONCERNS/QUERIES	RESPONSIBLE PERSON	ACTION/RESPONSE
		know how and where the tunnel will be constructed.
Will you incorporate the tourism potential and features in the project design?	**Municipal Agriculture Officer**	**EIA Study Team:** The tourism potential and features will be brought up to DPWH and JICA.
Will there be resettlement in the project?	**Municipal Social Welfare and Development Officer**	**EIA Study Team:** Resettlement considerations are part of the JICA study for the project. A separate study team will be preparing a resettlement action plan (RAP) for the project.
We have an IP policy in Aritao, which states that IPs must be given priority for livelihood and employment.	**Indigenous Peoples Mandatory Representative**	**EIA Study Team:** Both locals and IPs have a chance to be employed if they are qualified. The LGU can prepare the locals and IPs in undergoing Technical Education and Skills Development Authority (TESDA) accredited trainings in anticipation of the manpower requirements for the project.
Suggestion for joint RAP consultations in the Municipalities of Aritao and Santa Fe	**Indigenous Peoples Mandatory Representative**	**EIA Study Team:** The EIA study team noted the comments from the Indigenous Peoples Mandatory Representative. The consultation for RAP is different from the consultation for the EIA process. We also need to consider Covid-19 and the limitations set by the local government and IATF on mass gatherings.
Will there be agricultural areas that will be affected by the proposed project?	**Municipal Agriculture Officer**	**EIA Study Team:** The project-affected lands (agriculture and non-agriculture) and structures will be discussed during the RAP study team.
Will there be compensation for people who will be affected/need to be relocated?	**Municipal Environment and Natural Resources Officer**	**EIA Study Team:** The compensation for project-affected persons/families (PAP/Fs) will be discussed thoroughly by the RAP study team.
One of DPWH's contractors did not comply with the MOA	**Indigenous Peoples Mandatory Representative**	**Engr. Ronel Bulan (DPWH):** Ms. Lalaine Catulong of DPWH has advised the IPs to submit Letter to DPWH Region regarding this matter.
Will there be a resolution regarding the boundary dispute of Canabuan, Aritao and Canabuan, Santa Fe?	**Indigenous Peoples Mandatory Representative**	**EIA Study Team:** The EIA study team noted the comments from the Indigenous Peoples Mandatory Representative.

ISSUES/CONCERNS/QUERIES	RESPONSIBLE PERSON	ACTION/RESPONSE
		The study team will look into the said issue and include discussions in the Environmental Impact Assessment (EIA) Report
On Japanese Burial Sites	**JICA Study Team**	The participants mentioned that there were no known Japanese Burial Sites in the municipality.
B. IEC FOR SANTA FE, NUEVA VIZCAYA		
Clarification about the tunnel – how many will be constructed?	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** A route selection was conducted. As presented, there were two tunnels that will be constructed for the project.
This is a good project. How about the road issues of the existing Dalton Pass?	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** The proposed alternative road will allow for DPWH to address the issues and implement rehabilitation of the existing Dalton Pass. There is also an ongoing road widening across the Pan Philippine Highway.
What about the economic impact of the proposed project to our municipality? Will DPWH have a plan for the next 9 years (project completion) to address the economic impacts of the proposed project to our municipality? The number of vehicles will be reduced, hence the number of potential sources of income (transients/motorist) will also be reduced, if DPEAR will be completed.	**Municipal Administrator**	**Engr. Ronel Bulan (DPWH):** This issue will be carefully studied and will be part of the analysis.
May we use this opportunity to request to urge DPWH Region II to address the "poorly maintained" road of the existing Dalton Pass passing the municipality of Santa Fe.	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** We have noted your concern and we will relay this to our Project Director for appropriate guidance and action.
Is the project part of the North-East Luzon Expressway (NELEX)?	**Municipal Administrator**	**Engr. Ronel Bulan (DPWH):** The project is not part of NELEX.
Why not widen the existing expressway in San Nicolas, Pangasinan? Our concern is on the economic impact once traffic is diverted from existing Dalton Pass to the alternative road.	**Indigenous Peoples Mandatory Representative**	**Engr. Ronel Bulan (DPWH):** San Nicolas, Pangasinan was originally envisioned as the alternate route but was strongly opposed by the IPs during the Free and Prior Informed Consent (FPIC). DPWH did not push through with the alignment/project due to opposition.

ISSUES/CONCERNS/QUERIES	RESPONSIBLE PERSON	ACTION/RESPONSE
		The economic implications of the project to the municipality of Santa Fe will be part of the study. The project will undergo evaluation by the National Economic and Development Authority (NEDA).
Will the IPs in Brgy. Bantina, adjacent to Brgy. Canabuan, be affected? They are also an IP community. In the next consultations, kindly involve more stakeholders.	**Municipal Mayor**	**EIA Study Team:** The EIA study team noted the comments from Hon. Tidong A. Benito. More stakeholders will be invited in the succeeding consultations.
On Japanese Burial Sites.	**JICA Study Team**	The participants mentioned that there were Japanese Burial Sites in Barangay Tactac/Balete Pass/Barangay Malico area in 1970s. Some of the Japanese remains were already returned to the Japanese Government.
C. IEC FOR CARRANGLAN, NUEVA ECIJA		
In the previously presented alignment, there were few farmlands that will be affected. As it was changed, there were a lot of farmlands that were affected. Can the project alignment be changed to avoid the said farmlands?	**Barangay Captain of Brgy. Salazar**	**EIA Study Team:** There will be a Resettlement Action Plan (RAP) to be prepared for the project to identify the extent of the impacts of the project to project-affected lands. **Municipal Engineer:** As per Road Right-of-Way (RROW) Act, affected private landowners will be compensated - if land titled only. **Engr. Bill Ponce (DPWH):** Republic Act No. 10752 states that there will be just compensation for affected landowners.
During the initial meetings for the project, some of the landowners inquired if the project alignment can be adjusted.	**Sangguniang Bayan Member**	**EIA Study Team:** The current proposed alignment is selected based on route analysis. A separate study team will be preparing a resettlement action plan (RAP) for the project.
The on-going study on NELEX: Private domains (including agricultural areas) and ancestral lands that will be affected. Both NELEX and DPEAR projects can affect agricultural areas in	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** NELEX is under DPWH-UMO-RMCII (Multilateral). The project cost was higher than economic internal rate of return, therefore not economically feasible.

ISSUES/CONCERNS/QUERIES	RESPONSIBLE PERSON	ACTION/RESPONSE
Carranglan. Agriculture is the main source of livelihood in the municipality.		Regarding the effects to agriculture (food security and economy), this will be included in the study being conducted for the proposed project.
The existing segment already has damages. Who will undertake the operations and maintenance (O&M) of the existing segments?	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** The O&M for the existing segments is within jurisdiction of the DPWH Regional Office and District Engineering Offices (DEOs).
The value of property in Carranglan, especially near the road, will become higher and will benefit the generations of people in the municipality.	**Municipal Engineer**	**EIA Study Team:** The EIA study team noted the comments from the Municipal Engineer.
It is important that all those who will be affected by the project will be properly compensated and supported.	**Municipal Mayor**	**EIA Study Team:** The EIA study team noted the comments from Hon. Mary B. Abad. Consultations will be conducted by EIA Team, RAP Team, IP Team for all stakeholders.
Please have a list of project-affected farmers.	**Municipal Agriculture Officer**	**EIA Study Team:** A separate study team will be preparing a resettlement action plan (RAP) for the project. They will ensure that project-affected farmers will be listed and documented.
On Japanese Burial Sites	**JICA Study Team**	The participants mentioned that there were no known Japanese Burial Sites in the municipality.

Public Scoping

The schedule and the gender disaggregated number of participants during the public scoping. To provide better connectivity and access to the participants, online public scoping stations were set up for each Municipal Halls. The total number of participants who participated in the public scoping via zoom conference was 68.

LGU	DATE & TIME	MALE PARTICIPANTS	FEMALE PARTICIPANTS	TOTAL PARTICIPANTS
Aritao, Nueva Vizcaya	16 November 2021 1:00 - 3:00PM	2	0	**2**
Santa Fe, Nueva Vizcaya		16	8	**24**
Carranglan, Nueva Ecija		9	7	**16**
Zoom Registration		20	6	**26**

LGU	DATE & TIME	MALE PARTICIPANTS	FEMALE PARTICIPANTS	TOTAL PARTICIPANTS
	TOTAL	**47**	**21**	**68**

The issues, concerns, and suggestions raised by the participants during the open forum and the corresponding responses of the Proponent, and the EIA preparer were summarized in the matrix below.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
A. PROJECT DESCRIPTION		
Are there alternative routes for the proposed project?	**Municipal Engineering Officer of Sta. Fe**	**Engr. Ronel Bulan (DPWH):** We have considered alternate routes, such as the North Luzon East Expressway (NELEX), before. However, the NELEX economic feasibility failed. There were no other alternatives for DPEAR Project.
Will there be maintenance and improvement work in the existing roads like Dalton Pass and others?	**Municipal Administrator of Sta. Fe**	**Engr. Ronel Bulan (DPWH):** We have regional and district engineering offices implementing various maintenance projects along the Pan Philippine Highway Network.
B. LAND		
The tunnel sections of the proposed project contain minerals like quartz based on the previous studies conducted in the area. What will DPWH do with the mined minerals, if any?	**Municipal Engineering Officer of Sta. Fe**	**LCI Envi Corporation:** This comment was noted. This will form part of the EIA study for the proposed project.
Will there be disposal sites of the excavated materials for the proposed project?		**Engr. Ronel Bulan (DPWH):** We have identified disposal sites for the proposed project. If the materials excavated were found to be suitable for construction, the project will utilize them. If unsuitable, we will transport them in the identified disposal sites.
C. AIR		
No issues and concerns raised for the air module.		
D. WATER		
No issues and concerns raised for the water module.		
E. PEOPLE		
What are your plans for the indigenous peoples (IPs)? Will the IPs be affected?	**Municipal Environment and Natural Resources Officer of Sta. Fe**	**Engr. Ronel Bulan (DPWH):** We have secured the certification precondition (CP) from the National Commission on Indigenous Peoples (NCIP), which contains the commitments of DPWH to the ADs and IPs affected by the proposed project.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
Will DPWH consider getting laborers in the affected LGUs to work for the proposed project?	**Municipal Administrator of Sta. Fe**	**Engr. Ronel Bulan (DPWH):** As part of the compliance to the Department of Labor and Employment (DOLE) requirements of hiring, DPWH, through its qualified contractors will prioritize hiring of the qualified skilled laborers in the proposed project.
We are supportive of the proposed project. We will wait for further consultations for the proposed project for the implementation of the development projects for the affected barangays, especially on indigenous peoples.	**Municipal Mayor of Carranglan**	**Lalaine Catulong (DPWH):** An Indigenous Peoples Plan (IPP) will be prepared to address the impacts, mitigation, and development programs/projects/activities (P/P/As). **LCI Envi Corporation:** This comment was noted. This will form part of the EIA study for the proposed project. We will integrate the IPP and Resettlement Action Plan (RAP) in the EIA study.

Public Consultation Meeting

The Public Consultation meeting for the Proposed Dalton Pass East Alignment Road Project was held on 24 November 2022 (Thursday) from 9:00 AM to 11:30 AM in Aritao Municipal Covered Court covering the host barangays of Canabuan and Canarem, and from 1:30 PM to 4:00 PM in Santa Fe Municipal Covered Court covering the host barangay of Canabuan. Moreover, another session was held on 25 November 2022 (Friday) from 9:00 AM to 11:30 AM in Carranglan Municipal (Pag-asa) Covered Court covering the host Barangays of Bunga, Burgos, and Salazar. A total of 161 participants (93 males and 68 females) participated in the said consultations.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
Aritao, Nueva Vizcaya		
Project Description		
Does the presented 60-meter span of the project encompass both road and tunnel designs?	**Mr. Reynaldo Pugsong, Chairman, Barangay Canabuan**	**EIA Preparer** Yes, based on the latest design of the project. To achieve the 60 meters, measure 30 meters to the left and right of the centerline of the project.
As previously stated, the Project may become a tourist destination; is there a difference in traffic safety	**Mr. Bernel A. Prado, SB Member, LGU-Aritao**	**EIA Preparer** The Tunnel Operations Center (TOC) is what makes this project distinctive.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
between the proposed project and the existing tunnel?		CCTVs will be installed along the length of the tunnel, and emergency and firefighting facilities are included into the design of the tunnel to ensure the safety of the road users.
Does the project qualify as an expressway? If so, will there be a toll? If yes, would a sum be allocated to assist the community?	**DENR-CENRO**	**DPWH** There will, indeed, be a toll. This suggestion was acknowledged by the Proponent.
Will there be road fencing if this project is classified as an expressway?	**Mr. Bernel A. Prado, SB Member, LGU-Aritao**	**DPWH** To avoid accidents from crossing humans and animals, fence will be built along the side of the road. During the DED Phase of the Project, this topic will be discussed in greater depth.
Land		
When was the tree inventory conducted in relation to the given number of trees affected along the project alignment? The DENR also oversees a National Greening Program in Barangays Canarem and Canabuan.	**For. Marlon Bayag, DENR-PENRO Nueva Vizcaya**	**EIA Preparer** The Resettlement Action Plan (RAP) Team conducted a preliminary tree inventory survey in 2022. Aerial/Remote Satellite Photos were utilized to estimate the number of trees. The affected trees covered by the National Greening Project was considered in the report. Furthermore, the EIA Study Team has previously spoken with Forest Management Plan-Project Management. During the DED Stage of the project, the team will conduct a full tree inventory survey and will cooperate with DENR during validation.
It was indicated in the presentation that for every tree that is cut down, 100 saplings would be planted. Is it feasible to substitute fruit-bearing tree saplings?	**Kagawad, Barangay Canarem**	**EIA Preparer** We will adhere to the process of the Tree Cutting Permit. The replacement seedlings will be given to the DENR-PENRO or CENRO in charge of the area. They will also decide which tree species are required in the region and who will get seedlings.
Water		
What are the specific names of the waterbodies sampled to acquire the baseline data along the project alignment?	**For. Steve Esguerra, DENR-EMB Region II**	**EIA Preparer** The complete EIA report for the Project includes a more detailed discussion and presentation of data on the baseline assessment. Following the first Technical

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
In which stations or barangays did the Fecal Coliform findings exceed the DENR standards?		Review, it will be posted to the EMB website. Once the EIA Report is posted online, we will send a copy to your office.
We appreciate the information presented in the EIA Report, which might serve as a benchmark for the LGU. We request to obtain a copy of the study as well as the IP Development Plan (IPDP).	**Mr. Joseph Opena, MENRO, LGU-Aritao**	**EIA Preparer** We are obligated to send a copy of the report to the local governments. The report will be available for download from the Official EMB website. Concerning the IPDP, the consultation findings and report will be completed before being shared with the LGU.
Air		
This module received no comments.		
People		
What will happen to the structures (houses) impacted by the project alignment? Will they be moved or paid before the project construction begins? We hope that the settlement with the affected households will be completed before the commencement of construction in 2026.	**Mr. Manric Gaynat, Chairman, Barangay Canarem**	**DPWH** As a policy of the DPWH, the project will not commence if the right-of-way is not yet cleared or settled. During the Project's Detailed Engineering Design Phase, the optimal alignment will be established, and negotiations with individuals inside the alignment's 60-meter width will begin. Rest confident that public engagement will continue during the DED, and appropriate compensation will be provided prior to the commencement of the project. **EIA Preparer** JICA will also monitor the implementation of RAP and ensure that impacted individuals are compensated prior to the start of the project.
What types of project-related works are appropriate for women?	**Carmelita Pugsong, Women's Association Representative, Barangay Canabuan**	**EIA Preparer** As stated in the law, there shall be no discrimination in the workplace. Individuals are permitted to work in any occupation if they are willing and have an able body. There will also be a posting of manpower requirements, and the proponent will coordinate with the LGU's Public Employment Service Office (PESO) to discuss this matter.
What relevant livelihood programs can you provide to	**Hon. Jason Ferrer, Vice Mayor, LGU-Aritao**	**EIA Preparer**

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
our constituents, particularly women?		The RAP discusses livelihood rehabilitation (skills training) for those whose livelihoods may be impacted by the project. LGUs may collaborate with TESDA to secure the manpower requirements of the project.
The LGU of Aritao can enter into a Memorandum of Agreement (MOA) with the DPWH to ensure that residents of Aritao can apply for job in the TOC.	**Hon. Jason Ferrer, Vice Mayor, LGU-Aritao**	**EIA Preparer** We will take note of your suggestion and will discuss it once the specifics of the Tunnel Operation's manpower have been finalized.
Santa Fe, Nueva Vizcaya		
Project Description		
Previously, the road and tunnel design were only two lanes; however, in today's presentation, it was altered to four lanes. Could you kindly specify which is which?	**Mr. Benjamin Baguyo, Municipal IPMR**	**EIA Preparer** The latest design is being developed for the 60-meter right-of-way, regardless of the number of lanes. **DPWH** The change from two to four lanes has no major impact on the current environment as long as it stays within the 60-meter road-right-of-way.
Land		
A Memorandum of Agreement (MOA) was recently signed between DPWH Region 2 and DENR Regional Executive Director about the seedling replacement. Based on the MOA there is a new guideline regarding seedling establishment and replacement.	**For. Marlon Bayag, DENR-PENRO Nueva Vizcaya**	**EIA Preparer** We will investigate that guideline and check its applicability to the project.
In terms of the Tree Cutting Permit procedure, what steps will it take if the tree is within a CADT?	**Mr. Benjamin Baguyo, Municipal IPMR**	**EIA Preparer** A tree inventory will be performed to determine whether a tree has been planted. Trees that are planted will be tagged to their owner (e.g., IP). According to the project's RAP, persons who own a certain number of trees would be compensated. This procedure is distinct from the application for a tree cutting permission. **DPWH** The individual who planted the tree will receive compensation for the trees that will

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
		be cut down. The DPWH will get a certification from the barangay to verify who owns the tree.
Where are we going to dispose of the excavated soil during tunnel works?	**Mr. Aries Valderama, OIC Municipal Engineer, LGU-Santa Fe**	**EIA Preparer** A designated soil disposal site will be established. As of now, possible disposal sites have been identified at the tunnel section's entrance and exit points, which are still subject to IP approval (for locations areas inside a CADT). There is also prior discussion that if the excavated soil may be utilized as a construction material, compensation would be provided.
What are the findings on the minerals that can be extracted during the excavation?	**Engr. Kennedy Baluyan Jr., MPDC**	**EIA Preparer** A tunnel boring survey was carried out, although it was only conducted to the tunnel entrance and exits. We also consulted DENR-MGB about the minerals that may be discovered in the region. They confirmed that the proposed area is not designated as mineral land (no valuable minerals).
Water		
Did the study address the implications of tunnel boring on local water sources?	**Mr. Aries Valderama, OIC Municipal Engineer, LGU-Santa Fe**	**EIA Preparer** It should be noted that the New Austrian Tunneling Method (NATM) use a drill jumbo rather than a tunnel boring equipment. The alignment of the tunnel is intended to avoid crossing any bodies of water or subsurface water, as this might jeopardize the structural stability of the tunnel.
If the project is completed by 2030, there is a good chance it will become a tourist attraction. What measures does the government do to ensure that the livelihood along the existing Dalton Pass will not be severely affected by the alternate route?	**Mr. Aries Valderama, OIC Municipal Engineer, LGU-Santa Fe**	**EIA Preparer** Yes, the tunnel in this project has the potential to be a tourist destination given that it will be the longest tunnel in the country. This concern is being considered. In fact, not all vehicles will be able to use the Dalton Pass East Alignment Road. Many vehicles will still use the existing one. These things are still being studied and subject to NEDA approval.
Considering the project's stated design and its potential as a tourist attraction, we recommend providing a	**Engr. Kennedy Baluyan Jr., MPDC**	**EIA Preparer** The suggestion is great and has been taken into consideration. These are the details

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
parking space for individuals who wish to appreciate the structure while also considering their safety.		that may be addressed further during the project's DED Stage. As of now, emergency bays are one of the safety features of this project. We underline that the highway's design speed is 60 kph. It may endanger individuals who stop in the middle of the road.
Air		
Dust might be present during construction. Does it have an effect to our Barangay Constituents? And how will we address this?	**Mr. Alejo Talapi, Brgy. Canabuan IPMR**	**EIA Preparer** To reduce the spread of dust, mitigating measures include using coverings and dampening the roadways. The morbidity and mortality rate of the project area is also incorporated in the report as a baseline. If there is an increase in respiratory diseases and there is construction going on, it might be ascribed to the activities. You can file a complaint with the GRM and request that the proponent address your concerns.
People		
As previously agreed during the earlier consultations, manpower will be sourced from Barangay Canabuan.	**Mr. Ben Balalong, Chairperson, Barangay Canabuan**	**EIA Preparer** Yes, it is the commitment of the proponent to hire manpower from the impact barangays. We presented DPWH hiring policies to underline that there will be no discrimination while applying for project work. We also presented the project timeline to ensure that the workers from barangays will be able to prepare and equipped themselves for the work.
How can we be certain that the workers will receive the correct compensation/rate?	**Engr. Kennedy Baluyan Jr., MPDC**	**EIA Preparer** The fact that this project is foreign assisted is a plus. JICA guarantees that the social safeguards will be enforced. A Grievance Redress Mechanism will also be established to address grievances, such as wage difficulties and the like.
As shown in the presentation, what will be the composition of the monitoring team for the project?	**Benjamin Baguyo, Municipal IPMR**	**EIA Preparer** The DENR will require the project to establish a Multi-Partite Monitoring Team (MMT) once the proponent has acquired the ECC.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
		The MMT will be composed of the municipal officials, IPs, and DPWH. A separate MOA will be formulated by the DENR. **DPWH** The MMT that will be formed is required by the DENR to monitor the environmental impact of the project. There is another Monitoring Evaluation Team initiated by NCIP for the RAP. It was mentioned in the previous MOA, and it has undergone the FPIC process. Representatives from affected families will also be part of the Monitoring Team. The DPWH also has a monitoring team called "Municipal Resettlement Implementation Committee". This committee will monitor the process of how to acquire the road right-of-way. The monitoring of DPWH and on the MOA is being conducted prior to the start of the constructions.
Since the project has a 60-meter span, many households will be affected. Will they be compensated?	**Mr. Romeo, ME Office**	**EIA Preparer** Since the alignment of the project has been identified, a team was sent to identify the households or individuals affected by the project. The study is ongoing for this and the list of individuals that will be affected will be finalized during the DED Stage of the project. Rest assured that the process is documented, and all project affected individuals will be compensated before the start of the construction. **DPWH** Clarification, the compensation for the affected lands inside a CADT area will be given to People's Organization and not to a certain individual.
Will a consultation meeting take place even at the DED stage of the project?	**Mr. Aries Valderama, OIC Municipal Engineer, LGU-Santa Fe**	**EIA Preparer** Consultation with the stakeholders will be continuous.
Others		

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
We request a copy of the MOA with DPWH so that we may monitor the agreements indicated in the Agreement.	**Benjamin Baguyo, Municipal IPMR**	**EIA Preparer** On behalf of the DPWH, we can send a copy of the MOA to the LGU through email.
The present Dalton Pass in Santa Fe is quite narrow. We are optimistic that the DPWH will be able to expand the current road by 2031.	**Engr. Kennedy Baluyan Jr., MPDC**	**EIA Preparer** We will take note of this and will discuss this on another forum.
The existing Dalton Pass Road is usually broken. We hope that the DPWH would investigate this and come up with an appropriate solution.	**Hon. Liwayway Caramat, Municipal Mayor**	**DPWH** If the DPWH performs a project, all materials that will be utilized in the construction are tested. We guarantee everyone that the materials and design for Dalton Pass East Alignment Road Project meets all standards and requirements. Regarding the concerns with the existing Dalton Pass, you may submit a letter to the DPWH CO.
We hope that we can name the tunnels/ roads/ bridges that will be constructed after our culture.	**Engr. Kennedy Baluyan Jr., MPDC**	**EIA Preparer** This suggestion is highly appreciated, and we will take note of this.
Carranglan, Nueva Ecija		
Will the affected farmlands in Barangay Bunga be compensated?	**Betty Bankial, Brgy. Salazar**	**EIA Preparer** We are still determining the extent of the project's impact. The amount of compensation for properties will be disclosed prior to the start of the project.
Since most of the affected households in Barangay Burgos are tenants, would they also be compensated?	**Espino Bagsic, Zone 1 President, Barangay Burgos**	**EIA Preparer** If the survey starts, the owner of the structure/s and land/s are entitled for compensation.
We have had the experience of not getting paid even after the road project was done. When will the compensation be settled? Before or after the completion of the project? What are the requirements for presenting to DPWH to claim the compensation?	**Mr. Faustino Natividad, Chairman, Barangay Bunga**	**EIA Preparer** Since the project is foreign-funded and managed by the DPWH Central Office, construction will not begin until compensation for project-affected persons is finalized. The requirements will be coordinated with the local government. To be eligible for compensation, you must have a Land Title and a Tax Declaration.
We hope that the worth of our properties will not be as low as the official price suggests.	**Ms. Annaliza Inway, BHW and IP, Barangay Salazar**	**DPWH** (in Ilokano) We went through the FPIC process with the NCIP to explore property agreements for the Barangays within an Ancestral Domain. We agreed that compensation for

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
		properties inside CADT would be based on the BIR Zonal Value. The compensation amount will be given to the People's Organization. Private properties in non-IP areas will be compensated depending on market value. Consultation meetings will be continuous throughout the DED.
Does this meeting fall under the purview of the Feasibility Study Stage?	**For. Alfredo Kimayong, CENRO Munoz**	**EIA Preparer** Yes, we intend to complete the FS Stage by early next year.
Will a fence be built to avoid accidents (for animals)?	**CENRO Munoz**	**EIA Preparer** Based on the discussions yesterday, it is possible that a fence will be built on some sections of the road.
I would like to follow up the results of the concerns discussed during our meeting with the RAP Team.	**Barangay Bunga**	**DPWH** (in Ilokano) The initial RAP was conducted this year and the report will be submitted to us by the RAP Team this month. The final RAP will be validated and based during the DED stage of the project.

Public Hearing

Public Hearing for Nueva Vizcaya. The public hearing for Nueva Vizcaya for the proposed Dalton Pass East Alignment Road Project was held last 3 May 2023 (Wednesday) from 9:00 AM to 12:00 NN at the Covered Court of the Municipal Hall of Aritao, Aritao, Nueva Vizcaya.

The number of participants who attended the public hearing for Nueva Vizcaya was 84 (21 females and 63 males).

Public Hearing for Nueva Ecija. The public hearing for Nueva Ecija for the proposed Dalton Pass East Alignment Road Project was held last 4 May 2023 (Thursday) from 9:00 AM to 12:00 NN at the PAG-ASA Gymnasium of the Municipal Hall of Carranglan, Carranglan, Nueva Ecija.

The number of participants who attended the public hearing for Nueva Ecija was 88 (23 females and 65 males).

DATE & TIME	ATTENDEES	PARTICIPANTS		
		MALE	FEMALE	TOTAL
Nueva Vizcaya				
03 May 2023 (9:00AM – 12:00NN)	**Provincial Government of Nueva Vizcaya** • Provincial Environment and Natural Resources Office • Provincial Planning and Development Office • Provincial Engineering Office	3	0	**3**
	LGU Aritao • Municipal Engineer • MPDO Representative • MENRO • Municipal Administrator • PESO Manager • Municipal IPMR	5	3	**8**
	Barangay Canabuan, Aritao • Barangay Officials • Barangay IPMR • Non-Government Office • Indigenous People	6	5	**11**
	Barangay Canarem, Aritao • Barangay Officials • Sangguniang Kabataan (Youth)	7	3	**10**
	Barangay Beti 1. Barangay Officials	1	0	**1**
	LGU Santa Fe • Municipal Administrator • Municipal Planning and Development Coordinator • OIC- Municipal Engineer • MENRO • SB Members	8	0	**8**
	Barangay Canabuan, Santa Fe • Barangay Officials • Barangay IPMR • IP Elder/ Chieftain • Senior Citizens • Sangguniang Kabataan (Youth)	14	4	**18**
	Barangay Bantinan, Santa Fe • Barangay Officials	1	0	**1**
	Residents of Nueva Vizcaya	1	0	**1**
	Carranglan LGU	2	0	**2**
	DENR-EMB Central Office	2	1	**3**
	EIA Review Committee	1	0	**1**
	DENR-MGB Region II	1	5	**6**
	DENR-EMB Region II	1	0	**1**
	DENR-PENRO Nueva Vizcaya	1	0	**1**
	DENR-CENRO Aritao	1	0	**1**
	DPWH Representatives	4	0	**4**
	LCI (Local EIA Consultant)	4	0	**4**
	SUB-TOTAL	***63***	***21***	***84***
Nueva Ecija				
04 May 2023	**Provincial Government of Nueva Ecija** • Provincial Engineering Office	4	0	**4**

DATE & TIME	ATTENDEES	PARTICIPANTS		
		MALE	FEMALE	TOTAL
(9:00AM – 12:00NN)	• Provincial Environment and Natural Resources Office			
	LGU Carranglan • Municipal Mayor • Municipal Engineer • MENRO • Municipal Health Office Representative	5	1	**6**
	Barangay Bunga, Carranglan • Barangay Officials • Residents	9	3	**12**
	Barangay Burgos, Carranglan • Barangay Officials • Barangay IPMR • IP Elders • Zone Leaders	7	2	**9**
	Barangay Salazar, Carranglan • Barangay Officials • Sangguniang Kabataan (Youth) • Senior Citizens • People's Organization Representative/ IP • Residents	18	9	**27**
	Barangay RA Padilla, Carranglan • Barangay Official	1	0	**1**
	Residents of Nueva Ecija	4	2	**6**
	DENR-EMB Central Office	1	1	**2**
	EIA Review Committee	1	0	**1**
	DENR-EMB Region III	1	2	**3**
	DENR-PENRO Nueva Ecija	2	0	**2**
	DENR-CENRO Munoz	1	0	**1**
	NCIP- Nueva Ecija Provincial Office	3	2	**5**
	DPWH Representatives	4	1	**5**
	LCI (Local EIA Consultant)	4	0	**4**
	SUB-TOTAL	***65***	***23***	***88***
	TOTAL	**128**	**44**	**172**

The issues, concerns, and suggestions raised by the participants during the open forum and the corresponding responses of **DPWH**, and the EIA preparer were summarized below.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
A. NUEVA VIZCAYA		
Project Description		
What decommissioning and restoration plans are the proponent proposing? What plans does the proponent have for people who will lose their livelihood because of the project?	**Engr. Aries Valderama, OIC-Municipal Engineer, Santa Fe, NV**	**EIA Consultant:** To be clear, the study includes the different phases of the project which are pre-construction, construction, and operation phases.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
		Perhaps you mean demobilization after the construction phase rather than "decommissioning." The existence of temporary facilities in the area may provide the locals with a source of income. However, following construction, the demobilization and clearance of the temporary facilities will take place, leaving the residents without a source of income. This will be considered in our report. Compensation will be provided to those who may be displaced and/or lose their livelihoods as a result of the project's development. This will be expanded upon in a separate document titled Resettlement Action Plan and Right-of-Way Acquisition.
Could you perhaps clarify why the title of the project changed so abruptly?	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**EIA Consultant:** In 2021, we used the "Dalton Pass East Alternative Road Project" in all our presentations. However, in 2023, the project was included to the list of the new national government's flagship infrastructure programs, resulting in a name change to "Dalton Pass East Alignment Project." To accommodate the rapid shift, we revised all project-related documentation and reports.
Is the project classified as High Standard Highway 1 or 2?	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**DPWH (Engr. Ponce):** Regarding the category of the project, whether High Standard Highway 1 or 2, will be clarified in the Detailed Engineering Design of the project. **DPWH (Engr. Bulan):** The project is part of the High Standard Highway. The 23-kilometer length is constructed with a 60-meter road right of way and a speed limit of 60 kilometers per hour since these are the criteria for a High-Standard Highway (HSH). The main objective of this project is to have an alternate route for the existing Dalton Pass.
Will the OCC, operation and maintenance of the project be	**Mr. Edgardo Sabado,**	**DPWH (Engr. Bulan):**

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
outsourced/ contracted or handled directly by DPWH?	**Provincial Planning and Development Coordinator, NV**	Recently, JICA conducted a fact-finding mission for this project. Since we are still in the project preparation stage, these kinds of discussions or questions are still being finalized. The JICA team is presently assessing the capabilities of DPWH to manage the operations and maintenance of the project. This question will be addressed at the project evaluation stage because preliminary designs will be available during that time.
Does the project (tunnel) have emergency exits, particularly for usage during earthquakes or other emergencies?	**Mr. Jerry Tan, Assistant Provincial Engineer, NV**	**DPWH (Engr. Bulan):** The conceptual design of the project was shown in the audio-video presentation. During the project's operation, the Operation Control Center will ensure that the facility is equipped with safety features. The proposal includes two tunnels so that they may use the second tunnel to redirect traffic or as an evacuation place during crises. There are other emergency exits in the tunnels such as cross passages. CCTV cameras will be installed to monitor what is going on within the tunnels and other safety features such as lightings, ventilation and among others as presented in the video
Since the project is not yet in the DED phase, may we incorporate a service bay provision? May we also construct a platform where tourists may snap pictures outside the tunnel to encourage tourism?	**Representatives from Canabuan, Aritao**	**EIA Consultant:** This proposal has been taken into consideration. These will also be included in our documentation of this public hearing, as well as recommendations in the final report.
Land		
It will create a significant amount of garbage during the project. What are your plans for solid waste management? Is it feasible that the DPWH will build its own sanitary landfill?	**Forester John D. Simeon, MENRO, Santa Fe, NV**	**EIA Consultant:** Construction waste will be generated during the development of the project. As mentioned in the report, temporary facilities such as the Material Recovery Facility (MRFs) will be built. It is also mentioned that the contractor is

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
		obliged to coordinate with the municipality regarding how to dispose of the solid waste. **DPWH (EnP. Del Mundo):** Usually, the construction waste created throughout the development of the project is minimal. The volume of excavated soil will account for most of the waste. Excavated materials will be subjected to material/soil testing, if found suitable, DPWH will utilize these suitable materials as embankment for the road construction. The notion of building our own sanitary landfill will incur additional expenditures for the project. Rest assured that the volume of garbage created by the project will be disclosed in the plan.
What will your approach or alternative be if you come across critical flora and fauna during construction?	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**EIA Consultant:** For the Tree Cutting Permit, the proponent and CENRO will have their full inventory for the project. Flora and fauna found along the alignment will be documented. If the team comes across any critical flora or fauna, the CENRO guidelines for dealing with it shall apply. We will emphasize the recommended process and include it in the mitigation actions. In addition to this, we will update the institutional plan on how this will operate. **PENRO:** The procedure before we conduct construction is 100% inventory. We also have guidelines for replacement and rehabilitation. All species discovered along the alignment will be reported and submitted to the Undersecretary for Field Operations' Office.
Where will the trees that will be chopped down end up, and is it	**Hon. Ben Balalong, Punong Barangay,**	**PENRO:** There is a joint memorandum policy with DPWH regarding this. The

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
possible to request any of the cut down trees?	**Brgy. Canabuan, Santa Fe, NV**	chopped trees will be turned over to the bureau for suitable storage. Barangays may seek to use the trees, which must be approved by the DENR Office.
Water		
According to the presentation, the tunnel is rather lengthy. Will the tunnel construction have an impact on the water supply in the lowlands?	**Hon. Bautista, SB Member, Santa Fe NV**	**EIA Consultant:** During the initial discussions with the JICA Study Team, the effect of the project on the groundwater resource in the area was considered. A groundwater assessment was conducted to ensure that the project will not affect the existing water resource in the area. The results of the assessment were considered in designing the location or alignment of the tunnels.
Air		
How will the proponent meet the provided baseline (pre-construction) for noise during project operation? I suggest planting trees on the on-grade portion of the project as a natural noise barrier.	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**EIA Consultant:** We are now comparing the baseline noise data to the existing DENR Standards while taking into account the present usage of the site (residential, commercial, industrial, etc.). Once the project is completed, the existing usage of the site will be updated, and appropriate standards will be used to compare future monitoring results. Your idea to put trees as natural noise barriers will be considered further in the Detailed Engineering Design.
People		
Given that a portion of the project is in ancestral domain, why is NCIP not present? Some information in the presentation is not included or disclosed in our Memorandum of Agreement.	**Mr. Bayani Larosa, Municipal IPMR, Aritao NV**	**EIA Consultant:** We invited NCIP by sending the Public Hearing Notice and an invitation letter. For any further issues raised in our presentation, you can contact NCIP directly or request a special session with DPWH to address the IPs' concerns.
If a conflict arose within the ancestral domain, who would govern, the ancestral domain boundary or the political boundary?	**Mr. Bayani Larosa, Municipal IPMR, Aritao NV**	**EIA Consultant:** The MOA signed by DPWH and the IPs mentioned a Grievance Redress Mechanism for the project. The GRM

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		discusses how the team will resolve the IP issues. **DPWH (Engr. Bulan):** In addition, it was also mentioned in the GRM that if there is a concern or problem, it will be resolved first in the locality which is the IP Groups. If it is not resolved there, it will be escalated to the next level.
In case of emergencies within the tunnels, what are the protocols?	**Representatives from Nueva Vizcaya Provincial LGU**	**DPWH (Engr. Ponce):** Emergency responders, fire trucks, and a generator will be stationed near the tunnels during the operation phase of the project. **EIA Consultant:** For the OCC, we will highlight the importance of having good coordination with the LGUs.
Do we have a Memorandum of Agreement for recruiting laborers who prioritize affected households?	**Mr. June, Radio Aritao**	**DPWH (Engr. Ponce):** The DPWH already has a policy which mandates contractors to utilize local labor - 60% for unskilled workers and 40% for skilled labors. It is required that the applicant be qualified for the position.
Can we consider the IP First Policy while hiring workers?	**Mr. Bayani Larosa, Municipal IPMR, Aritao NV**	**EIA Consultant:** We will take note of this suggestion and will compare your suggestion to existing policies of DPWH. The context of the policy of DPWH is to hire people from the locality. If the IP community is located there, then you will also be prioritized. **DPWH (Engr. Ponce):** Regarding the suggestion on IP First Policy, it is better to coordinate with the barangay so that they will also be prioritized during hiring of workers for the project.
Regarding the IP First Policy recommendation, I believe it is preferable that the contractor collaborate with the PESO of the municipality. Because we have a collection of profiles of barangay	**Representatives from Santa Fe, Nueva Vizcaya**	The PH Officer took note of the suggestion.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
inhabitants that includes their skills in PESO.		
Highlight the application of RA 11291 or the Magna Carta of the Poor in the agreement with the IPs when recruiting workers.	**Representatives from Nueva Vizcaya Provincial LGU**	**EIA Consultant:** This is noted.
Others		
In the presentation, the MMT was only mentioned during the construction phase. What about the operation and maintenance of the project? Who will also monitor the mitigation measures during the operation phase of the project? I still propose to continue the operation of the MMT even after the construction to still monitor the project.	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**DENR-EMB:** For the MMT, if the validity of the ECC is continuous, MMT will be present. The termination of the MMT during the operation and maintenance phase will be requested. EMB will nevertheless assess the request. The affected municipalities will be a part of the MMT, and they will decide whether the MMT should continue to operate during the project's operating period. The MMT is distinct from the monitoring team of EMB. Hence, EMB will still monitor the project even if the MMT was discontinued or not. **EIA Consultant:** We will take note of all your suggestions. **DPWH (Engr. Ponce):** During the implementation of the project, DPWH and the Contractors are preparing an Environmental Compliance Report (monthly or semi-annually) to highlight our compliance with the conditions stated in the ECC.
B. NUEVA ECIJA		
Project Description		
May we request to discuss the project alignment again?	**Representatives from Nueva Ecija Provincial LGU**	Engr. Bulan (DPWH) discuss again the slides pertaining to the project alignment.
Land		
Structures and farmlands with land titles in Sitio Baratwill be directly affected by the road alignment. What benefits will they receive?	**Mr. Espino Bagsic, Brgy. Burgos, Carranglan, NE**	**DPWH (EnP. Del Mundo):** We have the Road-Right-of-way Acquisition Plan, and we will comply with RA 10752. Rest assured that DPWH will coordinate and compensate the affected land and structure owners.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
We propose modifying the alignment such that it will not directly affect our lands. We have a land title, but we were unable to register it again since it was designated within a protected area and ancestral domain. Will it have an impact on the amount of compensation we receive?	**Ms. Annaliza Inway, IP, Barangay Salazar**	**DPWH (Engr. Ponce):** We have a checklist of documents that the landowner must submit as proof of their authority over the land for them to be properly compensated provided that the lot owner will cooperate by showing/submitting on time the proof of ownership and other documentary requirements listed in the checklist for compensation based on law. **DENR-APASu (Mr. Udasco):** I think that this issue regarding the land within a protected area and ancestral domain can only be addressed by the NCIP. **DPWH (Engr. Bulan):** Since the land you were mentioning belongs to the CADT, the ownership of the land is under the CADT and not for an individual. According to RA 10752 and indicated in our MOA, if the project-affected land belongs to the CADT, the mode of payment mentioned in the Road-Right-of-way Acquisition is easement mode of acquisition. This means that the land will be priced based on the BIR Zonal Value and the payment will be given to the CADT. If the land is not part of a CADT, current market value will prevail.
Water		
This module received no comments.		
Air		
This module received no comments.		
People		
What are the proponent's plans for those who were not listed to the project-affected persons during our first list consolidation?	**Resident from Brgy. Bunga**	**DPWH (Engr. Ponce and EnP. Del Mundo):** We will update the master list of the project-affected individuals as of the FS stage. Hence, for those who are not listed in the master list per FS stage, they will be included in the final RAP updating and validation during the DED stage. Moreover, there is a 'cut-off' date wherein it will determine who will be included in the final master list of PAPs.

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Is it also on the proponent's agenda to provide TESDA training to IPs in order to prepare them for prospective project work?	**Ms. Annaliza Inway, IP, Barangay Salazar**	**DPWH (Engr. Bulan):** We will coordinate with the LGUs in providing the skills training. The RAP also discussed the provision of providing livelihood to those who will lose their livelihood because of the project.
Others		
Is it still possible to change the MOA to incorporate new conditions?	**Hon. Andres Bucasan, Punong Barangay, Salazar, Carranglan NE**	**DPWH (Engr. Bulan):** If the IPs offer modifications, we encourage that they communicate first with the NCIP to make such changes since we are all aware that the MOA is signed among NCIP, DPWH, and ICCs/IPs representatives. For NCIP to assess and evaluate your request. Following that, you can share your concerns with DPWH.
Is the project's provided EIS part of the feasibility study mentioned in the Resolution with DPWH?	**Mr. Leonardo Udasco, APASu DENR-CENRO Munoz/ DENR- PAMB PCWFR**	**EIA Consultant:** This EIA Study is part of the resolution you mentioned, together with the RAP and the IPP.
As previously stated, there will be a spoil zone. Is it located in a protected area?	**Mr. Leonardo Udasco, APASu DENR-CENRO Munoz/ DENR- PAMB PCWFR**	**EIA Consultant:** The spoils area is part of the tunnel area. Probably, it is within the CADT areas and PCWFR. However, the location of the spoils area is still subjected to finalization.
After reviewing the conducted studies for the project, we can certify that the proponent properly researched the proposal and its environmental impact. We encourage everyone to voice their opinion through their representatives so their opinions can be heard.	**Mr. Leonardo Udasco, APASu DENR-CENRO Munoz/ DENR- PAMB PCWFR**	The PH Officer and the EIA preparers took note of the statements.
I encourage my fellow Carranglan and Nueva Ecija citizens to embrace and support the project since it will bring us forward.	**Engr. Bernardo, Municipal Engineer, Carranglan NE**	The PH Officer and the EIA preparers took note of the statement.

EIA SUMMARY

Summary of Alternatives

The following is the presentation of the evaluation of the alternatives in determining the best alignment to be implemented for the proposed project. The criteria were as follow: (1) Planning

and Construction Technology, (2) Natural Environment, (3) Social Environment, and (4) Economy.

From this comparative table, ALT-D earned the highest score and was chosen to undergo further studies and be implemented accordingly.

NO.	PRIMARY CRITERIA	SECONDARY CRITERIA	SCORE ALLOCATION	ALT-A	ALT- B	ALT-C	ALT-D
1.1	Planning and Construction Technology (60)	Road Length (m)	10	26,730m	24,790m	22,420m	23,260m
				8.40	9.00	10.00	9.60
1.2		Construction Technology (The construction technologies required for tunnels, bridges, and earthworks)	10	High technologies are required.	High technologies are required.	High technologies are not required.	High technologies are not required.
				5	6	8	9
1.3		Construction Period	10	36months	36months	50months	41months
				10.00	10.00	7.20	8.80
1.4		Strength against disasters (Distance through high-risk ground)	10	4,002m	4,545m	2,408m	1,958m
				4.89	4.31	8.13	10.00
1.5		Operation / Maintenance (Ease of regular maintenance (Length of each road structure)	5	3.80 Earth work:19,027m Bridge:3,934m Tunnel:3,650m	2.65 Earth work:15,585m Bridge:4,100m Tunnel:4,980m	3.63 Earth work:11,678m Bridge:3,240m Tunnel:7,380m	3.93 Earth work:13,759m Bridge:3,500m Tunnel:5,880m
1.6		Construction Costs	15	39,846 million Yen	42,018 million Yen	43,242 million Yen	40,668 million Yen
				15.00	14.22	13.82	14.70
1.7		**Sub-total**	**60**	**47.09**	**46.18**	**50.78**	**56.03**
2.1	Natural Environment (15)	Pollution Control (Estimated negative impacts of air quality, noise, water quality and wastes)	6	5.40 Air quality, noise:1.68 Water quality:1.72 Wastes:2.00	4.32 Air quality, noise:1.80 Water quality:1.06 Wastes:1.46	4.94 Air quality, noise:2.00 Water quality:2.00 Wastes:0.94	4.98 Air quality, noise:1.92 Water quality:1.82 Wastes:1.24
2.2		Protected Areas (Distance through the protected areas)	4	14.52km	13.77km	11.47km	12.02km
				3.16	3.32	4.00	3.80
2.3		Ecosystem (Total road distance)	5	26.73km	24.79km	22.42km	23.26km
				4.20	4.50	5.00	4.80
		Sub-total	**15**	**12.76**	**12.14**	**13.94**	**13.58**
3.1	Social Environment (15)	Land Acquisition / Resettlement (Areas of required land)	7	160.6ha	148.9ha	134.7ha	139.5ha
				5.87	6.33	7.00	6.76
3.2		Indigenous Peoples	8	4.2km	4.0km	4.7km	5.5km
				7.60	8.00	6.80	5.84

NO.	PRIMARY CRITERIA	SECONDARY CRITERIA	SCORE ALLOCATION	ALT-A	ALT- B	ALT-C	ALT-D
		(Distance through the ADs)					
		Sub-total	**15**	**13.47**	**14.33**	**13.80**	**12.60**
4.1	Economy (10)	Economic Feasibility (EIRR)	10	13.55%	13.45%	13.63%	14.03%
				6.00	4.00	8.00	10.00
Total			**100**	**79.32**	**76.65**	**86.52**	**92.21**

Source: JICA Study Team

No Project Option. If the proposed project is not implemented, the following issues and negative impacts are expected to continue:

- **Natural hazards.** Dalton Pass is extremely vulnerable to natural disasters and is often closed by earthquakes. Natural disasters such as typhoons frequently cause road closures, including the long-term suspension of traffic caused by the 1990 Baguio Earthquake. There is a high risk of earthquakes around the Dalton Pass, and there is a concern that the earthquake may cause long-term suspension of traffic and increase the suspension of traffic due to a typhoon disaster.

- **Lack of alternative route.** In case that the existing Dalton Pass is closed, there is no detour around it, and a very long detour is forced. (Approximately 350 km, 7 hours increase (according to the 2011 METI survey))

- The Dalton Pass is the only arterial road connecting Metro Manila and northern Luzon and is the key to transportation and logistics to Metro Manila. If the above issues are not solved, it will take time to pass the pass section. In addition, if a road is closed due to a natural disaster such as an earthquake or typhoon, a road collapse such as a falling rock or a debris flow, or a direct accident such as a traffic accident, emergency transportation and material transportation will be affected, and the areas will be isolated. Residents along the route and in northern Luzon have long awaited action.

- **Traffic condition.** Since the Dalton Pass is a mountain road, the hairpin curve is continuous, and the vertical gradient is steep. Because the traveling speed of large vehicles and trailers drops to about 10 km per hour and the following vehicles are forced to follow this, vehicles cannot secure a sufficient traveling speed. Due to severe alignment, traffic accidents including fatal accidents occur frequently. (In 2017, 541 accidents occurred on the Dalton Pass (including 21 fatal accidents and 118 severe accidents). The traffic volume in 2019 is 9,350 passenger car unit per day and has already reached to capacity.

- **Road conditions.** The road conditions in the eastern area (including the residential area of the indigenous peoples) of the Dalton Pass, where the project is planned, are extremely poor, and traveling in the rainy season is extremely difficult. The situation of relying on unpaved roads and river crossings by vehicles makes traveling difficult especially during the rainy season.

- From the above, it is difficult for the Philippine Government to adopt an option that does not implement an alternative road project that is resistant to disasters and has excellent runnability.

Key Findings of the Environmental Baseline Studies

The findings of the environmental baseline studies conducted for each of the four EIA modules are summarized in the following:

SUMMARY OF BASELINE FINDINGS ON LAND:

- **Land Use and Classification**
  - The proposed project alignment falls within agricultural areas, forestland, and open spaces.
  - Portions of the proposed project fall within the Pantabangan-Carranglan Watersed Forest Reserve (PCWFR).
  - The proposed project alignment is not within Mines and Geosciences Bureau-identified mineral lands.
  - The proposed project alignment will traverse two Ancestral Domains (ADs): the Kalanguya-Ikalahan Indigenous Cultural Communities (ICCs) in Nueva Vizcaya and the Kalanguya ICCs in Nueva Ecija.
- **Geology/Geomorphology**
  - Significant changes on the surface landform, geomorphology, topography, terrain, and slope of the proposed project site are not expected given the proposed project designs.
  - The proposed project site is susceptible to earthquakes, liquefaction, landslides, and flooding.
- **Terrestrial Ecology**
  - Under the IUCN, only one species is considered as highly threatened with endangered (EN) status which is Narra. However, Narra can still be found in many places in the Philippines. Also, it is one of the main species in reforestation activities, hence, listed as VU species and not as a highly threatened species in the country.
  - Under DAO 2017-11, aside from Narra, four other species were identified as vulnerable (VU) and one as Other Threatened Species (OTS). The vulnerable species in the area were Almon (*Shorea almon*), Red lauan (*Shorea negrosensis*), Malakmalak (*Palaquium philippense*), and Tagbak (*Alpinia elegans*). On the other hand, Gakakan (*Drypetes falcata*) was identified under the OTS.
  - During the wet season sampling, there are six fauna species under the updated list of threatened Philippine fauna species. One Critically Endangered (Amethyst Brown Dove), one Endangered (Philippine Deer), two Vulnerable (Wild Boar and Philippine Duck) and two species are under the Other Threatened Species category (Gecko and Python).
  - Under the DENR AO 2019-09, only two of the recorded species are included in the updated list of threatened Philippine fauna species during the wet season sampling. These are the Indigo Banded King Fisher (*Ceyx cyanopectus*) which is Critically Endangered, and the Gecko/Tokay (*Gecko gecko*) which is under the Other Threatened Species (OTS) category.

SUMMARY OF BASELINE FINDINGS ON WATER:

- **Competition in Water Use**
  - According to the list of water permittees of the National Water Resources Board (NWRB), there are no known water permittees near the proposed project alignment.
  - Depletion of water resources is not expected to result from the proposed project given its minimal water supply requirement.
  - There are no springs and groundwater sources found in the tunnel area.
- **Water Quality**
  - All parameters are within the general effluent standards (GES), except for fecal coliform in GW 1 may be due to extrusion of contaminants in the pipelines.
  - All parameters are within the GES, except for fecal coliform may be due to possible wastes upstream of river caused by agricultural activities (i.e., farming) and oil and grease in GW 9 due to presence of anthropogenic activities in the area.
- **Freshwater Ecology**
  - No macroinvertebrates or fish species of any significant value were identified in the survey The project site and its immediate surroundings do not currently support diverse or abundant aquatic ecological values, with very limited significant macroinvertebrate or fish species identified.

SUMMARY OF BASELINE FINDINGS ON AIR:

- **Meteorology**
  - The proposed project site mainly belongs to Type III climate under the modified Coronas classification in which seasons are no very pronounced: dry from November to April and wet the rest of the year.
  - Rainfall is highest in August and lowest in January.
  - The surface wind in the area is south and northeast. The south direction visits from May to September while the northeast comes during the months of November to February.
  - An average of 2 cyclones passes by every year.
- **Ambient Air Quality, Noise and Vibration**
  - Results of ambient air quality monitoring in all stations are within DENR standards.
  - The level of noise at almost all monitoring stations were above the maximum allowable level. This can be attributed to the intermittent peaks of vehicles passing by the monitoring station such as trucks, motorcycles/tricycles and all sorts of vehicles.
  - It can be observed that in most stations, vibration is higher during daytime as compared to the nighttime. But none of the stations exceeded the preferred vibration level stated in BS 6472-1992 for residences and offices.

SUMMARY OF BASELINE FINDINGS ON PEOPLE:

- Based on the 2020 PSA Census, Aritao has a total population of 42,197; Santa Fe has a total population of 18,276; and Carranglan has a total population of 42,420.
- The proposed project is within the Kalanguya Ikalahan and Kalanguya ADs. An Indigenous Peoples Plan (IPP) is currently being prepared by DPWH for the said ICCs/ADs.
- Right-of-Way Acquisition Plan (RAP) will be implemented for identified PAFs and ICCs located within the proposed project alignment and RRoW.
- Electricity in the project area is supplied by NUVELCO (Aritao and Santa Fe) and NEECO-II (Carranglan).
- Water supply is provided by LGUs (Level II & III) and BLGUs (Level II) in the municipalities of Aritao, Santa Fe, and Carranglan.
- There are no water rights permit holders (surface and groundwater) near the project alignment.
- In In terms of COVID-19 situation, there were a total of 22,861 cases in Nueva Vizcaya and 43,368 cases in Nueva Ecija.
- Half of the respondents from the direct and indirect impact areas were aware of the proposed project. Most of them knew about the proposed project from municipal and barangay officials.
- Around (58.59%) of the respondents perceived that the proposed project is beneficial. Only (4.58%) of the respondents mentioned that the project is detrimental.
- Increase in job, business, and economic activities were the most cited benefits that the proposed project will bring.

INTEGRATED SUMMARY OF IMPACTS AND RESIDUAL EFFECTS AFTER MITIGATION

The main project impacts of the proposed Project for each environmental component are summarized in the following table.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
A. PRE-CONSTRUCTION PHASE				
Acquisition of applicable permits and licenses	The People	Disclosure of project components and activities	▪ Submission of complete requirements for processing of all permits.	100% compliance to all applicable required permits and clearances.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
Local sourcing of labor	The People	Employment opportunities	▪ Priority hiring within the project affected barangays. ▪ Local labor requirement to be announced and posted in the barangay halls and public areas.	100% compliance with local policy on hiring of workers.
Land acquisition for the proposed road-right-of-way (RRoW)	The People	Involuntary resettlement of households and establishments	▪ Preparation and implementation of Right-of-Way Acquisition Plan (RAP). ▪ Provision of compensation to affected households based on RA No. 10752. and DPWH DO No. 152 series of 2017. ▪ Coordinate with the barangay LGUs.	100% implementation of RAP.
Effects to indigenous cultural communities (ICCs)	The People	Involuntary resettlement of IP households	▪ Preparation and implementation of RAP. ▪ Provision of compensation to affected households based on RA No. 10752 and Enforcement of the conditions in the Memorandum of Agreement (MOA) and Certification Precondition (CP). ▪ Preparation and implementation of Indigenous Peoples Plan (IPP).	100% implementation of RAP.
Clearing and demolition activities in the proposed RRoW	The Land, The Water, The People	Improper management of construction wastes and other solid wastes which may lead to soil contamination, contamination of nearby water bodies, potential health risks and may induce flooding due to clogging of drainage.	▪ Implementation of the solid waste management program by the contractor. ▪ Regular transport of construction debris and other solid waste in the approved designated area by the DENR. ▪ Provision of waste storage area within the site. ▪ Reuse and recycle demolished structures or facilities, whenever applicable.	100% compliance to RA 9003.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
	The Land	Ground vibration	▪ Apply non-vibration techniques during construction, if possible. ▪ Notify nearby residents about use of heavy equipment. ▪ For hauling trucks, comply with road weight limit standards to avoid ground vibration. ▪ Regular monitoring of ground vibration within the project sites.	Ground vibration will not be a nuisance to nearby residents. No complaints from nearby community.
	Terrestrial Ecology	Clearing of vegetation in the proposed site	▪ Apply for a tree cutting permit. ▪ Adherence to JMC 2014-01 to replace each tree to be cut with 100 seedlings/ saplings/ propagules. ▪ Limit clearing to the proposed footprint of facilities to avoid unnecessary vegetation and habitat removal. ▪ Off-setting of lost vegetation through rehabilitation of adjacent and suitable planting areas.	100% compliance to TCP conditions
	The Air, The People	Generation of dust which may pose health hazards	▪ Regular watering of construction site. ▪ Implement dust control management. ▪ Proper PPEs to workers.	Results of ambient air monitoring are within DAO 2000-81.
	The Air	Generation of air emissions and noise	▪ Regular maintenance of heavy equipment. ▪ Perform noisy activities during daytime.	Results of ambient noise monitoring is within the applicable standards.
	The People	Traffic congestion	▪ Provide early warning devices/road signs. ▪ Implement Traffic Management Plan. ▪ Coordinate with the barangay LGUs.	100% implementation of traffic management plan.
B. CONSTRUCTION PHASE				
Road Construction	The Land	Accumulation of construction debris and other solid waste	▪ Implementation of the solid waste management program by the contractor.	100% compliance to RA 9003.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
			▪ Regular transport of construction debris and other solid waste in the approved designated area by the DENR.	
	The Land	Generation of hazardous wastes	▪ Collect, store, and dispose of hazardous wastes in accordance with RA 6969. ▪ Treatment and dispose of hazardous wastes through DENR-accredited waste treaters.	100% compliance to RA 6969.
	The Land	Damages on trees and other vegetation	▪ Ensure construction activities to be within the project footprint. ▪ Confine movement activities in cleared areas only.	-
	Terrestrial fauna	Wildlife displacement due to dust and noise pollution	▪ Operation of high noise-emitting tunneling equipment must be scheduled to prevent unnecessary noise and dust accumulation. ▪ Regular water sprinkling to minimize dust resuspension. ▪ Schedule drilling activities in accordance with the migration and breeding schedule of birds. Activities that will generate high level noise should not coincide with the breeding season of birds.	Results of ambient noise monitoring is within the applicable standards. Results of ambient air monitoring are within DAO 2000-81.
	The Water	Possible siltation and surface runoff in nearby bodies of water Possible clogging of drainage due to siltation	▪ Establishment of mitigation measures such as sediment traps, erosion barriers, and silt curtains. ▪ Regular removal of silt and sediments.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.
	Aquatic ecology	Erosion of sediment and silt can increase water turbidity and significantly decrease light penetration, thereby reducing	▪ Stockpiles should be bundled or covered especially during heavy rains which can potentially erode and carry sediments to rivers and creeks.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
		the quantity of light available for phytoplankton and overall primary productivity, further leading to decrease in zooplankton abundance	▪ If possible, construction activities should be scheduled during the dry or summer months to avoid downpour of heavy rain which can potentially erode and deposit sediment and silt to the immediate marine and freshwater environment.	
	Aquatic ecology	Pollution from domestic wastes may generally decrease the frequency and abundances of phytoplankton, zooplankton, and soft-bottom animals	▪ Implement proper segregation, re-use, recycle and disposal. ▪ Adequate number of garbage bins and containers should be strategically located at all construction sites. ▪ Prompt and regular collection of wastes as well as removal of non-recyclable wastes from the site ▪ Natural organic debris should be gathered and disposed of in a designated area away from the rivers and other waterbodies.	100% compliance to RA 9003.
	The Air, The People	Generation of dust which may pose health hazards	▪ Minimization of unnecessary earth-movement. ▪ Regularly water construction sites that will generate dust. ▪ Avoid long exposure of excavated soil piles to strong winds by applying canvas covers. ▪ Proper PPEs to workers.	100% compliance to RA 9003.
Bridge Construction	The Land	Accumulation of construction debris and other solid waste	▪ Implementation of the solid waste management program by the contractor ▪ Regular transport of construction debris and other solid waste in the approved designated area by the DENR.	100% compliance to RA 9003.
	The Land	Generation of hazardous wastes	▪ Collect, store, and dispose hazardous wastes in accordance with RA 6969.	100% compliance to RA 6969.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
			▪ Treatment and dispose of hazardous wastes through DENR-accredited waste treaters.	
	The Land	Damages on trees and other vegetation	▪ Ensure construction activities to be within the project footprint. ▪ Confine movement activities in cleared areas only.	-
	Terrestrial fauna	Wildlife displacement due to dust and noise pollution	▪ Operation of high noise-emitting tunneling equipment must be scheduled to prevent unnecessary noise and dust accumulation. ▪ Regular water sprinkling to minimize dust resuspension. ▪ Schedule drilling activities in accordance with the migration and breeding schedule of birds. Activities that will generate high level noise should not coincide with the breeding season of birds.	Results of ambient noise monitoring is within the applicable standards. Results of ambient air monitoring are within DAO 2000-81.
	The Water	Possible siltation and surface runoff in nearby bodies of water	▪ Establishment of mitigation measures such as sediment traps erosion barriers, and silt curtains ▪ Regular removal of silt and sediments	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.
	Aquatic ecology	Erosion of sediment and silt can increase water turbidity and significantly decrease light penetration, thereby reducing the quantity of light available for phytoplankton and overall primary productivity, further leading to decrease in zooplankton abundance	▪ Stockpiles should be bundled or covered especially during heavy rains which can potentially erode and carry sediments to the rivers and other waterbodies. ▪ If possible, construction activities should be scheduled during the dry or summer months to avoid downpour of heavy rain which can potentially erode and deposit sediment and silt to the immediate marine and freshwater environment.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
	Aquatic ecology	Pollution from domestic wastes may generally decrease the frequency and abundances of phytoplankton, zooplankton, and soft-bottom animals	▪ Implement proper segregation, re-use, recycle and disposal. ▪ Adequate number of garbage bins and containers should be strategically located at all construction sites. ▪ Prompt and regular collection of wastes as well as removal of non-recyclable wastes from the site. ▪ Natural organic debris should be gathered and disposed of in a designated area away from the rivers and other waterbodies.	100% compliance to RA 9003.
	The Air, The People	Generation of dust which may pose health hazards	▪ Minimization of unnecessary earth-movement. ▪ Regularly water construction sites that will generate dust. ▪ Avoid long exposure of excavated soil piles to strong winds by applying canvas covers. ▪ Proper PPEs to workers.	100% compliance to RA 9003.
Tunnel Construction	The Land	Accumulation of construction debris and other solid waste	▪ Implementation of the solid waste management program by the contractor. ▪ Regular transport of construction debris and other solid waste in the approved designated area by the DENR.	100% compliance to RA 9003.
	The Land	Generation of hazardous wastes	▪ Collect, store, and dispose of hazardous wastes in accordance with RA 6969. ▪ Treatment and dispose of hazardous wastes through DENR-accredited waste treaters.	100% compliance to RA 6969.
	The Water	Possible siltation and surface runoff in nearby bodies of water	▪ Establishment of mitigation measures such as sediment traps, erosion barriers, and silt curtains.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
			▪ Regular removal of silt and sediments.	
	The Air, The People	Generation of dust which may pose health hazards	▪ Minimization of unnecessary earth-movement. ▪ Regularly water construction sites that will generate dust. ▪ Avoid long exposure of excavated soil piles to strong winds by applying canvas covers. ▪ Proper PPEs to workers.	100% compliance to RA 9003.
Earthwork activities (tunneling, excavation)	The Land	Alteration of topography Possible slope failure, ground subsidence or landslide during tunneling activities	▪ Application of excavating techniques giving few or no impacts on landslide and surface conditions. ▪ Application of proper reinforcement of excavation and tunneling sections. ▪ Implementation of construction management plan and best engineering practices.	Ground vibration will not be a nuisance to nearby residents. No complaints from nearby community.
	The Land	Generation of excavated soil	▪ Provision of temporary storage on-site ▪ Regularly haul excavated soil ▪ Reuse excavated soil as backfill	-
	The Water	Potential impact on groundwater level and groundwater quality	▪ Implementation of best engineering practices during construction. ▪ Installation of monitoring wells.	-
	The Water	Possible siltation and surface runoff	▪ Establishment of mitigation measures such as sediment traps, erosion barriers, and silt curtains. ▪ Regular removal of silt and sediments.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.
	The Air	Generation of Air Emissions and Noise	▪ Regular maintenance of heavy equipment. ▪ Perform noisy activities during daytime. ▪ Maintain green zone (existing vegetation surrounding the project site) to serve as natural noise barrier and/or install	Results of ambient noise monitoring is within the applicable standards.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
			a purpose-built barrier around the construction site.	
	The Air	Generation of dust	▪ Minimization of unnecessary earth-movement. ▪ Regularly water construction sites that will generate dust. ▪ Avoid long exposure of excavated soil piles to strong winds by applying canvas covers.	-
	The People	Traffic congestion	▪ Provide early warning devices/road signs. ▪ Implementation of traffic management plan. ▪ Provide parking spaces within project site. ▪ Coordinate with barangay LGU.	100% implementation of traffic management plan.
	The People	Possible damage of nearby properties due to ground vibration during tunneling activities	▪ Apply non-vibration and/or vibration-avoiding techniques during construction, if possible. ▪ Notify nearby residents about use of heavy equipment. ▪ Regularly monitor vibrations. ▪ For hauling trucks, comply with road weight limit standards to avoid ground vibration.	Ground vibration will not be a nuisance to nearby residents. No complaints from nearby community.
Use of heavy equipment, during construction works	The Land	Ground vibration	▪ Apply non-vibration and/or vibration-avoiding techniques during construction, if possible. ▪ Notify nearby residents about use of heavy equipment. ▪ Regularly monitor vibrations. ▪ For hauling trucks, comply with road weight limit standards to avoid ground vibration.	Ground vibration will not be a nuisance to nearby residents. No complaints from nearby community.
	The Land, The Water	Accidental oil spills/leaks which may cause soil contamination and contamination of	▪ Use sawdust, rice hulls, or coir dusts to absorb the oil spills. ▪ Implement oil spill management plan.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
		nearby water bodies	▪ Maintain canal in the maintenance and repair area of vehicles and equipment.	
	The Air	Generation of air emissions and noise	▪ Regular maintenance of heavy equipment. ▪ Perform noisy activities during daytime ▪ Maintain green zone (existing vegetation surrounding the project site). to serve as natural noise barrier and/or install a purpose-built barrier around the construction site.	Ambient noise is within the applicable standards.
	The People	Traffic congestion	▪ Provide early warning devices/road signs ▪ Implement traffic management plan ▪ Provide parking spaces within project site	100% implementation of traffic management plan.
Influx of workers	The Land	Generation of solid waste	▪ Implement solid waste management plan ▪ Hauling of discarded items by accredited haulers	100% compliance to RA 9003.
	The Water	Ground and coastal water contamination from improper disposal of domestic wastewater	▪ Provision of sanitation facilities for workers (e.g. toilets, showers, etc.) ▪ Follow basic housekeeping policies	1 toilet for every 25 male workers and 1 toilet for every 20 female workers.
	The People	Occupational health and safety	▪ Proper training on construction safety ▪ Provision of PPE. ▪ Proper supervision by trained professionals during construction activities. ▪ Implementation of Occupational Health and Safety Policy.	-
	The People	Employment opportunities	▪ Priority in hiring should be given to residents of host communities.	-
C. OPERATION PHASE				
-	The Land	Generation of solid waste	▪ Implement solid waste management plan. ▪ Provision of interim solid waste storage area in the	100% compliance to RA 9003.

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY
			intake and drainage facility.	
	The Water	Generation of wastewater from cleaning of the facilities	▪ Provision of sedimentation ponds outside the tunnel areas. ▪ Regular desilting of sedimentation ponds. ▪ Collected sediments must be disposed in the designated disposal site.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.
	The Air	Generation of road traffic noise	▪ Installation of sound insulation measures in the guardrails and fences.	-
	The People	Occupational health and safety	▪ Proper training on construction safety. ▪ Provision of PPE. ▪ Proper supervision by trained professionals during construction activities. ▪ Implementation of Occupational Health and Safety Policy.	-
	The People	Road safety	▪ Safety measures in road design, guardrails, and road markings.	-
D. ABANDONMENT PHASE				
Pull-out of equipment	The Air	Generation of air emissions and nose	▪ Regular maintenance of heavy equipment. ▪ Perform decommissioning during daytime.	-
Abandonment of offices and other facilities	The People	Abandonment of facilities	▪ Possible donation to LGU.	-
Termination of employment	The People	Loss of employment	▪ Provide 6 months' notice of impending termination of employment. ▪ Provide compensation to affected personnel. ▪ Provide training of personnel in preparation for other jobs.	-

RISKS AND UNCERTAINTIES

Risks and uncertainties identified relating to the EIA findings of for each environmental component are summarized in the following table.

MODULE	RISKS AND UNCERTAINTIES	IMPLICATION ON DECISION MAKING
Land/People/Water	Structural failure of project components (i.e., roads, tunnels, and bridges)	▪ Consider redundancy and best engineering design available in the implementation of the tunnel construction, operations, and maintenance. ▪ Consider earthquake and landslides in the design of the project components.
People	Accidents that may occur in the roads, bridges, and tunnel	▪ Ensure provision of traffic signages. ▪ Development and strict implementation of the tunnel control operations procedures. ▪ Conduct continuous monitoring, especially in the tunnel sections. ▪ Provision of emergency communications and services. ▪ Coordination with local authorities during emergency situations.

SECTION 1

PROJECT DESCRIPTION

[1]The Department of Public Works and Highways (DPWH), through the assistance of Japan International Cooperation Agency (JICA), will be developing the Dalton Pass East Alignment Road (DPEAR) Project in the Provinces of Nueva Vizcaya & Nueva Ecija.

[2]The basic objective of this project is to construct a bypass road that includes but not limited to roads, bridges, tunnels and slope protection works, that will serve as an alternate route bypassing the existing Dalton Pass Section along Pan-Philippine Highway (PPH) in the event of road closure brought about by calamities/natural disasters such as typhoons and earthquakes, thereby directly connecting the Cagayan Valley Region (Region II) and eastern part of Central Luzon Region (Region III) to the National Capital Region (NCR).

[3]The realization of this project will ensure the fast, continuous, and safer connectivity and transport of people, goods, and services from Regions II and III to the mainstreams and lifeline economic activities of the country as well as support agricultural, commercial, industrial, tourism, and other socio-economic activities within the project road's influence area thereby helps in uplifting the Philippine's economic growth.

[4]As enshrined in the Executive Order No. 292 Series of 1987, Book IV, Title V, Chapter I, DPWH is the Philippine Government's engineering and construction arm tasked to continuously develop its technology, for the purposes of ensuring the safety of all infrastructure facilities and securing for all public works and highways the highest efficiency and the most appropriate quality in construction.

[5]The planning, design, construction and maintenance of infrastructure facilities, especially national highways, flood control and water resources development of systems, and other public works in accordance with national development objectives, shall be the responsibility of DPWH.

[6]The state has accorded DPWH powers and functions to carry out its mandate, relative to the proposed project:

(1) Provide technical services for the planning, design, construction, maintenance, or operation of infrastructure facilities;

(2) Develop and implement effective codes, standards, and reasonable guidelines to ensure the safety of all public and private structures in the country and assure efficiency and proper quality in the construction of public works;

(3) Ascertain that all public works plans, and project implementation designs are consistent with current standards and guidelines;

(4) Identify, plan, secure funding for, program, design, construct or undertake prequalification, bidding, and award of contracts of public works projects with the exception only of specialized projects undertaken by Government corporate entities with established technical capability and as directed by the President of the Philippines or as provided by law;

(5) Provide the works supervision function for all public works constructions and ensure that actual construction is done in accordance with approved government plans and specifications;

(6) Maintain or cause to be maintained all highways, flood control, and other public works throughout the country except those that are the responsibility of other agencies as directed by the President of the Philippines or as provided by law; and

(7) Perform such other functions as may be provided by law.

[7]DPWH has managed to secure Certification Preconditions (CPs) from the 2 Ancestral Domains (AD)s that the proposed project will traverse, as well as the Protected Areas Management Board (PAMB) Certification to conduct its feasibility study within Pantabangan-Carranglan Watershed Forest Reserve.

[8]**Table 1-1** provided some basic information regarding the proposed project, the Proponent, and the Environmental Impact Assessment (EIA) preparer.

Table 1-1: Basic Information on the Proposed Project, Proponent, and EIA Preparer

Project Name	**Dalton Pass East Alignment Road Project**		
Project Location	**Province**	**Municipality**	**Barangay**
	Nueva Vizcaya (Region II)	Santa Fe	Canabuan
		Aritao	Canabuan Canarem
	Nueva Ecija (Region III)	Carranglan	Bunga Burgos Salazar
	Component	**Municipality**	**Barangay**
	Road (Highway)	All Municipalities	All Barangays
	North Tunnel	Santa Fe Carranglan	Canabuan Salazar
	South Tunnel	Carranglan	Burgos
	Bridge	Aritao Santa Fe Carranglan	Canabuan Canabuan Salazar Burgos
Project Type *(According to DENR MC 2014-15)*	3.4.1 Roads New Construction & 3.4.7 Tunnel and Sub-grade Roads and Railways		
Project Size/Capacity	**Road (Highway)**	**Total Length: ~23 km** Lane: 4 lanes Design Speed: 60 km/hr. Width: 60 m ROW	
	Tunnel	**Total Length: ~6.1 km** Length of the North Tunnel: 4.5 km Length of the South Tunnel: 1.6 km Construction of lighting, ventilation, and emergency facilities	
	Bridge	**Total Number: 14** Passage for rivers and creeks Slope protection is included	
Project Proponent	**Department of Public Works and Highways** **Roads Management Cluster I (Bilateral)** **Unified Project Management Office** Office Address: PJHL Building, NCR Compound-DPWH, 2nd Street,		

	Port Area, Manila Tel. No.: (02) 8304-3901 Authorized Representative: **Emil K. Sadain** Senior Undersecretary
EIA Preparer	**LCI Envi Corporation** Office Address: Unit 8L-M, Future Point Plaza 3, 111 Panay Avenue, South Triangle, Quezon City Tel. No.: (02) 8652-5890 / Fax No.: (02) 8961-9226 Authorized Representative: **Engr. Jose Marie U. Lim** EIA Team Leader

1.1 PROJECT LOCATION AND AREA

1.1.1 Project Location

[9]The proposed alignment of the DPEAR Project will traverse the Municipalities of Santa Fe and Aritao in Nueva Vizcaya and the Municipality of Carranglan in Nueva Ecija. The political and administrative jurisdictions encompassing the proposed alignment are found in **Table 1-2**.

Table 1-2: Project Location

PROVINCE	MUNICIPALITY	BARANGAY
Nueva Vizcaya (Region II)	Santa Fe	Canabuan
	Aritao	Canabuan Canarem
Nueva Ecija (Region III)	Carranglan	Bunga Burgos Salazar
COMPONENT	**MUNICIPALITY**	**BARANGAY**
Road (Highway)	All Municipalities	All Barangays
North Tunnel	Santa Fe Carranglan	Canabuan Salazar
South Tunnel	Carranglan	Burgos
Bridge	Aritao Santa Fe Carranglan	Canabuan Canabuan Salazar Burgos

[10]In addition, the portions of the proposed project are within the Certificate of Ancestral Domain Title (CADT) areas of the Kalanguya Ikalahan Indigenous Cultural Communities (ICCs) in Nueva Vizcaya and Kalanguya ICCs in Nueva Ecija.

[11]The general location map of the proposed project is shown in **Figure 1-1**, while the latest aerial photograph of the project area, taken last 24 October 2021, is shown in **Figure 1-2** to **Figure 1-5**.

[12]The geographic coordinates defining the road-right-of-way (RRoW) of the proposed project is presented in **Table 1-3**.

Table 1-3: Geographic Coordinates of the Proposed Project

STATION	LATITUDE (N)	LONGITUDE (E)
START OF DPEAR PROJECT ALIGNMENT		
0+000	16° 0'34.85"N	121° 2'44.58"E
0+100	16° 0'38.01"N	121° 2'45.40"E
0+200	16° 0'41.16"N	121° 2'46.27"E
0+300	16° 0'44.24"N	121° 2'47.34"E
0+400	16° 0'47.21"N	121° 2'48.69"E
0+500	16° 0'50.09"N	121° 2'50.28"E
0+600	16° 0'52.80"N	121° 2'52.12"E
0+700	16° 0'55.38"N	121° 2'54.18"E
0+800	16° 0'57.78"N	121° 2'56.44"E
0+900	16° 1'0.15"N	121° 2'58.74"E
1+000	16° 1'2.52"N	121° 3'1.05"E
1+100	16° 1'4.92"N	121° 3'3.33"E
1+200	16° 1'7.74"N	121° 3'4.96"E
1+300	16° 1'10.94"N	121° 3'5.40"E
1+400	16° 1'14.07"N	121° 3'4.57"E
1+500	16° 1'16.88"N	121° 3'2.89"E
1+600	16° 1'19.77"N	121° 3'1.35"E
1+700	16° 1'22.96"N	121° 3'0.85"E
1+800	16° 1'26.10"N	121° 3'1.61"E
1+900	16° 1'28.72"N	121° 3'3.57"E
1+914	16° 1'29.03"N	121° 3'3.90"E
START OF SOUTH TUNNEL (LEFT)		
1+914	16° 1'29.17"N	121° 3'3.78"E
2+000	16° 1'30.82"N	121° 3'6.11"E
2+100	16° 1'33.15"N	121° 3'8.43"E
2+200	16° 1'36.11"N	121° 3'9.79"E
2+300	16° 1'39.21"N	121° 3'10.85"E
2+400	16° 1'42.30"N	121° 3'11.90"E
2+500	16° 1'45.38"N	121° 3'12.95"E
2+600	16° 1'48.48"N	121° 3'14.00"E
2+700	16° 1'51.57"N	121° 3'15.06"E
2+800	16° 1'54.66"N	121° 3'16.11"E
2+900	16° 1'57.74"N	121° 3'17.16"E
3+000	16° 2'0.83"N	121° 3'18.21"E
3+100	16° 2'3.93"N	121° 3'19.26"E
3+200	16° 2'7.02"N	121° 3'20.32"E
3+300	16° 2'10.11"N	121° 3'21.37"E
3+400	16° 2'13.20"N	121° 3'22.42"E
3+500	16° 2'16.28"N	121° 3'23.47"E
3+600	16° 2'19.38"N	121° 3'24.52"E
3+700	16° 2'22.47"N	121° 3'25.58"E
3+800	16° 2'25.55"N	121° 3'26.63"E
3+900	16° 2'28.64"N	121° 3'27.69"E

STATION	LATITUDE (N)	LONGITUDE (E)
4+000	16° 2'31.73"N	121° 3'28.74"E
4+100	16° 2'34.82"N	121° 3'29.78"E
4+200	16° 2'37.92"N	121° 3'30.84"E
4+300	16° 2'41.01"N	121° 3'31.89"E
4+400	16° 2'44.16"N	121° 3'32.72"E
4+436	16° 2'45.31"N	121° 3'32.78"E
1+914	16° 1'29.17"N	121° 3'3.78"E
2+000	16° 1'30.82"N	121° 3'6.11"E
2+100	16° 1'33.15"N	121° 3'8.43"E
2+200	16° 1'36.11"N	121° 3'9.79"E
2+300	16° 1'39.21"N	121° 3'10.85"E
2+400	16° 1'42.30"N	121° 3'11.90"E
2+500	16° 1'45.38"N	121° 3'12.95"E
2+600	16° 1'48.48"N	121° 3'14.00"E
2+700	16° 1'51.57"N	121° 3'15.06"E
2+800	16° 1'54.66"N	121° 3'16.11"E
2+900	16° 1'57.74"N	121° 3'17.16"E
3+000	16° 2'0.83"N	121° 3'18.21"E
3+100	16° 2'3.93"N	121° 3'19.26"E
3+200	16° 2'7.02"N	121° 3'20.32"E
3+300	16° 2'10.11"N	121° 3'21.37"E
3+400	16° 2'13.20"N	121° 3'22.42"E
3+500	16° 2'16.28"N	121° 3'23.47"E
3+600	16° 2'19.38"N	121° 3'24.52"E
3+700	16° 2'22.47"N	121° 3'25.58"E
3+800	16° 2'25.55"N	121° 3'26.63"E
3+900	16° 2'28.64"N	121° 3'27.69"E
4+000	16° 2'31.73"N	121° 3'28.74"E
4+100	16° 2'34.82"N	121° 3'29.78"E
4+200	16° 2'37.92"N	121° 3'30.84"E
4+300	16° 2'41.01"N	121° 3'31.89"E
4+400	16° 2'44.16"N	121° 3'32.72"E
4+436	16° 2'45.31"N	121° 3'32.78"E
START OF SOUTH TUNNEL (RIGHT)		
1+914	16° 1'28.90"N	121° 3'4.02"E
2+000	16° 1'30.47"N	121° 3'6.41"E
2+100	16° 1'32.55"N	121° 3'8.98"E
2+200	16° 1'35.38"N	121° 3'10.60"E
2+300	16° 1'38.46"N	121° 3'11.65"E
2+400	16° 1'41.56"N	121° 3'12.71"E
2+500	16° 1'44.64"N	121° 3'13.76"E
2+600	16° 1'47.74"N	121° 3'14.82"E
2+700	16° 1'50.82"N	121° 3'15.87"E
2+800	16° 1'53.91"N	121° 3'16.92"E
2+900	16° 1'57.01"N	121° 3'17.97"E

STATION	LATITUDE (N)	LONGITUDE (E)
3+000	16° 2'0.09"N	121° 3'19.02"E
3+100	16° 2'3.18"N	121° 3'20.08"E
3+200	16° 2'6.27"N	121° 3'21.13"E
3+300	16° 2'9.36"N	121° 3'22.18"E
3+400	16° 2'12.45"N	121° 3'23.23"E
3+500	16° 2'15.55"N	121° 3'24.29"E
3+600	16° 2'18.64"N	121° 3'25.34"E
3+700	16° 2'21.73"N	121° 3'26.39"E
3+800	16° 2'24.81"N	121° 3'27.44"E
3+900	16° 2'27.91"N	121° 3'28.49"E
4+000	16° 2'30.99"N	121° 3'29.55"E
4+100	16° 2'34.09"N	121° 3'30.61"E
4+200	16° 2'37.17"N	121° 3'31.65"E
4+300	16° 2'40.33"N	121° 3'32.51"E
4+400	16° 2'43.53"N	121° 3'33.04"E
4+455	16° 2'45.32"N	121° 3'33.16"E
AFTER SOUTH TUNNEL ALIGNMENT		
4+XXX	16° 2'45.32"N	121° 3'32.97"E
4+500	16° 2'46.77"N	121° 3'32.85"E
4+600	16° 2'49.85"N	121° 3'31.80"E
4+700	16° 2'52.59"N	121° 3'29.98"E
4+800	16° 2'55.32"N	121° 3'28.16"E
4+900	16° 2'58.28"N	121° 3'26.77"E
5+000	16° 3'1.40"N	121° 3'25.82"E
5+100	16° 3'4.51"N	121° 3'24.86"E
5+200	16° 3'7.37"N	121° 3'23.25"E
5+300	16° 3'9.84"N	121° 3'21.06"E
5+400	16° 3'12.36"N	121° 3'18.97"E
5+500	16° 3'15.34"N	121° 3'17.62"E
5+600	16° 3'18.56"N	121° 3'17.16"E
5+700	16° 3'21.80"N	121° 3'16.91"E
5+800	16° 3'24.78"N	121° 3'15.63"E
5+900	16° 3'27.05"N	121° 3'13.25"E
6+000	16° 3'28.40"N	121° 3'10.20"E
6+100	16° 3'29.69"N	121° 3'7.12"E
6+200	16° 3'31.95"N	121° 3'4.74"E
6+300	16° 3'34.98"N	121° 3'3.62"E
6+400	16° 3'38.17"N	121° 3'3.98"E
6+500	16° 3'40.98"N	121° 3'5.65"E
6+600	16° 3'43.55"N	121° 3'7.72"E
6+700	16° 3'46.17"N	121° 3'9.70"E
6+800	16° 3'49.26"N	121° 3'10.64"E
6+900	16° 3'52.44"N	121° 3'10.08"E
7+000	16° 3'55.23"N	121° 3'8.37"E
7+100	16° 3'58.08"N	121° 3'6.81"E

STATION	LATITUDE (N)	LONGITUDE (E)
7+200	16° 4'1.23"N	121° 3'5.99"E
7+300	16° 4'4.47"N	121° 3'6.00"E
7+400	16° 4'7.62"N	121° 3'6.83"E
7+500	16° 4'10.57"N	121° 3'8.25"E
7+600	16° 4'13.39"N	121° 3'9.93"E
7+700	16° 4'16.22"N	121° 3'11.57"E
7+800	16° 4'19.21"N	121° 3'12.90"E
7+900	16° 4'22.34"N	121° 3'13.78"E
8+000	16° 4'25.57"N	121° 3'14.20"E
8+100	16° 4'28.82"N	121° 3'14.25"E
8+200	16° 4'32.08"N	121° 3'14.24"E
8+300	16° 4'35.33"N	121° 3'14.42"E
8+400	16° 4'38.52"N	121° 3'15.07"E
8+500	16° 4'41.53"N	121° 3'16.33"E
8+600	16° 4'44.32"N	121° 3'18.05"E
8+700	16° 4'47.06"N	121° 3'19.86"E
8+800	16° 4'49.81"N	121° 3'21.66"E
8+900	16° 4'52.56"N	121° 3'23.47"E
9+000	16° 4'55.30"N	121° 3'25.27"E
9+100	16° 4'58.05"N	121° 3'27.08"E
9+200	16° 5'0.79"N	121° 3'28.89"E
9+300	16° 5'3.54"N	121° 3'30.69"E
9+400	16° 5'6.28"N	121° 3'32.49"E
9+500	16° 5'9.02"N	121° 3'34.30"E
9+600	16° 5'11.79"N	121° 3'36.10"E
9+700	16° 5'14.52"N	121° 3'37.92"E
9+800	16° 5'17.27"N	121° 3'39.71"E
9+900	16° 5'20.01"N	121° 3'41.52"E
10+000	16° 5'22.76"N	121° 3'43.33"E
10+100	16° 5'25.50"N	121° 3'45.13"E
10+200	16° 5'28.26"N	121° 3'46.94"E
10+300	16° 5'31.08"N	121° 3'48.60"E
10+400	16° 5'34.11"N	121° 3'49.79"E
10+500	16° 5'37.31"N	121° 3'50.30"E
10+600	16° 5'40.53"N	121° 3'50.03"E
10+700	16° 5'43.60"N	121° 3'49.00"E
10+800	16° 5'46.37"N	121° 3'47.27"E
10+900	16° 5'48.69"N	121° 3'44.93"E
11+000	16° 5'50.41"N	121° 3'42.10"E
11+100	16° 5'51.44"N	121° 3'38.93"E
11+200	16° 5'51.76"N	121° 3'35.60"E
11+300	16° 5'51.36"N	121° 3'32.27"E
11+400	16° 5'50.29"N	121° 3'29.10"E
11+500	16° 5'48.91"N	121° 3'26.05"E
11+600	16° 5'47.58"N	121° 3'22.98"E

STATION	LATITUDE (N)	LONGITUDE (E)
11+700	16° 5'46.69"N	121° 3'19.75"E
11+800	16° 5'46.39"N	121° 3'16.42"E
11+900	16° 5'46.75"N	121° 3'13.09"E
12+000	16° 5'47.76"N	121° 3'9.90"E
12+100	16° 5'49.44"N	121° 3'7.03"E
12+200	16° 5'51.64"N	121° 3'4.57"E
12+300	16° 5'54.26"N	121° 3'2.61"E
12+400	16° 5'57.20"N	121° 3'1.23"E
12+500	16° 6'0.38"N	121° 3'0.43"E
12+600	16° 6'3.52"N	121° 2'59.62"E
12+700	16° 6'6.46"N	121° 2'58.18"E
12+800	16° 6'9.08"N	121° 2'56.19"E
12+900	16° 6'11.73"N	121° 2'54.25"E
13+000	16° 6'14.67"N	121° 2'52.83"E
13+100	16° 6'17.80"N	121° 2'51.95"E
13+200	16° 6'20.95"N	121° 2'51.08"E
13+300	16° 6'23.93"N	121° 2'49.73"E
13+350	16° 6'25.31"N	121° 2'48.89"E
START OF NORTH TUNNEL (LEFT)		
13+350	16° 6'25.22"N	121° 2'48.73"E
13+400	16° 6'26.55"N	121° 2'47.73"E
13+500	16° 6'28.92"N	121° 2'45.45"E
13+600	16° 6'31.17"N	121° 2'43.02"E
13+700	16° 6'34.22"N	121° 2'42.02"E
13+800	16° 6'37.43"N	121° 2'42.52"E
13+900	16° 6'40.63"N	121° 2'43.10"E
14+000	16° 6'43.84"N	121° 2'43.68"E
14+100	16° 6'47.04"N	121° 2'44.26"E
14+200	16° 6'50.25"N	121° 2'44.83"E
14+300	16° 6'53.45"N	121° 2'45.42"E
14+400	16° 6'56.66"N	121° 2'45.99"E
14+500	16° 6'59.86"N	121° 2'46.57"E
14+600	16° 7'3.06"N	121° 2'47.15"E
14+700	16° 7'6.27"N	121° 2'47.73"E
14+800	16° 7'9.47"N	121° 2'48.32"E
14+900	16° 7'12.68"N	121° 2'48.89"E
15+000	16° 7'15.86"N	121° 2'49.47"E
15+100	16° 7'19.08"N	121° 2'50.07"E
15+200	16° 7'22.28"N	121° 2'50.65"E
15+300	16° 7'25.49"N	121° 2'51.23"E
15+400	16° 7'28.69"N	121° 2'51.79"E
15+500	16° 7'31.91"N	121° 2'52.38"E
15+600	16° 7'35.11"N	121° 2'52.97"E
15+700	16° 7'38.30"N	121° 2'53.55"E
15+800	16° 7'41.51"N	121° 2'54.14"E

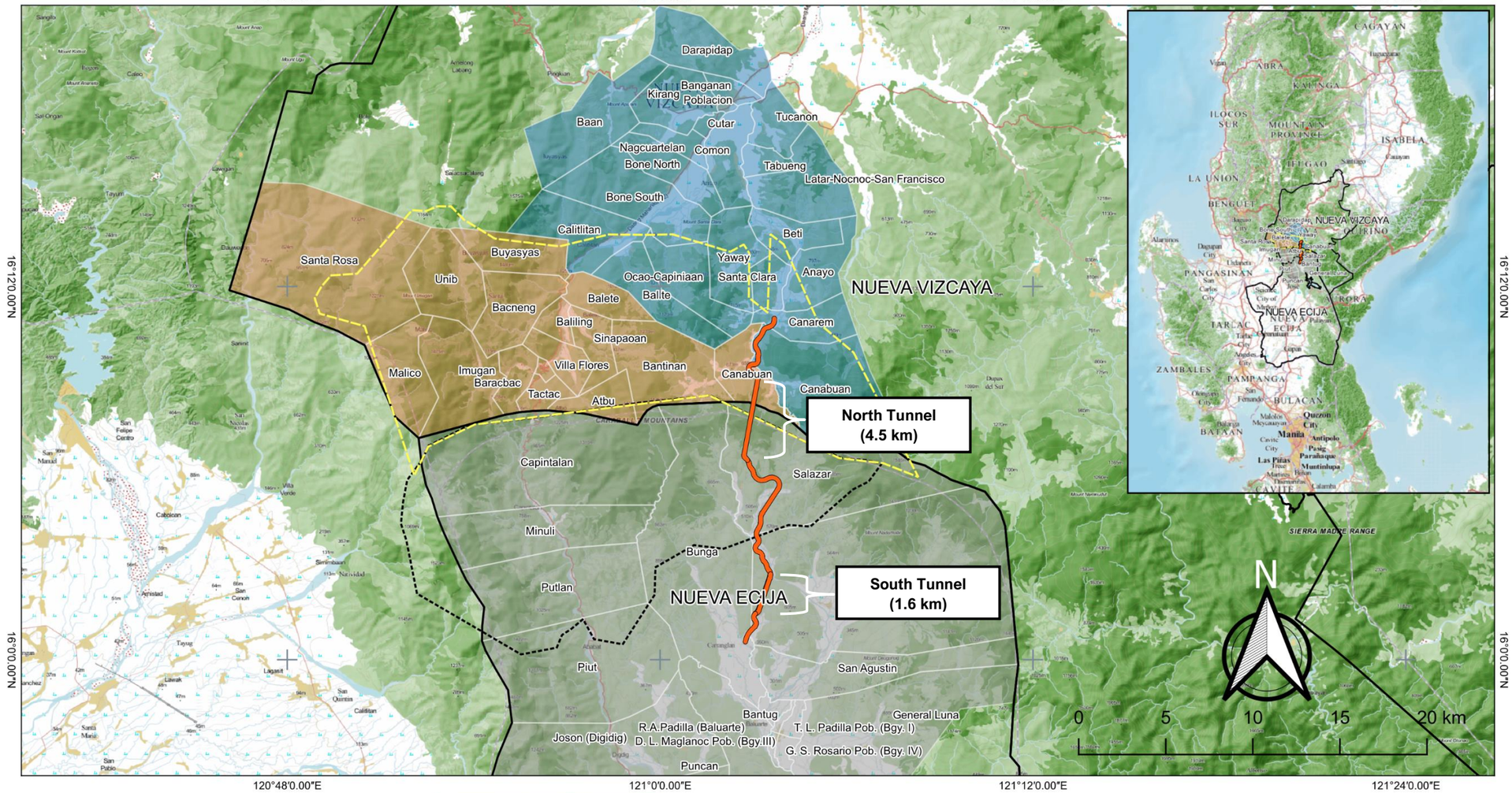
STATION	LATITUDE (N)	LONGITUDE (E)
15+900	16° 7'44.73"N	121° 2'54.71"E
16+000	16° 7'47.93"N	121° 2'55.28"E
16+100	16° 7'51.14"N	121° 2'55.86"E
16+200	16° 7'54.31"N	121° 2'56.45"E
16+300	16° 7'57.54"N	121° 2'57.03"E
16+400	16° 8'0.74"N	121° 2'57.61"E
16+500	16° 8'3.96"N	121° 2'58.19"E
16+600	16° 8'7.14"N	121° 2'58.76"E
16+700	16° 8'10.36"N	121° 2'59.34"E
16+800	16° 8'13.59"N	121° 2'59.92"E
16+900	16° 8'16.76"N	121° 3'0.50"E
17+000	16° 8'19.98"N	121° 3'1.07"E
17+100	16° 8'23.20"N	121° 3'1.67"E
17+200	16° 8'26.39"N	121° 3'2.25"E
17+300	16° 8'29.62"N	121° 3'2.83"E
17+400	16° 8'32.81"N	121° 3'3.40"E
17+500	16° 8'36.02"N	121° 3'3.99"E
17+600	16° 8'39.22"N	121° 3'4.57"E
17+700	16° 8'42.41"N	121° 3'5.16"E
17+800	16° 8'45.61"N	121° 3'5.74"E
17+900	16° 8'48.82"N	121° 3'6.32"E
18+000	16° 8'52.03"N	121° 3'6.90"E
18+100	16° 8'55.23"N	121° 3'7.48"E
18+200	16° 8'58.44"N	121° 3'8.06"E
18+300	16° 9'1.64"N	121° 3'8.65"E
18+400	16° 9'4.88"N	121° 3'8.74"E
18+500	16° 9'7.91"N	121° 3'7.58"E
18+600	16° 9'10.31"N	121° 3'5.34"E
18+700	16° 9'11.90"N	121° 3'2.42"E
18+730	16° 9'12.34"N	121° 3'1.51"E
START OF NORTH TUNNEL (RIGHT)		
13+350	16° 6'25.41"N	121° 2'49.03"E
13+400	16° 6'26.74"N	121° 2'48.04"E
13+500	16° 6'29.14"N	121° 2'45.77"E
13+600	16° 6'31.61"N	121° 2'43.61"E
13+700	16° 6'34.77"N	121° 2'43.08"E
13+800	16° 6'37.97"N	121° 2'43.64"E
13+900	16° 6'41.18"N	121° 2'44.22"E
14+000	16° 6'44.38"N	121° 2'44.80"E
14+100	16° 6'47.58"N	121° 2'45.38"E
14+200	16° 6'50.80"N	121° 2'45.97"E
14+300	16° 6'53.99"N	121° 2'46.54"E
14+400	16° 6'57.20"N	121° 2'47.13"E
14+500	16° 7'0.41"N	121° 2'47.71"E
14+600	16° 7'3.60"N	121° 2'48.29"E

STATION	LATITUDE (N)	LONGITUDE (E)
14+700	16° 7'6.80"N	121° 2'48.87"E
14+800	16° 7'10.01"N	121° 2'49.45"E
14+900	16° 7'13.23"N	121° 2'50.03"E
15+000	16° 7'16.42"N	121° 2'50.61"E
15+100	16° 7'19.63"N	121° 2'51.19"E
15+200	16° 7'22.82"N	121° 2'51.77"E
15+300	16° 7'26.03"N	121° 2'52.35"E
15+400	16° 7'29.24"N	121° 2'52.94"E
15+500	16° 7'32.45"N	121° 2'53.51"E
15+600	16° 7'35.65"N	121° 2'54.09"E
15+700	16° 7'38.85"N	121° 2'54.67"E
15+800	16° 7'42.06"N	121° 2'55.26"E
15+900	16° 7'45.25"N	121° 2'55.83"E
16+000	16° 7'48.47"N	121° 2'56.42"E
16+100	16° 7'51.68"N	121° 2'56.99"E
16+200	16° 7'54.88"N	121° 2'57.58"E
16+300	16° 7'58.07"N	121° 2'58.15"E
16+400	16° 8'1.29"N	121° 2'58.73"E
16+500	16° 8'4.49"N	121° 2'59.32"E
16+600	16° 8'7.70"N	121° 2'59.90"E
16+700	16° 8'10.90"N	121° 3'0.47"E
16+800	16° 8'14.11"N	121° 3'1.06"E
16+900	16° 8'17.31"N	121° 3'1.64"E
17+000	16° 8'20.51"N	121° 3'2.22"E
17+100	16° 8'23.73"N	121° 3'2.80"E
17+200	16° 8'26.93"N	121° 3'3.38"E
17+300	16° 8'30.12"N	121° 3'3.95"E
17+400	16° 8'33.33"N	121° 3'4.54"E
17+500	16° 8'36.54"N	121° 3'5.13"E
17+600	16° 8'39.73"N	121° 3'5.70"E
17+700	16° 8'42.95"N	121° 3'6.28"E
17+800	16° 8'46.16"N	121° 3'6.86"E
17+900	16° 8'49.35"N	121° 3'7.46"E
18+000	16° 8'52.57"N	121° 3'8.02"E
18+100	16° 8'55.77"N	121° 3'8.61"E
18+200	16° 8'58.97"N	121° 3'9.19"E
18+300	16° 9'2.18"N	121° 3'9.76"E
18+400	16° 9'5.42"N	121° 3'9.62"E
18+500	16° 9'8.35"N	121° 3'8.23"E
18+600	16° 9'10.59"N	121° 3'5.81"E
18+700	16° 9'12.10"N	121° 3'2.83"E
18+738	16° 9'12.66"N	121° 3'1.67"E
AFTER NORTH TUNNEL ALIGNMENT		
18+7XX	16° 9'12.50"N	121° 3'1.59"E
18+800	16° 9'13.39"N	121° 2'59.73"E

STATION	LATITUDE (N)	LONGITUDE (E)
18+900	16° 9'14.84"N	121° 2'56.72"E
19+000	16° 9'16.54"N	121° 2'53.87"E
19+100	16° 9'19.00"N	121° 2'51.75"E
19+200	16° 9'22.14"N	121° 2'51.02"E
19+300	16° 9'25.31"N	121° 2'51.59"E
19+400	16° 9'27.93"N	121° 2'53.50"E
19+500	16° 9'29.57"N	121° 2'56.35"E
19+600	16° 9'30.03"N	121° 2'59.66"E
19+700	16° 9'30.14"N	121° 3'3.02"E
19+800	16° 9'31.40"N	121° 3'6.08"E
19+900	16° 9'33.83"N	121° 3'8.27"E
20+000	16° 9'36.94"N	121° 3'9.16"E
20+100	16° 9'40.19"N	121° 3'9.07"E
20+200	16° 9'43.43"N	121° 3'9.12"E
20+300	16° 9'46.67"N	121° 3'9.52"E
20+400	16° 9'49.89"N	121° 3'9.96"E
20+500	16° 9'53.13"N	121° 3'9.74"E
20+600	16° 9'56.21"N	121° 3'8.70"E
20+700	16° 9'59.03"N	121° 3'7.03"E
20+800	16°10'1.83"N	121° 3'5.30"E
20+900	16°10'4.88"N	121° 3'4.15"E
21+000	16°10'8.10"N	121° 3'3.85"E
21+100	16°10'11.30"N	121° 3'4.42"E
21+200	16°10'14.25"N	121° 3'5.83"E
21+300	16°10'16.89"N	121° 3'7.80"E
21+400	16°10'19.36"N	121° 3'10.00"E
21+500	16°10'21.84"N	121° 3'12.16"E
21+600	16°10'24.49"N	121° 3'14.12"E
21+700	16°10'27.28"N	121° 3'15.84"E
21+800	16°10'30.21"N	121° 3'17.31"E
21+900	16°10'33.22"N	121° 3'18.59"E
22+000	16°10'36.15"N	121° 3'20.03"E
22+100	16°10'38.74"N	121° 3'22.05"E
22+200	16°10'40.52"N	121° 3'24.85"E
22+300	16°10'41.54"N	121° 3'28.05"E
22+400	16°10'42.58"N	121° 3'31.23"E
22+500	16°10'43.99"N	121° 3'34.26"E
22+600	16°10'46.03"N	121° 3'36.88"E
22+700	16°10'48.69"N	121° 3'38.78"E
22+800	16°10'51.77"N	121° 3'39.84"E
22+900	16°10'55.00"N	121° 3'40.28"E
23+000	16°10'58.25"N	121° 3'40.39"E
23+008	16°10'58.49"N	121° 3'40.39"E
END OF DPEAR PROJECT ALIGNMENT		

SOURCE: JICA Study Team

Figure 1-1: General Location Map of the Proposed Project



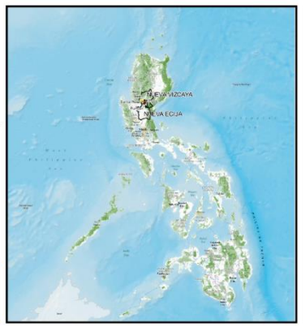
MAP SOURCE/S:

NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.



Map Legend

- DPEAR Project Alignment

Administrative Boundaries

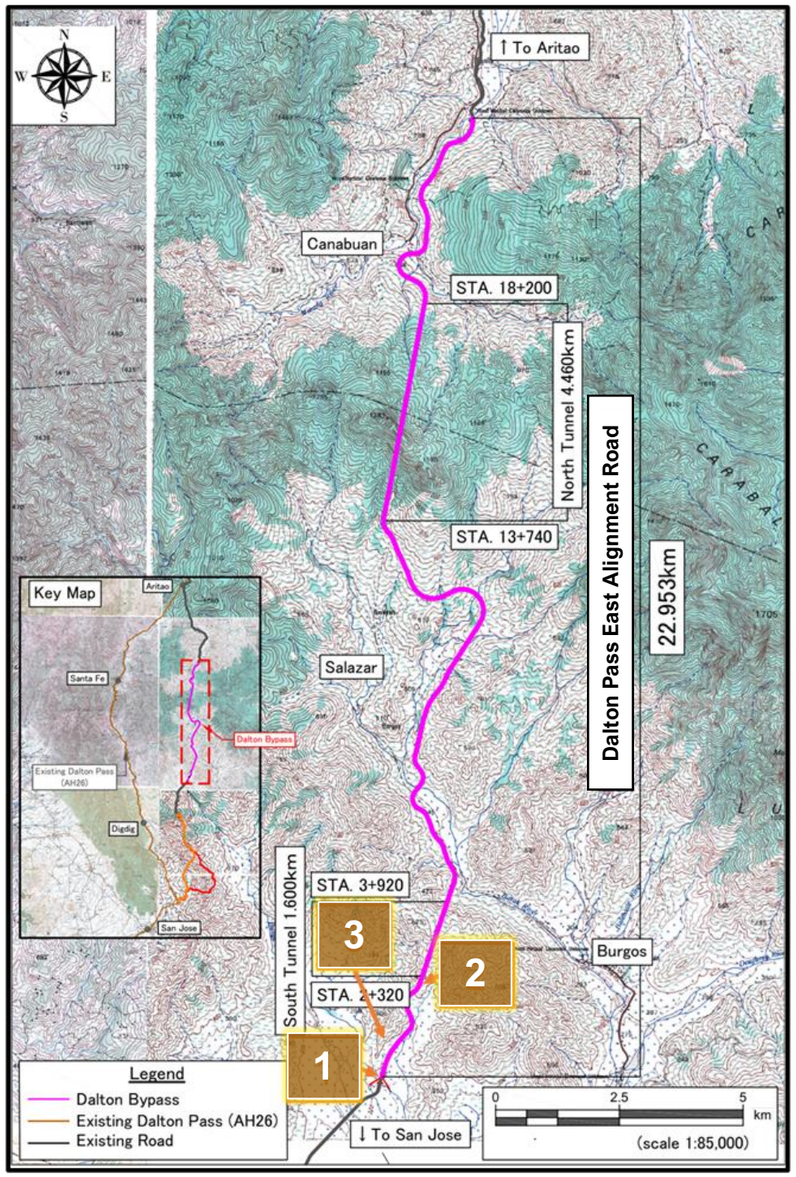
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija
- Municipality of Carranglan

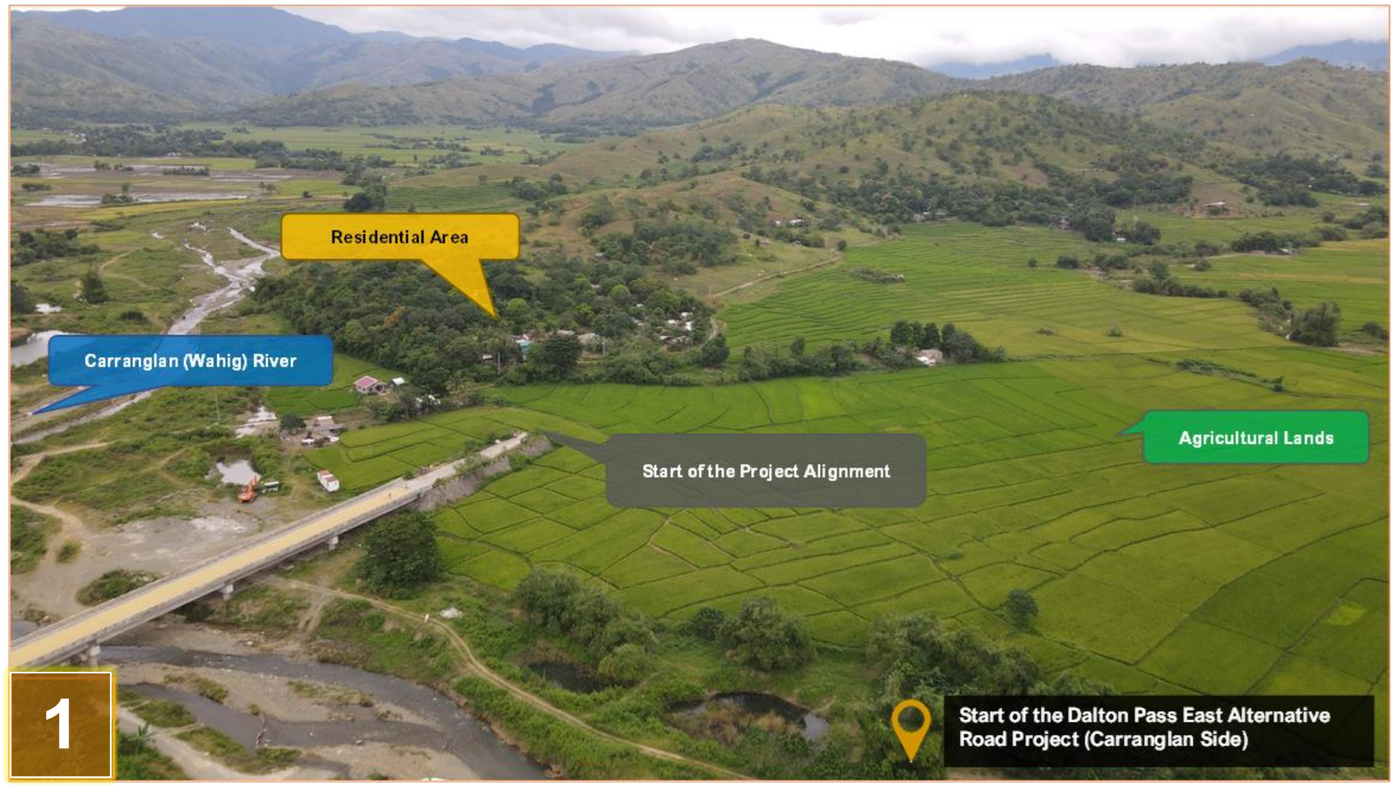
Ancestral Domain

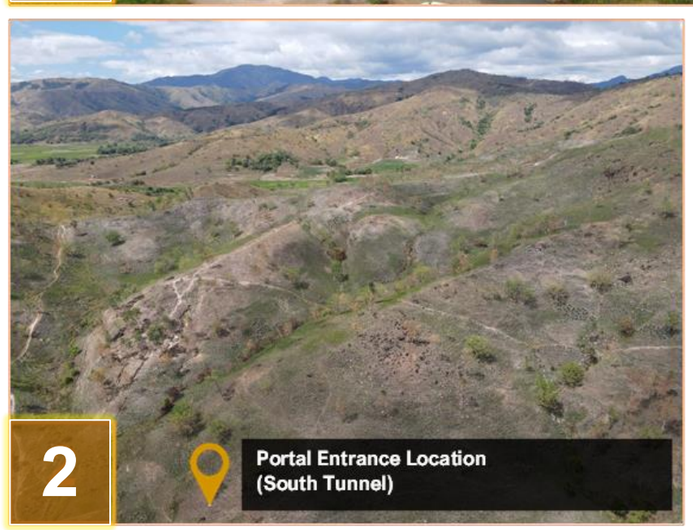
- Kalanguya Ikalahan AD
- Kalanguya AD

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**GENERAL LOCATION MAP OF THE PROPOSED PROJECT**	As above.	LCI ENVI CORPORATION

Figure 1-2: Aerial Photograph of the Proposed Project (1/4)

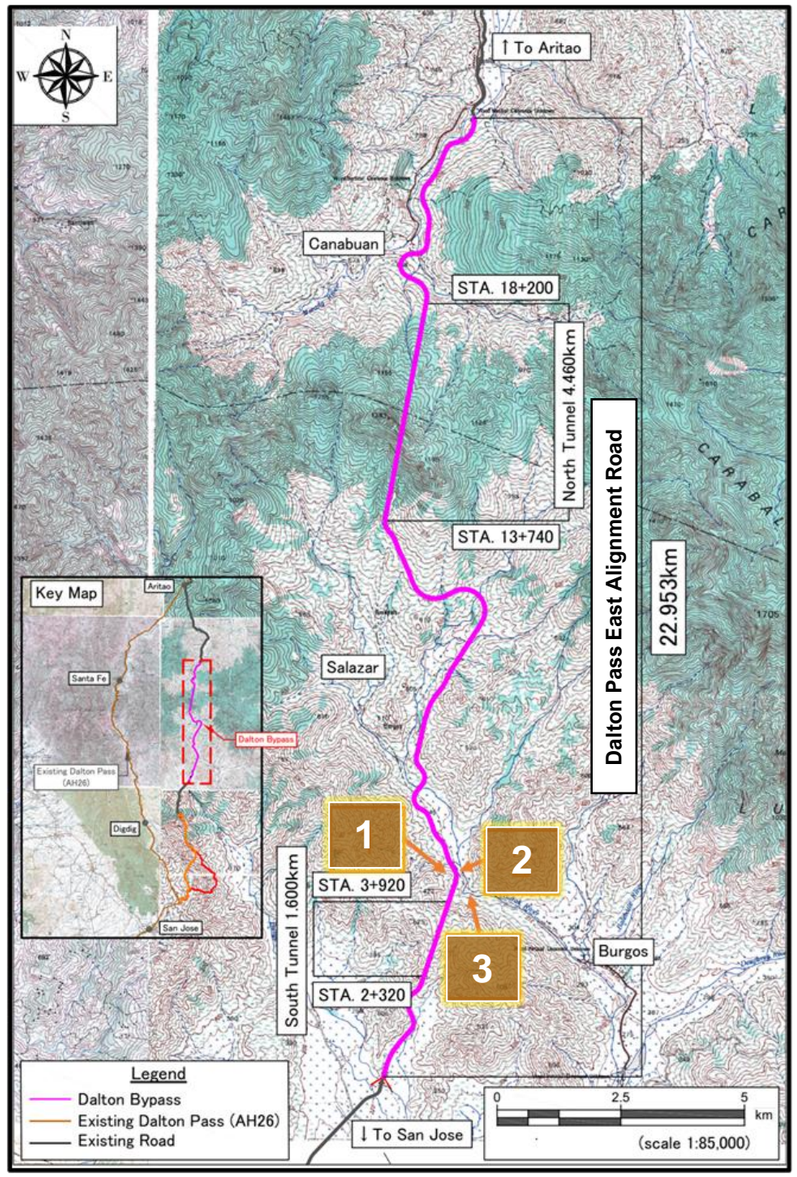


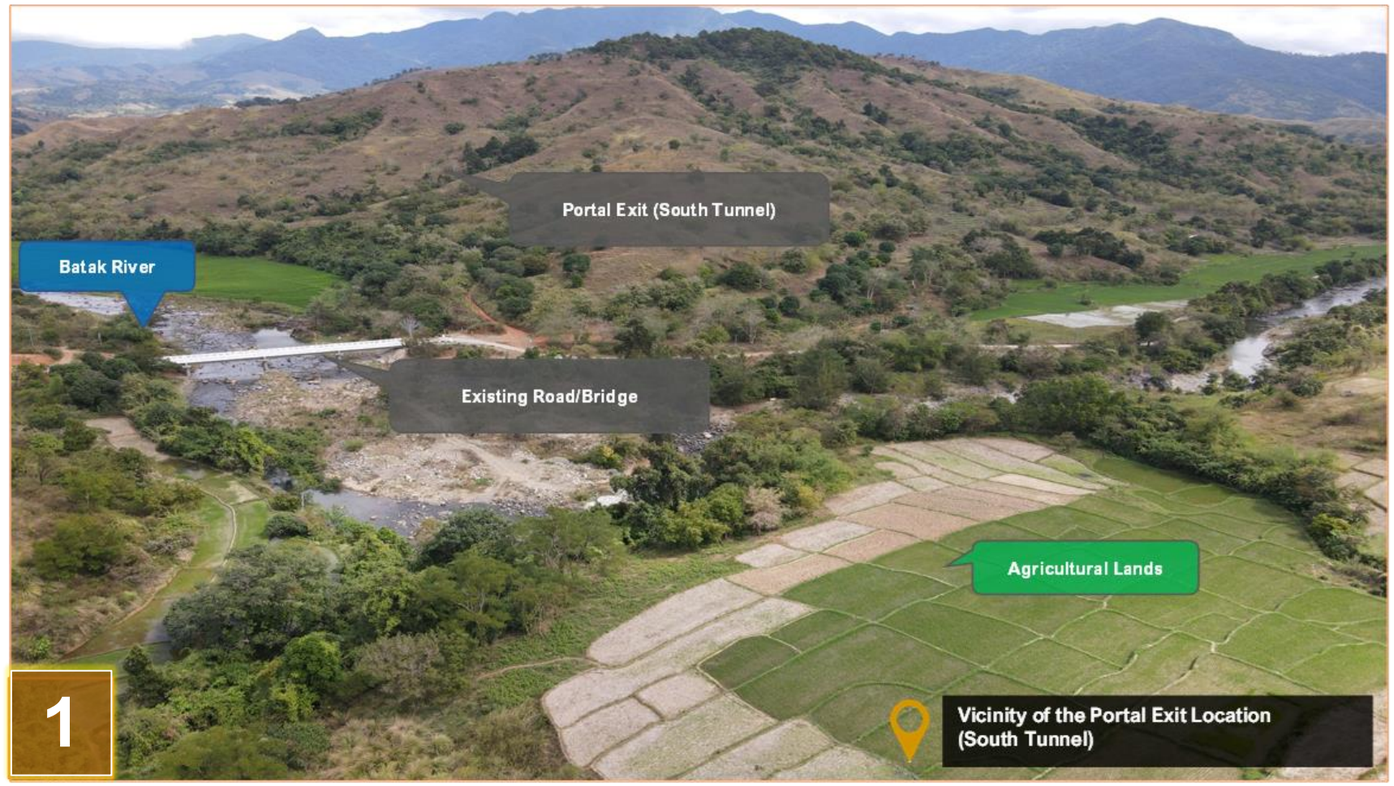


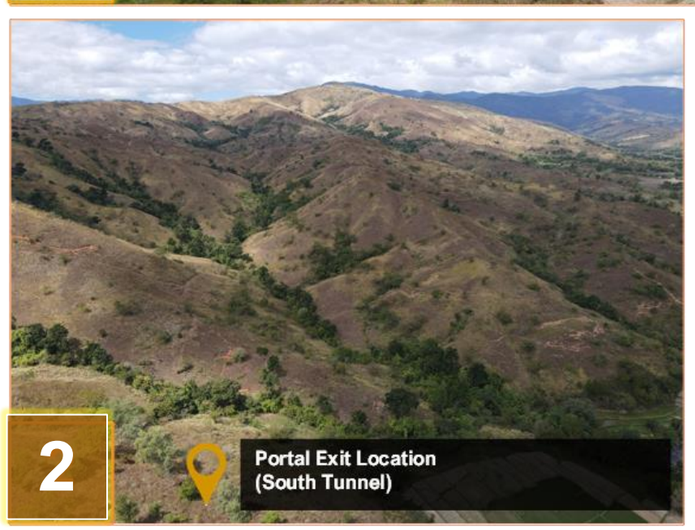


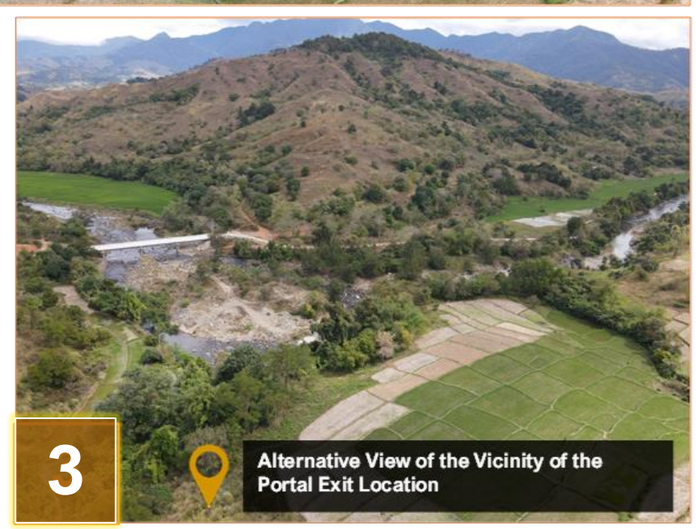
PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**AERIAL PHOTOGRAPH OF THE PROPOSED PROJECT (1/4)**	LCI Envi Corporation taken last 24 October 2021	LCI ENVI CORPORATION

Figure 1-3: Aerial Photograph of the Proposed Project (2/4)



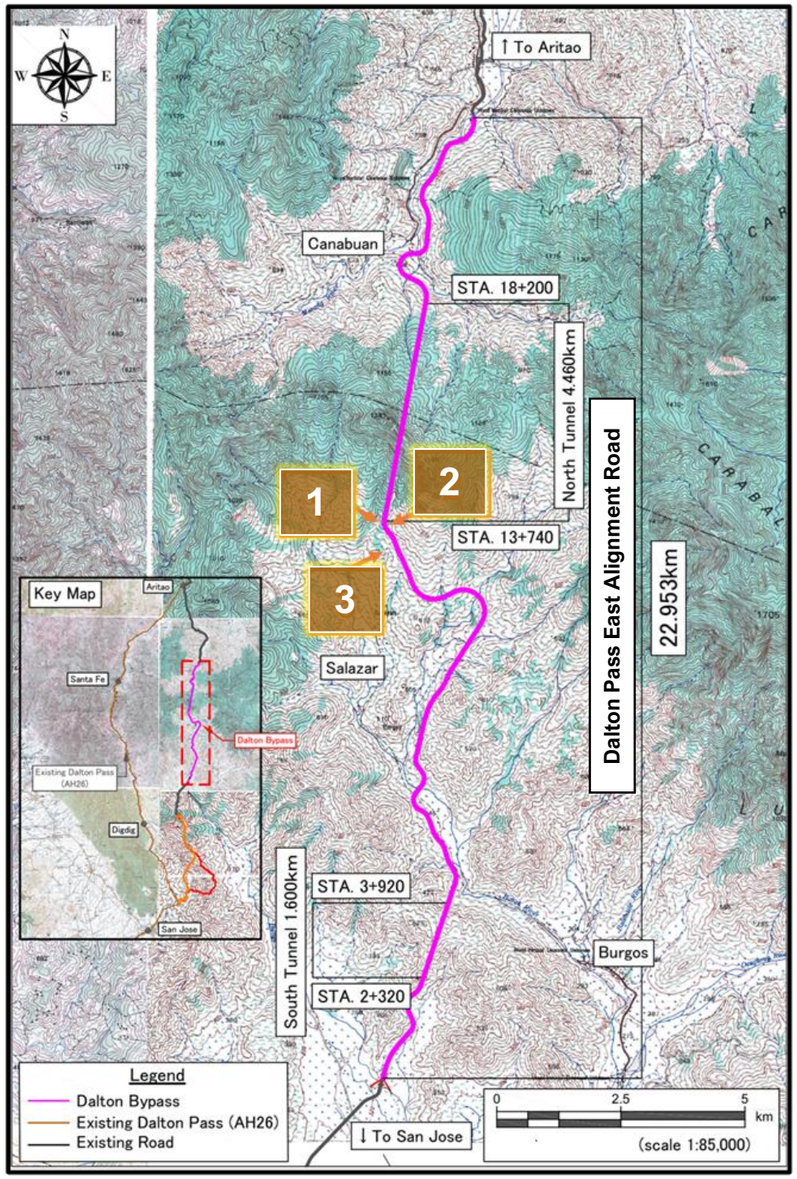


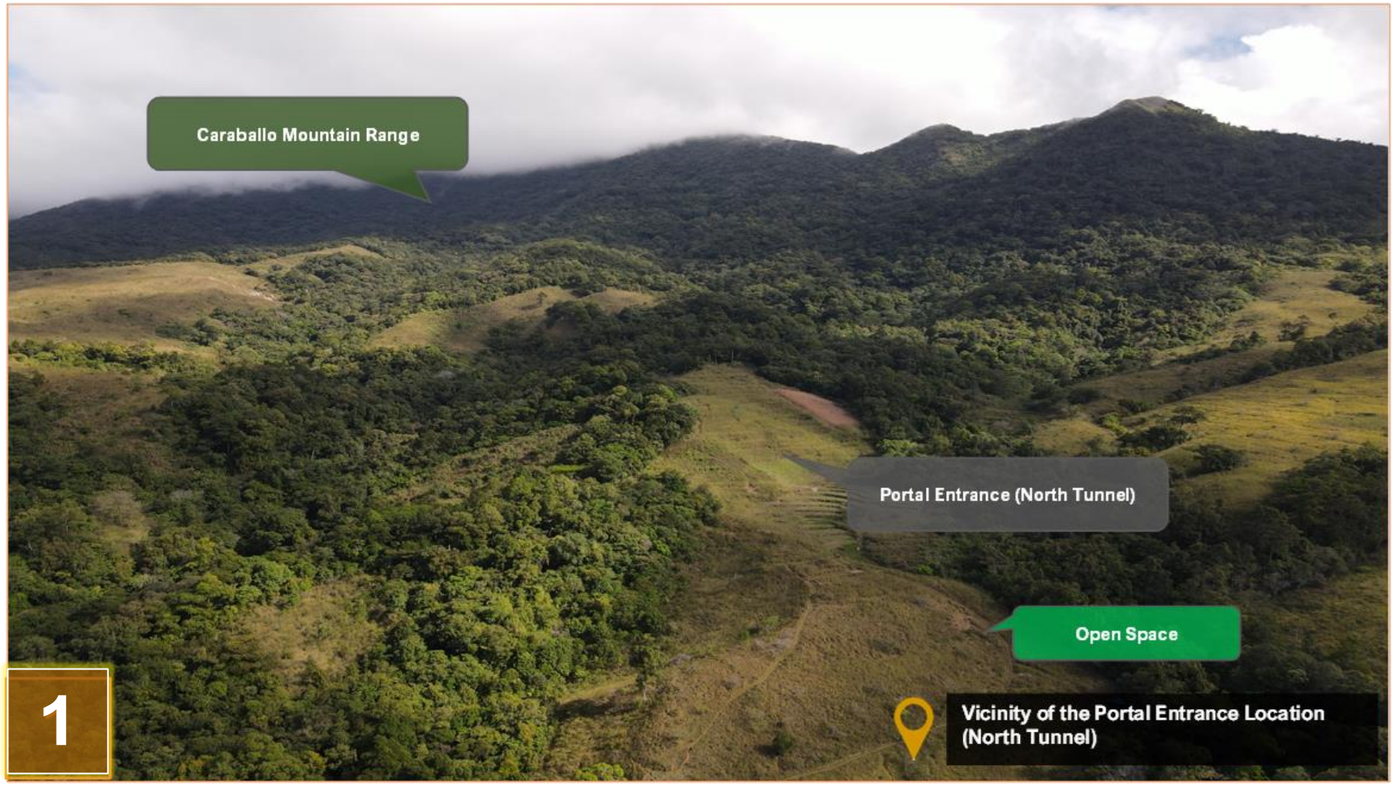


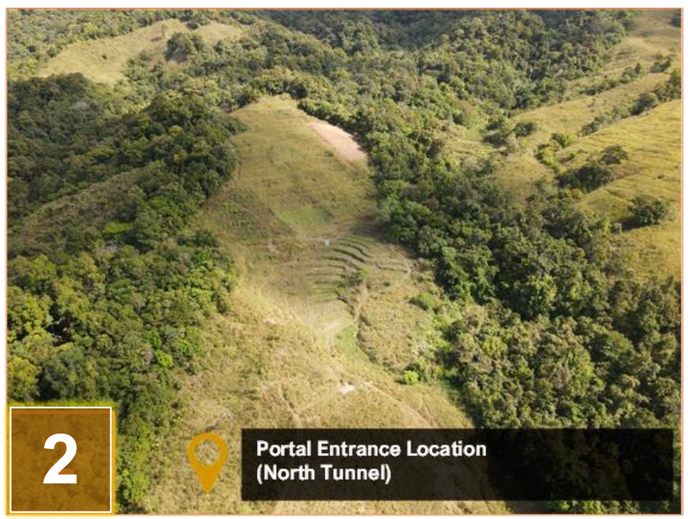


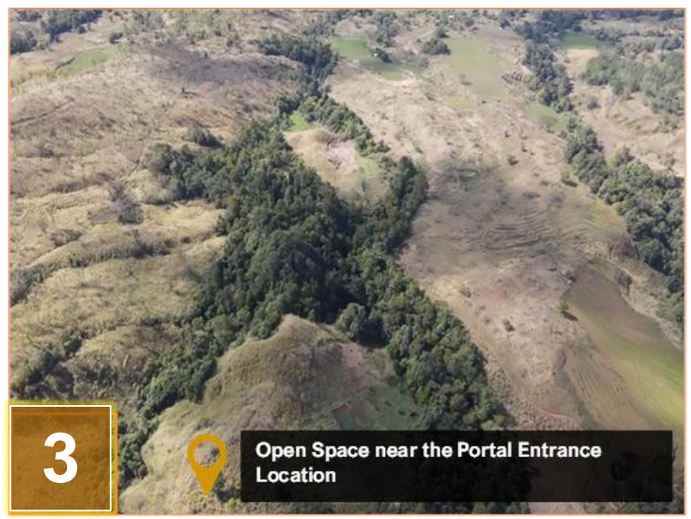
PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**AERIAL PHOTOGRAPH OF THE PROPOSED PROJECT (2/4)**	LCI Envi Corporation taken last 24 October 2021	LCI ENVI CORPORATION

Figure 1-4: Aerial Photograph of the Proposed Project (3/4)



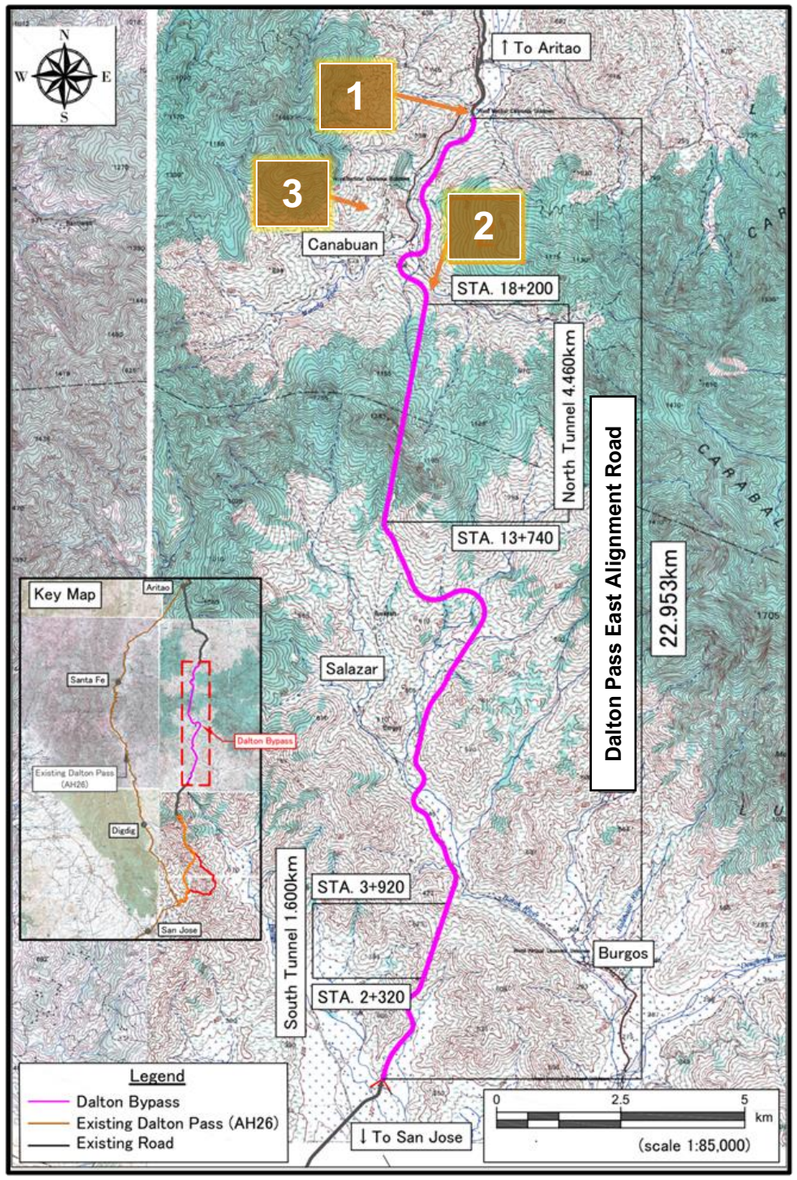


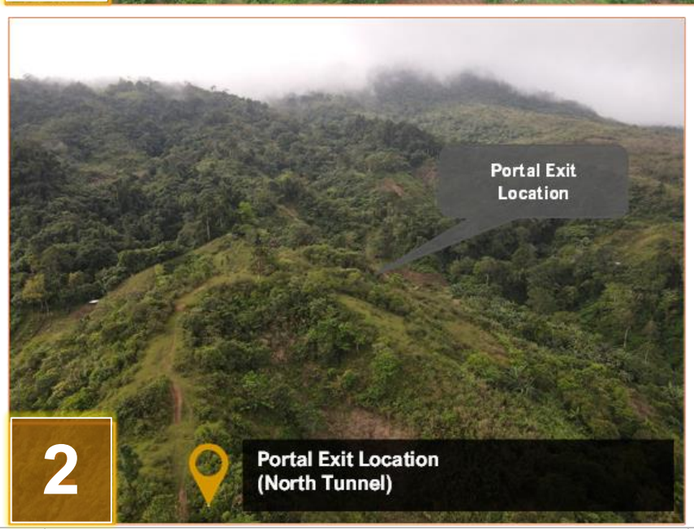




PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**AERIAL PHOTOGRAPH OF THE PROPOSED PROJECT (3/4)**	LCI Envi Corporation taken last 24 October 2021	LCI ENVI CORPORATION

Figure 1-5: Aerial Photograph of the Proposed Project (4/4)





PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**AERIAL PHOTOGRAPH OF THE PROPOSED PROJECT (4/4)**	LCI Envi Corporation taken last 24 October 2021	LCI ENVI CORPORATION

1.1.2 Project Area

1.1.3 Accessibility of the Project Site

[13]**Kilometer Zero.** The site can be accessed from Manila (Kilometer Zero) via North Luzon Expressway (NLEX) and exiting via Victoria/Talavera Exit of Subic-Clark-Tarlac Expressway (SCTEX).

[14]After, take the Guimba-Victoria Road, then Pangasinan-Nueva Ecija Road and Pan-Philippine Highway past San Jose City and Carranglan to reach the starting segment of the DPEAR.

[15]The total distance from Kilometer Zero to the proposed project site is 223 kms. and will take around 4 to 5 hours travel time.

[16]**Nueva Vizcaya.** The site can be accessed by traversing the 16.61 km completed segment (Seg. 6) from the Municipality of Aritao, leading to the completed bridge.

[17]**Nueva Ecija.** The site can be accessed by traversing the Tayabo (Diamond Park) segment (Seg. 1), traversing 31.40 km, leading to the Municipality of Carranglan. Similarly, from the existing Dalton Pass, the site can be reached via Digdig going to the Municipality of Carangglan. Once in Carranglan proper, a road leading to the end of the completed bridge crossing Bunga River.

1.1.4 Project Impact Areas

[18]Identification of impact areas for the proposed project is guided by Annex 3 of the DENR Memorandum Circular No. 2010-14. **Figure 1-7** shows the preliminary delineation of the proposed project's impact areas.

[19]As stated in the DENR guidelines, the direct impact area (DIA) is defined as the area where all the project facilities are proposed to be situated and where all operations are proposed to be undertaken. For this project, the DIA is initially delimited to consist of the 23-kilometer road length (project footprints).

[20]In contrast, the indirect impact area (IIA) covers the extent of the potential project impacts on biophysical (land, water, and air quality) and socio-economic aspects. The IIA of this project covers the areas in the immediate vicinity of the project site. The host local government units (LGUs) of the Municipality of Santa Fe and the Barangay LGU of Canabuan; Municipality of Aritao and Barangay LGUs of Canabuan and Canarem in the Province of Nueva Vizcaya; and the Municipality of Carranglan and the Barangay LGUs of Bunga, Burgos and Salazar in the Province of Nueva Ecija.

[21]Also included are the 2 Ancestral Domains (ADs) of the Kalanguya Ikalahan Indigenous Cultural Communities (ICCs) in Nueva Vizcaya and Kalanguya ICCs in Nueva Ecija. It can be noted that the proposed project has already secured the Certification Precondition (CP) from NCIP.

[22]Further, the proposed project will also traverse the Pantabangan-Carangglan Watershed Forest Reserve (PCWFR). The PCWFR was declared a watershed by virtue of Presidential Proclamation No. 561 series of 1969.

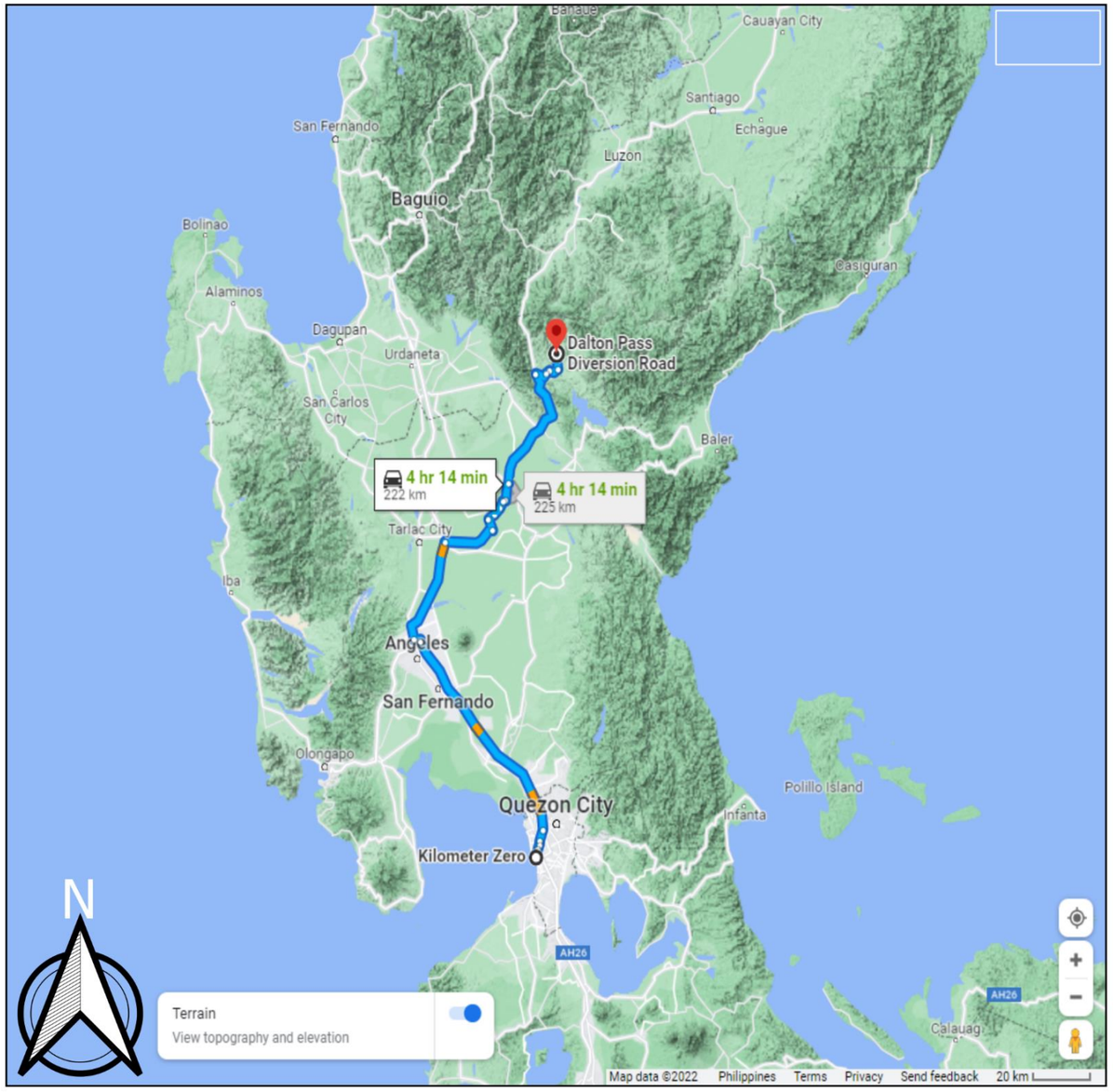
- For the Land component, the DIA pertains to the areas that will be cleared and developed for the construction of Dalton Pass East Alignment Road Project. This will also include the disposal sites of the excavated soil from the tunneling activities.

- For the Water component, the DIA refers to the portions of Carranglan (Wahig) River and Marang River where there will be bridge development. Further, this also includes the unnamed rivers and creeks that the project alignment will pass through, which may generate short-term impacts on the water quality during construction phase.

- For the Air Quality, Noise and Vibration components, the DIA includes the barangays where the proposed project will be located. Impact will only be limited during construction activities.

- For the People component, the DIA comprises the structures and households that will be affected by the construction of the proposed project. The households will be affected includes the Kalanguya Ikalahan and Kalanguya Indigenous Cultural Communities (ICCs), as well as agricultural and residential areas that might be affected by the vibration and noise during construction phase. The IIA includes the nearby barangays within the municipalities of Aritao, Santa Fe and Carranglan.

Figure 1-6: Accessibility Map of the Proposed Project



4 hr 14 min (225 km)

via R-8

Fastest route now due to traffic conditions

⚠ This route has tolls.

Kilometer Zero

HXJG+GFF, Roxas Blvd, Ermita, Manila, 1000 Metro Manila

› Take Padre Burgos Ave, R-8 and Dimasalang Rd to E1/R-8 in Balintawak, Quezon City

25 min (9.7 km)

› Follow E1/R-8 and N Luzon W Expy/SCTEx/Subic - Clark - Tarlac Expy to Tarlac City. Take exit 122 from N Luzon W Expy/SCTEx/Subic - Clark - Tarlac Expy/R-8

1 hr 28 min (113 km)

› Take Pan-Philippine Hwy/AH26 to Dalton Pass Diversion Rd in Carranglan

2 hr 24 min (103 km)

Dalton Pass Diversion Road

Carranglan, Nueva Ecija

MAP SOURCE/S:

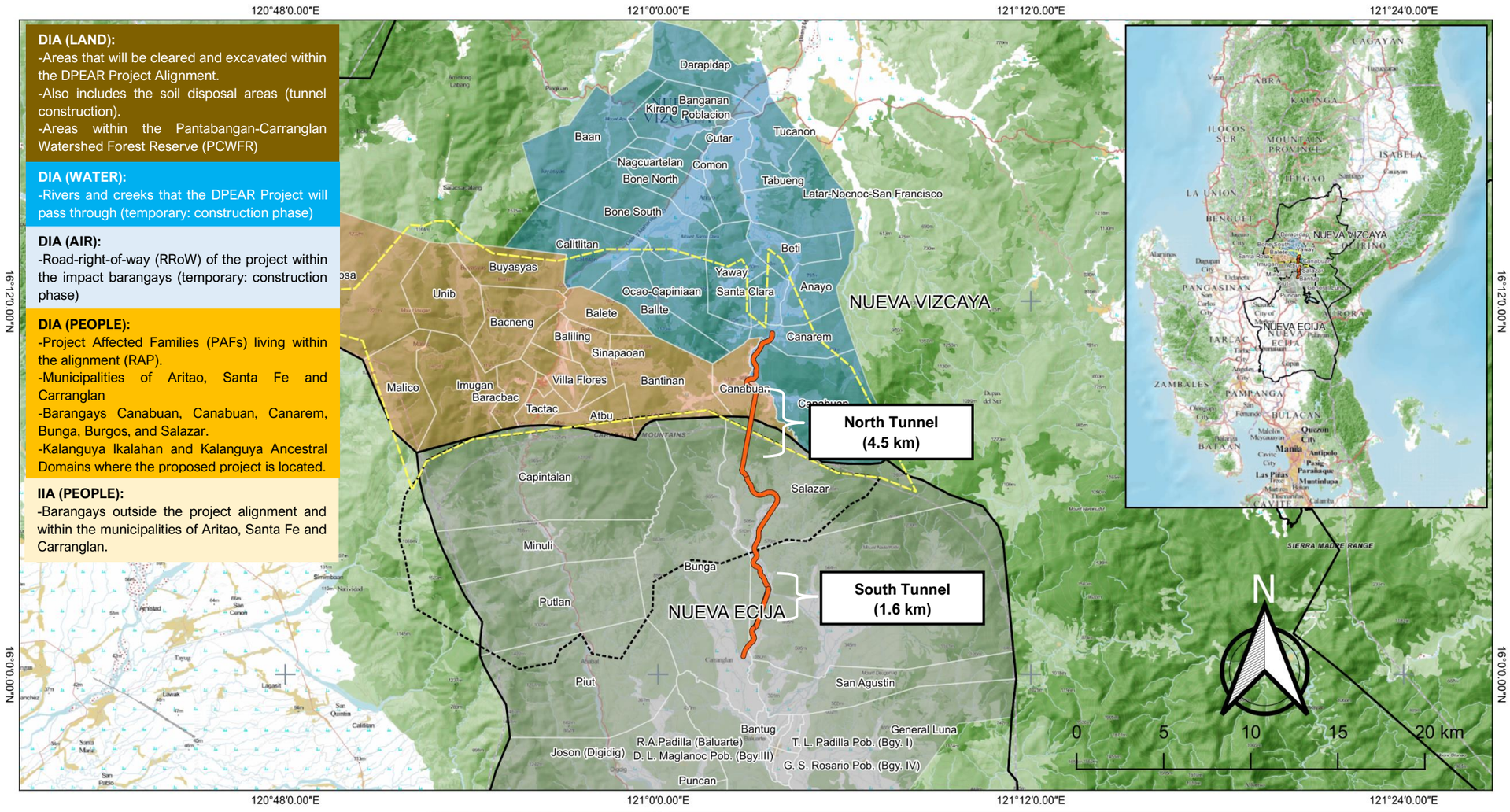
GOOGLE MAPS

MAP INFORMATION:
Map Scale : As shown
Administrative Boundaries: Google Maps
Base Map: Google Maps
Geographic Coordinate System: EPSG:4326 WGS 1984
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**ACCESSIBILITY MAP OF THE PROPOSED PROJECT**	Google Maps generated in 2022.	LCI ENVI CORPORATION

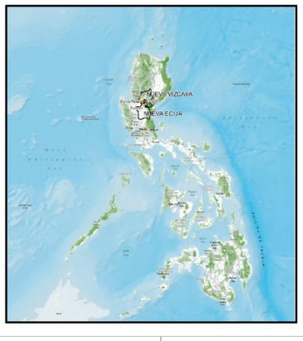
Figure 1-7: Project Impact Areas of the Proposed Project



MAP SOURCE/S:
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.



Map Legend

DPEAR Project Alignment

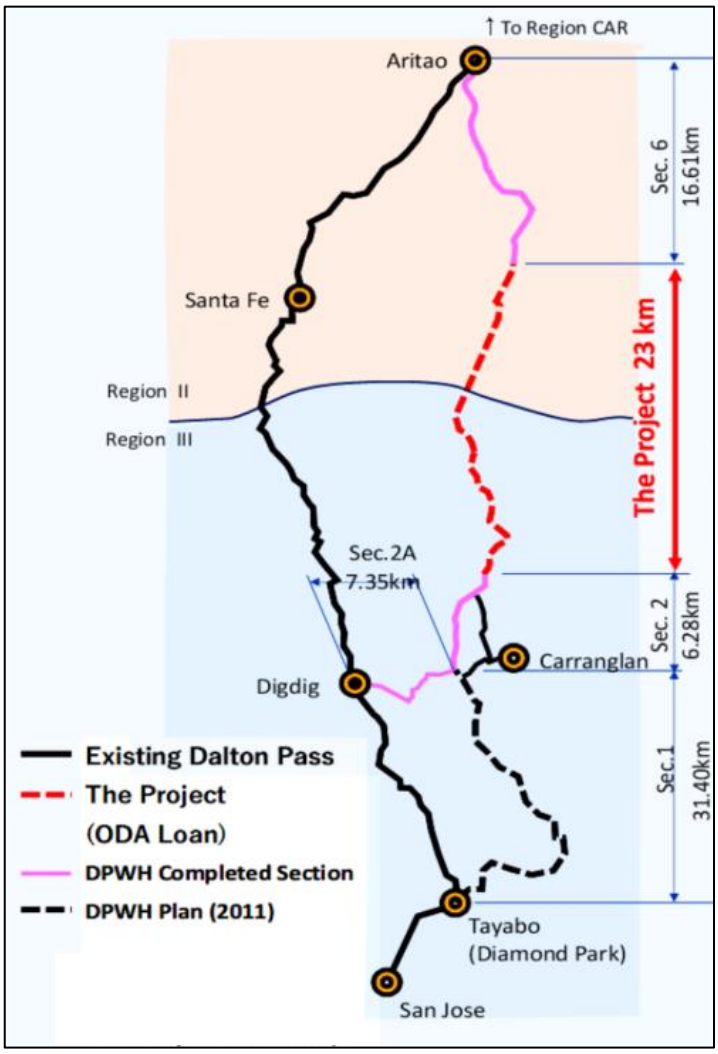
Administrative Boundaries
Province of Nueva Vizcaya
Municipality of Aritao
Municipality of Santa Fe
Province of Nueva Ecija
Municipality of Carranglan

Ancestral Domain
Kalanguya Ikalahan AD
Kalanguya AD

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**PROJECT IMPACT AREAS OF THE PROPOSED PROJECT**	As above.	LCI ENVI CORPORATION

1.2 PROJECT RATIONALE

[23]The existing Dalton Pass is a section of the Pan-Philippine Highway (PPH), one of the most important trunk roads of the North-to-South backbone of the Philippine Road Network System. The said section located between Barangay Tayabo, San Jose City, Nueva Ecija and Aritao, Nueva Vizcaya is critical and prone to frequent road closures due to the occurrences of landslides (rock falls/mudslides) causing the Dalton Pass impassable resulting to a long-time isolation of Region II (Cagayan Valley Region) until restored.



[24]Natural disasters caused by typhoons and earthquakes have frequently brought closures of the Dalton Pass. Sharp curves (vertical and horizontal) cause slow-moving traffic flow. Steep vertical gradient causes accidents (including fatal accidents) Dalton Pass is the only arterial road connecting to Metro Manila and Central/Northern regions of Luzon.

[25]More than 600 trucks pass through Dalton Pass every day to carry products to Metro Manila. Thus, heavy vehicles such as trucks and trailers run at speeds of about 10 km/h.

[26]The Government of the Philippines (GOP) made a request to the Government of Japan, through the Japan International Cooperation Agency (JICA) in funding and implementing the Dalton Pass East Alignment Road (DPEAR) Project.

[27]The basic objective of this project is to construct a bypass road that includes but not limited to roads, bridges, tunnels and slope protection works, that will serve as an alternate route bypassing the existing Dalton Pass Section along Pan-Philippine Highway (PPH) in the event of road closure brought about by calamities/natural disasters such as typhoons and earthquakes, thereby directly connecting the Cagayan Valley Region (Region II) and eastern part of Central Luzon Region (Region III) to the National Capital Region (NCR).

[28]The realization of this project will ensure the fast, continuous, and safer connectivity and transport of people, goods, and services from Regions II and III to the mainstreams and lifeline economic activities of the country as well as support agricultural, commercial, industrial, tourism, and other socio-economic activities within the project road's influence area thereby helps in uplifting the Philippine's economic growth.

The salient features of the proposed project are presented in **Figure 1-8**.

Figure 1-8: Salient Features of the Proposed Project

FIGURE TITLE:

SALIENT FEATURES OF THE PROPOSED PROJECT

PROJECT PROPONENT:	PROPOSED PROJECT:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	As above.	LCI ENVI CORPORATION

1.2.1 Consistency with the Philippine Development Plan (2017-2022)

[29]The Philippine Development Plan for 2017-2022 prepared by the National Economic and Development Authority (NEDA) is the highest-level National Development Plan in the Philippines. Accelerating infrastructure development is regarded as one of the key issues in the said plan. To develop foundations for sustainable development, the following transport strategies are presented to implement strategic infrastructure programs and projects:

- Enhance efficiency of the transport sector through providing adequate, accessible, reliable, and safe access for people and goods.; and
- Improve road-based transport to address traffic congestion through "engineering, enforcement, and education", and upgrade road network to the highest quality standards.

The construction of Dalton Pass East Alignment Road Project is consistent with those strategies in view of enhancement of connectivity between Regions II and III.

1.2.2 JICA's Environmental and Social Considerations

[30]The Proposed Dalton Pass East Alignment Road Project (DPEARP) will be assisted by the Japan International Cooperation Agency (JICA) as part of its Official Development Assistance (ODA). As a matter of policy, the proposed project must also adhere to the Guidelines for Environment and Social Considerations (2010) with regards to environmental and social impact assessment.

1) JICA's environmental and social considerations recognizes the following principles:

2) Projects must address a wide range of environmental and social impacts;

3) Measures for environmental and social considerations must be implemented from project conceptualization to monitoring;

4) Ensure accountability when implementing cooperation projects;

5) Ensure stakeholder participation in decision-making processes;

6) Appropriate disclosure of information;

7) Enhance organizational capacity of proponents; and

8) Promptness in project implementation.

[31]JICA's Guidelines for Social and Environmental Considerations also provided screening for various projects based on the following: a) project scale, b) nature, c) degree of impact on the natural and social environment, d) the site or location, e) mitigation measures required, among others. The proposed project falls under "roads, bridges, and highways" which is categorized as Category A.

> **Category A:** Proposed projects are classified as Category A if these are likely to have significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts, are also classified as Category A. These impacts may affect areas broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors, projects with characteristics that are likely to cause adverse impacts, and projects located in or near sensitive areas.

[32]Compliance to the principles and procedures as contained in the abovementioned guidelines by a thorough review of the environmental reports and ensure that all project impacts on the natural and social environment are identified and proper mitigating measures are discussed. In addition, the proposed project should conform to the environmental laws and standards of the Philippines or such other international financial intermediaries (i.e., World Bank's Safeguard Policies, Asian Development Bank's (ADB's) Safeguard Policy Statement (SPS)), whenever applicable.

[33]JICA has established an Advisory Committee for Environmental and Social Considerations to provide expert advice in preparatory surveys, environmental review, and monitoring of projects under consideration.

[34]DPWH has endeavored to fulfill the requirements for social and environmental considerations of JICA and undergo the Philippine Environmental Impact Statement System (PEISS) of DENR.

1.2.2.1 Comparison of Philippines' Laws and Policies and JICA's Environmental and Social Considerations

[35]An analysis of the Philippines' laws and policies and JICA's environmental and social considerations has been carried out. The results of the gap analysis, including the recommended actions to address the gaps are presented in **Table 1-4**.

Table 1-4: Comparison of Philippines' Laws and Policies and JICA's Environmental and Social Considerations

ITEMS	JICA GUIDELIENS FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS	THE PHILIPPINES SYSTEM	GAPS AND POLICIES
Basic Matters	Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan. (GL. Appendix1.1)	According to the DENR's PEISS revised process manual (2008), from the initial planning stage to the pre-feasibility study stage, the project proponents will consider the project site and the significance of the impact and will carry out initial scoping. In the feasibility study phase that follows, alternatives need to be considered and included in the EIA report.	No gaps.
Information disclosure	EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them. EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted. (GL. Appendix2)	The EIA report for the Philippines is prepared in the official language, English. The Project Fact Sheet in the EIA report will be written in a language that is familiar to the community. (PEISS revised process manual, 2008) The EIA report will be made public through Public Hearing during the draft stage, and the report reflecting Public Hearing will be posted on the DENR web site.	No gaps.
Public Consultation	For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans. (GL. Appendix1, 5. Social Acceptability, 1) In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared. Consultations with relevant stakeholders, such as local residents, should take place, if necessary, throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared. (GL. Appendix2, EIA Reports for Category A Projects)	Emphasis is placed on public participation, and the revised process manual (2008) specifies that public participation will be implemented through the following activities. · Public Relations Education (IEC) Activities · Public scoping · Participation of local stakeholders · Public Hearing · Sharing ECC and EIA reports Prior to public hearings and public consultations, the project's environmental assessment report will be made available to local EMB offices and local governments. After obtaining the ECC, the ECC will be published along with the EIA report.	No gaps.
Impacts to be Assessed	The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety. (GL. Appendix 1, Scope of Impacts to Be Assessed, 1) In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project. (GL. Appendix1, Scope of Impacts to Be Assessed, 2)	The evaluation items included in the environmental assessment and the details of the impact analysis to be included in the EIA report are as follows. Land (land use, geology/topography, soil, terrestrial organisms), water (hydrology (including groundwater), ocean, water quality, freshwater and marine life), air (meteorology/climate (including climate change), air quality, Noise), people (relocation, migration, indigenous peoples, public health, community contributions, basic services and resource allocation, transportation, local environmental management, affected local assets), (PEISS Revised Process Manual, 2008).	There is no difference in the evaluation items and contents. Regarding soil and vibration, no environmental standards are set in the Philippines. Compare and evaluate the expected impacts with reference to internationally recognized guidelines (WHO, IFC, etc.) or standards in developed countries.
Monitoring, Grievance Redress	Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders. (GL. Appendix1, Monitoring 3)	Project proponents that have obtained the ECC submit to the EMB a semi-annual compliance monitoring report (CMR) and a quarterly self-monitoring report(SMR). In addition, as a third-party monitoring, the MMT submits a compliance monitoring	No gaps.

ITEMS	JICA GUIDELIENS FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS	THE PHILIPPINES SYSTEM	GAPS AND POLICIES
	When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems. (GL. Appendix1, Monitoring 4)	and validation report (CMVR) to the EMB office every six months. These are subject to information disclosure. (PEISS revised process manual, 2008)	
Ecosystem and Biota	Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests. (GL. Appendix1, Ecosystem and Biota 1)	Development in protected areas is not prohibited by Philippine law. However, in the EIA procedure, it will be evaluated as "a region with significant environmental impact" and the clearance of the PAMB (Protection Area Management Committee) will be required.	In planning, the conversion and degradation of the protected area (PCWFR) should be suppressed. In the course of the EIA survey, sufficient discussions on related mitigation measures will be conducted by related organizations (DENR related departments).
Indigenous Peoples	Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses. (GL. Appendix1, Indigenous Peoples 1)	The FPIC process protects the indigenous people's will and rights when the projects may affect the ADs. (NCIP AO No.1, 1998, Section 7)	Although protection of indigenous peoples' rights has been claimed, it does not specify how to avoid or minimize the negative impact of the project. Avoid and minimize the impact in the early stages of project formation (route selection) and take effective measures within the IPP as necessary.

1.3 PROJECT ALTERNATIVES

1.3.1 Site Selection

[36]The project site for Dalton Pass East Alignment Road Project was identified based on the need for an alternative route to connect Cagayan Valley Region and the eastern part of Central Luzon Region as well as NCR.

[37]In preparation for the proposed project, Segment 1, composed of 6.42 km road and 2 bridges were completed by DPWH Region III. Similarly, Segment 5, composed of 16.43 km road and a bridge were already completed by DPWH Region II.

[38]Four alignment alternatives were considered during the route selection study. The profiles are shown in **Figure 1-9**. While the criteria used to determine the route was based on the following:

Table 1-5: Evaluation Criteria to Determine the Project Alignment

NO.	MAIN ITEMS	SUB-ITEMS	SCORE ALLOCATIONS	EVALUATION METHODS
1.1	**Planning and Construction Technology (60)**	Road Length (km)	10	The route with the shortest length was assigned the highest score, and other routes were scored according to the extension ratio to the shortest route.
1.2		Construction Technology	10	The construction technologies required for tunnels, bridges, and earthworks in each route plan were compared and examined.
1.3		Construction Period	10	The route alternative with the shortest construction period was assigned the highest score, and other route plans were scored according to the ratio of the construction period to the shortest route.
1.4		Strength Against Disasters (ground/flood)	10	High risk (0-5): routes passing high risk areas Low risk (6-10): routes passing low risk areas.
1.5		Operation/ Maintenance	5	The maintenance work required for tunnels, bridges, and earthworks of each route was compared and examined.
1.6		Construction Cost	15	The route with the lowest construction cost was assigned the highest score, and the other routes were scored according to the cost ratio.

NO.	MAIN ITEMS	SUB-ITEMS	SCORE ALLOCATIONS	EVALUATION METHODS
2.1	**Natural Environment (15)**	Pollution Control (Air Pollution, Water, Wastes)	6	Air quality and noise: The route with the shortest length was assigned the highest score, and the other routes were allocated according to the extension ratio. In addition, separation distance from the residential areas was considered. (Allocated score: 2) Water quality: The route with the shortest distance to the river was assigned the highest point, and the other routes were scored according to the distance ratio. (Assigned score: 2) Waste: From the viewpoint of the amount of tunnel excavation soil, the alternative with the shortest tunnel length was assigned the highest score, and the route was allocated to other route plans in proportion to the extension. (Assigned score: 2)
2.2		Protected Areas	4	Although the alternatives are inevitable to pass through the protected area geographically, the alternative with the shortest distance through the protected area was designated as the highest point, and the points were allocated to other route plans according to the distance ratio.
2.3		Ecosystem	5	The alternative with the shortest distance was assigned the highest score, and the other routes were scored according to the distance ratio.
3.1	**Social Environment (15)**	Land Acquisition/ Resettlement	7	The alternative with the least negative impact on land acquisition and structures was assigned the highest score and was assigned to other route plans according to the ratio of impact.
3.2		Indigenous Peoples	8	The alternative with the shortest distance passing through a region related to indigenous people including Ancestral Domains, was assigned the highest score, and other alternatives were assigned to in proportion to the distance.
4.1	**Economy (10)**	Economic Feasibility	10	10, 8, 6, and 4 were assigned according to the size of EIRR.

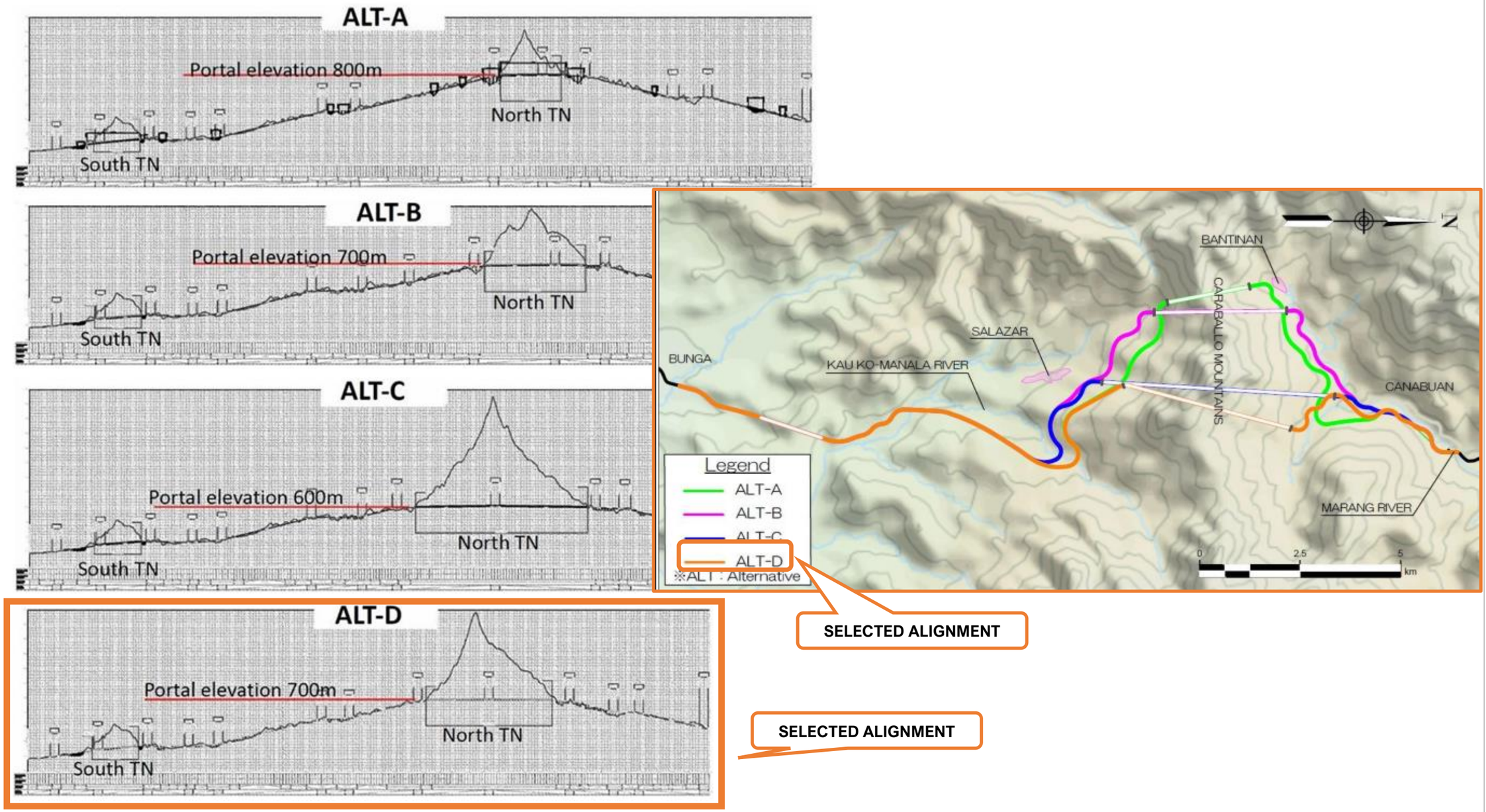
SOURCE: JICA Study Team

[39]The detailed result of the evaluation for alternatives was presented in **Table 1-6**. Based on the criteria, ALT-D obtained the highest evaluation with **92.91**. As such, **ALT-D** was chosen to undergo further studies and be implemented accordingly.

Table 1-6: Result of the Evaluation for Alternatives

NO.	PRIMARY CRITERIA	SECONDARY CRITERIA	SCORE ALLOCATION	ALT-A	ALT- B	ALT-C	ALT-D
1.1	Planning and Construction Technology (60)	Road Length (m)	10	26,730m	24,790m	22,420m	23,260m
				8.40	9.00	10.00	9.60
1.2		Construction Technology (The construction technologies required for tunnels, bridges, and earthworks)	10	High technologies are required.	High technologies are required.	High technologies are not required.	High technologies are not required.
				5	6	8	9
1.3		Construction Period	10	36months	36months	50months	41months
				10.00	10.00	7.20	8.80
1.4		Strength against disasters (Distance through high-risk ground)	10	4,002m	4,545m	2,408m	1,958m
				4.89	4.31	8.13	10.00
1.5		Operation / Maintenance (Ease of regular maintenance (Length of each road structure)	5	3.80 Earth work:19,027m Bridge:3,934m Tunnel:3,650m	2.65 Earth work:15,585m Bridge:4,100m Tunnel:4,980m	3.63 Earth work:11,678m Bridge:3,240m Tunnel:7,380m	3.93 Earth work:13,759m Bridge:3,500m Tunnel:5,880m
1.6		Construction Costs	15	39,846 million Yen	42,018 million Yen	43,242 million Yen	40,668 million Yen
				15.00	14.22	13.82	14.70
1.7		**Sub-total**	**60**	**47.09**	**46.18**	**50.78**	**56.03**
2.1	Natural Environment (15)	Pollution Control (Estimated negative impacts of air quality, noise, water quality and wastes)	6	5.40 Air quality, noise:1.68 Water quality:1.72 Wastes:2.00	4.32 Air quality, noise:1.80 Water quality:1.06 Wastes:1.46	4.94 Air quality, noise:2.00 Water quality:2.00 Wastes:0.94	4.98 Air quality, noise:1.92 Water quality:1.82 Wastes:1.24
2.2		Protected Areas (Distance through the protected areas)	4	14.52km	13.77km	11.47km	12.02km
				3.16	3.32	4.00	3.80
2.3		Ecosystem (Total road distance)	5	26.73km	24.79km	22.42km	23.26km
				4.20	4.50	5.00	4.80
		Sub-total	**15**	**12.76**	**12.14**	**13.94**	**13.58**
3.1	Social Environment (15)	Land Acquisition / Resettlement (Areas of required land)	7	160.6ha	148.9ha	134.7ha	139.5ha
				5.87	6.33	7.00	6.76
3.2		Indigenous Peoples (Distance through the ADs)	8	4.2km	4.0km	4.7km	5.5km
				7.60	8.00	6.80	5.84
		Sub-total	**15**	**13.47**	**14.33**	**13.80**	**12.60**
4.1	Economy (10)	Economic Feasibility (EIRR)	10	13.55%	13.45%	13.63%	14.03%
				6.00	4.00	8.00	10.00
Total			**100**	**79.32**	**76.65**	**86.52**	**92.21**

Figure 1-9: Profile of the Four Alignment Alternatives



PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**PROFILE OF THE FOUR ALIGNMENT ALTERNATIVES**	JICA Study Team	LCI ENVI CORPORATION

1.3.2 Technology/Design Selection

[40]**Road (Highway).** The following are the applicable codes and specifications for the highway design:

- Design Guidelines, Criteria & Standards, Volume 4 – Highway Design (2015)
- Japan Road Association Specifications for Highway Bridges (2017)

[41]The preliminary highway geometric design criteria are as presented in the following table.

Table 1-7: Preliminary Highway Design Criteria (Geometric)

ITEM	VALUE	APPLIED STANDARD
Design Speed	60 km/hr.	DGCS: Vol. 4 2015
Maximum Grade	5%	DGCS: Vol. 4 2015
Maximum Grade (Tunnel)	3%	Road Structure Ordinance 2004
Minimum Grade	0.3%	Road Structure Ordinance 2015
Radius (Minimum, Desirable)	120 m, 220 m	DGCS: Vol. 4 2015
Pavement Width	6.70 m	DGCS: Vol. 4 2015
Shoulder Width	2.50 m	DGCS: Vol. 4 2015
SOURCE: JICA Study Team, Interim Report (R6)		

[42]**Bridge.** The following are the applicable codes and specifications for the bridge design:

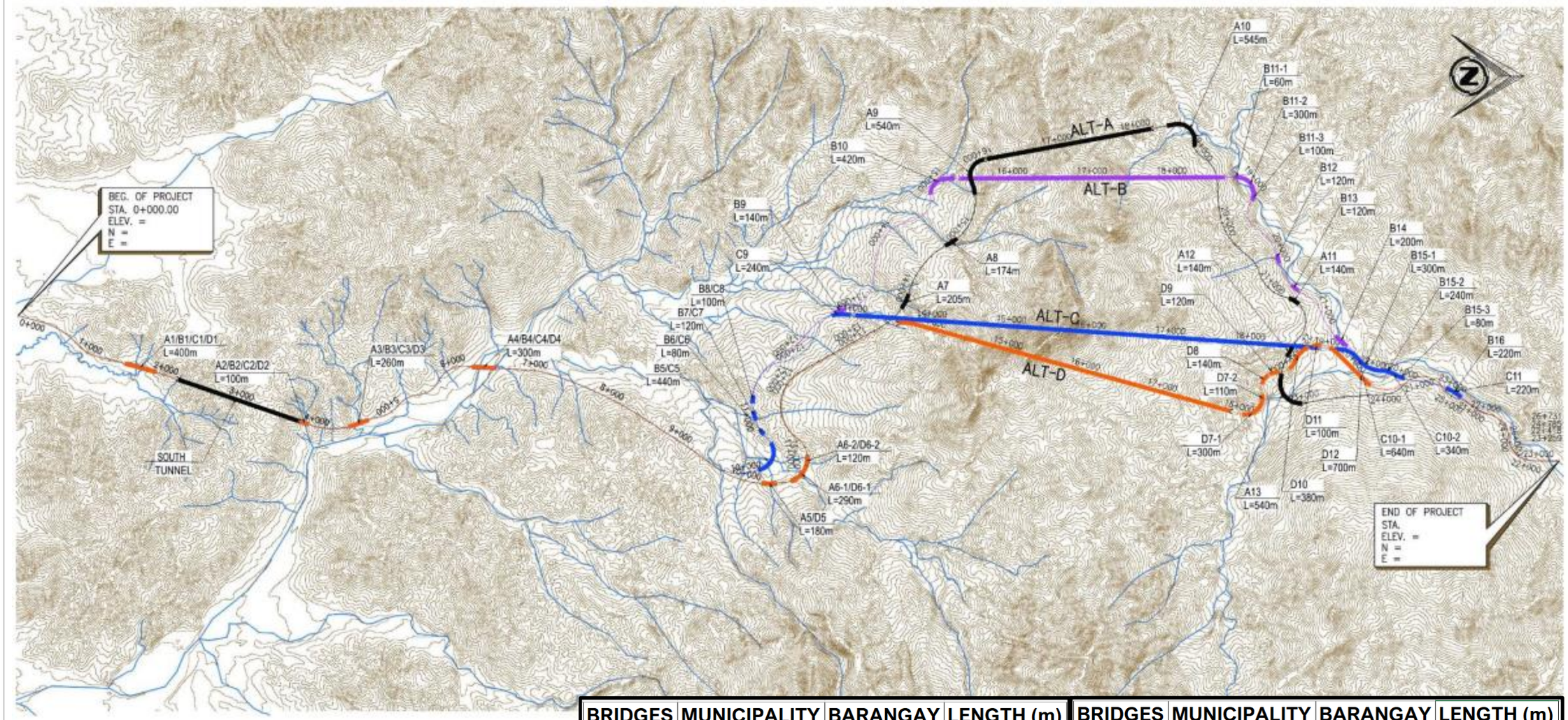
- DPWH Design Guidelines, Criteria & Standards, Volume 5 – Bridge Design (2015);
- DPWH LRFD Bridge Seismic Design Specifications, 1st Edition (2013) & Interim Revision (2019);
- AASHTO Bridge Design Specifications, 8th Edition (2018);
- AASHTO Bridge Construction Specifications, 3rd Edition (2016); and
- Japan Road Association Specifications for Highway Bridges (2017).

[43]The preliminary bridge design criteria considered are presented in the following table.

Table 1-8: Preliminary Bridge Design Criteria

ITEM	VALUE
Design Flood Level (River/Irrigation Canal)	5 m from riverbed
Freeboard	1.5 m
Construction Limit (Project Road)	5 m
SOURCE: JICA Study Team, Interim Report (R6)	

Figure 1-10: Location of the Bridges



BRIDGES	MUNICIPALITY	BARANGAY	LENGTH (m)
D1	Carranglan	Burgos	400
D2	Carranglan	Burgos	100
D3	Carranglan	Burgos	260
D4	Carranglan	Burgos	300
D5	Carranglan	Salazar	180
D6-1	Carranglan	Salazar	290
D6-2	Carranglan	Salazar	120

BRIDGES	MUNICIPALITY	BARANGAY	LENGTH (m)
D7-1	Santa Fe	Canabuan	300
D7-2	Santa Fe	Canabuan	110
D8	Santa Fe	Canabuan	140
D9	Santa Fe	Canabuan	120
D10	Santa Fe	Canabuan	380
D11	Aritao	Canabuan	100
D12	Aritao	Canabuan	700

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**LOCATION OF THE BRIDGES**	JICA Study Team	LCI ENVI CORPORATION

[44]**Tunnel.** The following are the applicable codes and specifications for the tunnel design:

- DPWH Design Guidelines, Criteria & Standards, Volume 4 – Highway Design (2015)
- Japan Society of Civil Engineers Standard Specification for Tunneling – Mountain Tunnels (2016)
- NEXCO the East, Middle, West Design Standard, Section 3 – Tunnel (2019)
- Japan Road Association Technical Standard for Road Tunnel – Structure Division (2003)

[45]The preliminary tunnel design criteria are presented in the following table:

Table 1-9: Preliminary Tunnel Design Criteria

ITEM	VALUE	APPLIED STANDARD
Traffic and Number of Tunnel Tube	Two main tunnels of 2 ways traffic and one evacuation tunnel	Technical
Lane Width	3.35 m	DGCS: Vol. 4 2015
Vertical Clearance	5.0 m	DGCS: Vol. 4 2015, pp.3-81
Width of Shoulder	0.75 m	DGCS: Vol. 4 2015, pp.3-65
Width of Sidewalk	0.50 m	DGCS: Vol. 4 2015, pp.3-81
Width of Maintenance Walk	0.75 m	NEXCO Standard
Height of Maintenance Walk	0.90 m	NEXCO Standard
Maximum Gradient	3.0%	Road Structure ordinance (2004)
Maximum Gradient	0.5%	Road Structure ordinance (2015)
Vertical Clearance of Maintenance Walk	2.00 m	NEXCO Standard
Interval of Emergency Crossing Passage for Pedestrian	750 m	Technical
Interval of Emergency Crossing Passage for Vehicle	1,500 m	Technical
Interval of Emergency Crossing Passage for Vehicle	750 m	Technical
Ventilation	Mechanical Jet-fan	Technical
SOURCE: JICA Study Team, Interim Report (R6)		

[46]**New Austrian Tunneling Method (NATM).** The extraction method and excavation system of the tunnel sections will apply the NATM, through shotcrete and rock bolt construction. The excavation method applies blasting method because rock classification is mostly CI or CII (refer to **Table 1-10**). The excavation system depends on rock conditions and tunnel excavation area.

[47]The extensive discussion and illustrations of the NATM can be found in **Section 1.5.1.3**.

Tunnel Drainage. The tunnel drainage is composed of perforated High-Density Polyethylene (HDPE) Pipes and side ditches as shown in **Figure 1-11**. The drainage works shall be started 15 days after the completion of the lining concrete work.

Figure 1-11: Tunnel Drainage

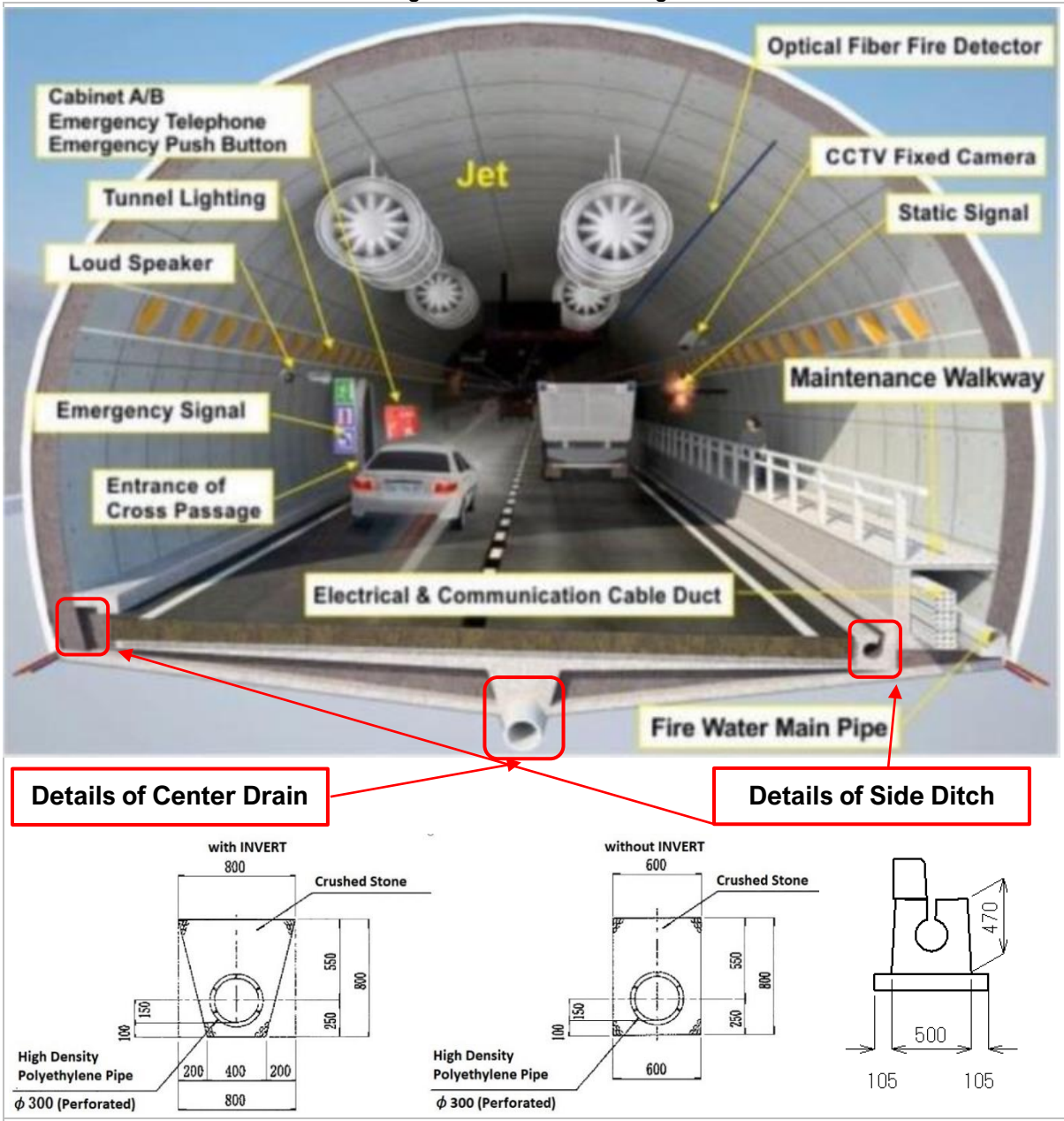


FIGURE TITLE:

TUNNEL DRAINAGE

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Table 1-10: Rock Mass Classifications for NATM

Grade of Rock Mass	Rock Groups	Representative Rock Name	Elastic Wave Velocity Vp (km/s) 1.0 2.0 3.0 4.0 5.0	Condition of Rock Mass: Rock Quality, Water influence	Condition of Rock Mass: Interval of Discontinuity	Condition of Rock Mass: Condition of Discontinuity	Condition of Boring Core, RQD (%)	Competence Factor	Circumstances of Tunnel Excavation
B	H, Massive	Granite, Granodiorite, Quartz porphyry, Hornfels		-It is fresh and hard, or it show slightly tendency of denaturation due to weathering. - There is not deterioration due to water.	-The interval of joint is 50cm as mean. - Although there are influences of stratification or schistosity, it has little influence on tunnel excavation.	-There are little slickenside and inflow clay in discontinuity. -The discontinuity is almost sticking.	-Shapes of boring core are clast shape, short column shaped and rod shaped. -The length of boring core is almost 10 to 20cm, but there are a few cores of around 5cm also. - RQD is more than 70.	-	-The strength of rock is much larger than the load acting by tunnel excavation. - The state of discontinuity is also good, and looseness due to tunnel excavation hardly occurs. The excavated surface may partially occurs the fall of rocks, but the working face is self-sustaining. - At the tunnel with an excavation width (D) of about 10 m, the inner space displacement accompanying excavation is settled a minute elastic deformation of about 15mm or less.
		Mesozoic-Paleozoic sandstone, Chert							
	M, Massive	Andesite, Basalt, Rhyolite, Dacite							
		Tertiary sandstone, Conglomerate							
	L, Massive	Ophiolite, Tuff, Tuff breccia							
	M, Layered	Slate, Mesozoic-Paleozoic shale							
	L, Layered	Black schist, Greenschist							
		Tertiary mudstone							
C1	H, Massive	Granite, Granodiorite, Quartz porphyry, Hornfels		-It is relatively fresh and hard, or it show slightly tendency of weathering and denaturation. -Soft rock with relatively high agglomeration degree. - There is not deterioration due to water.	-The interval of joint is 30cm as mean. - Stratification or schistosity is conspicuous; it has influence on tunnel excavation.	- There is slickenside and inflow clay in a little part of discontinuity. -The discontinuity is partially open, but the opening width is small.	-The length of boring core is about 5 to 20cm, but there are a few cores of less than 5cm also. - RQD is 40 to 70.	- more than 4	-The strength of rock is larger than the load acting by tunnel excavation. - The state of discontinuity is relatively good, and looseness due to tunnel excavation is partially. The excavated surface may partially fell along the relatively slippery discontinuity, but the working face is self-sustaining. - At the tunnel with an excavation width (D) of about 10 m, the inner space displacement accompanying excavation is settled a minute elastic deformation of about 15 to 20mm or less.
	M, Massive	Andesite, Basalt, Rhyolite, Dacite							
		Tertiary sandstone, Conglomerate							
	L, Massive	Ophiolite, Tuff, Tuff breccia							
	M, Layered	Slate, Mesozoic-Paleozoic shale							
	L, Layered	Black schist, Greenschist							
		Tertiary mudstone							
C2	H, Massive	Granite, Granodiorite, Quartz porphyry, Hornfels		- It is relatively fresh and hard, or it show slightly tendency of weathering and denaturation. -The rock quality is rather softened. -Soft rock with relatively high agglomeration degree. - There are deterioration and looseness due to water partially.	-The interval of joint is 20cm as mean. - Stratification or schistosity is conspicuous; it has influence on tunnel excavation.	-There is partially the slickenside and thin inflow clay in the discontinuity. -The discontinuity is partially open, and the opening width is relatively large. -Small faults with narrow width are interposed.	-The length of boring core is almost less than 10cm, and there are many cores of less than 5cm. - RQD is 10 to 40.	- more than 4	- The strength of the rock is not so large as compared with the load acting by tunnel excavation, but the deformation is almost within the range of elastic deformation. - A condition of the discontinuity is poor, and the looseness due to tunnel excavation increases along the slippery discontinuity. - The working face is almost self-sustaining. - When the rock strength is smaller than the load acting by tunnel excavation, the inner space displacement is about 30mm which is the boundary between elasticity and plasticity, in the tunnel with the excavation width (D) of about 10m, but it almost disappear at the distance of 2D.
	M, Massive	Andesite, Basalt, Rhyolite, Dacite							
		Tertiary sandstone, Conglomerate							
	L, Massive	Ophiolite, Tuff, Tuff breccia							
	M, Layered	Slate, Mesozoic-Paleozoic shale							
	L, Layered	Black schist, Greenschist							
		Tertiary mudstone							
D1	H, Massive	Granite, Granodiorite, Quartz porphyry, Hornfels		-The rock quality has some hard parts, but it has intense weathering and denaturation as a whole. -Stratification or schistosity is very noticeable. -The interval of discontinuity is less than 10cm as mean, and many of them are opening. -The opening width of discontinuity is large, and the slickenside and thin inflow clay is often interposed in the discontinuity. -Small faults with narrow width are interposed. -Soils containing many boulder and talus deposit, etc. -There are striking deterioration and looseness due to water.			-The boring core is seen like fragments, and partly it is seen like angular gravelly sand or clay. - RQD is less than about 10.	4 to 2	-The strength of the rock is not large as compared with the load acting by tunnel excavation, the elastic deformation occurs, also the plastic deformation occurs at a part. - A condition of the discontinuity is very poor, and the looseness increases along the many slippery discontinuity. Because the self-sustaining of working face is difficult, ring cut method or mortar spraying works may be required. - If closing of the invert is not performed early, the inner space displacement of about 30 - 60mm occurs, in the tunnel with the excavation width (D) of about 10m, and often it does not disappear even if the distance of 2D.
	M, Massive	Andesite, Basalt, Rhyolite, Dacite							
		Tertiary sandstone, Conglomerate							
	L, Massive	Ophiolite, Tuff, Tuff breccia							
	M, Layered	Slate, Mesozoic-Paleozoic shale							
	L, Layered	Black schist, Greenschist							
		Tertiary mudstone							
D2	H, Massive	Granite, Granodiorite, Quartz porphyry, Hornfels						2 to 1	-The strength of the rock is little as compared with the load acting by tunnel excavation, and the large plastic deformation occurs together with the elastic deformation. - A condition of the discontinuity is very poor, and the looseness increases along the many slippery discontinuity. Because the self-sustaining of working face is difficult, ring cut method or mortar spraying works may be required. - If closing of the invert is not performed early, the inner space displacement of about 60 - 200mm occurs, in the tunnel with the excavation width (D) of about 10m, and often it does not disappear even if the distance of 2D.
	M, Massive	Andesite, Basalt, Rhyolite, Dacite							
		Tertiary sandstone, Conglomerate							
	L, Massive	Ophiolite, Tuff, Tuff breccia							
	M, Layered	Slate, Mesozoic-Paleozoic shale							
	L, Layered	Black schist, Greenschist							
		Tertiary mudstone							

Note: (1) The rock mass better than this classification shall be "Grade A", the inferior rock mass shall be "Grade E". (2) The classification of H, M and L of "Rock Groups" are defined by uniaxial compressive strength (qu) as follows; H: qu≧ 80N/mm², M: 20 N/mm² ≦ qu <80N/mm², L: qu <20N/mm². (3) "Massive" and "Layered" of "Rock Groups" are defined as follows; Massive: Rock which the discontinuity is mostly joint. Layered: Rock which the discontinuity is mostly stratification or schistosity. (4) RQD stands for "Rock-quality designation", and it is a rough measure of the degree of joint or fracture in a rock mass, measured as a percentage of the boring core in lengths of 10 cm or more.

Source: Technical Standard (Structure) and Descriptions, of Road Tunnel (Issued by Japan Road Association)

1.3.3 Resources

[48]**Water Supply.** The water supply requirements of the proposed project will be obtained from local water supply in the area. Other options considered are based on available water sources (i.e., spring water, groundwater, rainwater, etc.).

[49]**Power Supply.** The power supply requirements of the proposed project will be obtained from local power supply utilities in the area. In some portions where electricity lines are not available/serviceable, generator sets will be utilized.

[50]**Construction Materials.** Materials for construction, including aggregates, will be procured, as much as possible, within the Provinces of Nueva Vizcaya and Nueva Ecija. Supplies from other nearby provinces shall also be considered.

[51]For ready-mixed concrete, **DPWH** shall utilize commercial batching plants certified by the DPWH Bureau of Research and Standards.

1.3.4 No Project Option

[52]If the proposed project is not implemented, the following issues and negative impacts are expected to continue:

- **Natural hazards.** Dalton Pass is extremely vulnerable to natural disasters and is often closed by earthquakes. Natural disasters such as typhoons frequently cause road closures, including the long-term suspension of traffic caused by the 1990 Baguio Earthquake. There is a high risk of earthquakes around the Dalton Pass, and there is a concern that the earthquake may cause long-term suspension of traffic and increase the suspension of traffic due to a typhoon disaster.

- **Lack of alternative route.** In case that the existing Dalton Pass is closed, there is no detour around it, and a very long detour is forced. (Approximately 350 km, 7 hours increase (according to the 2011 METI survey))

- The Dalton Pass is the only arterial road connecting Metro Manila and northern Luzon and is the key to transportation and logistics to Metro Manila. If the above issues are not solved, it will take time to pass the pass section. In addition, if a road is closed due to a natural disaster such as an earthquake or typhoon, a road collapse such as a falling rock or a debris flow, or a direct accident such as a traffic accident, emergency transportation and material transportation will be affected, and the areas will be isolated. Residents along the route and in northern Luzon have long awaited action.

- **Traffic condition.** Since the Dalton Pass is a mountain road, the hairpin curve is continuous, and the vertical gradient is steep. Because the traveling speed of large vehicles and trailers drops to about 10 km per hour and the following vehicles are forced to follow this, vehicles cannot secure a sufficient traveling speed. Due to severe alignment, traffic accidents including fatal accidents occur frequently. (In 2017, 541 accidents occurred on the Dalton Pass (including 21 fatal accidents and 118 severe accidents). The traffic volume in 2019 is 9,350 passenger car unit per day and has already reached to capacity.

- **Road conditions.** The road conditions in the eastern area (including the residential area of the indigenous peoples) of the Dalton Pass, where the project is planned, are extremely poor, and traveling in the rainy season is extremely difficult. The situation of relying on

unpaved roads and river crossings by vehicles makes traveling difficult especially during the rainy season.

- From the above, it is difficult for the Philippine Government to adopt an option that does not implement an alternative road project that is resistant to disasters and has excellent runnability.

1.4 PROJECT COMPONENTS

[53]The major project work components of the project are presented in **Table 1-11**.

Table 1-11: DPEAR Project Work Components

ITEM	VALUE	APPLIED STANDARD
Temporary Works	Preparation of access road, construction yard	Temporary Works
Road Works	Construction of main road work, i.e., excavation, embankment, slope protection, pavement, power transmission lines, substations, drainage, and traffic safety work	Road Works
Bridge Works	Construction of main road bridge	Bridge Works
Tunnel Works	Construction of tunnel	Tunnel Works
SOURCE: JICA Study Team, Interim Report (R6)		

1.4.1 General Layout of Facilities

[54]**Figure 1-13** presents the general layout of facilities of the proposed project.

1.4.2 Major Components

[55]The following are the brief description of the major components of the proposed project. The details and design considerations of each major components are described thoroughly in **Section 1.5 Process/Technology**. The major components will be updated once the project has reached the detailed engineering design (DED) stage.

- **Road (Highway).** 4 lanes within 60 meters road RRoW (30 meters from the centerline).

  Road safety facilities are installed for the proposed project to reduce risks of serious accidents to occur.

  - Safety barriers are provided to prevent vehicles from going off the road at high fill sections with the height of 5 m; and
  - Fences are installed at slope toes to prevent entry into the road area from the outside.

  Traffic control facilities are installed for the proposed project to achieve efficient traffic by giving road information to road users.

  - Road markings provide necessary information, guidance, warning, regulation, and instructions to road traffic by means of paint, road studs, and stones; and
  - Road signs are installed alongside or above the project road to provide necessary information to road users. They are installed to alert drivers to regulations and dangerous areas in order to prevent traffic accidents and to facilitate traffic flow by providing instructions and guidance.

  Other protection measures include entry protection fences to be installed at RRoW boundaries.

- **Bridges.** 14 bridges with a total length of 3.5 kms. The safety feature includes barriers to prevent fall accidents; and
- **North and South Tunnels.** Spanning 4.5 kms. and 1.6 kms., respectively. The tunnels will have communications and emergency facilities based on NEXCO design guidelines.

Table 1-12: Installation Intervals of Tunnel Emergency Facilities

FACILITIES	INSTALLATION INTERVALS
Emergency Telephone	Every 200m
Emergency Push Button	Every 100m
Fire Detector	Every 50m
Static Signal in Tunnel	Every Emergency Parking Bay
SOURCE: JICA Study Team	

[56]Variable Message Signboard (VMS) will be installed just before the tunnel entrances to inform the driver of the traffic situation in the tunnel ahead of the driver.

1.4.3 Temporary Facilities

1.4.3.1 Construction Yard

[57]Temporary yard will be installed in each major construction area to establish the concrete plant, supervisor office, contractor office, material/equipment storage, etc. In addition, the temporary yard will have a prestressed concrete (PC) girder production yard that is difficult to install in the mountainous area.

[58]As presented in **Figure 1-14**, the temporary facilities will have the following facilities:

- Substation and powerline equipment;
- Shotcrete plant and aggregate storage;
- Turbid water treatment basin;
- Water storage tank;
- Much temporary depot;
- Material stock yard;
- Repair shop;
- Machine parts warehouse;
- Worker rest station;
- Supervision crew room;
- Ventilation facilities for main tunnel;
- Ventilation facilities for evacuation tunnel;
- Water intake facilities;
- Powder magazine; and
- Powder works.

1.4.4 Support Facilities

1.4.4.1 Tunnel Operation Control Center (OCC)

[59]The Tunnel OCC shall be the base for operations and maintenance (O&M) of the tunnel facilities for the proposed project. The said Tunnel OCC monitors and controls both tunnels.

[60]The base for operations and maintenance (O&M) vehicles will be in the Tunnel OCC. As such, the Tunnel OCC shall have O&M vehicle garage, parking lots, and material warehouse based on the NEXCO design standard (Section 6, Tunnel Facilities).

[61]The Tunnel OCC will not have any refueling facility, due to the presence of gas station near the north side of the access road. Further, the water of fire engines supplied form the Tunnel OCC's water supply facility would be considered during the DED.

1.4.4.2 Power Supply and Demand

[62]Power supply for the proposed project will be provided by the local power utilities in the area. The project needs approximately 1,000 KW to 1,500 KW during maximum operation (tunnel construction works). In mountainous areas, generators will be considered to provide electricity.

[63]For project operations, the 13.2 kV power transmission lines/electricity posts and 2 substations, one for each tunnel sections, will be installed along the RRoW to ensure continuous power supply for the North and South Tunnels.

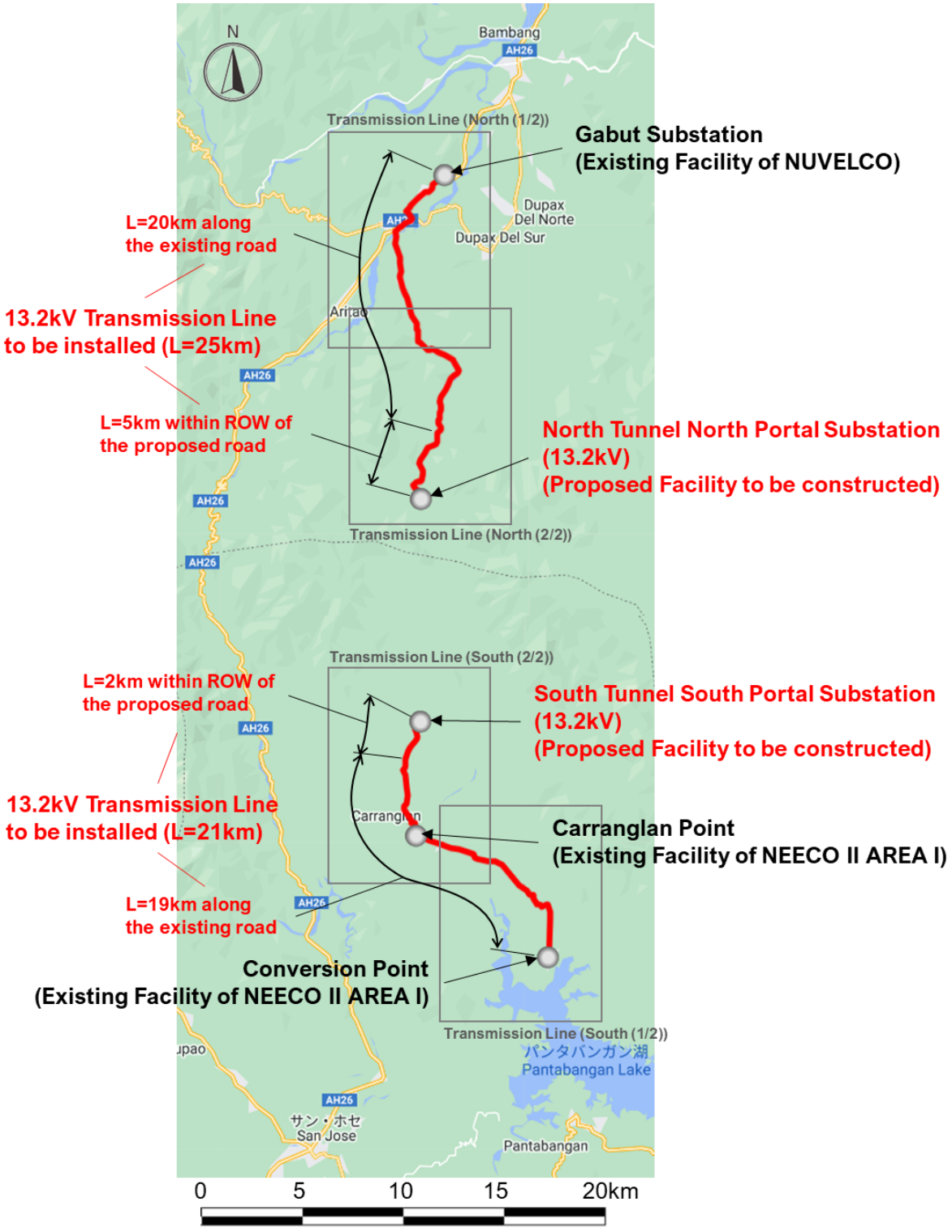
[64]For Nueva Vizcaya side, the project will tap from Nueva Vizcaya Electric Cooperative's (NUVELCO's) existing Gabut Substation in Dupax del Sur.

[65]For Nueva Ecija side, the project will tap from Nueva Ecija II Electric Cooperative, Inc.'s (NEECO II's) existing Conversion Substation in Pantabangan and Carranglan Substation.

[66]**DPWH** will enter into Memorandum of Agreement (MOA) with both NUVELCO and NEECO II regarding the power supply and operations and maintenance of the electricity posts and substations within the proposed project.

[67]**Figure 1-12** presents the location of the power transmission lines and substations supporting the project.

Figure 1-12: Location Map of Power Transmission Lines and Substations



Source: JICA Study Team

FIGURE TITLE:

LOCATION MAP OF POWER TRANSMISSION LINES AND SUBSTATIONS

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

1.4.4.3 Water Supply and Demand

[68]Water supply during the construction and operation phase of the proposed project will be obtained from the local water supply in the area as well as available water sources (i.e., spring water, surface water, groundwater, rainwater, etc.). The project's peak water requirement during construction is 475.65 m^3/day for civil works, drilling operations, and domestic use.

[69]During the drilling of holes for explosives and rock bolts, the drilling machine will be provided with water for the drilling process. The water flow requirement is 0.2 m^3/min (12 m^3/hr). The water supply will be pumped from the nearby river to a reservoir located at the tunnel entrance and will be pumped into the tunnel.

[70]The water requirement will significantly drop to 1.75 m^3 during the operations of the project. Water utilization is limited to domestic use. Should there be emergencies in the tunnel sections, firefighting equipment will be supplied with water through nearby spring and groundwater sources.

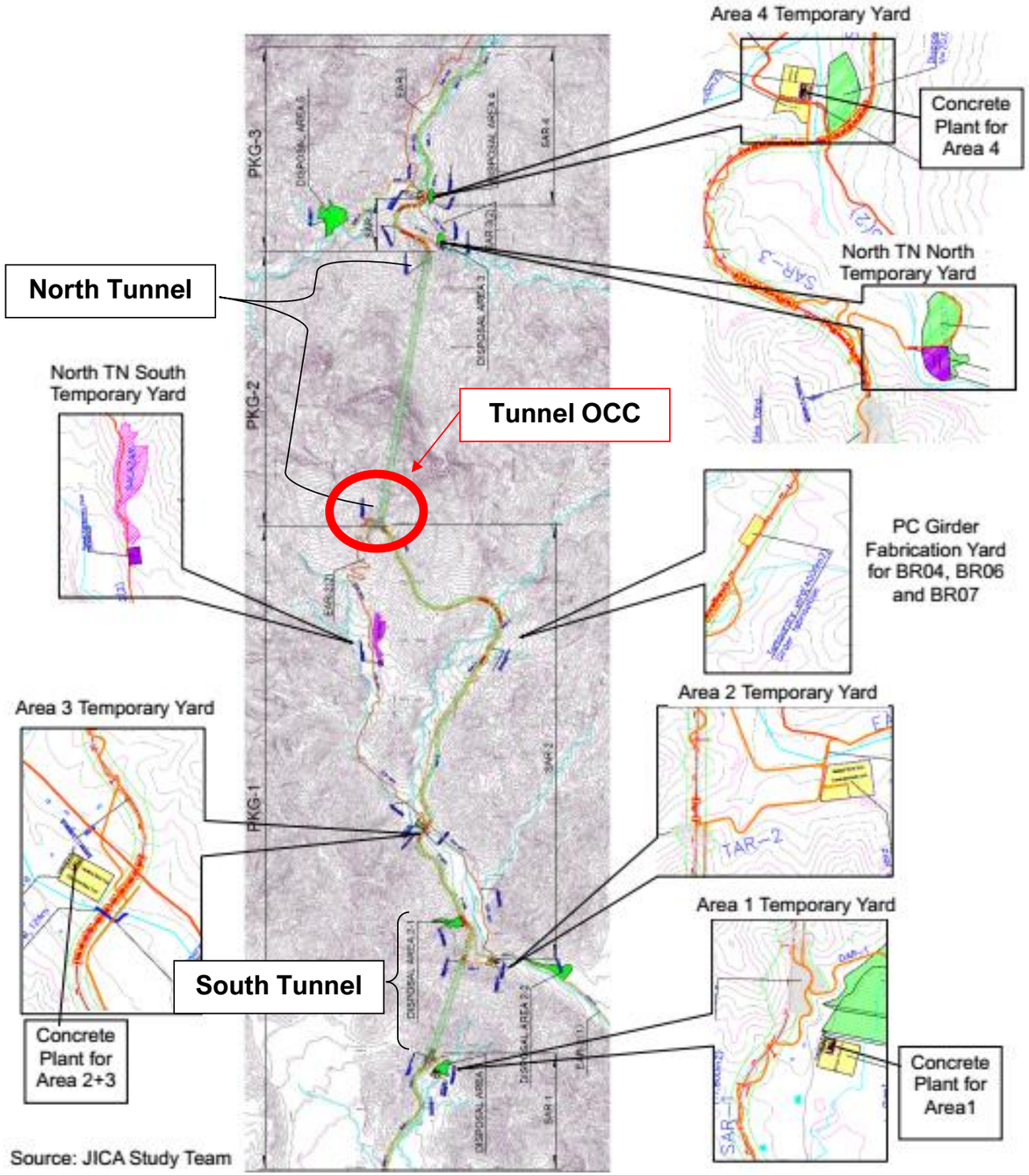
1.4.5 Combustible and Non-Combustible Equipment

[71]The following construction equipment were identified based on available project information:

Table 1-13: Combustible and Non-Combustible Equipment

ACTIVITY	EQUIPMENT
Road Construction	Dump truck 10t
	Bulldozer 110 CV
	Motor Grader 110 CV
	Tire Roller 16t
	Vibratory Roller 25t
Bridge Construction	Traveler crane
Tunnel Construction	Drill jumbo
	Breaker (hydraulic) 1,300 kg
	Wheel loader
	Dump truck 22t
	Backhoe
	Mortar grouting machine
	Turntable
	Concrete pumping vehicle
	Vibrator
Power Supply	Generator Sets
Non-combustible equipment	
None identified for now.	
SOURCE: JICA Study Team	

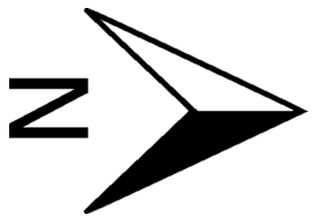
Figure 1-13: General Location of Facilities



Source: JICA Study Team

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**GENERAL LOCATION OF FACILITIES**	JICA Study Team	LCI ENVI CORPORATION

Figure 1-14: Tunnel Construction Yard (Temporary Facilities)

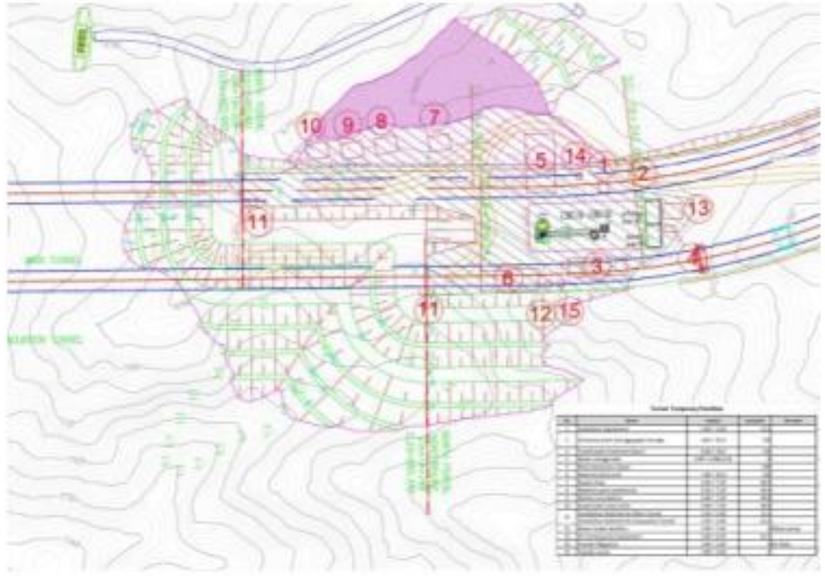


NO.	NAME
1	Substation equipment
2	Shotcrete plant and aggregate storage
3	Turbid water treatment basin
4	Water storage tank
5	Muck temporary depot
6	Material stock yard
7	Repair shop
8	Machine parts warehouse
9	Worker rest station
10	Supervision crew room
11	Ventilation facilities for main tunnel
	Ventilation facilities for evacuation tunnel
12	Water intake facilities
13	Powder magazine
14	Powder works

South Portal

North Portal

South Portal



North Portal

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**TUNNEL CONSTRUCTION YARD (TEMPORARY FACILITIES)**	JICA Study Team	LCI ENVI CORPORATION

1.5 PROCESS/TECHNOLOGY

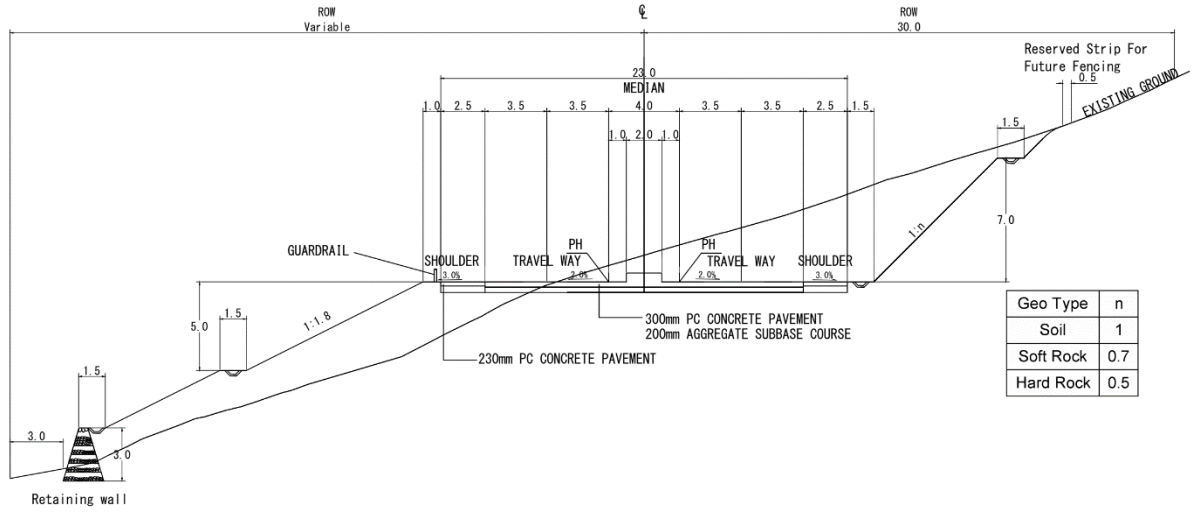
1.5.1 Major Components

1.5.1.1 Road (Highway)

[72]**Road (Highway).** The design of the 4-lane road was based on the design standards under the DPWH Design Guidelines, Criteria & Standards (DGCS) of 2015. In which, the road right-of-way (RRoW) has a width of 60 m - 30 m from the center line.

[73]The typical cross section of the cut and fill section is presented in **Figure 1-15**.

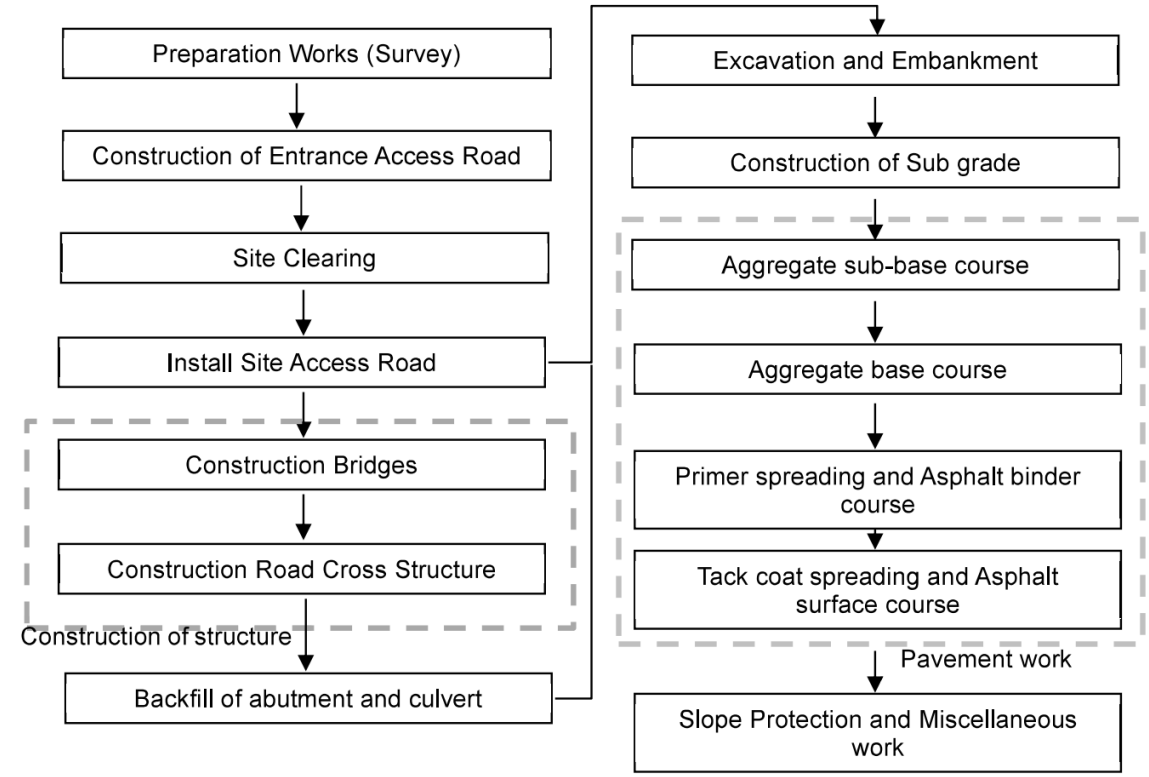
Figure 1-15: Typical Cross Section (Cut and Fill Section)



Source: JICA Study Team

FIGURE TITLE:		
TYPICAL CROSS SECTION (CUT AND FILL SECTION)		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Figure 1-16: Flowchart of Road Works



Source: JICA Study Team

FIGURE TITLE:		
FLOWCHART OF ROADWORKS		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[74]**Road (Excavation Work).** The excavation machine and transportation will be using three kinds of machine. The construction machine is classified by transport distance:

- Short distance transportation using bulldozer L ≤ 100 m;
- Middle distance transportation using scraper 100 m ≤ L ≤ 1,000 m; and
- Long distance transportation using shovel plus dump 1,000 m.

[75]The excavation works will entail bench cut method:

- Installation of pilot road by backhoe;
- Extension of top cutting area by backhoe; and
- Carry out bench cut.

Figure 1-17: Excavation Work (Bench Cut Method)

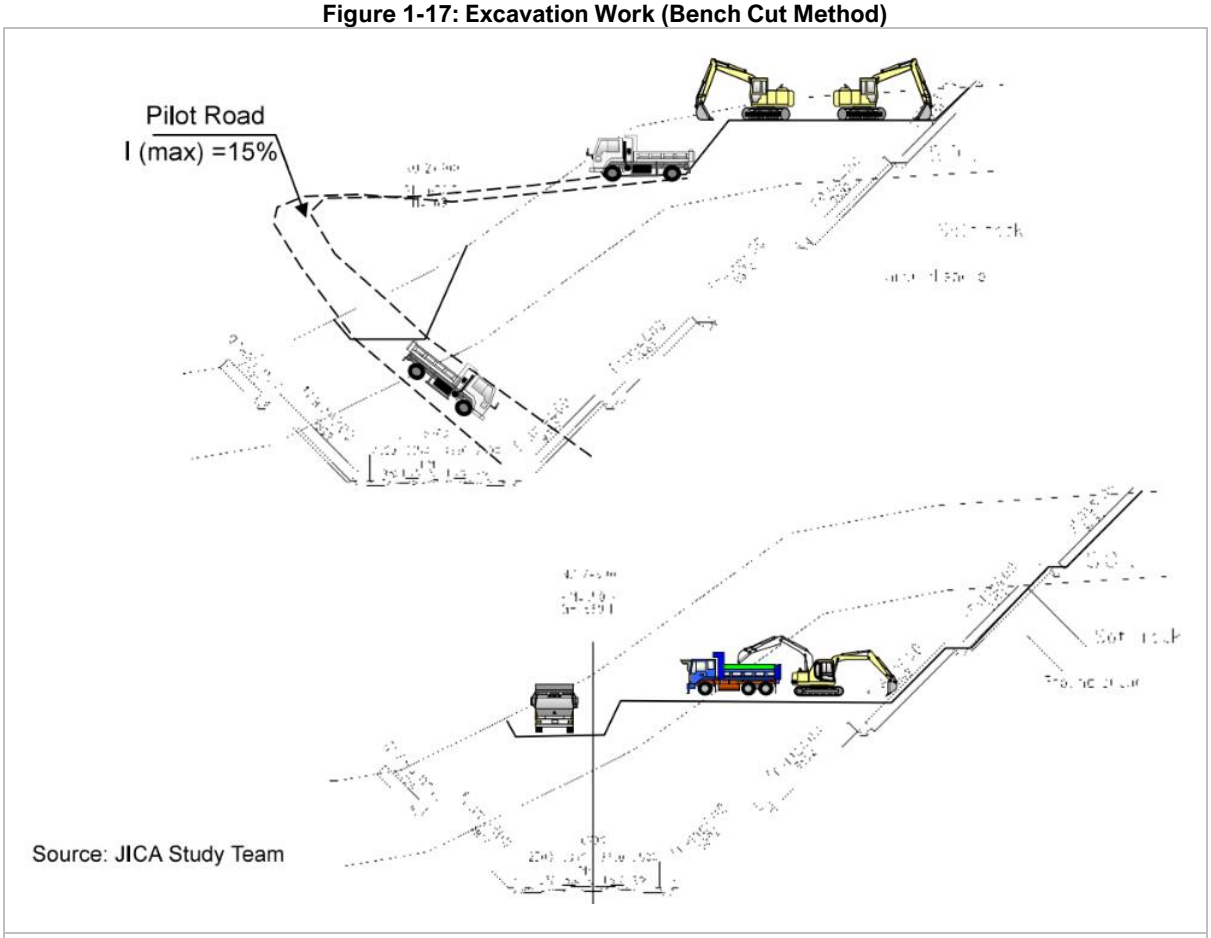


FIGURE TITLE:		
EXCAVATION WORK (BENCH CUT METHOD)		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[76]**Road (Embankment Work).** Embankment area implements a clearing and grubbing before the filling and the bench cut carries out in the slope. Finishing stake shall be installed in the start of embankment and the embankment shape based on an engineering design shall be constructed. The embankment material will be transported by a dump truck to a disposal area. In the case of large filling, it shall consider the drainage of the embankment surface.

Figure 1-18: Embankment Method

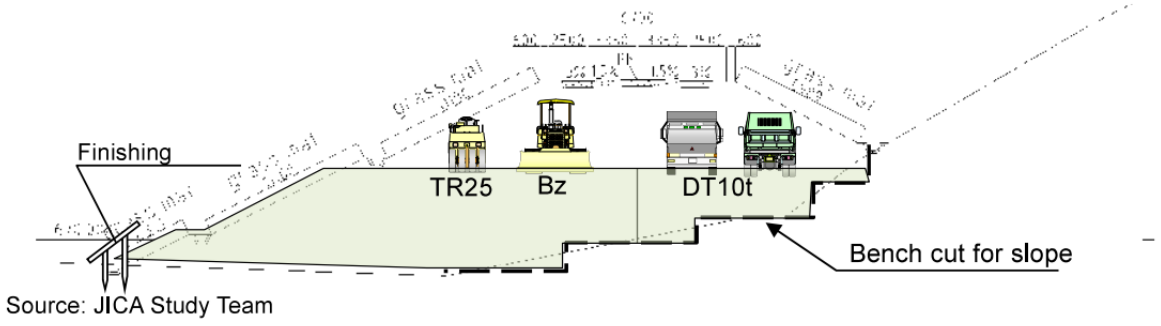


FIGURE TITLE:		
EMBANKMENT METHOD		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[77]**Road (Construction of Box Culvert).** Box culvert will be constructed before embankment. In the box culvert construction, the diversion of existing roads and waterways shall be considered.

Figure 1-19: Construction Procedure of Box Culvert

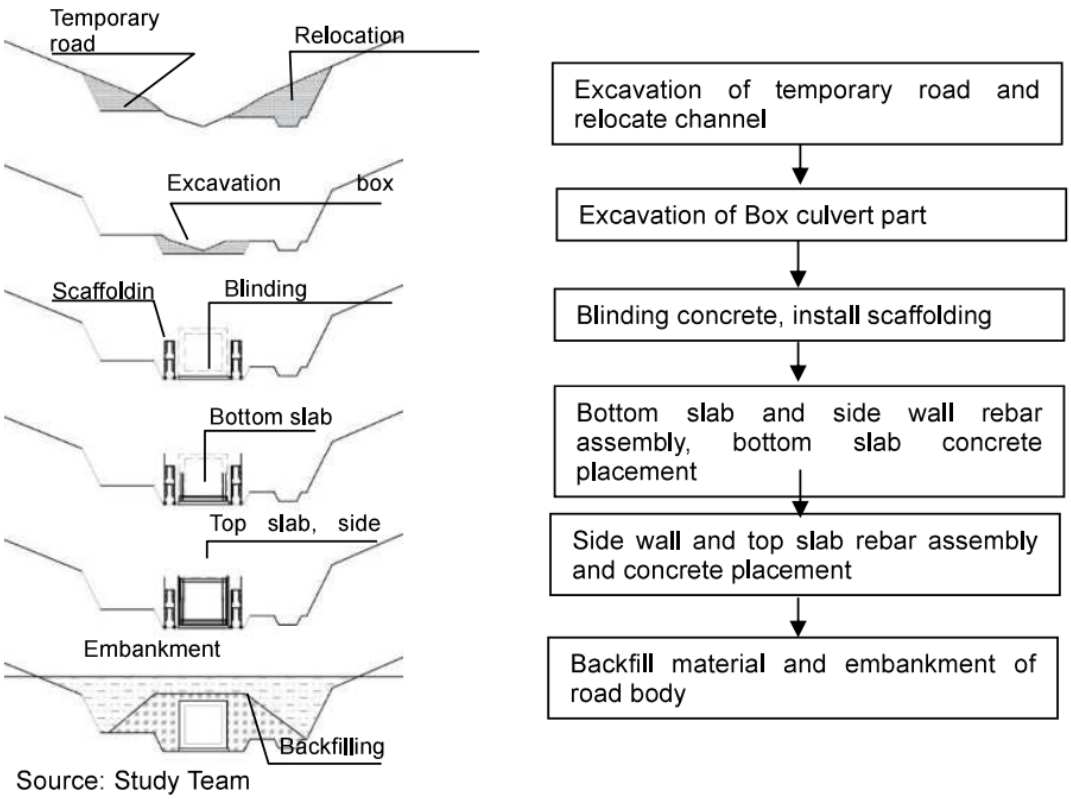


FIGURE TITLE:		
CONSTRUCTION PROCEDURE OF BOX CULVERT		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[78]**Road (Retaining Wall).** The planned retaining walls are gravity type and mechanically stabilized earth (MSE).

A. Gravity Type Retaining Wall

Figure 1-20: Construction Procedure of Gravity Type Retaining Wall

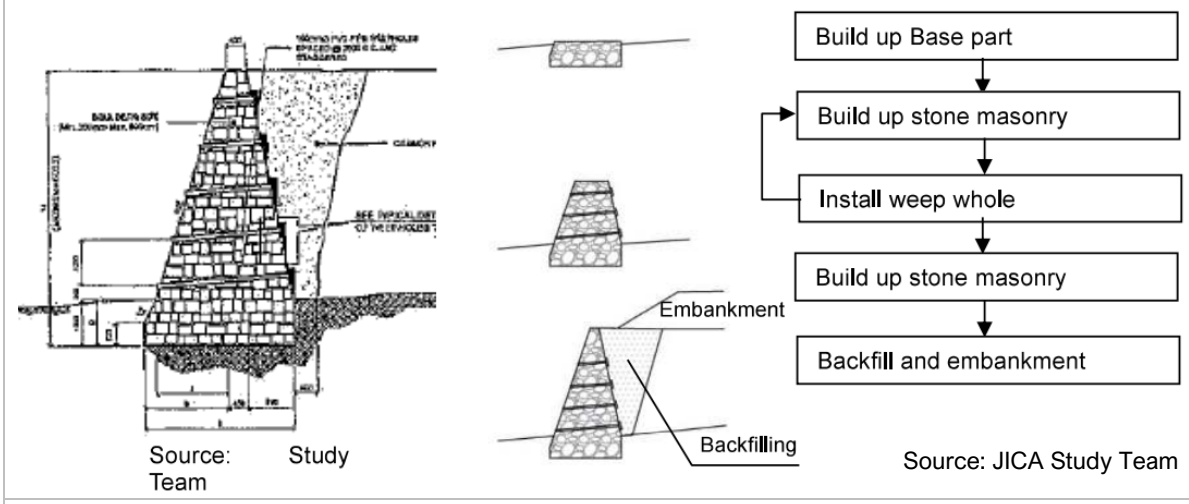


FIGURE TITLE:		
CONSTRUCTION PROCEDURE OF GRAVITY TYPE RETAINING WALL		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

B. Mechanically Stabilized Earth (MSE)

Figure 1-21: Construction Procedure of MSE Wall

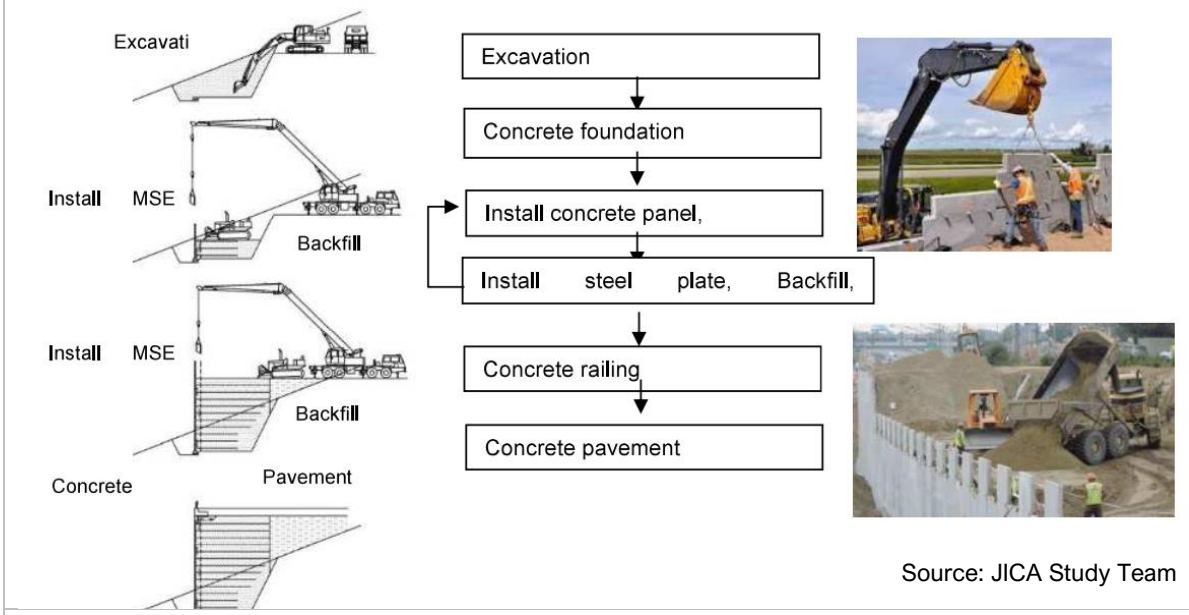
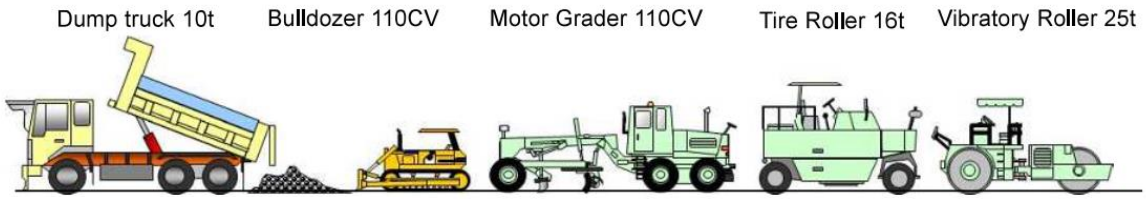


FIGURE TITLE:		
CONSTRUCTION PROCEDURE OF MSE WALL		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[79]**Road (Rigid Pavement).** The base course construction is divided in 2 layers. It shall be finished under 15 cm thickness. The composition of construction equipment of base course are as follows:

A. Base Course

Figure 1-22: Composition of Construction Equipment for Base Course



Source: JICA Study Team

FIGURE TITLE:		
COMPOSITION OF CONSTRUCTION EQUIPMENT FOR BASE COURSE		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

B. Rigid Pavement

[80]Two types of paving operations are used for the construction of rigid pavement. One is fixed-form paving and the other is slip-form paving. A survey line is established to facilitate setting forms at proper grade and alignment. Form setting is a critical construction operation since the final grade and smoothness of the pavement surface depends on how accurately the forms are set to line and grade on how well and uniformly the forms are supported by a firm foundation.

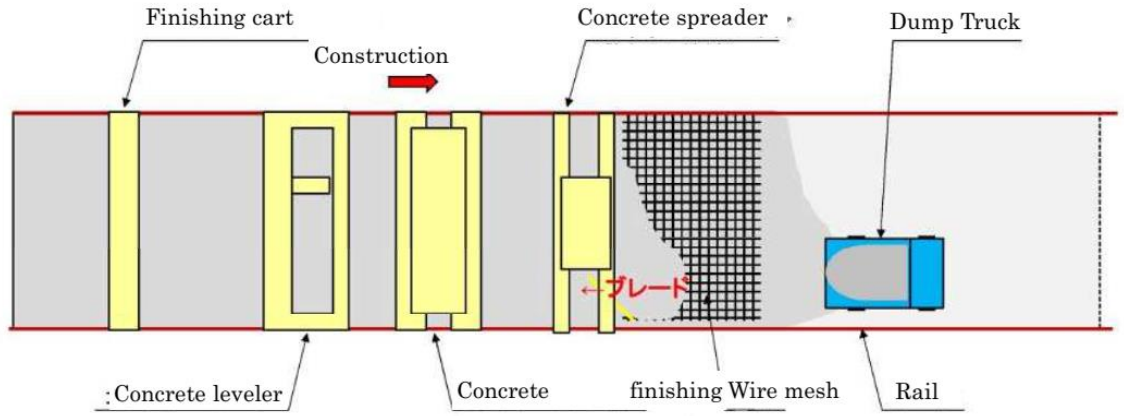
[81]The construction of rigid pavement shall use the following construction equipment (i.e., box-spreader/blade spreader, concrete finishing machine, concrete leveler, and finishing cart).

[82]**Concrete spreader (box-type & blade type).** Box spreader is spreading concrete by box which is received from transported concrete by a dump truck to the pavement area. Blade spreader is spreading concrete by blade which is placed directly to the pavement area.

[83]**Concrete finishing machine.** The concrete finisher shaves the laying concrete by the spreader to the transverse direction by screed and makes fixed height to it by planate vibrator

[84]**Concrete leveler.** The concrete leveler makes leveled surface after the concrete is compacted by concrete finisher.

Figure 1-23: Composition of Construction Equipment Component of Rigid Pavement



Source: JICA Study Team

FIGURE TITLE:		
COMPOSITION OF CONSTRUCTION EQUIPMENT COMPONENT OF RIGID PAVEMENT		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

1.5.1.2 Bridge

[85]**Bridge.** The 14 bridges were designed based on the following technical standards:

- DPWH DGCS: Volume 5 (2015);
- American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Seismic Design Specifications (1st Ed. 2013) & Interim Revision of (2019);
- AASHTO LRFD Bridge Design Specifications (8th Ed. 2018);
- AASHTO LRFD Bridge Construction Specifications (3rd Ed. 2016); and
- Japan Road Association Specifications for Highway Bridges (2017).

[86]The design flood level (DFL) for both rivers and irrigation canals were set at 5m from the riverbed. The freeboard was set at 1.5 m while the construction limit was set at 5 m.

Table 1-14: Bridges Location & Length

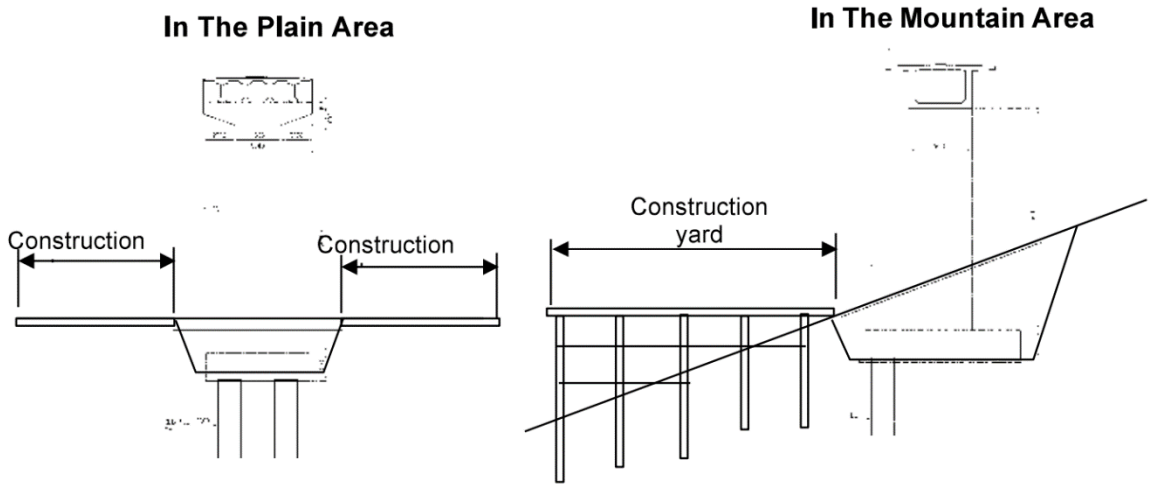
BRIDGES	MUNICIPALITY	BARANGAY	LENGTH (m)
D1	Carranglan	Burgos	400
D2	Carranglan	Burgos	100
D3	Carranglan	Burgos	260
D4	Carranglan	Burgos	300
D5	Carranglan	Salazar	180
D6-1	Carranglan	Salazar	290
D6-2	Carranglan	Salazar	120
D7-1	Santa Fe	Canabuan	300

BRIDGES	MUNICIPALITY	BARANGAY	LENGTH (m)
D7-2	Santa Fe	Canabuan	110
D8	Santa Fe	Canabuan	140
D9	Santa Fe	Canabuan	120
D10	Santa Fe	Canabuan	380
D11	Aritao	Canabuan	100
D12	Aritao	Canabuan	700
TOTAL			**3,500**

Bridge (Construction Method)

[87]**Bridge (Substructure).** Bridge plan in the mountain area is to apply high pier and foundation pile (D1.5 m to D2 m). Each pier has an installed construction yard about 40 m x 20 m for bored pile construction. The installed pier construction yard is either earthwork or steel platform.

Figure 1-24: Construction of Foundation Pile and Pile Cap



Source: JICA Study Team

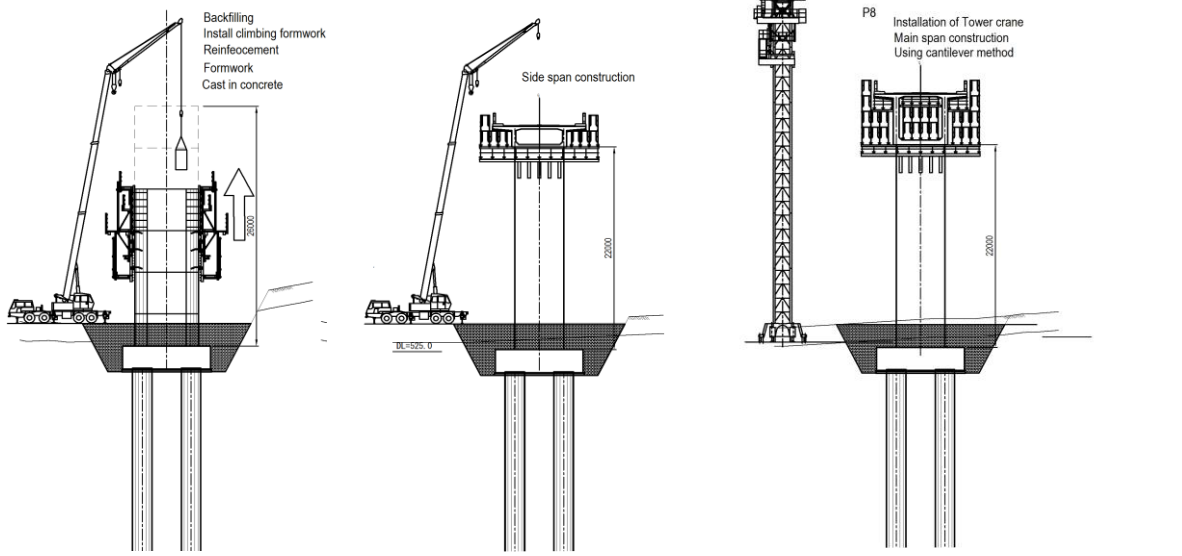
FIGURE TITLE:

CONSTRUCTION OF FOUNDATION PILE AND PILE CAP

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[88]**Bridge (Pier).** Construction of pier and pier head uses support and scaffolding. The pier head uses bracket-type support. In the case of high pier, tower crane may be used instead of truck crane.

Figure 1-25: Construction of Pier and Pier Head



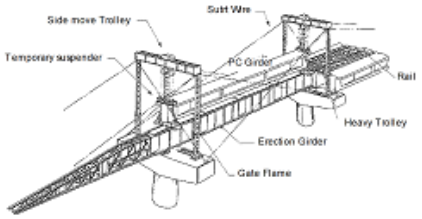
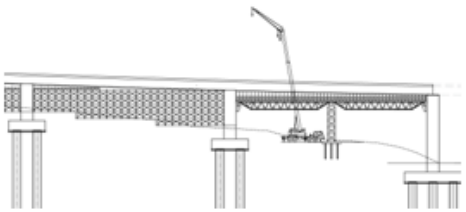
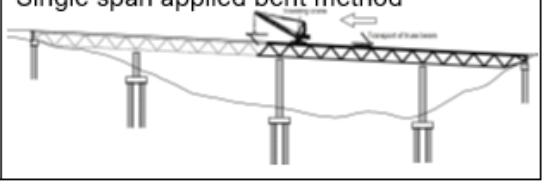
Source: JICA Study Team

FIGURE TITLE:		
CONSTRUCTION OF PIER AND PIER HEAD		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[89]**Bridge (Superstructure).** The planned superstructure type is four kind of bridge.

- PSCG: Post-tension PC-I girder (girder length is 30 m and 40 m);
- PC-Box: Applicable to cantilever and full support methods;
- PC Hollow: Apply to full support method; and
- Steel Truss: streel truss bridge.

Figure 1-26: Superstructure Construction Method

<table>
<tr><th>Superstructure Type</th><th>Construction Method</th><th>Remarks</th></tr>
<tr><td rowspan="2">PSCG</td><td>Launching girder method
Selected condition
✓ Straight alignment
✓ It difficult to use a truck crane
✓ There is a back yard on the back of the abutment</td><td> 
</td></tr>
<tr><td>Two crane method
Selected condition
✓ Crane can be used
Crane selection
<table><tr><th>Weight per 1girder</th><th>Standard of Crane Erection</th></tr><tr><td>35~60t</td><td>Hydraulic 120t x 2</td></tr><tr><td>60~100t</td><td>Hydraulic 160t x 2</td></tr><tr><td>100~160t</td><td>Hydraulic 200t x 2</td></tr></table></td><td> </td></tr>
<tr><td>PC-Box</td><td>Cantilever method
Selected condition
✓ Crossing river and road
✓ High position construction
✓ Continuous large span</td><td> </td></tr>
<tr><td>PC Hollow Slab</td><td>Full support method
Selected condition
✓ Concrete slab bridge
✓ Low position construction
✓ Ground is not soft soil</td><td>  </td></tr>
<tr><td>Steel Truss</td><td>Traveler crane method
Selected condition
✓ Continuous truss
✓ It is difficult to install a crane from the ground</td><td>Traveler crane cantilever method
Single span applied bent method
  </td></tr>
</table>

Source: JICA Study Team

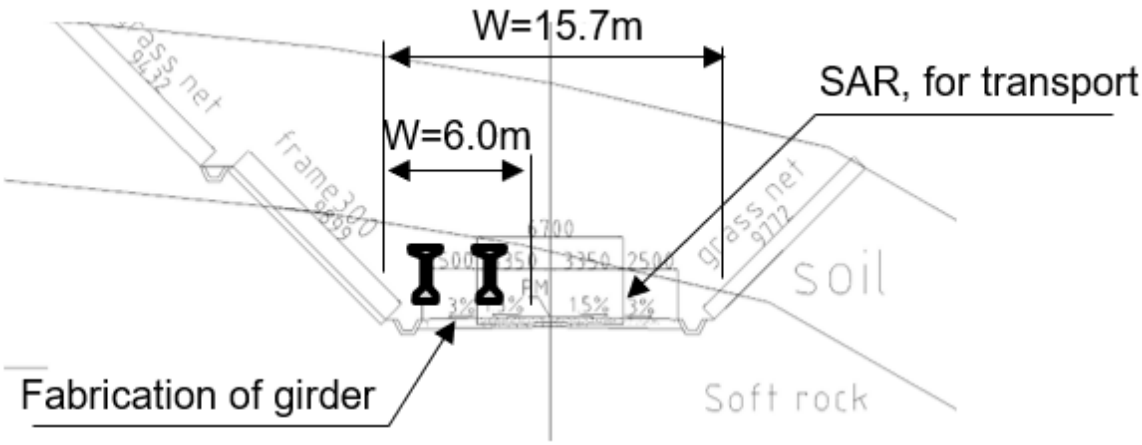
FIGURE TITLE:

SUPERSTRUCTURE CONSTRUCTION METHOD

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[91]Fabrication of PC-I girder shall be prepared in the bridge temporary yard. Each temporary yard shall be installed behind the abutment and near the bridge side. After fabrication of girder, it will be transported to the erection site by rail system and gantry crane.

Figure 1-27: Fabrication of PSCG Behind the Abutment

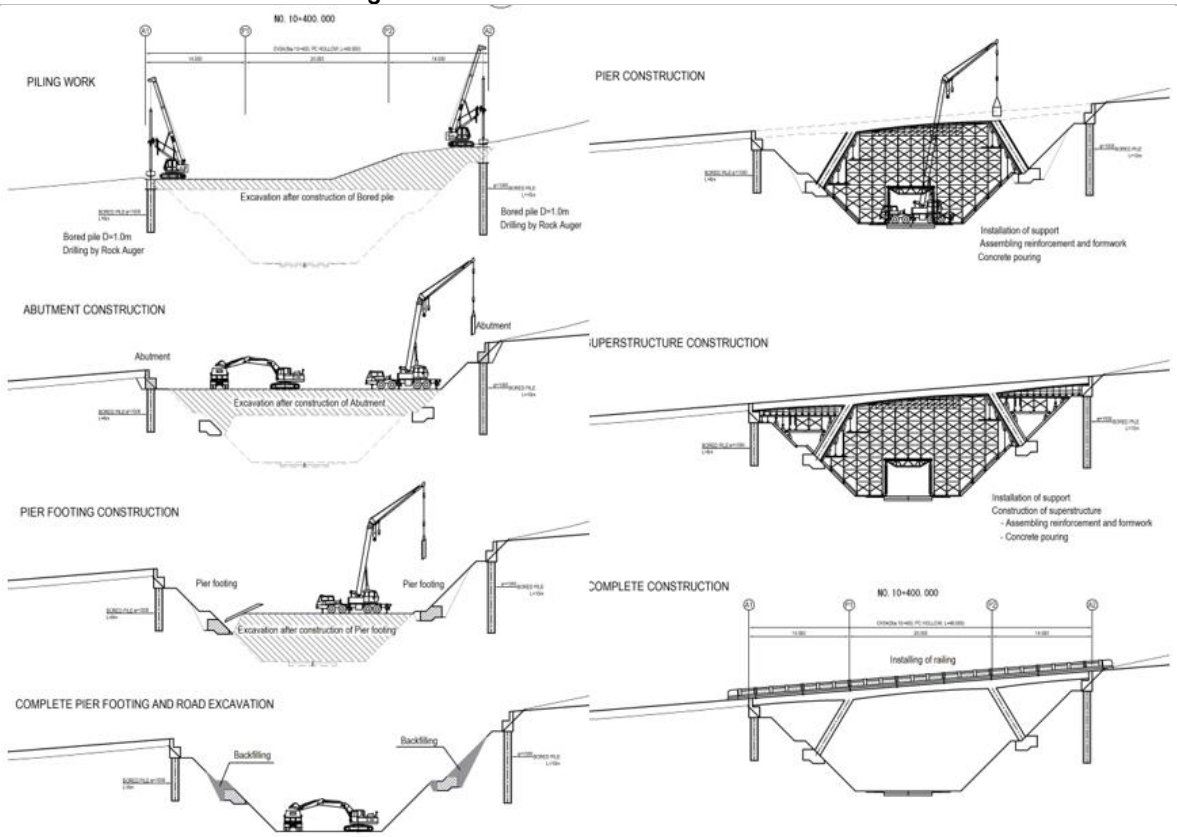


Source: JICA Study Team

FIGURE TITLE:		
FABRICATION OF PSCG BEHIND THE ABUTMENT		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[92]**OV Construction Method.** The said construction method will be implemented according to the progress of the earthwork.

Figure 1-28: Construction Procedure of OV



Source: JICA Study Team

FIGURE TITLE:		
CONSTRUCTION PROCEDURE OF OV		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

1.5.1.3 Tunnel

[93]**Tunnel.** The north and south tunnels, with a combined length of 6.1 kms., will be constructed using the New Austrian Tunneling Method (NATM). The NATM process involves the utilization of jumbo- sized drills for excavation and supported by 1,300 kg hydraulic breakers for chipping. The mucking or clean-up activities will be done using 22-ton dump trucks.

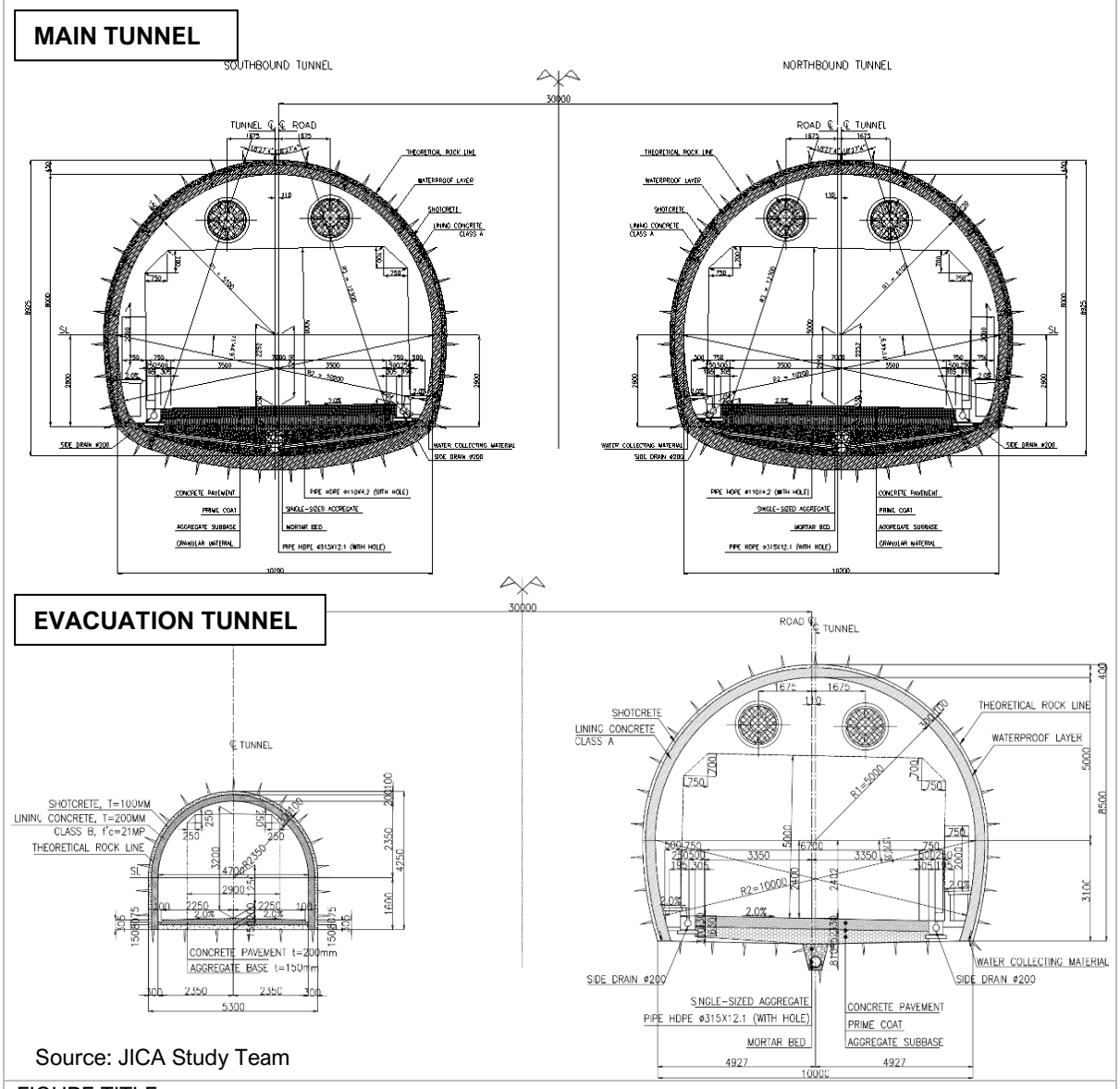
[94]The tunnel will have a lane with of 3.35 m and vertical clearance of 5 m. The tunnels will have lighting, ventilation, and emergency facilities.

[95]Tunnel General Conditions. The tunnel general conditions are shown in **Table 1-15** while the typical cross section of the tunnel is presented in **Figure 1-29**.

Table 1-15: Tunnel General Conditions

TUNNEL LAYOUT		START STA.	END STA.	GRADIENT	LENGTH (m)
South Tunnel	Main Tunnel	2+320	3+920	3.0%/-0.3%	1,600 m
	Evacuation Tunnel	2+340	3+910	3.0%/-0.3%	1,600 m
North Tunnel	Main Tunnel	14+740	18+200	0.3%/-0.95%	4,460 m
	Evacuation Tunnel	13+740	18+240	0.3%/-0.95%	4,500 m
SOURCE: JICA Study Team					

Figure 1-29: Typical Cross Section of Tunnel



Source: JICA Study Team

FIGURE TITLE:

TYPICAL CROSS SECTION OF TUNNEL

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[96]**Ground Classification for Construction.** The ground classification and length of each section are presented in **Table 1-16** and **Table 1-17**.

Table 1-16: Counting of Tunnel Support Classification of South Tunnel

TUNNEL	DIII	DII	CII	CII (EPB)	CI	CI (EPB)	PORTAL WORK	TOTAL
Main Tunnel	50.28	258.00	408.00	256.00	554.00	64.00	9.72	1,600
Ratio (%)	3.14	16.13	25.50	16.00	34.63	4.00	0.61	100
Evacuation Tunnel	50.28	228.00	408.00	256.00	554.00	64.00	9.72	1,570
Ratio (%)	3.20	14.52	25.99	16.31	35.29	4.08	0.62	100
SOURCE: JICA Study Team								

Table 1-17: Counting of Tunnel Support Classification of North Tunnel

TUNNEL	DIII	DII	CII	CII (EPB)	CI	CI (EPB)	PORTAL WORK	TOTAL
Main Tunnel	50.28	563.00	2,132.00	512.00	1,001.00	192.00	9.72	4,460
Ratio (%)	1.13	12.62	47.80	11.48	22.44	4.30	0.22	100
Evacuation Tunnel	50.28	603.00	2,132.00	512.00	1,001.00	192.00	9.72	4,500
Ratio (%)	1.12	13.40	47.38	11.38	22.24	4.27	0.22	100
SOURCE: JICA Study Team								

[97]**Excavation Method and System.** The construction system for the tunnel will be through the New Austrian Tunneling Method (NATM), which uses shotcrete and rock bolt construction. The excavation method applies blasting method, as most of the rock classification is CI & CII. Further, the excavation system shall depend on rock conditions in the tunnel excavation area.

Table 1-18: Tunnel Excavation Methods

EXCAVATION METHOD	ROCK CLASSIFICATIONS	EXCAVATION SYSTEM	CONSTRUCTION METHOD
Blasting Method	CI, CII, CI-L, CII-L	Full face method with auxiliary bench cut	Construction of top and bench at once method
	DII, DIII	Bench cut method (short bench cut method)	Half side (top and bench) alternate advance construction method
	Evacuation tunnel	Full face method	Construction of top and bench at once method
SOURCE: JICA Study Team			

Figure 1-30: Construction Flow of the Excavation System

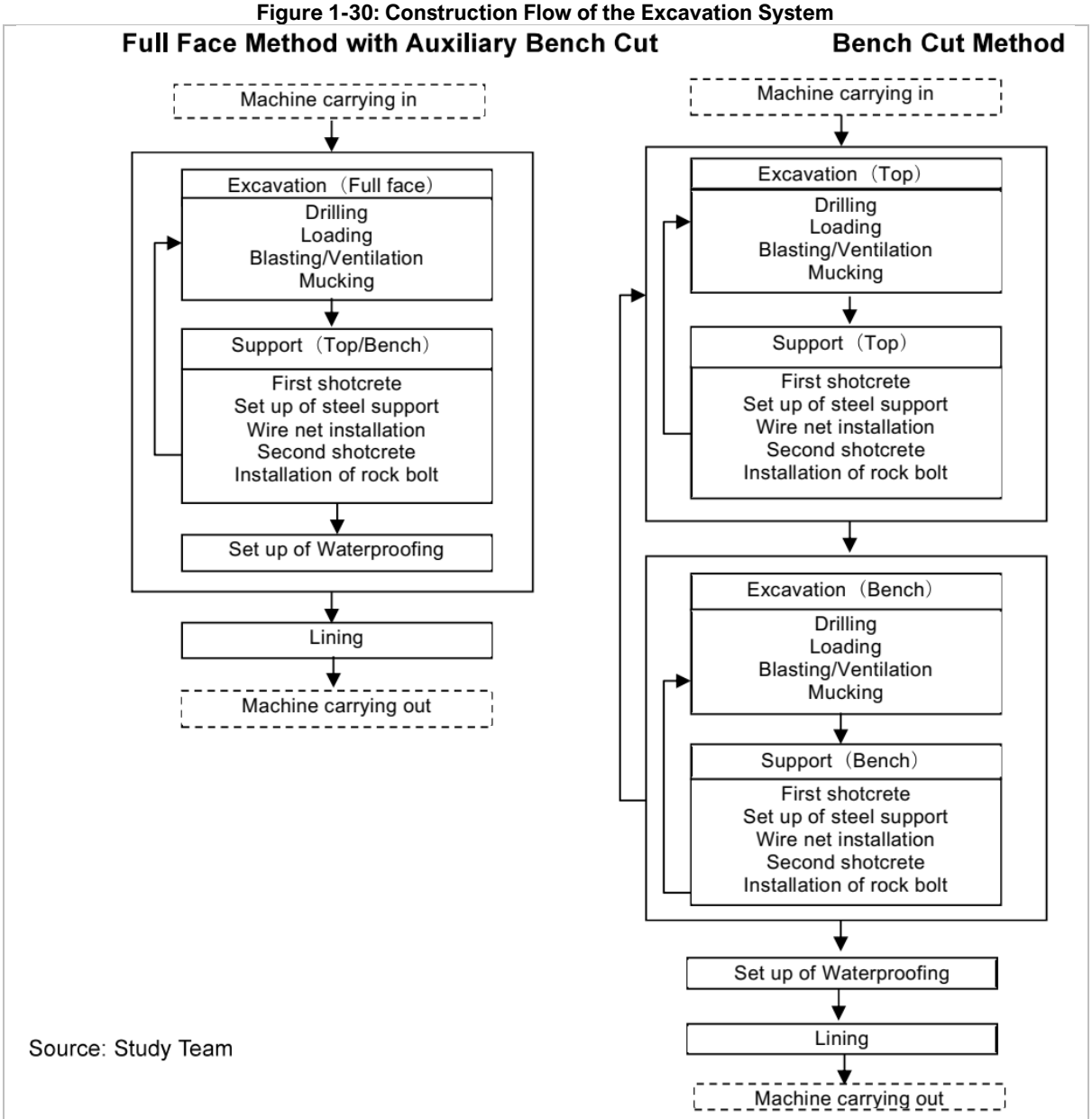


FIGURE TITLE:		
CONSTRUCTION FLOW OF THE EXCAVATION SYSTEM		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[98]**Full Face Method with Auxiliary Bench Cut Method.** The drill jumbo (wheel-type hydraulic with 3 booms) will be utilized for the full face drilling. The divided sections will be excavated simultaneously. The auxiliary bench length is set at 2.0 m to 5.0 m.

Figure 1-31: Component of Equipment for Full Face Excavation

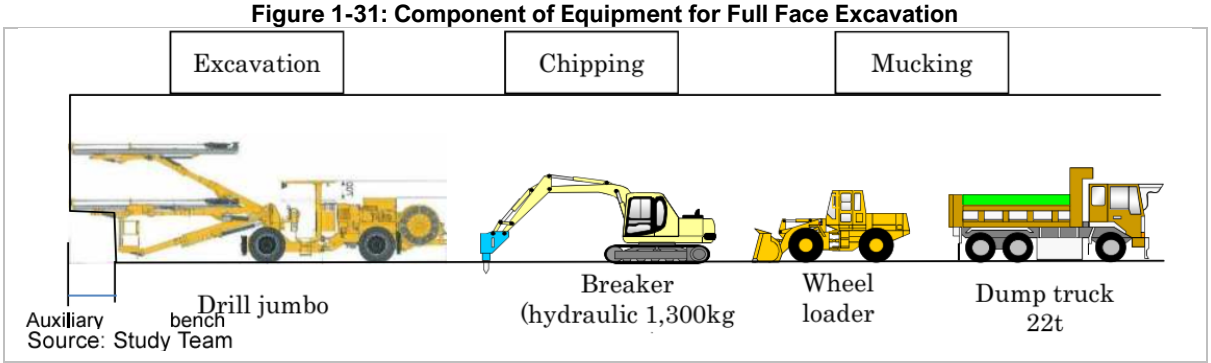


FIGURE TITLE:		
COMPONENT OF EQUIPMENT FOR FULL FACE EXCAVATION		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[99]**Bench Cut Method.** The upper side excavation and lower side excavation are repeated alternately. The rock drill arranges on set of drill jumbo (wheel-type hydraulic with 3 booms) to the upper side and is moving to the lower side after finishing the upper side excavation. The short bench length is 10 to 50 m, while the long bench is over 50 m.

Figure 1-32: Component of Equipment for Bench Cut Excavation

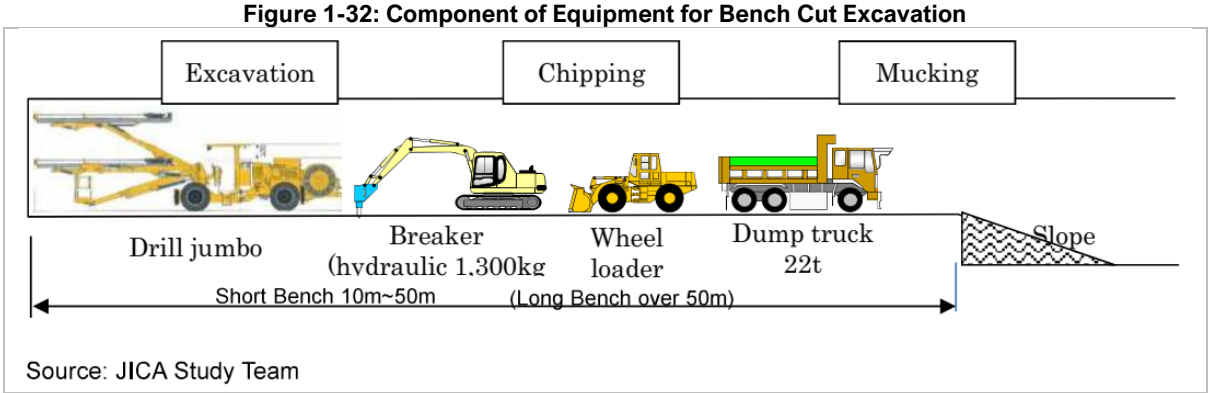


FIGURE TITLE:		
COMPONENT OF EQUIPMENT FOR BENCH CUT EXCAVATION		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[100]**Major Equipment for the Tunnel Construction.** The major equipment of the tunnel is presented in **Figure 1-33**.

Figure 1-33: Major Equipment of Tunnel/Excavation Face

Work Item			Construction Machine	Descriptions	Unit	Quantity/ one face
Excavation	Top Bench	Drill	Drill Jumbo	Drill jumbo (wheel type hydraulic 3 boom) drifter weight 150kg 115kw	no	1
		Chipping	Large-sized breaker	Hydraulics 1300kg class	no	1
			Backhoe	Large-sized breaker base machine Hydraulic crawler model 0.8m3 104kw	no	1
		Mucking	Wheel loader	Side dump type 2.3m3 140kw	no	1
			Dump-truck	Ordinary diesel 22t 246kw	no	4
			Backhoe	Hydraulic crawler model 0.5m3 64kw	no	1
			Turntable	Φ7.60m, max 41t, 3.2*15, 2.2kw*4	no	1
Support	Shotcrete		Shotcrete machine	wet machine of shotcrete integrate type (wheel type) 7 m shot ambit radius class (fuel flow6 ～ 20m3) （Run） 75kw （work） 39kw	no	1
			Truck-mixer	4.4m3class 213 k w	no	2
	Apparatus for the NATM		Electric dust collector	2,400 m³/min class 64kw	no	1
	Rock Bolts	Drill	Drill Jumbo	Same as excavation	no	1
		grouting	mortar grouting machine	fuel flow 950 /h 6kw	no	1
		Transport	Truck	For the tunnel work 2 t 98kw	no	1
			Truck	For the tunnel work With the Crane 4t, 2.9t hung 132kw	no	1
Lining Concrete	Waterproofing		Work cart	radius 5~7.0m length 4.5m 2.0kw	no	1
	Formwork		Slide centering form	R＝6.6m （average length） L＝12.0m 6.5kw	no	1
	Concrete work		Concrete pumping vehicle	Capacity 90~100m3/h 141kw	no	1
			vibrator	stick shape electric-type 60mm 1.1kw	no	5

Source: JICA Study Team

FIGURE TITLE:

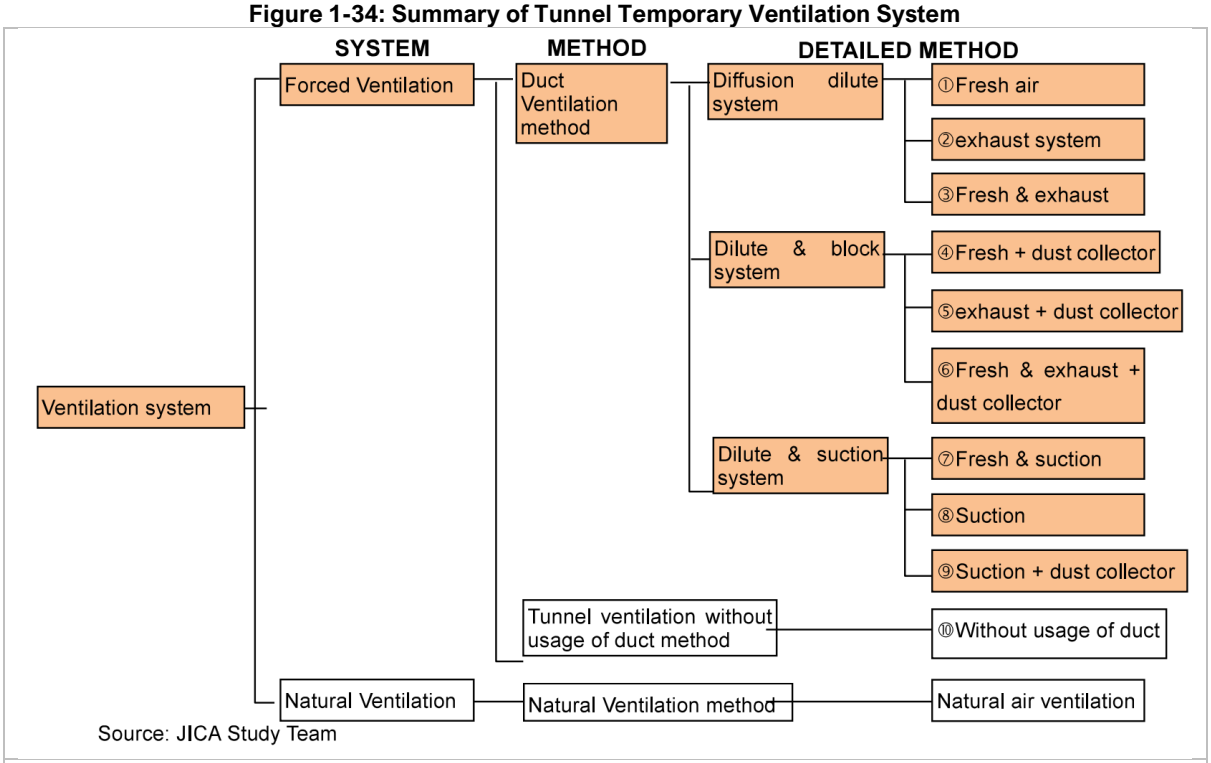
MAJOR EQUIPMENT OF TUNNEL/EXCAVATION FACE

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[101]**Temporary Ventilation System.** During the tunnel construction, the temporary ventilation system will provide adequate ventilation for tunnel workers. The ventilation system will follow the technical guide on the tunnel construction of the Japan Construction Occupational Safety and Health Association (JCOSHA).

[102]The tunnel temporary ventilation system has 2 systems, namely: (1) natural ventilation system and (2) forced ventilation system. The summary of both systems is presented in Figure 1-34.

Figure 1-34: Summary of Tunnel Temporary Ventilation System



Source: JICA Study Team

FIGURE TITLE:		
SUMMARY OF TUNNEL TEMPORARY VENTILATION SYSTEM		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[103]**Applicable Temporary Ventilation System.** The applicable temporary ventilation system for each tunnel is presented in **Table 1-19**.

Table 1-19: Applicable Temporary Ventilation System

POSITION	LENGTH	EXCAVATION LENGTH	APPLICABLE SYSTEM	EQUIPMENT/ ONE FACE
South Tunnel Main	1,600	800 m	Fresh air	1 main fan
South Tunnel Evacuation	1,570	785 m	Fresh air	1 main fan
North Tunnel Main	4,460	2,230 m	Exhaust plus dust collector	2 main fan 1 dust collector
North Tunnel Evacuation	4,500	2,250 m	Fresh air	1 main fan
SOURCE: JICA Study Team				

1.5.2 Pollution Control Facilities

[104]The pollution control facilities for the road project will include the following:

[105]**Air Pollution Sources and Control Devices.** Minimal carbon emissions are expected during construction and operation of the project. Noise and dust emission will come during construction and operation of the road and tunnel project, where vehicles and heavy equipment will be used. Regular maintenance of these equipment and regular sprinkling during construction will be conducted to mitigate these effects.

[106]**Temporary Ventilation System.** During the tunnel construction, the temporary ventilation system will provide adequate ventilation for tunnel workers. The ventilation system will follow the technical guide on the tunnel construction of the JCOSHA.

[107]**Temporary Drainage System.** Excavation of the South and North tunnels will be carried out on both sides with an ascending slope. The groundwater in the tunnel and the water supply used for excavation works will be drained on a natural gradient.

[108]**Wastewater Treatment.** Wastewater that will be generated during the construction and operation are limited to domestic wastewater. Portable toilet facilities will be installed on-site to cater the domestic wastewater that will be generated by the workers during the construction phase. These facilities will be regularly siphoned by DENR-accredited haulers.

[109]Further, turbid water discharged from the tunnel will be treated by installing a sand basin outside the tunnel. The treatment shall follow the prescribed limits of the DENR standards.

[110]**Solid Waste Management System.** Solid waste materials generated will be classified as hazardous and non-hazardous wastes. Separate receptacles and storage areas will be designated for each type of waste identified at the project site. Non-hazardous domestic solid wastes will be further classified as compostable, recyclable, and residual and will be managed based on the local disposal regulations consistent with the Ecological Solid Waste Management Act of 2000 (Republic Act 9003). Hazardous wastes will be handled, transported, and managed by DENR-accredited hazardous waste treaters in accordance with the Toxic Substances and Nuclear Wastes Control Act 1909 (Republic Act 6969).

1.5.3 Spoils Management

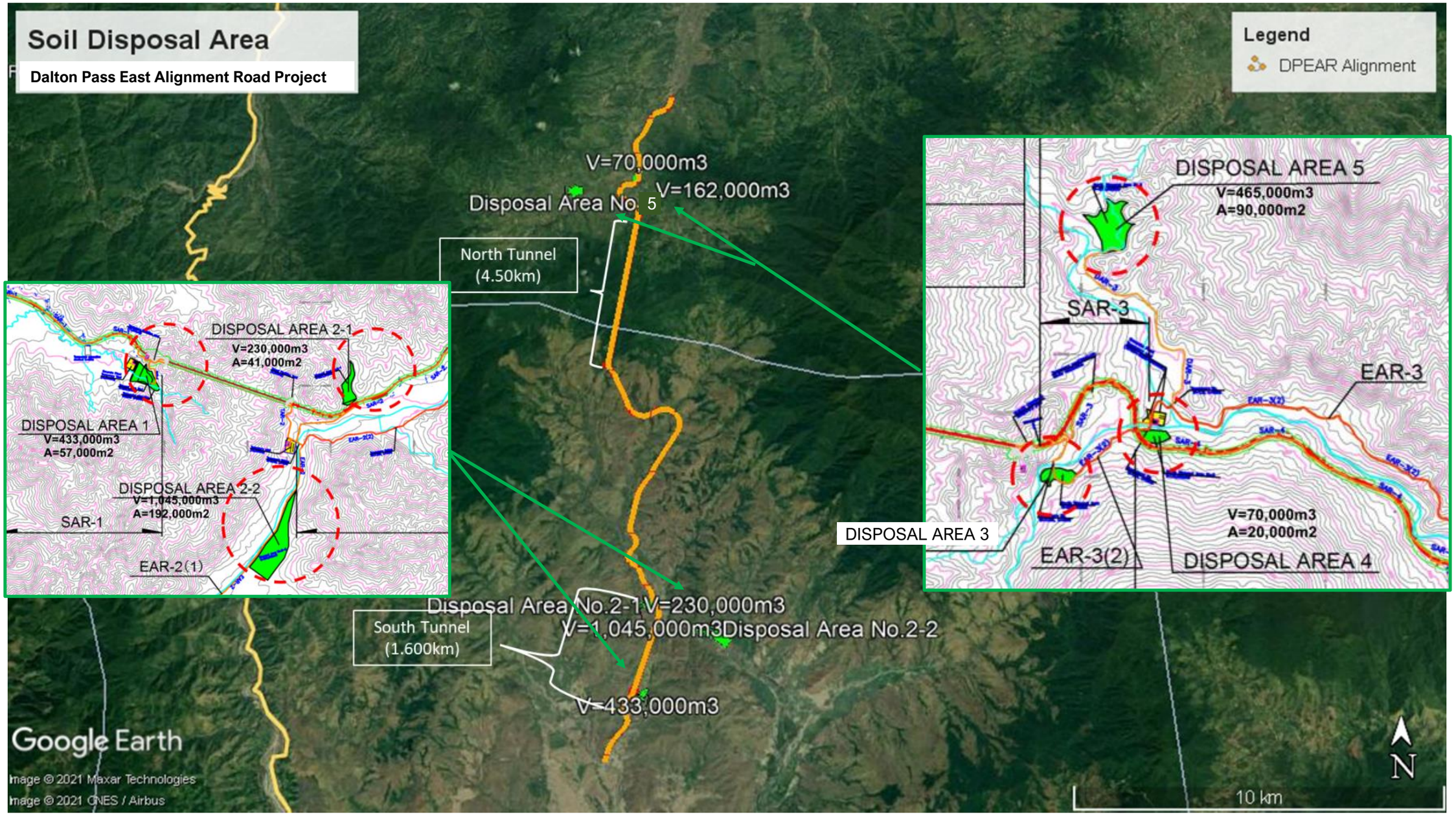
[111]**Disposal Area.** The excavated soils from the tunneling activities will be transported to newly designated disposal areas as identified and agreed with the IP Leaders of the 2 Ancestral Domains where the proposed project is located. Further, the excavated soils may also be used as fill materials in the road construction. The use of excavated materials for construction will still be subject to negotiations between DPWH and the IPs within the 2 Ancestral Domains. The proposed disposal areas were located on fields near the both the north and south tunnels. If possible, these excavated materials will be used as construction materials for the proposed project.

[112]A total of 6 sites were proposed to serve as the disposal sites for the soils. The details were as follow:

Table 1-20: Volume of Excavated Soils Per Disposal Area

SOIL DISPOSAL	SOUTH TUNNEL AREA (m^3)		NORTH TUNNEL AREA (m^3)	
LOCATIONS	No. 1	433,000	No. 3	162,000
	No. 2-1	230,000	No. 4	70,000
	No. 2-2	1,045,000	No. 5	465,000
	TOTAL	**1,708,000**	**TOTAL**	**697,000**
SOURCE: JICA Study Team				

Figure 1-35: Proposed Location of Soil Disposal Areas



PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**PROPOSED LOCATION OF SOIL DISPOSAL AREAS**	JICA Study Team	LCI ENVI CORPORATION

1.5.4 Road and Tunnel Operation and Maintenance

[113]**DPWH** operates and maintains infrastructure facilities (e.g., road drainage) based on Executive Order No. 124, Series of 1987, and organization structures of DPWH are stipulated in the Quality Management System Manual of Department Order No. 22, Series of 2017.

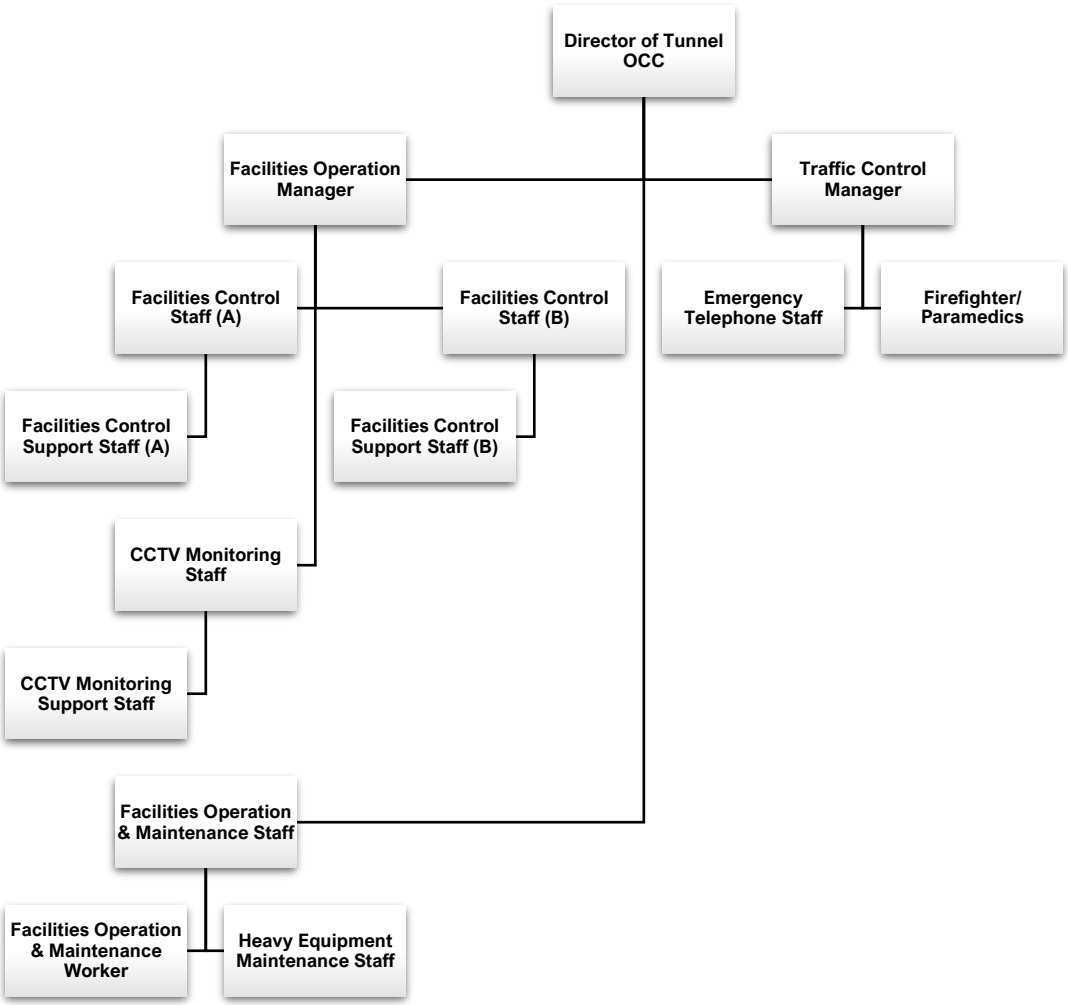
[114]The Bureau of Maintenance (BOM) of the DPWH Central Office operates and maintains the national highways and infrastructure facilities in coordination with the Regional Offices (ROs) and District Engineering Offices (DEOs).

[115]The Maintenance Division of the DPWH RO formulates the annual maintenance work program for the region, checks the budget execution status, and supervises the maintenance work by the DEOs in order to properly operate and maintain national highways and infrastructure facilities. The proposed Project is located within the administrative area of DPWH ROs II and III.

[116]The Maintenance Section of the DPWH DEO operates and maintains the national highways and infrastructure facilities. The proposed Project is located within the jurisdiction of Nueva Vizcaya 2nd DEO and Nueva Ecija 1st DEO. Each DEO shall operate and maintain the road sections that fall within its administrative boundaries, which shall be clearly indicated by signboards. For bridges crossing DEO boundaries, the DPWH Central Office shall confirm which DEO shall be responsible for the structure.

[117]The Tunnel Operation Control Center (Tunnel OCC) shall be established for the operation and maintenance (O&M) of the tunnel facilities for this Project. The Tunnel OCC shall be under the management of the DPWH Regional Offices, and staff will be assigned from both concerned DEOs. The following figure presents the organizational structure of the Tunnel OCC.

Figure 1-36: Organizational Structure of the Tunnel Operation Control Center



Source: JICA Study Team

FIGURE TITLE:		
ORGANIZATIONAL STRUCTURE OF THE TUNNEL OPERATION CONTROL CENTER		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

1.6 PROJECT SIZE

[118]The project's total length is about 23 kms. spanning the Municipalities of Santa Fe and Aritao in Nueva Vizcaya and the Municipality of Carranglan in Nueva Ecija. The project is designed for 4 lanes with intended vehicle speeds for up to 60 km/hr. Further, the project's road-right-of-way (RRoW) covers to 60 meters (30 meters from the centerline).

[119]There will be 2 tunnels within the proposed alignment for the project. The north tunnel's length is about 4.5 km while the south tunnel's length is 1.6 km. It can be noted that around 2.7 kilometers of the project's northern tunnel and 800 meters of road will course through within Caraballo Mountains, which is considered as an area with critical slope.

[120]In addition, there will be 10 bridges within the alignment that will serve as passage for rivers and creeks. These bridges will also have slope protection measures.

1.7 DEVELOPMENT PLAN, DESCRIPTION OF PROJECT PHASES, AND CORRESPONDING TIMEFRAMES

[121]The tentative project development plan is presented in the next pages. The matrix indicates the expected duration of the different aspects of the proposed project's execution.

1.7.1 Pre-Construction

[122]This phase primarily involves the conduct of preliminary site investigations and the acquisition of the necessary documents such as feasibility study (FS) for the Japan International Cooperation Agency (JICA), Environmental Compliance Certificate (ECC), Certification Precondition (CP), tree cutting permits, building permits, Permit to Operate (PTO), hazardous waste generation ID, discharge permits, among others before actual road, tunnel, and bridges construction.

[123]Site preparation such as clearing of existing vegetation and removal and demolition of existing structures in the proposed project alignment will also take place during this phase. Since there are households and facilities that will be affected and acquired for the proposed project, the acquisition of road right-of-way (RRoW) and implementation of right-of-way acquisition plan (RAP) shall also be done during this phase.

[124]Further, in preparation for the construction phase, hiring of workers and subcontractors and the procurement of construction materials will be done.

1.7.2 Construction

[125]This phase mainly includes civil, earthworks, and tunneling works for the road and tunnel project. Proper occupational health and safety procedures will be implemented to ensure the welfare of the workers. Target start of construction is on the 3rd Quarter of 2026. This phase will be completed in 53 months.

[126]The construction of the road shall follow the construction methodology indicated in **Section 1.5.1.1 Road (Highway)**. The construction of the road entails a lot of excavation and earthworks. Safety features of the road, such as markers and signages will be installed as well.

[127]The construction of the 14 bridges across the project alignment is indicated in **Section 1.5.1.2 Bridge**.

[128]The construction of the north and south tunnels will be through the New Austrian Tunneling Method (NATM) as detailed in **Section 1.5.1.3 Tunnel**. This method utilizes heavy machineries to drill through the indicated tunnel section and mucking of the drilled section. In the event that there will be hard rocks, the ANFO is proposed to be utilized to blast these hard rocks to form mucks. The mucks will be cleared out to continue the tunneling activities.

[129]The magazines are to be stored in a 4 m^2 storages, secured and away from the construction offices and unauthorized personnel. These will be located near the tunnel portal entrances. At any given time, the explosives to be utilized by the proposed project will not exceed 10 tons. Once the tunneling has been completed, safety and emergency equipment will be installed to ensure safety of the public.

1.7.3 Operation

[130]Given the nature of the project, operations will be limited to periodic repair and maintenance of the road and tunnel. The operations phase will commence by 2031. Operations will be handled by the Tunnel OCC. Throughout the operations phase, periodic maintenance will be conducted to ensure the integrity and reliability of DPEAR, especially the tunnel sections. The details of the operation phase are presented in **Section 1.5.6 Road and Tunnel Maintenance.**

1.7.4 Decommissioning/Abandonment/Rehabilitation

[131]The proposed project is not expected to be abandoned. However, abandonment of the road and tunnel project may be necessary due to the following potential scenarios:

- Unsustainable operations due to economic downturns;
- Closure order from government agencies;
- Accidents and emergencies (either natural or man-made) resulting to severe facility damage and/or loss of human life; and
- Non-renewal of the Memorandum of Agreement (MOA) between the Indigenous Peoples of both Nueva Vizcaya and Nueva Ecija.

Table 1-21: Indicative Project Development and Implementation Schedule

No.	Year / Quarter	Period (month)	2019 I	2019 II	2019 III	2019 IV	2020 I	2020 II	2020 III	2020 IV	2021 I	2021 II	2021 III	2021 IV	2022 I	2022 II	2022 III	2022 IV	2023 I	2023 II	2023 III	2023 IV	2024 I	2024 II	2024 III	2024 IV	2025 I	2025 II	2025 III	2025 IV	2026 I	2026 II	2026 III	2026 IV	2027 I	2027 II	2027 III	2027 IV	2028 I	2028 II	2028 III	2028 IV	2029 I	2029 II	2029 III	2029 IV
	Project Phase				Preparation Phase														Design Phase (15 months)				Bidding Phase (19 months)				Construction Phase (53 months)																Operation Phase			
A	Feasibility Study (JICA)																																											
A100	JICA: Procuement of F/S Consultant																																											
A200	Consultant: Feasibility Study (F/S)	12																																										
A300	JICA: AP Mission																																										
A400	L/A Sign																																										
B	Detailed Design (DPWH)																																											
B100	Procurement of D/D Consultant	12																																										
B200	D/D for Civil Works	15																																										
B300	D/D for Electromecanial Works	10																																										
C	Tender Assistance & Supervision (DPWH)																																											
C100	Procurement of C/S Consultant	12																																										
C200	Bidding (Civil Works) with PQ	16																																										
C300	Bidding (Electrical/Mechanical) with PQ	16																																										
C400	Construction Supervision	55																																										
D	Construction (DPWH)																																											
D100	Civil Works	50																																										
D200	Electrical/ Mechanical Works	30																																										
E	Operation and Maintenance (DPWH)																																											
E100	O&M Training	6																																										

Source: JICA Study Team

1.8 MANPOWER

[132]The estimated manpower requirement in each phase of the proposed project's implementation is specified in the following table. **DPWH** and its contractors will give priority to the host community members or residents whose skills and experience match the project's specific needs.

Table 1-22: Manpower Requirement per Project Phase

PROJECT PHASE	ESTIMATED MANPOWER REQUIREMENT	TASKS TO BE PERFORMED	SKILLS REQUIREMENT
Pre-Construction	120	▪ Conduct complete feasibility study ▪ Prepare detailed engineering designs and drawings ▪ Facilitate permit requirements and tender documents ▪ Resettlement/right-of-way acquisition	▪ Specialized technical skills/expertise on various engineering and scientific fields.
Construction	2,000	▪ Perform civil, architectural, and electro-mechanical works ▪ Resettlement/right-of-way acquisition	▪ Engineers, project managers, skilled and non- skilled laborers
Operation	25	▪ Oversee the entire operations of the proposed project, including emergency situations, ensuring the safety and welfare of its personnel ▪ Maintain conformity of the proposed project to relevant government regulations, including Occupational Health and Safety, ECC compliance etc. ▪ Promote and uphold a harmonious relationship with the host community	▪ Management and administration skills; ▪ over-all knowledge on the operation including key environmental, labor, and local ordinances
Abandonment	50	▪ Implement the abandonment plan	▪ As required

[133]**DPWH** adheres to Republic Act No. 6685 of 1998 entitled, *"An Act Requiring Private Contractors to Whom National, City and Municipal Public Works Projects Have Been Awarded Under Contract To Hire At Least Fifty Percent of the Unskilled and At Least Thirty Percent of the Skilled Labor Requirement to be Taken From the Available Bona Fide Residents in the Province, City, or Municipality in Which the Projects are to be Undertaken, and Penalizing Those Who Fail to Do So"* as well as Republic Act No. 9710 or the *"Magna Carta on Women"*, through the issuance of Department Order No. 130 series of 2016.

[134]**Guidelines for the Implementation of the Provisions of Republic Act No. 6685 and Republic Act No. 9710 or the Magna Carta on Women.** Pursuant to Section 7 of RA No. 6685 and MCW, the following implementing rules and regulations are issued accordingly:

a. The mandatory minimum percentage of 50% of unskilled labor requirement shall be recruited and be equally accessible to both women and men.

b. The mandatory minimum 30% of the skilled labor requirement shall be recruited and be equally accessible to both women and men.

[135]The conditions for items a. and b. were as follow:

i. First priority shall be recruited from the unemployed bona fide residents of the locality/barangay where the project is being undertaken who are ready, willing, and able as determined/certified by the City/Municipal Mayor concerned;

ii. If the un/skilled labor requirement is not fully met by the recruitment pursuant to item i. above, the deficiency shall be recruited from the unemployed bona fide residents of neighboring barangays of the city/municipality where the project is being undertaken who are ready, willing, and able as determined/certified by the City/Municipal Mayor concerned; and

iii. If still the un/skilled labor requirement is not fully satisfied after the recruitment pursuant to items i. and ii., then the deficiency shall be recruited from the unemployed bona fide residents of the province where the project is being undertaken who are ready, determined/certified by the Governor.

c. In case of a project traversing two or more barangays/ municipalities/ cities/ provinces, the labor requirement shall be recruited proportionately from the localities traversed by the project.

[136]**DPWH** shall also purposively employ women, to comprise at least 20% of the total workforce in skilled or unskilled positions, in various phases and stages of construction/civil work, form planning, design, pre-construction and construction and maintenance of a public works project.

[137]Since priority hiring of un/skilled labor only pertains to the geographic location of the persons, this may also be applicable to the members of Ikalahan Kalanguya and Kalanguya ICCs as well.

[138]Republic Act No. 10524 defines equal opportunity for employment as “no person with disability shall be denied access to opportunities for suitable employment. A qualified employee with disability shall be subject to the same terms and conditions of employment and the same compensation, privileges, benefits, fringe benefits, incentives, or allowances as a qualified able-bodied person”.

1.9 INDICATIVE PROJECT COST

[139]The Indicative cost for the proposed Dalton Pass East Alignment Road Project is estimated to be **Php 24,000,000,000.00 (24 Billion Pesos)** or around **¥58.10 Billion Japanese Yen** (prevailing exchange rate as of August 2022). The proposed project will be funded by JICA through the Official Development Assistance (ODA).

[140]These costs include the following:

- Detailed engineering studies and designs, including the feasibility study (FS) and acquisition of necessary government permits and licenses;
- Site preparation;
- Construction of project components and facilities;
- Procurement of necessary equipment and materials;
- Environmental management and protection, air pollution devices; and
- Environmental monitoring activities.

SECTION 2

ANALYSIS OF KEY ENVIRONMENTAL IMPACTS

2.1 THE LAND

2.1.1 Land Use and Classification

[141]The proposed project will be located within Regions II and III which covers two provinces namely Nueva Vizcaya and Nueva Ecija. As indicated in Section 1.1, the proposed project site lies within the political jurisdiction of the Municipalities of Aritao and Santa Fe in Nueva Vizcaya and the Municipality of Carranglan in Nueva Ecija. The respective land area of the municipalities and barangays covering the proposed project site are presented in the succeeding tables.

Municipality of Aritao

[142]The Municipality of Aritao is in the southern part of the Province of Nueva Vizcaya and is approximately 36.6 km away from Bayombong, the provincial capital of Nueva Vizcaya. It is bounded on the north by Bambang and Kayapa, on the east by Dupax del Sur, on the south by Carranglan, Nueva Ecija, and on the west by Santa Fe.

[143]Aritao is composed of 22 barangays, two of which are classified as urban, while the rest are rural. The classification and land area of each barangay in Aritao are listed in **Table 2-1**. The project will pass through Barangays Canabuan and Canarem which are both classified as rural. Barangay Canabuan has a land area of 5,291.84 ha or about 15.16% of the total land area of the municipality, while Canarem has a land area of 1,373.03 ha or 3.93% of the total land area.

Table 2-1: Classification and Land Area of Barangays in the Municipality of Aritao

BARANGAY	CLASSIFICATION	TOTAL AREA (HA)	% OF TOTAL AREA
Anayo	Rural	1,422.58	4.08
Baan	Rural	7,750.91	22.21
Balite	Rural	2,157.31	6.18
Banganan	Urban	245.55	0.70
Beti	Rural	1,395.65	4.00
Bone North	Rural	628.58	1.80
Bone South	Rural	1,000.03	2.87
Calitlitan	Rural	1,813.78	5.20
Canabuan	Rural	5,291.84	15.16
Canarem	Rural	1,373.03	3.93
Comon	Rural	1,030.97	2.95
Cutar	Rural	219.19	0.63
Darapidap	Rural	1,291.26	3.70
Kirang	Rural	2,759.15	7.91
Latar	Rural	1,228.10	3.52
Nagcuarterlan	Rural	209.50	0.60
Ocao-Capiñaan	Rural	1,859.39	5.33
Poblacion	Urban	426.69	1.22

BARANGAY	CLASSIFICATION	TOTAL AREA (HA)	% OF TOTAL AREA
Sta. Clara	Rural	737.66	2.11
Tabueng	Rural	325.05	0.93
Tucanon	Rural	725.97	2.08
Yaway	Rural	1,010.27	2.89
	TOTAL	**34,902.46**	**100**
SOURCE**:** Municipality of Aritao CLUP (2009-2024)			

Municipality of Santa Fe

[144]The Municipality of Santa Fe is situated in the southern part of Nueva Vizcaya and is approximately 68.4 km away from Bayombong (provincial capital). It is bounded on the northwest to northeast by the municipalities of Kayapa, Aritao, and Dupax Del Sur; on the southeast to southwest by Carranglan, Nueva Ecija and the municipalities of Natividad and San Nicolas in the Province of Pangasinan; and on the west by Itogon, Benguet.

[145]Santa Fe has 16 barangays which are all classified as rural. The classification and land area of each barangay in Santa Fe are listed in **Table 2-2**. The project will pass through Barangay Canabuan with a land area of 6,425.20 ha or about 16.07% of the total land area of Santa Fe.

Table 2-2: Classification and Land Area of Barangays in Santa Fe

BARANGAY	CLASSIFICATION	TOTAL AREA (HA)	% OF TOTAL AREA
Atbu	Rural	1,629.31	4.08
Bacneng	Rural	1,886.76	4.72
Balete	Rural	4,740.22	11.86
Baliling	Rural	526.45	1.32
Bantinan	Rural	1,241.85	3.11
Baracbac	Rural	552.58	1.38
Buyasyas	Rural	3,728.46	9.32
Canabuan	Rural	6,425.20	16.07
Imugan	Rural	1,304.41	3.26
Malico	Rural	1,617.86	4.04
Poblacion	Rural	88.86	0.22
Santa Rosa	Rural	10,801.12	27.01
Sinapaoan	Rural	1,562.90	3.91
Tactac	Rural	653.88	1.64
Unib	Rural	2,733.73	6.84
Villaflores	Rural	487.57	1.22
	TOTAL	**39,981.16**	**100**
SOURCE: Municipality of Santa Fe CLUP (2018-2027)			

Municipality of Carranglan

[146]The Municipality of Carranglan is in the northernmost part of the Province of Nueva Ecija. It is bounded on the north by the Province of Nueva Vizcaya, on the south by the municipalities of Lupao, Pantabangan, and San Jose City, and on the west by Pangasinan.

[147]Carranglan consists of 17 barangays, four of which are classified as urban, while the others as rural. The classification and land area of each barangay in Carranglan are listed in **Table 2-3**. The project-will pass through Barangays Burgos, Salazar and Bunga which are all categorized as rural. Burgos has a land area of 9,745.47 ha. Salazar has a land area of 7,106.74 ha, and Bunga has a total land area of 12,845.70 ha.

Table 2-3: Classification and Land Area of Barangays in Carranglan

BARANGAY	CLASSIFICATION	TOTAL AREA (HA)	% OF TOTAL AREA
Bantug	Rural	249.33	00.32
Bunga	Rural	12,845.70	16.45
Burgos	Rural	9,745.47	12.48
Capintalan	Rural	3,447.98	4.41
D.L. Magnaloc	Urban	197.23	0.25
F. C. Otic	Urban	53.01	0.07
G.S. Rosario	Urban	97.95	0.13
General Luna	Rural	9,406.02	12.04
Joson	Rural	8,015.06	10.26
Minuli	Rural	3,207.01	4.11
Piut	Rural	4,330.92	5.55
Puncan	Rural	6,271.73	8.03
Putlan	Rural	3,967.85	5.08
R. A. Padilla	Rural	5,258.78	6.73
Salazar	Rural	7,106.74	9.10
San Agustin	Rural	3,678.62	4.71
T. L. Padilla	Urban	220.60	0.28
	TOTAL	**78,100.00**	**100**
SOURCE: Municipality of Carranglan CLUP (2019-2028)			

2.1.1.1 Impact in terms of compatibility with existing land use

Municipality of Aritao

[148]Aritao has a total land area of 34,902.46 ha, of which 52.98% is classified as protected forest, 19.35% as production forest, and 17.04% as protected agriculture. The details of the various land uses are provided in **Table 2-4.**

[149]As presented in **Figure 2-1**, the proposed project alignment is within agricultural and forest areas.

Table 2-4: General Land Use Classification of Aritao

BARANGAYS	AREA (HA)	% TO TOTAL AREA
Residential	409.56	1.17
Commercial	7.00	0.02
Infrastructure/ Utilities	30.82	0.09
Institutional	15.88	0.05
Industrial	0.61	-
Production Forest	6,754.49	19.35
Production Agriculture	1,559.77	4.47
Protection Forest	18,490	52.98
Protection Agriculture	5,946.67	17.04
Water Bodies	1,490.13	4.27
Roads	189.38	0.54
Others (Cemeteries, dumpsites, etc.)	16.23	0.05
TOTAL	**34,902.46**	**100**
SOURCE: Municipality of Aritao CLUP (2009-2024)		

Municipality of Santa Fe

[150]The municipality of Santa Fe has a total land area of 39,981.16 ha. The details of the various land uses are provided in **Table 2-5.** The proposed north tunnel in Barangay Canabuan covers agricultural and forestland. While the road at the exit point of the tunnel covers agricultural land.

Table 2-5: General Land Use Classification of Santa Fe

BARANGAYS	AREA (HA)	% TO TOTAL AREA
Agricultural	10,866.76	25.82
Forestland	27,353.39	36.53
Built- Up Area *(Residential, institutional, commercial, and other urban land uses)*	1,761.01	1.38
TOTAL	**39,981.16**	**100**
SOURCE: Municipality of Santa Fe CLUP (2018-2027)		

Municipality of Carranglan

[151]The municipality of Carranglan has a total land area of 78,100 ha where 86.10% of the total land area is classified as forest land, while the rest are allocated for agriculture (6.40%), open space (4.21 %), and water bodies (2.79%). The details of the existing land uses are provided in **Table 2-6.**

[152] **Figure 2-3** presents the existing land use map of the municipality. The proposed project alignment will pass through Barangays Canabuan and Canarem with existing land uses of agricultural, agro-forestry and forestland.

Table 2-6: General Land Use Classification of Carranglan

BARANGAY	AREA (HAS.)	% TO TOTAL AREA
Residential	337.50	0.43
Commercial	3.66	0.00
Institutional	23.31	0.03
Industrial	7.28	0.01
Agri-industrial	14.89	0.02
Agricultural	4,999.22	6.40
Cemetery	3.70	0.00
Open Space	3,284.57	4.21
Forest	67,245.68	86.10
Water Body	2,180.19	2.79
TOTAL	**78,100.00**	**100**
SOURCE: Municipality of Carranglan CLUP (2019-2028)		

[153]**Land Cover.** Based on remotely sensed data of the National Mapping and Resource Authority (NAMRIA) as of 2020, the agricultural areas comprising 23.79% of the land cover consist of 307,928.71 m^2 of mostly prime agricultural lands that are planted with rice crops. As revealed during KIIs with farmer-leaders, there are no irrigation facilities in these areas; rice fields are basically rain-fed. Most of the farmers plant rice once a year during the rainy season. As an alternative, farmers plant vegetables on dried-up rice paddies during dry season.[1]

[1] Based on Draft Preliminary Right-of-Way Acquisition Plan prepared by Phil EarthUs Consultancy Co., Inc.

[154]**Land Classification.** Data obtained from the DENR Region III One Control Map for tenurial instruments indicated that the project alignment will fall in alienable and disposable lands and Forestlands.

[155]For Region II, the land classification map is not available and will be subject for re-projection of NAMRIA according to DENR Region II Land Records Section Survey and Mapping Division.

[156]**Table 2-7** presents the existing land uses, covers, and classifications along the project alignment.

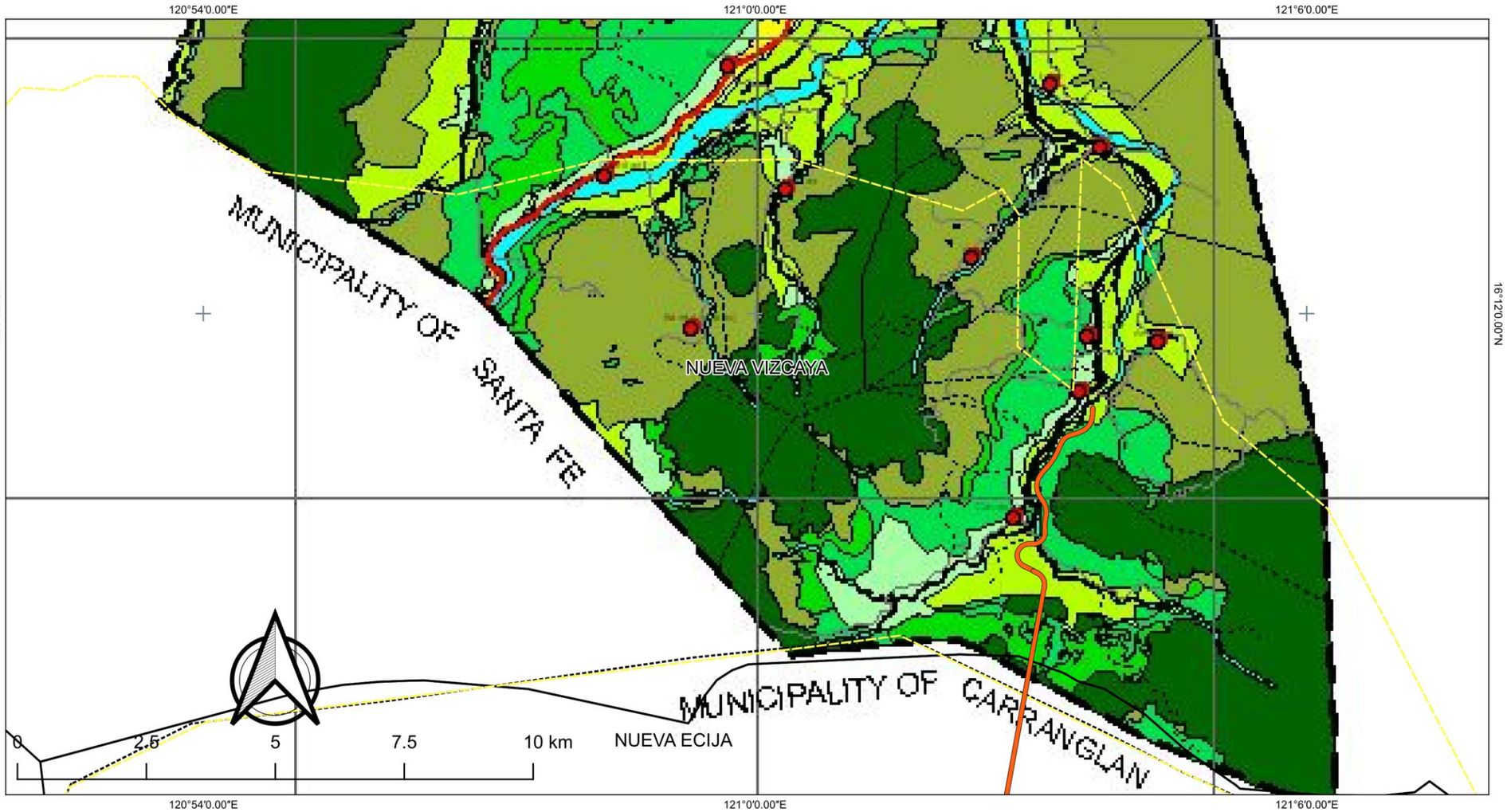
Table 2-7: Existing Land Uses in the Project Area

PROJECT ALIGNMENT	LOCATION	EXISTING LAND USES[a]	LAND COVER[b]	LAND CLASSIFICATION[c]
Road from KM 00 to South Tunnel	Bunga, Carranglan	Agricultural	Grassland	Alienable and Disposable
	Burgos, Carranglan	Forest	Grassland, Brush/Shrubs	Alienable and Disposable; Forestland
South Tunnel	Burgos, Carranglan	Forest	Grassland, Brush/Shrubs	Alienable and Disposable; Forestland
Road from South to North Tunnel	Burgos, Carranglan	Agricultural	Grassland, Annual Crop	Alienable and Disposable; Forestland
	Salazar, Carranglan	Agricultural, Forest	Grassland, Brush/Shrubs, Annual Crop, Open Forest	Alienable and Disposable; Forestland
North Tunnel	Salazar, Carranglan	Forest	Open and Closed Forest	Alienable and Disposable; Forestland
	Canabuan. Sta. Fe	Agricultural, Forest	Open and Closed Forest, Brush/Shrubs, Annual Crop	NDA
Road from North Tunnel to End	Canabuan, Sta. Fe	Agricultural	Annual Crop	NDA
	Canabuan, Aritao	Forest, Agro-Forestry, Agricultural	Grassland	NDA
	Canarem, Aritao	Agricultural	Grassland, Brush/Shrubs	NDA

NOTE:
a Comprehensive Land Use Plans (see **Figures 2-1** to **2-3**)
b NAMRIA Land Cover Map (see **Figure 2-4**)
c DENR Region 3 One Control Map (Tenurial Instruments) (see **Figure 2-5**)
NDA – No data available

DEFINITION BASED ON NAMRIA LAND CLASSIFICATION:
Annual Crop – Land cultivated with crops with a growing cycle under one year, which must be newly sown or planted for further production after harvesting.
Brush/Shrubs – Refer to vegetation types where the dominant woody elements are shrubs, generally of more than 0.5m and <5m in height on maturity and without a definite crown.
Closed Forest – Formations where trees in various storeys and the undergrowth cover a high proportion (>40%) of the ground and do not have a continuous dense grass layer.
Grassland – Areas predominantly vegetated with grasses such as *"Imperate and Saccharum spp."*, among others.
Open Forest – Formations with discontinuous tree layer but with a coverage of at least 10% and less than 40%.

Figure 2-1: General Land Use Map of Aritao



MAP SOURCE/S:

MUNICIPALITY OF ARITAO
PROPOSED GENERAL LAND USE MAP

MAP INFORMATION:
Map Scale : 1 : 8 5 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Aritao Proposed General Land Use Map
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment

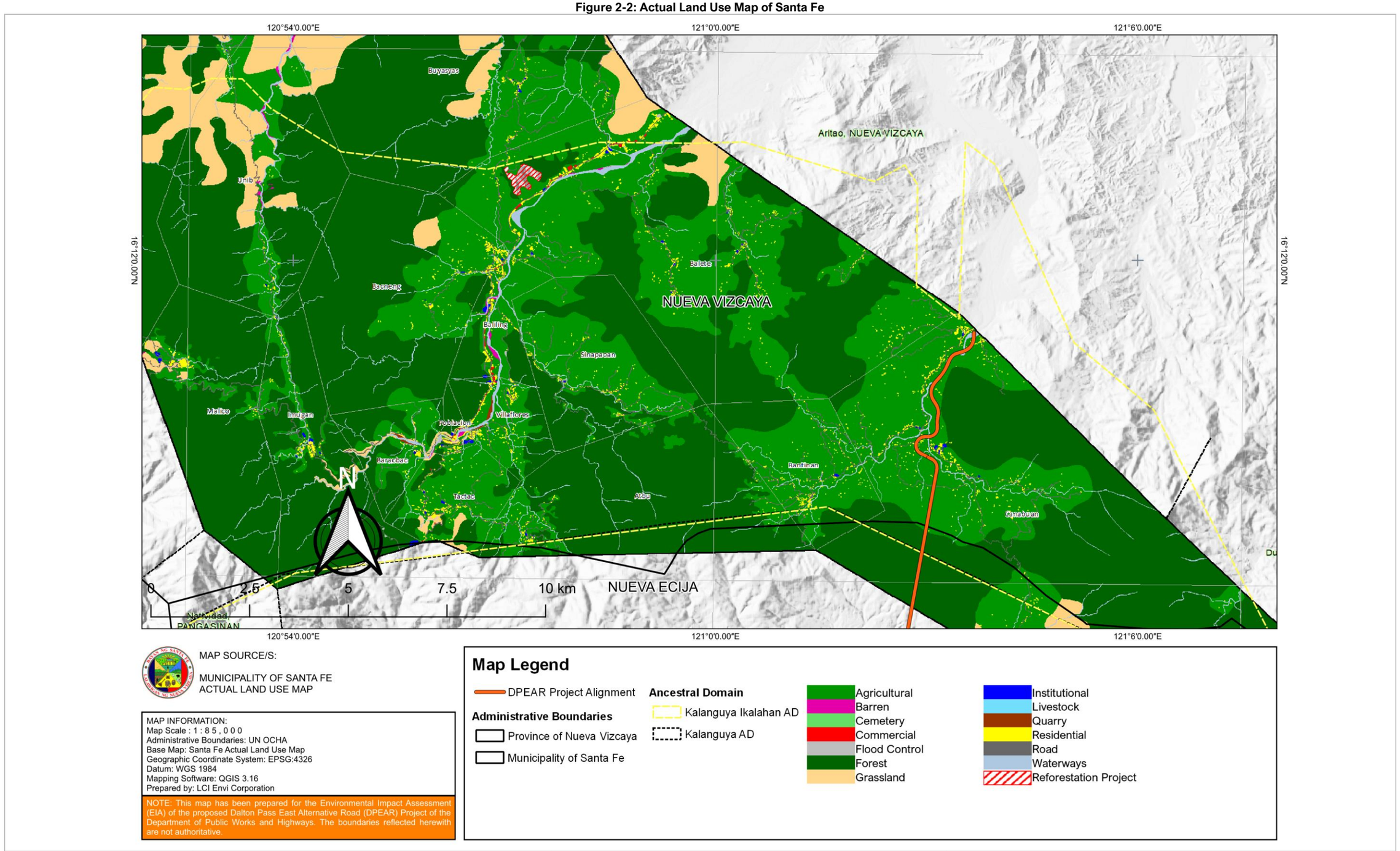
Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Aritao

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

- Agro-forestry
- Cemetery
- Dumpsite
- Institutional
- Multiple Use
- New Protection Forest
- Production Agriculture
- Protection Agriculture
- Rivers/Easement
- Roads/Infrastructure
- Agro-Industrial Zone
- Built-up Area
- Commercial
- Industrial Zone
- Timberland

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**GENERAL LAND USE MAP OF ARITAO**	Aritao CLUP (2009-2024)	LCI ENVI CORPORATION

Figure 2-2: Actual Land Use Map of Santa Fe



MAP SOURCE/S:

MUNICIPALITY OF SANTA FE
ACTUAL LAND USE MAP

MAP INFORMATION:
Map Scale : 1 : 8 5 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Santa Fe Actual Land Use Map
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

DPEAR Project Alignment

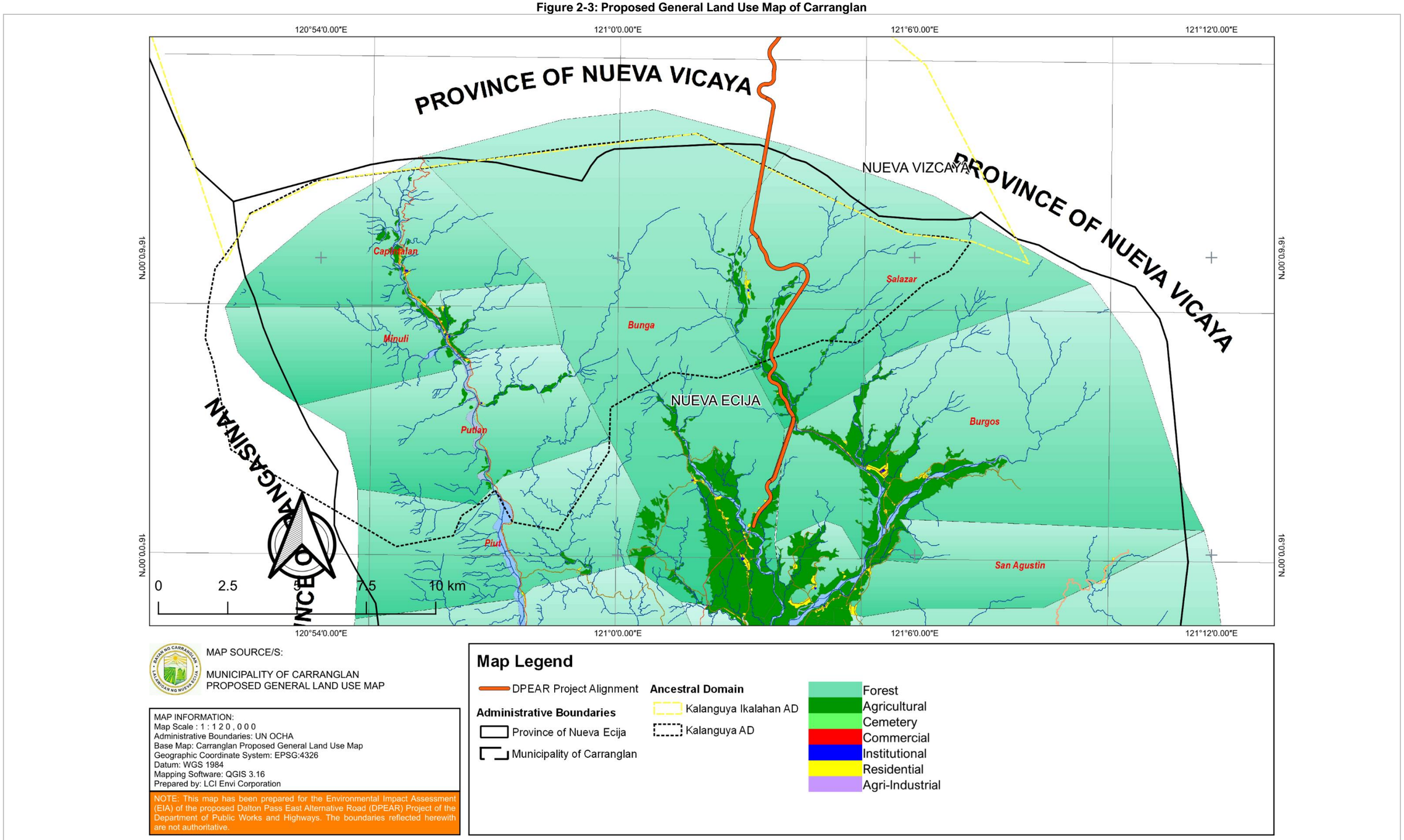
Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Santa Fe

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

- Agricultural
- Barren
- Cemetery
- Commercial
- Flood Control
- Forest
- Grassland
- Institutional
- Livestock
- Quarry
- Residential
- Road
- Waterways
- Reforestation Project

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**ACTUAL LAND USE MAP OF SANTA FE**	Santa Fe CLUP (2018-2027)	LCI ENVI CORPORATION

Figure 2-3: Proposed General Land Use Map of Carranglan



PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**PROPOSED GENERAL LAND USE MAP OF CARRANGLAN**	Carranglan CLUP (2019-2028)	LCI ENVI CORPORATION

2.1.1.2 Impact on compatibility with classification as an Environmentally Critical Area (ECA)

[157]As defined in the DENR Administrative Order No. (DAO) 2017-15, environmentally critical area (ECA) is "an area that is environmentally sensitive and is so listed under Presidential Proclamation No. 2146, Series of 1981, as well as other areas which the President of the Philippines may proclaim as environmentally critical in accordance with Section 4 of Presidential Decree No. 1586."

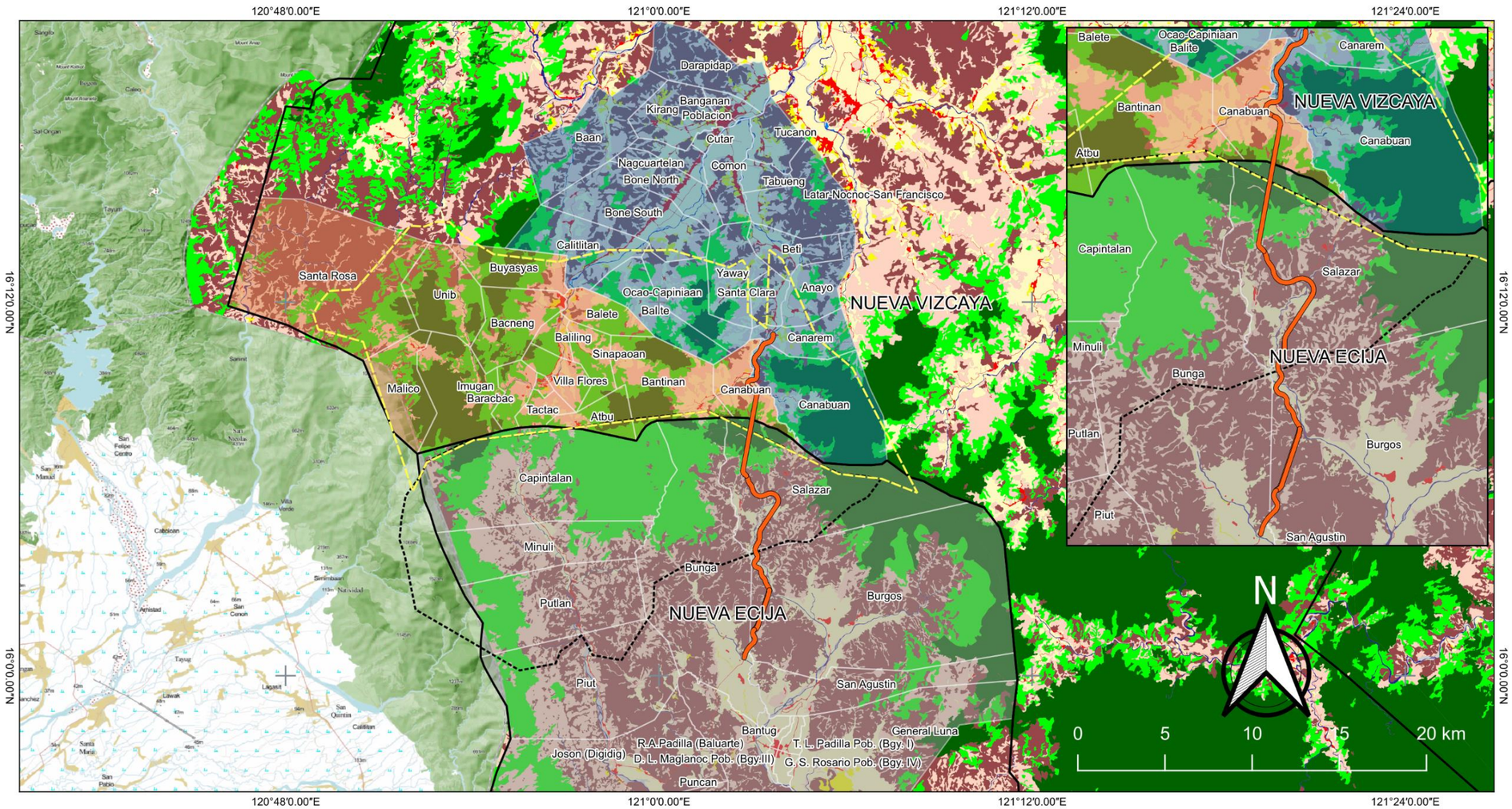
[158]**Table 2-8** shows the results of assessment conducted in the proposed project site in terms of ECA categorization.

Table 2-8: Environmental Critical Area Categorization

	ECA CLASS	YES	NO	REMARKS
A.	Area declared by law as a national park, watershed, reserve, wildlife preserves or sanctuary	✓		Among the 142 critical watersheds in the country, there are two watersheds which cover the project site. As presented in **Figure 2-6**, the proposed project is within the NIA-Upper Pampanga River Integrated Irrigation Systems (UPRIIS) in the south (Region III) and NIA-Magat River Integrated Irrigation System (MARIIS) in the north (Region II). UPRIIS covers about 87,351 ha of the Central Luzon's total land area, while MARIIS covers approximately 425,200 ha of the region's total area. **Figure 2-7** shows that the southern portion of the alignment also falls within the Pantabangan-Carranglan Watershed Forest Reserve (PCWFR), an initial component of the NIPAS. This watershed forest reserve has an estimated total area of 94,865 ha and was proclaimed last 1969. **Figure 2-9** shows the location of the strict protection zone (SPZ) of PCWFR.
B.	Area set aside as aesthetic, potential tourist spot		✓	The project area is not utilized for aesthetic and/or potential tourist spot.
C.	Area which constitutes the habitat for any endangered or threatened species of indigenous Philippine wildlife (flora and fauna)	✓		**Figure 2-9** presents the nearest key biodiversity area (KBA) from the Biodiversity Management Bureau (BMB). The nearest Terrestrial KBA is the Casecnan Protected Landscape, approximately 2.5 kilometers away from the nearest project component (northern tunnel section). Results of the terrestrial assessment conducted in the project site are presented in Section 2.1.4.
D.	Area of unique historic, archaeological, geological, or scientific interest		✓	From the PRECUP-TALAPAMANA of the National Commission for Culture and the Arts (NCCA), there are no known areas of unique history, archaeological,

	ECA CLASS	YES	NO	REMARKS
				geological, or scientific interest near the project site.
E.	Area which is traditionally occupied by cultural community or tribe	✓		The proposed project will traverse two Ancestral Domains (ADs): the Kalanguya Ikalahan Indigenous Cultural Communities (ICCs) in Nueva Vizcaya and the Kalanguya ICCs in Nueva Ecija. Culture or lifestyle of the people in the project site is further discussed in Section 2.4.3.
F.	Area frequently visited and/or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.)	✓		Geohazard assessment of the project site is discussed in Section 2.1.2
G.	Area with critical slope	✓		The elevation/topography, slope and geomorphology of the proposed project sites are discussed in Section 2.1.2. Around 2.7 kilometers of the project's northern tunnel and 800 meters of road will pass through within Caraballo Mountains, which is considered as an area with critical slope.
H.	Area classified as prime agricultural land		✓	There are no known prime agricultural lands that will be affected by the proposed project alignment and RRoW.
I.	Recharge area of aquifers		✓	There are no known recharge areas of aquifers that will be affected by the proposed project.
J.	Waterbody	✓		The alignment of the project will pass through rivers. These rivers are discussed in Section 2.2.1.
K.	Mangrove area		✓	There are no known mangrove areas that will be affected by the proposed project alignment and RRoW.
L.	Coral reef		✓	There are no coral reefs in the project area. Nearest coastal areas are Lingayen Gulf (70 kms.) and Baler Bay (55 kms.) away from the project site.

Figure 2-4: Land Cover Map of the Proposed Project Site



MAP SOURCE/S:

NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

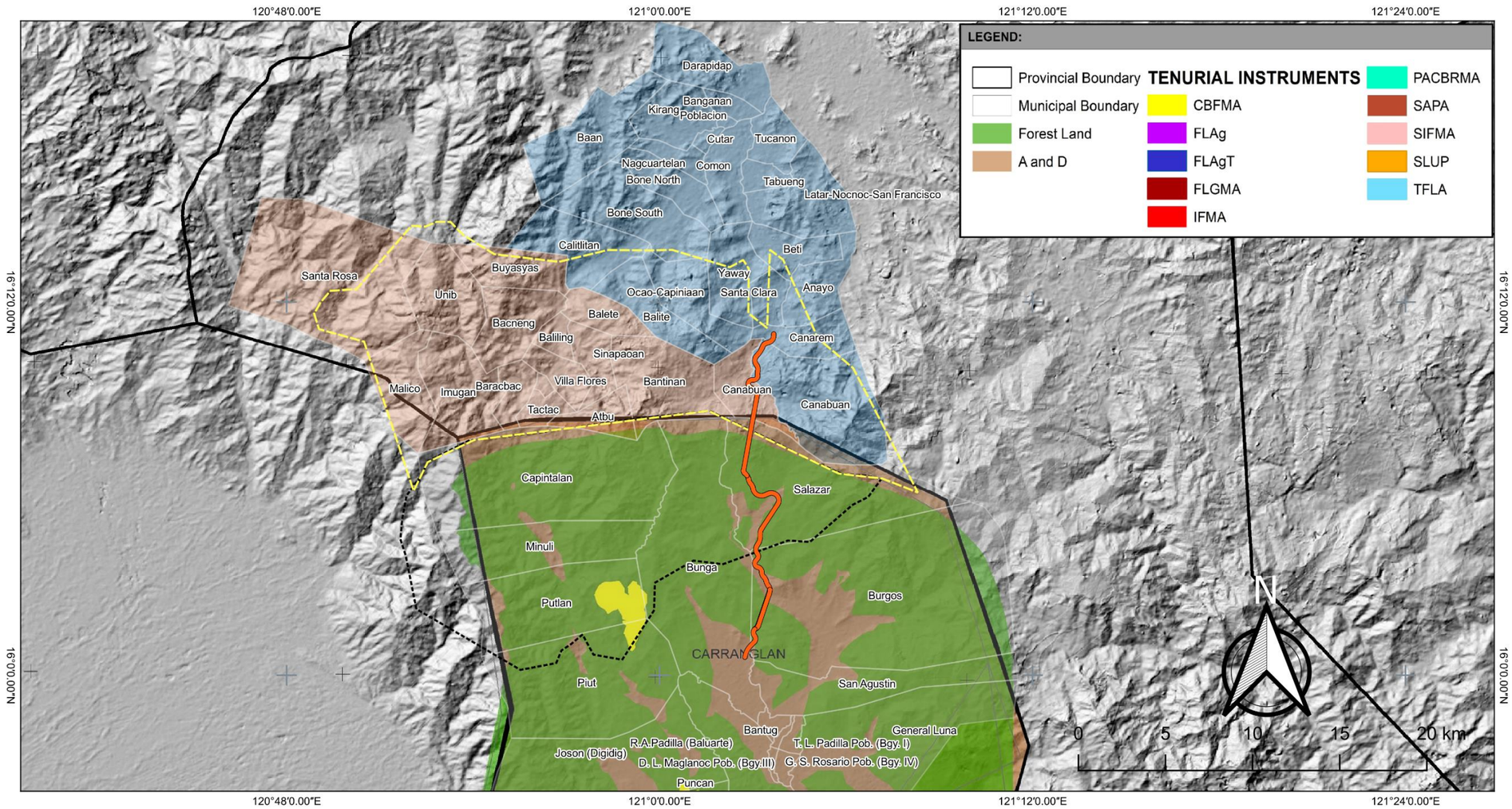
NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- **Administrative Boundaries**
  - Province of Nueva Vizcaya
  - Municipality of Aritao
  - Municipality of Santa Fe
  - Province of Nueva Ecija
  - Municipality of Carranglan
- **Ancestral Domain**
  - Kalanguya Ikalahan AD
  - Kalanguya AD
- **Land Cover (2020)**
  - Closed Forest
  - Open Forest
  - Brush/Shrubs
  - Grassland
  - Perennial Crop
  - Annual Crop
  - Built-up
  - Open/Barren
  - Mangrove Forest
  - Marshland/Swamp
  - Fishpond
  - Inland Water

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**LAND COVER MAP OF THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022. Land Cover (2020)	LCI ENVI CORPORATION

Figure 2-5: Land Classification Map of the Proposed Project Site (Region III)



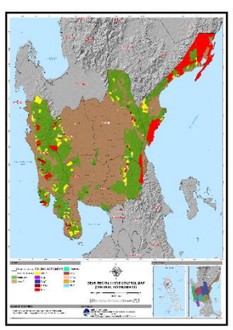
MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

DENR Region III One Control Map (Tenurial Instruments)

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.



Map Legend

- DPEAR Project Alignment
- Province of Nueva Ecija
- Municipality of Carranglan

Administrative Boundaries

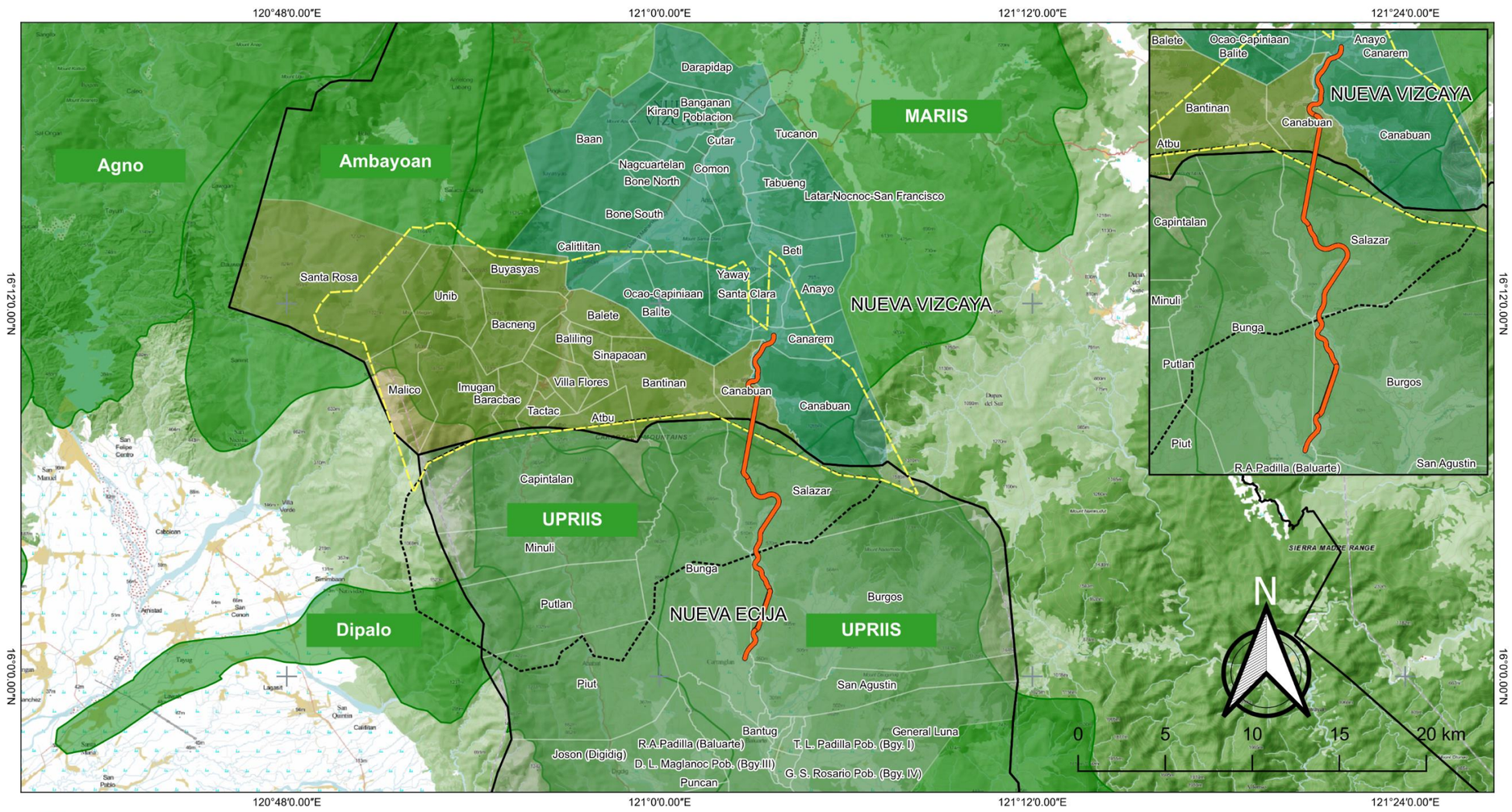
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe

Ancestral Domain

- Kalanguya Ikalahan AD
- Kalanguya AD

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**LAND CLASSIFICATION MAP OF THE PROPOSED PROJECT SITE (REGION III)**	As above. https://r3.denr.gov.ph/index.php/control-map accessed 2023.	LCI ENVI CORPORATION

Figure 2-6: Critical Watersheds Relative to the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Forest Management Bureau

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment

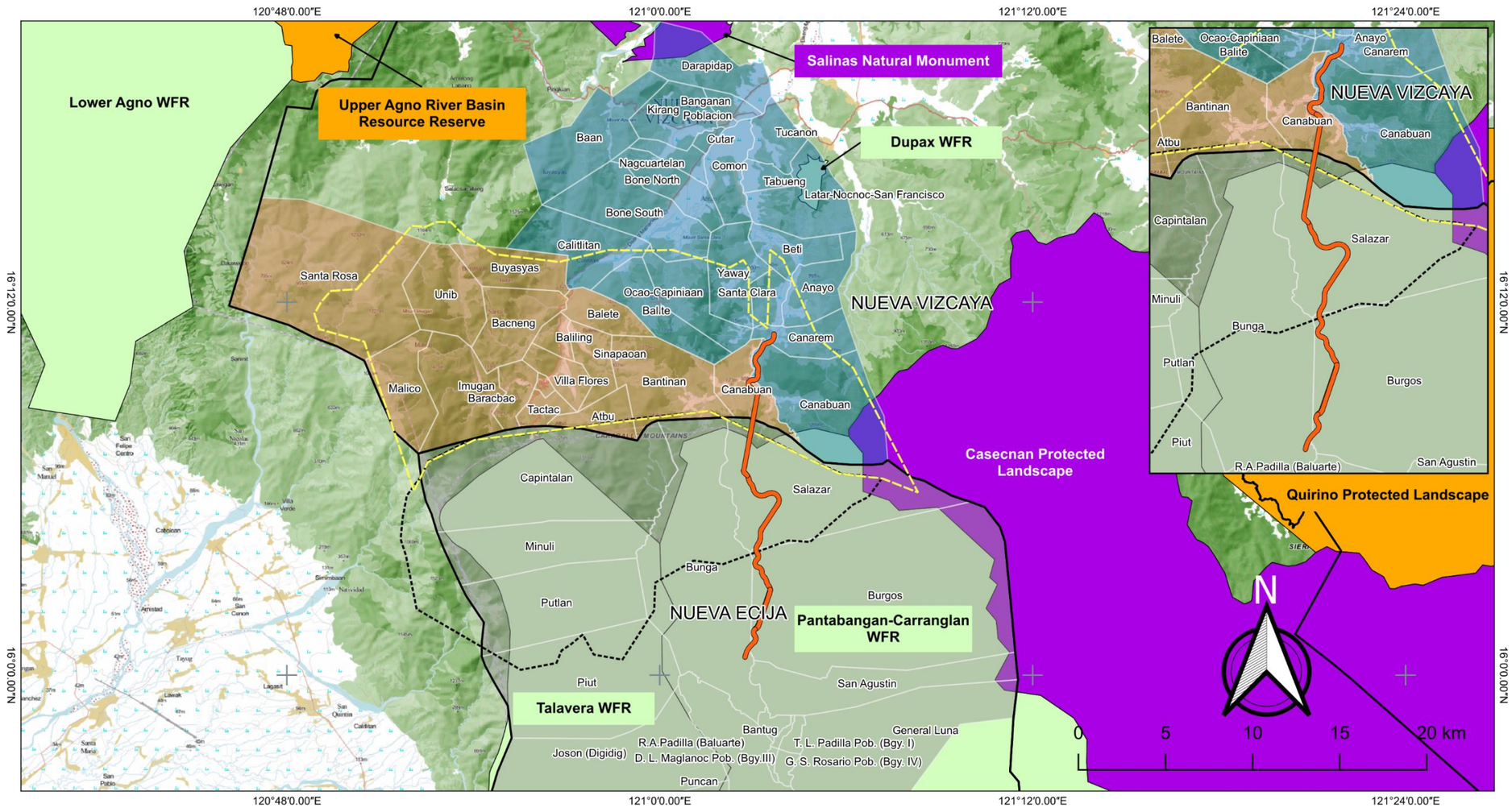
Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija
- Municipality of Carranglan

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

Critical Watershed
- Critical Watersheds
- NIA-Upper Pampanga River Integrated Irrigation Systems (UPRIIS)
- NIA-Magat River Integrated Irrigation System (MARIIS)

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**CRITICAL WATERSHEDS RELATIVE TO THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

Figure 2-7: National Integrated Protected Areas System Relative to the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Biodiversity Management Bureau

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

DPEAR Project Alignment

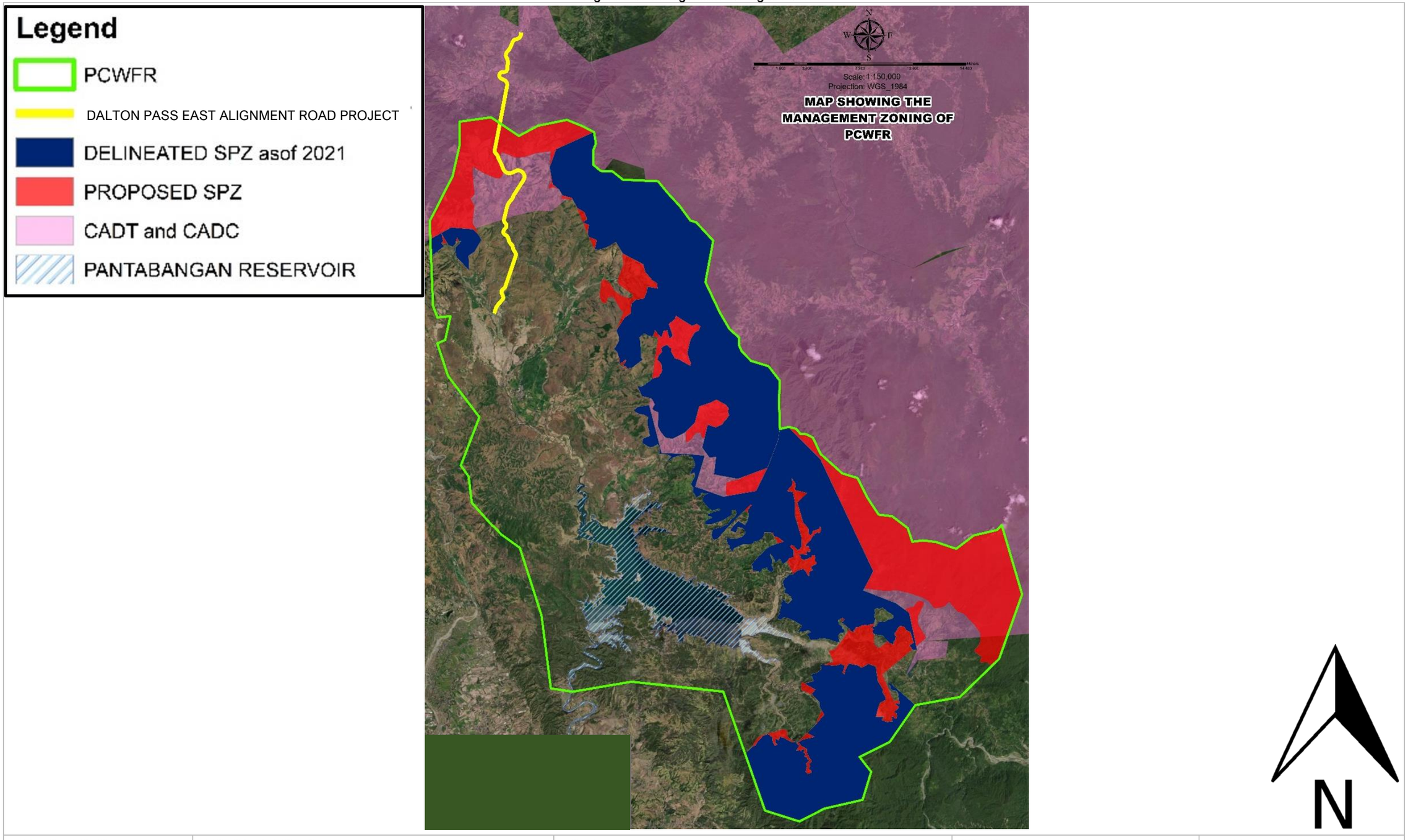
Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija
- Municipality of Carranglan

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

National Integrated Protected Areas System
- Initial Component
- Proclaimed
- Legislated

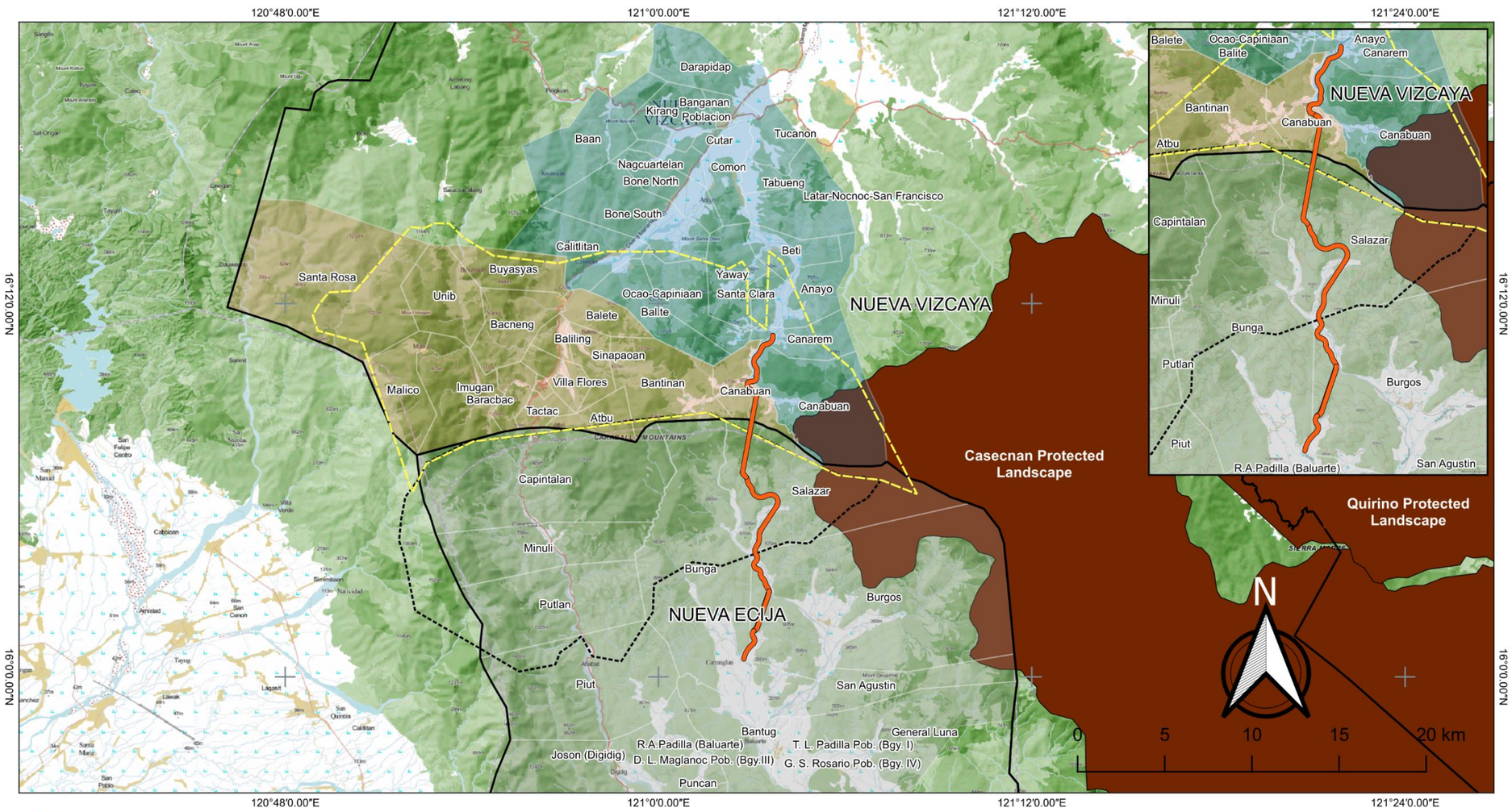
PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**NATIONAL INTEGRATED PROTECTED AREAS SYSTEM RELATIVE TO THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

Figure 2-8: Management Zoning of PCWFR



PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**MANAGEMENT ZONING OF PCWFR**	PCWFR PAMB	LCI ENVI CORPORATION

Figure 2-9: Key Biodiversity Areas Relative to the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Biodiversity Management Bureau

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Municipality of Carranglan

Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

Key Biodiversity Area
- Terrestrial KBA

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**KEY BIODIVERSITY AREAS RELATIVE TO THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

2.1.1.3 Impact in existing land tenure issue/s

[159]The proposed project alignment is not covered by the Comprehensive Agrarian Reform Program (CARP). However, it will traverse two (2) Ancestral Domains (ADs): the Kalanguya-Ikalahan Indigenous Cultural Communities (ICCs) in Nueva Vizcaya and the Kalanguya ICCs in Nueva Ecija. The Kalanguya-Ikalahan ICCs covers about 30,635.99 ha of the Municipality of Sta. Fe under CADT No. R02-STF-0406-045. On the other hand, the Kalanguya ICCs extends approximately 25,384.98 ha which includes Barangays Capintalan, Minuli, Salazar and Putlan of Carranglan under the CADT No. R03-CAR-1106-051 (see **Figure 2-10**). **DPWH** has already secured the Certification Precondition (CP) for the proposed project.

[160]In 2011, Executive Order (EO) No. 26, s. 2011 entitled Declaring an Interdepartmental Convergence Initiative for a National Greening Program was signed by the President of the Philippines. This EO mandated the Department of Agriculture (DA), Department of Agrarian Reform (DAR) and Department of Environment and Natural Resources (DENR) to develop NGP in cooperation with the Department of Education (DepEd), Commission on Higher Education (CHED), Department of Social Welfare and Development (DSWD), Department of Budget and Management (DBM), private sector and other concerned agencies and institutions. The National Greening Program (NGP) was launched to plant 1.5 billion trees in 1.5 million hectares for a period of six years, from 2011 to 2016. Among all the NGP sites in the country, five areas were near the proposed project alignment. As presented in **Figure 2-10**, four (2012, 2013, 2014 and 2015) are situated in the north portion of the alignment and the remaining (2011) in the south.

[161]On the east of the proposed exit road in Barangay Canarem, Aritao, Narra species was planted in a 1-ha NGP site in 2012. Barangay Canabuan, Aritao covers 2013 and 2015 NGP sites with 10 ha and 50 ha, respectively. 2013 NGP included Coffee, Guyabano, Narra and Tuai species, while 2015 NGP planted Tuai, Coffee, Anchoan dilaw and Ipil-ipil species. On the west of the proposed north tunnel in Barangay Canabuan, Sta. Fe, Almaciga, Coffee, Guyabano, Makaasim, Rambutan, Red and White Lauan, and Tuai-plantations were situated in a 100-ha land area.

[162]On the west of the proposed entry to the south tunnel in Barangay Bunga, Carranglan, Mango and Narra trees were planted in a 25-ha area as part of the 2011 NGP. Tree cutting will be limited to areas where project facilities will be built, as much as possible preserving old and endemic trees. Tree cutting will be conducted in accordance with the terms and conditions stipulated in the Tree Cutting Permit to be issued for the project. It is estimated that 870 hardwood/timber tree species and 10,347 fruit trees will be cut with estimated area of 51,397 m^2 and 608,712 m^2, respectively.

Pantabangan-Carranglan Watershed Forest Reserve. Portions of the proposed project passes through the Strict Protection Zone (SPZ) of Pantabangan-Carranglan Watershed Forest Reserve (PCWFR) in the water resource management plan that has been formulated and is proposed to be converted into Multiple Use Zone to accommodate the proposed project. As a concern of JICA, **DPWH** and JICA Study Team have conducted various communications and meetings were conducted since 2020 with DENR Region 3, Biodiversity Management Bureau (DENR-BMB), Forestland Management Project, Protected Areas Management Board (PAMB), Provincial Environment and Natural Resources Office (PENRO) Nueva Ecija, Community Environment and Natural Resources Office (CENRO) Muñoz, to ensure that the project can be allowed to proceed in the said protected area. In case that projects are implemented in protected areas, JICA Guidelines request appropriate responses for

"5 Conditions". Policies/responses for 5 Conditions of the proposed project are shown on the following:

i. There are no viable alternatives in areas other than areas specifically designated by the government for the protection of nature and cultural heritage under laws and regulations (hereinafter referred to as "the area").

The east side of this protected reserve is adjacent to multiple protected areas (Casecan Protected Landscape, Quirino Protected Landscape (also designated as Key Biodiversity Areas)) and continues to the Pacific Ocean, and the west side is also a protected area (Talavera Watershed Forest Reserve). There is no alternative route plan that avoids the protected area in the implementation of this project. (The existing road passes through Talavera Watershed Forest Reserve.)

Further, in terms of construction technology, the steep topography on the east and west sides of the protected area makes the construction of alternative roads less feasible in terms of technology and construction costs (design speed of 60 km and above as requested by the Philippines). It is extremely difficult to secure the specified economic internal rate of return (EIRR=10%) by planning as a construction project for a trunk national highway of h or more). In particular, the west side of this reserve, including the area around the existing road, has the Digdig active fault that caused extensive damage in the 1990 earthquake and has steep topography, and it cannot achieve the purpose of constructing disaster-resistant alternative roads.

ii. Development activities within protected areas must be permitted under the domestic laws of the host country.

Under the NIPAS Act (RA No.7586) concerning protected areas in the Philippines, development activities within protected areas are required to conduct an EIA study and obtain an ECC[2], and during the process of issuing the ECC the DENR examines whether the project can be implemented. In addition, in order to acquire ECC for projects within protected areas, it is necessary to obtain clearance from the PAMB (Protected Area Management Board) (ENIPAS Act (RA No.11038) Sec12). The implementation of this preparatory survey itself has been approved by the DENR and PAMB as a survey necessary for obtaining an ECC. The SPZ of the NIPAS Act is legally defined as an area free from human activity. Although the SPZ of the NIPAS Act is legally defined as an area free from human activity, the zoning of the protected area (PCWFR) through which the project will pass, including the SPZ, has not yet been finalized as the protected area management plan is being prepared.

Through the preparatory survey, JICA examined the project plan and confirm the validity, effectiveness, efficiency, etc. of the project, including the impacts on the environment and society, and supported DPWH. Based on the domestic rules of the Philippines, JICA is providing the information necessary for the examination of the issuance of an ECC for the project.

[2] Republic Act No. 11038Sec.12 (ENIPAS）

iii. The implementing agency of the project must comply with the laws and ordinances related to the area, the management plan of the protected area, etc.

In the agreement documents (L/A, etc.) with the implementing agency (DPWH), JICA will clearly state that DPWH will comply with the laws, ordinances, protected area management plans, etc. in the Philippines. In addition, JICA will encourage implementing agencies to comply with the conditions associated with the issuance of ECCs and will confirm this through monitoring.

iv. The project implementing agency, etc. has consulted with the responsible agency for management of the area, the surrounding community, and other appropriate stakeholders, and has reached an agreement on the implementation of the project.

To support the acquisition of ECC, JICA will hold discussions with the PAMB, which manages this protected area, as well as related parties and organizations[3], and supported PAMB's consensus building. In addition, through stakeholders' meetings held on EIA procedures, RAP surveys, and IPP surveys, JICA supported to build consensus with the surrounding communities.

v. In order for the area to be effectively managed in accordance with its conservation objectives, the implementing agency of the project should implement additional programs as necessary.

Based on the purpose of the protected area (development, improvement, and utilization of water resources), the negative impacts of the project were examined through field surveys and discussions with stakeholders (EIA, RAP, IPP). As a result, negative impacts such as depletion of water sources, deterioration of water quality, deforestation, and safety of slopes are expected.

In particular, regarding the depletion of water sources and deterioration of water quality, which are considered to have a large impact on the environment and society of the area, detailed examination of construction work will be conducted in the detailed design study, and an additional monitoring study was proposed. Regarding deforestation, based on the system of the Philippines, DPWH who is the project proponents formulates a reforestation plan, and more trees will be planted than the current situation through a reforestation plan based on field surveys of felled trees.

[163]**DPWH** has managed to secure the support of the abovementioned offices for the proposed project. After the processing of the ECC, **DPWH** will present the findings of the EIA to PAMB for the issuance of PAMB Certification.

[164]**Table 2-9** presents the chronology of events pertaining to PCWFR and DENR-related concerns from 2020 to present.

Table 2-9: Chronology of Events on PCWFR Activities

DATE	ACTIVITY	TOPIC	MEDIUM	PARTIES INVOLVED
2020-02-17	Gathered info on PCWFR (NIPAS and IUCN Category) - thru online sources, call to DENR Region 3 and BMB	PCWFR (NIPAS and IUCN Category)	Email / phone call	DENR R3, BMB

[3] Including PAS (Protected Area Superintendent), CENRO (Community Environment & Natural Resource Office)

DATE	ACTIVITY	TOPIC	MEDIUM	PARTIES INVOLVED
2020-02-27	Courtesy Visit / Coordination with CENRO Muñoz	Presentation of the Project	Face-to-face meeting	CENRO, DPWH, JST
2020-03-06	Gathered info on PCWFR and NIPAS/ENIPAS through online sources and call to CENRO Muñoz	PCWFR and NIPAS/ENIPAS	Research / writing	CENRO, JST
2020-03-18	Inquired with PENRO Nueva Ecija re: PCWFR PAMP status	PCWFR PAMP status	Email / phone call	PENRO
2020-05-22	Received and forwarded partial data from CENRO Muñoz (scanned map of PCWFR) to JST	PCWFR map	Email / phone call	CENRO, JST
2020-05-28	Received and forwarded partial data from CENRO Muñoz (PCWFR and TWFR KMZ files) to JST	PCWFR and TWFR KMZ files	Email / phone call	CENRO, JST
2020-07-08	Meeting between DENR Region 3 and DPWH-UPMO-RMC1	Presentation of the Project	Face-to-face meeting	DENR R3, DPWH
2020-08-25	Zoom Meeting with DENR (FMB, Region 3, PENRO, CENRO), JICA, DPWH-UMPO-RMC-I(B)	PCWFR	Online meeting	DENR (FMB, DENR R3, PENRO, CENRO), DPWH, JST
2020-09-16	Zoom Meeting with DENR (BMB, FMB, Region 3), JICA, DPWH-UPMO-RMC-I(B)	PCWFR	Online meeting	DENR (BMB, FMB, DENR R3), DPWH, JST
2020-09-19	Received and forwarded replies from PENRO and CENRO to JST	-	Email / phone call	PENRO, CENRO, JST
2020-09-23	Sent request for Barat Sub-Watershed Management Plan cover letter to CENRO Muñoz; Received PENRO reply (no. 4)	Barat Sub-Watershed Management Plan	Email / phone call	PENRO, CENRO, JST
2020-10-14	Received official FMB letter/replies (no. 13-19, 27)	-	Email / phone call	FMB, JST
2020-10-22	Received and forwarded PENRO/CENRO replies (no. 25-26) to JST	-	Email / phone call	PENRO, CENRO, JST
2020-10-26	Received FMB replies	-	Email / phone call	FMB, JST
2020-10-27	Received and forwarded PENRO replies (no. 31-34) to JST	-	Email / phone call	PENRO, JST
2020-10-29	Received and forwarded PENRO/CENRO replies (no. 32-34) to JST	-	Email / phone call	PENRO, CENRO, JST
2020-11-02	Received DPWH replies (no. 37)	-	Email / phone call	DPWH, JST
2020-11-10	PAMB Special Meeting	-	Face-to-face meeting	PCWFR PAMB, PENRO, CENRO, DPWH
2020-12-03	Received and forwarded PENRO/CENRO reply (no. 40) to JST	-	Email / phone call	PENRO, CENRO, JST
2020-12-09	Received and forwarded BMB-NPD and PENRO replies (no. 26a, 42)	-	Email / phone call	BMB-NPD, PENRO, JST
2020-12-14	Received DPWH replies (no. 39, 41) with attachments	-	Email / phone call	DPWH, JST
2020-12-16	Received and forwarded PENRO replies (no.39a) to JST	-	Email / phone call	PENRO, JST

DATE	ACTIVITY	TOPIC	MEDIUM	PARTIES INVOLVED
2021-01-14	Received FMP replies (no. 43)	-	Email / phone call	FMP, JST
2021-01-15	Received CENRO replies (no. 44-47)	-	Email / phone call	CENRO, JST
SOURCE: JICA Study Team				

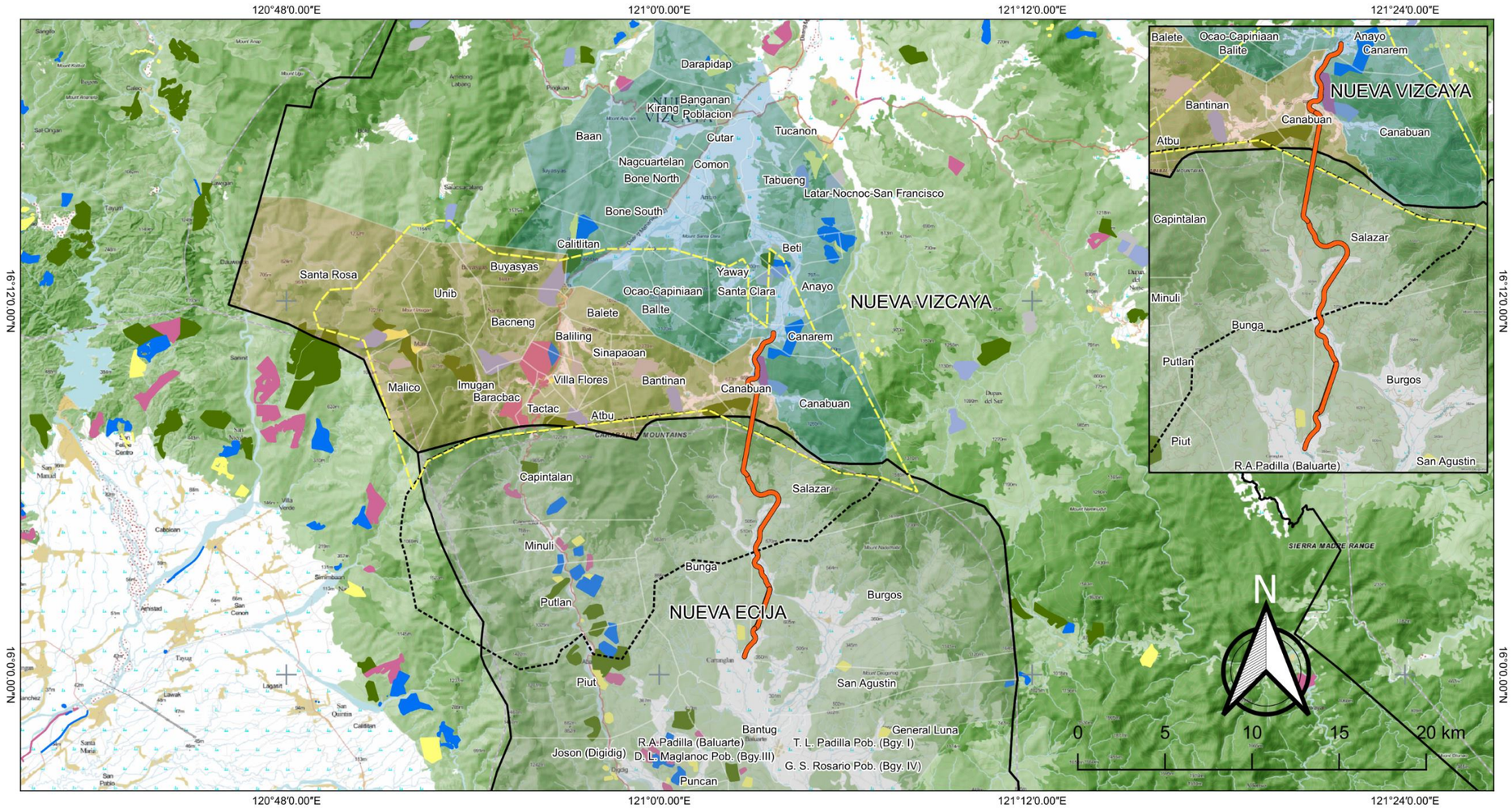
2.1.1.4 Impairment of visual aesthetics

[165]Site preparation will take place during the pre-construction phase. The construction of the tunnel may also have a temporary minimal impact on the visual aesthetics on site.

2.1.1.5 Devaluation of land as a result of improper solid waste management and other related impacts

[166]The solid waste generation will be limited to construction debris during the construction phase and domestic wastes during the operational phase. As a mitigation measure, a Solid Waste Management Plan will be strictly implemented based on the local disposal regulations and consistent with the Ecological Solid Waste Management Act of 2000 (Republic Act 9003). The proposed plan is discussed in Section 3: Environmental Management Plan of this document.

Figure 2-10: Ancestral Domains and National Greening Project Sites Relative to the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Forest Management Bureau

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Municipality of Carranglan

Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

National Greening Project Sites (Year)
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**ANCESTRAL DOMAINS AND NATIONAL GREENING PROJECT SITES RELATIVE TO THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

2.1.2 Geology/Geomorphology

Elevation/Topography

Municipality of Aritao

[167]The topography of Aritao is considered mountainous, in which it is dominated by the elevation category of 500 to 1,000 meters above sea level (masl) with a total area of 20,015.94 ha or 57.35% of its total land area. This is followed by elevation below 500 masl which covers 9,386.97 ha or 26.89% and the remaining 5,499.52 ha or 15.76% is situated above 1,000 masl. The project alignment will pass through areas with elevation above 1000 masl.

Municipality of Santa Fe

[168]The topography of Santa Fe is considered as an upland area, with elevations greater than 260 masl. Mt. Imugan, with an elevation of 1685 masl, is the highest peak of the municipality. A portion of the north tunnel and road will pass through areas with elevation above 1000 masl.

Municipality of Carranglan

[169]The topography of Carranglan is considered as level to gently level; rolling to moderately steep; and hilly to mountainous. The highest elevation is 1,705 masl located at Kasahingan sub-watershed. While the minimum elevation is 140 masl situated at Kasahingan and Talavera sub watersheds.

Slope

Municipality of Aritao

[170]The Municipality of Aritao is mostly composed of areas with slope class 30-50% (12,434.62 hectares) followed by 50% and above (10,979.96 hectares), 18-30% (5,122.35 hectares), 0-3% (4,822.93 hectares), 8-18% (1,190.60 hectares) and 3-8% (351.95 hectares). Barangays Canarem and Canabuan have level to rolling plains. The slope map is presented in **Figure 2-12**.

Municipality of Santa Fe

[171]Santa Fe is dominated of areas with slope ranging from 30-50%, which are described as steep and very steep area. These areas comprise a total of 24,776.52 ha or 61.97% the total land area. Barangay Canabuan has level to moderately sloping areas (0-18%), that spans 4,631.72 ha or 72.09% of its total land area.

Municipality of Carranglan

[172]Majority of the land in the Municipality of Carranglan has slopes ranging from 8-18%, which are described as undulating to rolling terrains. These areas cover 20,546.79 ha of the total land area. It is followed by steep areas (17,271.33 ha) and rolling to moderately steep terrains (14,685.11 ha). The proposed project is located in Barangays Burgos, Salazar and Bunga with slopes ranging from gently sloping to very steep areas.

[173]The slope, elevation and topography in the proposed project is summarized in **Table 2-10**.

Table 2-10: Slope, Elevation, and Topography in the Project Area

PROJECT ALIGNMENT	LOCATION	ELEVATION[a]/ TOPOGRAPHY/ SLOPE[b]
Road from KM 00 to South Tunnel	Bunga, Carranglan	Undulating to rolling (8 to 18%)
	Burgos, Carranglan	Undulating to rolling (8 to 18%)
South Tunnel	Burgos, Carranglan	Gently sloping to moderately steep (3 to 30%)
Road from South to North Tunnel	Burgos, Carranglan	Gently sloping to moderately steep (3 to 30%)
	Salazar, Carranglan	Undulating to steep (8 to 50%)
North Tunnel	Salazar, Carranglan	Steep to very steep (30% and above)
	Canabuan. Sta. Fe	Very steep (above 50%; elevation at 500 masl and above)
Road from North Tunnel to End	Canabuan, Sta. Fe	Rolling to moderately steep (18 to 30%; elevation at 1000 masl and above)
	Canabuan, Aritao	Gently sloping to rolling (3 to 18%; elevation at 1000 masl and above)
	Canarem, Aritao	Level to nearly level (0 to 3%; elevation at 1000 masl and above)

NOTE:
a Comprehensive Land Use Plans
b See **Figure 2-10**

Geology

[174]The Mines and Geo-sciences Bureau's geologic map of the Philippines is shown in **Figure 2-13**.

[175]Based on the geologic map, the geology widely distributed in the project area is the "Dupax Batholith" formed in the Paleogene Oligocene to Neogene Miocene. The covering layer is divided into Quaternary unconsolidated sediments (cliff cone sediments and colluvium sediments, alluvial sediments).

[176]The Dupax granodiorite-diorite complex distributed around the study area, formerly called "Dupax Batholith", is the product of the second magma intrusion period in the Carabalo Mountains, and is a product of granites, granodiorite, and diorite. It is mainly composed of diorite containing various quartz such as rocks.

[177]These bodies are a collection of diorites from Caravaro and quartz diorite from Northern Sheramadre Batholith. These rock bodies are named for their distribution from Burgos to Aritao and Nueva Vizcaya and are intrusive into the Caravaro Formation and other older formations.

[178]The JICA study team conducted a surface geological survey, and the summary of the geological strata in the survey area is shown in **Table 2-11**. In addition, the geology condition of the proposed alignment is presented in **Table 2-12.** While the geological map based on the geological conditions confirmed during the survey is presented in **Figure 2-14**.

Table 2-11: Summary of Geological Strata in the Project Area

GEOLOGIC AGE			GEOLOGIC NAME		DESCRIPTION
Cenozoic Era	Quaternary Period	Holocene	River Deposits		This terrain forms a flat or gentle slope along the river channel. It is composed of gravel (round to sub-round with boulders)
			Alluvial Plain Deposits		It is composed of a soft layer mainly of silt and clay. It forms a flat surface to gentle slope.
			Talus Deposits		It is composed of gravel mixed with sandy and cohesive soil supplied from the upper part. The size of the gravel is several tens of centimeters.
			Debris Flow Deposits		It is composed of grave mainly of sub-circular to sub-angle gravel with boulders. The topography of this area is steeper than the area where riverbed sediments are distributed.
			Alluvial Fan Deposits		It is composed of sub-circular to sub-angle gravel mixed with sandy or cohesive soil.
			Terrace Deposits		It is distributed on the left and right banks of the rivers. It is an old riverbed deposit and is composed of sub-circular to sub-angle gravel mixed with sandy or cohesive soil.
		Pleistocene	Old Debris Flow Deposits		It is widely distributed on the south side of the mountain ridge in the northern tunnel transition area. It is composed of gravel mixed with sandy and cohesive soil.
	Tertiary	Early Oligocene – Early Miocene	Dupax Diorite Complex	Dolerite	These rocks are widely distributed around the transition point of the mountain ridge and northern tunnel. It is an igneous rock composed of fine to medium grain minerals with dark green to black gray. Fresh rock is lumpy and hard, and is not easily weathered. Since some dew rocks have a flow structure, some rock bodies may be lava.
				Granodiorite-diorite Complex	These rocks are widely distributed along the planned route from the vicinity of the north tunnel entrance to the end point. It is composed of fully crystalline medium to fine-grained granodiorite or diorite containing colored minerals such as amphibole.
				Granodiorite-diorite Complex (With intrusive rocks of basic rocks)	These rocks are mainly distributed from the road origin side to the vicinity of the north entrance of the south tunnel. Intrusive rocks (dolerite) and xenoliths (diorite and gabbro) intervene this lithology. The area near the surface is affected by strong weathering, giving the appearance of sandy soil.

SOURCE: JICA Study Team

Table 2-12: Geologic Conditions of the Proposed Project Alignment

PROJECT ALIGNMENT	LOCATION	GEOLOGICAL CONDITION [a]
Road from KM 00 to South Tunnel	Bunga, Carranglan	Alluvial Plain Deposits
	Burgos, Carranglan	Alluvial Plain Deposits; Granodiorite-diorite Complex
South Tunnel	Burgos, Carranglan	Granodiorite-diorite Complex
Road from South to North Tunnel	Burgos, Carranglan	Talus Deposit; Debris Flow Deposits; Terrace Deposits; Granodiorite-diorite Complex
	Salazar, Carranglan	Talus Deposit; Granodiorite-diorite Complex
North Tunnel	Salazar, Carranglan	Dolerite; Granodiorite-diorite Complex
	Canabuan. Sta. Fe	Talus Deposit; Dolerite; Granodiorite-diorite Complex
Road from North Tunnel to End	Canabuan, Sta. Fe	Talus Deposit; Alluvial Fan Deposit; Granodiorite-diorite Complex
	Canabuan, Aritao	Talus Deposit
	Canarem, Aritao	Talus Deposit; Alluvial Fan Deposit

NOTE:
a Refer to **Table 2-9** and **Figure 2-12**

[180]In line with the geographical survey conducted by JICA Study Team, 68 boreholes were considered. 45 of which was for the bridge foundations since the proposed project passes through rivers and creeks. The geological conditions of the planned bridge foundation ground are presented in **Table 2-13**.

Table 2-13: Geological Conditions of the Planned Bridge Foundation

Bridge Number	Planned section STA.	+m	STA.	+m	Boring Hole Number	掘進長(m)	50<N Depth(m)	Rockbed Depth(m)	W.L. GL-(m)	Geological condition of the foundation ground
(South) Br-1	3	957	4	052	BV-BR-04	10.0	2.55	2.55	6.00	Since the recent collapsed area cannot be confirmed on the slope of the planned site, it seems to be generally stable. The foundation ground is a granodiorite-diorite complex. The weathering depth becomes deeper on the left bank slope. The reach depth of medium to hard rocks is 8 to 12 m on the left bank slope, 7 to 15 m on the right bank slope, and several meters on the riverbed. The thickness of unconsolidated sediments and strongly weathered rocks ("Masa") is about 2-8 m. The distribution depth of the groundwater level in the ground on the slope is about GL-4 to 6 m.
					BV-BR-05	12.0	2.55	2.55	—	
					BV-BR-06	10.0	7.55	7.55	4.00	
(North)	3	979	4	104	BV-BR-40	10.0	8.55	8.55	2.70	Since the recent collapsed area cannot be confirmed on the slope of the planned site, it seems to be generally stable. The foundation ground is a granodiorite-diorite complex. The weathering depth is about the same on the left and right bank slopes. The reach depth of medium to hard rocks is about 15 m on the left bank slope, about 18 m on the right bank slope, and about 4 m on the riverbed. The thickness of unconsolidated sediments and strongly weathered rocks ("Masa") is about 2-5 m. The distribution depth of the groundwater level in the ground on the slope is about GL-2 to 9 m.
					BV-BR-41	10.0	2.00	2.00	8.68	
					BV-BR-42	10.0	7.05	7.05	1.20	
(South)	4	615	4	830	BV-BR-07	10.0	5.55	5.55	7.14	In addition to the current riverbed gravel, old debris flow deposits and alluvial fan deposits are widely distributed around the riverbed (maximum thickness of about 8 m). The slopes of the left and right banks are gentle, and no significant collapsed areas are observed. The foundation ground is a granodiorite-diorite complex. The thickness of unconsolidated sediments and strong weathered rocks ("Masa") is about 5 to 10 m on the left bank slope and about 3 to 10 m on the right bank slope. The reach depth of medium to hard rocks is about 8 to 20 m on the left and right bank slopes and about 8 to 10 m on the riverbed. The distribution depth of the groundwater level is about GL-5 to 7 m.
Br-2					BV-BR-08	10.0	4.50	8.50	5.35	
(North)	4	590	4	845	BV-BR-09	10.0	3.55	—	5.00	
(South)	6	336	6	792	BV-BR-10	13.0	10.05	10.05	2.17	It is a planned bridge that crosses the main stream of the Barak River. The current riverbed gravel is distributed in the main stream of the river (layer thickness is about 3 m). Terrace deposits are widely distributed on both the left and right banks. The foundation ground is a granodiorite-diorite complex. The thickness of unconsolidated sediments and strong weathered rocks ("Masa") is about 3 to 10 m on the left bank slope and about 3 to 14 m on the right bank slope. The reach depth of medium to hard rocks is about 10 to 15 m on the left and right bank slopes and about 3 m on the riverbed. The distribution depth of the groundwater level is about GL-0.8 to 6m.
					BV-BR-11	10.0	3.00	3.00	2.60	
Br-3					BV-BR-12	10.0	3.00		0.80	
					BV-BR-13	16.0	13.50	13.50	—	
(North)	6	311	6	802	BV-BR-43	12.0	8.55	8.55	6.05	
(South)	9	736	9	911	BV-BR-13A	12.0	9.55	9.55	3.68	It is a planned bridge that crosses a tributary of the left bank of the Barak River. In addition to the current riverbed gravel, debris flow deposits are widely and thickly distributed around the riverbed (maximum thickness is about 9 m). A lot of boulders are scattered. Sediments of talus and old collapse deposits are distributed on the left and right banks (thickness is about 10 to 12 m). No medium to hard rocks have been confirmed in boring in this area (depth is 12 to 15 m or deeper). The distribution depth of the groundwater level is about GL-1.5-3.7m.
Br-4					BV-BR-13B	12.0	8.05	8.05	1.52	
(North)	9	741	9	911	BV-BR-13C	15.0	11.50	11.50	1.91	
(South)	10	515.5	11	167	BV-BR-14	10.0	7.50	7.50	4.60	It is a planned bridge that crosses the main stream of the tributary on the left bank of the Barak River. In addition to the current riverbed gravel, old debris flow deposits are widely and thickly distributed around the riverbed (maximum thickness is about 10 m). A lot of boulders are scattered. Old debris flow deposits are supplied from the main river and tributaries, and are distributed widely along both banks of the current riverbed. Alluvial fan deposits are distributed on the left bank and form a gently sloping surface (maximum thickness is about 15 m). The foundation ground is a granodiorite-diorite complex. The thickness of unconsolidated sediments and strong weathered rocks ("Masa") is about 6 to 14 m on the left bank slope and about 7 to 10 m on the right bank slope. Medium-hard rocks to hard rocks are confirmed at a depth of 4 to 9 m in riverbed boring, but not confirmed on the left and right bank slopes. The distribution depth of the groundwater level is about GL-2 to 9 m.
					BV-BR-15	17.0	14.50	14.50	9.00	
					BV-BR-16	10.0	2.00	10<	6.00	
					BV-BR-17	12.0	4.90	4.90	5.00	
Br-5					BV-BR-18	10.0	4.00	9.00	6.00	
					BV-BR-19	10.0	0.00	6.00	1.87	
					BV-BR-20	10.0	3.00	8.00	3.43	
(North)	10	517	11	187	BV-BR-21	10.0	7.50	7.50	2.71	
	11	620	11	681	BV-BR-22	10.0	5.50	10<	3.18	It is a planned bridge that crosses a tributary of the left bank of the Barak River. The current riverbed gravel, debris flow deposits, and old collapse deposits are widely and thickly distributed around the riverbed (maximum thickness is 15 m or more). Boulders of Φ3m size are scattered.Immediately downstream, fallen trees (tree diameter 1 to 1.5 m) cross the river. The rock landing depth is unconfirmed. The distribution depth of the groundwater level is about GL-3 to 5 m.
Br-6	11	622	11	683	BV-BR-23	10.0	2.50	15<	4.50	
(South)	13	493	13	594.5	BV-BR-24	15.0	11.50	11.50	7.35	Since the recent collapsed area cannot be confirmed on the slope of the planned site, it seems to be generally stable. On the left bank slope, talus deposits are thickly distributed (maximum thickness is about 12 m). On the other hand, on the slope on the right bank side, the covering layer is thin, and rock mass is observed at a depth of 2 m or deeper. The current riverbed gravel and old debris flow deposits are thickly distributed around the riverbed (maximum thickness is 10 m or more). Boulders with a size of Φ1 to 3m are scattered. The foundation ground is a granodiorite-diorite complex. The reach depth of medium to hard rocks on the slope is unconfirmed, but it is estimated to be 15 m or deeper on the left bank slope and about 10 m on the right bank slope depending on the conditions of dew rocks. It is deeper than 10m in the riverbed. The distribution depth of the groundwater level is about GL-6 to 8 m.
Br-7					BV-BR-25	10.0	2.50	2.50	6.25	
	13	506	13	596	BV-BR-44	10.0	7.55	7.55	8.35	
(North)					BV-BR-45	10.0	2.00	10<	7.55	
(South)	18	410	18	644	BV-BR-26	10.0	2.65	2.65	3.49	Since the recent collapsed area cannot be confirmed on the slope of the planned site, it seems to be generally stable. The foundation ground is a granodiorite-diorite complex. The talus deposits are distributed on both banks of the slope, but the thickness is thin (thickness is about 3 to 5 m). The strong weathered rock corresponding to "Masa" has a layer thickness of about 3 to 5 m on the southern survey line, but tends to be as thick as a maximum layer thickness of about 10 m on the slope on the starting point side of the northern survey line. The slopes on the end point side are steep on both survey lines, and the maximum thickness of talus deposits and strong weathered rocks corresponding to "Masa" is about 5 m. Strongly weathered rocks corresponding to "Masa" generally show a value of N <50, and appear to have the appearance of "sandy soil". The distribution depth of the groundwater level is about GL-2 to 5 m, but it is about GL-7 m on the slope on the starting point side of the northern survey line.
					BV-BR-28	10.0	4.50	4.50	2.37	
Br-8					BV-BR-46	10.0	8.55	0.00	7.09	
(North)			18	655	BV-BR-27	10.0	8.55	0.00	4.58	

Bridge Number	Planned section				Boring Hole		50<N Depth(m)	Rockbed Depth(m)	W.L. GL-(m)	Geological condition of the foundation ground
	STA.	+m	STA.	+m	Number	掘進長(m)				
(South)	18	760	18	970	BV-BR-29	15.0	10.40	10.40	1.81	Around the riverbed, alluvial fan deposits caused by the current riverbed gravel and old debris flow are widely and thickly distributed (thickness is about 7 to 12 m). The slopes of the left and right banks are gentle, and no significant collapsed areas are observed. The foundation ground is a granodiorite-diorite complex. The maximum thickness of unconsolidated sediments and strong weathered rocks ("Masa") is about 10 m on the right bank slope and about 2 to 3 m on the left bank slope. The reach depth of medium-hard rock to hard rock is about 2 to 15 m on the left bank slope and about 14 m on the right bank slope. The distribution depth of the groundwater level is about GL-1 to 3 m.
Br-9					BV-BR-30	15.0	0.00	0.00	1.08	
(North)	18	740	18	980	BV-BR-31	18.0	7.00	7.00	2.85	
(South)	19	364	19	991	BV-BR-35	16.0	13.00	13.50	2.90	It is a planned bridge that crosses the main stream of the Matang River. The current riverbed gravel (thickness is about 4 m) and debris flow deposits (thickness is about 7 m) are distributed in the main stream of the river. Terrace deposits (thickness of about 5 to 11 m) are widely distributed on the left bank side from gentle slopes to flat surfaces, and are covered with alluvial fan deposits and old debris flow deposits spreading at the end of the tributary. On the other hand, on the right bank side, talus deposits are distributed on a gentle slope. The foundation ground is granodiorite-diorite complex and diorite. The strata corresponding to strong weathered rocks ("Masa") are not thick according to the boring log. The reach depth of medium to hard rocks is about 6 to 7 m in the riverbed, but it has not been confirmed in the left and right bank slopes. The distribution depth of the groundwater level is about GL-3 to 6 m on the left and right slopes of shou, and GL-1 to 2 m on the riverbed.
					BV-BR-47	15.0	11.55	11.55	5.85	
					BV-BR-36	11.0	8.55	8.55	0.11	
Br-10					BV-BR-37	20.0	7.00	7.00	0.29	
					BV-BR-38	20.0	6.20	6.20	2.04	
(North)	19	364	19	975	BV-BR-39	15.0	7.05	7.05	3.97	
					BV-BR-48	10.0	8.55	8.55	6.15	

SOURCE: JICA Study Team

[181]The JICA study team also determined the soil and bedrock conditions in the tunnel sections. **Figure 2-15** shows the vertical cross-sectional view of the south tunnel's geology. The rocks that make up the ground in the tunnel section are granodiorite and diorite, which belong to the granodiorite-diorite complex. This complex often intervenes basic rock intrusive rocks such as gabbro and dolerite.

[182]Meanwhile, **Figure 2-16** presents the vertical cross-sectional view of the north tunnel. The geology of the tunnel section is granodiorite, diorite, and dolerite, which belong to then granodiorite-diorite complex. The distribution of dolerite (Dol) was estimated in the section with large overburden in the center of the ground. Since the distribution of alteration zones and crack zones is assumed at the boundary between this rock body and the granodiorite-diorite complex, a bedrock deterioration zone was set in this section.

[183]Around the north wellhead, the covering layer such as talus deposits is not thickly distributed. The granodiorite to diorite that composes the ground has been strongly weathered to a depth of about 10 m.

[184]This is supported by **Table 2-14** and **Table 2-15**, which summarizes the geology, bedrock conditions and ground risk factors in the transitional sections of the north and south tunnels, respectively.

Table 2-14: Summary Table of Geological and Rock Properties (North Tunnel)

North Tunnel(Southbound)

STA.		STA.		Geological and Ground Risk Factors							Geology and Bedrock Conditions	Elastic Wave Exploration / PS logging		Electrical Exploration(Specific Resistance Value) (Ω・m)	Uniaxial Compressive Strength (Mpa)
STA.	+ m	STA.	+ m	Unconsol-idated deposits	Rock Deterioration and Rock Separation Surface: Weath-ering	Slack	Crack	Shear zone	Unbalanced Pressure: Alteration	Sudden Spring Water		Vp(km/sec)	Vs(km/sec)		
13	754	13	772	○							Topsoil and talus deposits	＜1.0	—	＜5	
13	772	13	872		○	○	△				Strongly weathered bedrock (“Masa”), granodiorite～diorite	1.8～2.0	—	5～129.06	
13	872	13	972		△	△	○				Weakly weathered bedrock (with cracks), granodiorite～diorite	2.0～2.5	—	129.06～290.99	
13	972	14	122			△	○				Massive / cracked bedrock, granodiorite～diorite	2.3～3.2	1.4～1.7	129.06～416.96	
14	122	14	162				○	○	○	○	Faults and fracture zones (estimated) are accompanied by alteration zones. It was estimated based on the results of electrical exploration and the outcrop conditions in the surrounding area.	(1.5～2.5)	—	483.3⇒83.44	
14	162	14	522						△		Massive / hard bedrock, granodiorite～diorite (with intrusive rocks of basic rocks)	(3.8＜)	—	3,716.52＜	
14	522	14	542				○		△	(△)	Fissure rock, granodiorite-diorite and dolerite lithological boundary (estimated)	(2.0～2.5)	—	(129.06～416.96)	
14	542	16	357								Massive / hard rock, dolerite (estimated)	(3.7＜)	—	3,716.52＜	
16	357	16	377				○		△	(△)	Fissure rock, granodiorite-diorite and dolerite lithological boundary (estimated)	(2.0～2.5)	—	(129.06～416.96)	
16	377	18	92				△		△		Generally good bedrock (with cracks), granodiorite～diorite (with basic rock intrusive rocks)	(3.8＜)	—	923.41～3,716.52	BV-TNN-NA2
18	92	18	162				○				Massive / cracked bedrock, granodiorite～diorite	(2.5～3.2)	—	138.51～354.17	35-65
18	162	18	207		△	△	○				Weakly weathered bedrock (with cracks), granodiorite～diorite	2.0～2.5	—	10～138.51	
18	207	18	208	△	○	○	△				Strongly weathered bedrock (“Masa”), granodiorite～diorite	1.8～2.0	—	＜10	

Estimated value in ( )

STA.		STA.		Geological and Ground Risk Factors							Geology and Bedrock Conditions	Elastic Wave Exploration / PS logging		Electrical Exploration(Specific Resistance Value) (Ω・m)	Uniaxial Compressive Strength (Mpa)
STA.	+ m	STA.	+ m	Unconsol-idated deposits	Rock Deterioration and Rock Separation Surface: Weath-ering	Slack	Crack	Shear zone	Unbalanced Pressure: Alteration	Sudden Spring Water		Vp(km/sec)	Vs(km/sec)		
13	732	13	750	○							Topsoil and talus deposits	＜1.0	—	＜5	
13	750	13	850		○	○	△				Strongly weathered bedrock (“Masa”), granodiorite～diorite	1.8～2.0	—	5～129.06	
13	850	13	950		△	△	○				Weakly weathered bedrock (with cracks), granodiorite～diorite	2.0～2.5	—	129.06～290.99	
13	950	14	100			△	○				Massive / cracked bedrock, granodiorite～diorite	2.3～3.2	1.4～1.7	129.06～416.96	
14	100	14	140				○	○	○	○	Faults and fracture zones (estimated) are accompanied by alteration zones. It was estimated based on the results of electrical exploration and the outcrop conditions in the surrounding area.	(1.5～2.5)	—	483.3⇒83.44	
14	140	14	500						△		Massive / hard bedrock, granodiorite～diorite (with intrusive rocks of basic rocks)	(3.8＜)	—	3,716.52＜	
14	500	14	520				○		△	(△)	Fissure rock, granodiorite-diorite and dolerite lithological boundary (estimated)	(2.0～2.5)	—	(129.06～416.96)	
14	520	16	335								Massive / hard rock, dolerite (estimated)	(3.7＜)	—	3,716.52＜	
16	335	16	355				○		△	(△)	Fissure rock, granodiorite-diorite and dolerite lithological boundary (estimated)	(2.0～2.5)	—	(129.06～416.96)	
16	355	18	070				△		△		Generally good bedrock (with cracks), granodiorite～diorite (with basic rock intrusive rocks)	(3.8＜)	—	923.41～3,716.52	BV-TNN-NA2
18	070	18	140				○				Massive / cracked bedrock, granodiorite～diorite	(2.5～3.2)	—	138.51～354.17	35-65
18	140	18	185		△	△	○				Weakly weathered bedrock (with cracks), granodiorite～diorite	2.0～2.5	—	10～138.51	
18	185	18	248	△	○	○	△				Strongly weathered bedrock (“Masa”), granodiorite～diorite	1.8～2.0	—	＜10	

Table 2-15: Summary Table of Geological and Rock Properties (South Tunnel)

South Tunnel(Southbound)

STA.		STA.		Geological and Ground Risk Factors							Geology and Bedrock Conditions	Elastic Wave Exploration / PS logging		Electrical Exploration(Specific Resistance Value) (Ω·m)	Uniaxial Compressive Strength (Mpa)
STA.	+ m	STA.	+ m	Unconsol-idated deposits	Rock Deterioration and Rock Separation Surface: Weath-ering	Slack	Crack	Shear zone	Unbalanced Pressure: Alteration	Sudden Spring Water		Vp(km/sec)	Vs(km/sec)		
2	327	2	396		○	○	○				Loose bedrock, loosening along high-angle cracks, granodiorite～diorite (with basic rock intrusive rocks)	3.3～3.7	—	＜265.26	BV-TNS-S1
2	396	2	416				○			(△)	High-angle fissure rock (estimated), granodiorite～diorite (with basic rock intrusive rocks)	2.3～2.5	—	183.63～335.94	50-85
2	416	2	486				△				Good bedrock (with cracks), granodiorite～diorite (with basic rock intrusive rocks)	3.3～3.7	—	265.26～934.15	75-85
2	486	2	611								Massive / hard bedrock, granodiorite～diorite (with intrusive rocks of basic rocks)	3.8＜	—	934.15～2,406.85	BV-TNS-S3
2	611	2	641				○			(△)	High-angle fissure rock (estimated), granodiorite～diorite (with basic rock intrusive rocks)	(3.3～3.7)	—	(265.26～934.15)	
2	641	2	731				△				Generally good bedrock (with cracks), granodiorite～diorite (with basic rock intrusive rocks)	(3.8＜)	—	(934.15～2,406.85)	
2	731	2	786				○			(△)	High-angle fissure rock (estimated), granodiorite～diorite (with basic rock intrusive rocks)	(3.3～3.7)	—	(183.63～335.94)	
2	786	3	431								Massive / hard bedrock, granodiorite～diorite (with intrusive rocks of basic rocks)	(3.8＜)	—	(934.15～2,406.85)	
3	431	3	451				○			(△)	High-angle fissure rock (estimated), granodiorite～diorite (with basic rock intrusive rocks)	(3.3～3.7)	—	(265.26～934.15)	BV-TNS-N1
3	451	3	758								Massive / hard bedrock, granodiorite～diorite (with intrusive rocks of basic rocks)	(3.5～5.1)	(1.8～1.9)	(2,406.85＜)	60-70
3	758	3	864								Massive / hard bedrock, granodiorite～diorite (with intrusive rocks of basic rocks)	3.8＜	—	934.15～2,406.85	
3	864	3	876				△				Generally good bedrock (with cracks), granodiorite～diorite (with basic rock intrusive rocks)	3.3～3.7	—	265.26～934.15	BV-TNS-N2
3	876	3	891				○			(△)	High-angle fissure rock (estimated), granodiorite～diorite (with basic rock intrusive rocks)	2.3～2.5	—	183.63～290.99	32-82
3	891	3	909		○	○	△				Strongly weathered bedrock ("Masa"), granodiorite～diorite (with intrusive rocks of basic rocks)	1.3～2.0		5～183.63	
3	909	3	932	○							Topsoil and talus deposits	＜1.0	—	＜5	

South Tunnel(Northbound)

STA.		STA.		Geological and Ground Risk Factors							Geology and Bedrock Conditions	Elastic Wave Exploration / PS logging		Electrical Exploration(Specific Resistance Value) (Ω·m)	Uniaxial Compressive Strength (Mpa)
STA.	+ m	STA.	+ m	Unconsol-idated deposits	Rock Deterioration and Rock Separation Surface: Weath-ering	Slack	Crack	Shear zone	Unbalanced Pressure: Alteration	Sudden Spring Water		Vp(km/sec)	Vs(km/sec)		
2	362	2	410		○	○	○				Loose bedrock, loosening along high-angle cracks, granodiorite～diorite (with basic rock intrusive rocks)	3.3～3.7	—	＜265.26	BV-TNS-S1
2	410	2	430				○			(△)	High-angle fissure rock (estimated), granodiorite～diorite (with basic rock intrusive rocks)	2.3～2.5	—	183.63～335.94	50-85
2	430	2	500				△				Good bedrock (with cracks), granodiorite～diorite (with basic rock intrusive rocks)	3.3～3.7	—	265.26～934.15	75-85
2	500	2	625								Massive / hard bedrock, granodiorite～diorite (with intrusive rocks of basic rocks)	3.8＜	—	934.15～2,406.85	BV-TNS-S3
2	625	2	655				○			(△)	High-angle fissure rock (estimated), granodiorite～diorite (with basic rock intrusive rocks)	(3.3～3.7)	—	(265.26～934.15)	
2	655	2	745				△				Generally good bedrock (with cracks), granodiorite～diorite (with basic rock intrusive rocks)	(3.8＜)	—	(934.15～2,406.85)	
2	745	2	800				○			(△)	High-angle fissure rock (estimated), granodiorite～diorite (with basic rock intrusive rocks)	(3.3～3.7)	—	(183.63～335.94)	
2	800	3	445								Massive / hard bedrock, granodiorite～diorite (with intrusive rocks of basic rocks)	(3.8＜)	—	(934.15～2,406.85)	
3	445	3	465				○			(△)	High-angle fissure rock (estimated), granodiorite～diorite (with basic rock intrusive rocks)	(3.3～3.7)	—	(265.26～934.15)	BV-TNS-N1
3	465	3	772								Massive / hard bedrock, granodiorite～diorite (with intrusive rocks of basic rocks)	(3.5～5.1)	(1.8～1.9)	(2,406.85＜)	60-70
3	772	3	878								Massive / hard bedrock, granodiorite～diorite (with intrusive rocks of basic rocks)	3.8＜	—	934.15～2,406.85	
3	878	3	890				△				Generally good bedrock (with cracks), granodiorite～diorite (with basic rock intrusive rocks)	3.3～3.7	—	265.26～934.15	BV-TNS-N2
3	890	3	905				○			(△)	High-angle fissure rock (estimated), granodiorite～diorite (with basic rock intrusive rocks)	2.3～2.5	—	183.63～290.99	32-82
3	905	3	923		○	○	△				Strongly weathered bedrock ("Masa"), granodiorite～diorite (with intrusive rocks of basic rocks)	1.3～2.0	—	5～183.63	
3	923	3	936	○							Topsoil and talus deposits	＜1.0	—	＜5	

[185]**Mineral Land (Mining Sites). Figure 2-17** presents the mining areas mapped by the Mines and Geosciences Bureau (MGB). The proposed project is not within any known mineral land. The nearest mineral lands are found 30 to 40 kms. away from the project alignment. The presence of minerals may be found on the tunnel sections; however, they may not be economically feasible for mining application.

[186]**Tectonic Setting.** The Island of Luzon is bounded by two oppositely dipping subduction zones namely: the Manila Trench to the west and the Philippine Trench-East Luzon Trough to the east. The Manila Trench is the morphological expression of the westward subduction of the South China Sea marginal basin beneath the Philippine Mobile Belt (Barrier *et al*., 1991). The Philippine Trench-East Luzon Trough, on the other hand, represents the westward oblique subduction of Eocene Philippine Sea Plate (Cardwell *et al*., 1980). Convergence of the Philippine Mobile Belt and the surrounding blocks is associated with seismicity and formation of volcanic chains in the region (Daligdig and Besana, 1993).

[187]The Philippine Fault is a major contributor to the deformation of the Philippine Mobile Belt. The movement of the Philippine Fault System is considered to be left-lateral. The Philippine Fault extends more than 1,200 kilometers, transecting the Philippine archipelago from Luzon to Eastern Mindanao. Its age of initiation is still controversial, although extensive studies by Aurelio *et al*, 1990 on the Philippine Fault, particularly in Luzon and Visayas indicate that fault activity began during the Pliocene. The trace of the Philippine fault is defined by young geomorphic features including fault scarps, sinistral stream offsets, fault parallel ridges and narrow elongate troughs.

[188]The Province of Nueva Vizcaya has two major fault zones with distributed minor fault lines while others are inferred from deduced photographs. One of the major fault lines in the province is the Digdig Fault located west-northwest of the Municipality of Aritao cutting across the Municipality of Sta. Fe and moving towards Kayapa and Itogon, Benguet.

[189]The Municipality of Carranglan is transected by the Philippine Fault in the western part of the municipality. The Philippine Fault transects Barangays Capintalan, Minuli, Putlan, Piut, Joson and Puncan.

[190]**Historical Earthquakes. Table 2-16** shows the destructive earthquakes recorded in Luzon. The nearest destructive earthquake event from the project alignment is the Luzon Earthquake which occurred last July 16, 1990. The Luzon Earthquake with magnitude 7.8 created a 125 km-long ground rupture as a result of strike-slip movements along the NW segment of the Philippine Fault Zone and its splay, the Digdig Fault.

Table 2-16: Destructive Earthquakes in Luzon

EARTHQUAKE EVENT	YEAR	EPICENTER LOCATION		MAGNITUDE
		Latitude	Longitude	
Itbayat, Batanes Earthquake	2019	20° 48' 00.00" N	122° 00' 00.00" E	5.9
Central Luzon Earthquake	2019	15° 05' 59.99" N	120° 17' 59.99" E	6.1
Masbate Earthquake	2003	12° 12' 00.00" N	123° 47' 59.99" E	6.2
Luzon Earthquake	1990	15° 42' 00.00" N	121° 06' 59.76" E	7.8
Laoag Earthquake	1983	18° 13' 51.60" N	120° 51' 35.99" E	7.3
Ragay Gulf Earthquake	1973	13° 24' 36.00" N	122° 52' 12.00" E	7.3
Source: PHIVOLCS				

[191]**Historical Landslides.** Due to the geographic and geotectonic setting of the country, it is prone to various natural hazards such as earthquakes, volcanic eruptions, and typhoons.

[192]These natural hazards are considered as the major triggers of landslides, particularly in the mountainous terrains of the country. Some of the landslide events recorded in Luzon in the past two decades are summarized in **Table 2-17**.

Table 2-17: Historical Landslides in Luzon

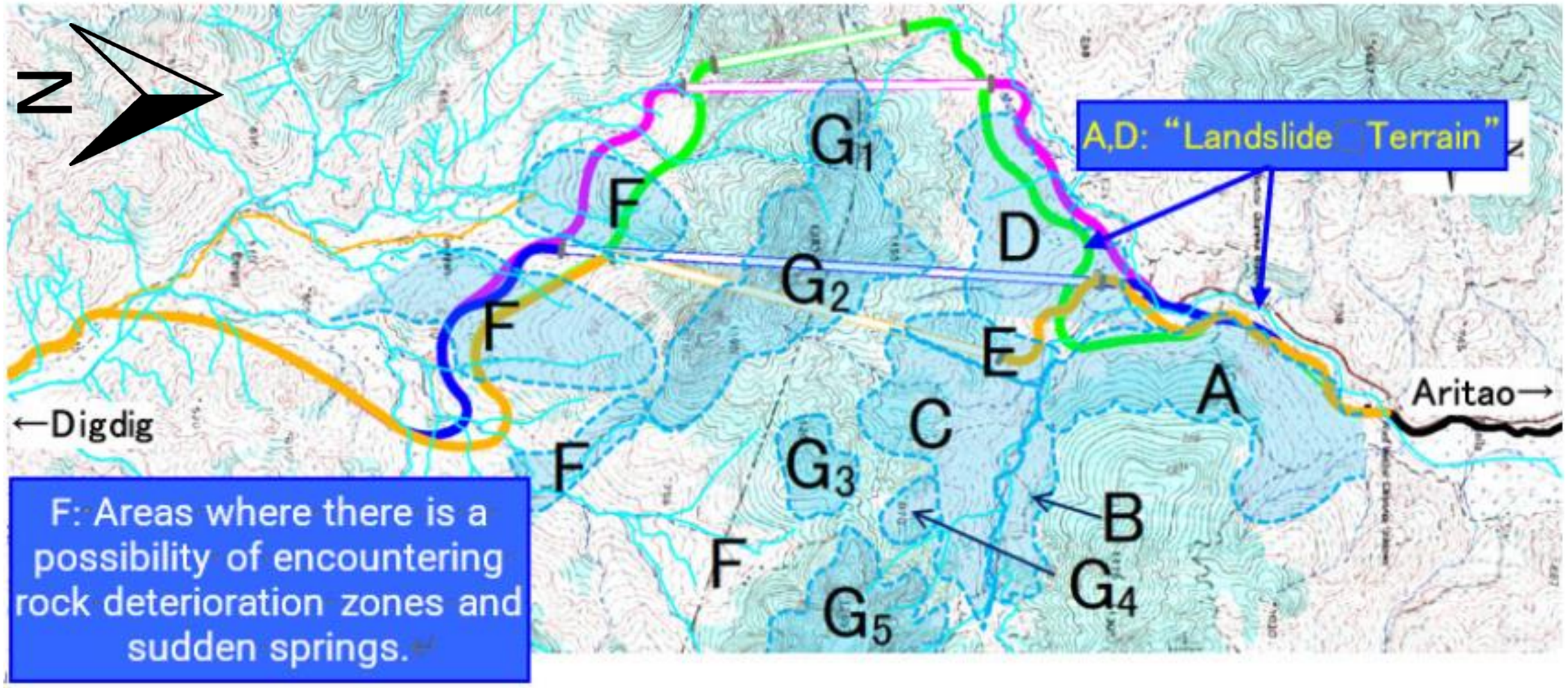
LANDSLIDE EVENT	DATE	CASUALTY
Itogon, Benguet	September 2018	~58 people
Cordillera	October 2009	~492 people, 47 people went missing due to Typhoon Pepeng
SOURCE: PHIVOLCS		

[193]The Cordillera landslide in Baguio City and Benguet Province is adjacent to the project area in northern Luzon. Considering this landslide and the geologic conditions from the results of the survey, the following portion of the alignment (ALT-D) is most likely susceptible to landslides as shown in **Table 2-18**. While **Figure 2-11** illustrates the portion of the proposed alignment.

Table 2-18: Geological Conditions in the Proposed Project Alignment

LEGEND	GEOLOGIC CONDITIONS
A	Granodiorite-diorite complex and dolerite distribution area. There is a high possibility of "collapsed terrain" or "landslide terrain" at the old age. It is a slope with thick distribution of colluvium and talus deposits, and the distribution of swamps is small (the stability of the ground is poor, and it is difficult to remain as swamp topography). At present, it is generally stable.
B	Granodiorite-diorite complex distribution area, slopes of talus deposits and strong weathered rocks. Since a small mountain stream can be confirmed, the slope is generally stable. In the strong weather zone, hard granite blocks are included in the soiled soft rocks.
C	It is a slope of talus deposits and strong weathered (massified) rocks in the granodiorite diorite complex distribution area. Since a small mountain stream can be confirmed, the slope is generally stable. In the strong weather zone, hard granite blocks are included in the soiled soft rocks.
D	It is a granodiorite-diorite complex distribution area and is likely to be a landslide topography. It is a slope with thick distribution of colluvium and talus deposits, and the distribution of small mountain streams is small (the stability of the ground is poor, and it is difficult to form small mountain streams).
E	It is a granodiorite-diorite complex distribution area, and although talus deposits can be seen below the ridge, it is stable as a ground.
F	It is a gentle terrain that extends to the lower part of the mountaintop area (G area) surrounded by steep slopes. It is composed of boulder mixed with sandy soil and cohesive soil supplied from the upper part of the hillside slope. It is a large-scale collapse deposit that occurred during the old geological age (Pleistocene). The granodiorite-diorite complex is unconformably covered. The terrain is generally stable at present.
G1-5	The mountain ridge area is composed of "dorerite" and "granodiorite-diorite complex". The hillside slope has a steep slope, and generally hard rock is distributed.
SOURCE: JICA Study Team	

Figure 2-11: Geologic Conditions of the Project Site



PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**GEOLOGIC CONDITIONS OF THE PROJECT SITE**	JICA Study Team.	LCI ENVI CORPORATION

[194] **Geologic Hazards.** Georisk Philippines' HazardHunterPH was used for the assessment of geologic hazards. **Table 2-19** shows the geologic hazards for the proposed project.

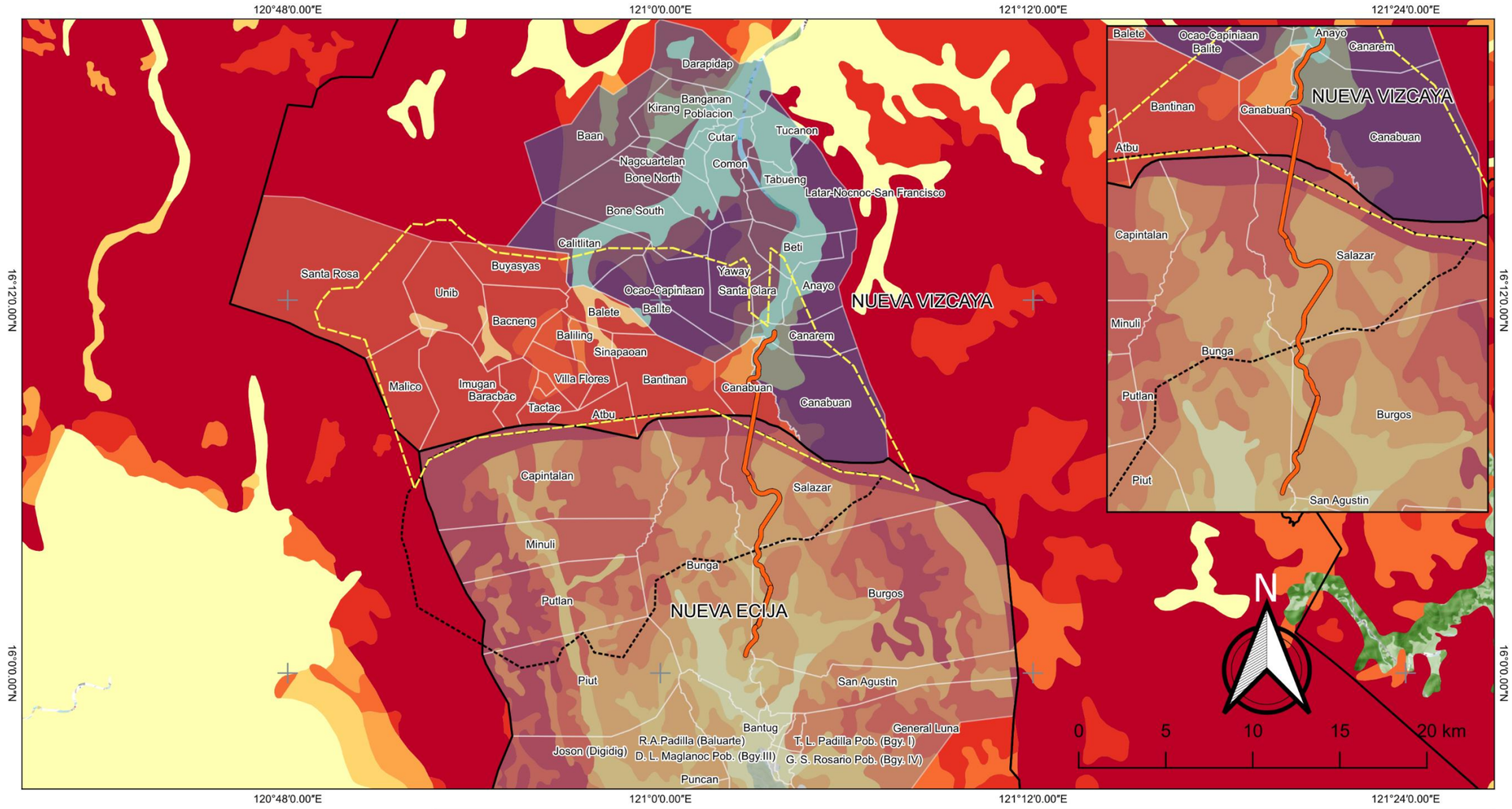
Table 2-19: Summary of Geologic Hazards

GEOLOGIC HAZARD	DESCRIPTION	FINDINGS (PROJECT LOCATION)	REMARKS/ MITIGATING MEASURES
Earthquake	An earthquake, as defined by the United States Geologic Survey (USGS), is used to describe both sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth. As seen in **Figure 2-13**, the closest fault, the Philippine Fault system, approximately 11 kilometers west of the proposed project site. Further, the project site is susceptible to Philippine Earthquake Intensity Scale (PEIS) VIII – characterized as very destructive to devastating groundshaking.	▪ The project location is approximately 11 km east of the Philippine Fault System. ▪ The project location is susceptible to earthquake.	▪ Incorporation of seismic design criteria in the detailed engineering designs based on structural codes particularly on the tunnel structures, and equipment installations. ▪ Implement standard design and procedures during construction as stated in the Building Code.
Liquefaction	The typical soil that is susceptible to liquefaction is loose sand located near the surface and with shallow groundwater table. During an earthquake, ground shaking causes loosely consolidated sand deposits to contract resulting in an increase in pore water pressure and reduced grain to grain effective stress (Seed, 1970). This causes loss of soil bearing capacity and makes the soil behave like fluid. In the process, there is an upward flow of water to the ground surface where it emerges in the form of mud spouts or sand boils. Liquefaction is usually accompanied by differential settlement and lateral spreading because of withdrawal of materials beneath the ground surface. Areas where liquefaction is likely to occur include riverbeds, old or abandoned riverbeds and meanders, swamps, and back swamps. Alluvial plains, pyroclastic plains, and coastal plains with shallow groundwater and with silty to sandy soils are also possible sites for liquefaction. Based on the northern and southern portion of proposed project location has potential susceptible to liquefaction.	▪ The entry and exit roads of the proposed alignment are susceptible to liquefaction.	▪ Incorporation of soil investigation results in the detailed engineering design.
Landslide	Landslide is the general term for readily perceptible mass movements, slow or rapid. It includes, rockslide, rock fall, mudflow, slump, debris avalanche and many others.	▪ The project location has varying susceptibility to earthquake-induced landslide.	▪ Incorporation of seismic hazards in the detailed engineering design. ▪ Application of excavation techniques

GEOLOGIC HAZARD	DESCRIPTION	FINDINGS (PROJECT LOCATION)	REMARKS/ MITIGATING MEASURES
	Areas with high risk of landslide are those with steep slopes, high precipitation, highly fractured rocks (sheared zone), scarce vegetation and location close to active faults. Based on **Figure 2-19 and Figure 2-20,** the project site is susceptible to earth-induced and rain-induced landslides.	▪ Portion of the north tunnel and the exit road in Brgys. Canabuan and Canarem have high susceptibility to rain-induced landslide.	giving few or no impacts on landslide and surface conditions. ▪ Possible construction of protection structures (i.e., embankments, barrier walls) ▪ Removal of unstable soil during site development.
Volcanic Events	Volcanic hazards from volcanic activity and eruption include lava flow, debris flow, pyroclastic flow, debris avalanche, lahar, bombs and ballistics projectiles, ash fall, volcanic gases emission, flooding, and volcanic quakes. This may cause health problems since ash fall may contaminate water sources and cause respiratory illnesses. Active volcanoes are defined by PHIVOLCS as volcanoes having erupted within historical times (last 600 years), accounts of these eruptions were documented. The Philippines, based on the latest PHIVOLCS data, has 23 active volcanoes. The most active volcanoes considered by PHIVOLCS are: Mayon, Taal, Bulusan, Canlaon and Hibok-Hibok. The project site is not located near any active, potentially active, and non-active volcanoes as seen in **Figure 2-21**.	▪ The project location is not susceptible to any volcanic events.	N/A
Tsunami	Tsunamis occur when a large volume of water is displaced due to a seismic activity, volcanic eruption or other large water explosion or collision. This materializes as a series of tidal waves, which may occur for extended periods of time, with longer wavelengths. The project sites are not prone to tsunami since locations are not near coastal areas as presented in **Figure 2-22**.	▪ The project location is not prone to tsunami.	N/A
Flooding	Flooding in the country is often caused by prolonged rain. As such, the majority of the flood occurrences are then associated with tropical cyclones or monsoon rains. In addition to this, anthropogenic activities such as accumulation of improperly disposed solid wastes, poor flood dynamics in public facilities and infrastructures, illegal or extreme logging without reforestation and inadequate	▪ The southern portion of the project alignment in Barangays Salazar, Burgos and Bunga have low to moderate susceptibility to flooding.	▪ Proper design and construction of drainage system as part of the proposed project.

GEOLOGIC HAZARD	DESCRIPTION	FINDINGS (PROJECT LOCATION)	REMARKS/ MITIGATING MEASURES
	preparedness for natural calamities may also cause or even worsen flooding events. Based on **Figure 2-23**, the southern portion of the project location has low to moderate flood susceptibility. While the northern portion has high susceptibility to flooding.	▪ The northern/exit road of the alignment has high susceptibility to flooding.	
NOTE: 1: Indicating range of hazardous probabilities as Low, Mid and High. Items ranked as “Mid” or “High” are required countermeasures to prevent the hazard.			

Figure 2-12: Slope Map of the Project Site



MAP SOURCE/S:

PHILIPPINE GIS

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

DPEAR Project Alignment

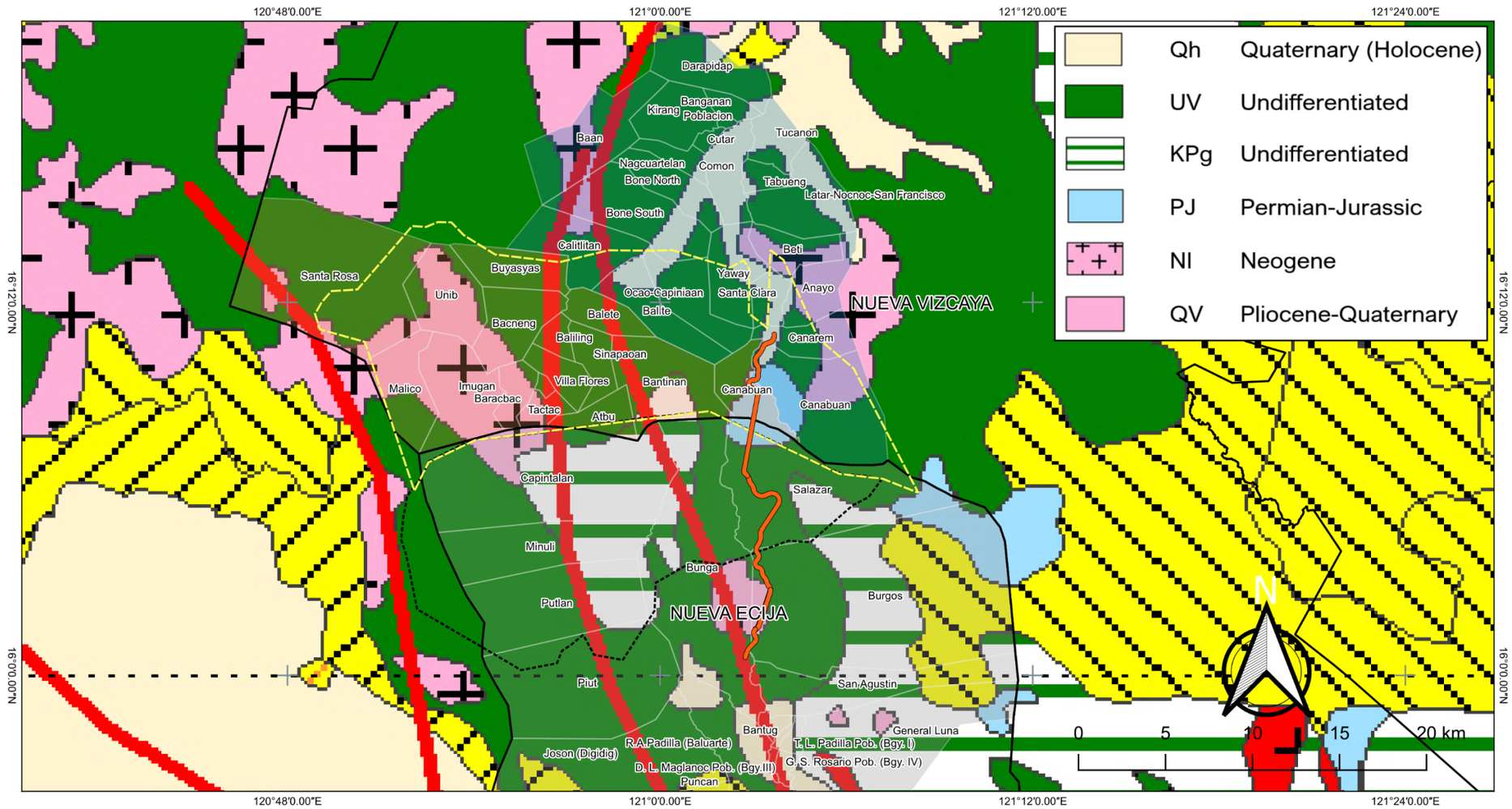
Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija
- Municipality of Carranglan

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

Slope Classification
- Level to nearly level
- Gently sloping to undulating
- Undulating to rolling
- Rolling to moderately steep
- Steep
- Very Steep

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**SLOPE MAP OF THE PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

Figure 2-13: Geologic and Tectonic Map of the Proposed Project Site



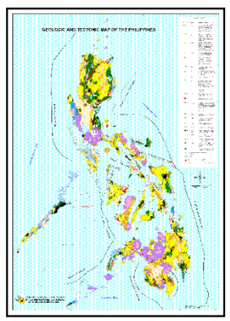
MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Mines and Geosciences Bureau

Geology of the Philippines (2010)

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.



Map Legend

DPEAR Project Alignment
Municipality of Carranglan

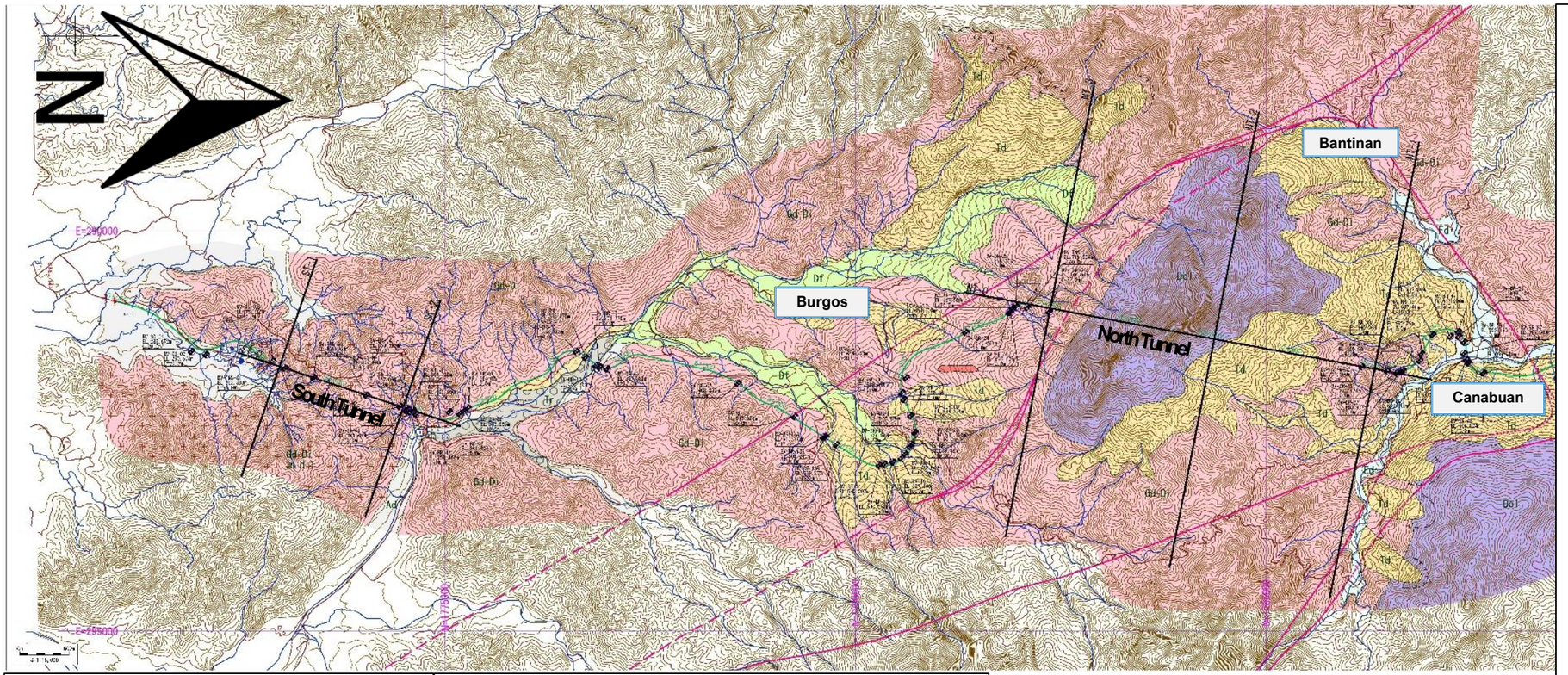
Administrative Boundaries
Province of Nueva Vizcaya
Municipality of Aritao
Municipality of Santa Fe
Province of Nueva Ecija

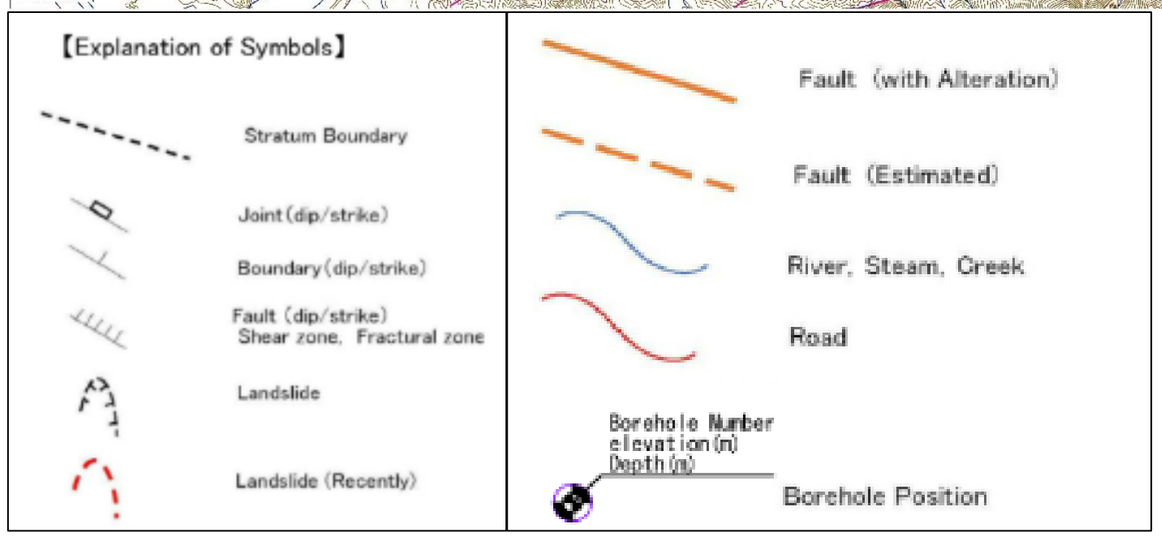
Ancestral Domain
Kalanguya Ikalahan AD
Kalanguya AD

Active Fault
Fault Line

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**GEOLOGIC AND TECTONIC MAP OF THE PROPOSED PROJECT SITE**	Geology of the Philippines, 2nd Edition (2010)	LCI ENVI CORPORATION

Figure 2-14: Geologic Map of the Proposed Project Site

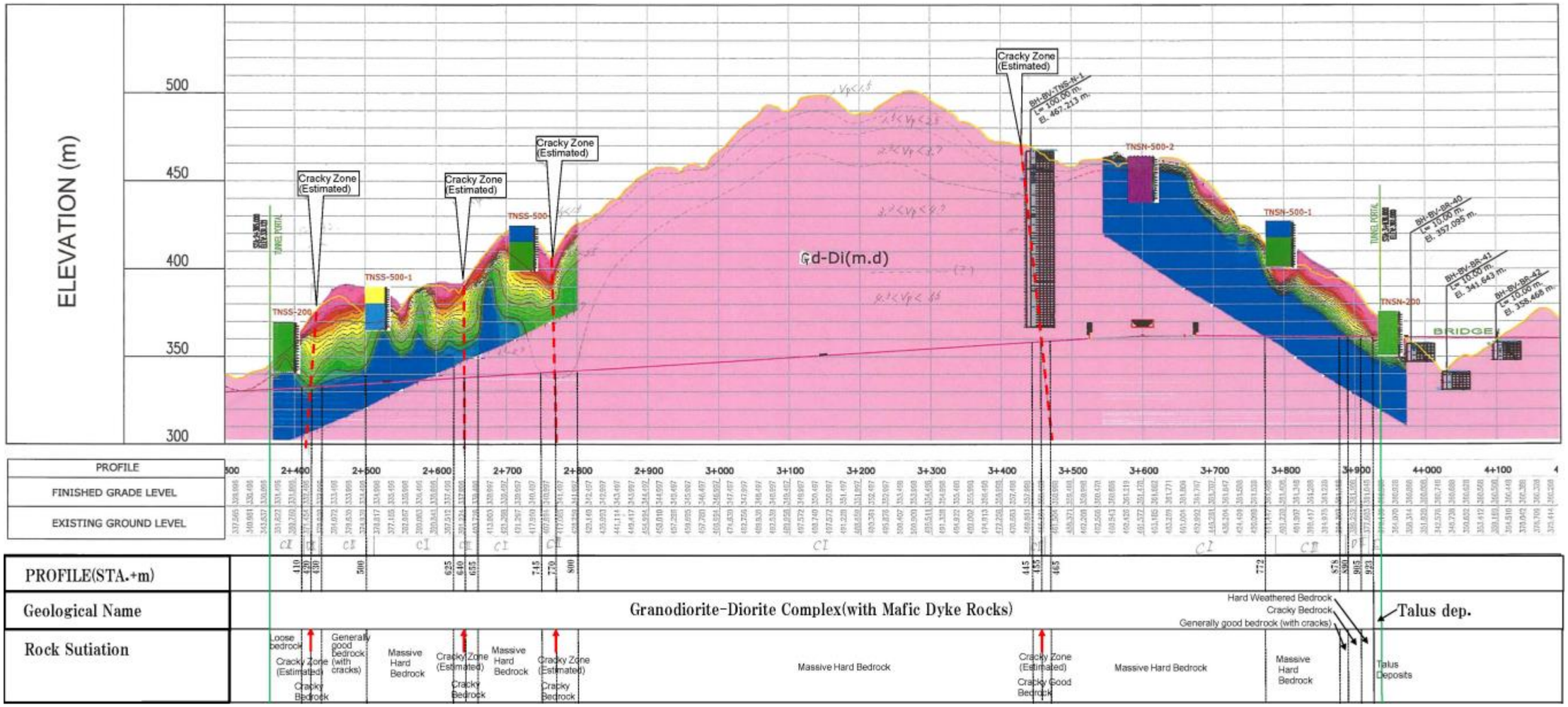




Geologic Age			Geological Name	Symbol
Cenozoic Era	Quaternary Period	Holocene	River Deposits	Rd
			Alluvial Plain Deposits	Ad
			Talus Deposits	Td
			Debris Flow Deposits	Df
			Alluvial Fan Deposits	Fd
			Terrace Deposits	Tr
		Pleistocene	Old Debris Flow Deposits	Mm
	Tertiary Period	Eary Oligocene—Eary Miocene	Dupax Diorite Complex: Dolerite	Dol
			Dupax Diorite Complex: Granodiorite -diorite Complex	Gd-Di
			Dupax Diorite Complex: Granodiorite -diorite Complex (With intrusive rocks of basic rocks)	Gd-Di (qp.d)

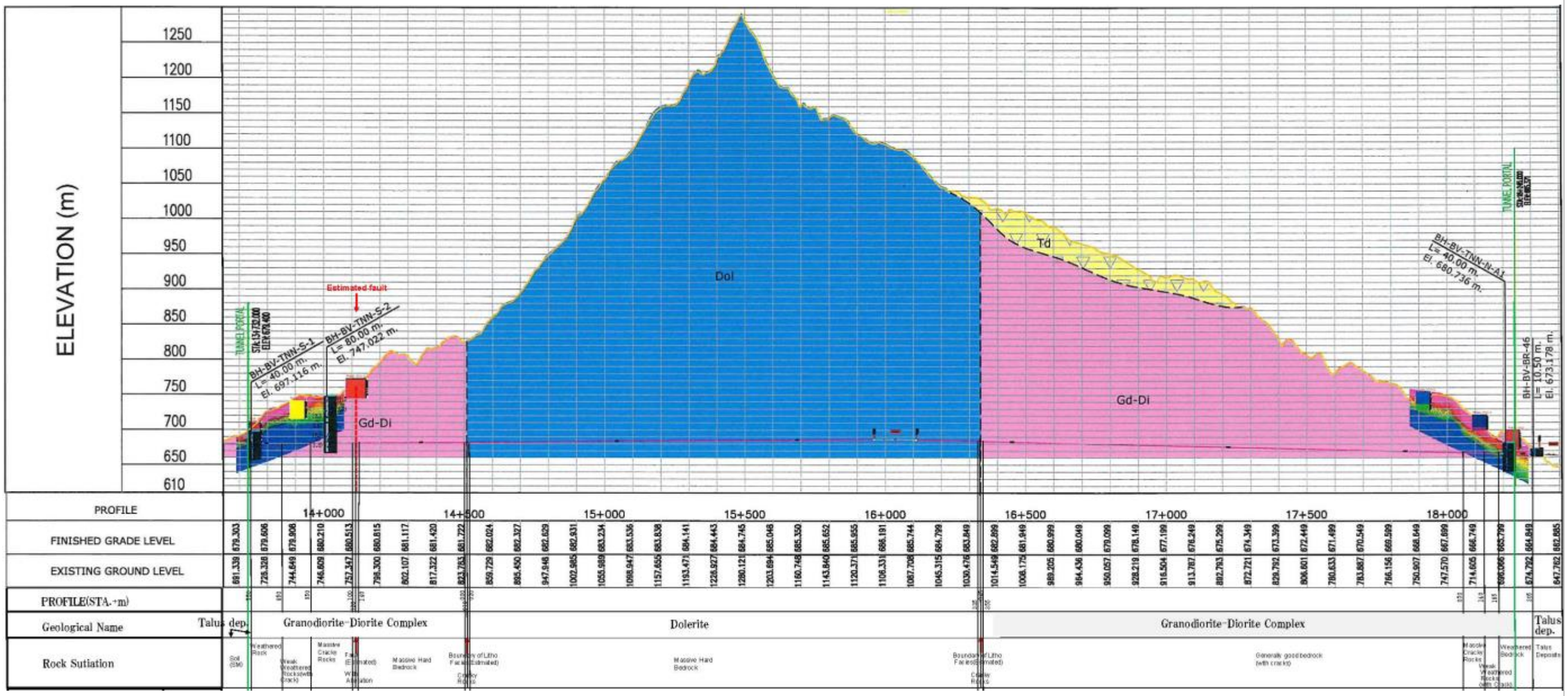
PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**GEOLOGIC MAP OF THE PROPOSED PROJECT AREA**	JICA Study Team	LCI ENVI CORPORATION

Figure 2-15: Geological Profile of the South Tunnel



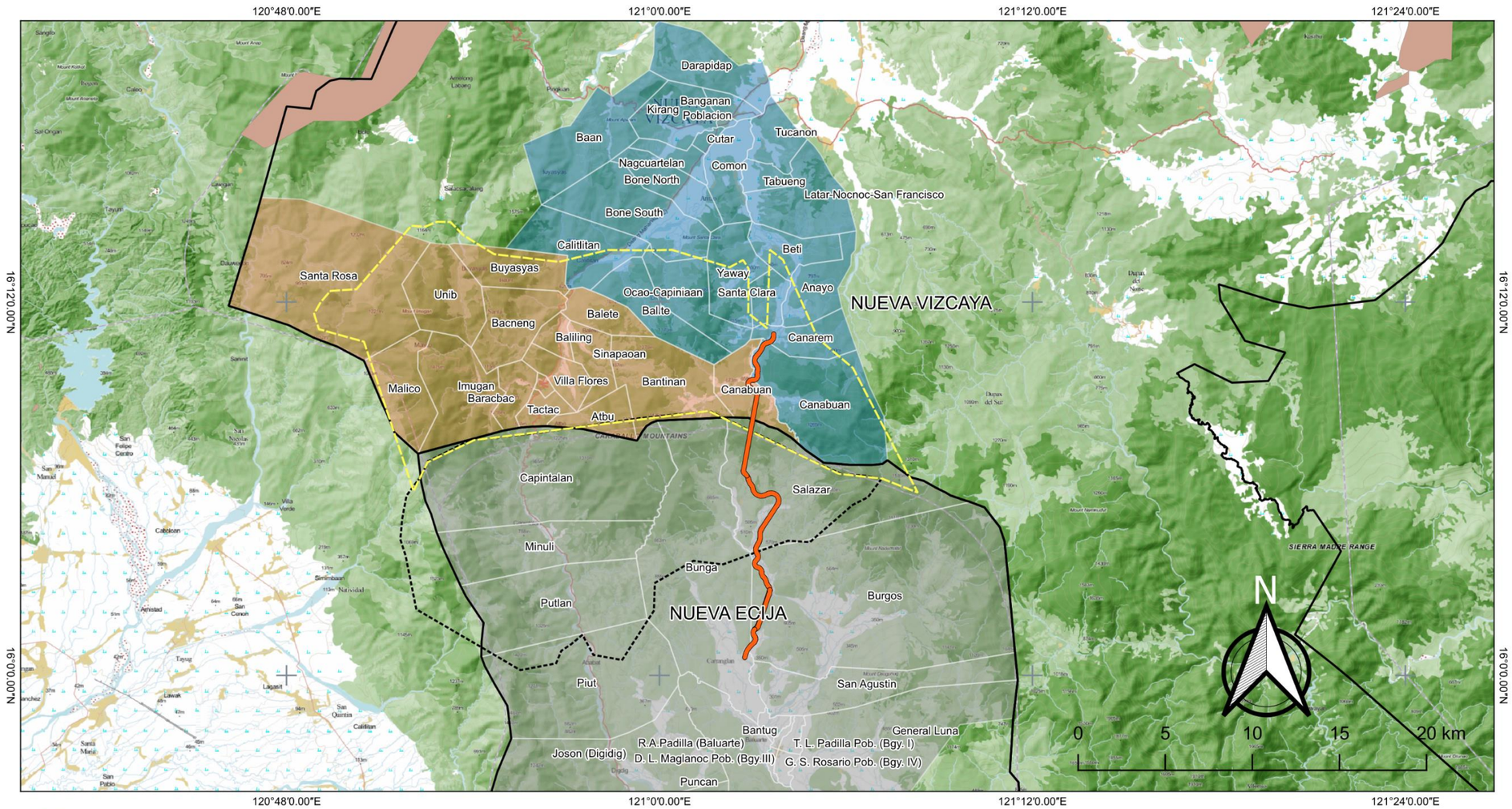
PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**GEOLOGICAL PROFILE OF THE SOUTH TUNNEL**	JICA Study Team	LCI ENVI CORPORATION

Figure 2-16: Geological Profile of the North Tunnel



PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**GEOLOGICAL PROFILE OF THE NORTH TUNNEL**	JICA Study Team	LCI ENVI CORPORATION

Figure 2-17: Location of Mining Sites Relative to the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Mines and Geosciences Bureau

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Municipality of Carranglan

Administrative Boundaries

- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija

Ancestral Domain

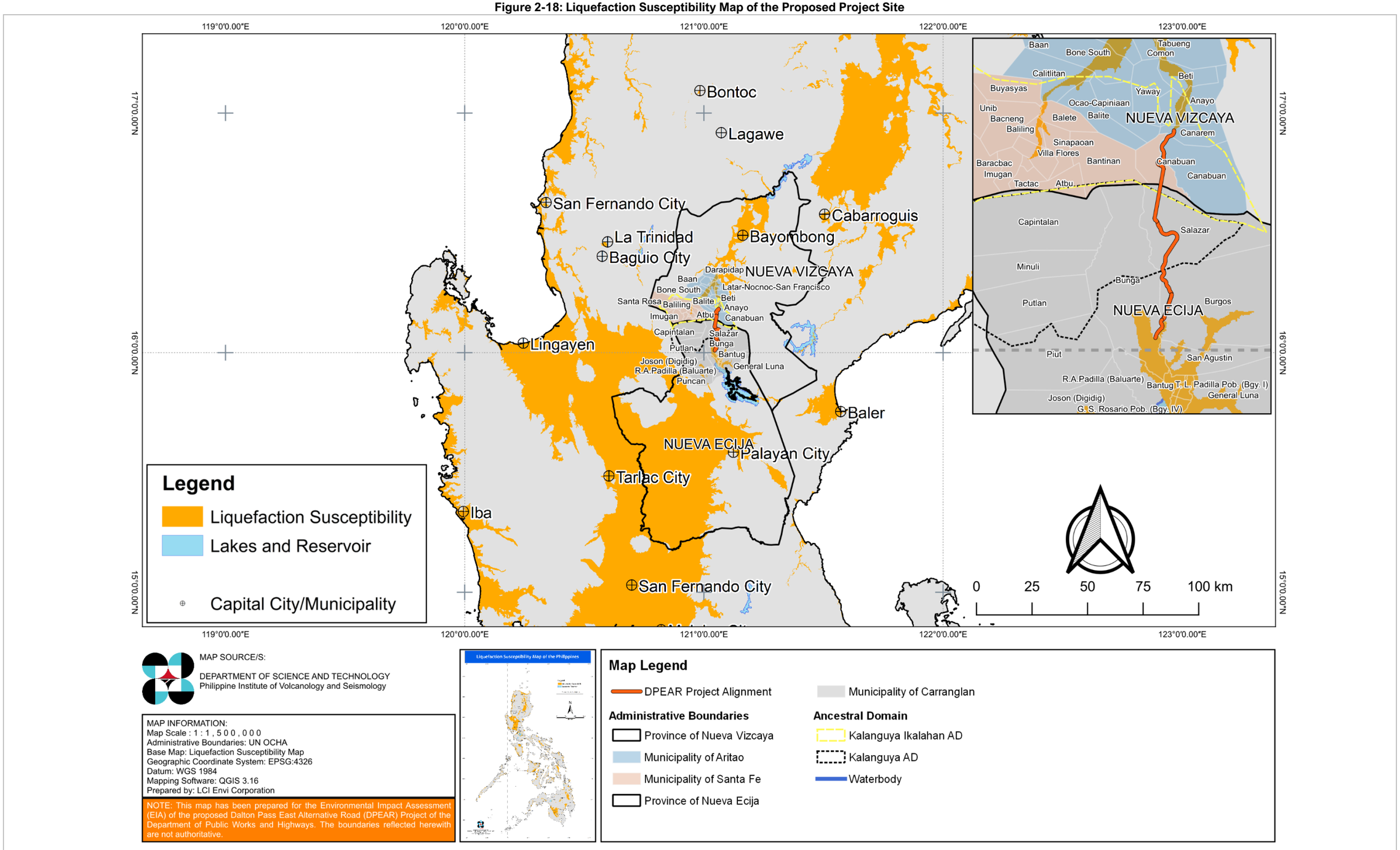
- Kalanguya Ikalahan AD
- Kalanguya AD

Mineral Land

- Mining Site

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**LOCATION OF MINING SITES RELATIVE TO THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

Figure 2-18: Liquefaction Susceptibility Map of the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF SCIENCE AND TECHNOLOGY
Philippine Institute of Volcanology and Seismology

MAP INFORMATION:
Map Scale : 1 : 1 , 5 0 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Liquefaction Susceptibility Map
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Municipality of Carranglan

Administrative Boundaries

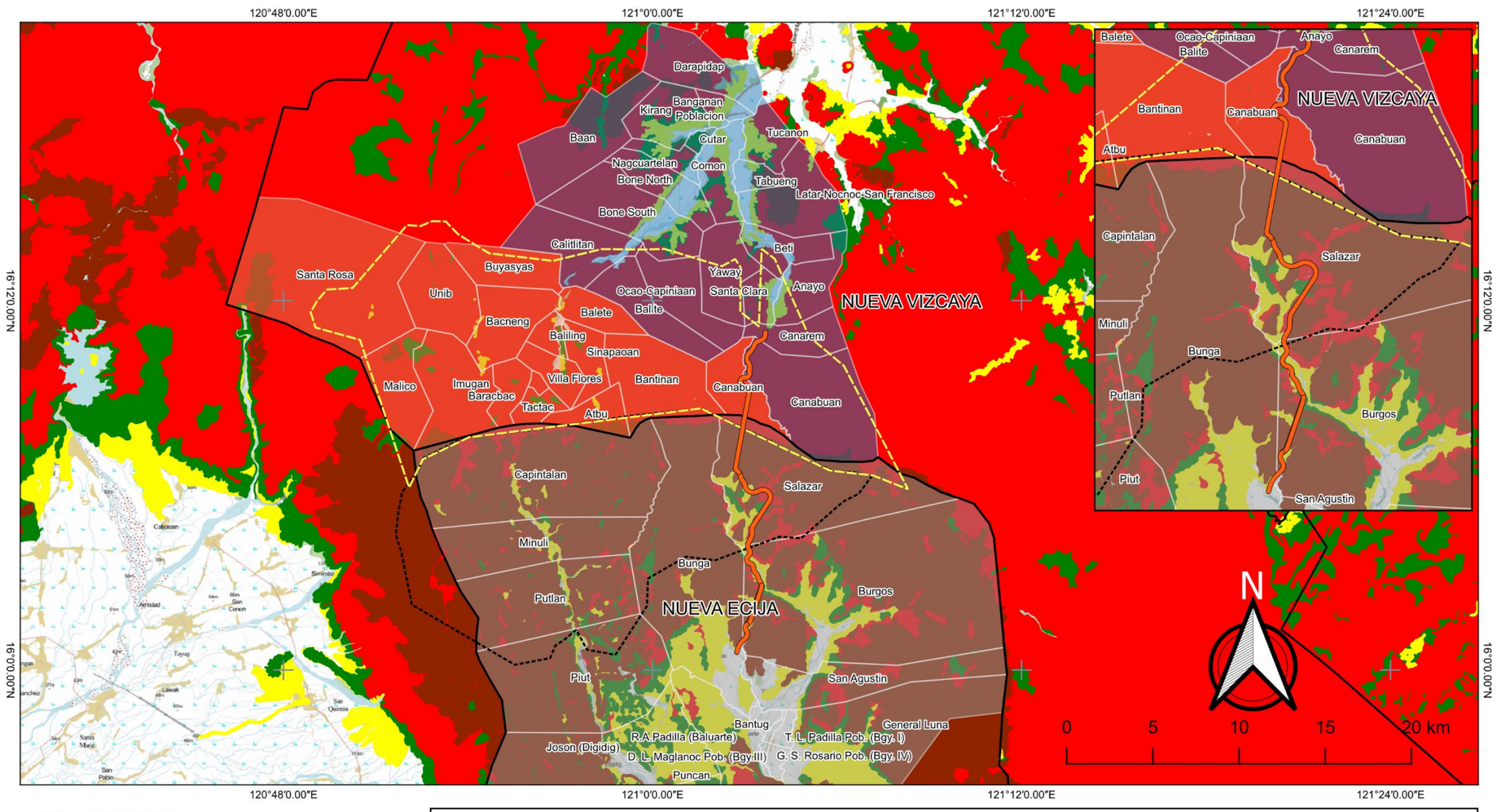
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija

Ancestral Domain

- Kalanguya Ikalahan AD
- Kalanguya AD
- Waterbody

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**LIQUEFACTION SUSCEPTIBILITY MAP OF THE PROPOSED PROJECT SITE**	As above.	LCI ENVI CORPORATION

Figure 2-19: Earthquake-Induced Landslide Susceptibility Map of the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Mines and Geosciences Bureau

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment

Administrative Boundaries

- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija
- Municipality of Carranglan

Ancestral Domain

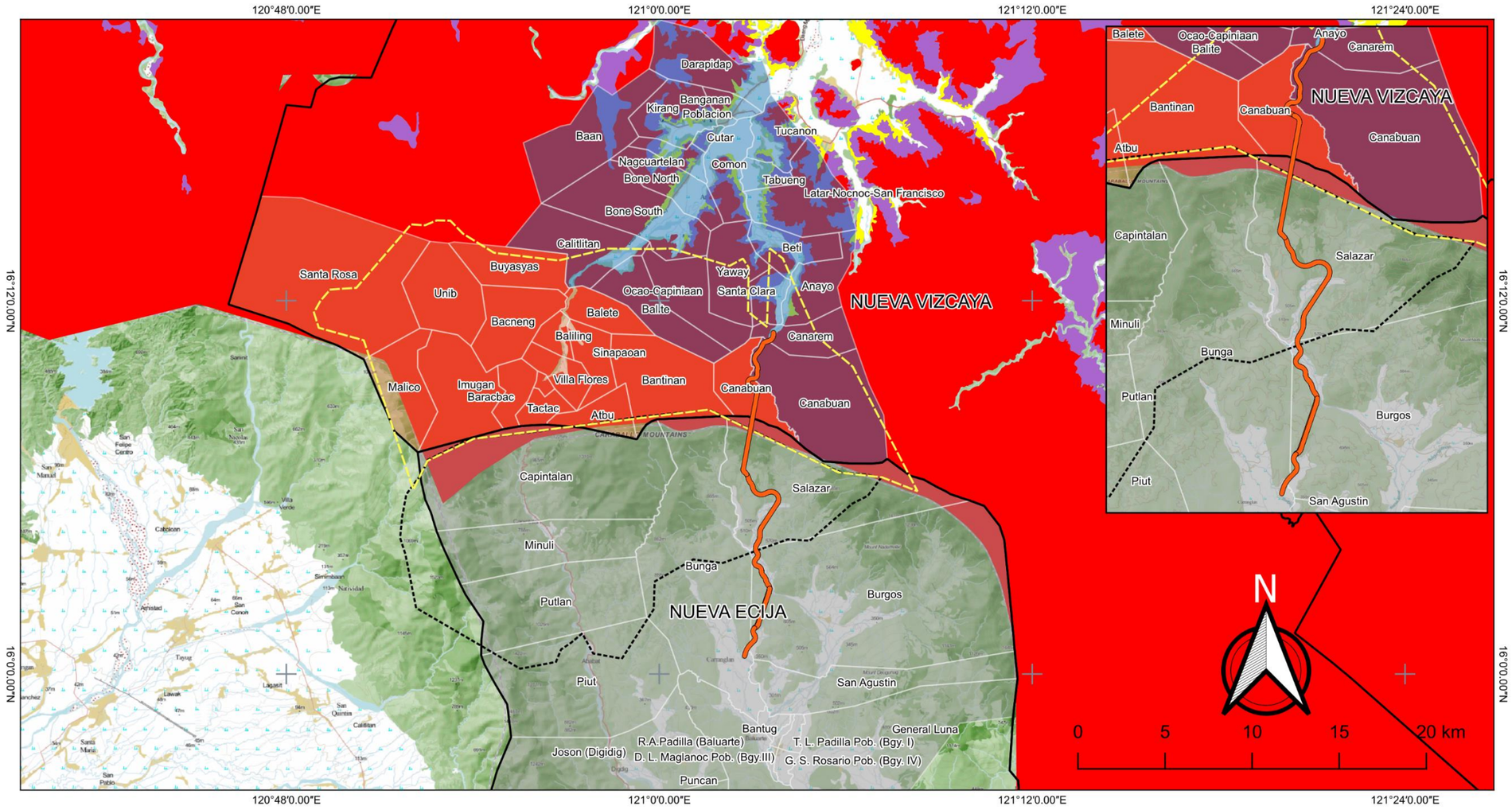
- Kalanguya Ikalahan AD
- Kalanguya AD

Landslide Susceptibility

- Very High
- High
- Moderate
- Low
- No Data

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**EARTHQUAKE-INDUCED LANDSLIDE SUSCEPTIBILITY MAP OF THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

Figure 2-20: Rain-Induced Landslide Susceptibility Map of the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Mines and Geosciences Bureau

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment

Administrative Boundaries

- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija
- Municipality of Carranglan

Ancestral Domain

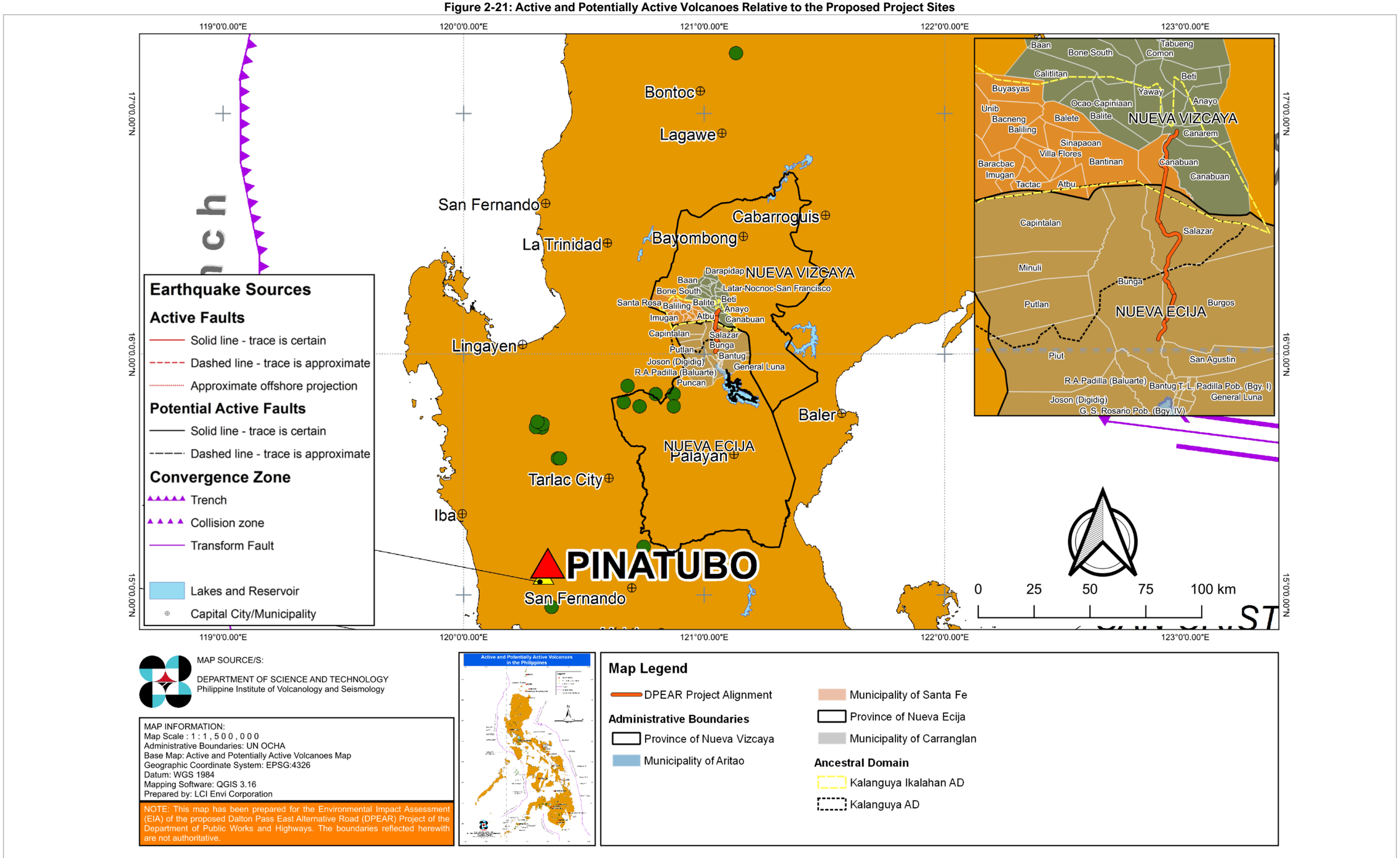
- Kalanguya Ikalahan AD
- Kalanguya AD

Landslide Susceptibility

- High
- Moderate
- Low
- No Data

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**RAIN-INDUCED LANDSLIDE SUSCEPTIBILITY MAP OF THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

Figure 2-21: Active and Potentially Active Volcanoes Relative to the Proposed Project Sites



MAP SOURCE/S:

DEPARTMENT OF SCIENCE AND TECHNOLOGY
Philippine Institute of Volcanology and Seismology

MAP INFORMATION:
Map Scale : 1 : 1 , 5 0 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Active and Potentially Active Volcanoes Map
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

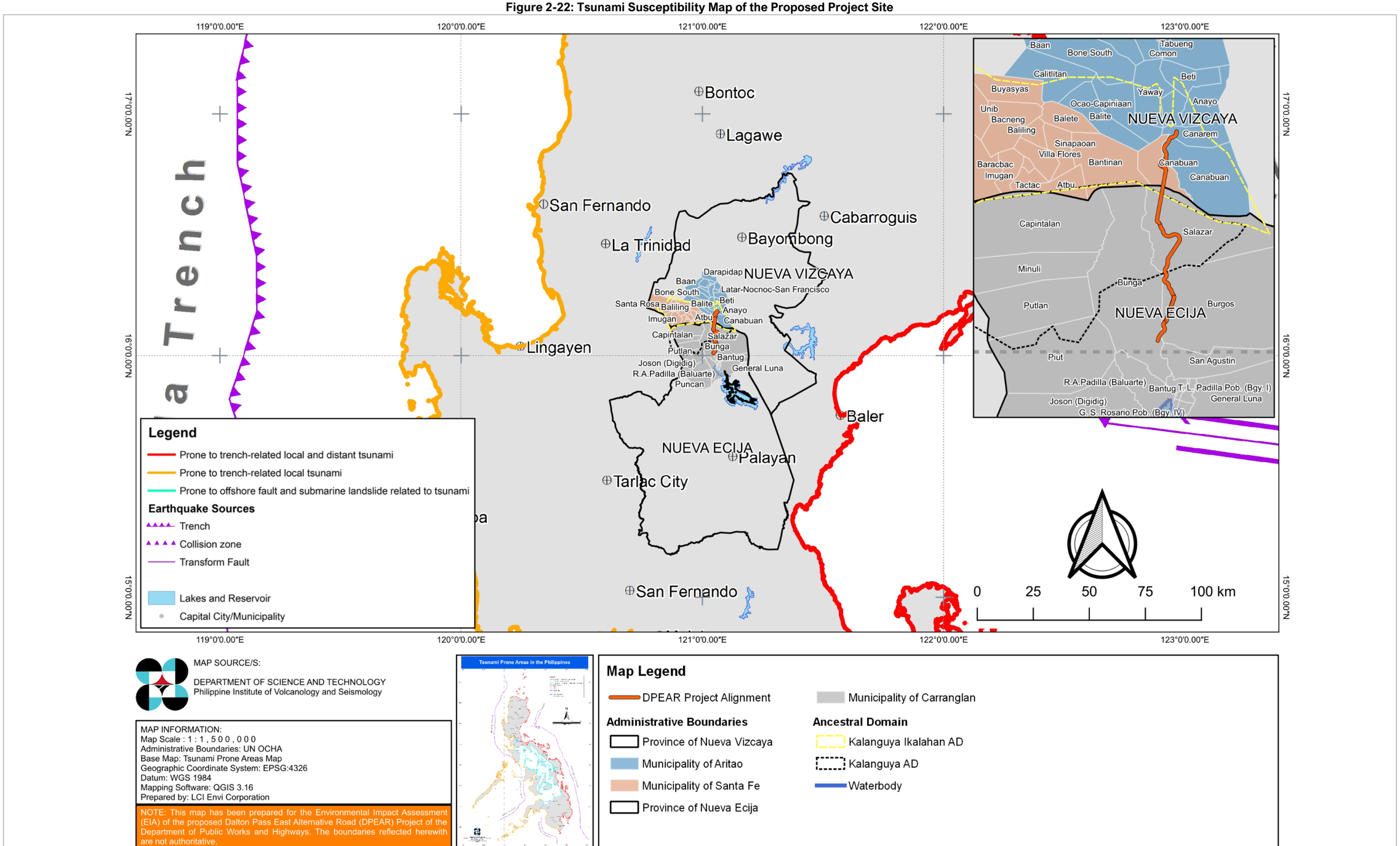
DPEAR Project Alignment

Administrative Boundaries
Province of Nueva Vizcaya
Municipality of Aritao
Municipality of Santa Fe
Province of Nueva Ecija
Municipality of Carranglan

Ancestral Domain
Kalanguya Ikalahan AD
Kalanguya AD

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**ACTIVE AND POTENTIALLY ACTIVE VOLCANOES RELATIVE TO THE PROPOSED PROJECT SITE**	As above.	LCI ENVI CORPORATION

Figure 2-22: Tsunami Susceptibility Map of the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF SCIENCE AND TECHNOLOGY
Philippine Institute of Volcanology and Seismology

MAP INFORMATION:
Map Scale : 1 : 1 , 5 0 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Tsunami Prone Areas Map
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

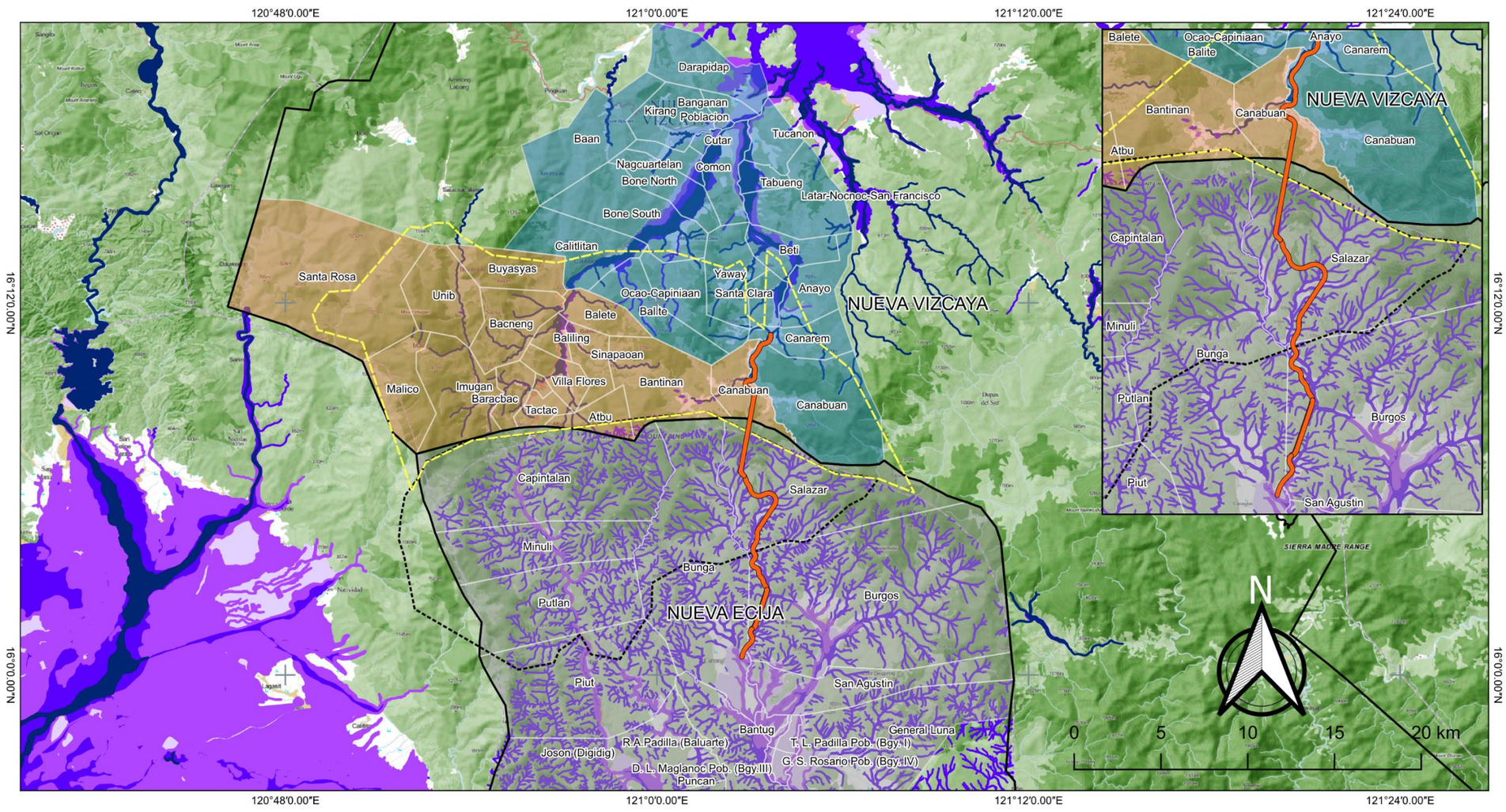
DPEAR Project Alignment
Municipality of Carranglan

Administrative Boundaries
Province of Nueva Vizcaya
Municipality of Aritao
Municipality of Santa Fe
Province of Nueva Ecija

Ancestral Domain
Kalanguya Ikalahan AD
Kalanguya AD
Waterbody

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**TSUNAMI SUSCEPTIBILITY MAP OF THE PROPOSED PROJECT SITE**	As above.	LCI ENVI CORPORATION

Figure 2-23: Flood Susceptibility Map of the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Mines and Geosciences Bureau

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment

Administrative Boundaries

- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija
- Municipality of Carranglan

Ancestral Domain

- Kalanguya Ikalahan AD
- Kalanguya AD

Flood Susceptibility

- Very High
- High
- Moderate
- Low

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**FLOOD SUSCEPTIBILITY MAP OF THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

2.1.2.1 Change in surface landform/geomorphology/topography/terrain/slope

[195]Significant changes on the surface landform, geomorphology, topography, terrain, and slope of the proposed project site are not expected given the proposed project design. Excavation techniques (i.e., application of proper reinforcement of excavation and tunneling sections) will be applied to ensure few or no impacts on landslide and surface conditions. This will be incorporated in the construction management plan which also includes best engineering practices.

[196]Excavated soil from the tunneling activities must be immediately transported to the disposal sites to prevent stockpiling of surplus soil along the project area, which could otherwise cause changes in the topography of the project area. Another option being considered is the reuse of excavated soil as backfill in other areas of the proposed project.

2.1.2.2 Change in sub-surface geology/underground conditions

[197]The proposed project is expected to cause a change in sub-surface geology or underground conditions due to the tunneling component of the proposed project. In line with this, the following shall be considered in the design and construction of the project.

Table 2-20: Design and Construction Considerations

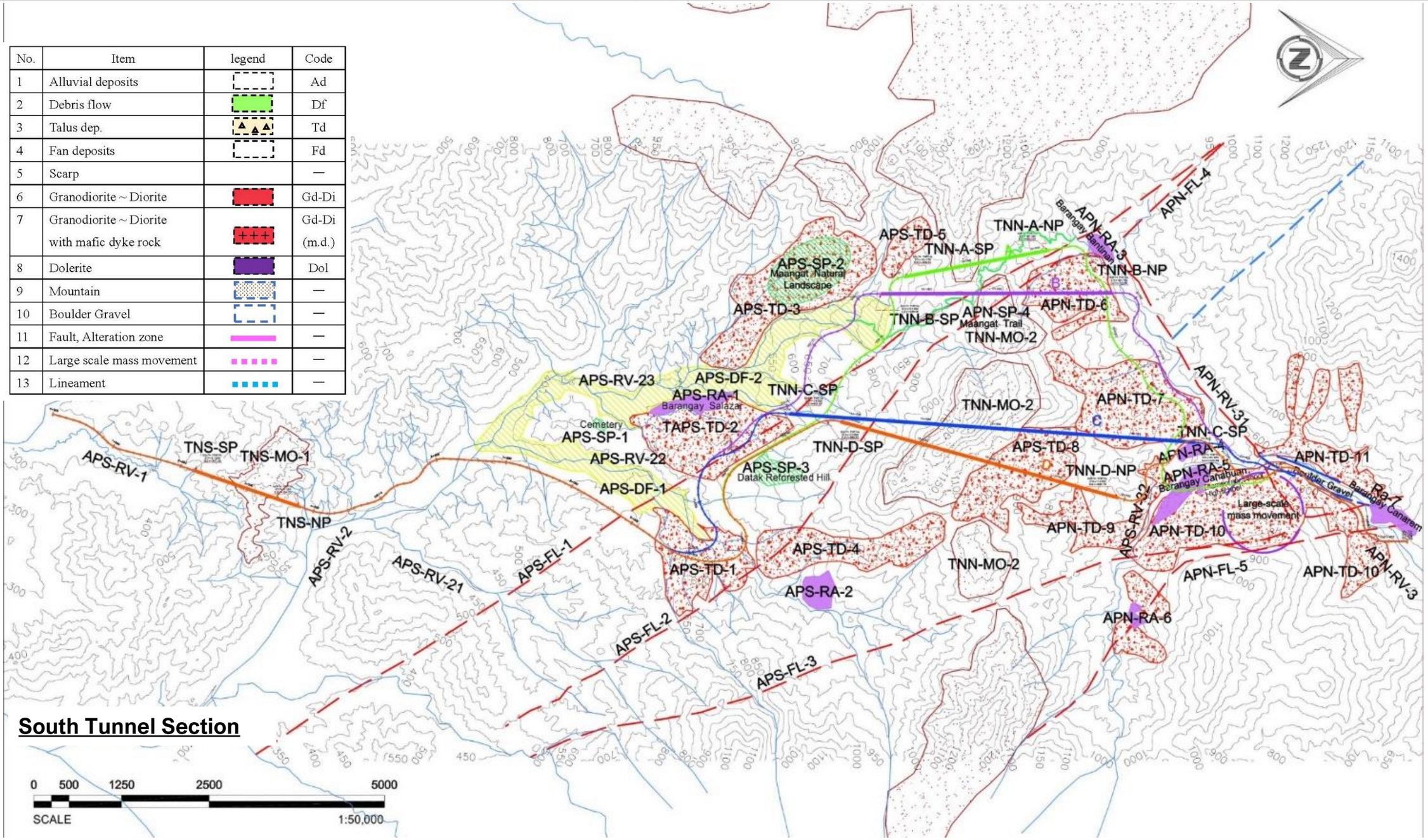
GEOLOGY		DESIGN AND CONSTRUCTION CONSIDERATIONS
Quaternary	Unconsolidated deposits	• Properties of cut slopes along the route, landslides near tunnel entrances, colluvium, and talus deposits. • Geological properties and distribution depth of support layers for the foundation ground of road structures such as bridges • Geological properties, distribution, and scale of "soft ground layer" in alluvial lowlands
Miocene-Neogene Oligocene-Paleogene	Dolerite and Granodiorite-diorite complex	• Strongly weathered rocks: Understanding soil properties and distribution properties near cut slopes and tunnel entrances. Check if the slope has collapsed. • At the intrusive boundary of the tunnel section, a crack system develops due to the influence of thermal alteration, etc., so there is a possibility that deteriorated rock mass will be distributed. • When accompanied by swelling clay minerals, there is a problem with the stability of the excavated cross section.
SOURCE: JICA Study Team		

2.1.2.3 Inducement of subsidence, liquefaction, landslides, mud, debris flow, etc.

[198]The proposed project is not expected to induce or cause subsidence, liquefaction, mud/debris flow, landslide, and any other geological hazard as presented in the structural geographic map of the tunnel areas in the proposed alignment (see **Figure 2-24**).

[199]There might be some concerns about the susceptibility of the roads and tunnels to sudden earth movements. **DPWH** will employ safety guidelines and proper procedures to minimize the occurrence of erosions near the project site.

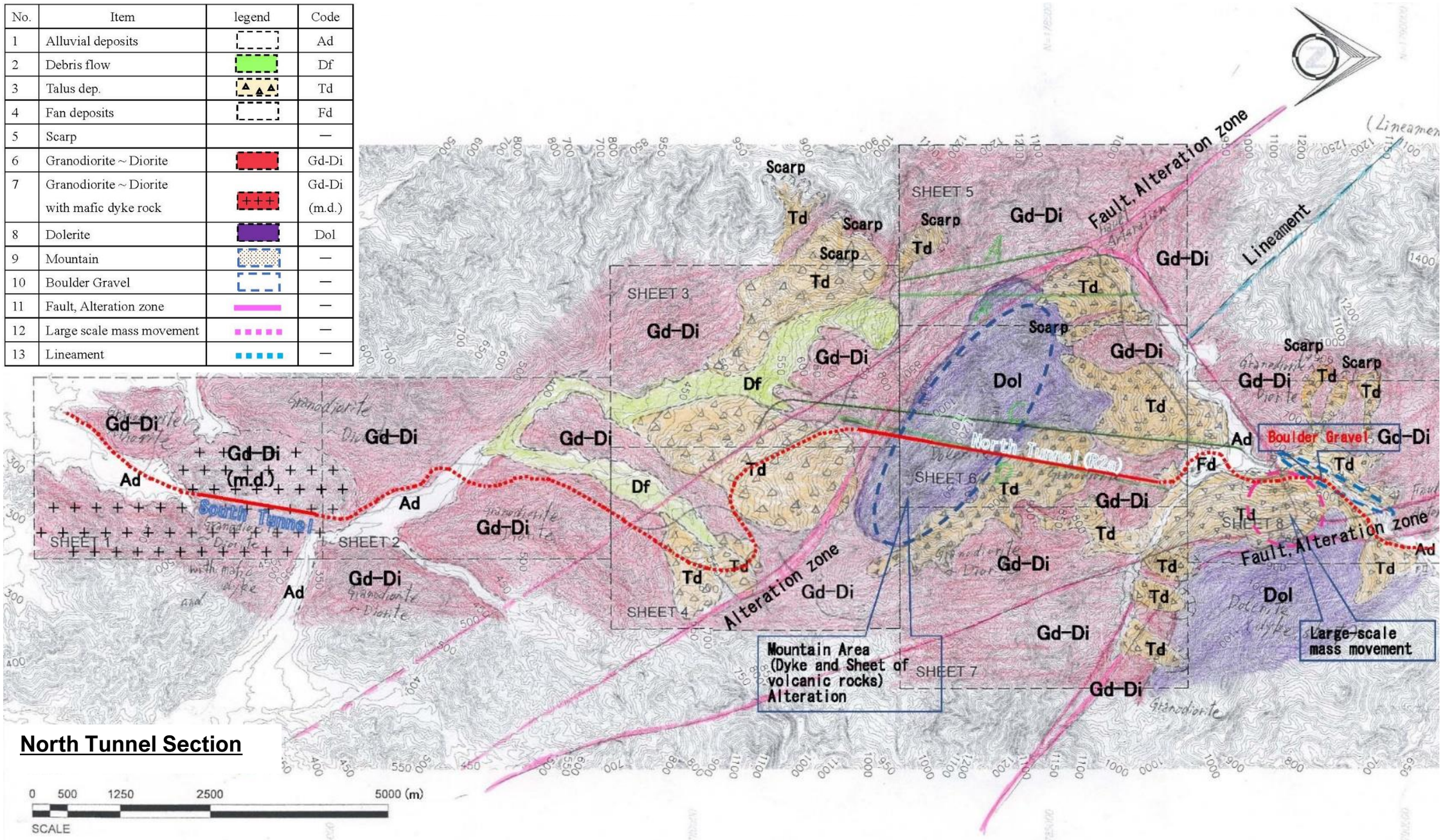
Figure 2-24: Structural Geologic Map of the Tunnel Areas of the South Tunnel Section



PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**STRUCTURAL GEOLOGIC MAP OF THE TUNNEL AEAS OF THE SOUTH TUNNEL SECTION**	JICA Study Team	LCI ENVI CORPORATION

Figure 2-25: Structural Geologic Map of the Tunnel Areas of the North Tunnel Section

No.	Item	legend	Code
1	Alluvial deposits		Ad
2	Debris flow		Df
3	Talus dep.		Td
4	Fan deposits		Fd
5	Scarp		—
6	Granodiorite ~ Diorite		Gd-Di
7	Granodiorite ~ Diorite with mafic dyke rock		Gd-Di (m.d.)
8	Dolerite		Dol
9	Mountain		—
10	Boulder Gravel		—
11	Fault, Alteration zone		—
12	Large scale mass movement		—
13	Lineament		—



PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**STRUCTURAL GEOLOGIC MAP OF THE TUNNEL AEAS OF THE NORTH TUNNEL SECTION**	JICA Study Team	LCI ENVI CORPORATION

2.1.3 Pedology

Municipality of Aritao

[200]The Municipality of Aritao has 10 soil series with several soil types for each soil series as shown in **Figure 2-26**. Soil Complex is the dominant series of soil in the municipality, with an area of 14,705.22 ha or 42.13% of the total land area of Aritao. This series of soil consists of two dominant types such as Burgos clay loam and Guimbalaon clay.

[201]The soil classification in the proposed project alignment is Guimbalaon Clay Loam which is under the Soil Complex series. **Table 2-21** shows the soil series in the municipality and its covered area.

Table 2-21: Soil Series in the Municipality of Aritao

SOIL SERIES	AREA (HAS)
Soil Complex	14,705.22
Tarug Soil	10, 236.65
Burgos Soil	3,272.20
Umingan Soil	1,579.84
Annam Soil	1,425.59
Maligaya	1,406.83
Bago	945.94
Riverwash	742.73
Guimbalaon	572.67
San Manuel	14.75
SOURCE: Municipality of Aritao CLUP (2009-2024)	

Municipality of Santa Fe

[202]The Municipality of Santa Fe has five different soil series. Annam Clay Loam is the dominant type in the municipality that covers 28,655.32 ha of the total land area of Santa Fe, followed by Guimbalaon Clay Loam Eroded Phase with 9,231.59 ha. Barangay Canabuan where the proposed project site is located has Annam Clay Loam soil type. **Table 2-22** shows the soil series in the municipality and its covered area.

Table 2-22: Soil Series in the Municipality of Santa Fe

SOIL SERIES	AREA (HAS)
Annam Clay Loam	28,655.32
Guimbalaon Clay Loam Eroded Phase	9,231.59
Guimbalaon Annam Complex	985.73
Umingan Loam	899.20
Sevilla Clay Loam/ Sevilla Sandy Clay Loam	209.32
SOURCE: Municipality of Santa Fe CLUP (2018-2027)	

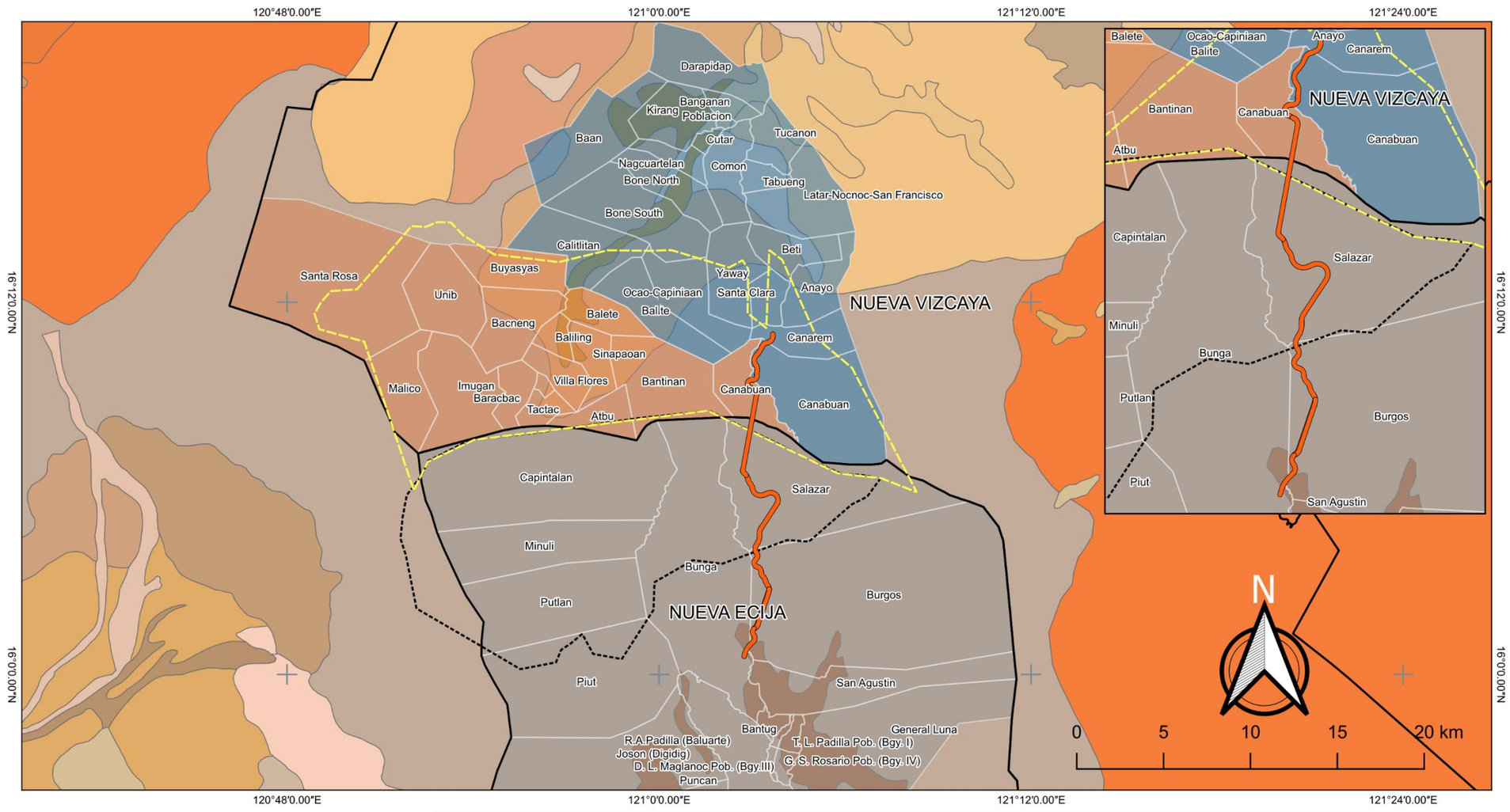
Municipality of Carranglan

[203]Three predominant soil types cover the Municipality of Carranglan, namely Annam Clay Loam, Umingan Sand, and Annam Sandy Clay Loam. Annam Clay Loam has more than 80% of the total land area, Umingan Soil covers 11% of the total land area, and Annam Sandy Clay Loam comprises 9% of the total land area.

Table 2-23: Soil Types in the Municipality of Carranglan

SOIL SERIES	AREA (HAS)
Annam Clay Loam	62,840
Umingan Loam	8,591
Annam Sandy Clay Loam	7,029
SOURCE: Municipality of Carranglan CLUP (2019-2028)	

Figure 2-26: Soil Map of the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF AGRICULTURE
Bureau of Soils and Water Management

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- **Administrative Boundaries**
  - Province of Nueva Vizcaya
  - Municipality of Aritao
  - Municipality of Santa Fe
  - Province of Nueva Ecija
  - Municipality of Carranglan
- **Ancestral Domain**
  - Kalanguya Ikalahan AD
  - Kalanguya AD
- **Soil Type**
  - Annam Clay Loam
  - Annam Sandy Clay Loam
  - Guimbalaon Clay Loam
  - Guimbalaon Clay Loam (Eroded Phase)
  - Mountain Soil (Undifferentiated)
  - Quinga Silt Loam

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**SOIL MAP OF THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

[204]To determine the existing soil quality prior to development, soil samples were collected one meter below the ground. Soil sampling was conducted on 9 February 2022 at the proposed project sites. The photos and coordinates of the soil sampling points are provided **Table 2-24**. The location map is shown in **Figure 2-27**.

[205]Laboratory analysis of the collected soil sample were performed by the CRL Environmental Corporation, a DENR-recognized laboratory based in Clark Freeport Zone, Pampanga. The test methods and results of the soil quality analysis are summarized in **Table 2-25** and detailed in the laboratory report in **ANNEX** of this report.

[206]In the absence of Philippine soil quality standards during the conduct of this study, the soil quality analysis results are compared with the soil remediation intervention values specified in Annex 1 (Table 1) of the Dutch Soil Remediation Circular 2013 (version of 1 July 2013). The intervention values for soil remediation indicate when the functional properties of the soil for humans, plants, and animals are seriously impaired or in danger of being so. They are representative of the level of contamination above which a case of soil contamination is deemed to be severe.

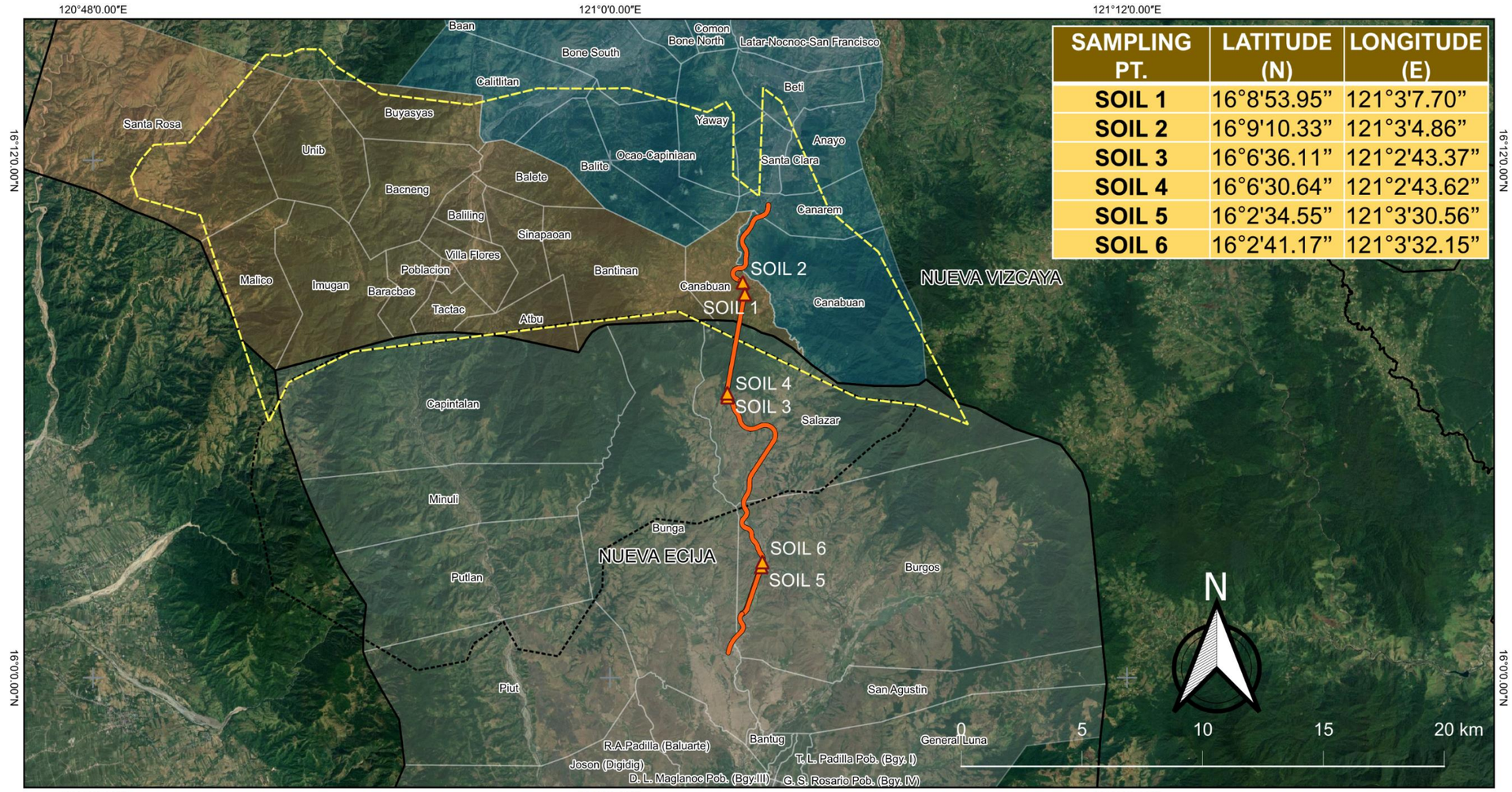
[207]As presented, the detected levels of all parameters tested were way below the respective threshold limits/intervention values.

Table 2-24: Location of Soil Sampling Points

SAMPLING POINT	PHOTOS	LATITUDE (N)	LONGITUDE (E)
Soil 1		16°8'53.95" N	121°3'7.70" E
Soil 2		16°9'10.33" N	121°3'4.86" E
Soil 3		16°6'36.11" N	121°2'43.37" E

SAMPLING POINT	PHOTOS	LATITUDE (N)	LONGITUDE (E)
Soil 4		16°6'30.64" N	121°2'43.62" E
Soil 5		16°2'34.55" N	121°3'30.56" E
Soil 6		16°2'41.17" N	121°3'32.15" E

Figure 2-27: Soil Sampling Location Map



SAMPLING PT.	LATITUDE (N)	LONGITUDE (E)
SOIL 1	16°8'53.95"	121°3'7.70"
SOIL 2	16°9'10.33"	121°3'4.86"
SOIL 3	16°6'36.11"	121°2'43.37"
SOIL 4	16°6'30.64"	121°2'43.62"
SOIL 5	16°2'34.55"	121°3'30.56"
SOIL 6	16°2'41.17"	121°3'32.15"

MAP SOURCE/S:

JICA STUDY TEAM

MAP INFORMATION:
Map Scale : 1 : 1 8 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Google Earth Satellite
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Municipality of Carranglan

Administrative Boundaries

- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija

Ancestral Domain

- Kalanguya Ikalahan AD
- Kalanguya AD

Sampling Station

- SOIL 1 to SOIL 6

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**SOIL SAMPLING LOCATION MAP**	As above.	LCI ENVI CORPORATION

Table 2-25: Summary of the Soil Sample Analysis

PARAMETER	UNIT	DETECTED LEVEL AT THE SAMPLING POINTS BASED ON LABORATORY ANALYSIS (Values in RED exceed reference standard/s)						DUTCH INTERVENTION VALUE
		SP1	SP2	SP3	SP4	SP5	SP6	*(Dutch Soil Remediation Circular 2013)*
A. Micronutrients								
Iron	mg/Kg	14,500	30,200	-	-	-	-	-
Boron	mg/Kg	ND	ND	ND	ND	ND	ND	-
Manganese	mg/Kg	207	80	420	173	44	26	-
Zinc	mg/Kg	13	2.6	1.0	8.7	3.3	0.7	720
Copper	mg/Kg	24	5.9	16	9.0	0.7	1.0	190
Molybdenum	mg/Kg	ND	ND	ND	ND	ND	ND	190
Nickel	mg/Kg	1.0	0.5	3.0	1.2	ND	ND	100
B. Metals								
Arsenic	mg/Kg	ND	ND	ND	ND	ND	ND	76
Cadmium	mg/Kg	0.2	0.09	0.3	0.2	ND	ND	13
Mercury	mg/Kg	ND	ND	ND	ND	ND	ND	-
Lead	mg/Kg	0.9	0.6	1.0	0.4	ND	ND	530
Potassium	mg/Kg	415	33	15	67	67	ND	-
Selenium	mg/Kg	ND	ND	ND	ND	ND	ND	100
C. Wet Chemistry								
pH		5.4	6.2	6.6	5.8	5.8	5.8	-
Total Phosphorus	mg/Kg	303	326	297	330	133	230	-
Hexavalent Chromium	mg/Kg	ND	ND	ND	ND	ND	ND	-
Fluoride	mg/Kg	0.3	0.9	1.2	0.6	0.4	0.4	-
Total Organic Matter	% w/w	0.56	1.26	0.9	2.22	1.24	0.16	

NOTES: SP = Sampling Point | ND = Not Detected | mg/kg = milligrams per kilogram | (*) Method detection limit
REFERENCE: Dutch Soil Remediation Circular, 2013, Annex 1, Table 1

2.1.3.1 Soil erosion/loss of topsoil/overburden

[208]Erosion occurs mainly on the naturally exposed surfaces, on man-made cuts and excavation along the trails and existing roadways. For the Project area, this is caused primarily by the excavation or earth movement in the quarry sites. The removal of trees and soil-binders can increase this problem. During heavy rains or strong winds, landslides and erosions can be triggered, thus putting significant threats to the low-lying communities.

[209]Erosion can be greatly mitigated by constructing erosion barriers, silt traps, etc. The exact location of the silt traps will depend on the strategy of the contractor on land clearing and the existing drainage. If the existing drainage will be used, a silt trap or siltation pond will be installed before discharge to nearby river.

2.1.3.2 Change in soil quality/fertility

[210]The main impact of the project on soil quality is the possible soil contamination due to use of heavy equipment during the construction of the project components. To avoid possible soil contamination, the proponent shall construct and maintain canals in the maintenance areas of vehicles and heavy equipment, as well as in truck marshalling areas. The Proponent shall implement oil spill management plan which includes the use of sawdust, rice hulls, or coir dusts to absorb the oil spills.

[211]The excavated soil may also contain hazardous substances (i.e., heavy metals) that may cause soil contamination within the disposal site.

2.1.4 Terrestrial Ecology

[212]Terrestrial ecology assessment was conducted in 12 sampling stations along the proposed project alignment traversing the provinces of Nueva Vizcaya and Nueva Ecija in June 2021 and January 2022 (see **Table 2-26** and **Figure 2-28**). The assessment aimed to identify the existing vegetation cover and prevailing wildlife species in the project site. It also evaluated the significant impacts of the project to the environment, especially to the terrestrial ecosystems within the proposed project area and determined appropriate mitigating measures to minimize the impact of the project to the flora and fauna species. The entire assessment report is attached as **ANNEX E** of the EIA report.

Table 2-26: Location of Terrestrial Ecology Sampling Points

SAMPLING POINT	LOCATION	LATITUDE (N)	LONGITUDE (E)
S01	Brgy. Bunga Carranglan, Nueva Ecija	16° 0'46.08"	121° 2'45.64"
S02	Brgy. Bunga Carranglan, Nueva Ecija	16° 1'10.82"	121° 3'3.98"
S03	Brgy. Bunga Carranglan, Nueva Ecija	16° 1'31.93"	121° 3'11.25"
S04	Brgy. Burgos Carranglan, Nueva Ecija	16° 2'38.59"	121° 3'36.17"
S05	Brgy. Burgos Carranglan, Nueva Ecija	16° 3'23.27"	121° 3'15.73"
S06	Brgy. Salazar Carranglan, Nueva Ecija	16° 3'50.35"	121° 2'56.06"
S07	Brgy. Salazar Carranglan, Nueva Ecija	16° 5'0.54"	121° 3'7.86"
S08	Brgy. Salazar Carranglan, Nueva Ecija	16° 5'52.54"	121° 3'21.55"
S09	Brgy. Canabuan Sta Fe, Nueva Viscaya	16° 8'7.63"	121° 3'50.40"
S10	Brgy. Canabuan Sta Fe, Nueva Viscaya	16° 9'3.16"	121° 3'31.83"
S11	Brgy. Canabuan Aritao, Nueva Viscaya	16° 9'45.12"	121° 3'6.28"
S12	Brgy. Canarem Aritao, Nueva Viscaya	16°10'41.79"	121° 3'33.95"

Figure 2-28: Location Map of Terrestrial Ecology Sampling Points

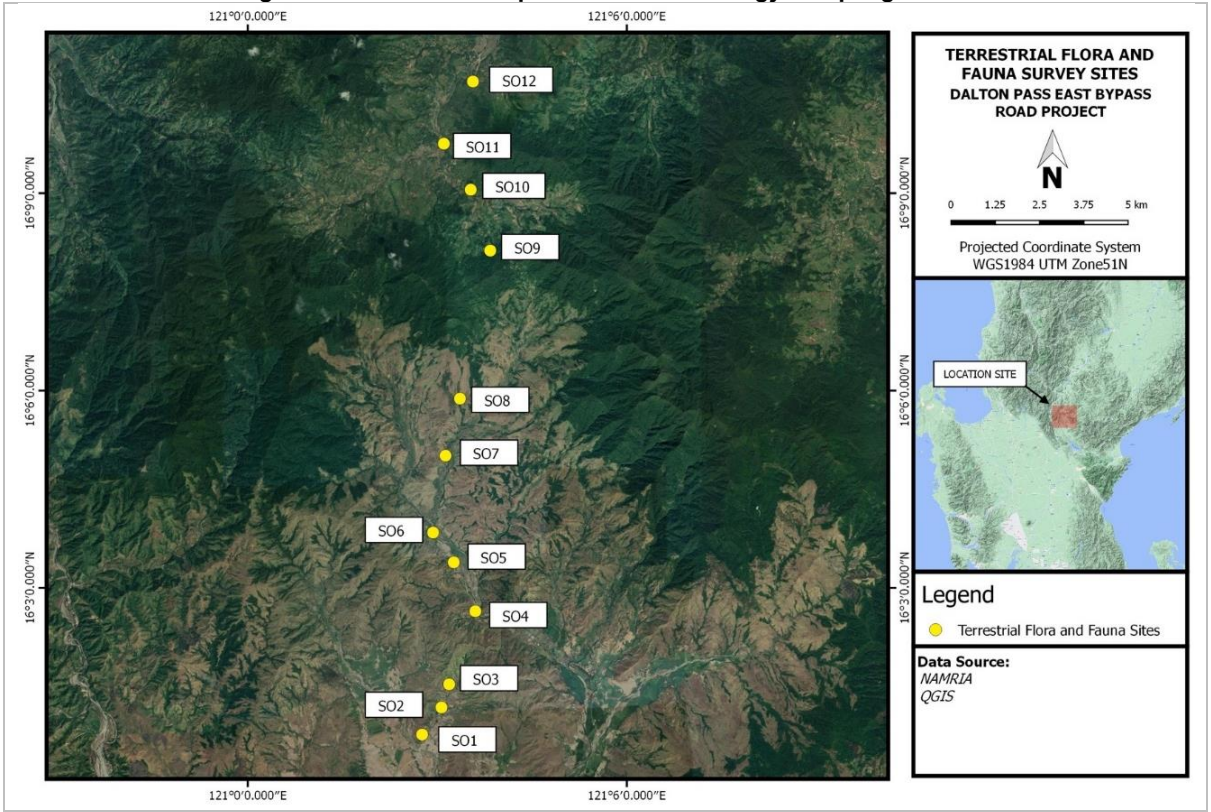


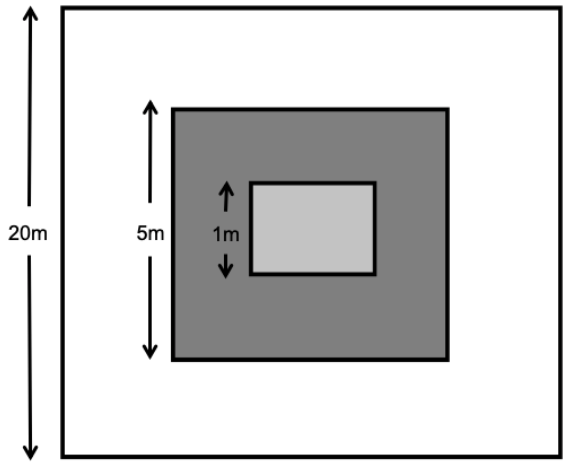
FIGURE TITLE:		
LOCATION MAP OF TERRESTRIAL ECOLOGY SAMPLING POINTS		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

2.1.4.1 Methodology

213 **Floristic Survey Methodology.** A rapid survey method was employed in the conduct of floristic assessment within the project area. Plot establishment follows the nested quadrat sampling technique (see **Figure 2-29**), which is one of the most applicable and most rapid vegetation sampling methods to cover the major plant groups (i.e., canopy, intermediate, and understory layer).

214 The sampling quadrats were established by laying a 20 x 20-meter quadrat where all flora species (plants) were recorded. Within the 20 x 20-meter quadrat, all large trees with a diameter at breast height (DBH, in cm) greater than 10 (>10-cm DBH) were subsequently identified and measured. Nested within the 20 x 20-meter quadrat (hence nested quadrat design) was a 5 x 5-meter (25 m^2) sampling quadrat where smaller trees having 5- to 10-cm DBH were also identified and measured. Another nested 1 x 1-meter (1 m^2) sampling quadrat was established to measure all trees (> 5-cm DBH), herbs, grasses, and creepers. Same plots sampled during the wet season survey were sampled during the dry season survey.

Figure 2-29: Nested Quadrat Sampling Design Employed during the Flora Survey



20 x 20 meter (400 m²)
- Canopy layer
- All trees with >10 cm DBH were measured and identified

5 x 5 meter (25 m²)
- Intermediate layer
- All trees with ≥5 to <10 cm DBH was measured and identified

1 x 1 meter (1 m²)
- Understory layer
- Percentage cover of all trees (>5 cm DBH), grasses, herbs and other ground cover were estimated

FIGURE TITLE:

NESTED QUADRAT SAMPLING DESIGN EMPLOYED DURING THE FLORA SURVEY

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Figure 2-30: Plot Establishment and Floristic Survey used During Dry and Wet Season Floristic Survey

Lay-outing flora sampling plot using horizontal tape

Diameter measurement using diameter tape

Herb sampling

Species collection and identification

FIGURE TITLE:

PLOT ESTABLISHMENT AND FLORISTIC SURVEY USED DURING DRY AND WET SEASON FLORISTIC SURVEY

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[215]Data collected during the floristic survey were analyzed using different measures of biodiversity. Biodiversity measures include taxonomic structure (i.e., species richness, abundance, diameter distribution, importance value index), distribution status, and conservation status according to global and local red lists.

a. Biodiversity Measures

[216]**Species Richness**. This represents the number of species found in the study area. The number of species was recorded for each sampling plot.

[217]**Species Abundance**. This represents the number of individuals found in the study area. The number of individuals of each species was recorded for each sampling plot.

[218]**Importance Value Index (%IVI)**. This refers to the sum of relative abundance (%RA), relative frequency (%RF), and relative dominance (%RD). %RA is the proportion of the total number of individuals of a species relative to overall abundance (A). %RF is the proportion of the number of species occurrences relative to the overall frequency of occurrence (F). %RD is the proportion of a species' total basal area relative to the overall basal area (D). The following formulas were used:

$$\textit{Basal Area } (m^2)\ (D) = 0.7854\ (DBH/100)$$

$$\textit{Relative Dominance (\%RD)} = \frac{\Sigma \text{ basal area1 of species } (m^2)}{\text{Plot area } (m2)} \times 100$$

$$\textit{Abundance (A)} = \frac{\text{Number of individuals of any species}}{\text{Area sample}}$$

$$\textit{Relative Abundance (\%RA)} = \frac{\text{Density of a species}}{\text{Total density of all species}} \times 100$$

$$\textit{Frequency (F)} \quad \frac{\text{Number of plots in which species occur}}{\text{Total number of plots sampled}}$$

$$\textit{Relative Frequency (\%RF)} \quad \frac{\text{Frequency of a species}}{\text{Total frequency of all species}} \times 100$$

$$\textit{Importance Value Index (IVI\%)} \quad \%RD + \%RA + \%RF$$

[219]**Biodiversity Status**. The Shannon-Wiener (***H'***) diversity index and the Pielou's Evenness (***J'***) indexes were used to represent biodiversity status. The diversity ***H'*** index assumes that individuals are randomly sampled from a large population and that all species are represented in the sample. It gives an estimate of species richness and distribution. The evenness ***J'*** index, on the other hand, indicates the inequality component of diversity or how the number of individuals of each species is evenly counted in an ecosystem – in this case, in each studied sampling station. The diversity ***H'*** and evenness ***J'*** indices were calculated through the following formulas:

$$\textit{Shannon-Wiener Diversity H'} = -\Sigma pi \ln (pi)$$

where:

H'	*represents the symbol for the amount of diversity in an ecosystem (species diversity)*
pi	*represents the proportion or relative abundance of each species to the total (measured from 0 to 1)*
ln pi	*represents the natural logarithm of pi*

$$\textit{Pielou's Evenness J'} = H'/Hmax = H=H'/\ln S$$

where:

J	*represents the symbol for the species richness*
H'	*species diversity*
Hmax	*species maximum diversity*
S	*number of species in the community*

[220]The interpretation of the values obtained using the above formulas will be based on the Fernando Biodiversity Scale (1998)[4] shown in **Table 2-27**.

Table 2-27: The Fernando Biodiversity Scale (1998)

RELATIVE VALUES	SHANNON –WIENER BIODIVERSITY (H') INDEX	PIELOU'S (J') EVENNESS INDEX
Very High	3.50 and above	0.75-1.00
High	3.00 – 3.49	0.50-0.74
Moderate	2.50 – 2.99	0.25-0.49
Low	2.00 – 2.49	0.15-0.24
Very Low	1.99 and below	0.05-0.14

b. Distribution Status

[221]Distribution status (endemicity) refers to the geographic origin of flora species to either native or non-native range. It is categorized as native species if a species is naturally growing in the country and can be further identified as **endemic** or species naturally growing only in the Philippines, and as **indigenous** or species growing naturally but with range that is not limited to the Philippines. Non-native species are species that are not naturally growing in the Philippines. These species are known as **exotic** or species introduced in the Philippines.

c. Conservation Status

[222]Conservation status of flora species is determined with reference to the International Union for Conservation of Nature (IUCN) Global Red List of Threatened Species version 2021-3[5] and the Philippine Red List adaptation known as the DENR Administrative Order No. (DAO) 2017-11 or the Updated National List of Threatened Philippine Plants and their Categories[6].

[223]The Red List aims to provide scientifically based information on the status of the species and sub-species at a global level; draw attention to the magnitude and importance of threatened biodiversity; influence national and international policy and decision-making; and provide information to guide actions to conserve biological diversity[7]. It also aims to convey the urgency of conservation issues to the public and policymakers, as well as to help the international community to try to reduce species extinction.

[224]The conservation categories for flora species based on IUCN (2021) are defined below:

[4] Fernando 1998. Forest formation and flora of the Philippines. College of Forestry and Natural Resources, University of the Philippines Los Baños.

[5] IUCN. 2021. The IUCN Red List of Threatened Species. Version 2021-3. https://www.iucnredlist.org/

[6] DENR Administrative Order No. (DAO) 2017-11. Updated National List of Threatened Philippine Plants and their Categories. https://bmb.gov.ph/index.php/facts-and-figures-wild/national-list-of-threatened-flora

[7] Convention on International Trade of Wild Flora and Fauna, Joint Meeting of the Animals and Plants Committee, Shepherds town, USA., December 2000.

- Critically Endangered (CR) – A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered (EN) – A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild soon.
- Vulnerable (VU) – A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild soon.
- Near threatened (NT) – Taxa which do not qualify for Conservation Dependent, but which are close to qualify for Vulnerable.
- Least Concern (LC) – Taxa that do not qualify for Conservation Dependent or Near Threatened. Assessment for the IUCN Global Red List only.
- Data deficient (DD) – A taxon is categorized with insufficient information for a proper assessment of conservation status to be made which indicates that little or no information is available on the abundance and distribution of the species. Assessment for the IUCN Global Red List only.

[225]The conservation categories for flora species based on DAO 2017-11 are defined below:

- Critically Endangered (CR) – refers to a species, subspecies, varieties, or other infraspecific categories facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered (EN) – refers to species, subspecies, varieties, or forma that is not critically endangered but whose survival in the wild is unlikely if the causal factors continue operating.
- Vulnerable (VU) – refers to a species or subspecies, varieties, forma, or other infraspecific categories of plants that are not critically endangered nor endangered but are under threat from adverse factors throughout their range and is likely to move to the endangered category in the future. This shall include varieties, forma, or other infraspecific categories.
- Other Threatened Species (OTS) – refers to a species or subspecies that is not critically endangered, endangered, or vulnerable but is under threat from adverse factors, such as over-collection, throughout its range and is likely to move to the vulnerable category soon. Assessment for the Philippine Red List only.

[226]**Fauna Survey Methodology.** The faunal composition and diversity of the study area were assessed thru rapid ocular sampling within selected habitats/ecosystems. The survey covered the four main groups of wildlife fauna: avifauna, mammals, reptiles, and amphibians. Wildlife fauna species were identified through visual and aural observation, as well as through inspection of tracks, droppings, and call, if possible. The frequency/abundance and occurrence of each species sighted/encountered were also recorded as basis in computing biodiversity parameters. As much as possible, wild fauna encountered were photographed for documentation and further verification, when necessary. Double counting of individuals of the same species was avoided. Species encountered at the sampling sites were also photographed for documentation purposes.

[227]**Birds**. The Point Area or Time Area Count Method (TACM), alongside/following foot trails and dirt roads, was employed for the sampling. All bird species sighted, heard, and/or observed through fecal droplets, abandoned nests, and faded feathers were recorded and documented.

The observation was conducted from 6 AM to 10 AM and from 3 PM to 6 PM when birds were most active and feeding.

[228]**Mammals**. For nocturnal and volant vertebrates like nightjars, owls, and bats, observation during dusk hour was undertaken on selected sites. A mist net was also employed to catch volant mammals. In addition, an interview of locals who served as key informants was undertaken to determine the presence/absence of non-volant mammals.

[229]**Reptiles and Amphibians**. A visual encounter survey was conducted by walking through a 50-meter transect for an average of 10 to 20 minutes. Active search for potential abode or breeding areas of amphibians (e.g., small water pools, water channels, bamboo calms) and suitable micro-habitats for both amphibians and reptiles (e.g., stones, pond bunds, crevices, leaf litter/debris, rotten log) was also done within the survey sites. For each species observed/heard, the species name, number of individuals, and the type of habitat where it was found were recorded.

[230]**Fauna Assessment.** Species richness for wildlife fauna was determined based on the data collected. Fauna richness presents the number of different species sampled in an existing ecosystem.

[231]Relative abundance is the ratio of abundance of one species to one or multiple other species thriving in an ecosystem; it describes how common or rare the species are within the sampled ecosystem and how the different species are distributed throughout the entire study area.

[232]Relative frequency of occurrence of each species is the ratio of how many times each species has appeared within the total sampled sites.

[233]The relative abundance and frequency of each species are computed using the following equations below.

$$Relative\ Abundance, in\ \% = \frac{Total\ No. of\ Species\ A}{Total\ No. of\ Individual\ of\ All\ Species}\ x\ 100\%$$

$$Relative\ Frequency\ , in\ \% = \frac{Total\ species\ occurence}{Total\ No. of\ sampling\ site}\ x\ 100\%$$

a. Shannon-Wiener Biodiversity Scale and Pielou's Evenness Index

[234]Species diversity and evenness measurements follow the Shannon-Wiener Index indicated by H' and Pielou's Evenness Index or J'. Computed values for H' and J' shall be referred to the Fernando Biodiversity Scale as previously presented in Table 2-27 to quantify sampled areas in terms of diversity and evenness levels.

b. Conservation Status, Endemism, and Geographical Distribution

[235]Conservation status and endemism of the fauna species is determined with reference to the IUCN Global Red List of Threatened Species version 2021-3[8] and the Philippine Red List based

[8]IUCN. 2021. The IUCN Red List of Threatened Species. Version 2021-3. https://www.iucnredlist.org/

on DAO 2019-09 or the Updated National List of Threatened Philippine Fauna and their Categories[9] pursuant to Section 22 of Republic Act No. 9147, otherwise known as the "Wildlife Resources Conservation and Protection Act".

[236]The conservation categories for fauna species based on IUCN (2021) are defined below:

- Critically Endangered (CR) – A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered (EN) – A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild soon.
- Vulnerable (VU) – A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild soon.
- Near threatened (NT) – Taxa which do not qualify for Conservation Dependent, but which are close to qualify for Vulnerable.
- Least Concern (LC) – Taxa which do not qualify for Conservation Dependent or Near Threatened. Assessment for the IUCN Global Red List only.
- Data deficient (DD) – A taxon categorized with insufficient information for a proper assessment of conservation status to be made which indicates that little or no information is available on the abundance and distribution of the species. Assessment for the IUCN Global Red List only.

The conservation categories for fauna species based on DAO 2019-09 are defined below:

- Critically Endangered (CR) – Refers to a species that is facing an extremely high risk of extinction in the wild in the immediate future; presumed extinct species upon the rediscovery of a population of such a group shall be automatically categorized as critically endangered.
- Endangered (EN) – Refers to a species that is not critically endangered whose survival in the wild is unlikely if the causal factors continue operating.
- Vulnerable (VU) – Refers to a species that is neither critically endangered nor endangered but is under threat from adverse factors throughout its range and is likely to be moved to the endangered category in the future; and,
- Other Threatened/Wildlife Species (OTS/OWS) – Refers to a species that is not critically endangered, endangered, or vulnerable but is under threat from adverse factors, such as over-collection throughout its range, and is likely to be moved to the vulnerable category soon. It also includes species that have the tendency to become threatened due to predation, destruction of habitats, or other similar causes, new species, and species with insufficient scientific information. Such species may be included in the threatened species list by the Secretary upon the recommendation of the Philippine Red list Committee (PRLC) for Wild Fauna and endorsement of the National Wildlife Management Committee (NWMC).

[9] DAO 2019-09 or the Updated National List of Threatened Philippine Fauna and their Categories. https://bmb.gov.ph/index.php/facts-and-figures-wild/national-list-of-threatened-fauna

2.1.4.2 Results and discussion

Results of Flora Survey

a. Taxonomic Composition, Species Richness, and Abundance

[237]A total of 105 species were recorded in 12 monitoring stations across two-season sampling – wet and dry season. During the wet season sampling, 98 plant species were identified which belong to 87 genera and 40 families (see **Table 2-28**). Of these, 40 species are recorded under the canopy layer, 45 species in the intermediate and the remaining 48 species are listed in the understory layer.

[238]While during the dry season sampling, 94 species were recorded which belong to 82 genera and 38 families. Similar species distribution between vegetation layer/type. The vegetations in/around the project site were considered as secondary vegetations. The communities in the proposed project site practice swidden farming/slash-and-burn or *"kaingin"* agriculture. This farming method involves the cutting, slashing, and burning of plant life in a forest or woodland area to create a field called a swidden.

Table 2-28: Number of Species, Genera, and Family for All Species and for each Sampling Layer – Canopy, Intermediate, and Understory Layer, Between Wet and Dry Season Sampling

SEASON / TYPE	SPECIES	GENUS	FAMILY
Wet and Dry Season	**105**	**92**	**41**
Wet season	**98**	**87**	**40**
Canopy layer	40	33	21
Intermediate layer	45	38	25
Understory layer	48	47	23
Dry Season	**94**	**82**	**38**
Canopy layer	41	33	21
Intermediate layer	42	35	24
Understory layer	41	39	20

[239]During the wet season sampling, the most speciose family was Poaceae or the grass family with 10 representative species. This can be due to the habitat types observed in the area which are open areas. These open areas are dominated by grass species such as native grasses like cogon (*Imperata cylindrica*), bagokbok (*Themeda triandra*), and balaniu (*Cymbopogon tortilis*). The second most speciose is Fabaceae or legumes family with nine representative species. Legumes are commonly found in open areas and can grow to a variety of habitats. As observed in the sampling sites, the legumes recorded are narra (*Pterocarpus indicus*), alibangbang (*Piliostigma malabaricum*), auri (*Acacia auriculiformis*) and dilang butiki (*Centrosema pubescens*). Third in the list is the Euphorbiacae with seven representative species, which are also known as tree species in open and secondary forests. These tree species are binunga (*Macaranga tanarius*), banato (*Mallotus philippensis*), and balanti (*Omalanthus populneus*). Among the 40 families, 23 families have single representative species (see **Figure 2-31**).

[240]Similar speciose families were recorded during the dry season sampling. The survey recorded nine representative species each for Fabaceae and Poaceae, eight for Lamiaceae, seven for Euphorbiaceae, and six for Rubiaceae and Asteraceae. This indicates the diversity of species of these families during the wet and dry season sampling.

Figure 2-31: Flora Species Tally by Family Across the Study Between Wet and Dry Season Sampling

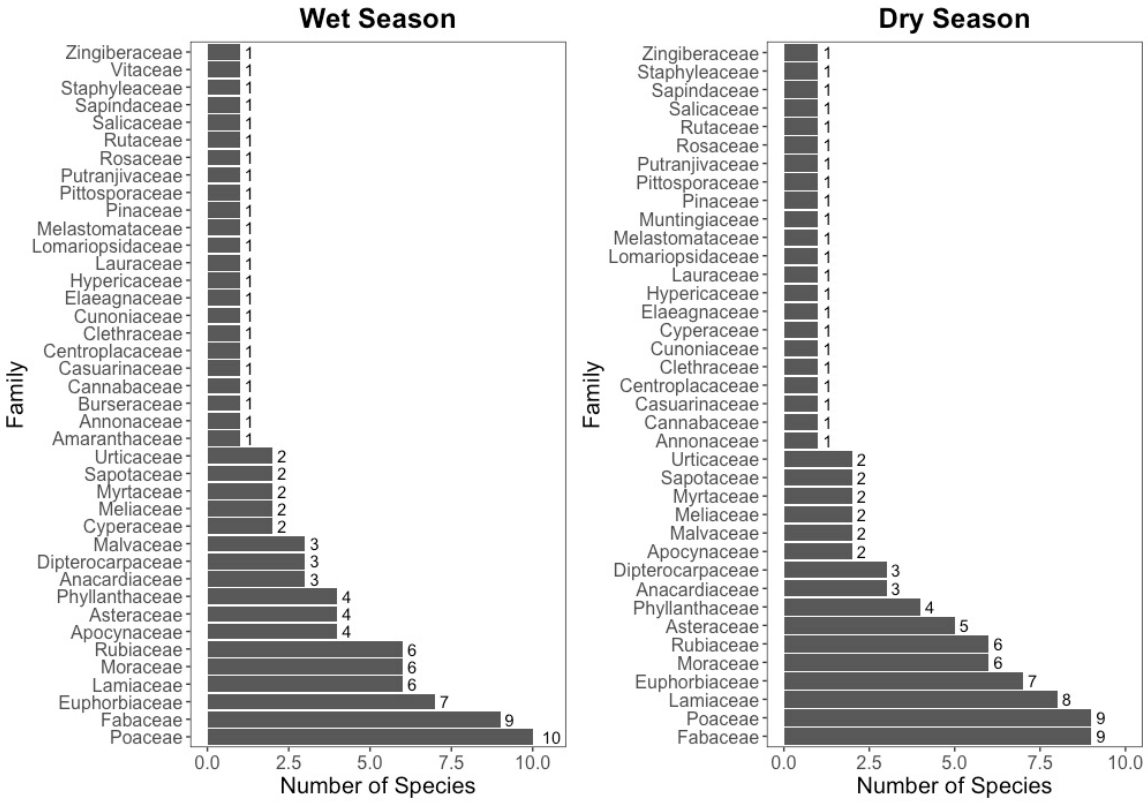


FIGURE TITLE:

FLORA SPECIES TALLY BY FAMILY ACROSS THE STUDY BETWEEN WET AND DRY SEASON SAMPLING

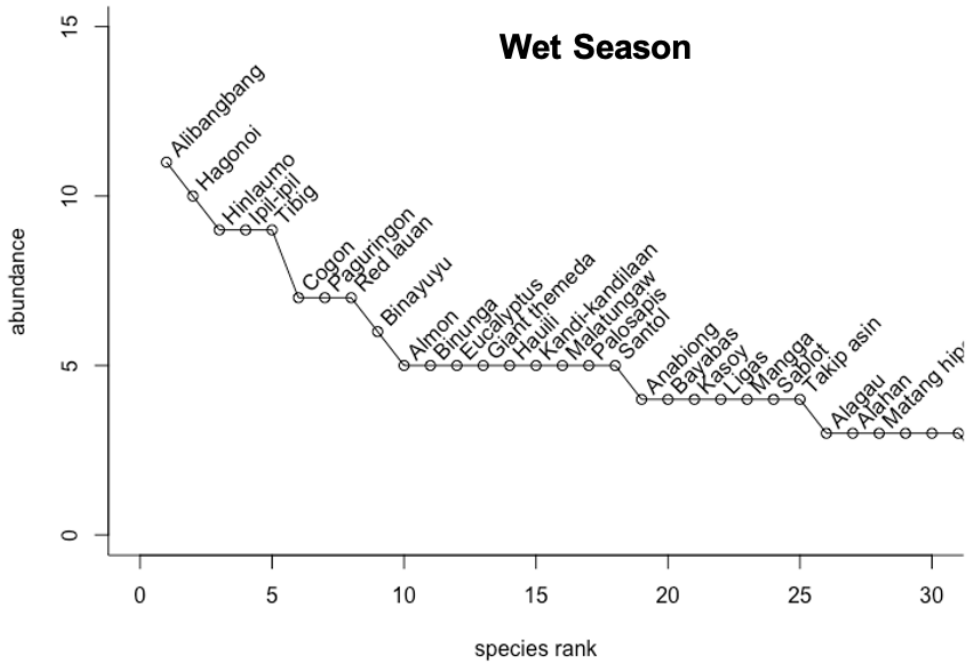
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[241]Among the species in the sampling area during the wet season sampling, the most abundant is alibangbang which are found along grasslands and agricultural landscape. Second, Hagonoi, an understory shrub, is observed in almost all the sampling stations. Other species with similar abundancy are hinlaumo, ipil-ipil, and tibig, with hinlaumo observed in forested and open areas, ipil-ipil in residential and agricultural areas (as fence), and tibig in nearby streams (see **Figure 2-32**).

[242]During the dry season sampling, alibangbang remains the most abundant species across the study area. Shrubs and grasses declined in abundance during the dry season which can be due to forest fires and drying. While trees were almost similar in number between two sampling seasons.

[243]The survey indicates that the abundance of these species in the study area is not changing between wet and dry season. It might need at least a year interval to see the difference.

Figure 2-32: Tree Species Tally by Family Across the Study Between Wet and Dry Season Sampling



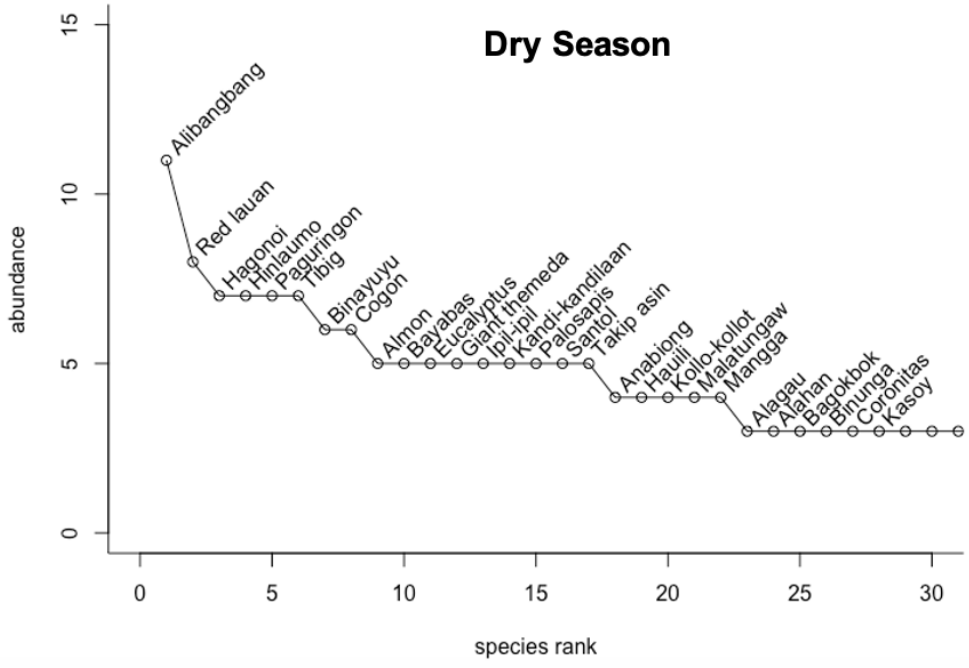


FIGURE TITLE:

TREE SPECIES TALLY BY FAMILY ACROSS THE STUDY BETWEEN WET AND DRY SEASON SAMPLING

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[244]Abundance and species richness per sampling station are presented in **Figure 2-33**. During the wet season sampling, species abundance ranges from seven (open area in plot S01) to 32 stems (forest ecosystem in plot S09) The number of species was also least in plot S01 with six species recorded. While sampling plots S04, S05 and S11 were the most speciose plots with 19 species each. These are combined species from the canopy, intermediate and understory layers. Similar patterns were observed in the sampling stations during the dry season sampling.

Figure 2-33: Species Abundance (Red Bars) and Species Richness (Blue Bars) Distribution in Each Sampling Plot During Wet and Dry Season Sampling

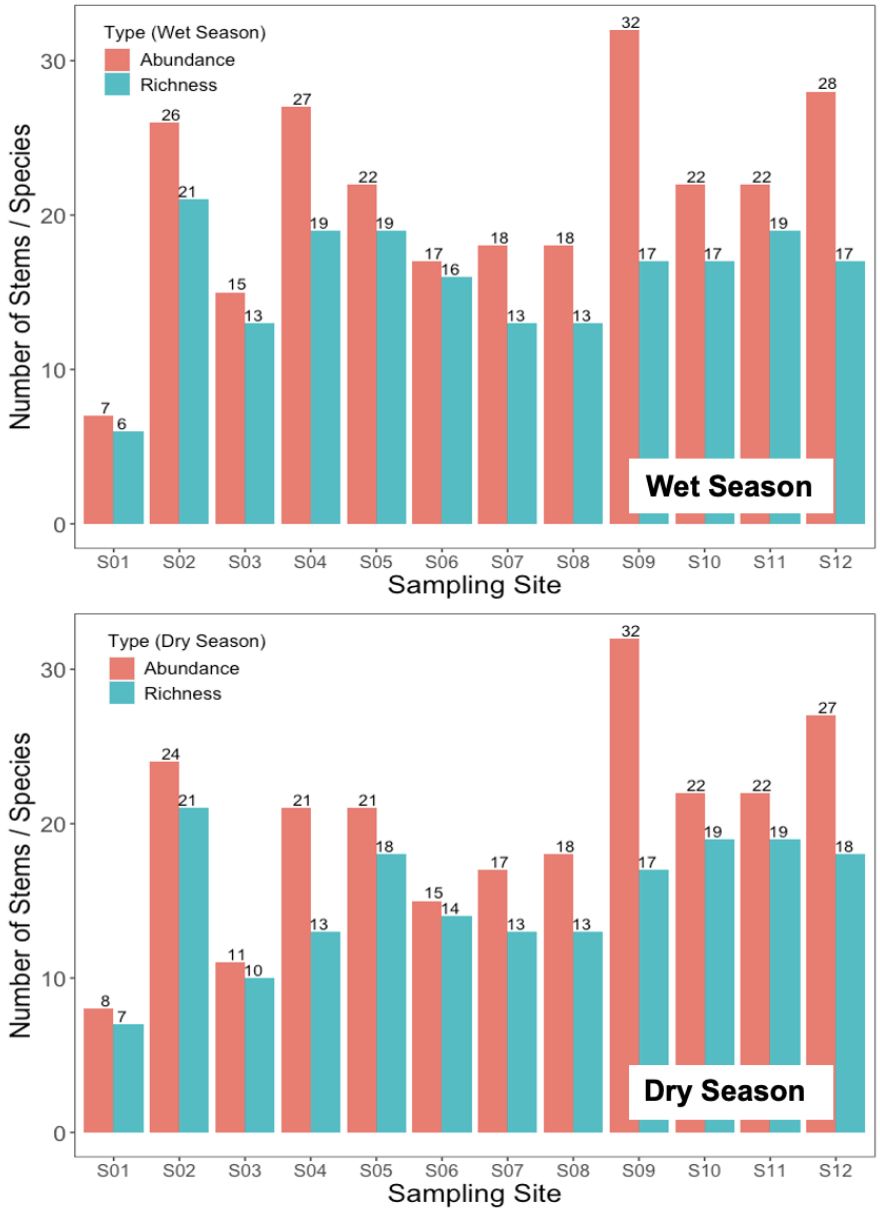


FIGURE TITLE:

SPECIES ABUNDANCE (RED BARS) AND SPECIES RICHNESS (BLUE BARS) DISTRIBUTION IN EACH SAMPLING PLOT DURING WET AND DRY SEASON SAMPLING

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

b. Importance Value Index

[245]The IVI provides an objective score to assess the most important species in terms of their basal area (D = dominance), the frequency of occurrence (F), and density (A = abundance) in the study area, as presented in **Table 2-29**.

[246]During the wet season sampling, the top 15 most important species based on their calculated IVI values comprised 50% of all the 98 species recorded in this study. The dipterocarp species, Palosapis, red lauan, and almon appeared to be the most important species with IVI values of 18.96, 16.24, and 15.29, respectively. This is due to their high basal area values (%RD = 15.41, 12.96, 12.8, respectively). Ranked fourth and fifth were fruit trees Mangga and Santol with IVI values = 11.18 and 11.09, also due to their big diameter/basal area values (%RD = 8.03 and 7.02, respectively). Among all the species recorded, the most abundant species was alibangbang (%RA = 4.33), which ranked sixth with IVI = 10.54, while the most frequently occurring species was hagonoi (%RF = 5.26), which ranked seventh in most important species with IVI = 9.43. This result means that dominance values which are found in big diameter trees were considered as the most important species, even though these are not abundant and frequently occurring. This also indicates that majority of the other species has small diameter stems. On the other hand, few big stems were recorded in some sampling plots, such as in plot 09, the forest ecosystem in this study. However, this plot will not be directly affected by the proposed project since a tunnel road will be constructed under it which will not require the removal of these species.

[247]Results gathered during the dry season sampling showed that the 15 most important species comprised 50% of the 94 species recorded. Same with the wet season sampling, the most important species in the study area are the dipterocarp species, Palosapis, red lauan, and almon, with IVI values of 18.99, 16.85 and 15.27, respectively.

[248]Hagonoi remains the most frequently observed species across the landscape. It is followed by cogon and binayuyu. As for species abundance, alibabang remains the most abundant in the project area. Dominance remains high for the topmost species between two sampling seasons - palosapis, red lauan, almon, manga, and santol, which are the biggest trees identified in the study area. The result indicates that the highest IVI flora species remains the most frequent, abundant, and dominant at a given temporal scale between two seasonal time frames.

Table 2-29: The Importance Value Index (%IVI) Indicates the Most Important Species Due to Frequency of Occurrence (F), Abundance (A), and Dominance (D)

COMMON NAME	F	A	D	%RF	%RA	%RD	IVI
Wet Season Sampling							
Palosapis	0.25	5	0.82	1.58	1.97	15.41	18.96
Red lauan	0.08	7	0.69	0.53	2.76	12.96	16.24
Almon	0.08	5	0.68	0.53	1.97	12.8	15.29
Mangga	0.25	4	0.43	1.58	1.57	8.03	11.18
Santol	0.33	5	0.37	2.11	1.97	7.02	11.09
Alibangbang	0.25	11	0.25	1.58	4.33	4.63	10.54
Hagonoi	0.83	10	0.01	5.26	3.94	0.23	9.43
Kasoy	0.25	4	0.32	1.58	1.57	6.05	9.2
Hinlaumo	0.33	9	0.14	2.11	3.54	2.53	8.18
Tibig	0.5	9	0.06	3.16	3.54	1.1	7.8
Eucalyptus	0.17	5	0.22	1.05	1.97	4.17	7.19
Cogon	0.58	7	0.01	3.68	2.76	0.24	6.68
Ipil-ipil	0.33	9	0.04	2.11	3.54	0.74	6.39
Binayuyu	0.5	6	0.04	3.16	2.36	0.8	6.32
Paguringon	0.25	7	0.03	1.58	2.76	0.59	4.92
Dry Season Sampling							
Palosapis	0.25	5	0.83	1.65	2.1	15.24	18.99
Red lauan	0.08	8	0.7	0.55	3.36	12.94	16.85
Almon	0.08	5	0.69	0.55	2.1	12.62	15.27
Santol	0.33	5	0.39	2.2	2.1	7.13	11.43
Mangga	0.25	4	0.43	1.65	1.68	7.97	11.3
Alibangbang	0.25	11	0.26	1.65	4.62	4.74	11.01
Kasoy	0.17	3	0.32	1.1	1.26	5.92	8.28
Hinlaumo	0.33	7	0.13	2.2	2.94	2.46	7.6
Eucalyptus	0.17	5	0.23	1.1	2.1	4.19	7.39
Hagonoi	0.58	7	0	3.85	2.94	0.08	6.86
Tibig	0.42	7	0.06	2.75	2.94	1.06	6.75
Binayuyu	0.5	6	0.05	3.3	2.52	0.86	6.67
Cogon	0.5	6	0	3.3	2.52	0.08	5.9
Paguringon	0.25	7	0.03	1.65	2.94	0.59	5.18
Giant themeda	0.42	5	0.01	2.75	2.1	0.27	5.11

c. Biodiversity Index

[250]**Figure 2-34** presents the calculated Shannon-Wiener diversity H' and Pielou's evenness J' indices which explain the biodiversity status of the sampling stations. This follows the assessment criteria based on the Fernando Biodiversity Scale (1998).

[251]During the wet season sampling, the diversity H' index indicates that the studied sampling plots have either very low diversity, low diversity, or moderate diversity. Majority of the sampling plots has moderate diversity. Most of the species recorded are categorized in the understory level such as grasses and weeds. Evenness J' index was equally observed for each species, showing Pielou's evenness values close to 1 for all the plots. This means that the number of individuals for each species is mostly equal to each study plot.

[252]During the dry season sampling, the diversity H' index in some plots differed from what has been calculated during the wet season sampling. During the dry season, S02 was considered

with high diversity, which is due to the combination of planted species (agricultural and fruit trees) and naturally grown shrubs and grasses. Among the sampling plots, two of which (S03 and S04) became of low diversity status due to burned landscape in its ecosystem. The diversity H' of the rest remained the same as calculated during the wet season sampling.

Figure 2-34: Flora Biodiversity Indices Between Wet and Dry Season Sampling

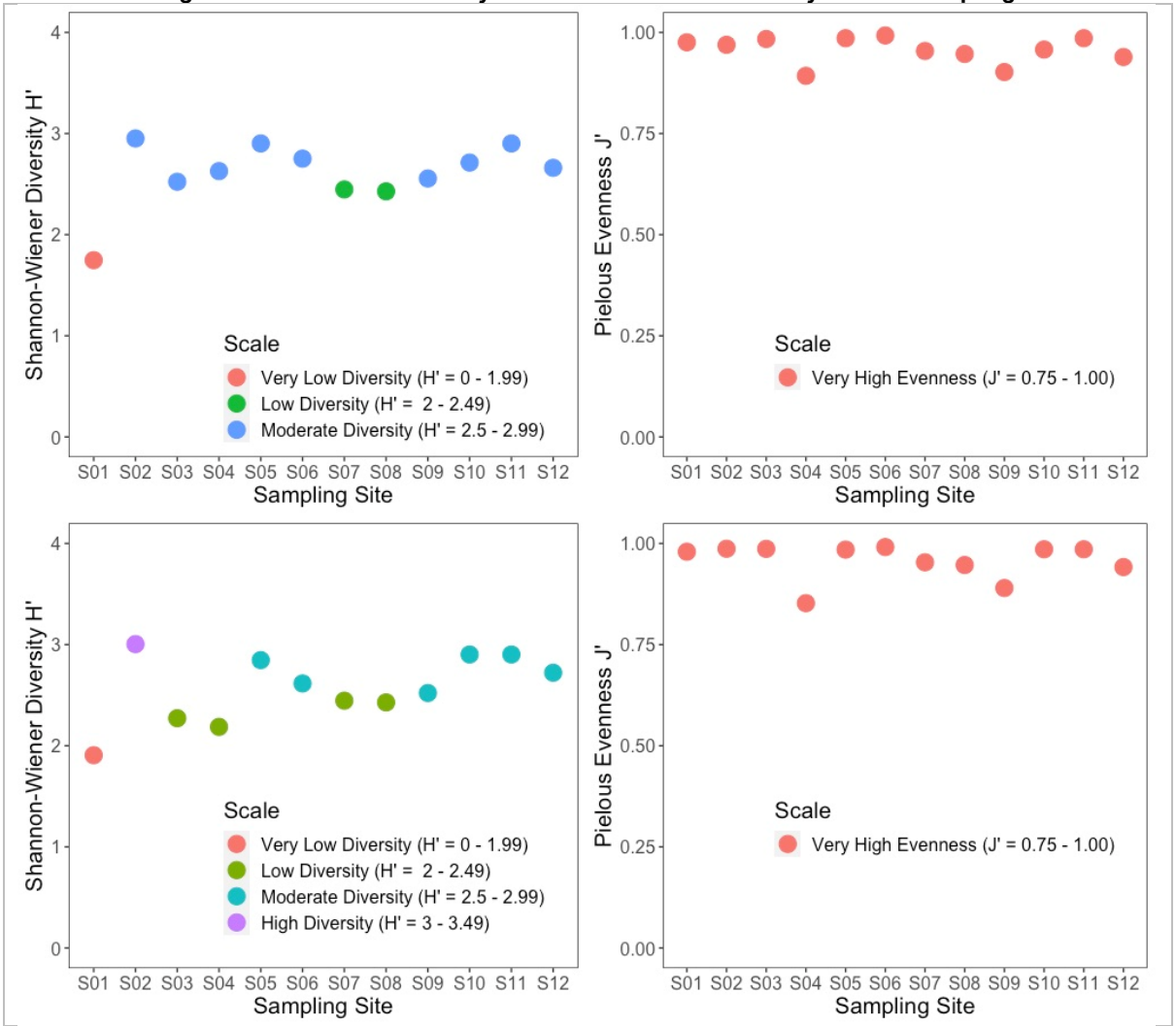


FIGURE TITLE:

FLORA BIODIVERSITY INDICES BETWEEN WET AND DRY SEASON SAMPLING

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

d. Distribution and Conservation Status

[253]**Endemicity**. As shown in **Figure 2-35**, during the wet season, 17 species are considered as endemic or species that can only be found in the Philippines. Some of these species are antipolo, bayag usa, gakakan, itangan, lisak, red lauan and takip asin. Majority (58) of the species are classified as indigenous or species which are native in the Philippines but are not restricted in the country. One example is Matunga which grows profusely in higher elevation areas. Endemic and indigenous species listed in this study, specifically the tree species can be used as priority species in reforestation activities. Also, there are 24 exotic species recorded in the sampling plots. These are non-native species in the Philippines or have been introduced species that can potentially be invasive. Exotic species in the study area are hagonoi, kandi-kandilaan, and coronitas and others are planted species such as gmelina, sampalok, teak, and langka. During the dry season sampling (see **Figure 2-35**), endemic and indigenous species were fewer with 16 and 52 species recorded, respectively. Also, there are more exotic species identified during the dry season sampling. This indicates the growth of some exotic weeds (i.e., bulak manok, red flower ragweed, and suob kabayo) and drying or death of some native species (i.e., kaliantan, pandakaki, and bayag usa).

Figure 2-35: Flora Endemicity Distribution Identified as Endemic, Indigenous and Exotic Species Between Wet and Dry Season Sampling

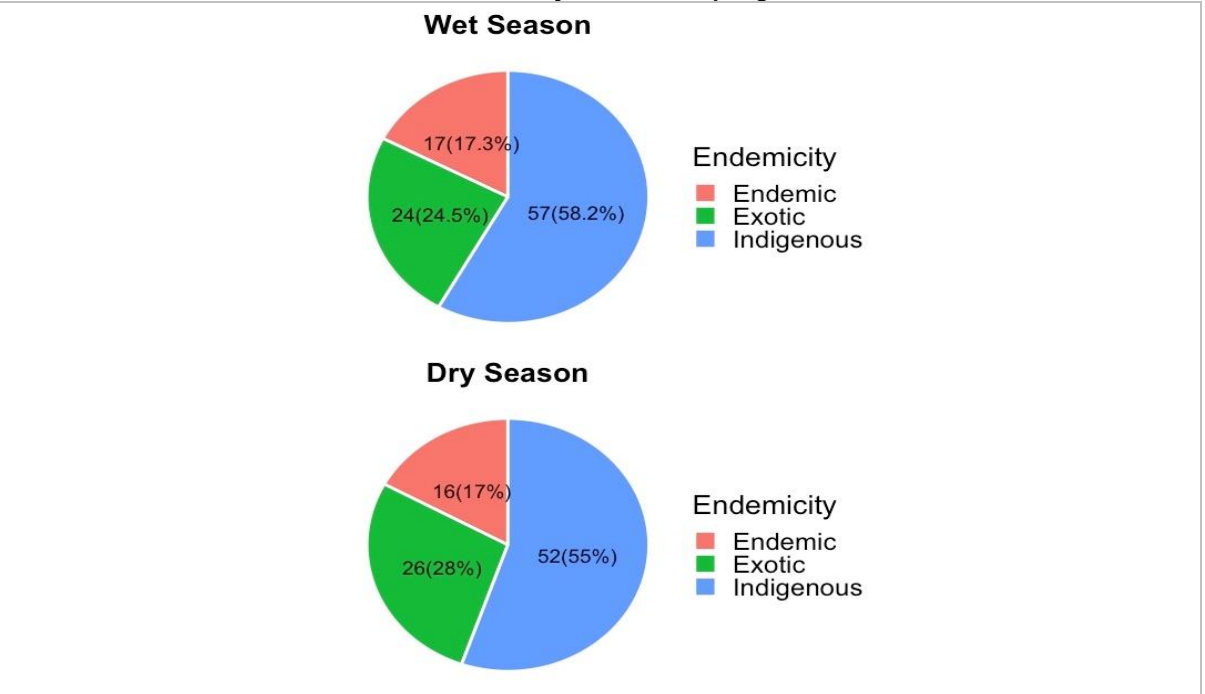


FIGURE TITLE:		
FLORA ENDEMICITY DISTRIBUTION IDENTIFIED AS ENDEMIC, INDIGENOUS AND EXOTIC SPECIES BETWEEN WET AND DRY SEASON SAMPLING		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[254]**Conservation Status**. A total of 56 species were listed under IUCN 2021 and DAO 2017-11 red list (see **Table 2-30**).

[255]During the wet season sampling, there are 51 out of 98 species recorded either under the DAO 2017-11 or IUCN 2021 conservation categories. Of the 51 species, six were under DAO 2017-11, with five vulnerable (VU) species, namely red lauan, almon, narra, malak-malak, and

tagbak, and the remaining was listed in other threatened species (OTS). Based on DAO 2017-11, no species was recorded as highly threatened (critically endangered, endangered). Under the IUCN category, 49 species were identified. 40 of these are of least concern (LC), one is data deficient (DD), three are near threatened (NT), and four VU species. Only one species is considered as highly threatened with endangered (EN) status which is Narra. However, Narra can still be found in many places in the Philippines. Also, it is one of the main species in reforestation activities, hence, listed as VU species and not as a highly threatened species in the country.

[256]During the dry season sampling, 46 species were listed either under IUCN or DAO. Under DAO 2017-11, four species were identified which are the same species listed during the wet season sampling. Under IUCN, 45 species were listed, but 42 of these are either data deficient (DD), of least concern (LC), or as near threatened (NT) species, while the remaining three species were identified as vulnerable (VU). This indicates that there are no species listed as critically endangered (CR). This also means that no species are of serious concern within the proposed project alignment covered by the sampling plots studied.

[257]**Table 2-30** summarizes the priority species listed in this study to be used in reforestation activities with consideration of the endemicity status.

Table 2-30: Conservation Status of Plants Recorded in the Study Area

NO.	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	WET SEASON	DRY SEASON	DAO 2017-11	IUCN 2021
1	Anacardiaceae	*Anacardium occidentale*	Kasoy	x	-	-	LC
2	Anacardiaceae	*Mangifera indica*	Mangga	x	x	-	DD
3	Annonaceae	*Annona muricata*	Guyabano	x	x	-	LC
4	Apocynaceae	*Alstonia macrophylla*	Batino	x	x	-	LC
5	Apocynaceae	*Tabernaemontana pandacaqui*	Pandakaki	x	-	-	LC
6	Apocynaceae	*Voacanga globosa*	Bayag usa	x	-	-	LC
7	Apocynaceae	*Wrightia pubescens*	Lanete	x	x	-	LC
8	Asteraceae	*Blumea balsamifera*	Sambong	x	x	-	LC
9	Burseraceae	*Canarium asperum*	Pagsahingin	x	-	-	LC
10	Casuarinaceae	*Casuarina equisetifolia*	Agoho	x	x	-	LC
11	Centroplacaceae	*Bhesa paniculata*	Biku-biku	x	x	-	LC
12	Cunoniaceae	*Weinmannia luzoniensis*	Itangan	x	x	-	NT
13	Cyperaceae	*Cyperus rotundus*	Mutha	x	-	-	LC
14	Dipterocarpaceae	*Anisoptera thurifera*	Palosapis	x	x	-	VU
15	Dipterocarpaceae	*Shorea almon*	Almon	x	x	VU	NT
16	Dipterocarpaceae	*Shorea negrosensis*	Red lauan	x	x	VU	LC
17	Euphorbiaceae	*Homonoia riparia*	Lumanai	x	x	-	LC
18	Euphorbiaceae	*Macaranga grandifolia*	Takip asin	x	x	-	VU
19	Euphorbiaceae	*Macaranga tanarius*	Binunga	x	x	-	LC
20	Euphorbiaceae	*Mallotus mollissimus*	Hinlaumo	x	x	-	LC
21	Euphorbiaceae	*Mallotus philippensis*	Banato	x	x	-	LC
22	Fabaceae	*Acacia auriculiformis*	Auri	x	x	-	LC
23	Fabaceae	*Albizia lebbeck*	Langil	x	x	-	LC
24	Fabaceae	*Mimosa pudica*	Makahiya	-	x	-	LC
25	Fabaceae	*Pterocarpus indicus*	Narra	x	-	VU	EN
26	Fabaceae	*Tamarindus indica*	Sampalok	x	x	-	LC
27	Hypericaceae	*Cratoxylum sumatranum*	Paguringon	x	x	-	LC
28	Lamiaceae	*Clerodendrum macrostegium*	Pay-at	x	x	-	LC
29	Lamiaceae	*Gmelina arborea*	Gmelina	x	x	-	LC
30	Lamiaceae	*Stachytarpheta jamaicensis*	Kandi-kandilaan	x	x	-	LC

NO.	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	WET SEASON	DRY SEASON	DAO 2017-11	IUCN 2021
31	Lauraceae	*Litsea glutinosa*	Sablot	x	-	-	LC
32	Malvaceae	*Commersonia bartramia*	Kakaag	x	-	-	LC
33	Malvaceae	*Urena lobata*	Kollo-kollot	-	x	-	LC
34	Meliaceae	*Sandoricum koetjape*	Santol	x	X	-	LC
35	Meliaceae	*Sandoricum vidalii*	Malasantol	x	X	-	VU
36	Moraceae	*Artocarpus blancoi*	Antipolo	x	X	-	LC
37	Moraceae	*Ficus minahassae*	Hagimit	x	X	-	LC
38	Moraceae	*Ficus nota*	Tibig	x	-	-	LC
39	Moraceae	*Ficus ruficaulis*	Tabgun	x	X	-	LC
40	Moraceae	*Ficus septica*	Hauili	x	X	-	LC
41	Myrtaceae	*Eucalyptus robusta*	Eucalyptus	x	X	-	NT
42	Myrtaceae	*Psidium guajava*	Bayabas	x	X	-	LC
43	Phyllanthaceae	*Antidesma ghaesembilla*	Binayuyu	x	X	-	LC
44	Phyllanthaceae	*Bischofia javanica*	Tuai	x	X	-	LC
45	Phyllanthaceae	*Breynia vitis-idaea*	Matang hipon	x	X	-	LC
46	Pinaceae	*Pinus kesiya*	Benguet pine	x	X	-	LC
47	Poaceae	*Paspalum conjugatum*	Carabao grass	x	X	-	LC
48	Poaceae	*Saccharum spontaneum*	Talahib	x	X	-	LC
49	Putranjivaceae	*Drypetes falcata*	Gakakan	x	X	OTS	-
50	Rubiaceae	*Mussaenda anisophylla*	Mussaenda	x	X	-	NT
51	Rubiaceae	*Neonauclea bartlingii*	Lisak	x	X	-	LC
52	Sapindaceae	*Guioa koelreuteria*	Alahan	x	X	-	LC
53	Sapotaceae	*Palaquium philippense*	Malakmalak	x	X	VU	LC
54	Sapotaceae	*Pouteria campechiana*	Tiesa	x	X	-	LC
55	Urticaceae	*Leucosyke capitellata*	Alagasi	x	x	-	LC
56	Zingiberaceae	*Alpinia elegans*	Tagbak	x	-	VU	-

[258]**Results of Fauna Survey**. Combining the recorded species during the survey in June 2021 (wet season) and January 2022 (dry season), a total of 74 wild fauna species were identified within the study area. Recorded fauna was dominated by birds composed of 61 species or 82.4%. Other species are reptiles (5.4%), mammals (9.4%), and amphibians (2.7%). Included in the record are those species sited outside the transect route but within the periphery of the study area, and species reported by locals that are presumed to be still in existence and infrequently wandering in the area. A decrease in population is expected due to hunting, human disturbance, and loss of habitat due to human encroachment in the forest land and conversion of forest land to agriculture. Among the reported species includes the Wild boar, Philippine Macaque, Common Palm Civet, Python, Philippine Deer, and monitor lizard.

[259]In a survey during the wet season (June 2021), there are 48 species of birds that are recorded within the project area. While during the dry season (January 2022), there are 49 species of birds that are recorded. Notably, 36 of the species recorded are found to be common and prevailing during the two-survey period. Relative to this, there are 12 species found during the wet season which are not encountered during the dry season survey. Conversely, 13 species of avifauna are recorded in the dry season survey that was not encountered in the wet season survey period. Among the possible reason for the absence/presence of some avifauna species during the survey periods can be associated with timing, weather condition, availability of forage, disturbance in the area due to incurring human activities in the area like road improvement works, existence of vegetation cover, and other factors.

[260]The distribution of recorded avifauna species showed that 14 or 22.9% species are endemic in the country, 39 or 63.9% are resident or native, 6 or 9.8% are migrant, and 2 or 3.27% are

resident with migrant population. Data shows that majority of the resident or native species are the dominant species followed by endemic species.

[261]In terms of the conservation status, there are only 3 bird species that are included in the list of threatened species which include the Amethyst Brown Dove (*Phapitreron amethystine*)- Critically Endangered (DAO 2019-09), Indigo banded King Fisher (*Ceyx cyanopectus*)- Critically Endangered (DAO 2019-09), and the Philippine Duck (*Anas luzonica*)- Critically Endangered (IUCN and DAO 2019-09). The complete list of faunal species and their conservation status is found in **ANNEX E** (Summary List of Flora and Fauna Species).

Table 2-31: Species Not Encountered During the Survey Period

A. SPECIES NOT ENCOUNTERED DURING THE DRY SEASON BUT RECORDED IN WET SEASON SURVEY		B. SPECIES NOT ENCOUNTERED DURING THE WET SEASON SURVEY BUT RECORDED IN DRY SEASON SURVEY	
Amethyst Brown Dove*	*Phapitreron amethystina*	**Barn Swallow**	*Hirundo rustica*
Asian Emerald Dove*	*Chalcopaps indica*	**Brown Shrike**	*Lanius cristatus*
Barred Rail	*Gallirallus torquatus*	**Cattle Egret**	*Bubulcus ibis*
Brahminy Kite	*Haliastur inbus*	**Black-shouldered Kite**	*Elanus caeruleus*
Cinnamon Bittern	*Ixobrychus cinnamomeus*	**Guaiabero**	*Bolbopsittacus lunulatus*
Little Ringed Plover*	*Charadrius dubius*	**Indigo banded King Fisher**	*Ceyx cyanopectus*
Little Pied Flycatcher	*Ficedula westermanni*	**Little Egret**	*Egretta garzetta*
Philippine Duck*	*Anas luzonica*	**Pacific Swallow**	*Hirundo tahita*
Pied Thriller	*Lalage nigra*	**Pied Harrier**	*Circus melanoleucos*
Plain Bush Hen*	*Amauronis olivaceus*	**Red Crested Malkoha**	*Phaenicophaeus superciliosus*
Red Jungle Fowl*	*Gallus gallus*	**Scale Feathered Malkoha**	*Lepidogrammus cumingi*
Small Bottom Quail**	*Turnix sylvatica*	**Spotted Bottom Quail**	*Butorides striatus*
		White Belied Munia	*Lonchura leucogastra*

a. Fauna Composition During the Wet Season Survey

[262]A total of 60 wild fauna species was recorded within the study area composed of 48 birds (80%), four reptiles (6.7%), six mammals (10%), and two amphibians (3.3%). Directly observed fauna species within the sampling sites were composed of 39 species or 65% represented by 37 birds and two reptiles. Outside the sampling points, there are about thirteen (13) species or 22% are observed composed of 10 birds, two amphibians and one mammal. Furthermore, the interview of the key informant revealed the presence of eight species not encountered during the survey. These species were one bird, two reptiles and five mammals.

[263]**Table** 2-32 presents the distribution of fauna species recorded within the study area.

[264]There were reported species which were not observed during the entire duration of the survey in the study area. These are the Philippine Deer (*Rusa Sp*.), Wild Boar (*Sus philippensis*), Monitor Lizard (*Varanus salvator*), Small Botton Quail (*Turnix sylvatica*), Common Philippine field rat (*Rattus rattus*), Common Palm Civit (*Paradoxurus hermaphroditus*), Philippine Long-Tailed Macaque (*Macaca fascicularis philippensis*), and Python (*Python reticulatus*).

Table 2-32: Distribution and Composition of Recorded Fauna Species Wet Season Survey

LOCATION	BIRD	AMPHIBIAN	REPTILE	MAMMAL	TOTAL	%
Species observed within sampling sites	37	0	2	0	39	65
Species observed outside the plot	10	2	0	1	13	21.67
Reported species	1	0	2	5	8	13.33
TOTAL	**48**	**2**	**4**	**6**	**60**	**100**

[265]Recorded species in the study area are living in the lowland areas which include agricultural, shrubs, grass, inland wetlands, and even along residential areas. Listed avifauna species are varieties of frugivores and insectivores which commonly feed on varieties of fruits, fish, flower's nectar, and preys on other living organisms (i.e., insects, and spiders).

[266]Birds are the dominant wild fauna in the area. Birds are highly mobile in nature that can move from one place to another depending on the availability of food sources and less pervasiveness of disturbances brought by anthropogenic activities. In this study, some of the recorded species are presumed to be passersby or just visiting the site to feed.

b. Species Richness and Abundance of Observed Species (Using the Avifauna Data) During the Wet Season Survey

[267]The assessed area covering the 12 sampling stations garnered a total richness of 37 species. Sampling station S09 has the highest species richness of 13 followed by station S03 with 12 species and S02 and S05 with the same species richness of 9. Conversely, stations S01, S11, and S12 have the lowest species richness of 4 (each), see **Figure 2-36**.

[268]In terms of abundance, the 12 sampled stations have a total of 240 individuals. The sampling station in S12 registered the highest abundance of 67 individuals. It is followed by sampling stations S10 and SO3 with a total abundance of 28 and 21 individuals, respectively. The species with the highest computed relative abundance is the Chestnut Munia (*Lonchura atricapilla*) with a total of 27.50%. It is followed by the Yellow Vented Bulbul (*Pycnonotus goiavier*) and Scaly-breasted Munia (*Lonchura punctulata*) with a relative abundance of 10.42% and 10.0%, respectively, (see **Figure 2-37**). Habitat of these species is associated with agricultural areas, shrublands, and open areas.

Figure 2-36: Avifauna Richness and Abundance of the 12 Sampling Stations During the Wet Season Survey

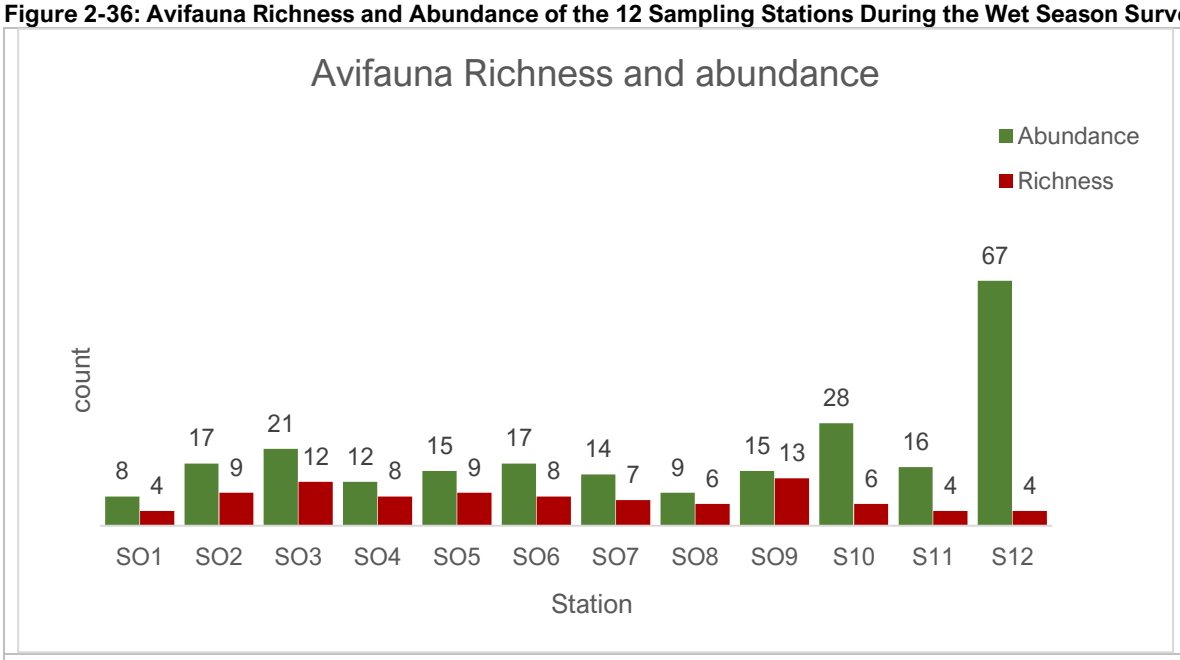


FIGURE TITLE:

AVIFAUNA RICHNESS AND ABUNDANCE OF THE 12 SAMPLING STATIONS DURING THE WET SEASON SURVEY

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Figure 2-37: Species Abundance of Observed Bird Species Within the 12 Sampling Stations During the Wet Season Survey

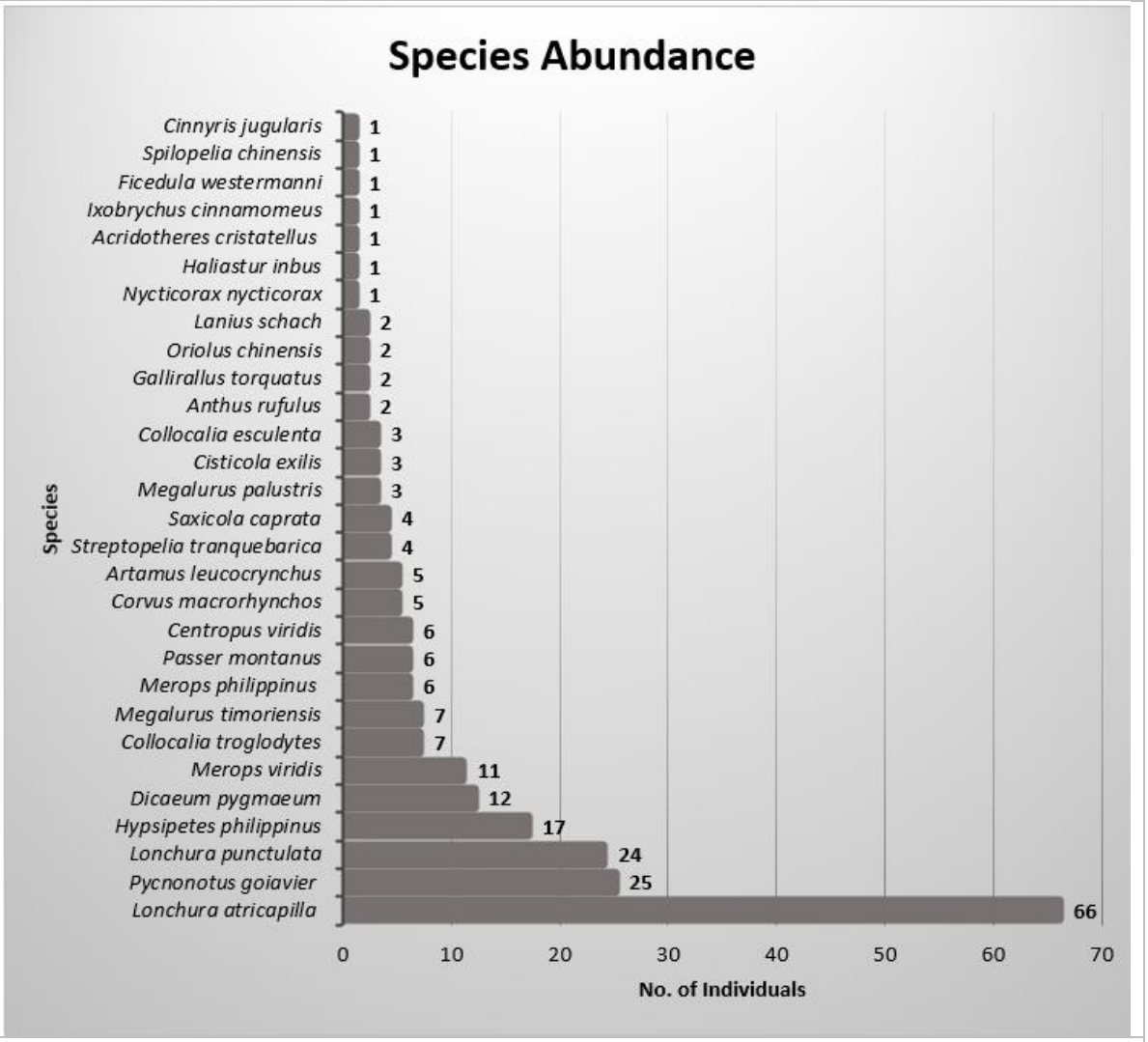


FIGURE TITLE:

SPECIES ABUNDANCE OF OBSERVED BIRD SPECIES WITHIN THE 12 SAMPLING STATIONS DURING THE WET SEASON SURVEY

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

c. Family Composition (Avifauna only)

[269]The overall recorded avifauna species within the sampled sites belong to 19 families dominated by Columbidae with six species represented by doves. It is followed by Motacillidae with four species of Wagtails, Swallows, and Pipit. Other prevailing families are the Alcedinidae, Ardeidae, and Muscicapidae composed of three species of each family. Species under these families are the Kingfishers, Egrets, Fantails, Bush chats, and Flycatchers. The remaining 14 families are commonly represented by either two or one species, see **Figure 2-38.**

Figure 2-38: Avifauna Family and Species Composition During the Wet Season Survey

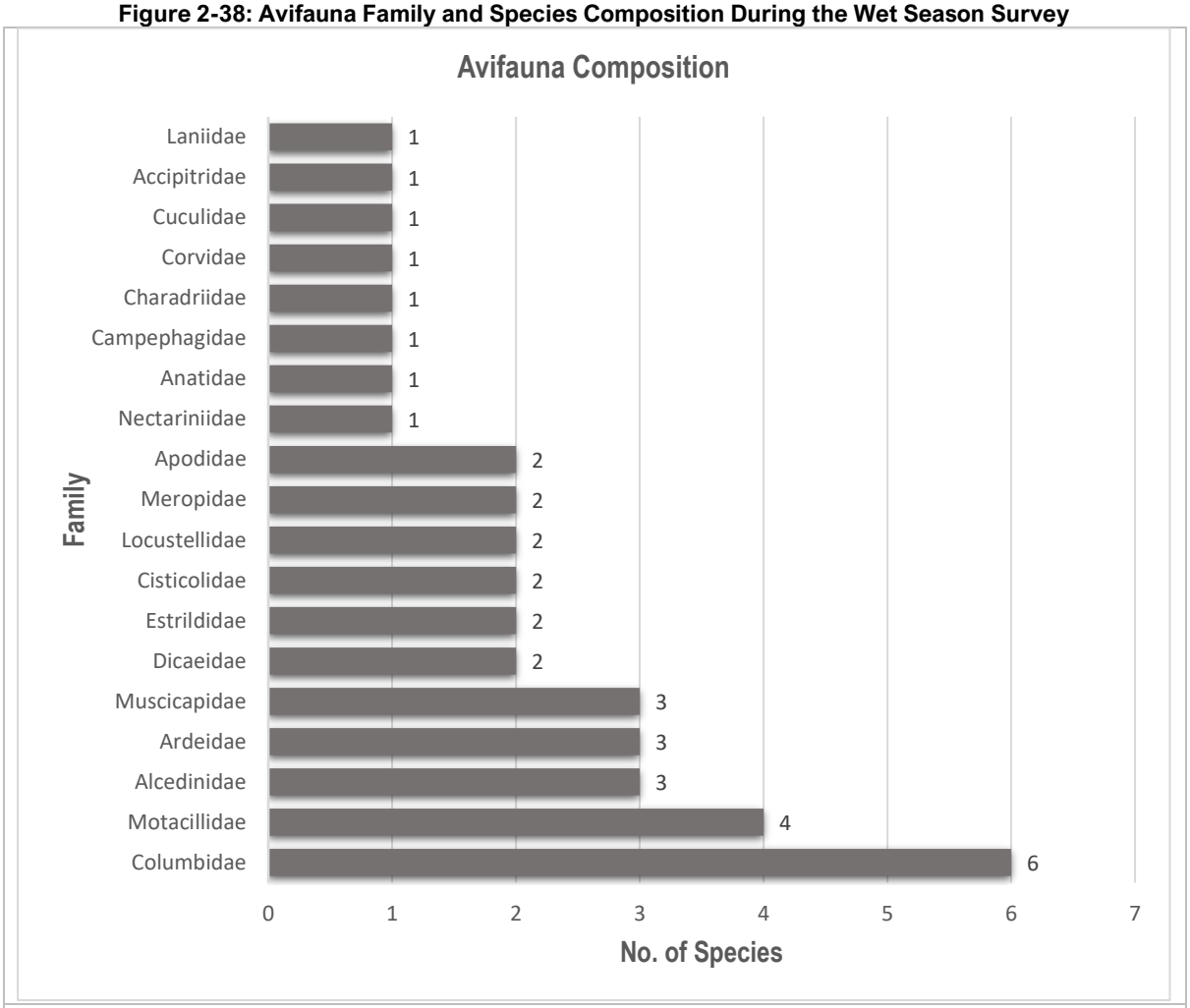


FIGURE TITLE:

AVIFAUNA FAMILY AND SPECIES COMPOSITION DURING THE WET SEASON SURVEY

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

d. Relative Frequency of Species During the Wet Season Survey

[270]Species with the highest computed relative frequency of occurrence within the 12 sampling sites are the Yellow Vented Bulbul (*Pycnonotus goiavier*), Philippine Bulbul (*Hypsipetes philippinus*), Philippine Coucal (*Centropus viridis*), and Chestnut Munia (*Lonchura atricapilla*) with 10.8%, 7.2%, 6.0%, and 6.0%, respectively]. The rest has a computed relative frequency ranging from 1.2% to 4.8%.

e. Conservation Status of Species During the Wet Season Survey

[271]The conservation status of the 60 recorded species within the study area was referred to the International Union for Conservation of Nature (IUCN) Red List and DENR Administrative Order 2019-09. Under IUCN, Philippine Duck (*Anas luzonica*), Wild Boar (*Sus philippensis*) and Philippine Deer (*Rusa Sp.*) are Vulnerable in the category. The category is described as not Critically Endangered or Endangered but is facing a high risk of extinction in the wild soon. Conversely, the Common Philippine field rat (*Rattus rattus*) and Philippine Mabuya (*Eutropis multicarinata*) are not evaluated against the categories. The rest of the species fall under the

Least Concern category described as not qualified for Conservation Dependent or Near Threatened.

[272]Under DAO 2019-09, there are six fauna species under the updated list of threatened Philippine fauna species. One Critically Endangered, one Endangered, two Vulnerable and two species are under the Other Threatened Species category. Three of these species are reported, two are observed outside the sampling sites and one is observed within the sampling site (see **Table 2-33)**. The rest of the species are not included in the list. The status of these species is described as follows;

- Critically Endangered. A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered. A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.
- Vulnerable. A taxon is Vulnerable when it is not Critically Endangered or
- Endangered but is facing a high risk of extinction in the wild in the near future.
- Other Threatened Species. A species or sub-species that is not critically endangered, endangered nor vulnerable but is under threat from adverse factors, such as over collection, throughout its range and is likely to move to the vulnerable category soon. Assessment for the Philippine Red List only.

Table 2-33: Threatened Species Under DAO 2019-09 During the Wet Season Survey

COMMON NAME	SCIENTIFIC NAME	STATUS
Amethyst Brown Dove*	*Phapitreron amethystina*	Critically Endangered (CR)
(CR)Philippine Deer**	*Rusa Sp.*	Endangered (EN)
Wild Boar**	*Sus philippensis*	Vulnerable (VU)
Philippine Duck*	*Anas luzonica*	Vulnerable (VU)
Gecko/Tokay	*Gecko gecko*	Other Threatened Species OTS)
Python**	*Python reticulatus*	Other Threatened Species (OTS)

f. Distribution Status of Species Recorded During the Wet Season Survey

[273]Endemism is the ecological state of a species being unique to a defined geographic location i.e., island, nation or country, habitat type or an ecosystem, or another defined biogeographic zone. In the case of fauna species recorded within the study area, there are 18 species found to be endemic in the country composed of 10 birds, two reptiles, five mammals, and one amphibian (see **Table 2-34**). The list of endemic species is presented in **Table 2-35**. On other hand, 37 of the species are resident or Native in the country which is composed of 34 birds, one mammal, and two reptiles. Other species are migrant, introduced, and resident with migrant population. Migrant species are the Yellow-wagtail (*Motacilla flava*), Black Crowned Night Heron (*Nycticorax nycticorax*), and Common King Fisher (*Alcedo atthis*). While introduced species in the country is the Marine Toad (*Bufo marinus*) which is intended for various purposes as a predator to pest to biologically control insect pest in agricultural areas.

Table 2-34: Fauna Distribution Status and Abundance

ENDEMICITY	COUNT	REMARKS
Endemic	18	10 birds, 2 reptiles, 5 mammals, 1 amphibian
Resident with migrant population	1	Bird
Resident/Native	37	34 birds, 1 mammal and 2 reptiles
Migrant	3	all birds
Introduced	1	Amphibian

Table 2-35: Endemic Fauna Species

GROUP	COMMON NAME	SCIENTIFIC NAME
Bird	Amethyst Brown Dove*	*Phapitreron amethystina*
Bird	Philippine Bulbul	*Hypsipetes philippinus*
Bird	Philippine Coucal	*Centropus viridis*
Bird	Philippine Duck*	*Anas luzonica*
Bird	Philippine Pied-Fantail	*Rhipidura nigritorquis*
Bird	Plain Bush Hen*	*Amauronis olivaceus*
Bird	Pygmy Flower Pecker	*Dicaeum pygmaeum*
Bird	Pygmy Swiftlet*	*Collocalia troglodytes*
Bird	Red-keeled Flowerpecker*	*Dicaeum 2-86ustral*
Bird	White Eared Brown Dove*	*Phapitreron leucotis*
Reptile	Philippine Mabuya	*Eutropis multicarinata*
Reptile	Python**	*Python reticulatus*
Amphibian	Asian Narrow Mouth Frog*	*Kalaulo picta*
Mammal	Philippine Long-Tailed Macaque**	*Macaca fascicularis philippensis*
Mammal	Lesser musky fruit bat*	*Ptenochirus minor*
Mammal	Common Philippine field rat **	*Rattus rattus mindanensis*
Mammal	Philippine Deer**	*Rusa Sp.*
Mammal	Wild Boar**	*Sus philippensis*

g. Diversity and Evenness Indices of Species Recorded During the Wet Season Survey

[274]Diversity level and species evenness indices were computed by employing the Shannon-Wiener (H') Diversity and Pielou's (J') Evenness Indices using the **"R" program**. Results showed that the diversity level of the assessed area is from **very low** to **low diversity,** see **Figure 2-39**. The computed values ranged between 1.3 to 2.6. The sampling station with the highest computed diversity is SO3 with a diversity (H) value of 2.39. However, under the Fernando Biodiversity Scale (1998), it is interpreted to be low in diversity. Conversely, site nos. S09 and S011 have the lowest computed diversity of 1.3 which is interesting to be very low on the scale.

Figure 2-39: Diversity Index Following the Fernando Biodiversity Scale

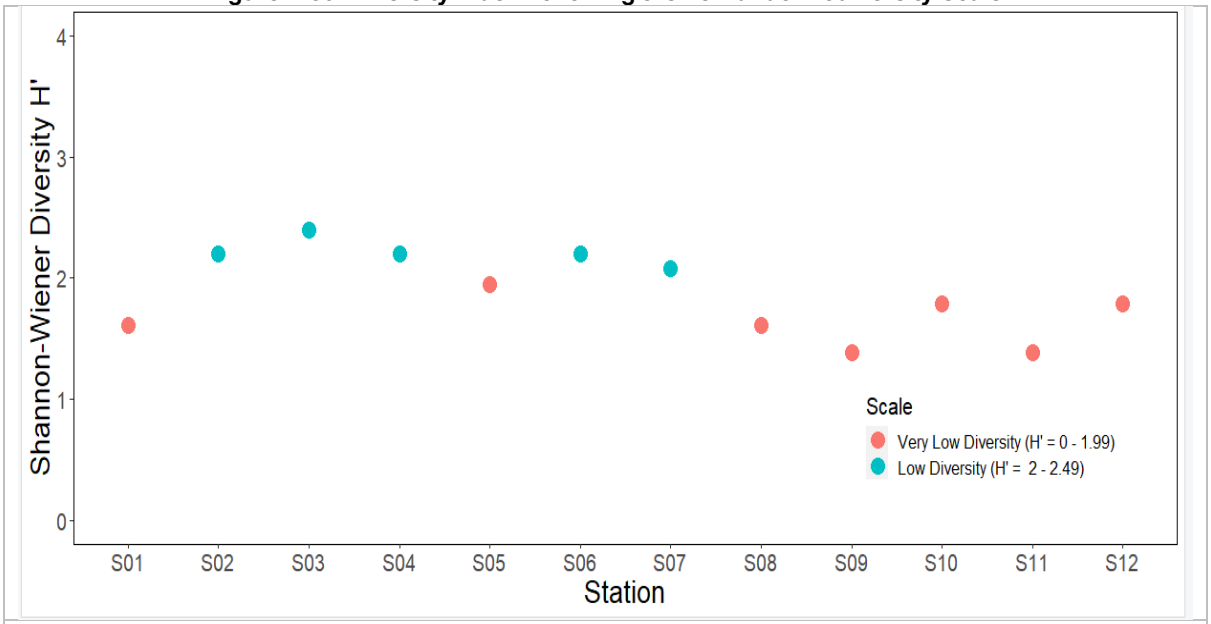


FIGURE TITLE:		
DIVERSITY INDEX FOLLOWING THE FERNANDO BIODIVERSITY SCALE		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[275]On the other hand, the computed evenness scale of the twelve (12) stations registered a very high evenness with computed values ranging from 0.75 to 1.0 as referred to Fernando Biodiversity Scale. **Figure 2-40** shows the graphical presentation of the species evenness indices of the sampled sites. The result of computed evenness of the sampled sites reveals that the recorded species are commonly found in the study area.

Figure 2-40: Evenness Index Following the Fernando Biodiversity Scale of Species During the Wet Season Survey

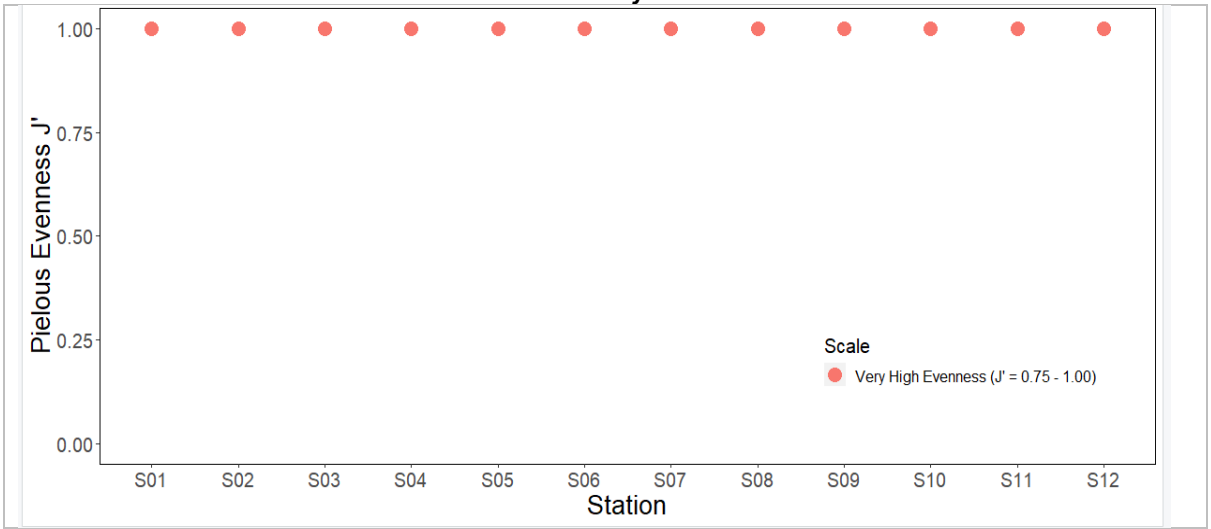


FIGURE TITLE:		
EVENNESS INDEX FOLLOWING THE FERNANDO BIODIVERSITY SCALE OF SPECIES DURING THE WET SEASON SURVEY		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

h. Fauna Composition During the Dry Season Survey

[276]During the dry season survey, a total of 54 wild fauna species was recorded within the study area. It is composed of 49 birds (90.7%), three reptiles (5.6%), one mammal (1.9%), and one amphibian (1.9%). Fauna species recorded within the sampling sites are composed of 41 species or 81.5% represented by 41 birds, one amphibian, one mammal, and one reptile. The rest are observed outside the sampling points. **Table 2-36** presents the distribution and faunal composition recorded within this period.

Table 2-36: Distribution and Fauna Composition During Dry the Season Survey

LOCATION	BIRD	AMPHIBIAN	REPTILE	MAMMAL	TOTAL	%
Species observed within sampling sites	41	1	1	1	44	81.5
Species observed outside the plot	8	0	2	0	10	18.5
TOTAL	**49**	**1**	**3**	**1**	**54**	**100**

[277]The recorded species in the study area are extant in the lowland areas which include agricultural, shrubland, grassland, inland wetlands, and even along residential areas. Recorded avifauna species are varieties of frugivores, piscivore, nectarivore, omnivore, and insectivores which commonly feed on varieties of fruits, fish, nectar, and preys on other living organisms such as insects and spiders.

[278]Birds are the dominant wild fauna in the area which are highly mobile in nature that moves from one place to another depending on the availability of food sources and less pervasiveness

of disturbances brought by anthropogenic activities. In this study, some of the recorded species are presumed to be passersby or just visiting the site to feed.

i. Species Richness and Abundance of Observed Species (Using the Avifauna Data) During the Dry Season Sampling

[279]The assessed area covering the 12 sampling stations garnered a total richness of 41 species. The sampling stations having the highest species richness are SO6, S04, S03, and S07 composed of 12, 11, 10, and 10 species, respectively. Conversely, stations with the lowest species composition are S09 and S11 which are in agricultural areas and forest ecosystems, see **Figure 2-41.**

[280]Relative to abundance, the 12 sampled stations had a total of 225 individuals. Sampling station S12 registered the highest abundance of 45 individuals. It is followed by sampling stations S07, S05, and S01 with an abundance of 25, 24, and 24 individuals, respectively. On the other hand, the species with the highest computed relative abundance is the Eurasian Tree Sparrow (*Passer montanus*) with a 16.0% computed value. It is followed by Pygmy Flower Pecker (*Dicaeum pygmaeum*) and Yellow Vented Bulbul (*Pycnonotus goiavier*) with a computed value of 7.1% and 6.2 %, respectively (see: **Figure 2-42**) Habitat of these species are closely associated with agricultural areas, shrublands, grassland, and even within settlement sites.

Figure 2-41: Avifauna Richness and Abundance of the 12 Sampling Stations During the Dry Season Survey

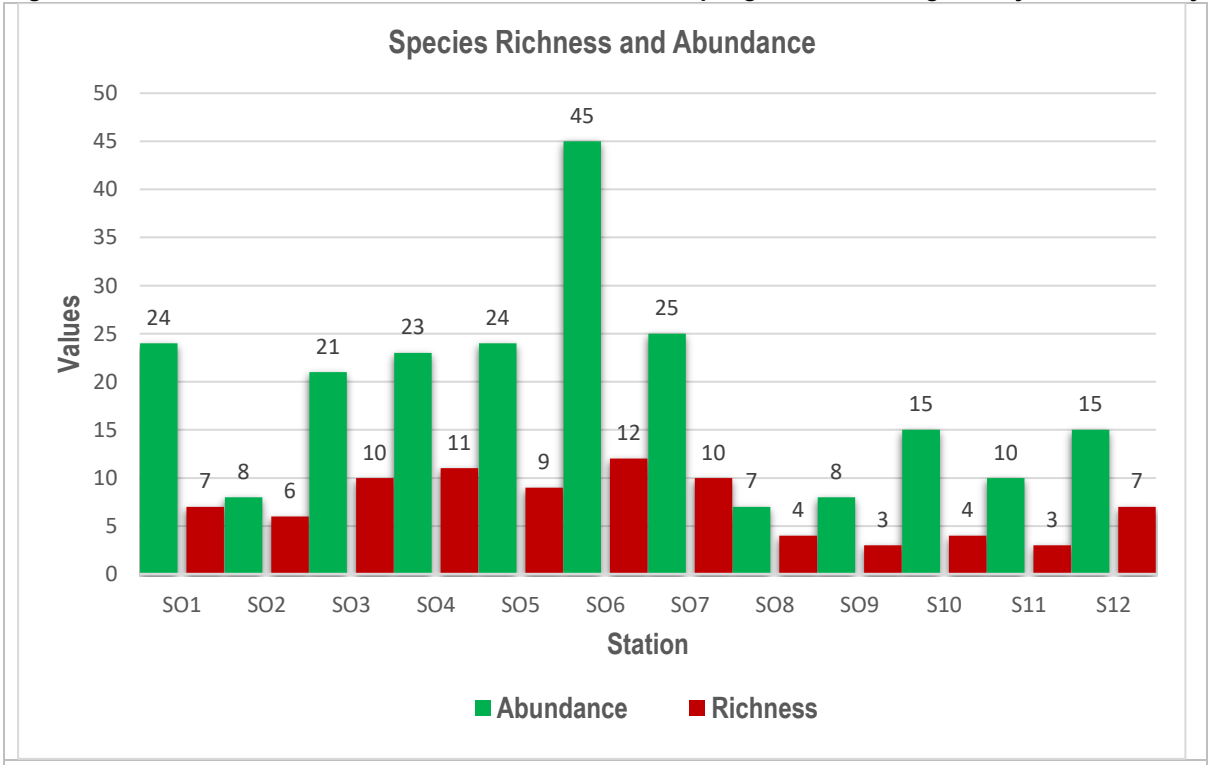


FIGURE TITLE:

AVIFAUNA RICHNESS AND ABUNDANCE OF THE 12 SAMPLING STATIONS DURING THE DRY SEASON SURVEY

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Figure 2-42: Species Abundance of Observed Bird Species Within the 12 Sampling Stations During the Dry Season Survey

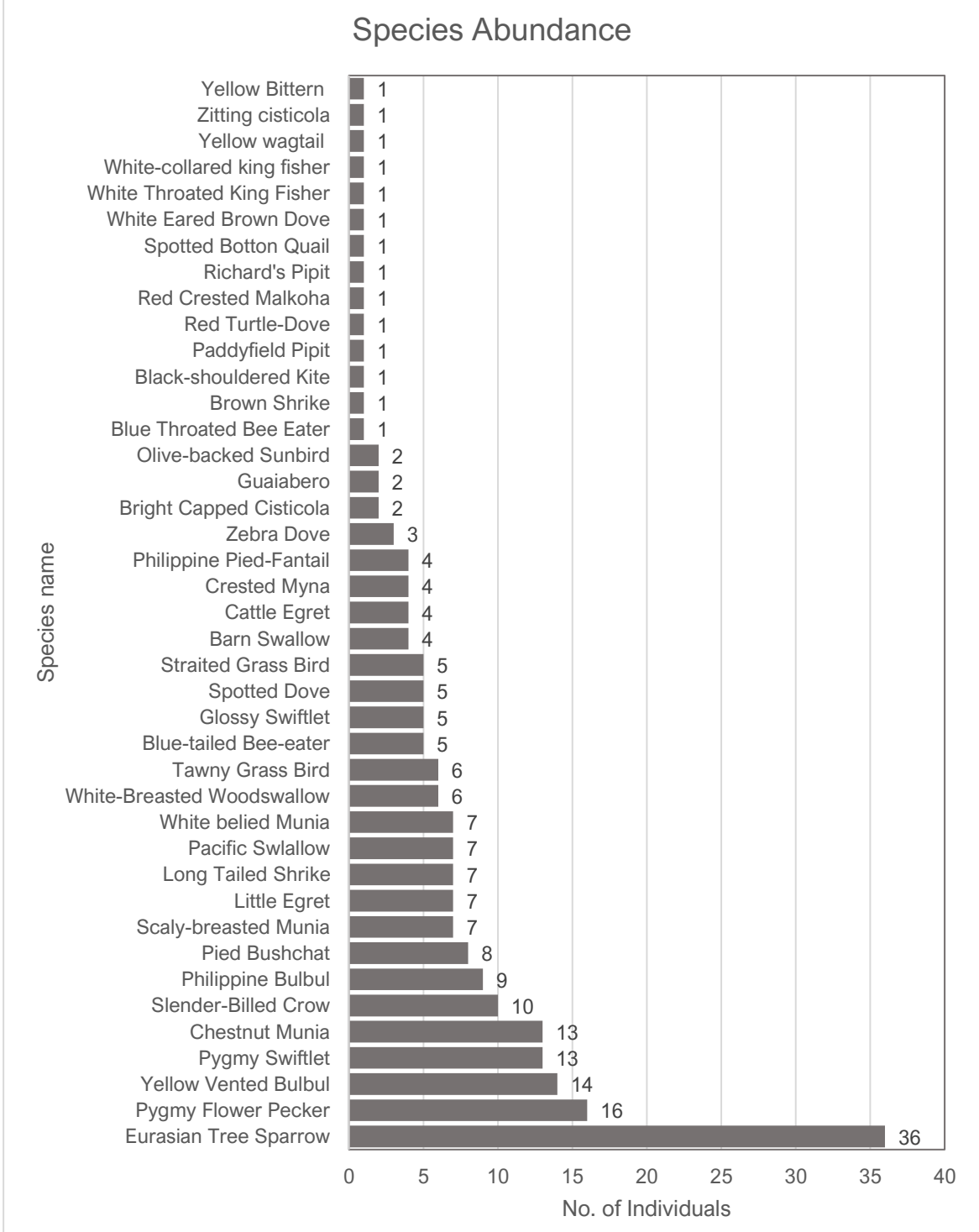


FIGURE TITLE:

SPECIES ABUNDANCE OF OBSERVED BIRD SPECIES WITHIN THE 12 SAMPLING STATIONS DURING THE DRY SEASON SURVEY

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

j. Relative Frequency During the Dry Season Survey

[281]Species with the highest relative frequency of occurrence are the Long-Tailed Shrike (*Lanius schach*) and Pied Bushchat (*Saxicola caprata*) with the same computed relative frequency of 7.0%. It is followed by the Eurasian Tree Sparrow (*Passer montanus*) and Yellow Vented Bulbul (*Pycnonotus goiavier*) with the same computed value of 5.8%.

k. Family Composition (Avifauna Only) During the Dry Season Survey

[282]Overall recorded avifauna species within the sampled sites belonged to 23 families dominated by Columbidae, Alcenididae, Motacillidae, and Ardeidae. Each family is composed of four species. Other prevailing families are Estrildidae and Cuculidae with three species in each family represented by munias and malkoha and caucals. The remaining 17 families are commonly represented by either two or one species, see **Figure 2-43.**

Figure 2-43: Avifauna Family and Species Composition During the Dry Season Survey

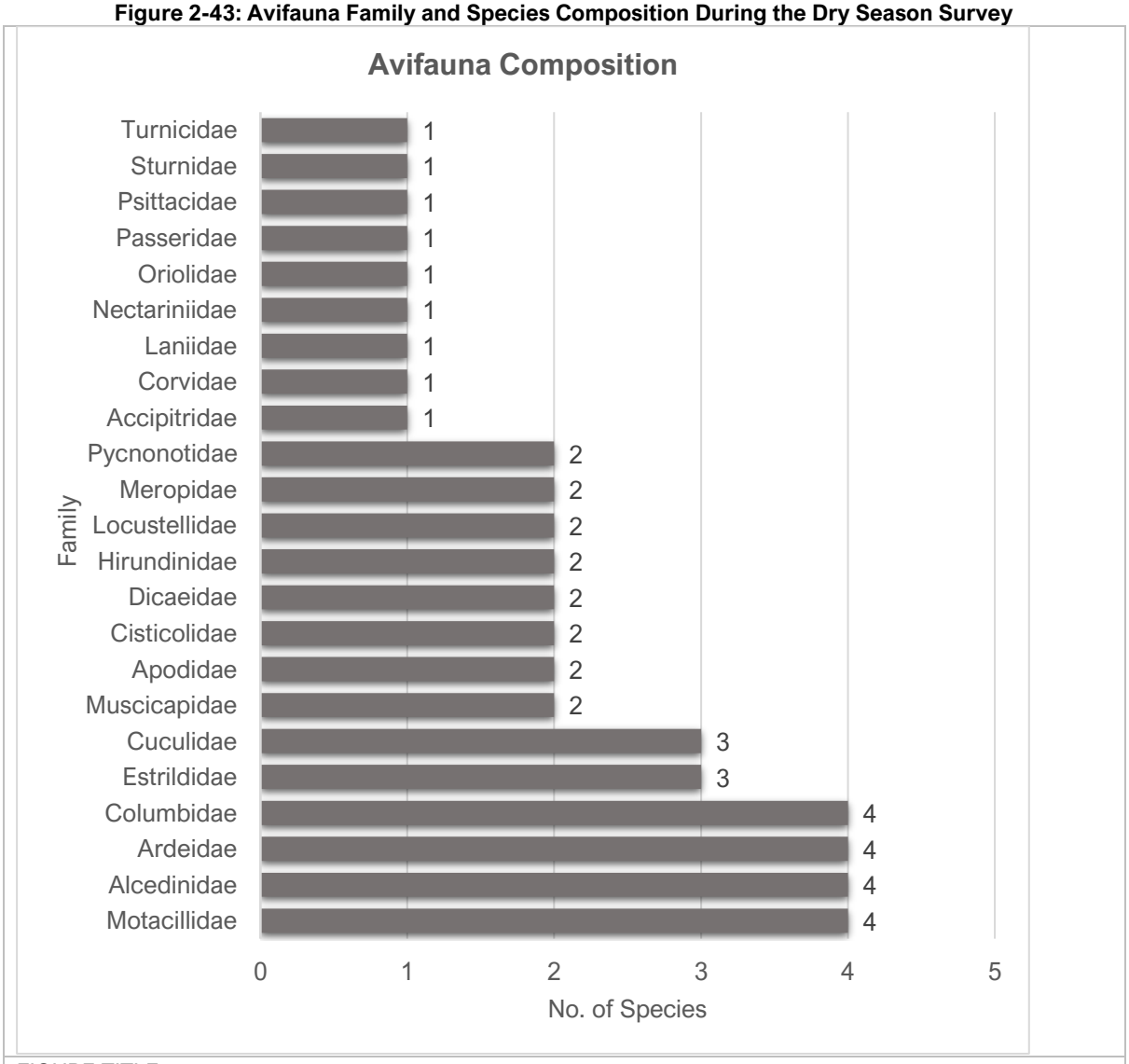


FIGURE TITLE:

AVIFAUNA FAMILY AND SPECIES COMPOSITION DURING THE DRY SEASON SURVEY

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

l. Conservation Status of Species Recorded During the Dry Season Survey

[283]The conservation status of the 54 recorded species within the study area was referred to the International Union for Conservation of Nature (IUCN) Red List and DENR Administrative Order 2019-09. Under IUCN, all the recorded species are under Least Concern Category described as not qualified for Conservation Dependent or Near Threatened.

[284]Under the DENR AO 2019-09, only two of the recorded species are included in the updated list of threatened Philippine fauna species. These are the Indigo Banded King Fisher (*Ceyx cyanopectus*) which is Critically Endangered, and the Gecko/Tokay (*Gecko gecko*) which is under the Other Threatened Species (OTS) category. The rest of the species are not included in the updated list of threatened Philippine fauna. The status of these species is described as follows:

- Critically Endangered. A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
- Other Threatened Species. A species or sub-species that is not critically endangered, endangered, or vulnerable but is under threat from adverse factors, such as over-collection, throughout its range and is likely to move to the vulnerable category soon. Assessment for the Philippine Red List only.

m. Species Distribution Status of Species Recorded During the Dry Season Survey

[285]Endemism is the ecological state of a species being unique to a defined geographic location i.e., island, nation or country, habitat type or an ecosystem, or another defined biogeographic zone. During the survey period (dry season), there are 12 species found to be endemic in the country composed of 11 birds and one reptile (see **Table 2-37**). The list of endemic species is presented in **Table 2-38**. On other hand, 34 of the species are resident or Native in the country, which is composed of 31 birds, one mammal, and two reptiles. Migrant species are represented by six birds. Resident with migrant population is composed of only one bird. Lastly, the introduced species is composed of only one amphibian species.

[286]Migrant species recorded within the study area are the Yellow-wagtail (*Motacilla flava*), Black Crowned Night Heron (*Nycticorax nycticorax*), Barn Swallow (*Hirundo rustica*), Brown Shrike (*Lanius cristatus*), Common King Fisher (*Alcedo atthis*), and the Pied Harrier (*Circus melanoleucos*). While introduced species in the country is the Marine Toad (*Bufo marinus*) which is intended for various purposes as a predator to pest to biologically control insect pest in agricultural areas.

Table 2-37. Fauna Distribution Status and Abundance During the Dry Season Survey

ENDEMICITY	COUNT	REMARKS
Endemic	12	11 birds and 1 reptile
Resident with migrant population	1	Bird
Resident/Native	34	31 birds, 1 mammal and 2 reptiles
Migrant	6	all birds
Introduced	1	Amphibian

Table 2-38. Endemic Fauna Species

GROUP	COMMON NAME	SCIENTIFIC NAME
Bird	Guaiabero	*Bolbopsittacus lunulatus*
Bird	Indigo banded King Fisher	*Ceyx cyanopectus*
Bird	Philippine Bulbul	*Hypsipetes philippinus*
Bird	Philippine Coucal	*Centropus viridis*
Bird	Philippine Pied-Fantail	*Rhipidura nigritorquis*
Bird	Pygmy Flower Pecker	*Dicaeum pygmaeum*
Bird	Pygmy Swiftlet	*Collocalia troglodytes*
Bird	Red-keeled Flowerpecker*	*Dicaeum australe*
Bird	Red Crested Malkoha	*Phaenicophaeus superciliosus*
Bird	Scale Feathered Malkoha	*Lepidogrammus cumingi*
Bird	White Eared Brown Dove	*Phapitreron leucotis*
Reptile	Philippine Mabuya	*Eutropis multicarinata*

n. Computed Diversity and Evenness Indices using Shannon-Wiener Index (H') and Pielou's index (J') During the Dry Season Survey

[287]The diversity level and species evenness indices were computed by employing the Shannon-Wiener (H') Diversity and Pielou's (J') Evenness Indices using the **"R" program**. Results showed that the diversity level of the 12 sampling stations is **Low** to **Very Low diversity,** see **Figure 2-44** for the computed diversity index and Fernando's Biodiversity scale (1998). The computed values range between 0.80 to 2.18. The sampling stations with the highest computed diversity are SO3, S04, and S07 with a diversity (H) value of 2.15, 2.16, and 2.18, respectively. While the least diverse stations are S09 and S11 with diversity values of .90 and .80, respectively.

[288]On the other hand, the computed evenness scale of the 12 stations registered a very high evenness with computed values ranging from 0.73 to 0.97 as referred to Fernando Biodiversity Scale (**Table 2-27**). This result reveals that the recorded species within the 12 sampling stations are common or evenly found in the study area.

Figure 2-44: Diversity Index Following the Fernando Biodiversity Scale

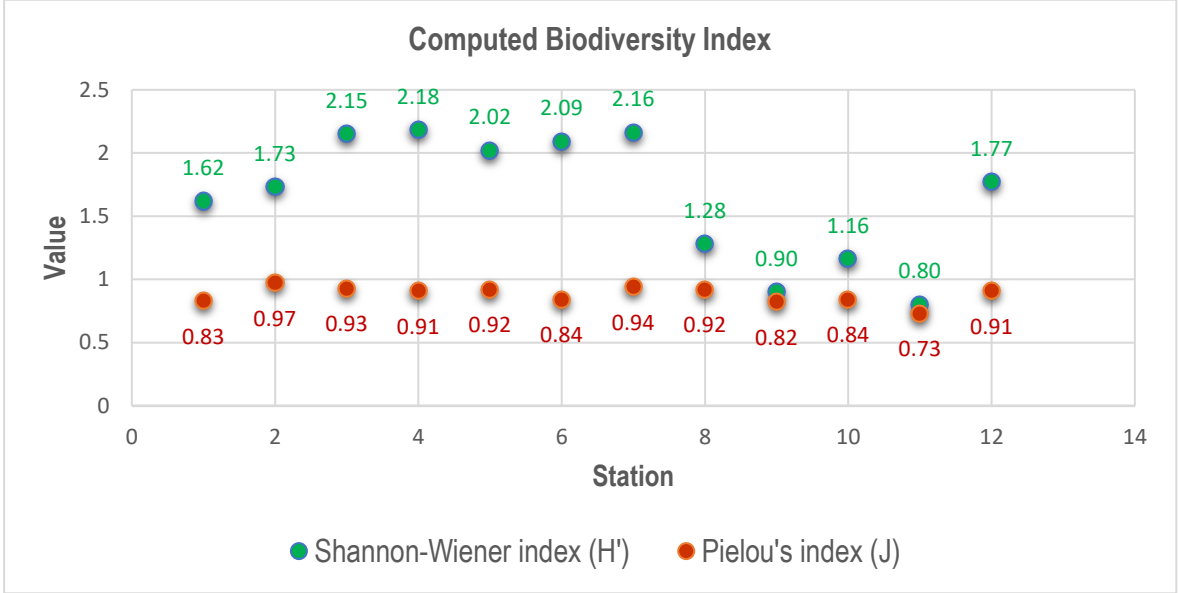


FIGURE TITLE:		
DIVERSITY INDEX FOLLOWING THE FERNANDO BIODIVERSITY SCALE		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

o. Other Related Studies Covering the Study Area

[289]Survey of nocturnal migrant birds at Dalton Pass, Nueva Vizcaya was conducted by Round, P. D. & Allen, D. (2010). It is conducted under a joint agreement between The Wetland Trust (UK) and the Department of Environment and Natural Resources and in collaboration with the Wild Bird Club of the Philippines. A total of 116 bird species was recorded in and around the Dalton Pass area, of which 43 species were among nocturnal migrants. According to the report, among the species caught which are Red Data Book-listed (of conservation concern) were Japanese Night Heron *Gorsachius goisagi* (Endangered), Brown-banded Rails *Lewinia mirifica* (Data Deficient) and Spotted Imperial Pigeon *Ducula carola* (Vulnerable). Others are of least concern status and/or not yet evaluated against the IUCN categories.

[290]Pertaining to the recorded species in the 2010 survey, there are 12 similar species observed in this survey namely; Barred Rail (*Gallirallus torquatus)*, Chestnut Munia (*Lonchura malacca)*, Emerald Dove (*Chacopaps indica*), Long-tailed Shrike (*Lanius schach*), Olive-backed Sunbird (*Cinnyris jugularis*), Philippine Bulbul (Ixos philippinus), Pygmy Flowerpecker (*Dicaeum pygmaeum*), Red-keeled Flowerpecker (*Dicaeum austral*), Scaly-breasted Munia (*Lonchura punctulate*), Tawny Grassbird (*Megalurus timoriensis*), Yellow-vented Bulbul (*Pycnonotus goiavier*) and Zebra Dove (*Geopelia striata*).

2.1.4.3 Vegetation removal and loss of habitat

[291]**Vegetation Loss.** While vegetation in most of the proposed alignment will not be affected due to tunnel construction, portions of the remaining vegetation going from Sta. Fe to Aritao will be affected to give way for the right of way for the construction of the proposed project structures and facilities. Compensating vegetation loss due the vegetation clearing during the construction phase should be implemented, which include but not limited to:

[292]Identification of native and threatened mother trees. This can be source of seeds for seedling nursery for reforestation activities. There are 17 endemic species and 57 indigenous species that forms from understory to canopy layer species listed in this study. In addition, take note of the threatened species which included six vulnerable (VU) species under local category (DAO 2017-11), and/or the 3 VU and 1 endangered species under global category (IUCN 2021). This species should be the priority species that can be used for reforestation activities.

[293]Land clearing should be confined on designated sites only. Vegetation to be cleared should be delineated to avoid unnecessary vegetation removal. As for the trees to be cut, the proponent should follow the DENR Memorandum Order no. 05 of 2012 which mandates the "Uniform replacement ratio for cut or relocated trees" item 2.2 "For planted trees in private land and forest lands. Tree replacement shall be 1:50 while naturally growing trees on the same area, including those affected by the project shall be 1:100 ratio in support of the National Greening Program (NGP) and Climate Change Initiatives of the Government". A tree inventory is therefore required before tree cutting be implemented. The proponent should also follow DAO 2018-16 which mandates the following:

a. **Section 3.2** Determination of the number of trees, location and its species nomenclature/common name, classification if naturally grown or planted, and corresponding volume shall be verified and determined upon the conduct of geotagging and tree scaling by CENRO concerned during the actual tree cutting activities. These shall serve as basis for determining the tree replacement and schedule of hauling logs and to the concerned DENR office, computation of forest charges, among others.

b. **Section 3.3** Tree removal and relocation operations, including turnover and transport of logs, shall only be done under the presence and close supervision of the DENR. Correspondingly, the DPWH shall shoulder all operational costs.

[294]Further, Joint Memorandum Circular (JMC) 2014-01: "Guidelines for the Implementation of the DPWH-DENR-DSWD Partnership on the Tree Replacement Project" states:

> "To rectify the deforestation of natural parks and forests in all regions affected by DPWH infrastructure projects through the replacement of each tree cut with the planting of **one hundred (100)** seedlings/ saplings/ propagules"

[295]**Habitat Loss for Wildlife Fauna.** Clearing portions of the project road alignment entails to loss of parcels of habitat that may affect wildlife fauna diversity and abundance. Likewise, disturbance during construction and operation may include but not limited to noise pollution brought by heavy equipment during construction, other machineries, vehicles, and increase in presence of people around may result to migration of wildlife species. In this case, movement of fauna species from the project site to nearby areas is expected where disturbance is less.

[296]To be able to minimize impact of the project, adherence to the detailed engineering design (DED) of the project especially during land clearing should be observed. Vegetation removal shall be confined on designated sites based on the approved plan. It is recommended that tree planting activity in open areas and borders of the project shall be implemented. Perhaps, providing green spaces for tree planting along the road alignment can be a good management

option. Species that can be used in these buffer zones and allotted green spaces must be indigenous trees and/or fruit bearing trees native in the place that can attract wildlife species.

2.1.4.4 Threat to existence and/or loss of important local species

[297]The result of the terrestrial flora biodiversity study showed that diversity of surveyed sites was of moderate status with several endemic and threatened status. There should still be a reforestation/rehabilitation management plan be implemented to ensure that plant diversity enhancement will be addressed, especially the threatened and native flora species.

[298]In the faunal side, species recorded in the area are assemblages of highly mobile species commonly found in the lowlands and in diverse ecosystems which include Doves, Grass birds, King fishers, Swallows, Herons, Fantails, Munia, and other species which habitat is closely associated to grass lands, agro-ecosystems, shrublands and wetlands. Recorded species within the study area are also found and common in adjacent provinces and regions.

[299]Furthermore, during construction the contractor shall ensure to prohibit his employees from engaging in any mode of wildlife collection and/or hunting. It is also necessary for the contractor to enjoined in the conservation and protection of remaining wildlife species. Putting up warning signages in strategic areas for public information and warning are among of the possible strategies.

2.1.4.5 Threat to abundance, frequency, and distribution of important species

[300]The result of the terrestrial flora biodiversity study showed that diversity of surveyed sites was of moderate status with several endemic and threatened status. The proposed project may affect these flora species but many of these are abundant in the study area, where possible reproduction and source of seedlings can be found. There should still be a reforestation/rehabilitation management plan be implemented to ensure that plant diversity enhancement will be addressed, especially the threatened and native flora species.

[301]In the faunal side, species recorded in the area are assemblages of highly mobile species commonly found in the lowlands and in diverse ecosystems which include Doves, Grass birds, King fishers, Swallows, Herons, Fantails, Munia, and other species which habitat is closely associated to grass lands, agro-ecosystems, shrublands and wetlands. Recorded species within the study area are also found and common in adjacent provinces and regions. Though, it is possible that the project can co-exist with the existing fauna species, it is still necessary that during the detailed planning and construction it is encourage that recommended mitigating measures shall be observed by the contractor to minimize impact to wild fauna especially to non-volant mammals and to the remaining habitats. This information could also assist in the conduct of further studies on how we could sustainably manage and protect the project area and its surrounding ecosystems.

2.1.4.6 Hindrance to wildlife access

[302]Though, it is possible that the project can co-exist with the existing fauna species, it is still necessary that during the detailed planning and construction it is encourage that recommended mitigating measures shall be observed by the contractor to minimize impact to wild fauna especially to non-volant mammals and to the remaining habitats.

2.1.5 Summary of Baseline Findings, Impacts and Mitigation on Land

[303]The following table lists the impacts and mitigation on Land.

Table 2-39: Summary of Significant Baseline Findings and Potential Impacts and Mitigation on Land

SUMMARY OF BASELINE FINDINGS ON LAND:

- **Land Use and Classification**
  - The proposed project alignment falls within agricultural areas, forestland, and open spaces.
  - Portions of the proposed project fall within the Pantabangan-Carranglan Watersed Forest Reserve (PCWFR).
  - The proposed project alignment is not within Mines and Geosciences Bureau-identified mineral lands.
  - The proposed project alignment will traverse two Ancestral Domains (ADs): the Kalanguya-Ikalahan Indigenous Cultural Communities (ICCs) in Nueva Vizcaya and the Kalanguya ICCs in Nueva Ecija.
- **Geology/Geomorphology**
  - Significant changes on the surface landform, geomorphology, topography, terrain, and slope of the proposed project site are not expected given the proposed project designs.
  - The proposed project site is susceptible to earthquakes, liquefaction, landslides, and flooding.
- **Terrestrial Ecology**
  - Under the IUCN, only one species is considered as highly threatened with endangered (EN) status which is Narra. However, Narra can still be found in many places in the Philippines. Also, it is one of the main species in reforestation activities, hence, listed as VU species and not as a highly threatened species in the country.
  - Under DAO 2017-11, aside from Narra, four other species were identified as vulnerable (VU) and one as Other Threatened Species (OTS). The vulnerable species in the area were Almon (*Shorea almon*), Red lauan (*Shorea negrosensis*), Malakmalak (*Palaquium philippense*), and Tagbak (*Alpinia elegans*). On the other hand, Gakakan (*Drypetes falcata*) was identified under the OTS.
  - During the wet season sampling, there are six fauna species under the updated list of threatened Philippine fauna species. One Critically Endangered (Amethyst Brown Dove), one Endangered (Philippine Deer), two Vulnerable (Wild Boar and Philippine Duck) and two species are under the Other Threatened Species category (Gecko and Python).
  - Under the DENR AO 2019-09, only two of the recorded species are included in the updated list of threatened Philippine fauna species during the wet season sampling. These are the Indigo Banded King Fisher (*Ceyx cyanopectus*) which is Critically Endangered, and the Gecko/Tokay (*Gecko gecko*) which is under the Other Threatened Species (OTS) category.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
LAND USE AND CLASSIFICATION			
Impact in terms of compatibility with existing land use	Pre-Construction	The proposed project alignment falls within agricultural areas, forestland, and open spaces.	Secure necessary clearances that pertain to land use compatibility from LGU as well as proof of authority from concerned agencies (i.e., LGU, DENR)
Impact in existing land tenure issue/s	Pre-Construction	The proposed project alignment will traverse two Ancestral Domains (ADs): the Kalanguya-Ikalahan	Necessary permits will be acquired by the Proponent.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
		Indigenous Cultural Communities (ICCs) in Nueva Vizcaya and the Kalanguya ICCs in Nueva Ecija. DPWH has also secured the CP from the abovementioned ICCs for the proposed project.	
Devaluation of land value as a result of improper solid waste management and other related impacts	Construction Operations Abandonment	Solid waste is expected to be produced.	Implementation of a solid waste management plan
PEDOLOGY			
Soil erosion/Loss of topsoil	Construction Operations	There may be some soil erosion due to the earth movement during construction & operations activities.	Limitation of earth movement to areas where site development is necessary
Change in soil quality/fertility	Construction Operations	There is a risk of soil contamination due to the maintenance of heavy equipment.	Use sawdust, rice hulls, or coir dusts to absorb the oil spills Soil testing has been done and showed that the materials are non-toxic
TERRESTRIAL ECOLOGY			
Vegetation removal and loss of habitat	Construction Operations	Clearing of portions of the project road alignment entails to loss of parcels of habitat and vegetation.	Adherence to the development plan of the project site especially during land clearing should be observed. Vegetation removal shall be confined on designated sites based on the approved plan.
Threat to abundance, frequency, and distribution of important species	Construction Operations Abandonment	The diversity of surveyed sites was of moderate status with several endemic and threatened status.	Implementation of reforestation/rehabilitation management plan to ensure that plant diversity enhancement will be addressed.

THE WATER

2.2.1 Hydrology/Hydrogeology

[304]As presented in **Figure 2-45**, the proposed project is will approach/be proximate to the following rivers and streams:

- Bunga River: Before the start of the project alignment) in Brgy. Bunga, Carranglan;
- Wahig River: After the northern portion of the South Tunnel in Brgys. Burgos and Salazar, Carranglan; and
- Marang River: After the norther portion of the North Tunnel, leading to the end of project alignment in Brgys. Canabuan and Canarem in Aritao, Nueva Ecija.

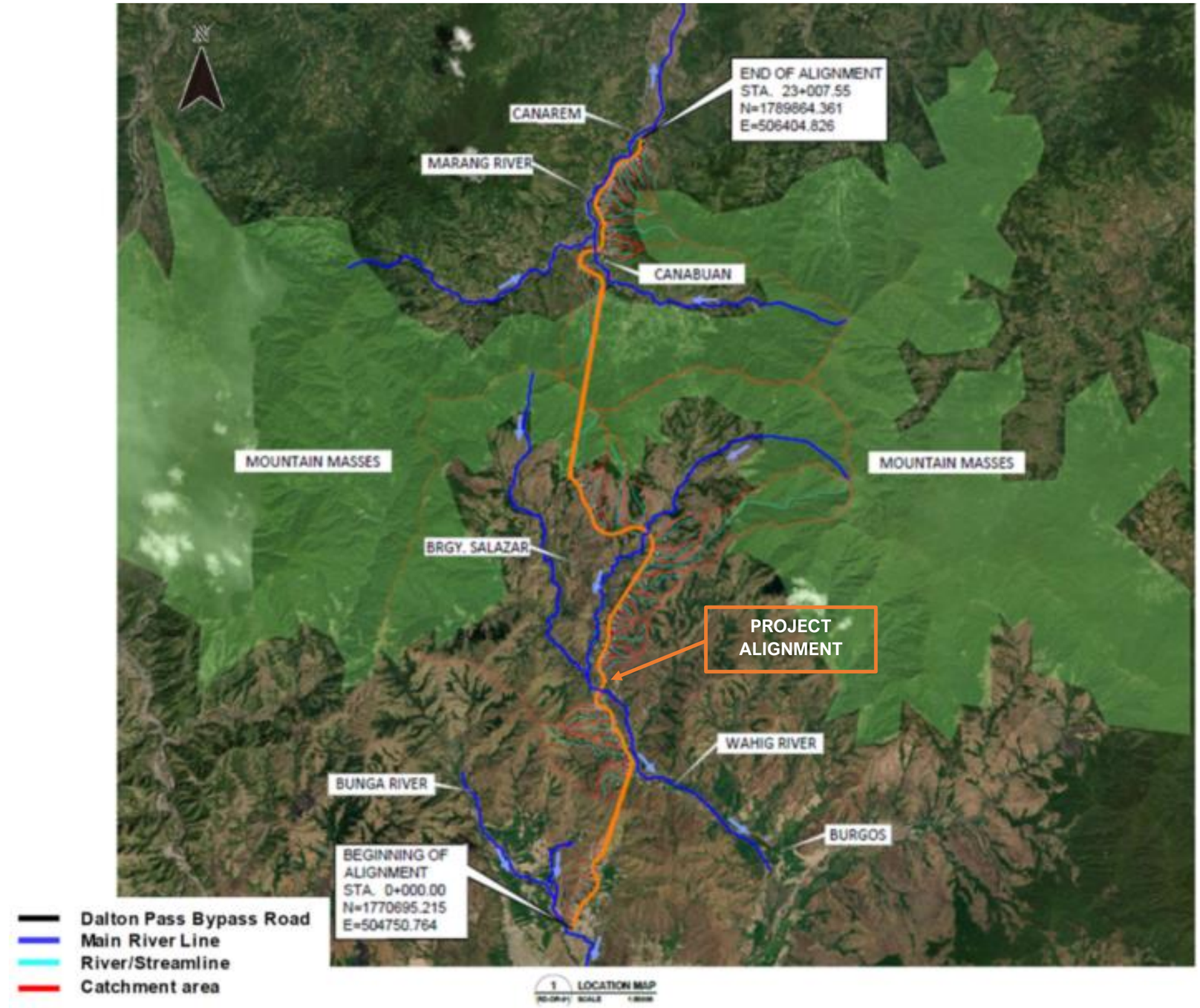
[305]**Marang River.** Marang River is one of the rivers located near the project site. The river is in the Marang Watershed and originates on the eastern slopes of the Caraballo Mountains flowing towards Bagabag and ultimately to the reservoir of Magat Dam in Ramon, Isabela. It also traverses some of the barangays in Municipalities of Santa Fe and Aritao.

[306]**Figure 2-46** and **Figure 2-47** show the drainage map of Aritao and Santa Fe, respectively.

[307]**Wahig/Carranglan River.** The Wahig or Carranglan River is one of the numerous tributaries of the Pantabangan-Carranglan Watershed Forest Reserve (PCWFR). The river as well as the other major rivers in the municipality are characterized by the wide, braided, and shallow riverbed. It also serves as the main source of water for the Pantabangan Reservoir which is used as irrigation to the agricultural needs of the municipality of Carranglan. **Figure 2-48** shows the drainage map of Carranglan.

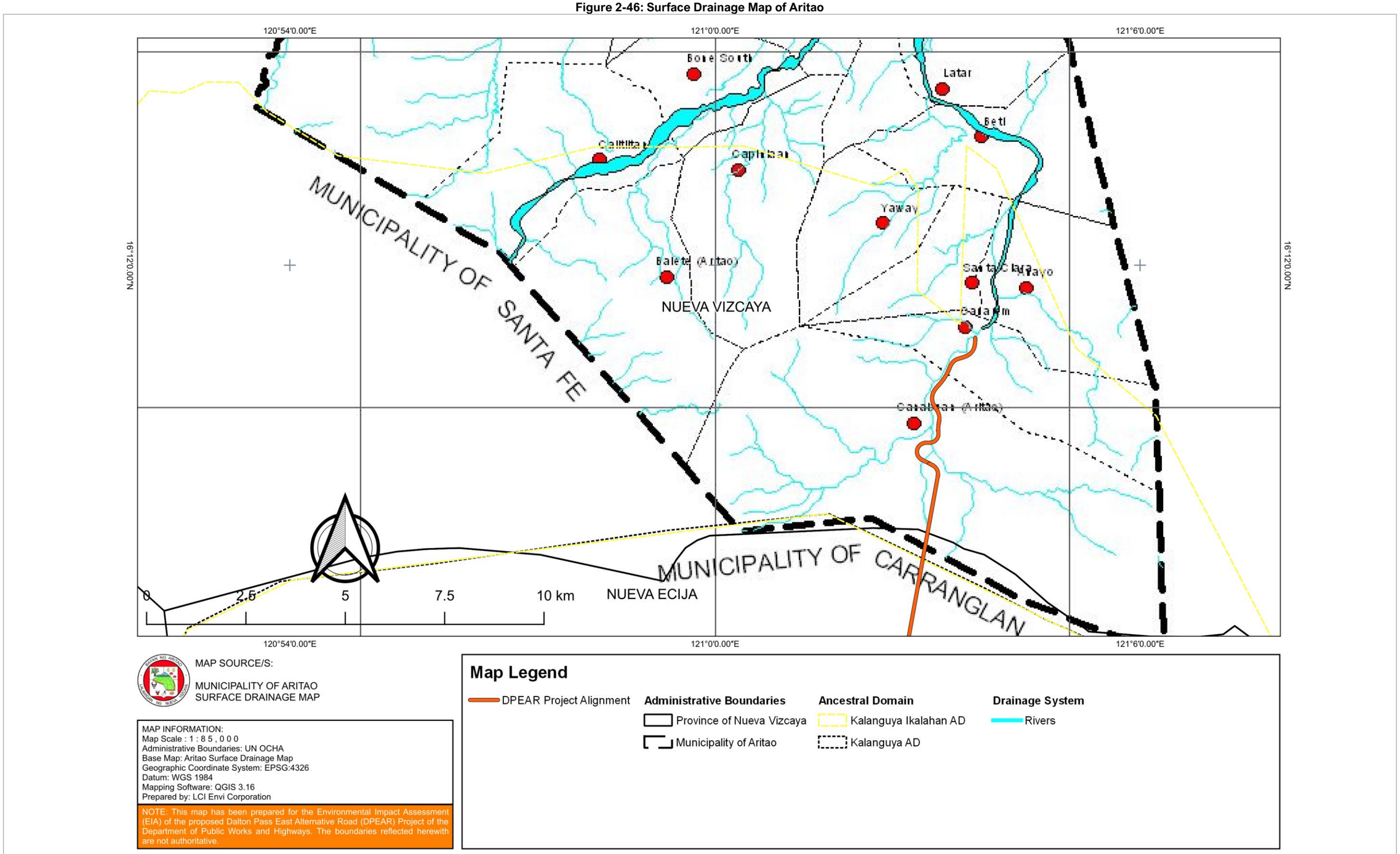
[308]**Figure 2-49** shows the proclaimed watersheds relative to the project site.

Figure 2-45: River/Stream Crossings



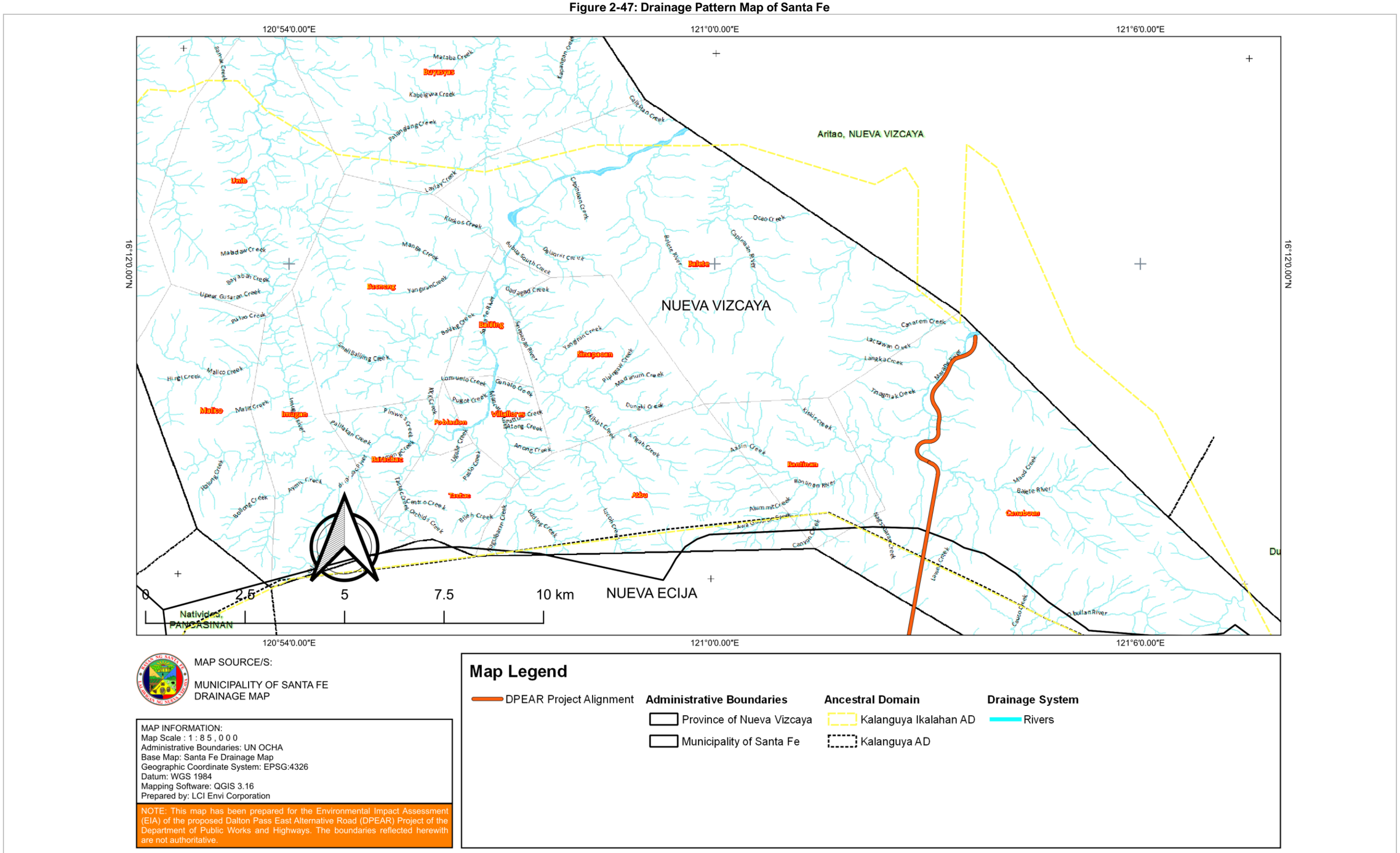
PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**RIVER/STREAM CROSSINGS**	Aritao CLUP (2009-2024)	LCI ENVI CORPORATION

Figure 2-46: Surface Drainage Map of Aritao



PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**SURFACE DRAINAGE MAP OF ARITAO**	Aritao CLUP (2009-2024)	LCI ENVI CORPORATION

Figure 2-47: Drainage Pattern Map of Santa Fe



MAP SOURCE/S:

MUNICIPALITY OF SANTA FE
DRAINAGE MAP

MAP INFORMATION:
Map Scale : 1 : 8 5 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Santa Fe Drainage Map
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

DPEAR Project Alignment

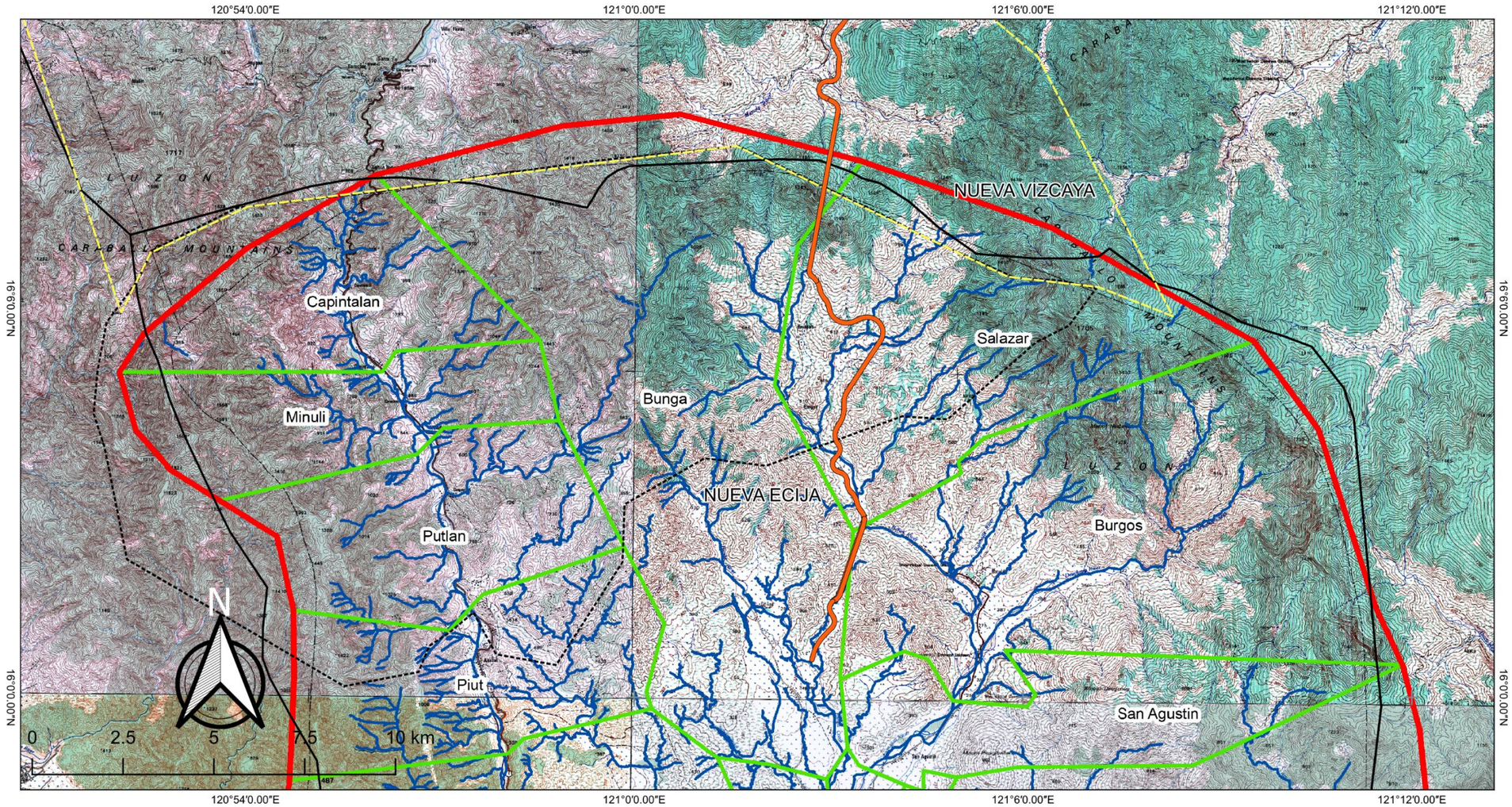
Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Santa Fe

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

Drainage System
- Rivers

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**DRAINAGE PATTERN MAP OF SANTA FE**	Santa Fe CLUP (2018-2027)	LCI ENVI CORPORATION

Figure 2-48: Drainage Map of Carranglan



MAP SOURCE/S:

MUNICIPALITY OF CARRANGLAN
DRAINAGE MAP

MAP INFORMATION:
Map Scale : 1 : 1 2 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Carranglan Drainage Map
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

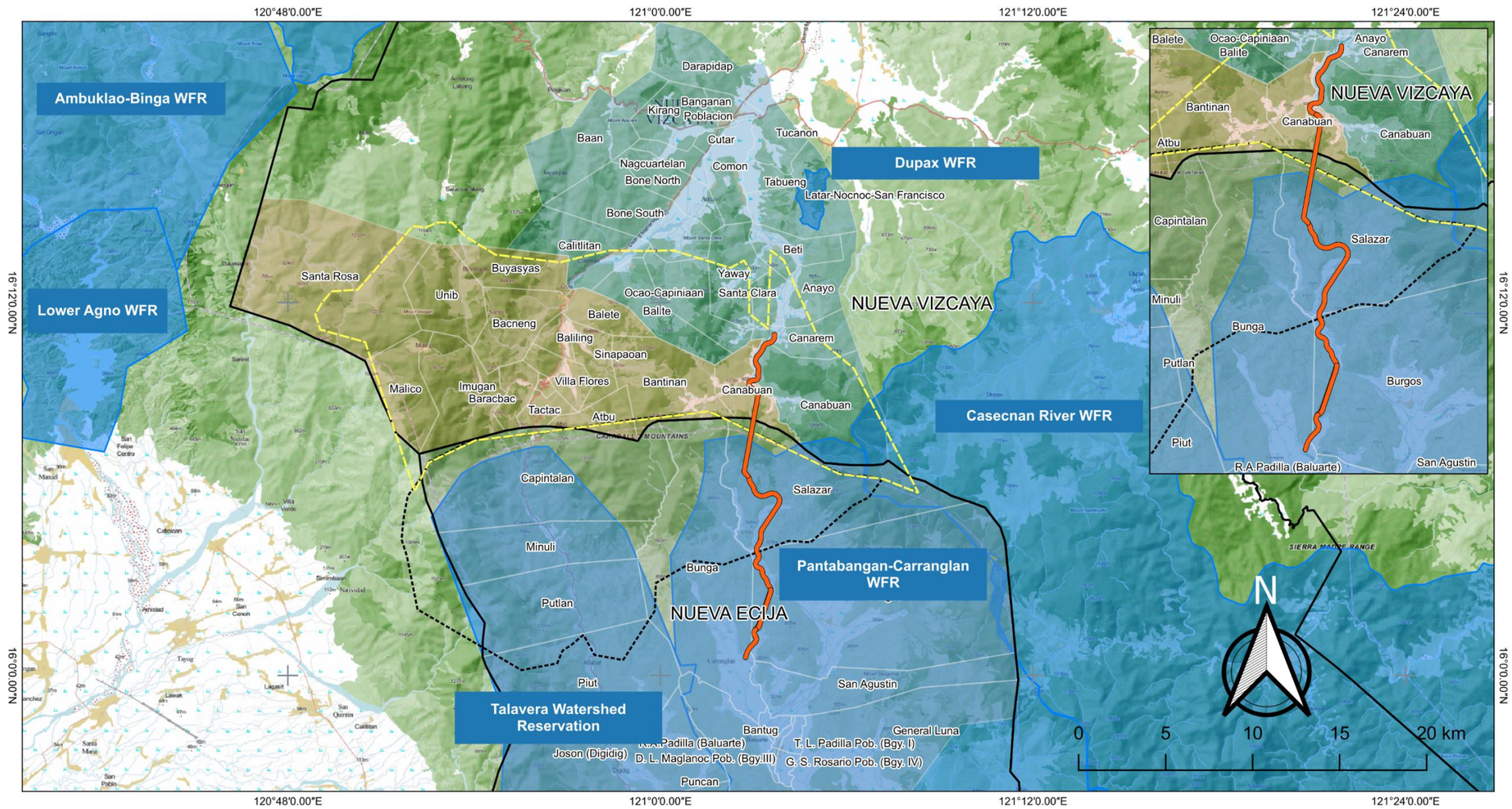
NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Brgy. Boundary
- **Drainage System**
  - Rivers
- **Administrative Boundaries**
  - Province of Nueva Ecija
  - Municipality of Carranglan
- **Ancestral Domain**
  - Kalanguya Ikalahan AD
  - Kalanguya AD

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**DRAINAGE MAP OF CARRANGLAN**	Carranglan CLUP (2019-2028)	LCI ENVI CORPORATION

Figure 2-49: Proclaimed Watershed Relative to the Proposed Project Site



MAP SOURCE/S:

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Forest Management Bureau

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Municipality of Carranglan

Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

Proclaimed Watershed
- Proclaimed Watershed

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**PROCLAIMED WATERSHEDS RELATIVE TO THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

2.2.1.1 Change in drainage morphology/inducement of flooding/reduction in stream volumetric flow

[309]Change in drainage morphology is inevitable given the nature and scale of the project. To mitigate adverse impacts due to this change, the proposed road development project shall develop the drainage during the construction of the project.

[310]The project will not induce flooding in the area since there will be a drainage system along the project.

2.2.1.2 Change in stream, lake water depth

[311]The surface run-off from the construction areas may contain sediments that may cause siltation and affect the depth of nearby creeks and rivers. Slope protection and proper drainage system will be installed to mitigate the effect.

2.2.1.3 Depletion of water resources/competition in water use

[312]As discussed in Section 1 and as presented in **Table 2-40**, water supply during the construction and operation phase of the proposed project will be obtained from the local water supply in the area as well as available water sources (i.e., spring water, surface water, groundwater, rainwater, etc.). Surface water near the project sites include Bunga River, Wahig River, and Marang River, which have potential to serve the water supply requirements of the project.

[313]The said potential water sources will be studied once the project has reached the detailed engineering and design phase. Once finalized, **DPWH** will secure water permits for groundwater extraction and surface water abstraction from the National Water Resources Board (NWRB).

[314]The project's peak water requirement during construction is 475.65 m^3/day for civil works, drilling operations, and domestic use.

[315]During the drilling of holes for explosives and rock bolts, the drilling machine will be provided with water for the drilling process. The water flow requirement is 0.2 m^3/min (12 m^3/hr). The water supply will be pumped from the nearby river to a reservoir located at the tunnel entrance and will be pumped into the tunnel.

[316]The water requirement will significantly drop to 1.75 m^3/day during the operations of the project. Water utilization is limited to domestic use. Should there be emergencies in the tunnel sections, firefighting equipment will be supplied with water through nearby springs and groundwater sources.

Table 2-40: Estimated Water Requirements of the Project

ACTIVITIES	EST. WATER REQUIREMENT (CU. M./DAY)	REMARKS
A. Construction Phase		
Civil Works	47.65	3000 psi cement mix
Drilling Operations	288	0.2 m^3/min
Domestic Use	140	70 Liters/person/day
TOTAL	**475.65**	

ACTIVITIES	EST. WATER REQUIREMENT (CU. M./DAY)	REMARKS
B. Operation Phase		
Domestic Use	1.75	70 Liters/person/day
TOTAL	**1.75**	
NOTE: Subject to confirmation during the Detailed Engineering and Design Phase		

[317]Depletion of water resources is not expected to result from the proposed project given its minimal water supply requirement. Based on interviews with barangays, there are no known springs or groundwater sources found in the tunnel areas.

[318]During the drone survey shown in **Figure 1-2** to **Figure 1-5**, particularly the tunnel sections, there were no agricultural/irrigation facilities located in the portal and top sections of the tunnel.

[319]However, detailed investigation must be done during the detailed engineering design of the project to verify the information collected.

[320]Water conservation practices, such as provision of rainwater harvesting and provision of water-efficient toilets, water pipe maintenance, among others, should be implemented by **DPWH** and its contractors.

2.2.2 Oceanography

[321]The proposed project is situated in the landlocked provinces of Nueva Vizcaya and Nueva Ecija. Hence, this section is not applicable.

2.2.2.1 Change/disruption in water circulation pattern, littoral current, and coastal erosion and deposition

[322]This impact is not expected to result from the project.

2.2.2.2 Change in bathymetry

[323]This impact is not expected to result from the project.

2.2.3 Water Quality

[324]Water sampling was conducted to determine the existing baseline groundwater and surface water quality conditions in the project area prior to construction and operation of the Dalton Pass East Alignment Road Project. Future monitoring activities can use the same sampling points for comparability. The results are discussed in the following subsections.

2.2.3.1 Degradation of groundwater quality

[325]Groundwater sampling was conducted for dry season (February 9-10, 2022). A total of 4 groundwater samples were collected at various points within the study area. The photos and geographic coordinates of the groundwater sampling points are provided in **Table 2-41**. The location maps are shown in **Figure 2-50**.

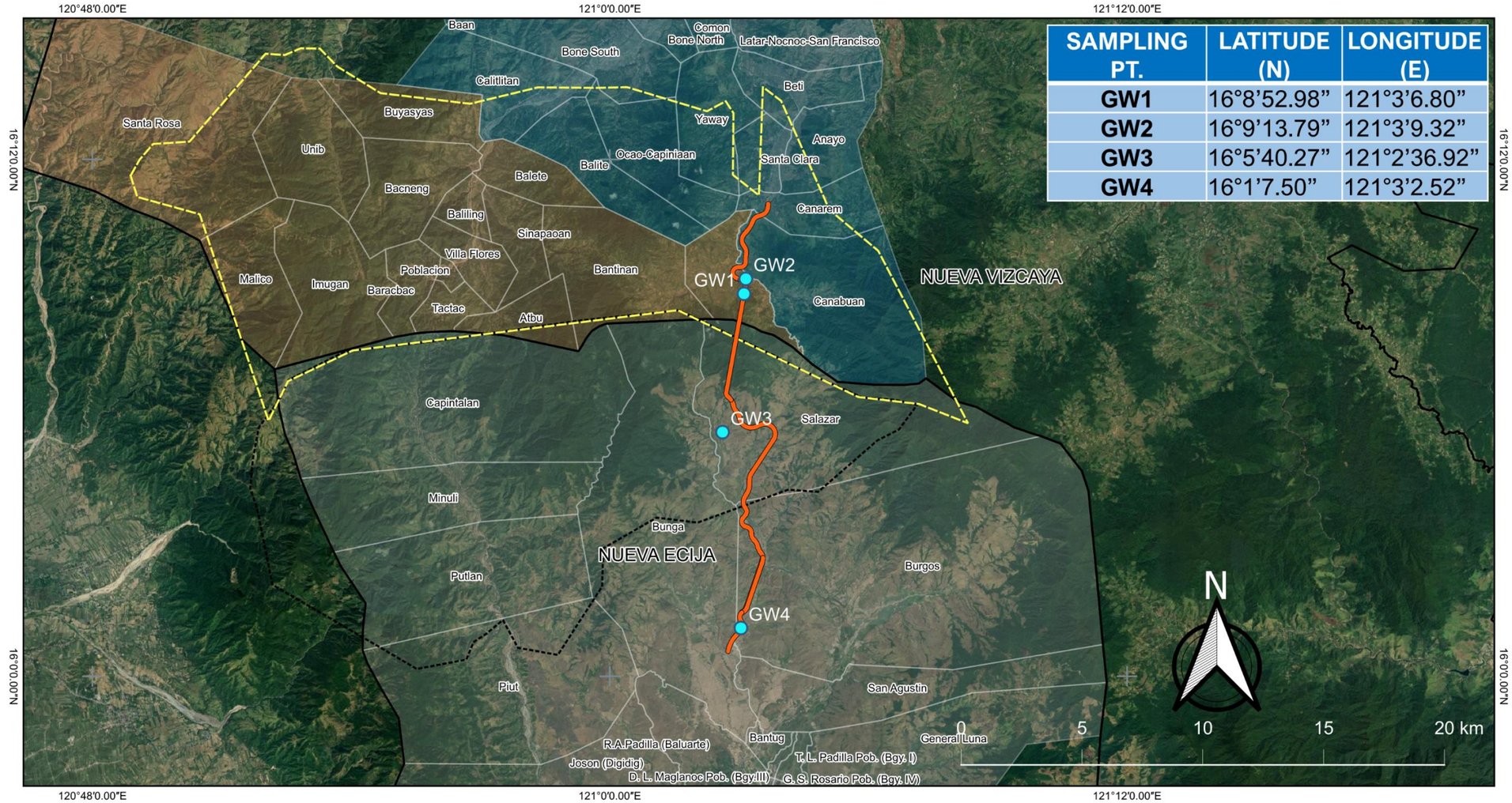
[326]The collected groundwater samples were sent to CRL Environmental Corporation for laboratory analysis. Temperature and pH of the water samples were measured on-site. The

results of the groundwater quality analysis are summarized in **Table 2-42**. The values were compared to the Philippine National Standards for Drinking Water of 2017 and with the Water Quality Guidelines for Class A water body as per DAO 2016-08.

Table 2-41: Photos and Geographic Coordinates of the Groundwater Sampling Points

SAMPLING POINT	PHOTO	LATITUDE (N)	LONGITUDE (E)
GW 1		16°8’52.98” N	121°3’6.80” E
GW 2		16°9’13.79” N	121°3’9.32” E
GW 3		16°5’40.27” N	121°2’36.92” E
GW 4		16°1’7.50” N	121°3’2.52” E

Figure 2-50: Groundwater Sampling Location Map



SAMPLING PT.	LATITUDE (N)	LONGITUDE (E)
GW1	16°8'52.98"	121°3'6.80"
GW2	16°9'13.79"	121°3'9.32"
GW3	16°5'40.27"	121°2'36.92"
GW4	16°1'7.50"	121°3'2.52"

MAP SOURCE/S:

JICA STUDY TEAM

MAP INFORMATION:
Map Scale : 1 : 1 8 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Google Earth Satellite
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Municipality of Carranglan

Administrative Boundaries

- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija

Ancestral Domain

- Kalanguya Ikalahan AD
- Kalanguya AD

Sampling Station

- GW1 to GW4

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**GROUNDWATER SAMPLING LOCATION MAP**	As above.	LCI ENVI CORPORATION

Table 2-42: Results of Groundwater Analysis

PARAMETER	UNIT	RESULTS OF ANALYSIS (Values in RED exceed the reference standard/s)				GUIDELINE VALUE FOR CLASS A WATER BODY	GUIDELINE VALUE FOR DRINKING WATER QUALITY
		GW 1	*GW 2*	*GW 3*	*GW 4*	*(DAO 2016-08)*	*(DOH AO 2017-10)*
pH	pH	**7.96**	**7.24**	**8.1**	**7.48**	6.5-8.5	6.5 – 8.5
Temperature	°C	**22.2**	**25.0**	**28.4**	**27.9**	26-30	*
Total Suspended Solids	mg/L	**<2.38**	**<2.38**	**<2.38**	**<2.38**	50	*
Color	CU	**5**	**3**	**5**	**3**	50	10
Nitrate	mg/L	**<0.006**	**<0.006**	**<0.006**	**0.7**	7	50
Phosphate	mg/L	**<0.0064**	**0.02**	**<0.0064**	**<0.0064**	0.5	*
Fecal Coliform	MPN/100 mL	**>8.0**	**<1.1**	**<1.1**	**<1.1**	<1.1	<1.1
Chloride	mg/L	**<0.14**	**<0.14**	**<0.14**	**18**	250	250

NOTES: GW = Groundwater | (*) = No guideline value at present | mg/L = Milligrams per liter | MPN/100mL = Most probable number per 100 milliliters | NTU = Nephelometric Turbidity unit
REFERENCES: DOH AO 2017-0010 (Philippine National Standards for Drinking Water of 2017)
DENR AO 2016-08 (Water Quality Guidelines and General Effluent Standards of 2016)

[327]All parameters are within the standards, except fecal coliform in GW 1 may be due to extrusion of contaminants in the pipeline. Continuous monitoring activities especially during tunneling activities must be implemented to check for contaminants in groundwater sources.

2.2.3.2 Degradation of surface water quality

[328]Surface water sampling was likewise conducted for both dry season (24 January to 11 February 2022) and wet season (22 June 2021). A total of 10 surface water samples were collected at various surface water that will be traversed or near the proposed project alignment. The photos and geographic coordinates of the surface water sampling points are provided in **Table 2-43**. The location map is shown in **Figure 2-51**.

[329]The collected surface water samples were likewise sent to CRL Environmental Corporation for laboratory analysis. Temperature and pH of the water samples were measured on-site. The results of the surface water quality analysis are summarized in **Table 2-44** (wet season) and **Table 2-45**(dry season). The values were compared to the Water Quality Guidelines and General Effluent Standards (DAO 2016-08) for Class C Waters.

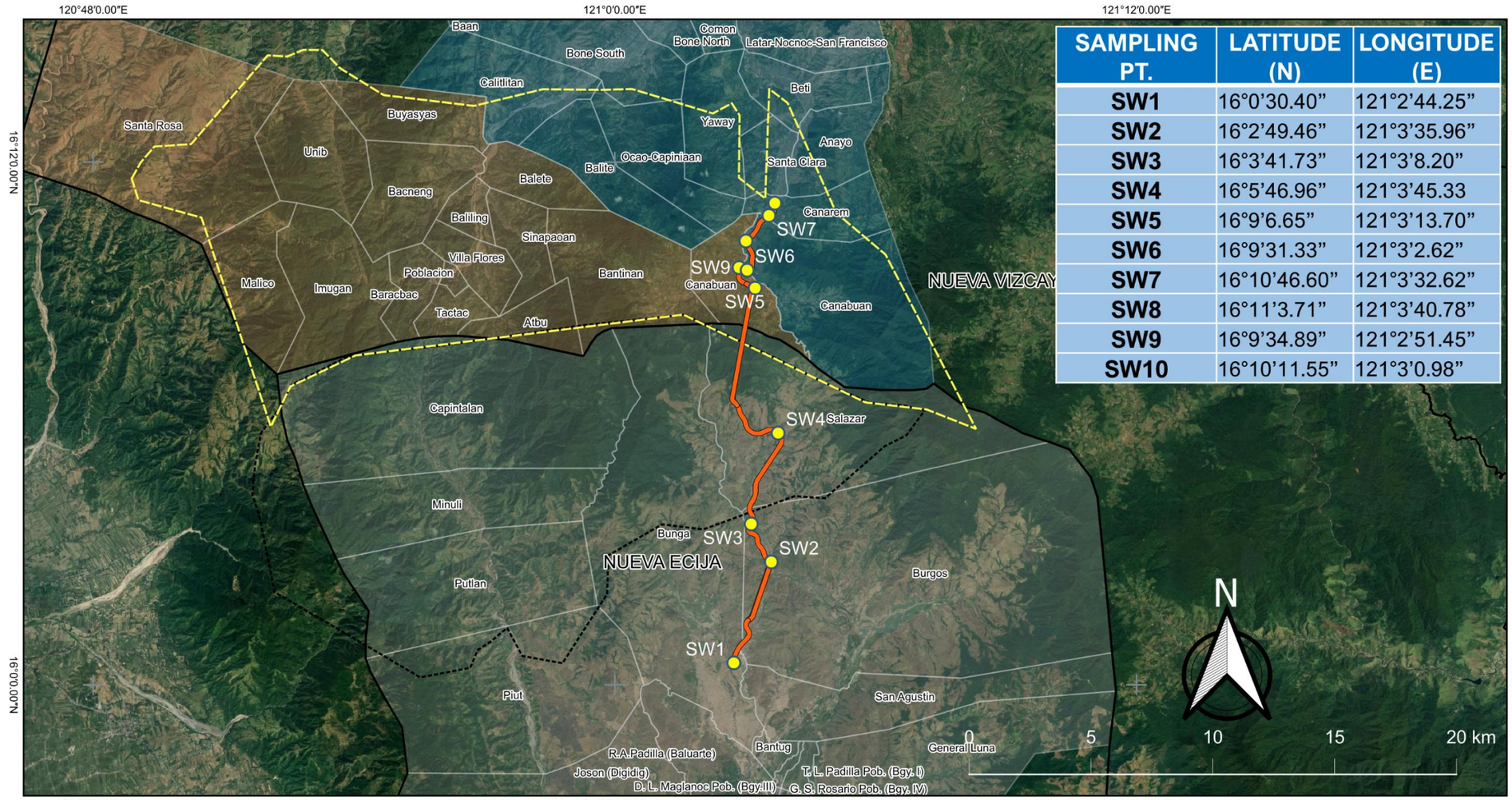
Table 2-43: Photos and Geographic Coordinates of the Surface Water Sampling Points

SAMPLING POINT	PHOTO	LATITUDE (N)	LONGITUDE (E)
SW 1		16°0’30.40” N	121°2’44.25” E
SW 2		16°2’49.46” N	121°3’35.96” E
SW 3		16°3’41.73” N	121°3’8.20” E

SAMPLING POINT	PHOTO	LATITUDE (N)	LONGITUDE (E)
SW 4		16°5'46.96" N	121°3'45.33"
SW 5		16°9'6.65" N	121°3'13.70" E
SW 6		16°9'31.33" N	121°3'2.62" E
SW 7		16°10'46.60" N	121°3'32.62" E
SW 8		16°11'3.71" N	121°3'40.78" E

SAMPLING POINT	PHOTO	LATITUDE (N)	LONGITUDE (E)
SW 9		16°9'34.89" N	121°2'51.45" E
SW 10		16°10'11.55" N	121°3'0.98" E

Figure 2-51: Surface Water Sampling Location Map



SAMPLING PT.	LATITUDE (N)	LONGITUDE (E)
SW1	16°0'30.40"	121°2'44.25"
SW2	16°2'49.46"	121°3'35.96"
SW3	16°3'41.73"	121°3'8.20"
SW4	16°5'46.96"	121°3'45.33
SW5	16°9'6.65"	121°3'13.70"
SW6	16°9'31.33"	121°3'2.62"
SW7	16°10'46.60"	121°3'32.62"
SW8	16°11'3.71"	121°3'40.78"
SW9	16°9'34.89"	121°2'51.45"
SW10	16°10'11.55"	121°3'0.98"

MAP SOURCE/S:

JICA STUDY TEAM

MAP INFORMATION:
Map Scale : 1 : 1 8 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Google Earth Satellite
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Municipality of Carranglan

Administrative Boundaries

- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija

Ancestral Domain

- Kalanguya Ikalahan AD
- Kalanguya AD

Sampling Station

- SW1 to SW10

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**SURFACE WATER SAMPLING LOCATION MAP**	As above.	LCI ENVI CORPORATION

Table 2-44: Results of Surface Water Analysis (Wet Season)

PARAMETER	UNIT	RESULTS OF ANALYSIS (Values in RED exceed the reference standard/s)										GUIDELINE VALUE FOR CLASS C WATER BODY
		SW 1	*SW 2*	*SW 3*	*SW 4*	*SW 5*	*SW 6*	*SW 7*	*SW 8*	*SW 9*	*SW 10*	*(DAO 2016-08)*
Color	TCU	**5**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	75
pH	pH	**7.8**	**8.0**	**7.9**	**7.9**	**8.1**	**8.2**	**8.2**	**8.2**	**8.3**	**8.3**	6.5 – 9.0
Temperature	°C	**34.2**	**30.9**	**30.5**	**28.5**	**26.1**	**25.4**	**25.8**	**26.3**	**26.0**	**25.8**	25-31
Dissolved Oxygen	mg/L	**7**	**9**	**8**	**8**	**8**	**8**	**9**	**8**	**8**	**9**	5 (minimum)
Total Suspended Solids	mg/L	**<2.38**	**8**	**22**	**11**	**7.5**	**2.5**	**5.5**	**3.5**	**0.08**	**4**	80
Biochemical Oxygen Demand	mg/L	**2**	**1**	**<1**	**1**	**1**	**1**	**<1**	**<1**	**<1**	**1**	7
Chloride	mg/L	**5**	**1.5**	**1.5**	**2**	**1.5**	**1**	**1**	**1.5**	**1.5**	**1**	350
Nitrate	mg/L	**0.06**	**0.07**	**0.06**	**0.05**	**<0.017**	**<0.017**	**<0.017**	**<0.017**	**<0.017**	**<0.017**	7
Oil and Grease	mg/L	**0.98**	**1.2**	**1.6**	**1.5**	**1.1**	**1.1**	**1.1**	**1.1**	**6**	**1.2**	2
Phosphate	mg/L	**<0.0064**	**<0.0064**	**<0.0064**	**0.01**	**<0.0064**	**0.01**	**0.01**	**0.02**	**0.02**	**<0.0064**	0.5
Surfactants	mg/L	**0.09**	**0.07**	**0.08**	**0.09**	**0.07**	**0.08**	**0.1**	**0.08**	**0.08**	**0.06**	1.5
Fecal Coliform	MPN/ 100mL	**5,400**	**350**	**3,500**	**240**	**790**	**2,800**	**5,400**	**3,500**	**2,400**	**9,200**	200
Total Coliform	MPN/ 100mL	**9,200**	**1,600**	**5,400**	**1,600**	**1,700**	**9,200**	**5,400**	**1,600**	**9,200**	**2,400**	*
Dissolved Copper	mg/L	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.004**	**<0.003**	0.02
Arsenic	mg/L	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**0.007**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	0.02
Cadmium	mg/L	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	0.005
Hexavalent Chromium	mg/L	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	0.01
Cyanide	mg/L	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	0.1
Lead	mg/L	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	0.05
Mercury	mg/L	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	0.002
Organophosphate as Malathion	µg/L	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	3

NOTES: SW = Surface Water | (*) = No guideline value at present | mg/L = Milligrams per liter | TCU = True color unit | ND = Not Detected
[REFERENCE: DENR AO 2016-08 (Water Quality Guidelines and General Effluent Standards of 2016)

Table 2-45: Results of Surface Water Analysis (Dry Season)

PARAMETER	UNIT	RESULTS OF ANALYSIS (Values in RED exceed the reference standard/s)										GUIDELINE VALUE FOR CLASS C WATER BODY
		SW 1	*SW 2*	*SW 3*	*SW 4*	*SW 5*	*SW 6*	*SW 7*	*SW 8*	*SW 9*	*SW 10*	*(DAO 2016-08)*
Color	TCU	**5**	**10**	**10**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	75
pH	pH	**8.4**	**8.4**	**7.9**	**7.9**	**8**	**7.7**	**8.9**	**8.9**	**8.4**	**8.5**	6.5 – 9.0
Temperature	°C	**28.9**	**28.7**	**28.2**	**24.7**	**22.1**	**22.4**	**23.5**	**24.1**	**22.9**	**23.1**	25-31
Dissolved Oxygen	mg/L	**9**	**8**	**9**	**8**	**9**	**8**	**9**	**8**	**9**	**9**	5 (minimum)
Total Suspended Solids	mg/L	**12**	**9**	**7**	**<2.38**	**3.5**	**3.5**	**11**	**12**	**8**	**7.5**	80
Biochemical Oxygen Demand	mg/L	**<1**	**<1**	**<1**	**<1**	**1**	**1**	**2**	**1**	**1**	**<1**	7
Chloride	mg/L	**4**	**<0.14**	**<0.14**	**<0.14**	**<0.14**	**<0.14**	**<0.14**	**<0.14**	**<0.14**	**<0.14**	350
Nitrate	mg/L	**0.1**	**0.06**	**0.02**	**0.03**	**0.2**	**0.2**	**0.1**	**0.2**	**0.1**	**0.3**	7
Oil and Grease	mg/L	**1.4**	**1.4**	**1.5**	**1.4**	**1.4**	**1.4**	**1.4**	**1.3**	**1.4**	**1.4**	2
Phosphate	mg/L	**0.01**	**<0.0064**	**<0.0064**	**<0.0064**	**<0.0064**	**<0.0064**	**<0.0064**	**<0.0064**	**<0.0064**	**<0.0064**	0.5
Surfactants	mg/L	**0.2**	**0.2**	**0.3**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	1.5
Fecal Coliform	MPN/ 100mL	**350**	**110**	**390**	**350**	**920**	**540**	**2,400**	**1,300**	**1,300**	**2,400**	200
Total Coliform	MPN/ 100mL	**1,600**	**350**	**2,200**	**540**	**920**	**1,600**	**2,400**	**2,400**	**2,400**	**2,400**	*
Dissolved Copper	mg/L	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.003**	**<0.003**	0.02
Arsenic	mg/L	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	0.02
Cadmium	mg/L	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	0.005
Hexavalent Chromium	mg/L	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	**<0.004**	0.01
Cyanide	mg/L	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	**<0.007**	0.1
Lead	mg/L	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	0.05
Mercury	mg/L	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	0.002
Organophosphate as Malathion	µg/L	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	3

NOTES: SW = Surface Water | (*) = No guideline value at present | mg/L = Milligrams per liter | TCU = True color unit | ND = Not Detected
[REFERENCE: DENR AO 2016-08 (Water Quality Guidelines and General Effluent Standards of 2016)

[330]All parameters are within the standards, except for fecal coliform may be due to possible wastes upstream of river caused by agricultural activities (i.e., farming) and oil and grease on SW9 due to anthropogenic activities in the area.

[331]The proposed projects will not pose any impacts on the water quality of the nearby rivers except during the construction activities due to excavation and backfilling activities. Installation of silt protection and regular monitoring may be done to mitigate these effects.

2.2.4 Freshwater Ecology

[332]The aquatic ecology assessment focused on 4 functional aquatic groups – phytoplankton, zooplankton benthic macrofauna and fishes and other fauna present in 8 different stations in the project areas.

2.2.4.1 Methodology

[333]**Sampling Site Selection/Description.** Sampling site selection was taken in to account the gathered secondary data. The study made use of GPS techniques, Satellite Imagery and Geographic Information System to determine total area to be surveyed and general locations of sampling sites for the aquatic ecology. These stations were verified during reconnaissance and site visit.

[334]The sampling program is based on the areas covered by the map presented as **Figure 2-52**. The geographic coordinates of each of the stations were taken using Garmin Montana 680 with the position format of hours-minutes-seconds. **Table 2-46** shows the coordinates and descriptions of Aquatic Ecology Station.

Table 2-46: Freshwater Ecology Sampling Location Geographical Coordinates

STATION / LOCATION	REMARKS/DESCRIPTION	DATE	LATITUDE (N)	LONGITUDE (E)
Station PZB 1 – Bunga, Carranglan, Nueva Ecija	▪ Agricultural ecosystem mainly planted with palay ▪ Wahig River, Downstream of Mandalukdok Bridge	June 17-18, 2021 (Wet Season) January 15-16, 2022 (Dry Season)	16°0'21.38" N	121°3'1.19" E
Station PZB 2 – Burgos, Carranglan, Nueva Ecija	▪ Aggregates of agricultural ecosystem (planted with palay) and shrubland ecosystem near settlement area ▪ Lomboy Bridge	June 17-18, 2021 (Wet Season) January 15-16, 2022 (Dry Season)	16°2'46.27" N	121°3'28.14" E
Station PZB 3 – Salazar, Carranglan, Nueva Ecija	▪ Amalgamation of agricultural ecosystem (mainly planted with palay) and shrubland ecosystem ▪ Along Poblacion – Salazar Road	June 17-18, 2021 (Wet Season) January 15-16, 2022 (Dry Season)	16°4'0.58" N	121°2'51.03" E
Station PZB 4 – Salazar, Carranglan, Nueva Ecija	▪ Agricultural ecosystem mainly planted with palay within settlement area ▪ Popo Bridge	June 17-18, 2021 (Wet Season) January 15-16, 2022 (Dry Season)	16°4'10.08" N	121°2'59.35" E

STATION / LOCATION	REMARKS/DESCRIPTION	DATE	LATITUDE (N)	LONGITUDE (E)
Station PZB 5 – Salazar, Carranglan, Nueva Ecija	▪ Riverbank, mixture of agricultural ecosystem and shrubland ecosystem ▪ Sinuratan Bridge	June 17-18, 2021 (Wet Season) January 15-16, 2022 (Dry Season)	16°5'38.04" N	121°3'41.49" E
Station PZB 6 – Canabuan, Sta. Fe, Nueva Vizcaya	▪ Mixture of agricultural ecosystem (planted with palay and vegetable crops) and shrubland ecosystem near settlement area ▪ Upstream Marang River	June 17-18, 2021 (Wet Season) January 15-16, 2022 (Dry Season)	16°9'4.69" N	121°3'20.58" E
Station PZB 7 – Canabuan, Aritao, Nueva Vizcaya	▪ Amalgamation of agricultural ecosystem (planted with vegetables and palay) and agroforestry ecosystem (dominated by mango crops) near settlement area ▪ Midstream Marang River	June 17-18, 2021 (Wet Season) January 15-16, 2022 (Dry Season)	16°9'43.53" N	121°3'2.88" E
Station PZB 7 – Canarem, Aritao, Nueva Vizcaya	▪ Riverbank, agricultural ecosystem along settlement area ▪ Downstream Marang Bridge, Marang River	June 17-18, 2021 (Wet Season) January 15-16, 2022 (Dry Season)	16°11'3.80" N	121°3'43.04" E

Figure 2-52: Location of Freshwater Ecology Sampling Stations

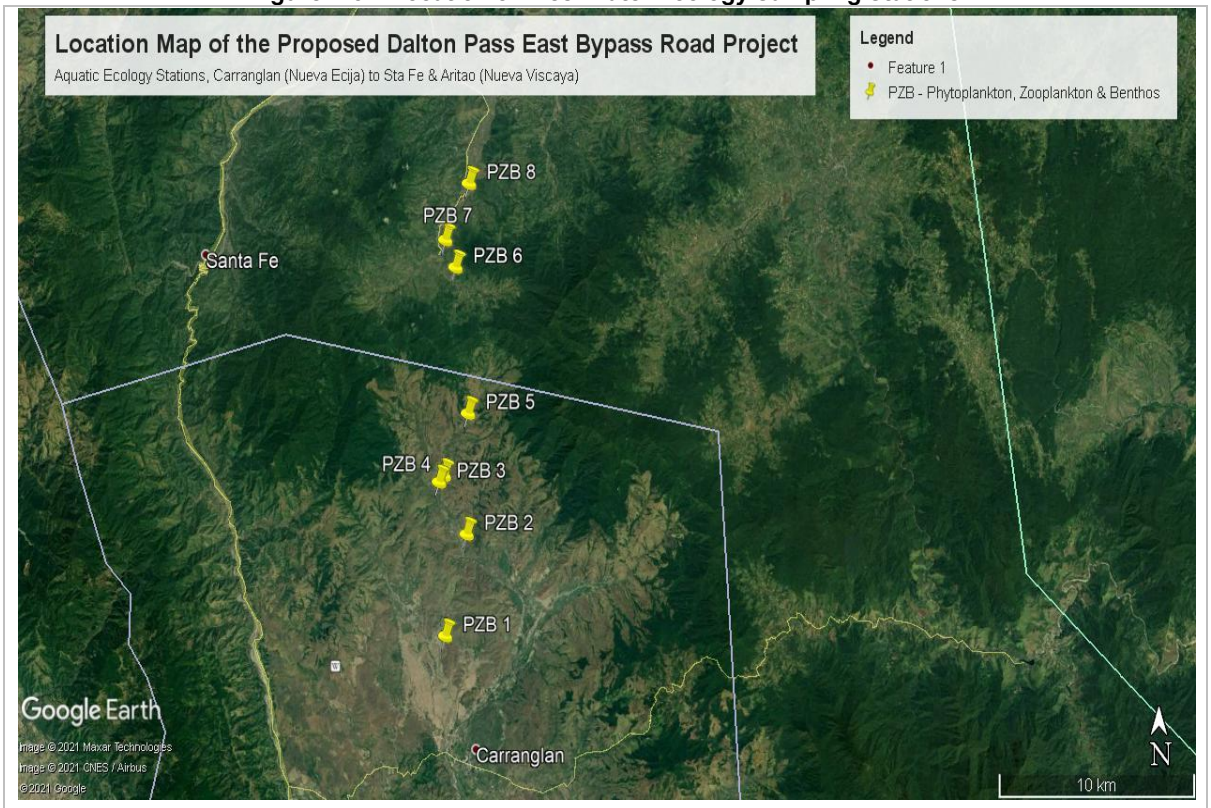


FIGURE TITLE:		
LOCATION OF FRESHWATER ECOLOGY SAMPLING STATIONS		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[335]From the established 8 sampling stations, this component took samples in the upstream, midstream, and downstream of the river to describe the fishes, benthic organisms, and plankton assemblage in the area. Sampling includes macroinvertebrates, fish fauna and other aquatic floral assemblage inventory.

[336]In sampling sites where water is deep and unsafe to wade into and where there is poor access to the water edge, an Alpha sampler was used. Vertical plankton sampling method for deep samples and kick-netting were carried out at wadable depths for the plankton and benthos sampling. Primary data were gathered through direct observation and field sampling.

2.2.4.2 Benthic macroinvertebrates (soft bottom community) sampling and analysis

[337]The survey was intended to evaluate the benthic community in the area with respect to its composition, density, and relative abundance.

[338]Replicate samples were obtained using a stream sampling method (kick-sampling). Benthic samples were then placed in pre-labeled plastic containers. The grab samples for faunal analysis were fixed immediately with 5% formalin and stained with Rose Bengal Powder and brought to the laboratory for processing. In the laboratory, the samples were wet sieved using different openings. The collected samples were further sorted and identified in the laboratory using a dissecting microscope and readily available taxonomic keys.

[339]Benthic macroinvertebrates in each sample were identified down to the lowest practicable taxonomic level and enumerated as much as possible.

2.2.4.3 Zooplankton and phytoplankton sampling and analysis

[340]Phytoplankton and zooplankton suspended in water were collected by scooping method and passed through or filtered using plankton net. Collected phyto- and zooplankton samples were placed in resealable plastic sampling bottles and preserved with Lugol's solution or 5% formalin with Rose Bengal Powder stain. Samples were brought to the laboratory for identification and determination of the relative abundance of the plankton species present. Photomicrographs of the most dominant organisms were also done for documentation purposes.

[341]At each station, zooplankton samples were collected using a 60 µ plankton net and a sieve with 20 µ mesh size for phytoplankton. Since majority of the stations were relatively shallow, plankton sampling technique were standardized by employing scooping method of plankton sampling. Sampling was done through filtration using pail and plankton net. Known volumes of water samples were filtered or passed through the zooplankton net and sieve.

[342]Phytoplankton samples were preserved with Lugol's solution, while samples of zooplankton were fixed with 5% formaldehyde immediately after collection. Prior to the analysis of zooplankton, samples were further concentrated to 1ml and were all analyzed. For phytoplankton samples, a 1ml aliquot sub-sample was placed in a Sedgewick-Rafter cell counter and was examined under a Zeiss Primo Star microscope. **Figure 2-53** shows the sampling photos.

2.2.4.4 Freshwater fishes and other fauna

[343]Prior to the actual sampling, a rapid reconnaissance survey was conducted to look for sampling sites, with the assistance of local guides and in coordination with the barangay officials.

[344]Key Informant Interviews (KIIs) was conducted to identify other fish species that are present in the project area which may not be captured during the sampling methods. The identified key informants are the same people using the active gears during the sampling activity. **Figure 2-54** shows the sampling photos for freshwater fish survey/assessment.

Figure 2-53: Zooplankton and Phytoplankton Sampling Photos

FIGURE TITLE:

ZOOPLANKTON AND PHYTOPLANKTON SAMPLING PHOTOS

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Figure 2-54: Freshwater Fishes Sampling Photos

FIGURE TITLE:		
FRESHWATER FISHES SAMPLING PHOTOS		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

2.2.4.5 Data processing and analyses for freshwater ecology

[345]Ecological condition indicators were computed for each sampling station using the formulas below.

[346]**Dominance.** The dominant species for each site were determined based on the importance value (IV). The IV is the sum of the relative density, relative frequency, and relative dominance. These were computed using the following formula:

$$\textbf{Density} = \frac{\text{Total number of individuals counted for a given species}}{\text{Total area sampled}}$$

$$\textbf{Relative density} = \frac{\text{Total number of individuals of a given species} \times 100}{\text{Total number of individuals of all species}}$$

$$\textbf{Dominance} = \frac{\text{Total area covered by a given species}}{\text{Total area sampled}}$$

$$\textbf{Relative dominance} = \frac{\text{Total coverage of a species} \times 100}{\text{Total coverage of all species}}$$

$$\textbf{Frequency} = \frac{\text{Number of plots where a given species occurs} \times 100}{\text{Total number of plots in the site}}$$

$$\textbf{Relative frequency} = \frac{\text{Frequency of a given species} \times 100}{\text{Total frequency of all species}}$$

$$\textbf{Importance Value} = \text{Relative density} + \text{Relative dominance} + \text{Relative frequency}$$

[347]**Species Diversity and Abundance.** On the other hand, species diversity indices were computed using the following formula:

Shannon-Weiner diversity index (H')

$$H' = -\Sigma p_i \ln p_i$$

where p_i, the proportional abundance of the ith species $= (n_i/N)$

Evenness (J) of the species was calculated using the formula:

$$J = H'/\ln S$$

where S, number of species in a stand

Pielou's Evenness $= J = H/Hmax = -[\sum(p_i)(\ln p_i)]/\ln S$, where,

"J" – represents the symbol for the species richness
"H'" – species diversity
"Hmax" – species maximum diversity
"S" – number of species in the community

[348]The interpretation of the values obtained using the above formulas were based on the Fernando Biodiversity Scale, 1998 shown in the table below.

Table 2-47: The Fernando Scale, 1998

RELATIVE VALUES	SHANNON BIODIVERSITY (H') INDEX	PIELOU (J') EVENNESS INDEX
Very High	3.5 and above	0.75 – 1.00
High	3.0 – 3.49	0.50 – 0.74
Moderate	2.5 – 2.99	0.25 – 0.49
Low	2.0 – 2.49	0.15 – 0.24
Very Low	1.9 and below	0.05 – 0.14

2.2.4.6 Result and discussion

[349]**Phytoplankton Communities (Wet Season).** Detailed information of the wet season for phytoplankton community is provided in **Table 2-48**. Overall, the result of the microscopy analysis revealed a total of 28 phytoplankton genera belonging to diatoms (14 genera), green algae (10 genera) and cyanobacteria (2 genera), euglenoids (1 genera) and dinoflagellates (1 genus). Diatoms were the most dominant group in all stations (**Figure 2-55**).

Figure 2-55: Percentage Composition of Major Phytoplankton Group (Wet Season)

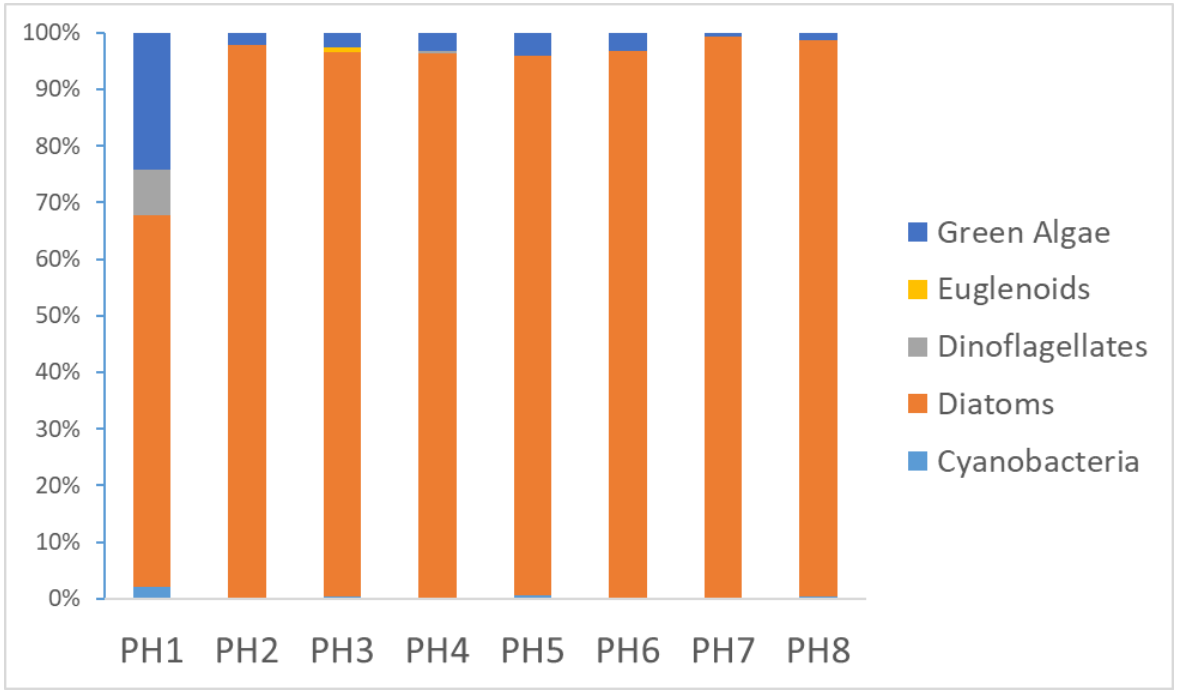


FIGURE TITLE:

PERCENTAGE COMPOSITION OF MAJOR PHYTOPLANKTON GROUP (WET SEASON)

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Table 2-48: Phytoplankton Composition, Distribution, Diversity and Abundance (cells/L) – Wet Season

TAXA	STATIONS								GRAND TOTAL	REL. ABUND.
	Ph1	Ph2	Ph3	Ph4	Ph5	Ph6	Ph7	Ph8		
Cyanobacteria	**1,333**		**7,333**		**633**		**3,683**	**5,667**	**18,650**	**0.25**
Anabaena	1,000								1,000	0.01
Oscillatoria	333		7,333		633		3,683	5,667	17,650	0.24
Diatoms	**43,333**	**203,700**	**1,751,305**	**143,367**	**120,333**	**850,629**	**2,157,111**	**1,903,433**	**7,173,211**	**97.45**
Achnanthes	333			1,417		1,200			2,950	0.04
Aulacosiera	5,667		909,333	1,417		27,600	5,667	45,050	994,733	13.51
Cymbella		17,100	114,767	3,967	1,267	19,200	62,333	102,000	320,633	4.36
Diatoma	1,333	900	2,567	567		2,400			7,767	0.11
Eunotia		900	2,567			1,200	1,983		6,650	0.09
Fragillaria	2,000	101,100	408,571	24,083	11,717	302,400	451,444	895,333	2,196,649	29.84
Melosira		29,100	112,567	90,100	96,583	345,429	1,411,000	504,333	2,589,112	35.17
Navicula	1,000	900		1,133	633	2,400	1,983		8,050	0.11
Nitzschia	3,667	30,000	75,900	1,133	1,267	1,200	15,017	5,100	133,283	1.81
Pinnularia				1,133		2,400	15,017	16,150	34,700	0.47
Pleurosigma	333	4,200		6,800	2,217		5,667	11,617	30,833	0.42
Rhabdonema	333		2,567		317		1,983		5,200	0.07
Surirella	26,000	9,300	9,900	3,967	5,067	9,600	17,000	51,850	132,683	1.80
Synedra	2,667	10,200	112,567	7,650	1,267	135,600	168,017	272,000	709,967	9.65
Dinoflagellates	**5,333**			**567**					**5,900**	**0.08**
Peridinium	5,333			567					5,900	0.08
Euglenoids			**14,667**						**14,667**	**0.20**
Trachelamonas			14,667						14,667	0.20
Green algae	16,000	4,500	49,133	4,817	5,067	27,600	17,000	24,367	148,483	2.02
Closterium	3,000	1,800		1,133	633	26,400	9,350	12,467	54,783	0.74
Cosmarium	667	1,800		1,983	1,267				5,717	0.08
Filamentous green algae	4,333				2,533	1,200	7,650		15,717	0.21
Green algae-like	3,667								3,667	0.05
Pediastrum			7,333	567	317				8,217	0.11
Scenedesmus	2,333	900							3,233	0.04
Spirogyra			9,900					11,900	21,800	0.30
Staurastrum	1,000		29,333						30,333	0.41
Staurodesmus	667								667	0.01

TAXA	STATIONS								GRAND TOTAL	REL. ABUND.
	Ph1	Ph2	Ph3	Ph4	Ph5	Ph6	Ph7	Ph8		
Stauroneis	333		2,567	1,133	317				4,350	0.06
Grand Total	**66,000**	**208,200**	**1,822,438**	**148,750**	**126,033**	**878,229**	**2,177,794**	**1,933,467**	**7,360,911**	**100**
Richness	**21**	**13**	**16**	**17**	**15**	**14**	**15**	**12**		
Evenness (J')	**0.75**	**0.64**	**0.57**	**0.52**	**0.37**	**0.55**	**0.41**	**0.60**		
Diversity (H')	**2.27**	**1.65**	**1.58**	**1.48**	**1.01**	**1.45**	**1.12**	**1.49**		

[350]Station Ph1 which is located in a water body with agricultural system in Bunga, Carranglan, Nueva Ecija had a total phytoplankton density of 66,000 cells per L composed of 21 genera (Table 1). Of which, the pennate diatom Surirella sp. was the most abundant with 26,000 cells per L. Index of evenness and diversity were high at 0.75 and 2.27.

[351]Station Ph2 which is located in a water body also characterized with agricultural ecosystem in Burgos, Carranglan, Nueva Ecija had a total phytoplankton density of 208,200 cells per L composed of 13 genera. Among the genera identified, the pennate diatom Fragilaria sp. was the most abundant with 101,100 cells per L. Index of evenness and diversity were low at 0.64 and 1.65 respectively due to the high abundance of Fragilaria sp. The high abundance of Fragilaria in this body of water indicates high nutrient inputs resulting to the dominance of this taxa.

[352]Station Ph3 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total phytoplankton density of 1,822,438 cells per L composed of 16 genera. Of these, the pennate taxa Fragilaria was the most abundant with 408,571 cells per L. Index of evenness and diversity were low at 0.57 and 1.58 indicative of relatively even community. This species however is non-harmful and not considered a threat to aquatic ecosystem.

[353]Station Ph4 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total phytoplankton density of 148,750 cells per L composed of 17 genera. Of all the stations, the number of genera identified here was the highest. Among the diatoms identified, the centric diatom Melosira sp. was the most abundant with 90,100 cells per L. Index of evenness and diversity were low at 0.52 and 1.48 respectively indicative of relatively even community.

[354]Station Ph5 which is located in a riverbank in Salazar, Carranglan, Nueva Ecija had a total density of 126,033 cells per L composed of 15 genera. Among the genera identified, the centric diatom Melosira was the most abundant with 96,583 cells per L. Index of evenness and diversity were very low at 0.37 and 1.01.

[355]Station Ph6 which is located in a water body in Canabuan, Sta. Fe, Nueva Vizcaya had a total phytoplankton density of 878,229 cells per L composed of 14 genera. The high abundance was mainly due to Melosira sp. with cell density of 345,429 cells per L. This resulted to a low index of evenness and diversity values at 0.55 and 1.45, respectively.

[356]Station Ph7 which is located in a water body in Canabuan, Aritao, Nueva Vizcaya had a total phytoplankton density of 2,177,764 cells per L composed of 15 genera. The cell abundance quantified in this station was the highest among all the stations. The bulk of the abundance is due to the bloom of Melosira at 1,411,000 cells per L. Index of evenness and diversity were very low at 0.41 and 1.12.

[357]Station Ph8 which is located in a riverbank in Canarem, Aritao, Nueva Vizcaya had a total phytoplankton density of 1,933,467 cells per L composed of 12 genera. The taxa richness in this station was the poorest. Among the genera identified, pennate diatom Fragilaria was the most abundant with 895,333 cells per L. Index of evenness and diversity were low at 0.60 and 1.49.

[358]To sum up, phytoplankton taxa identified in each sampling station is typical of an aquatic environment. Cell abundance was notably highest in station Ph7 while the lowest was quantified in station Ph1. The most taxa rich station was observed in station Ph4 with 17 while the most depauperate was observed in station Ph8. Diversity however was overall low except in station of Ph1. Diversity index values that are greater than 2.0 indicate normal conditions for

aquatic biota and the associated habitat. Values above 3.0 indicate that the habitat structure is stable and balanced, while values midway from 1.0 to 2.0 describe a threatened condition; furthermore, values lower than 1.0 indicate pollution and degradation occurring in the habitat structure (Goncalves and Menezes, 2011). High plankton diversity in water systems may indicate healthy and unpolluted conditions while dominance of only a few species may suggest otherwise (Rai et al, 2008).

[359]**Phytoplankton Communities (Dry Season).** For dry season assessment, the result of the microscopy analysis revealed a total of 20 phytoplankton genera belonging to diatoms (15 genera), green algae (4 genera), and cyanobacteria (1 genus). Detailed information of the phytoplankton community is provided in **Table 2-49**. Diatoms were also the most dominant group in all stations during dry season (**Figure 2-56**).

Figure 2-56: Percentage Composition of Major Phytoplankton Group (Dry Season)

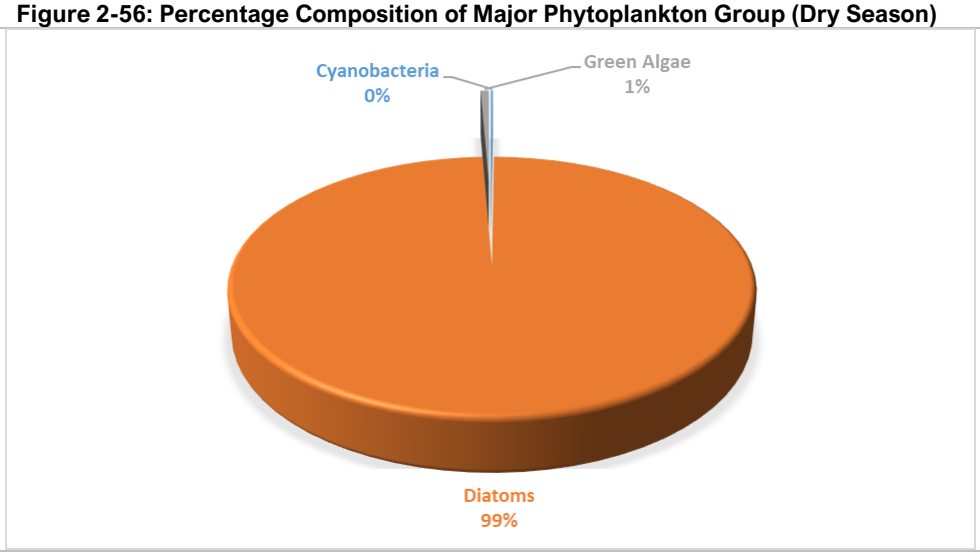


FIGURE TITLE:		
PERCENTAGE COMPOSITION OF MAJOR PHYTOPLANKTON GROUP (DRY SEASON)		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Table 2-49: Phytoplankton Composition, distribution, Diversity and Abundance (cells/L) – Dry Season

TAXA	STATIONS								GRAND TOTAL	REL. ABUND.
	Ph1	Ph2	Ph3	Ph4	Ph5	Ph6	Ph7	Ph8		
Cyanobacteria			**120**	**60**	**120**				**300**	**0.15**
Oscillatoria			120	60	120				300	**0.15**
Diatoms	**21,120**	**33,740**	**17,490**	**31,020**	**7,755**	**52,077**	**13,133**	**16,215**	**192,550**	**99.20**
Achnanthes		260	150	60	30	198	83	270	1,052	**0.54**
Asterumphalus	37	60	30		30				157	**0.08**
Aulacosiera				740			167		907	**0.47**
Cymbella	1,613	2,060	1,470	2,800	750	1,048	700	1,500	11,942	**6.15**
Diploneis	37							30	67	**0.03**
Eunotia	275	800	480	200					1,755	**0.90**
Fragillaria	13,475	15,260	7,800	6,740	3,075	12,183	7,133	3,780	69,447	**35.78**
Melosira	3,997	11,340	6,225	16,800	2,145	31,450	2,667	9,000	83,623	**43.08**
Navicula				60		198			258	**0.13**
Nitzschia	220	740	720	1,940	795	4,618	917	825	10,775	**5.55**
Pinnularia	147	200	180	140		482	167	30	1,345	**0.69**
Pleurosigma		140	30	200		198	33		602	**0.31**
Stauroneis	183	140	75	200	75				673	**0.35**
Surirella	733	1,740	150	400	180	652	633	330	4,818	**2.48**
Synedra	403	1,000	180	740	675	1,048	633	450	5,130	**2.64**
Green algae	**312**		**225**	**400**	**45**			**270**	**1,252**	**0.64**
Closterium	37			60	45			270	412	**0.21**
Geminella			225						225	**0.12**
Pediastrum	275								275	**0.14**
Spirogyra				340					340	**0.18**
Grand Total	**21,432**	**33,740**	**17,835**	**31,480**	**7,920**	**52,077**	**13,133**	**16,485**	**194,102**	**100**
Richness	**13**	**12**	**14**	**16**	**11**	**10**	**10**	**10**		
Evenness (J')	**0.49**	**0.58**	**0.56**	**0.54**	**0.69**	**0.51**	**0.63**	**0.60**		
Diversity (H')	**1.26**	**1.45**	**1.47**	**1.50**	**1.65**	**1.18**	**1.45**	**1.37**		

[360]Station Ph1 which is located in a water body with the agricultural system in Bunga, Carranglan, Nueva Ecija had a total phytoplankton density of 21,432 cells per m^3 composed of 13 genera (**Table 2-49**). Of which, the pennate diatom *Fragillaria* sp. was the most abundant with 13,475 cells per L. Index of evenness and diversity were high at 0.49 and 1.26.

[361]Station Ph2 which is located in a water body also characterized with the agricultural ecosystem in Burgos, Carranglan, Nueva Ecija had a total phytoplankton density of 33,740 cells per m^3 composed of 12 genera. Among the genera identified, the pennate diatom *Fragilaria sp.* was the most abundant with 15,260 cells per m^3. Index of evenness and diversity were low at 0.58 and 1.45 respectively due to the high abundance of *Fragilaria* sp. The high abundance of *Fragilaria* in this body of water indicates high nutrient inputs resulting in the dominance of this taxa.

[362]Station Ph3 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total phytoplankton density of 17,835 cells per m^3 composed of 14 genera. Of these, the centric taxa *Fragilaria* was the most abundant with 7,800 cells per m^3. Index of evenness and diversity were low at 0.56 and 1.47 indicative of a relatively even community. This species however is non-harmful and not considered a threat to the aquatic ecosystem.

[363]Station Ph4 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total phytoplankton density of 31,480 cells per m^3 composed of 16 genera. Of all the stations, the number of genera identified here was the highest. This station also harbored the highest phytoplankton density. Among the diatoms identified, the centric diatom *Melosira* sp. was the most abundant with 16,800 cells per m^3. Index of evenness and diversity were low at 0.54 and 1.50 respectively indicative of relatively even community.

[364]Station Ph5 which is located on a riverbank in Salazar, Carranglan, Nueva Ecija had a total density of 7,920 cells per m^3 composed of 11 genera. Among the genera identified, the centric diatom *Fragilaria* was the most abundant with 3,075 cells per L. Index of evenness and diversity was low at 0.69 and 1.65.

[365]Station Ph6 which is located in a water body in Canabuan, Sta. Fe, Nueva Vizcaya had a total phytoplankton density of 52,077 cells per m^3 composed of 10 genera. The high abundance was mainly due to *Melosira sp.* with a cell density of 31,450 cells per m^3. This resulted to a low index of evenness and diversity values at 0.51 and 1.18 respectively.

[366]Station Ph7 which is located in a water body in Canabuan, Aritao, Nueva Vizcaya had a total phytoplankton density of 13,133 cells per m^3 composed of 10 genera. The bulk of the abundance is due to the bloom of *Fragilaria* at 7,133 cells per m^3. Index of evenness and diversity were very low at 0.63 and 1.45.

[367]Station Ph8 which is located in a riverbank in Canarem, Aritao, Nueva Vizcaya had a total phytoplankton density of 16,485 cells per L composed of 10 genera. The taxa richness in this station was among the poorest. Among the genera identified, pennate diatom *Melosira* was the most abundant with 16,485 cells per m^3. Index of evenness and diversity were low at 0.60 and 1.37.

[368]Same as wet season, phytoplankton taxa identified in each sampling station is typical of an aquatic environment. Cell abundance was notably highest in station Ph4 while the lowest was quantified in station Ph5. The most taxa-rich station was observed in station PH4 with 16 while the most depauperate was observed in stations PH6-PH8. Diversity however was overall low. Diversity index values that are greater than 2.0 indicate normal conditions for aquatic biota

and the associated habitat. Values above 3.0 indicate that the habitat structure is stable and balanced, while values midway from 1.0 to 2.0 describe a threatened condition; furthermore, values lower than 1.0 indicate pollution and degradation occurring in the habitat structure (Goncalves and Menezes, 2011). High plankton diversity in water systems may indicate healthy and unpolluted conditions while the dominance of only a few species may suggest otherwise (Rai et al, 2008).

369 **Zooplankton Communities (Wet Season).** An assessment of the composition and abundance of the zooplankton which are equally important was also conducted at the same sampling stations obtained for phytoplankton. Zooplankters are drifting organism living in the oceans, particularly the pelagic and littoral zones, as well as in rivers, lakes, and ponds. They play an important role in the conservation of energy from primary producer (phytoplankton) to higher trophic levels.

370 Analysis of samples taken from the eight sampling stations revealed a total of 8 zooplankton groups belonging to Cladocera, Rotifera, Ostracoda, Copepoda, Polychaeta. Cladocerans were the most abundant in stations ZP1 and ZP6, rotifers in stations ZP2, ZP3, ZP7, and polychaetes in stations ZP5 and ZP8 (**Figure 2-57**). Details of the zooplankton composition, abundance and diversity is presented in **Table 2-50**.

Figure 2-57: Percentage Composition of Major Zooplankton Groups (Wet Season)

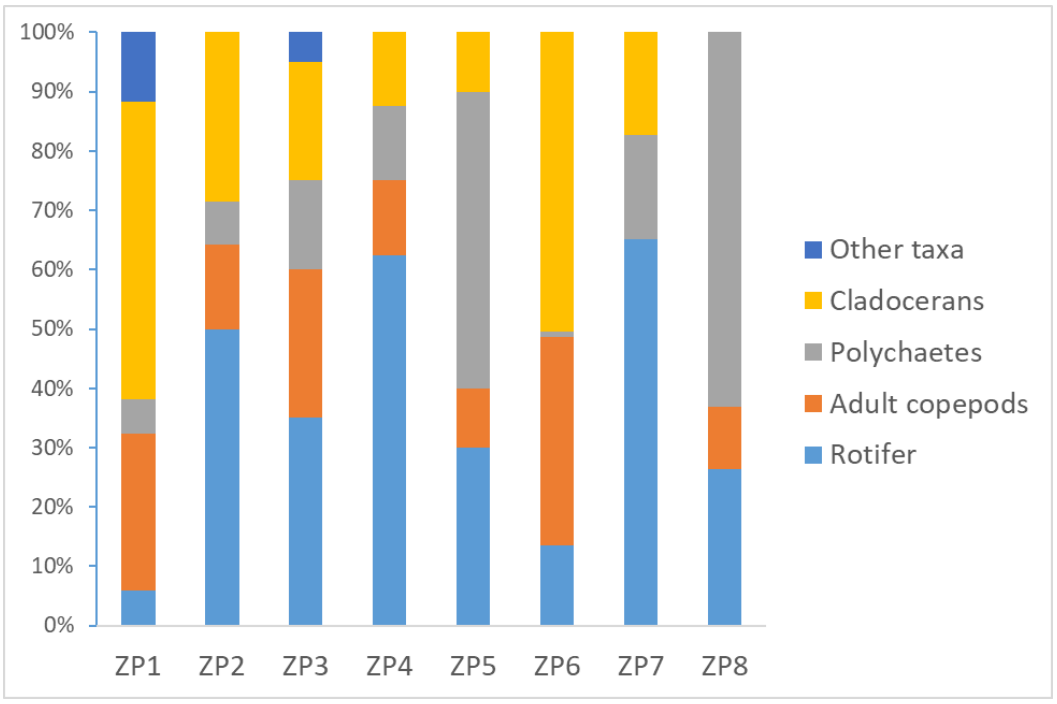


FIGURE TITLE:		
PERCENTAGE COMPOSITION OF MAJOR ZOOPLANKTON GROUPS (WET SEASON)		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
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Table 2-50: Zooplankton Composition, Distribution, Diversity and Abundance (individuals/ m^3) – Wet Season

TAXA	STATIONS								GRAND TOTAL	REL. ABUND.
	ZP1	ZP 2	ZP3	ZP4	ZP5	ZP6	ZP7	ZP8		
Adult Form	**1,067**	**467**	**633**	**267**	**333**	**3,700**	**767**	**633**	**7,867**	**98.74**
Brachionus	67	167	100	33	33	267	0	33	700	8.79
Polychaetes	67	33	100	33	167	33	133	400	967	12.13
Cladocerans	567	133	133	33	33	1,867	133	0	2,900	36.40
Ostracods	67	0	0	0	0	0	0	0	67	0.84
Calanoids	167	0	67	0	0	533	0	33	800	10.04
Cyclopoids	133	67	100	33	33	767	0	33	1,167	14.64
Bdelloida	0	67	133	133	67	233	500	133	1,267	15.90
Larval Form	**67**	**0**	**33**	**0**	**0**	**0**	**0**	**0**	**100**	**1.26**
Copepod nauplii	67	0	33	0	0	0	0	0	100	1.26
Grand Total	**1,133**	**467**	**667**	**267**	**333**	**3,700**	**767**	**633**	**7,967**	**100**
Richness	**7**	**5**	**7**	**5**	**5**	**6**	**3**	**5**		
Evenness (J')	**0.79**	**0.91**	**0.96**	**0.86**	**0.84**	**0.76**	**0.81**	**0.67**		
Diversity (H')	**1.55**	**1.47**	**1.88**	**1.39**	**1.36**	**1.36**	**0.89**	**1.08**		

[371]Station ZP1 which is located in a water body with agricultural system in Bunga, Carranglan, Nueva Ecija had a total zooplankton density of 1,133 ind per m3 composed of 7 taxa (Table X-X). Of which, cladocerans were the most abundant with 567cells per m3. Index of evenness was high at 0.79 but diversity was low at 1.55. Cladocerans are commonly known as water fleas are ubiquitous in inland freshwater habitat. They occupy a key position in the aquatic food chain as the intermediate link between primary and secondary productivity and they also serve as model species in environmental toxicology because of their high sensitivity to water quality (Siciliano et al., 2015).

[372]Station ZP2 which is located in a water body also characterized with agricultural ecosystem in Burgos, Carranglan, Nueva Ecija had a total zooplankton density of 467 ind per m3 composed of 5 taxa. Among the taxa identified, the rotifer Brachionus was the most abundant with 167 ind per m3. Index of evenness was high at 0.91 but diversity was low at 1.47. Ecologically, they are beneficial in stabilizing organic wastes, stimulating microfloral activity and decomposition, enhancing oxygen penetration, and recycling mineral nutrients. The principal role of rotifers in wastewater is the removal of bacteria and the development of floc.

[373]Station ZP3 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total zooplankton density of 667 cells per m3 composed of 7 taxa. Of these, Cladocerans were the most abundant with 667 cells per m3. Index of evenness was high at 0.96 but diversity was low at 1.88.

[374]Station ZP4 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total density of 267 ind per m3 composed of 5 taxa. Among the taxa identified, the Bdelloid rotifers were the most abundant with 133 cells per m3. Index of evenness was high at 0.86 but diversity was low at 1.39.

[375]Station ZP5 which is located in a riverbank in Salazar, Carranglan, Nueva Ecija had a total density of 333 ind per m3 composed of 5 taxa. Among the taxa identified, polychaetes were the most abundant with 167 cells per m3. Index of evenness was high at 0.84 but diversity was low at 1.36. Polychaetes play a major role in the functioning of benthic communities, in terms of recycling and reworking of benthic sediments, bioturbating sediments and in the burial of organic matter.

[376]Station ZP6 which is located in a water body in Canabuan, Sta. Fe, Nueva Vizcaya had a total density of 3,700 ind per m3 composed of 6 taxa. The abundance quantified in this station was the highest among all the stations. The high abundance was mainly due Cladocerans. with density of 1,867 ind per m3. This resulted to a low index of evenness and diversity values at 0.76 and 1.36 respectively.

[377]Station ZP7 which is located in a water body in Canabuan, Aritao, Nueva Vizcaya had a total density of 767 ind per m3 composed of 3 taxa Among the taxa identified, the Bdelloid rotifers were the most abundant with 500 cells per m3. Index of evenness was high at 0.81 but diversity was low at 0.89

[378]Station ZP8 which is located in a riverbank in Canarem, Aritao, Nueva Vizcaya had a total density of 633 ind per m3 composed of 5 taxa. Among the taxa identified, polychaetes were the most abundant with 400 cells per m3. Index of evenness and diversity were low at 0.67 and 1.08.

[379]**Figure 2-58** shows the common plankton taxa identified in 8 stations.

Figure 2-58: Common Plankton Taxa Identified in Sampling Stations (Wet Season)

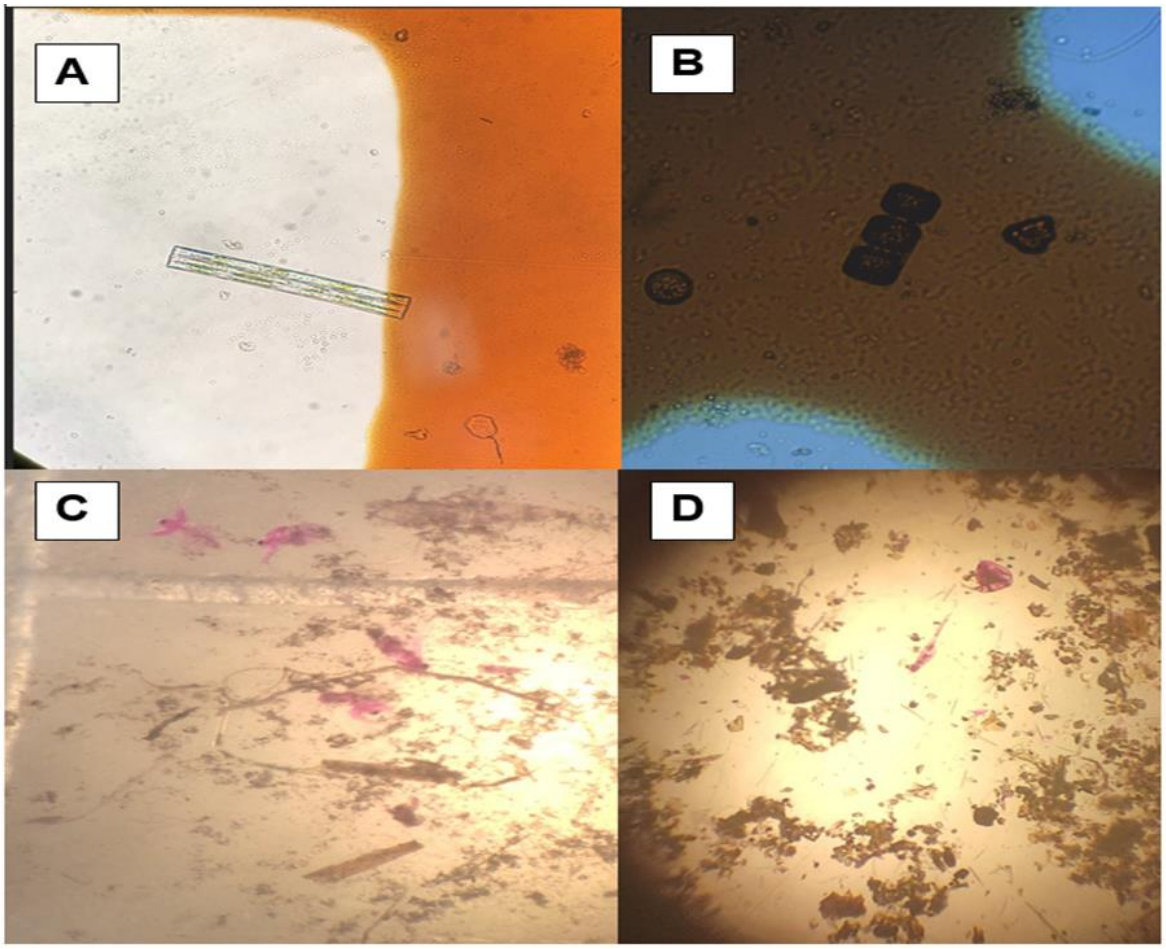


FIGURE TITLE:		
COMMON PLANKTON TAXA IDENTIFIED IN SAMPLING STATIONS (WET SEASON)		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[380]**Zooplankton Communities (Dry Season).** Analysis of samples taken from the eight sampling stations during dry season revealed a total of 3 zooplankton groups belonging to Rotifera, Polychaeta, and Copepoda. Rotifers were the most abundant group in most stations while polychaetes were in station ZP7 (**Figure 2-59**). Details of the zooplankton composition, abundance, and diversity are presented in **Table 2-51**.

Figure 2-59: Percentage Composition of Major Zooplankton Groups (Dry Season)

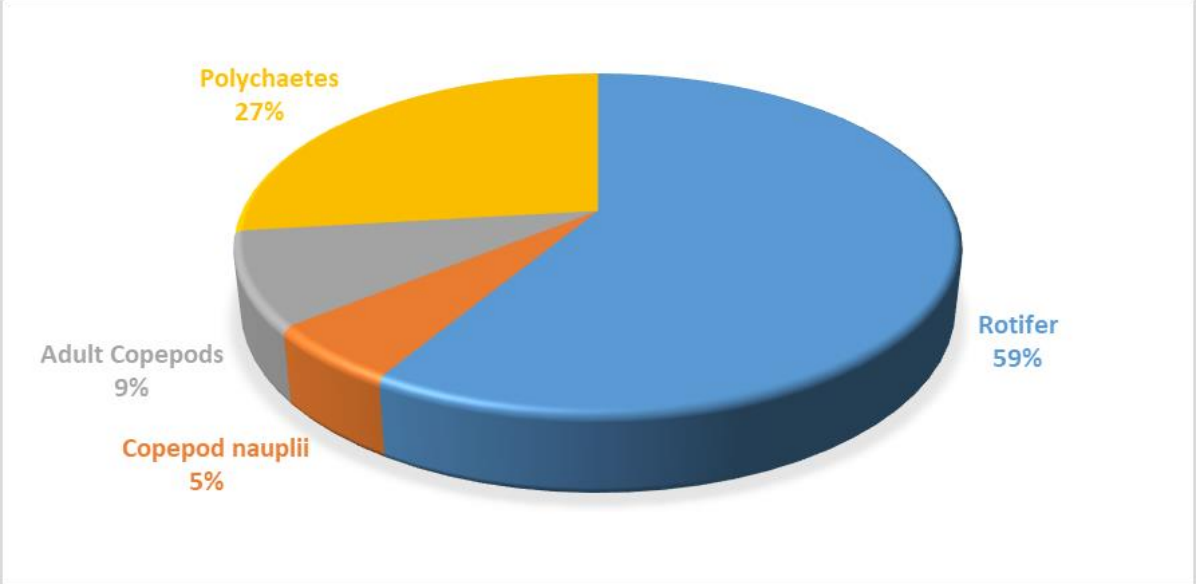


FIGURE TITLE:

PERCENTAGE COMPOSITION OF MAJOR ZOOPLANKTON GROUPS (DRY SEASON)

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Table 2-51: Zooplankton Composition, Distribution, Diversity and Abundance (individuals/ m³) – Dry Season

TAXA	STATIONS								GRAND TOTAL	REL. ABUND.
	ZP1	ZP 2	ZP3	ZP4	ZP5	ZP6	ZP7	ZP8		
Adult Form										
Brachionus			66	66		231			363	7.59
Polychaetes	330	198	66	66	99	99	429		1,287	26.90
Calanoids							33		33	0.69
Cyclopoids	132	66			33		66	33	330	6.90
Harpacticoids		33	33						66	1.38
Bdelloida		792	99	363	198	594	297	99	2,442	51.03
Larval Form										
Copepod nauplii				33		99	132		264	5.52
Grand Total	**462**	**1089**	**264**	**528**	**330**	**1023**	**957**	**132**	**4,785**	**100**
Richness	**2**	**4**	**4**	**4**	**3**	**4**	**5**	**2**		
Evenness (J')	**0.86**	**0.59**	**0.95**	**0.69**	**0.82**	**0.80**	**0.81**	**0.81**		
Diversity (H')	**0.60**	**0.82**	**1.32**	**0.95**	**0.90**	**1.10**	**1.30**	**0.56**		

[381]Station ZP1 which is located in a water body with the agricultural system in Bunga, Carranglan, Nueva Ecija had a total zooplankton density of 462 ind per m^3 composed of 2 taxa (**Table 2-51**). Of which, Polychaetes were the most abundant with 330 per m^3. Index of evenness was high at 0.86 but diversity was low at 0.60.

[382]Station ZP2 which is located in a water body also characterized with the agricultural ecosystem in Burgos, Carranglan, Nueva Ecija had a total zooplankton density of 1,089 ind per m^3 composed of 4 taxa. The abundance quantified in this station was the highest among all the stations. Among the taxa identified, the rotifer *Bdelloida* was the most abundant with 792 ind per m^3. Index of evenness and diversity was low at 0.59 and 0.82. Ecologically, they are beneficial in stabilizing organic wastes, stimulating microfloral activity and decomposition, enhancing oxygen penetration, and recycling mineral nutrients. The principal role of rotifers in wastewater is the removal of bacteria and the development of floc.

[383]Station ZP3 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total zooplankton density of 264 cells per m^3 composed of4 taxa. Of these, Bdelloids were the most abundant with 99 cells per m^3. Index of evenness was high at 0.95 but diversity was low at 1.32.

[384]Station ZP4 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total density of 528 ind per m^3 composed of 4 taxa. Among the taxa identified, the Bdelloids were the most abundant with 363 cells per m^3. Index of evenness and diversity was low at 0.69 and 0.95.

[385]Station ZP5 which is located in a riverbank in Salazar, Carranglan, Nueva Ecija had a total density of 330 ind per m^3 composed of 4 taxa. Among the taxa identified, Bdelloids were the most abundant with 198 cells per m^3. Index of evenness was high at 0.82 but diversity was low at 0.90.

[386]Station ZP6 which is located in a water body in Canabuan, Sta. Fe, Nueva Vizcaya had a total density of 1,023 ind per m^3 composed of 4 taxa. The high abundance was mainly due to Bdelloids with a density of 594 ind per m^3. This resulted to a low index of evenness and diversity values at 0.80 and 1.10 respectively.

[387]Station ZP7 which is located in a water body in Canabuan, Aritao, Nueva Vizcaya had a total density of 957 ind per m^3 composed of 5 taxa. Among the taxa identified, the Bdelloid rotifers were the most abundant with 99 cells per m^3. Index of evenness was high at 0.81 but diversity was low at 1.30

[388]Station ZP8 which is located in a riverbank in Canarem, Aritao, Nueva Vizcaya had a total density of 132 ind per m^3 composed of 2 taxa. Taxa abundance and richness are the lowest in this station. Among the taxa identified, Bdelloids were the most abundant with 99 cells per m^3. Index of evenness was high at 0.81 but diversity was low at 0.56.

[389]For dry season zooplankton taxa identified in each sampling station are also typical of an aquatic environment. Zooplankton abundance and richness were notably high in station ZP1. All diversity values are low (<2.0). Diversity index values that are greater than 2.0 indicate normal conditions for aquatic biota and the associated habitat. Values above 3.0 indicate that the habitat structure is stable and balanced, while values midway from 1.0 to 2.0 describe a threatened condition; furthermore, values lower than 1.0 indicate pollution and degradation occurring in the habitat structure (Goncalves and Menezes, 2011). High plankton diversity in

water systems may indicate healthy and unpolluted conditions while the dominance of only a few species may suggest otherwise (Rai et al, 2008).

[390]**Figure 2-60** shows the common plankton taxa identified in 8 stations.

Figure 2-60: Percentage Composition of Major Macrobenthos Groups (Dry Season)

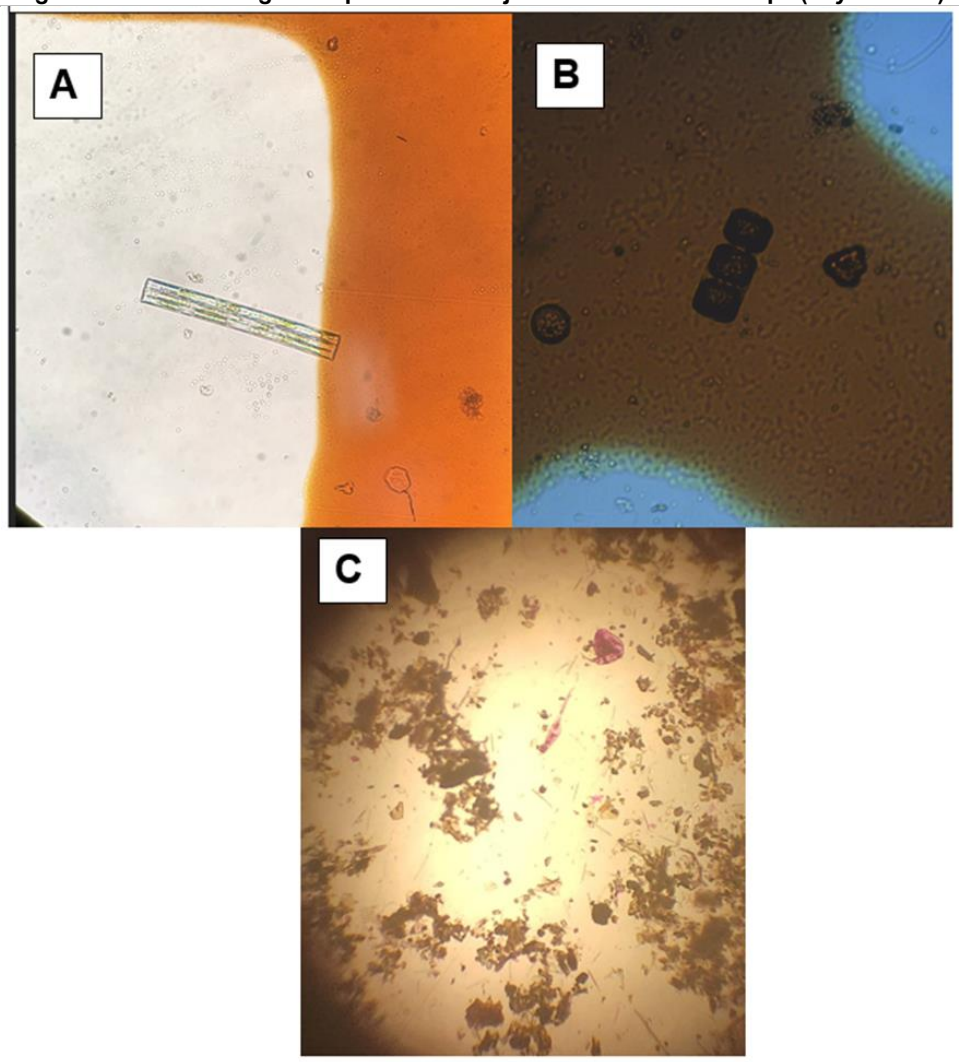


FIGURE TITLE:		
COMMON PLANKTON TAXA IDENTIFIED IN SAMPLING STATIONS (DRY SEASON)		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[391]**Freshwater Macrobenthos Fauna.** Benthic fauna (also known as "benthos") are small animals living among stones, logs, sediments, and aquatic plants on the bottom of streams, rivers and lakes. They are large enough to see with the naked eye (macro) and have no backbone (invertebrate). These organisms contribute immensely to the functioning of the aquatic ecosystem. Communities of macrobenthos provide many ecosystem services that help to maintain good water and sediment quality. Filter feeders remove particles from the water column, which may result in enhanced water clarity. Given the importance of light in shallow aquatic ecosystems, filter feeding may improve shallow water habitat for submerged aquatic

plants and benthic microalgae. Accordingly, the changes in benthic species composition and abundances could aid as an alarm system and even allow the quantification of environmental alterations (Hutchinson, 1993).

[392]Benthic macrofauna are small, bottom-dwelling aquatic organisms that are found in and around water bodies during some period of their lives. They are often found attached to rocks, vegetation, logs and sticks or burrowed into the bottom sand and sediments. They are reliable indicators because they spend all or most of their lives in water, are easy to collect and differ in their tolerance to pollution.

[393]**Freshwater Macrobenthos Fauna (Wet Season).** A summary of macrobenthos recorded in eight stations sampled in water bodies encompassing the towns in Nueva Ecija and Nueva Vizcaya is presented in **Table 2-52** while the percent contribution of each phylum is shown in **Figure 2-61**. Overall, a total of 7 taxa was identified belonging to phylum, Arthropoda, Mollusca and Chordata. Arthropods were overall the most dominant macrobenthos group (**Figure 2-61**).

Figure 2-61: Percentage Composition of Major Macrobenthos Groups (Wet Season)

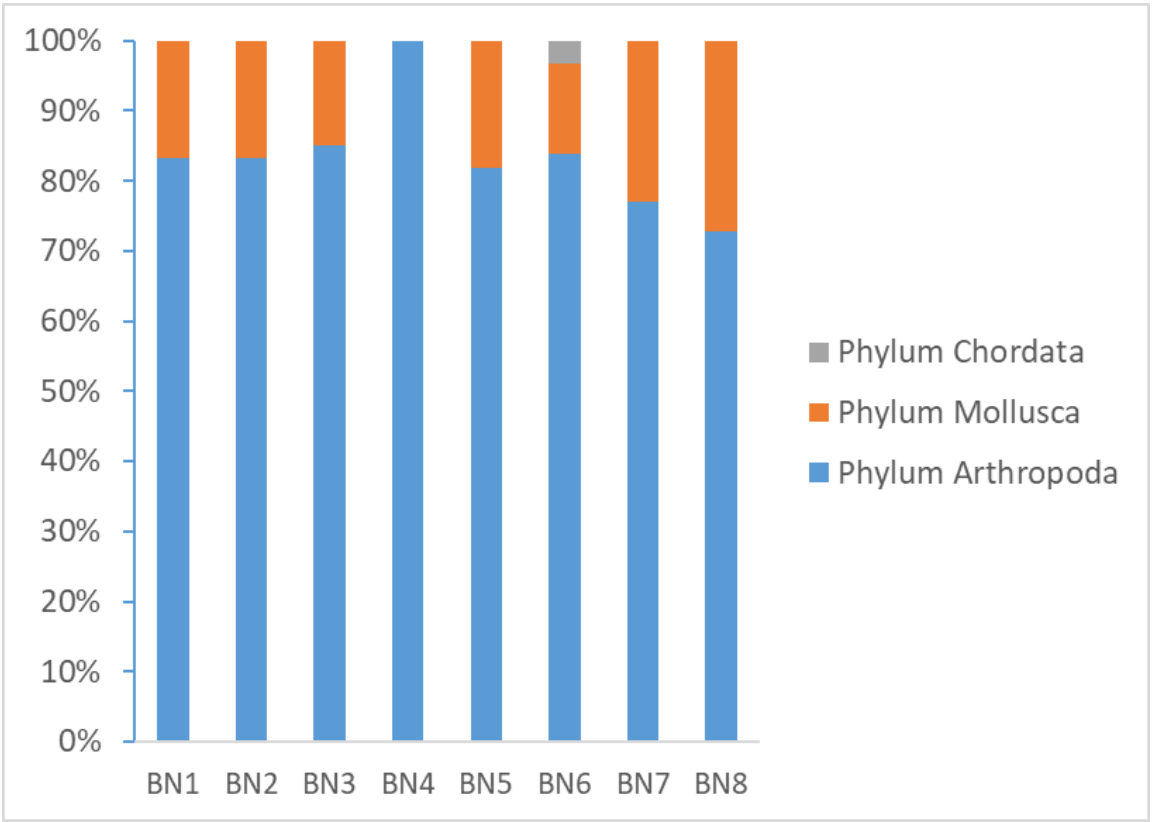


FIGURE TITLE:		
PERCENTAGE COMPOSITION OF MAJOR MACROBENTHOS GROUPS (WET SEASON)		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Table 2-52: Macrobenthos Composition, Abundance and Distribution (individuals/ m^3) – Wet Season

TAXA	STATIONS								GRAND TOTAL	REL. ABUND.
	BN1	BN2	BN3	BN4	BN5	BN6	BN7	BN8		
Phylum Arthropoda	**15**	**15**	**17**	**8**	**18**	**26**	**20**	**24**	**143**	**68.42**
Subphylum Crustacea										
Class Insecta										
Order Ephemeroptera										
Family Baetidae										
***Baetis* sp.**		6	5	3	7	8	3	8	40	19.14
Order Hemiptera										
Family Pentatomidae						3			3	1.44
Order Coleoptera										
Family Noteridae										
Noterus sp.		1	2			3			6	2.87
Order Diptera										
Family Chironomidae										
Chironomous sp.	15	8	10	5	11	12	17	16	94	44.98
Phylum Mollusca	**3**	**3**	**3**		**4**	**4**	**6**	**9**	**32**	**15.31**
Class Gastropoda										
Family Viviparidae										
Bellamya sp.	1		3		4		6	9	23	11.00
Family Thiaridae										
Melanoides sp.	2	3				4			9	4.31
Phylum Chordata						**1**			**1**	**0.48**
Class Actinopterygii										
Order Gobiformes										
Family Gobiidae						**1**			**1**	**0.48**
Grand Total	**21**	**21**	**23**	**8**	**26**	**36**	**32**	**42**	**209**	**100**
Richness	**3**	**4**	**4**	**2**	**3**	**6**	**3**	**3**		
Evenness (J')	**0.51**	**0.86**	**0.87**	**0.95**	**0.93**	**0.86**	**0.79**	**0.95**		
Diversity (H')	**0.56**	**1.19**	**1.21**	**0.66**	**1.02**	**1.54**	**0.87**	**1.05**		

[394]Station BN1 which is located in a water body with agricultural system in Bunga, Carranglan, Nueva Ecija had a total of 21 individuals of macrobenthos composed of 3 taxa (**Table 2-52**). Of which, the dipteran insect *Chironomous sp.* was the most abundant with 15 individuals. Index of evenness and diversity were low at 0.51 and 0.56.

[395]Station BN2 which is located in a water body also characterized with agricultural ecosystem in Burgos, Carranglan, Nueva Ecija had a total of 21 individuals of macrobenthos composed of 4 taxa. Among the taxa identified, the dipteran insect *Chironomous sp.* was also the most abundant with 8 individuals. Index of evenness was high at 0.86 but diversity was low at 1.21.

[396]Station BN3 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total of 23 individuals of macrobenthos composed 4 taxa. Of these, the dipteran insect *Chironomous sp.* was the most abundant with 10 individuals. Index of evenness and diversity were low at 0.57 and 1.54 indicative of relatively even community.

[397]Station BN4 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total of 8 individuals of macrobenthos composed of 2 taxa. Among the taxa identified, the dipteran insect *Chironomous sp.* was the most abundant with 8 individuals. Index of evenness was high at 0.95 but diversity was low 0.66.

[398]Station BN5 which is located in a riverbank in Salazar, Carranglan, Nueva Ecija had a total of 26 individuals of macrobenthos composed of 3 genera. Among the taxa identified, the dipteran insect *Chironomous sp.* was the most abundant with 11 individuals. Index of evenness was high at 0.93 but diversity was low at 1.02.

[399]Station BN6 which is located in a water body in Canabuan, Sta. Fe, Nueva Vizcaya had a total 36 individuals of macrobenthos composed of 6 taxa. The high abundance was mainly due to the dipteran insect *Chironomous sp.* with 12 individuals. Index of evenness was high at 0.86 but diversity was low at 1.54.

[400]Station BN7 which is located in a water body in Canabuan, Aritao, Nueva Vizcaya had a total of 32 individuals of macrobenthos composed of 3 taxa. Among the taxa identified, the dipteran insect *Chironomous sp* was the most abundant with 17 individuals. Index of evenness was high at 0.79 but diversity was low at 0.87.

[401]Station BN8 which is located in a riverbank in Canarem, Aritao, Nueva Vizcaya had a total of 42 individuals of macrobenthos composed of 3 taxa. Among the taxa identified, the dipteran insect *Chironomous sp* was the most abundant with 16 individuals. Index of evenness was high at 0.95 but diversity was low at 1.05.

[402]To sum up, macrobenthos present in the present survey only consisted of phylum, Chordata, Arthropoda and Mollusca. Of the 3, arthropods were generally the most abundant phyla which accounted 68%. Among the arthropods, the chironomids, also known as “non-biting midges” was always most abundant taxa in every stations. They are one of the important groups of insects worldwide in freshwater, aquatic ecosystems with very wide distribution. They are important as indicator organisms, i.e., the presence, absence, or quantities of various species in a body of water can indicate whether pollutants are present (Armitage 1995). Abundance of macrobenthos was low in all locations and varied from sample to sample. The densest sample was found in BN8 with 42 individuals. The least dense sample was recorded in station BN4 with only 8 individuals. Taxa richness was also relatively low but comparable among stations (2–6 taxa). Shannon-Wiener Diversity Index (H) was employed to measure the diversity of macrobenthos at the sampling sites. Diversity was low ranging from 0.56 in station BN1 to 1.54

in BN6. Overall, the abundance, richness, and diversity six stations sampled in all water bodies were poor. Physical and chemical factors such as sediment types, temperature, productivity, salinity, oxygen, and depth of the sampling sites are known to be among the various factors that affect the density and composition of the macrobenthos. The macrobenthos monitoring report should be read in conjunction with the monitoring report for the physio-chemical parameters as changes in the physical environment would eventually affect the ecology of the surrounding environment.

[403]**Freshwater Macrobenthos Fauna (Dry Season). Table 2-54** shows the summary of macrobenthos recorded during dry season while the percent contribution of each phylum is shown in **Figure 2-62**. Overall, a total of 7 taxa was identified belonging to the phylum Arthropoda, Mollusca, and Chordata. Arthropods were overall the most dominant macrobenthos group.

Figure 2-62: Percentage Composition of Major Macrobenthos Groups (Dry Season)

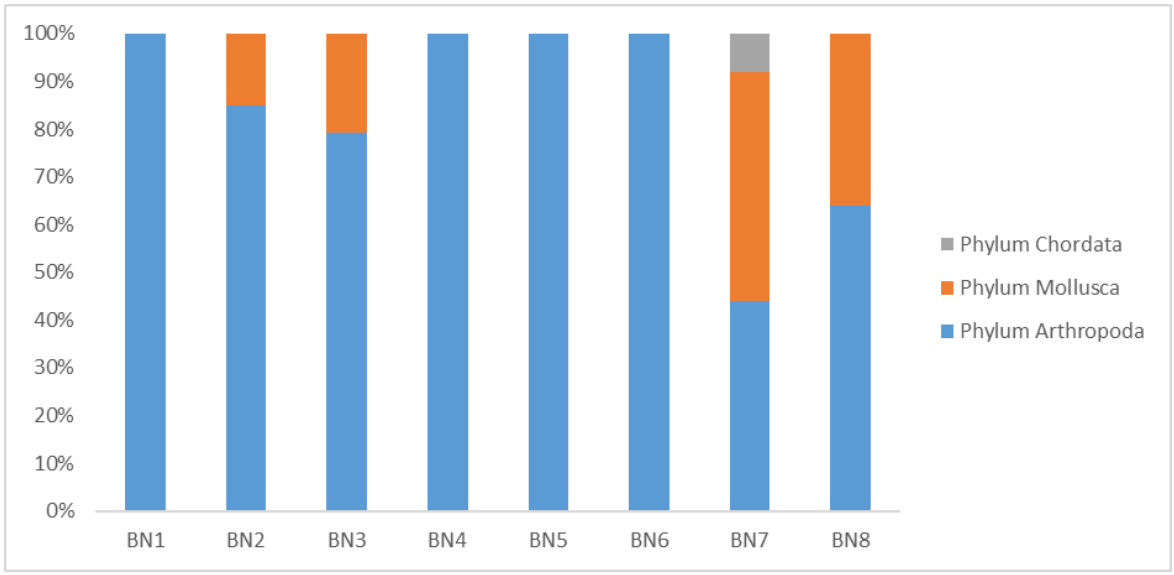


FIGURE TITLE:		
PERCENTAGE COMPOSITION OF MAJOR MACROBENTHOS GROUPS (DRY SEASON)		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Table 2-53: Macrobenthos Composition, Abundance and Distribution (individuals/ m^3) – Wet Season

TAXA	STATIONS								GRAND TOTAL
	BN1	BN2	BN3	BN4	BN5	BN6	BN7	BN8	
Phylum Arthropoda	16	34	19	99	63	34	11	23	299
Subphylum Crustacea									
Family Baetidae									
***Baetis* sp.**	4	3	1	1	7	9	8	8	41
***Heptagenia* sp.**					3			2	5
Order Hemiptera									
Family Pentatomidae									0
Family Gerridae	1					1	1	1	
Family Veliidae	3								
Order Coleoptera									
Family Noteridae									
Noterus sp.								1	1
Family Hydrophilidae									
Order Diptera									
Family Chironomidae									
Chironomous sp.	8	31	18	98	53	24	2	11	245
Phylum Mollusca	0	6	5	0	0	0	12	13	36
Class Gastropoda									
Family Viviparidae									
Bellamya sp.			5				8	13	26
Family Thiaridae									
Melanoides sp.		6							6
Phylum Chordata							2		2
Class Actinopterygii									
Order Gobiformes									
Family Gobiidae							2		2
Grand Total	**16**	**46**	**29**	**99**	**63**	**34**	**35**	**49**	**371**
Richness	**4**	**3**	**3**	**2**	**3**	**3**	**5**	**6**	
Evenness (J')	**0.85**	**0.62**	**0.61**	**0.08**	**0.49**	**0.64**	**0.83**	**0.79**	
Diversity (H')	**1.18**	**0.68**	**0.67**	**0.06**	**0.53**	**0.70**	**1.33**	**1.42**	

[404]Station BN1 which is located in a water body with agricultural system in Bunga, Carranglan, Nueva Ecija had a total of 16 individuals of macrobenthos composed of 4 taxa (**Table 2-54**). Of which, the dipteran insect *Chironomous sp*. was the most abundant with 8 individuals. The index of evenness was high at 0.85 but the diversity was low at 1.18.

[405]Station BN2 which is located in a water body also characterized with agricultural ecosystem in Burgos, Carranglan, Nueva Ecija had a total of 46 individuals of macrobenthos composed of 3 taxa. Among the taxa identified, the dipteran insect *Chironomous* sp. was also the most abundant with 31 individuals. Index of evenness and diversity was low at 0.62 and 0.68.

[406]Station BN3 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total of 29 individuals of macrobenthos composed 3 taxa. Of these, the dipteran insect Chironomous *sp*. was the most abundant with 18 individuals. Index of evenness and diversity were low at 0.61 and 0.67 indicative of a relatively even community.

[407]Station BN4 which is a water body located in Salazar, Carranglan, Nueva Ecija had a total of 99 individuals of macrobenthos composed of 2 taxa. Among the taxa identified, the dipteran insect *Chironomous sp*. was the most abundant with 98 individuals. Index of evenness was very low at 0.08 but diversity was low 0.06.

[408]Station BN5 which is located on a riverbank in Salazar, Caranglan, Nueva Ecija had a total of 63 individuals of macrobenthos composed of 3 genera. Among the taxa identified, the dipteran insect *Chironomous sp.* was the most abundant with 53 individuals. Index of evenness was low at 0.49 but diversity was low at 0.53.

[409]Station BN6 which is located in a water body in Canabuan, Sta. Fe, Nueva Vizcaya had a total of 34 individuals of macrobenthos composed of 3 taxa. The high abundance was mainly due to the dipteran insect *Chironomous sp.* with 24 individuals. Index of evenness was high at 0.64 but diversity was low at 0.70.

[410]Station BN7 which is located in a water body in Canabuan, Aritao, Nueva Vizcaya had a total of 35 individuals of macrobenthos composed of 5 taxa. Among the taxa identified, the gastropod *Bellamya* sp. was the most abundant with 8 individuals. Index of evenness was high at 0.83 but diversity was low at 1.33.

[411]Station BN8 which is located on a riverbank in Canarem, Aritao, Nueva Vizcaya had a total of 49 individuals of macrobenthos composed of 6 taxa. Among the taxa identified, the gastropod *Bellamya* sp was the most abundant with 13 individuals. Index of evenness was high at 0.79 but diversity was low at 1.42.

[412]Macrobenthos present in the dry season survey only consisted of phylum, Chordata, Arthropoda and Mollusca (**Table 2-54**). Of the three, arthropods were generally the most abundant phyla which accounted for 81%. Among the arthropods, the chironomids, also known as “non-biting midges” were always the most abundant taxa in every stations. They are one of the important groups of insects worldwide in freshwater, aquatic ecosystems with very wide distribution. They are important as indicator organisms, i.e., the presence, absence, or quantities of various species in a body of water can indicate whether pollutants are present (Armitage 1995). Abundance of macrobenthos was low in all locations and varied from sample to sample. The densest sample was found in BN4 with 99 individuals. The least dense sample was recorded in station BN1 with only 16 individuals. Taxa richness was also relatively low but comparable among stations (2–6 taxa). Shannon-Wiener Diversity Index (H) was employed to measure the diversity of macrobenthos at the sampling sites. Diversity was low ranging from

0.06 in station BN4 to 1.42 in BN8. Overall, the abundance, richness, and diversity of six stations sampled in all water bodies were poor. Physical and chemical factors such as sediment types, temperature, productivity, salinity, oxygen, and depth of the sampling sites are known to be among the various factors that affect the density and composition of the macrobenthos. The macrobenthos monitoring report should be read in conjunction with the monitoring report for the physio-chemical parameters as changes in the physical environment would eventually affect the ecology of the surrounding environment.

413 **Freshwater Fish and Other Fauna.** Fishes are an integral part of the ecosystem as they play significant roles in maintaining ecological balance including food chain and other natural environmental processes. Fishes influence the temporal availability of nutrients and the potential for algal blooms in nutrient-rich lakes, since they mineralize nitrogen and phosphorus through excretion and defecation, thereby making these nutrients available for primary production. Studies reveal that fish communities can also regulate the carbon-fixing capacity of nutrient-rich lakes, and thus, indirectly mediate the flux of carbon between a lake and the atmosphere. Through bioturbation (the physical disturbance of sediment associated with foraging or burrowing activities by consumers), fishes are known to modify the structure of bottom conditions in rivers and lakes. There is also considerable evidence for the importance of fish as “mobile links" between ecosystems at short distances, relating to their daily migrating between feeding and resting areas. Fishes also act as bio-indicators by display an array of biotic responses, such as changes in growth, distribution and abundance related to water pollution, critical habitat degradation, eutrophication, organic enrichment, chemical toxicity, thermal changes, and food availability and thus, should be key elements of ecosystem monitoring programs.

414 Aside from their value in the ecosystem, fishes also provide economic importance in various aspects. Fish provide food and a livelihood for millions of the world’s poorest people, and also contribute to the overall economic well-being by means of export commodity trade, tourism and recreation. Fish are used in management to mitigate vector-borne diseases like schistosomiasis and malaria. Commercially, fishes are being utilized as trade pets.

415 Freshwater fishes have also been significant in inspiring art, literature, and society in many countries for centuries. People linked to river fisheries through culture, tradition and economics incorporate these fisheries as dominant components of their human identities (Brown et al., 1996; Jackson, 1991). Likewise, they provide abundant opportunities in the field of science and research.

416 However, as fishes offer a variety of commercial values and open several livelihood sources, its utilization are not being regulated as to the case of over-collection and destructive fishing methods. In addition to this, rapid urbanization is severely affecting river systems throughout the world. These scenarios put their population at risk of being threatened and have the probability of getting extinct if left unresolved.

417 During an interview conducted with the residents living near the rivers to be traversed by the project, the fish species and other aquatic biota commonly caught are pasayan (freshwater shrimp) (*Macrobrachium sp.),* eel (*Anguilla sp*.), tilapia (*Oreochromis niloticus*), hito or pantat, (*Clarias batrachus*), and freshwater gobies.

418 Based on the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List, there are no vulnerable, threatened, or endangered species observed/collected.

419 Aside from the collected specimens, the Key Informant Interview (KII) identified other freshwater species that can be found in the river but was not collected using the sampling

methods employed. The informants were shown photographs based on the field guides to verify their information. Accordingly, the species identified are as follows:

Phylum Chordata	**Phylum Mollusca**
Class Actynopterygii	Class Gastropoda
Order Gobiiformes	Family Viviparidae
Family Gobiidae	*Bellamya sp.*
	Family Thiaridae
	Melanoides sp.

2.2.4.7 Threat to existence and/or loss of important local species and habitat

[420]No macroinvertebrates or fish species of any significant value were identified in the survey. The scarcity of sampled organisms (zooplankton and benthic fauna) could be due to the swift flow of water current which made it difficult to conduct benthic sampling and the water quality of the rivers/creeks sampled.

2.2.4.8 Threat to abundance, frequency, and distribution

[421]The project site and its immediate surroundings do not currently support diverse or abundant aquatic ecological values, with very limited significant macroinvertebrate or fish species identified. Studies worldwide have shown an overwhelmingly negative response of invertebrate communities to low pH, with taxa such as mayflies, crustaceans, and mollusks being very sensitive to low pH (Suren & McKerchar, 2001).

[422]Activities that may cause potential environmental impacts of freshwater ecology during construction include site preparation (e.g., clearing and grading), facility construction, and vehicular and pedestrians. However, many of these impacts would be reduced by implementing good practices and restoring disturbed areas once construction activities have been completed.

[423]Most impacts to ecological resources (aquatic biota) would be low and localized during the construction phase. Activities such as site clearing and grading, road construction, and vehicle traffic have the potential to affect ecological resources by disturbing habitat, increasing erosion and runoff, and creating noise at the project site.

2.2.5 Marine Ecology

[424]Since there are no project activities, discharges and structures in marine waters, this section is not applicable.

2.2.5.1 Threat to existence and/or loss of important local species and habitat

[425]Since there are no project activities, discharges and structures in marine waters, this section is not applicable.

2.2.5.2 Threat to abundance, frequency, and distribution

[426]Since there are no project activities, discharges and structures in marine waters, this section is not applicable.

2.2.6 Summary of Baseline Findings, Impacts and Mitigation on Water

[427]The following table lists the impacts and mitigation on Water:

Table 2-54: Summary of Significant Baseline Findings and Potential Impacts and Mitigation on Water

SUMMARY OF BASELINE FINDINGS ON WATER:

- **Competition in Water Use**
  - According to the list of water permittees of the National Water Resources Board (NWRB), there are no known water permittees near the proposed project alignment.
  - Depletion of water resources is not expected to result from the proposed project given its minimal water supply requirement.
  - There are no springs and groundwater sources found in the tunnel area.
- **Water Quality**
  - All parameters are within the standards, except fecal coliform in GW 1 may be due to extrusion of contaminants in the pipeline.
  - All parameters are within the GES, except for fecal coliform may be due to possible wastes upstream of river caused by agricultural activities (i.e., farming) and oil and grease in GW 9 due to presence of anthropogenic activities in the area.
- **Freshwater Ecology**
  - No macroinvertebrates or fish species of any significant value were identified in the survey
  - The project site and its immediate surroundings do not currently support diverse or abundant aquatic ecological values, with very limited significant macroinvertebrate or fish species identified.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
WATER QUALITY			
Degradation of surface and groundwater quality	Construction Operations	Possible siltation and increase of turbidity on the nearby surface water Accidental oil spill from delivery trucks	Use sawdust, rice hulls, or coir dusts to absorb the oil spills Maintain canal in the maintenance and repair area of vehicles and equipment
Degradation of surface and groundwater quality	Construction Operations	Surface and ground water contamination from improper disposal of wastes, percolated wastewater, sludge and fecal matter	Provision of sanitation facilities for workers (e.g. toilets, showers, etc.)

2.3 THE AIR

2.3.1 Meteorology/Climatology

2.3.1.1 Change in the local micro-climate e.g., local temperature

[428]**Temperature.** Climate pertains to the average long-term weather of an area and is typically determined over a period of at least 30 years. It is an essential environmental factor as it affects general growth and development. In the Philippines, climate is classified into 4 types based on the rainfall distribution and pattern.

[429]As presented in the climatological map of the Philippines in **Figure 2-63**, the proposed project site mainly belongs to Type III climate under the modified Coronas classification in which seasons are no very pronounced: dry from November to April and wet the rest of the year.

[430]**Rainfall.** According to the Climatological Normals in Cabanatuan City, Nueva Ecija, the area may experience about 1,747.3 mm of rainfall annually, with 111 rainy days (1987-2018). The highest amount of rainfall is experienced in August (386.8mm), while the lowest amount of rainfall is experienced in January (6.7mm).

[431]**Surface Wind.** Wind directions in the area are south and northeast. The south direction visits from May to September while the northeast comes during the months of November to February.

[432]**Tropical Cyclones.** Tropical cyclones or typhoons are the most influential factors that bring considerable rainfall in the Philippines. Typhoons usually occur in the country from June to December, with highest frequencies during the months of July and August. The mean annual number of typhoons that pass through the Philippine Area of Responsibility (PAR) is about 20. As shown in **Figure 2-64**, an average of 2 cyclones passes the project site every year.

[433]**Global Warming and PAGASA Climate Projection.** In November 2011, DENR-EMB released a memorandum circular numbered 005 (MC 2011-005), which mandates the inclusion of DRR and CCA in the Philippine EIS System, to “ensure that the project is resilient and that their environmental impact do not exacerbate natural hazards or climate change’s effects on human or natural systems”. The circular aims to provide information on changes that may happen to the area based on projections made by PAGASA. The projections include data for 2020 and 2050. The PAGASA projections are shown in **Figure 2-65**.

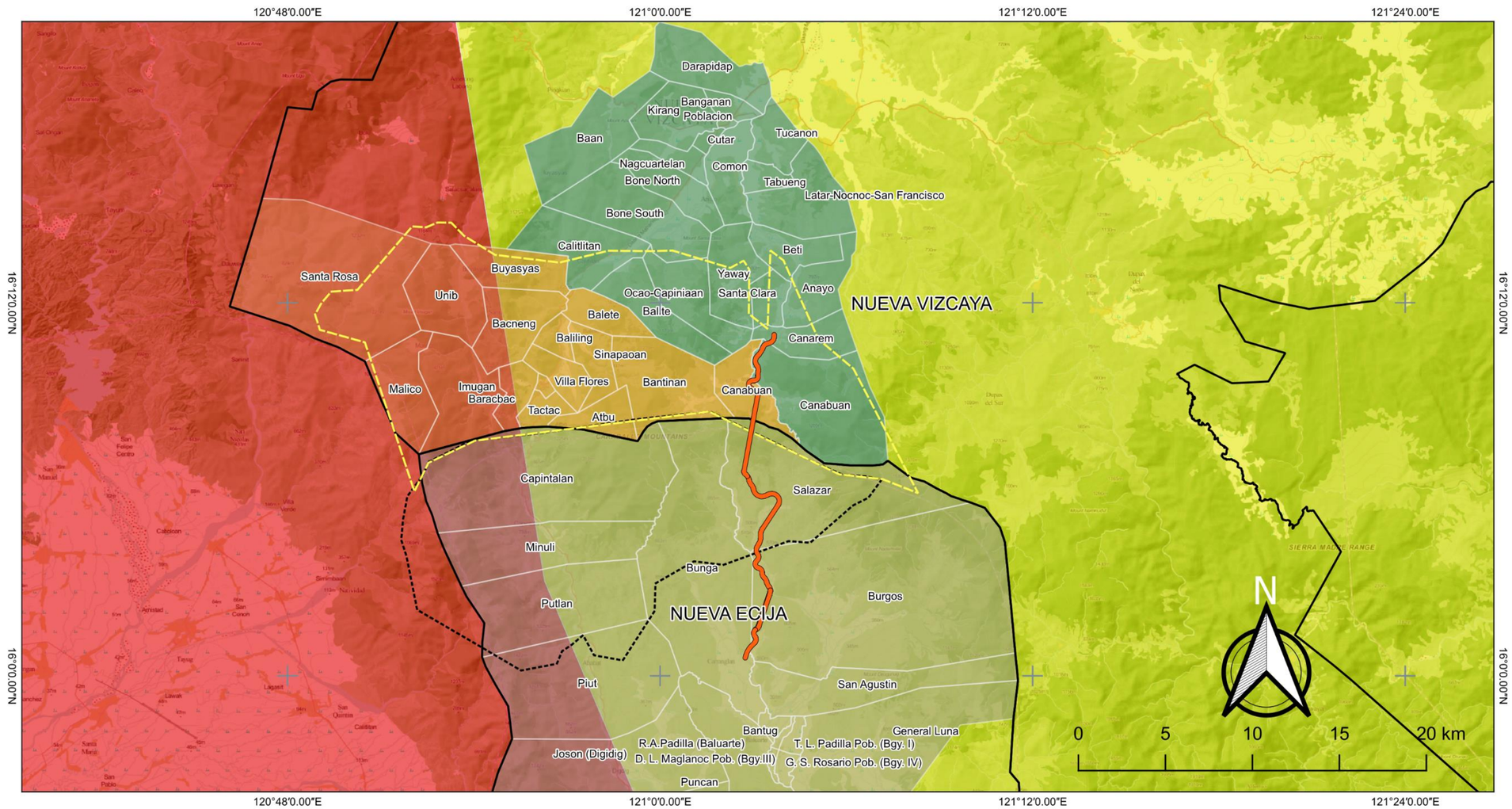
[434]From PAGASA projection in 2020 and 2050, Nueva Ecija and Nueva Vizcaya would experience higher temperatures during summer season and increased rainfall during the rainy season by year 2020 and 2050. Higher temperatures will result in water shortages, and increased rainfall may induce flooding.

[435]Frequency of extreme events under medium-range emission scenario will increase in 2020 and 2050. Considering these figures, appropriate precautionary measures may be employed during the construction phase of the project to avoid any complication in the long run.

[436]Climate change is attributed mainly to the release of carbon into the atmosphere. Due to the nature of the project, carbon will unfortunately be released to the atmosphere, thus the possibility of influencing the local micro-climate.

[437]Considering these figures, water shortages may be the main impact of less rainfall and higher temperature. Appropriate measures such as tree planting and water conservation shall be employed during the construction phase of the project to avoid any complications in the long run.

Figure 2-63: Climatological Map of the Philippines

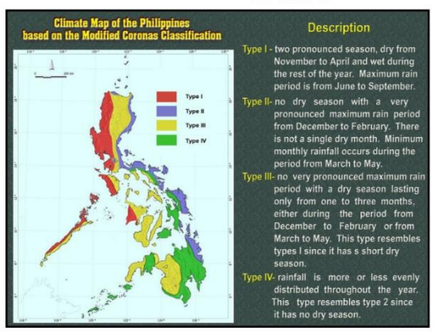


MAP SOURCE/S:

DEPARTMENT OF SCIENCE AND TECHNOLOGY
Philippine Atmospheric, Geophysical and
Astronomical Services Administration

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.



Map Legend

DPEAR Project Alignment

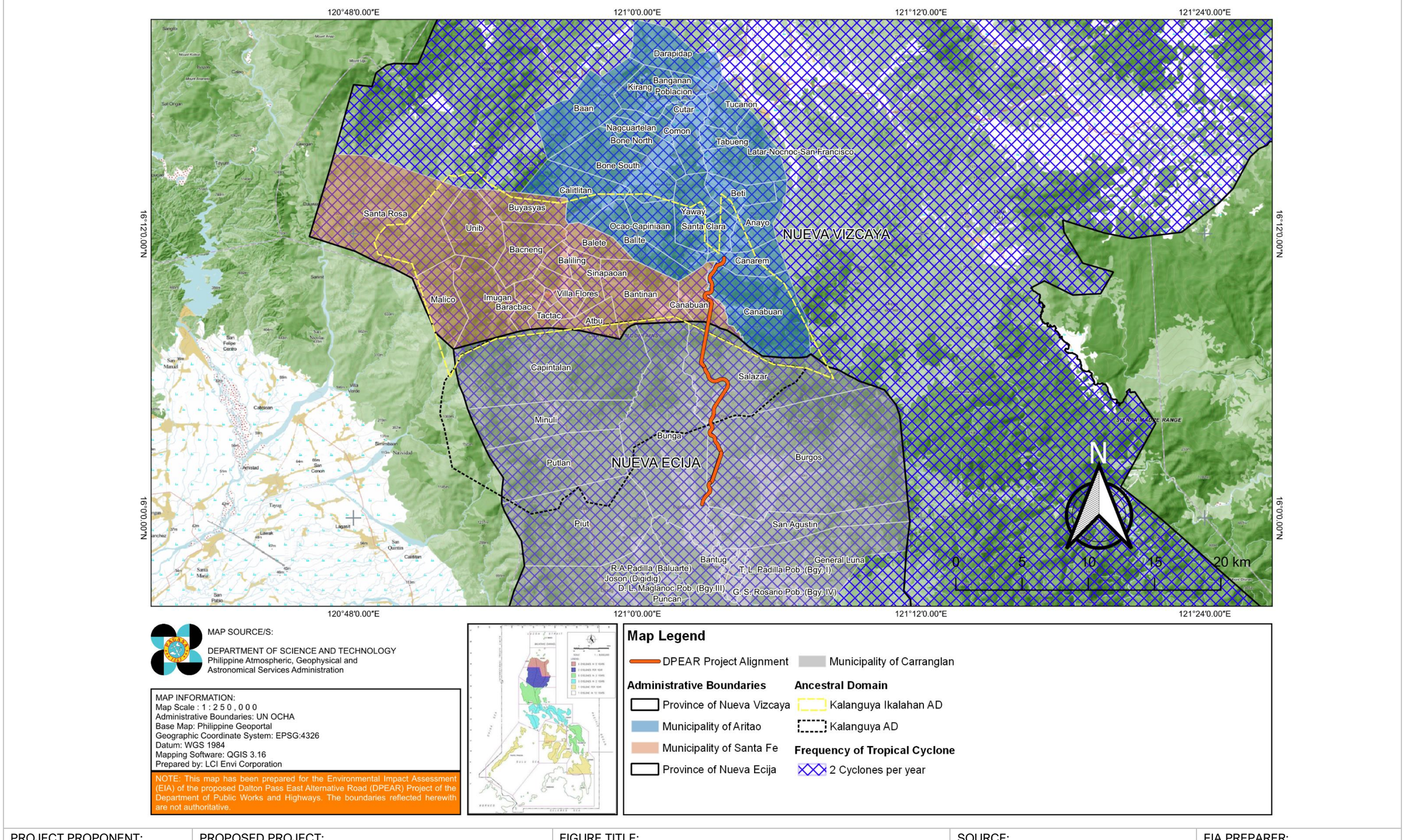
Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija
- Municipality of Carranglan

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

Climate Type
- Type I
- Type II
- Type III
- Type IV

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**CLIMATOLOGICAL MAP OF THE PHILIPPINES**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

Figure 2-64: Frequencies of Tropical Cyclones in the Philippines



MAP SOURCE/S:

DEPARTMENT OF SCIENCE AND TECHNOLOGY
Philippine Atmospheric, Geophysical and
Astronomical Services Administration

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Municipality of Carranglan

Administrative Boundaries
- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija

Ancestral Domain
- Kalanguya Ikalahan AD
- Kalanguya AD

Frequency of Tropical Cyclone
- 2 Cyclones per year

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**FREQUENCIES OF TROPICAL CYCLONES THE PHILIPPINES**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

Figure 2-65: PAGASA Climate Projection for 2020 and 2050 Covering Nueva Ecija and Nueva Vizcaya

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 2

PROVINCES	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 2												
CAGAYAN	24.5	28.1	28.9	27.1	0.8	1.0	0.9	0.8	2.0	2.2	2.0	1.8
ISABELA	24.1	27.9	28.7	26.8	0.8	0.9	0.9	0.8	2.0	2.1	2.1	1.9
NUEVA VIZCAYA	22.3	25.1	25.4	24.4	0.9	1.0	0.9	0.9	2.0	2.1	1.9	1.9
BATANES	23.0	26.7	28.8	26.9	0.7	0.6	0.6	0.7	1.8	1.6	1.4	1.5
QUIRINO	23.7	26.8	27.6	26.2	0.9	1.0	1.0	0.9	2.0	2.2	2.0	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 2

PROVINCES	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 2												
CAGAYAN	284.4	207.7	538.4	832.1	6.9	-3.6	2.9	16.3	14.6	-23.3	0.9	-1.0
ISABELA	412.2	325.0	530.8	867.0	3.9	-8.6	5.1	13.5	25.1	-29.2	8.7	1.7
NUEVA VIZCAYA	180.9	416.8	1149.8	880.5	-3.5	-8.6	20.1	9.8	-7.8	-23.6	36.1	-0.5
BATANES	531.1	354.5	928.7	1057.8	-2.1	-7.8	6.4	-14.4	-4.9	-4.4	10.2	-7.4
QUIRINO	419.0	465.9	776.4	957.9	-5.7	-18.2	9.7	6.1	-0.9	-33.9	12.9	-5.8

Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 2

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
CAGAYAN	Aparri	273	1276	2403	8156	6498	6770	16	33	24
	Tuguegarao	2769	3930	5119	8573	6513	6580	6	25	22
BATANES	Basco	51	1	24	7038	5112	5315	17	13	20

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 3

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 3												
AURORA	24.5	27.1	27.9	26.7	0.9	0.9	1.0	1.0	1.9	2.0	2.0	2.0
BATAAN	26.4	28.7	27.6	27.3	1.0	1.1	0.8	1.0	2.0	2.1	1.7	1.9
BULACAN	25.6	27.9	27.1	26.7	0.9	1.1	0.9	1.0	1.9	2.1	1.7	1.9
NUEVA ECIJA	25.3	27.7	27.5	26.8	0.9	1.1	0.9	1.0	2.0	2.1	1.8	2.0
PAMPANGA	26.0	28.3	27.5	27.1	1.0	1.1	0.9	1.0	2.1	2.2	1.8	2.0
TARLAC	26.1	28.3	27.8	27.3	1.1	1.1	1.0	1.1	2.2	2.2	1.9	2.1
ZAMBALES	26.3	28.3	27.4	27.2	1.0	1.1	0.9	1.0	2.1	2.1	1.7	1.9

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 3

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 3												
AURORA	615.7	546.4	768.7	1151.1	-0.3	-17.1	6.7	5.8	8.7	-29.2	7.4	-5.7
BATAAN	71.7	368.7	1326.2	872.6	2.7	-5.2	9.4	-0.4	-8.2	-8.1	29.1	1.5
BULACAN	212.4	288.9	1041.4	842.1	4.2	-23.0	12.8	-2.9	-13.2	-36.4	23.6	-3.3
NUEVA ECIJA	155.2	316.5	995.0	745.0	7.5	-13.8	10.1	1.6	-7.4	-25.7	22.7	-2.4
PAMPANGA	120.8	320.6	1030.4	785.2	16.3	-18.8	4.4	-5.1	-15.4	-26.4	13.9	-7.2
TARLAC	43.4	265.4	1193.5	644.3	26.0	-13.7	-1.6	-9.6	-6.7	-18.2	8.8	-5.5
ZAMBALES	40.9	368.0	1793.9	872.0	34.2	-4.5	13.3	-1.6	-2.2	-21.6	31.4	5.6

Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 3

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
AURORA	Baler	397	819	2008	1295	6176	6161	12	43	43
NUEVA ECIJA	Cabanatuan	1293	3271	4796	8113	6117	6202	9	13	17
PAMPANGA	Clark	355	1855	3108	889	5701	5754	8	12	12
ZAMBALES	Iba	259	573	1573	8034	6500	6325	4	12	13

FIGURE TITLE:

PAGASA CLIMATE PROJECTION FOR 2020 AND 2050 COVERING NUEVA ECIJA AND NUEVA VIZCAYA

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

2.3.1.2 Contribution in terms of greenhouse gas emissions

[438]Emissions from heavy equipment and vehicles will be expected during construction in the intake and outlet structures. Minimal greenhouse gas emissions will be emitted from tunnel construction.

2.3.2 Air Quality (& Noise)

2.3.2.1 Degradation of air quality

[439]Two-season ambient air sampling was done last 21 June 2021 to 7 July 2021 (wet season) and last 24 January 2022 to 10 February 2022 (dry season), to assess the baseline ambient air quality in the vicinity of the project alignment (proximity to the alignment, nearby communities and proposed temporary structures). The location map is shown in **Figure 2-66**.

[440]Twenty-four-hour monitoring was done for each station. Field sampling and laboratory analysis were performed by CRL Calabarquez Corporation, a DENR-recognized laboratory based in Laguna.

[441]Ambient air quality monitoring results are compared with the National Ambient Air Quality Standards (NAAQS) as per the Implementing Rules and Regulations (IRR) of the Philippine Clean Air Act of 1999 or Republic Act 8749 (DAO 2000-81). The observed 24-hour ambient air concentrations at the monitoring stations are summarized in **Table 2-55** and **Table 2-56**.

[442]As presented, the results showed acceptable ambient air condition with all values below the specified NAAQS limits. Implementation of construction mitigating measures and regular monitoring will still be conducted check if there are exceedances from the standards.

Table 2-55: Results of Ambient Air Quality Analysis (21 June to 7 July 2021)

STATION	LOCATION	OBSERVED 24-HOUR AMBIENT AIR CONCENTRATIONS, µg/Ncm						
		TSP	*PM_{10}*	*NO_2*	*SO_2*	Lead	*O_3*	CO
A1	Brgy. Canabuan, Sta. Fe (NV), near church	29.1	9.9	1.9	7.9	ND	13.10	1.07
A2	Brgy. Canabuan, Sta. Fe (NV), near barangay hall	28.0	14.9	1.9	6.0	ND	3.80	1.21
A3	Brgy. Canabuan, Sta. Fe (NV), Sitio Spanish	21.0	19.3	1.3	4.1	ND	4.9	1.34
A4	Brgy. Canarem, Aritao (NV), near residential area	18.4	11.6	1.0	16.7	ND	4.9	1.34
A5	Brgy. Beti Aritao (NV), near residential area	29.1	14.1	2.2	9.9	ND	9.2	1.22
A6	Brgy. Salazar, Carranglan (NE), Sitio Popo	42.2	16.3	1.8	8.8	ND	11.2	1.56
A7	Brgy. Burgos, Carranglan (NE), Sitio Barat	66.4	65.8	1.2	15.1	ND	9.5	1.64
A8	Brgy. Salazar, Carranglan (NE), Zone II	52.1	41.6	3.5	10.4	ND	5.2	2.83
A9	Brgy. Salazar, Carranglan (NE), Sitio Labug	22.8	13.1	1.8	14.6	ND	5.5	1.25
A10	Brgy. Bunga, Carranglan (NE), Sitio Laat 1	13.7	13.2	1.8	14.6	ND	10.0	1.12
A11	Brgy. Bunga, Carranglan (NE), Sitio Laat 2	12.6	21.9	2.0	ND	ND	11.5	1.06

STATION	LOCATION	OBSERVED 24-HOUR AMBIENT AIR CONCENTRATIONS, µg/Ncm						
		TSP	*PM_{10}*	*NO_2*	*SO_2*	Lead	*O_3*	CO
A12	Brgy. R.A. Padilla, Carranglan (NE), Sitio Coral	21.2	24.7	1.5	7.6	ND	12.4	1.08
A13	Brgy. San Agustin, Carranglan (NE), near day care center	30.0	23.5	4.7	61.6	ND	6.3	1.87
NAAQS (24-hour sampling)		**230**	**150**	**150**	**180**	**20***	**60**	**9**

NOTES:
ND = Not detected / below detection limit (NO_2 = 0.26µg; SO_2 = 0.75µg);
(*) = Evaluation of this standard is carried out for 30-minute averaging time.
REFERENCE: DAO 2000-81 (IRR of Republic Act 8749)
Red Marks: Exceeds Standards

Table 2-56: Results of Ambient Air Quality Analysis (24 January to 10 February 2022)

STATION	LOCATION	OBSERVED 24-HOUR AMBIENT AIR CONCENTRATIONS, µg/Ncm						
		TSP	*PM_{10}*	*NO_2*	*SO_2*	Lead	*O_3*	CO
A1	Brgy. Canabuan, Sta. Fe (NV), near church	25.5	27.7	1	ND	NA	ND	2.34
A2	Brgy. Canabuan, Sta. Fe (NV), near barangay hall	15.1	14.7	1.7	ND	NA	ND	5.67
A3	Brgy. Canabuan, Sta. Fe (NV), Sitio Spanish	11.5	6.2	1	ND	NA	ND	2.67
A4	Brgy. Canarem, Aritao (NV), near residential area	23.3	17.3	0.8	ND	NA	ND	2.73
A5	Brgy. Beti Aritao (NV), near residential area	35.2	31.5	2.2	ND	NA	ND	2.32
A6	Brgy. Salazar, Carranglan (NE), Sitio Popo	36.2	26.6	1.6	8.7	NA	24.7	2.95
A7	Brgy. Burgos, Carranglan (NE), Sitio Barat	10.3	6	1.5	8.6	NA	17.4	3.85
A8	Brgy. Salazar, Carranglan (NE), Zone II	14.5	6	1.6	ND	NA	77	2.11
A9	Brgy. Salazar, Carranglan (NE), Sitio Labug	11.9	14.7	0.8	ND	NA	ND	3.29
A10	Brgy. Bunga, Carranglan (NE), Sitio Laat 1	10.4	6.1	2.2	ND	NA	ND	3.26
A11	Brgy. Bunga, Carranglan (NE), Sitio Laat 2	28.1	16.1	2.2	2.5	NA	ND	2.54
A12	Brgy. R.A. Padilla, Carranglan (NE), Sitio Coral	24	11.2	1.8	ND	NA	ND	3.59
A13	Brgy. San Agustin, Carranglan (NE), near day care center	30.4	15	2.5	ND	NA	ND	2.72
NAAQS (24-hour sampling)		**230**	**150**	**150**	**180**	**20***	**60**	**9**

NOTES:
ND = Not detected / below detection limit (NO_2 = 0.26µg; SO_2 = 0.75µg);
NA = Not analyzed
(*) = Evaluation of this standard is carried out for 30-minute averaging time.
REFERENCE: DAO 2000-81 (IRR of Republic Act 8749)
Red Marks: Exceeds Standards

2.3.2.2 Increase in ambient noise level

[443]Noise level monitoring was conducted by the LCI Study Team from 21 June 2021 to 07 July 2021 at 13 stations along the proposed alignment. The location of sampling stations is provided in **Table 2-57**. The location map is shown in **Figure 2-66**.

[444]For each station, noise (LAeq) and Sound Pressure Level (SPL) in dB(A)) were measured every 10 minutes for 24-hours monitoring.

Table 2-57: Location of Noise and Vibration Monitoring Stations

STATION	LOCATION	SAMPLING PHOTOS	LATITUDE (N)	LONGITUDE (E)
A1	Brgy. Canabuan, Sta. Fe (NV), near church		16° 9'12.80"N	121° 3'22.38"E
A2	Brgy. Canabuan, Sta. Fe (NV), near barangay hall		16° 9'23.56"N	121° 3'13.61"E
A3	Brgy. Canabuan, Sta. Fe (NV), Sitio Spanish		16° 9'30.10"N	121° 2'53.59"E
A4	Brgy. Canarem, Aritao (NV), near residential area		16°11'8.92"N	121° 3'43.58"E

STATION	LOCATION	SAMPLING PHOTOS	LATITUDE (N)	LONGITUDE (E)
A5	Brgy. Beti Aritao (NV), near residential area		16°13'27.25"N	121° 4'14.10"E
A6	Brgy. Salazar, Carranglan (NE), Sitio Popo		16° 4'12.84"N	121° 3'4.63"E
A7	Brgy. Burgos, Carranglan (NE), Sitio Barat		16° 3'11.48"N	121° 3'21.02"E
A8	Brgy. Salazar, Carranglan (NE), Zone II		16° 5'40.32"N	121° 2'36.55"E
A9	Brgy. Salazar, Carranglan (NE), Sitio Labug		16° 5'51.46"N	121° 3'26.54"E

STATION	LOCATION	SAMPLING PHOTOS	LATITUDE (N)	LONGITUDE (E)
A10	Brgy. Bunga, Carranglan (NE), Sitio Laat 1		16° 1'13.98"N	121° 3'5.03"E
A11	Brgy. Bunga, Carranglan (NE), Sitio Laat 2		16° 0'41.16"N	121° 2'44.89"E
A12	Brgy. R.A. Padilla, Carranglan (NE), Sitio Coral		15°59'6.83"N	121° 1'52.04"E
A13	Brgy. San Agustin, Carranglan (NE), near day care center		15°59'1.63"N	121° 4'15.50"E

[445]Noise level monitoring results are compared with the appropriate guideline values stipulated under the National Pollution Control Commission (NPCC) Memorandum Circular No. 002, Series of 1980 as shown in **Table 2-58** and **Table 2-59.**

[446]During the dry season, the level of noise at almost all monitoring stations were above the maximum allowable level. Some noise sources that were recorded in the sampling stations were passing vehicles, animals, and human activities within the vicinity. In addition, the alignment passes under residential, churches and institutions, and along major roads, where noise level is higher in the evening as compared in the morning.

[447] During the wet season sampling, more sampling stations were compliant to the maximum allowable noise level. Most sampling stations recorded noise level which exceeded the standards during the morning and nighttime monitoring. This can be attributed to the passing

vehicles, animals, human activities, and the weather condition during the sampling activity. It was recorded that there were days/nights where rainfall occurred.

Table 2-58: Results of Noise Level Monitoring during the Dry Season Sampling, LA_{eq} (dB(A))

STATION	LOCATION	OBSERVED 24-HOUR NOISE LEVEL dB(A)			
		Morning (0500-0900H)	Daytime (0900-1800H)	Evening (1800-2200H)	Nighttime (2200-0500H)
A1*	Brgy. Canabuan, Sta. Fe (NV), near church	56	59	58	57
A2*	Brgy. Canabuan, Sta. Fe (NV), near barangay hall	52	53	55	53
A3**	Brgy. Canabuan, Sta. Fe (NV), Sitio Spanish	55	54	57	56
A4**	Brgy. Canarem, Aritao (NV), near residential area	60	63	64	62
A5**	Brgy. Beti Aritao (NV), near residential area	58	60	62	59
A6**	Brgy. Salazar, Carranglan (NE), Sitio Popo	52	53	53	52
A7**	Brgy. Burgos, Carranglan (NE), Sitio Barat	55	58	59	56
A8**	Brgy. Salazar, Carranglan (NE), Zone II	48	53	51	49
A9**	Brgy. Salazar, Carranglan (NE), Sitio Labug	53	54	55	54
A10**	Brgy. Bunga, Carranglan (NE), Sitio Laat 1	55	56	56	55
A11**	Brgy. Bunga, Carranglan (NE), Sitio Laat 2	56	55	58	56
A12**	Brgy. R.A. Padilla, Carranglan (NE), Sitio Coral	59	56	61	60
A13*	Brgy. San Agustin, Carranglan (NE), near day care center	60	61	61	61
MAXIMUM ALLOWABLE NOISE LEVEL, dB(A)	***Class AA**	**45**	**50**	**45**	**40**
	****Class A**	**50**	**55**	**50**	**45**

Notes:
(*) Class AA = Area which required quietness (areas within 100 m from nursery schools and institutions)
(**) Class A = Residential area
REFERENCE: NPCC Memorandum Circular No. 1980-002
Red Marks: Exceeds Standards

Table 2-59: Results of Noise Level Monitoring during the Wet Season Sampling, LA_{eq} (dB(A))

STATION	LOCATION	OBSERVED 24-HOUR NOISE LEVEL dB(A)			
		Morning (0500-0900H)	Daytime (0900-1800H)	Evening (1800-2200H)	Nighttime (2200-0500H)
A1*	Brgy. Canabuan, Sta. Fe (NV), near church	46	49	48	44
A2*	Brgy. Canabuan, Sta. Fe (NV), near barangay hall	49	48	45	45
A3**	Brgy. Canabuan, Sta. Fe (NV), Sitio Spanish	53	51	49	48
A4**	Brgy. Canarem, Aritao (NV), near residential area	52	52	50	50
A5**	Brgy. Beti Aritao (NV), near residential area	52	53	52	53
A6**	Brgy. Salazar, Carranglan (NE), Sitio Popo	47	48	42	37
A7**	Brgy. Burgos, Carranglan (NE), Sitio Barat	52	54	49	48
A8**	Brgy. Salazar, Carranglan (NE), Zone II	59	56	58	59
A9**	Brgy. Salazar, Carranglan (NE), Sitio Labug	62	63	68	60
A10**	Brgy. Bunga, Carranglan (NE), Sitio Laat 1	50	49	46	47
A11**	Brgy. Bunga, Carranglan (NE), Sitio Laat 2	54	58	48	54
A12**	Brgy. R.A. Padilla, Carranglan (NE), Sitio Coral	43	45	47	40
A13*	Brgy. San Agustin, Carranglan (NE), near day care center	51	55	53	39
MAXIMUM ALLOWABLE NOISE LEVEL, dB(A)	***Class AA**	**45**	**50**	**45**	**40**
	****Class A**	**50**	**55**	**50**	**45**

Notes:
(*) Class AA = Area which required quietness (areas within 100 m from nursery schools and institutions)
(**) Class A = Residential area
REFERENCE: NPCC Memorandum Circular No. 1980-002
Red Marks: Exceeds Standards

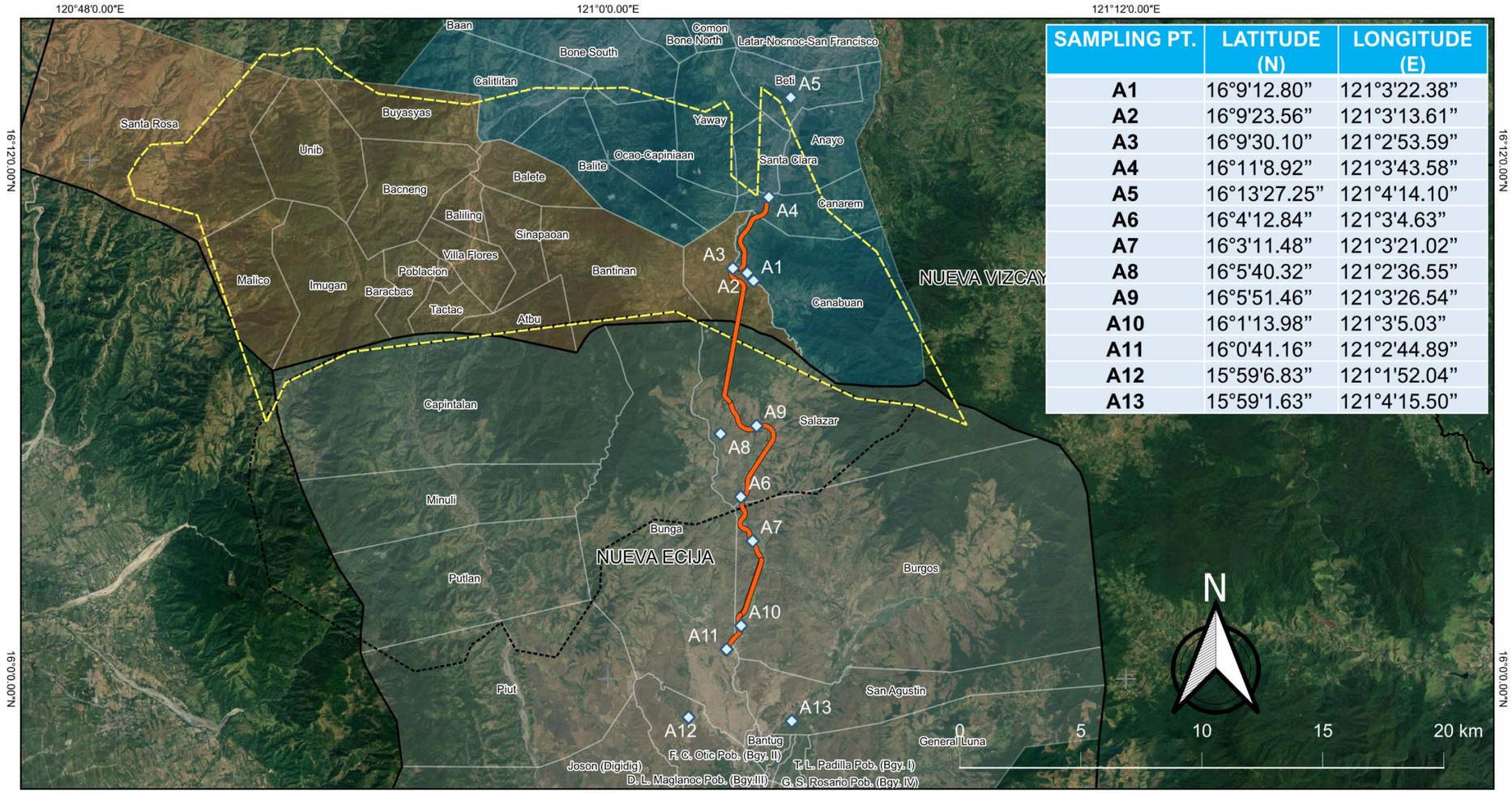
[448]Noise is expected to be generated by heavy equipment during demolition activities and construction. **Table 2-60** presents the expected noise levels of construction equipment, which is expected to attenuate with distance.

[449]The proponent must implement mitigating measures to control noise. Some measures that the proponent will apply are proper maintenance of engines and other mechanical parts of the heavy equipment, installation of exhaust mufflers, and installing enclosures surrounding the project site. The proponent will also limit activities during normal working hours.

Table 2-60: Expected Noise Levels from Heavy Equipment

EQUIPMENT	DISTANCE (M)				
	15	**30**	**60**	**120**	**240**
Front Loader	75	69	63	57	51
Backhoes	85	79	73	67	61
Graders	88	82	76	70	64
Trucks	91	85	79	73	67
Concrete Mixers	82	79	73	67	61
Cranes	83	77	71	65	59
Generators	78	72	66	60	54
Compressors	81	75	69	63	57
Pumps	76	70	64	58	52
Pile Drivers	101	95	89	83	77
Jackhammers	88	82	76	70	64
Source: Larry W. Canter, Environmental Impact Assessment, New York, 1977					

Figure 2-66: Ambient Air, Noise, and Vibration Sampling Location Map



SAMPLING PT.	LATITUDE (N)	LONGITUDE (E)
A1	16°9'12.80"	121°3'22.38"
A2	16°9'23.56"	121°3'13.61"
A3	16°9'30.10"	121°2'53.59"
A4	16°11'8.92"	121°3'43.58"
A5	16°13'27.25"	121°4'14.10"
A6	16°4'12.84"	121°3'4.63"
A7	16°3'11.48"	121°3'21.02"
A8	16°5'40.32"	121°2'36.55"
A9	16°5'51.46"	121°3'26.54"
A10	16°1'13.98"	121°3'5.03"
A11	16°0'41.16"	121°2'44.89"
A12	15°59'6.83"	121°1'52.04"
A13	15°59'1.63"	121°4'15.50"

MAP SOURCE/S:

JICA STUDY TEAM

MAP INFORMATION:
Map Scale : 1 : 1 8 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Google Earth Satellite
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment
- Municipality of Carranglan

Administrative Boundaries

- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija

Ancestral Domain

- Kalanguya Ikalahan AD
- Kalanguya AD

Sampling Station

- A1 to A13

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**AMBIENT AIR, NOISE, AND VIBRATION SAMPLING LOCATION MAP**	As above.	LCI ENVI CORPORATION

2.3.2.3 Increase in vibration level

[450]Ground vibration monitoring was also conducted at the same time and stations along the alignment as indicated in **Table 2-61** and **Figure 2-66** to monitor the ground movement, particularly on the location of the tunnel section. Sensitive receptors (i.e., hospitals, schools, houses) along the alignment were considered in selecting the sampling points.

[451]The vibration measurement followed the British standard: Guide to evaluation of human exposure to vibration in buildings (BS 6472-1992) since the DENR-EMB does not yet have a defined vibration standards or procedures. At each site, vibration level was measured for 24 hours using a Micromate Vibrometer.

Table 2-61: Observed Vibration Levels (dB) along the Alignment

STATION	LOCATION	Daytime	Nighttime
A1**	Brgy. Canabuan, Sta. Fe (NV), near church	72	68
A2**	Brgy. Canabuan, Sta. Fe (NV), near barangay hall	73	68
A3*	Brgy. Canabuan, Sta. Fe (NV), Sitio Spanish	69	71
A4*	Brgy. Canarem, Aritao (NV), near residential area	70	69
A5*	Brgy. Beti Aritao (NV), near residential area	68	68
A6*	Brgy. Salazar, Carranglan (NE), Sitio Popo	69	69
A7*	Brgy. Burgos, Carranglan (NE), Sitio Barat	68	68
A8*	Brgy. Salazar, Carranglan (NE), Zone II	68	68
A9*	Brgy. Salazar, Carranglan (NE), Sitio Labug	70	69
A10*	Brgy. Bunga, Carranglan (NE), Sitio Laat 1	71	67
A11*	Brgy. Bunga, Carranglan (NE), Sitio Laat 2	67	66
A12*	Brgy. R.A. Padilla, Carranglan (NE), Sitio Coral	72	67
A13**	Brgy. San Agustin, Carranglan (NE), near day care center	72	67
BS 6472-1992 Preferred Vibration Level (dB)	Residences*	**80**	**77**
	Offices**	**86**	**86**

NOTE:
(*) Residential area
(**) Offices
REFERENCE: BS 6472-1992
Red Marks: Exceeds Standards

[452]Three stations (A1, A2 and A13) were considered under the Offices Category of the BS 6472-1992 which includes institutions, schools, and churches. While the other 10 stations were considered under the Residences Category.

[453]It can be observed that in most stations, vibration is higher during daytime as compared to the nighttime. But none of the stations exceeded the preferred vibration level stated in BS 6472-1992 for residences and offices.

[454]Increase in ground vibrations may be experienced due to excavation, construction works and the use of heavy equipment. The operation of the project may also generate ground vibrations.

2.3.3 Summary of Baseline Findings, Impacts and Mitigation on Air

[455]The following table lists the impacts and mitigation on Air.

Table 2-62: Summary of Significant Baseline Findings and Potential Impacts and Mitigation on Air

SUMMARY OF BASELINE FINDINGS ON AIR:

- **Meteorology**
  - The proposed project site mainly belongs to Type III climate under the modified Coronas classification in which seasons are no very pronounced: dry from November to April and wet the rest of the year.
  - Rainfall is highest in August and lowest in January.
  - The surface wind in the area is south and northeast. The south direction visits from May to September while the northeast comes during the months of November to February.
  - An average of 2 cyclones passes by every year.
- **Ambient Air Quality, Noise and Vibration**
  - Results of ambient air quality monitoring in all stations are within DENR standards.
  - The level of noise at almost all monitoring stations were above the maximum allowable level. This can be attributed to the intermittent peaks of vehicles passing by the monitoring station such as trucks, motorcycles/tricycles, and all sorts of vehicles
  - It can be observed that in most stations, vibration is higher during daytime as compared to the nighttime. But none of the stations exceeded the preferred vibration level stated in BS 6472-1992 for residences and offices.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
AMBIENT AIR QUALITY AND NOISE			
Impact on Air Quality	Construction Operations	TSP, PM10, NO_x, SO_2, and CO emissions from heavy equipment that will be used during construction TSP, PM10, NO_x, SO_2, and CO emissions from vehicles during operations in the tunnel area	Proper maintenance on heavy equipment Road watering within the project site to control dust Provide adequate ventilation in the tunnel area Regular ventilation maintenance in the tunnel area
Increase in Ambient Noise and Vibration Level	Construction Operations	Noise and vibration will be generated by heavy equipment during construction	Maintenance of engines and other mechanical parts of the equipment Installation of exhaust mufflers Constructing enclosures surrounding the project site Maintenance of vegetation surrounding the area to serve as natural noise barriers

2.4 THE PEOPLE

Land Area

Municipality of Aritao

[456]The Aritao is a 2nd Class Municipality located in a landlocked Province of Nueva Vizcaya. Aritao has a total land area of 26,560 hectares and it comprises 5.52% of the total land area of Nueva Vizcaya.

[457]The Municipality of Aritao has 21 barangays, 2 urban and 19 rural barangays. Aritao is currently governed by Honorable Remelina M. Peros Galam.

Municipality of Santa Fe

[458]Santa Fe is a 3rd Class Municipality located in the Province of Nueva Vizcaya and has a total land area of 39,981 hectares which constitutes 8.31% of Nueva Vizcaya's total land area.

[459]The Municipality of Santa Fe has 16 barangays. Santa Fe is currently headed by Honorable Tidong A. Benito.

Municipality of Carranglan

[460]Carranglan is a 1st Class Municipality located in the Province of Nueva Ecija and has a total land area of 70,531 hectares. It comprises 12.39% of the land area of Nueva Ecija.

[461]The municipality is politically subdivided into 17 barangays, in which 4 are considered urban barangays while 13 are rural barangays. At present, Honorable Rogelio B. Abad governs the municipality.

Demography

Municipality of Aritao

[462]Aritao has a total population of 42,197 people based on the 2020 Philippine Statistics Authority (PSA) Census. This represents 9.32% of the total population of Nueva Vizcaya. The number of households in Aritao is 8,562 and the average household size is 4.3 based on the 2015 census data from PSA.

[463]Barangay Bone South was documented to have the highest population with 4,390 people while Barangay Anayo was noted to have the lowest population with 453 people. The host barangays, Canabuan and Canarem, have a population of 774 and 946, respectively.

Municipality of Santa Fe

[464]Santa Fe has a total population of 18,276 based on the 2020 PSA Census. This represents 3.67% of the total population of Nueva Vizcaya. The number of households in Santa Fe is 3,758 and the average household size is 4.9 based on the 2015 Census data from PSA.

[465]Barangay Canabuan, one of the host barangays, has the highest population with 2,047 people while Barangay Malico has the lowest population with 234 people. Barangay Poblacion has a total population of 1,197 people.

Municipality of Carranglan

[466]Carranglan has a total population of 42,420 based on the 2020 PSA Census. According to the 2015 census data from PSA, the number of households in Carranglan is 9,642 and the average household size is 4.5.

[467]Barangay Joson has the highest population with 5,573 people, while Barangay Piut has the lowest population with 838 people. The host barangays, Barangay Burgos, Bunga, and Barangay Salazar, have a total population of 4,231, 3,916, and 943, respectively.

Table 2-63: Population, Household, Area, and Population Density of the Municipalities of Aritao, Santa Fe and Carranglan

PROVINCE, MUNICIPALITY, BARANGAY	DIA/ IIA	POPULATION (2020)	POPULATION (2015)	NO. OF HOUSEHOLDS (2015)	LAND AREA (HAS.)	POPULATION DENSITY (2020)
Province of Nueva Vizcaya		**497,432**	**452,287**	**111,340**	**481,388.00**	**103**
Municipality of Aritao	**-**	**42,197**	**37,225**	**8,562**	**26,560.00**	**159**
Barangay Beti	IIA	2,172	2,033	-	1,395.65	
Barangay Canabuan	DIA	774	721	-	5,291.84	
Barangay Canarem	DIA	946	919	-	1,373.03	
Barangay Poblacion	IIA	4,354	4,030	-	426.69	
Barangay Santa Clara	IIA	1,219	1,100	-	737.66	
Municipality of Santa Fe	**-**	**18,276**	**16,180**	**3,758**	**39,801.12**	**46**
Barangay Canabuan	DIA	2,047	1,650	-	6,425.20	32
Barangay Poblacion	IIA	1,197	1,084	-	88.86	
Province of Nueva Ecija		**2,310,134**	**2,151,461**	**496,977**	**568,969.00**	**406**
Municipality of Carranglan	**-**	**42,420**	**41,131**	**9,642**	**70,531.00**	**60**
Barangay Bunga	DIA	3,916	3,919	-	12,845.70	30
Barangay Burgos	DIA	4,231	3,844	-	9,745.47	43
Barangay R.A. Padilla	IIA	2,428	2,205	-	5,258.78	46
Barangay Salazar	DIA	943	1,218	-	7,106.74	13
Barangay San Agustin	IIA	2,484	2,276	-	3,678.62	68

SOURCES: Philippine Statistics Authority, 2015 & 2020
Aritao CLUP
Santa Fe CLUP
Carranglan CLUP

Population Density

[468]**Table 2-63** shows that the Municipality of Aritao's population density is at 159 people per square kilometer while the Municipality of Santa Fe is 46 people per square kilometer. Aritao's population density is higher than Nueva Vizcaya's with 103 people per square kilometer while Santa Fe's population density is lower than Nueva Vizcaya's population density.

[469]Further, the table also shows that the Municipality of Carranglan's population density is at 60 people per square kilometer. Carranglan's population density is lower than Nueva Ecija's population density with 406 people per square kilometer.

Population Growth Rate

[470]Based on the 2015 census, the population of Aritao was only 37,225. Over 5 years, the population increased by 42,197, an increase of 4,972 people translating to a +2.67% annual growth rate.

[471]For Santa Fe, the population in 2015 was 16,180. Over 5 years, the population increased by 18,276, an increase of 2,096, translating to an annual growth rate of +2.60%.

[472]For Carranglan, the population in 2015 was 41,131. Over 5 years, the population increased by 42,420, an increase of 1,289, translating to an annual growth rate of +0.65%.

Population by Age Group and Gender

Municipality of Aritao

[473]Based on the 2015 Census, the age group with the highest population in Aritao is 1 to 4, with 4,281 individuals. In contrast, the age bracket of 75 to 79 has the lowest population with 356 individuals. The median age of Aritao is 24. It indicates that half of the entire population of Aritao are aged less than 24 and the other half are over the age of 24.

[474]Of the total population, the males comprised a larger portion of the population at 50.96% compared to the females who made up to 49.04% of the population.

Table 2-64: Population by Age and Gender, Municipality of Aritao

AGE GROUP	POPULATION (2015)	AGE GROUP PERCENTAGE	MALE	FEMALE
Under 1	1,120	3.01%	579	541
01 to 04	**4,281**	**11.50%**	**2,248**	**2,033**
05 to 09	3,608	9.69%	1,855	1,753
10 to 14	3,665	9.85%	1,190	1,755
15 to 19	3,318	8.91%	1,744	1,574
20 to 24	3,050	8.19%	1,566	1,484
25 to 29	2,749	7.38%	1,380	1,369
30 to 34	2,634	7.08%	1,376	1,258
35 to 39	2,404	6.46%	1,223	1,181
40 to 44	2,078	5.58%	1,058	1,020
45 to 49	1,958	5.26%	1,023	935
50 to 54	1,884	5.06%	939	945
55 to 59	1,468	3.94%	746	722
60 to 64	1127	3.03%	560	567
65 to 69	796	2.14%	367	429
70 to 74	361	0.97%	147	214
75 to 79	356	0.96%	118	238
80 and over	368	0.99%	129	239
TOTAL	**37,225**	**100.00%**	**18,968**	**18,257**

SOURCE: PSA, 2015

Municipality of Santa Fe

[475]Based on the 2015 Census, the age group with the highest population in Santa Fe is 10 to 14, with 1,813 individuals. In contrast, the age bracket of 75 to 79 has the lowest population with 118 individuals. The median age of Santa Fe is 23. It indicates that half of the entire population of Santa Fe are aged less than 23 and the other half are over the age of 23.

[476]Of the total population, the males comprised a larger portion of the population at 51.52% compared to the females who made up to 48.48% of the population.

Table 2-65: Population by Age Group and Gender, Municipality of Santa Fe

AGE GROUP	POPULATION (2015)	AGE GROUP PERCENTAGE	MALE	FEMALE
Under 1	320	1.98%	173	147
01 to 04	1,515	9.35%	816	**697**
05 to 09	1,744	10.78%	884	860
10 to 14	**1,813**	**11.21%**	**900**	**913**
15 to 19	1,648	10.19%	804	844
20 to 24	1,532	9.47%	800	732
25 to 29	1,304	8.06%	698	606
30 to 34	1,161	7.18%	638	523
35 to 39	1,010	6.24%	530	480
40 to 44	895	5.53%	463	432
45 to 49	796	4.92%	406	390
50 to 54	734	4.54%	392	342
55 to 59	599	3.70%	318	281
60 to 64	444	2.74%	225	219
65 to 69	256	1.58%	130	126
70 to 74	135	0.83%	52	83
75 to 79	118	0.73%	49	69
80 and over	158	0.98%	58	100
TOTAL	**16,180**	**100.00%**	**8,336**	**7,844**

SOURCE: PSA, 2015

Municipality of Carranglan

[477]Based on the 2015 Census, the age group with the highest population in Carranglan is 5 to 9, with 4,301 individuals. In contrast, the age bracket of 80 and over has the lowest population with 292 individuals. The median age of Carranglan is 24. It indicates that half of the entire population of Carranglan are aged less than 24 and the other half are over the age of 24.

[478]Of the total population, the males comprised a larger portion of the population at 51.44% compared to the females who made up to 48.56% of the population.

Table 2-66: Population by Age Group and Gender, Municipality of Carranglan

AGE GROUP	POPULATION (2015)	AGE GROUP PERCENTAGE	MALE	FEMALE
Under 1	793	1.93%	403	390
01 to 04	3,561	8.66%	1,827	1,734
05 to 09	**4,301**	**10.46%**	**2,177**	**2,124**
10 to 14	4,259	10.35%	2,261	1,998
15 to 19	4,208	10.23%	2,120	2,088
20 to 24	4,419	10.09%	2,170	1,979
25 to 29	3,398	8.26%	1,792	1,606
30 to 34	2,785	6.77%	1,455	1,330
35 to 39	2,604	6.33%	1,367	1,237
40 to 44	2,437	5.92%	1,280	1,157
45 to 49	2,239	5.44%	1,175	1,064
50 to 54	2,012	4.89%	1,036	976
55 to 59	1,578	3.84%	817	761
60 to 64	1,060	2.58%	544	516
65 to 69	729	1.77%	342	387

AGE GROUP	POPULATION (2015)	AGE GROUP PERCENTAGE	MALE	FEMALE
70 to 74	375	0.91%	155	220
75 to 79	351	0.85%	141	210
80 and over	292	0.71%	97	195
TOTAL	**41,131**	**100.00%**	**21,159**	**19,972**

Source: PSA, 2015

2.4.1 Displacement of Settler/s

Direct Impact Barangays within Ancestral Domains

[479]For barangays located within ancestral domains, the results of the census conducted by the Indigenous Peoples Plan (IPP) Team were presented:

[480]**Land Tenure.** The respondents are residing in Ancestral Domains.

[481]**Housing Tenure.** Most of the respondents in the IP communities own their houses (78.2%), this was followed by (13.9%) of the respondents who answered that house is occupied with permission from the owner (family house). Further, 11 respondents answered that they are renting.

[482]**Housing Structure.** With regards to the type of housing structures, (28%) of the respondents are living in concrete houses (permanent), (35%) of the respondents are living in semi-concrete houses (semi-permanent), while (26.1%) of the respondents are living in houses made of light materials.

Municipality of Aritao

[483]As shown in **Table 2-67** on land tenure, the majority (81.36% and 68.52%) of the respondents from Barangays Beti and Sta. Clara claims to own the land that they are currently occupying; while the (48.33%) respondents from Barangay Poblacion said that they occupy the land with permission from the landowner.

[484]In terms of housing tenure in the project impact area (**Table 2-68**), most of the respondents from the 3 barangays are living in their own houses.

[485]With regards to the type of housing structures found in the project impact area (**Table 2-69**), the majority of the respondents (40% and 44.44%) from Barangays Beti and Sta. Clara is living in partially concreted houses. The (55%) respondents from Barangay Poblacion said that they occupy the land with permission from the landowner.

Table 2-67: Land Tenure in the Project Impact Area in Aritao, Nueva Vizcaya

LAND TENURE (*Aritao*)	PERCENTAGE DISTRIBUTION				
	DIA			IIA	
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Sta. Clara*
Own land	Refer to the discussion on Direct Impact Barangays within Ancestral Domains		**81.36%**	45.00%	**68.52%**
Land is being rented			3.39%	6.67%	11.11%
Land is occupied with permission from the owner			15.25%	**48.33%**	18.52%
Land is occupied without permission from the owner			-	-	-

LAND TENURE (*Aritao*)	PERCENTAGE DISTRIBUTION				
	DIA		IIA		
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Sta. Clara*
Others			-	-	-
Data not provided			-	-	1.85%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Table 2-68: Housing Tenure in the Project Impact Area in Aritao, Nueva Vizcaya

HOUSING TENURE (*Aritao*)	PERCENTAGE DISTRIBUTION				
	DIA		IIA		
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Santa Clara*
Own house	Refer to the discussion on Direct Impact Barangays within Ancestral Domains		**93.81%**	**75.00%**	**88.89%**
House is being rented			-	6.67%	-
House is occupied with permission from the owner			1.69%	16.67%	-
House is occupied without permission from the owner			-	1.67%	7.41%
Others			-	-	-
Data not provided			-	-	3.70%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Table 2-69: Type of Housing Structure in the Project Impact Area in Aritao, Nueva Vizcaya

HOUSING STRUCTURE (*Aritao*)	PERCENTAGE DISTRIBUTION				
	DIA		IIA		
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Santa Clara*
Fully concrete	Refer to the discussion on Direct Impact Barangays within Ancestral Domains		40.68%	**55.00%**	31.48%
Partially concrete			**44.07%**	28.33%	**44.44%**
Made of lightweight materials (nipa, cogon, bamboo, wood, etc.)			5.08%	8.33%	22.22%
Made of recycled materials (plastic, tin, etc.)			3.39%	-	-
Others			-	8.33%	-
Data not provided			-	-	1.85%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Municipality of Santa Fe

[486]As shown in **Table 2-70** on land tenure, the majority (70%) of the respondents from Barangays Poblacion claims to own the land that they are currently occupying.

[487]In terms of housing tenure in the project impact area (**Table 2-71**), the majority (85%) of the respondents from the Barangay Poblacion are living in their own houses.

[488]With regards to the type of housing structures found in the project impact area (**Table 2-72**), the majority (73.33%) of the respondents from Barangay Poblacion are living in partially concreted houses.

Table 2-70: Land Tenure in the Project Impact Area in Santa Fe, Nueva Vizcaya

LAND TENURE (*Santa Fe*)	PERCENTAGE DISTRIBUTION	
	DIA *Brgy. Canabuan*	IIA *Brgy. Poblacion*
Own land	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**70.00%**
Land is being rented		28.22%
Land is occupied with permission from the owner		-
Land is occupied without permission from the owner		-
Others		-
Data not provided		1.67%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.		

Table 2-71: Housing Tenure in the Project Impact Area in Santa Fe, Nueva Vizcaya

HOUSING TENURE (*Santa Fe*)	PERCENTAGE DISTRIBUTION	
	DIA *Brgy. Canabuan*	IIA *Brgy. Poblacion*
Own house	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**85.00%**
House is being rented		-
House is occupied with permission from the owner		15.00%
House is occupied without permission from the owner		-
Others		-
Data not provided		-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.		

Table 2-72: Type of Housing Structure in the Project Impact Area in Santa Fe, Nueva Vizcaya

HOUSING STRUCTURE (*Santa Fe*)	PERCENTAGE DISTRIBUTION	
	DIA *Brgy. Canabuan*	IIA *Brgy. Poblacion*
Fully concrete	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	23.33%
Partially concrete		**73.33%**
Made of lightweight materials (nipa, cogon, bamboo, wood, etc.)		3.33%
Made of recycled materials (plastic, tin, etc.)		-
Others		-
Data not provided		-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.		

Municipality of Carranglan

[489]As shown in **Table 2-73** on land tenure, the majority (89.15%, 75.48% and 68.33%) of the respondents from Barangays Bunga, Burgos and San Agustin claim to own the land that they are currently occupying; while the (86.67%) respondents from Barangay R.A. Padilla said that they occupy the land with permission from the landowner.

[490]In terms of housing tenure in the project impact area (**Table 2-74**), the majority (97.67%, 85.06% and 90%) of the respondents from Barangays Bunga, Burgos and San Agustin claim to own their houses; while the (55%) respondents from Barangay R.A. Padilla said that they occupy the house with permission from the landowner.

[491]With regards to the type of housing structures found in the project impact area (**Table 2-75**), the majority of the respondents (48.84% and 51.67%) from Barangays Bunga and San Agustin are living in fully concreted houses. The (57.85%) respondents from Barangay Poblacion said that they are living in partially concreted houses and the (60%) respondents from R. A. Padilla used lightweight materials on their houses.

Table 2-73: Land Tenure in the Project Impact Area in Carranglan, Nueva Ecija

LAND TENURE (*Carranglan*)	PERCENTAGE DISTRIBUTION				
	DIA			IIA	
	Brgy. Burgos	*Brgy. Bunga*	*Brgy. Salazar*	*Brgy. R.A. Padilla*	*Brgy. San Agustin*
Own land	**75.48%**	**89.15%**	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	11.67%	**68.33%**
Land is being rented	4.60%	-		-	5.00%
Land is occupied with permission from the owner	19.16%	10.85%		**86.67%**	26.67%
Land is occupied without permission from the owner	-	-		1.67%	-
Others	-	-		-	-
Data not provided	0.77%	-		-	-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Table 2-74: Housing Tenure in the Project Impact Area Carranglan, Nueva Ecija

HOUSING TENURE (*Carranglan*)	PERCENTAGE DISTRIBUTION				
	DIA			IIA	
	Brgy. Burgos	*Brgy. Bunga*	*Brgy. Salazar*	*Brgy. R.A. Padilla*	*Brgy. San Agustin*
Own house	**85.06%**	**97.67%**	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	45.00%	**90.00%**
House is being rented	-	-		-	-
House is occupied with permission from the owner	14.64%	2.33%		**55.00%**	8.33%
House is occupied without permission from the owner	-	-		-	1.67%
Others	-	-		-	-
Data not provided	-	-		-	-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Table 2-75: Type of Housing Structure in the Project Impact Area in Carranglan, Nueva Ecija

HOUSING STRUCTURE (*Carranglan*)	PERCENTAGE DISTRIBUTION				
	DIA			IIA	
	Brgy. Burgos	*Brgy. Bunga*	*Brgy. Salazar*	*Brgy. R.A. Padilla*	*Brgy. San Agustin*
Fully concrete	32.95%	**48.84%**	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	-	**51.67%**
Partially concrete	**57.85%**	27.91%		35.00%	21.67%
Made of lightweight materials (nipa, cogon, bamboo, wood, etc.)	8.81%	21.71		**60.00%**	26.67%
Made of recycled materials (plastic, tin, etc.)	0.38%	-		-	-
Others	-	0.78%		5.00%	-
Data not provided	-	0.39%		-	-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Scale and Scope of the Involuntary Resettlement

[492]The project is expected to displace settlers along its road right-of-way (RRoW). Primarily, the affected settlers are residing within the Kalanguya Ikalahan and Kalanguya Ancestral Domains (ADs). **DPWH**, in cooperation with the National Commission on Indigenous Peoples (NCIP), has already underwent Free and Prior Informed Consent (FPIC). In 2020, DPWH managed to secure the Certification Precondition (CP) from both Indigenous Cultural Communities (ICCs).

[493]**Right-of-Way Acquisition and Resettlement Policy.** A Right-of-Way Acquisition Plan (RAP) is currently being prepared for the involuntary resettlement and acquisition of lots, affected-structures, improvements, utilities, trees, and perennials within the RRoW of the proposed project.

[494]The RAP was prepared and guided based on the following pertinent national and international laws, issuances, policies, and standards:

Philippine Laws

- Republic Act No. 10752, s. 2016: "Right-of-Way Act";
- Republic Act No. 7279, s. 1992: "Urban Development and Housing Act";
- Republic Act No. 8371, s. 1997: "Indigenous People's Rights Act";

DPWH Policies and Issuances

- DPWH Department Order No. 5, s. 2003: "Creation of the Infrastructure Right-of-Way and Resettlement Project Management Office and the Implementation of the Improved IROW Process";
- DPWH Department Order No. 327, s. 2003: "Guidelines for Land Acquisition and Resettlement Action Plans for Infrastructure Projects;
- Land Acquisition, Resettlement, Rehabilitation, and Indigenous Peoples Policy (LARRIP), s. 2007; and
- DPWH Department Order No. 152, s. 2017: "Reissuance of Department Order No. 124, s. 2017, Directing the Use of the DPWH Right-of-Way Acquisition Manual by All Concerned".

JICA Guidelines

- JICA Guidelines for Environmental and Social Consideration s. 2010.

[495]**Project Affected Persons.** From the initial survey of the JICA Study Team, there were 170 project-affected persons (PAPs) identified who are living/occupying and/or doing economic activities inside the proposed ROW.

[496]However, only 163 respondents were interviewed, representing 82 PAPs in Nueva Ecija and 81 PAPs in Nueva Vizcaya based on the census and socio-economic survey conducted last 7 May 2022.

[497]**Inventory of Loss.** Based on the RAP prepared, the following are the identified assets that will be affected by the proposed project.

[498]**Land.** The potential total land area to be cleared to secure the project's ROW is approximately 129.4 Has. or 1,294,280 m^2. A total of 107 PAPs owned or have stewardship over these lands.

[499]The distribution of affected lands were as follow: (1) Brgy. Salazar - 480,408.56 m^2; (2) Brgy. Burgos - 238,327.70 m^2; (3) Brgy. Bunga - 202,717.82 m^2; (4) Brgy. Canabuan (Aritao) - 195,835.46 m^2; (5) Brgy. Canabuan (Santa Fe) - 127,361.74 m^2; and (6) Brgy. Canarem - 49,628.21 m^2.

[500]**Structures and Improvement.** A total of 102 structures and improvements were inventoried in the six barangays. There are 55 residential structures, 2 institutional structures (church), 1 warehouse, and 44 other structural improvements (i.e., solar dryers, windmill, farmhouses, dirty kitchens, animal pens, small stores, grave houses, deepwell, and shed).

[501]**Public Structures and Utilities.** There are 23 public structures located within the project ROW in Brgys. Bunga and Burgos. These include a basketball court and a waiting shed both owned by BLGU of Bunga. Further, there are 21 electric posts to be affected in Brgys. Bunga and Burgos, which are owned by Nueva Ecija Electric Cooperative (NEECO).

[502]**Trees and Perennials.** The estimated total area with planted timber species accounts for 51,937 m^2 or 870 timber trees. In addition, there were 18 fruit-bearing trees and perennials identified throughout the RRoW. The estimated total area with planted fruit-trees and perennials is 608,711.5 m^2 or 10,347 fruit-bearing trees.

[503]**Croplands Affected by the Project.** The estimated agricultural areas affected by the project is 307,928.71m^2. Most of the agricultural areas are planted with rice. From the KIIs of the RAP Study Team, there are no irrigation facilities in the area and the rice fields are rain-fed. Most of the farmers are only able to plant once a year during rainy season. During dry season, farmers would plant vegetables for household consumption only.

[504]**Entitlement Matrix.** A preliminary Entitlement Matrix was developed to mitigate the impacts of the proposed project with regards to involuntary resettlement. These will be updated and finalized once the Detailed Engineering Design (DED) RAP has been prepared.

Table 2-76: Proposed Entitlement Matrix

TYPE OF LOSS	APPLICATION*	ENTITLED PERSONS	ENTITLEMENT
(a) LAND			
Agricultural Lands	Severely Affected	PAFs with Transfer Certificate of Title (TCT) or Tax Declarations (TD)	▪ Cash compensation for loss of entire land at the current market value. ▪ If feasible, land for land will be provided in terms of a new parcel of land of equivalent value or productivity, at a location acceptable to PAFs. ▪ Cash compensation for damaged crops at the current market value. ▪ Rehabilitation assistance in the form of Skills Training equivalent to PHP 15,000 per family, if the present means of livelihood is no longer viable and the affected family will have to engage in a new income activity.
		Holders of Free or Homestead Patents under CA 141	▪ Cash compensation for land improvements only.

TYPE OF LOSS	APPLICATION*	ENTITLED PERSONS	ENTITLEMENT
			▪ Cash compensation for damaged crops at the market value. ▪ Disturbance compensation equivalent to five times the average of the gross harvest for the past 5 years but not less than PHP 15,000.
		PAPs without TCT or TD	▪ Cash compensation for land improvements only. ▪ Cash compensation for damaged crops, trees, and perennials at current market value.
		Lessees/Tenants of Agricultural Lands Agricultural Caretakers/ Settlers/ Rent-free Occupants	▪ Disturbance compensation equivalent to 5 times the average gross harvest during the last 5 years but not less than PHP 15,000. ▪ Financial Assistance equivalent to the average gross harvest for the last 3 years but not less than PHP 15,000.
	Marginally Affected	PAPs with TCT or TD	▪ Cash compensation for affected land at the current market value of land. ▪ Cash compensation for damaged crops at the current market value.
		Holders of Free or Homesteads Patents under CA 141	▪ Cash compensation for land improvements only. ▪ Cash compensation for damaged crops at the market value.
(b) STRUCTURE			
Residential	Severely Affected	Owners with or without TCT or TD	▪ Cash compensation for the entire structure at 100% Replacement Cost (RA 10752). ▪ Inconvenience Allowance in the amount of Php10,000 for relocation and new construction. ▪ Transportation Assistance.
	Marginally Affected	Owners with or without TCT or TD	▪ Cash compensation for affected portion of the structure at 100% replacement cost.
(c) OTHER IMPROVEMENTS			
Non-Dwelling Structures	Severely or Marginally Affected	PAPS with or without TCT or TD	▪ Cash compensation for affected portion of the structure at 100% replacement cost.
(d) CROPS, TREES, AND PERENNIALS			

TYPE OF LOSS	APPLICATION*	ENTITLED PERSONS	ENTITLEMENT
Crops, Trees, and Perennials	Severely or Marginally Affected	Owners of crops, trees, perennials	▪ Compensation for rice crops is incorporated in the compensation for rice lands. ▪ Cash compensation for trees, and perennials at the current market value as prescribed by the concerned LGUs, DENR, and Department of Agriculture. ▪ PAPs are allowed sufficient time to harvest their trees/ crops.
(e) VULNERABLE HOUSEHOLDS			
Additional Support to Nos. 1 to 5 Above	-	[05]Poorest of the poor; households, solo parents, persons with disabilities, and elderly (over 60 years old); unemployed HH members; out-of-school youths	▪ Administrative support for applying respective governmental social welfare program based on household conditions in cooperation with concerned LGUs. ▪ Provide priority for jobs related to the project based on capability of PAPs.
(f) COMMUNITY OR PUBLIC STRUCTURES			
Community Public Structures	Severely or Marginally Affected	Community or Public Structure Owners/ Administrators	▪ Replacement/ re-establishment of public structures through a Memorandum of Agreement with the barangay LGU or government agency concerned; DPWH to defray the attendant cost

SOURCE: Right-of-Way Acquisition Plan, EarthUs (2022)
NOTE:
***Severely Affected** when the PAPs stand to lose 20% or more of their assets, or even less than 20% if the remaining land or structure is rendered unviable for continued use as originally intended; or
***Marginally Affected** when the PAPs stand to lose less than 20% of their assets, or even more than 20% but the remaining land or structure is still viable for continued use as originally intended.

2.4.1.1 Displacement/disturbance of properties

[506]The project will cause disturbance to nearby properties, as the portion of Dalton Pass East Alignment Road Project construction and operations are within a Certificate of Ancestral Domain Titles (CADT) and Pantabangan-Carranglan Watershed Forest Reserve (PCWFR). **DPWH** shall adhere to the regulations in protecting the rights of the ICCs and the said protected area.

2.4.1.2 Change/conflict in land ownership

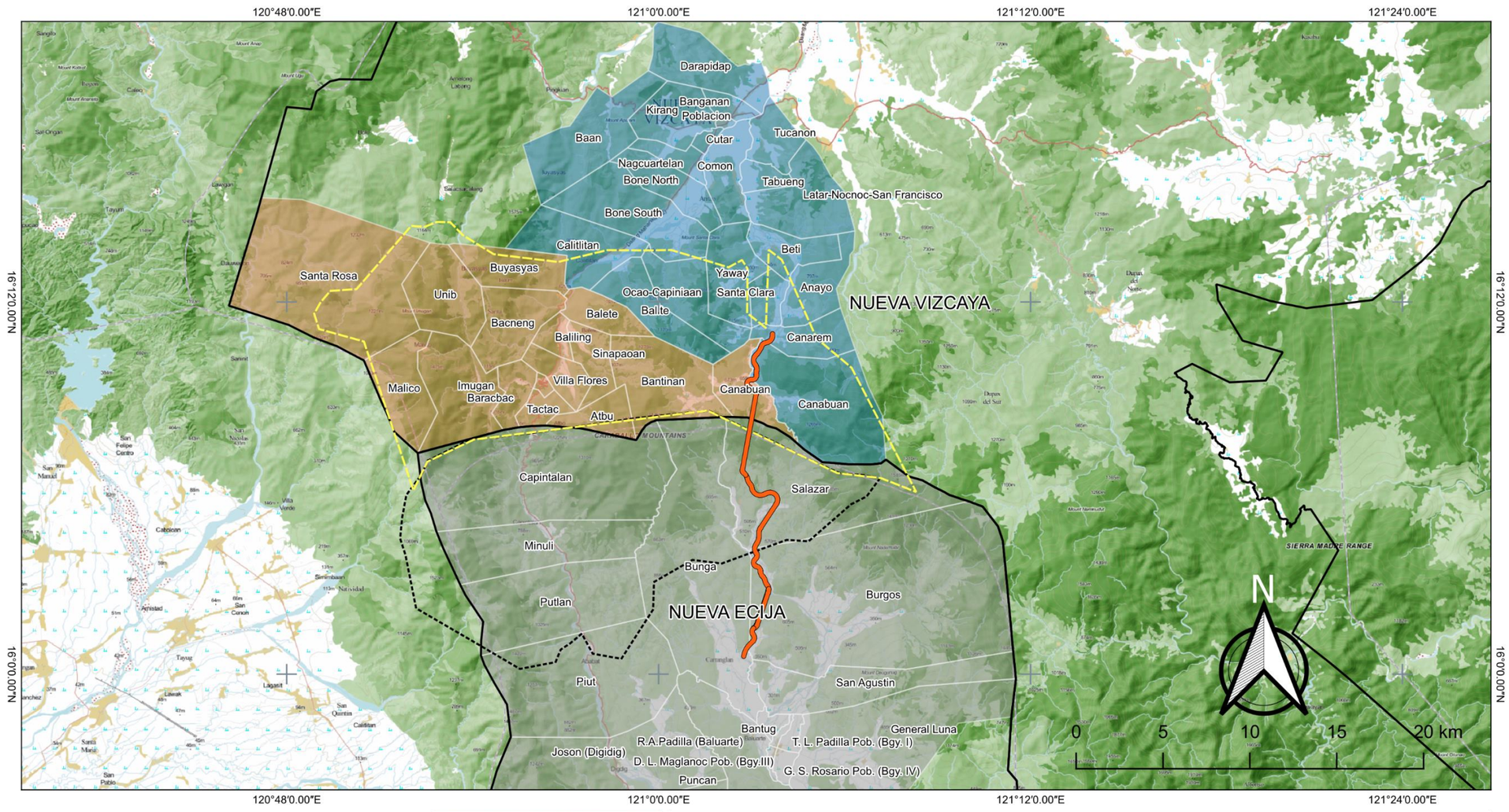
[507]The proposed alignment of the project will traverse the Municipalities of Aritao and Santa Fe in Nueva Vizcaya and the Municipality of Carranglan in Nueva Ecija which includes areas with CADT and PCWFR.

[508]**DPWH** has managed to secure the CP from NCIP and the ICC communities to ensure that there will be no conflict on the land ownership concerning the project.

[509]**DPWH** shall also obtain the Protected Area Management Board (PAMB) clearance for sections of the project that are within PCWFR.

[510]**Figure 2-67** presents the ancestral domains covering the proposed project.

Figure 2-67: Ancestral Domains Relative to the Proposed Project Site



MAP SOURCE/S:

NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY

NATIONAL COMMISSION ON INDIGENOUS PEOPLES

MAP INFORMATION:
Map Scale : 1 : 2 5 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Philippine Geoportal
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment

Administrative Boundaries

- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija
- Municipality of Carranglan

Ancestral Domain

- R02-STF-0406-045 (Kalanguya Ikalahan AD)
- R03-CAR-1106-051 (Kalanguya AD)

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**ANCESTRAL DOMAINS RELATIVE TO THE PROPOSED PROJECT SITE**	As above. https://www.geoportal.gov.ph/ accessed 2022.	LCI ENVI CORPORATION

2.4.1.3 Change/conflict on Right-of-Way

[511]The project will not cause any change or conflict on right-of-way (ROW) in the host municipalities.

2.4.1.4 Impact of public access

[512]In terms of impact to public access and as mentioned in Section 2.4.1.3 Change/conflict on Right-of-Way, the project will not utilize existing barangay road networks near the project area. Given the nature of the project, the proposed project will enhance the connectivity between Region II and Region III resulting in a decreased travel time in the area.

2.4.2 In-migration

[513]A total of 2,000 manpower will be sourced during the project construction and 25 during operation. The Department of Public Works and Highways (**DPWH**) commits to prioritizing employment of qualified workers from the host municipalities to mitigate the negative effects of in-migration.

[514]If migrant workers are hired, **DPWH** will coordinate with the host LGUs for the issuance of certificates containing pertinent information about the new employees. Further, employees who are not from the host barangay or municipality will be housed within the project vicinity to ensure their safety.

Place of Origin & Religious Affiliation

Direct Impact Barangays within Ancestral Domains

[515]For barangays located within ancestral domains, the results of the census conducted by the IPP Team were presented:

[516]**Ethnicity.** Majority (70.4%) of the respondents from Region II belongs to Kalanguya [Ikalahan] ICC, followed by (10.9%) who are Ibaloi ICCs. The rest of the respondents belongs to other ICCs in Nueva Vizcaya.

[517]Majority (69.14%) of the respondents from Region III belongs to Kalanguya IP Group while (19.07%) belong to Ibaloi ICCs. The rest of the respondents belongs to other ICCs in Nueva Ecija.

[518]**Religion.** In terms of religion for both Region II and III ICCs, majority are Roman Catholic. Around (13.1%) of the respondents in Region II are members of the United Church of Christ in the Philippines (UCCP). While (20.58%) of the respondents in Region 3 are Born Again Christians. The rest of the respondents belongs to other religious denominations/sects and churches present in Nueva Vizcaya and Nueva Ecija. It can be noted that there are IPs who do not belong to any religion.

Municipality of Aritao

[519]In terms of place of origin, the majority of the respondents (93.22%, 51.67% and 85.19%) from Barangays Beti, Poblacion, and Sta. Clara originated from Aritao.

[520]In terms of religious affiliation, majority of the population (83.05%, 86.67% and 77.87%) from Barangays Beti, Poblacion, and Sta Clara are Roman Catholics.

Table 2-77: Place of Origin of HH Heads in the Project Impact Area in Aritao

PLACE OF ORIGIN	PERCENTAGE DISTRIBUTION				
	DIA		IIA		
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Sta. Clara*
Aritao, Nueva Vizcaya	Refer to the discussion on Direct Impact Barangays within Ancestral Domains		**93.22%**	**51.67%**	**85.19%**
Other municipalities in Nueva Vizcaya			-	15.00%	12.96%
Other municipalities in Nueva Ecija			1.67%	5.00%	-
Metro Manila			-	-	-
Others			-	26.67%	-
Data not provided			5.08%	1.67%	1.85%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021					

Table 2-78: Religious Affiliation of HH Heads in the Project Impact Area in Aritao

RELIGIOUS AFFILIATION	PERCENTAGE DISTRIBUTION				
	DIA		IIA		
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Sta. Clara*
Roman Catholic	Refer to the discussion on Direct Impact Barangays within Ancestral Domains		**83.05%**	**86.67%**	**77.78%**
Iglesia Ni Cristo			13.56%	5.00%	14.81%
Born Again Christian			-	-	5.56%
Islam			-	-	-
Others			-	-	-
Data not provided			3.39%	8.33%	1.85%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Municipality of Santa Fe

[521]In terms of place of origin, (85%) of the population of Poblacion and Canabuan originated from Santa Fe.

[522]In terms of religious affiliation, (70%) of the population of Poblacion and Canabuan are Roman Catholics.

Table 2-79: Place of Origin of HH Heads in the Project Impact Area in Santa Fe

PLACE OF ORIGIN	PERCENTAGE DISTRIBUTION	
	DIA	IIA
	Brgy. Canabuan	*Brgy. Poblacion*
Santa Fe, Nueva Vizcaya	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**85.00%**
Other municipalities in Nueva Vizcaya		-
Other municipalities in Nueva Ecija		-
Metro Manila		-
Others		8.33%
Data not provided		6.67%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.		

Table 2-80: Religious Affiliation of HH Heads in the Project Impact Area in Santa Fe

RELIGIOUS AFFILIATION	PERCENTAGE DISTRIBUTION	
	DIA	IIA
	Brgy. Canabuan	*Brgy. Poblacion*
Roman Catholic	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**70.00%**
Iglesia Ni Cristo		10.00%
Born Again Christian		8.33%
Islam		-
Others		10.00%
Data not provided		1.67%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.		

Municipality of Carranglan

[523]In terms of place of origin, (91.57%) of the respondents from Barangay Burgos originated from Carranglan.

[524]In terms of religious affiliation, majority of the population (54.02%) of Barangay Burgos are Roman Catholics.

Table 2-81: Place of Origin of HH Heads in the Project Impact Area in Carranglan

PLACE OF ORIGIN	PERCENTAGE DISTRIBUTION				
	DIA			IIA	
	Brgy. Burgos	*Brgy. Bunga*	*Brgy. Salazar*	*Brgy. R.A. Padilla*	*Brgy. San Agustin*
Carranglan, Nueva Ecija	**91.57%**	**87.21%**	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**80.00%**	**86.67%**
Other municipalities in Nueva Vizcaya	3.06%	1.16%		5.00%	1.67%
Other municipalities in Nueva Ecija	3.06%	3.88%		1.67%	6.37%
Metro Manila	-	-		-	-
Others	2.68%	6.20%		11.67%	-
Data not provided	-	1.55%		1.67%	5.00%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Table 2-82: Religious Affiliation of HH Heads in the Project Impact Area in Carranglan

RELIGIOUS AFFILIATION	PERCENTAGE DISTRIBUTION				
	DIA			IIA	
	Brgy. Burgos	*Brgy. Bunga*	*Brgy. Salazar*	*Brgy. R.A. Padilla*	*Brgy. San Agustin*
Roman Catholic	**54.02%**	**60.47%**	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**83.33%**	**95.00%**
Iglesia Ni Cristo	4.98%	22.87%		-	-
Born Again Christian	6.51%	6.59%		6.67%	3.33%
Islam	-	-		-	-
Others	27.97%	5.43%		-	-
Data not provided	6.51%	4.65%		5.00%	1.67%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

2.4.2.1 Proliferation of informal settlers

[525]Proliferation of informal settlers is not expected to result from the project as **DPWH** intends to prioritize the employment of qualified workers living within the 3 municipalities.

2.4.3 Culture/Lifestyle Change (especially on Indigenous Peoples, if any)

[526]Given that the portion of the project lies within 2 Ancestral Domains (ADs), the Kalanguya Ikalahan Indigenous Cultural Communities ICCs in Nueva Vizcaya, and Kalanguya ICCs in Nueva Ecija, the proponent has undergone the Free and Prior Informed Consent (FPIC) and related processes to ensure that the affected ICCs will exercise their right in management, development, use, and utilization of their land and resources within their ancestral domain.

[527]To ensure that the proposed project will cater to the needs of the affected IPs, **DPWH** and JICA Study Team is also preparing an Indigenous Peoples Plan.

[528]**Indigenous Peoples Plan (IPP).** The Japan International Cooperating Agency (JICA) is one of the bilateral agencies in the world that recognizes respects, promotes and protects the rights of ICCs/IPs by strictly enforcing its Environmental and Social Considerations (ESC) in its programs and projects with other countries like the Philippines.

[529]In the worldview of the Indigenous Cultural Communities/Indigenous Peoples, *"land is life, air is life, and water is life".* This means the portion of the 2 ADs where the proposed project will be constructed are considered "THE LIFE" of the Kalanguya ICCs/Ips in Region III and Kalanguya-Ikalahan ICCs/IPs in Region II. However, in the worldview of outsiders, agencies, or institutions; the ancestral domain is just an ordinary domain/land where it should be utilized for its programs and projects. The difference in worldview matters which made the JICA required the formulation of an IPP as a requirement for its technical cooperation or financial assistance to the Philippine Government to ensure the ICCs/IPs will be given attention by the project to respect their rights as intergenerational stewards, owners, and rights holders of their ancestral domain.

[530]The DPWH on the other hand is committed and gives special attention to Indigenous Cultural Communities/Indigenous Peoples (ICCs/IPs) being affected by its road projects in the Philippines to ensure that their rights are not violated. This is manifested in the formulation and implementation of the Social and Environmental Management Systems Operational Manual 2016 that includes the updated Land Acquisition, Resettlement, Rehabilitation, and Indigenous Peoples Policy (LARRIPP) which was first formulated in 1999 and second edition formulated in 2004 and now the revised third edition on March 23, 2007. This is to complement the Republic Act 10752, "An Act Facilitating the Acquisition of Right-Of-Way, Site or Location for National Government Infrastructure Projects or otherwise known as "The Right of Way Act", which was signed on March 7, 2016, and took effect on March 22, 2016.

[531]The above commitments of JICA and DPWH resulted to the hiring of a local consultant, International Consultancy for Indigenous Peoples Environment and Development Co. (ICON IPED CO.) to facilitate the "Survey and Preparation of the Indigenous Peoples Plan (IPP) for Preparatory Survey of DPEARP in the Philippines "to ensure that proper and culture sensitive mitigations, as well as due compensation will be given to the ICCs/IPs affected by the project. Hence, the ICON IPED CO. Team of consultants conducted the document analysis, census and socio-economic survey, and conducted culture-based public consultations using Tongtongan to produce a Draft IPP Report.

[532]In this particular study, the consultants followed a simple social research standards following the series of activities: (1) collection of basic information about the demographic, socio-economic, socio-cultural, socio-political, community and environmental from all available secondary data within and around the ADs which all the data gathered will undergo document study and analysis; (2) preparation of field survey including census of socio-economic survey (making and validating survey tools, identifying sampling method to select respondents and their locations) then conduct of actual census and socio-economic survey to gather primary data that includes burning issues and negative impacts of the project within the affected ICCs/IPs; (3) preparation of culture-based community public meetings/consultations (making and validating forms/matrices to be used including finalizing selection of participants, locations, venue, and logistics) the conduct of actual Tongtongan to gather primary data in all aspects of the study; (4)analysis of the results of the field study and results of the culture-based community public meetings/consultations or Tongtongan which became the basis of the Draft Report; (5) making of Indigenous Peoples Plan (IPP) including propose plans, programs, projects and services (PPS) based on the results of all the data gathered from the secondary and primary data on adverse negative impacts and possible impacts; (6) prioritizing all the identified and listed propose plans, programs, projects and services; (7) propose for budgeting of all the identified, listed and prioritized PPS with clear implementation schedule or timeframe and responsible agencies/entities or proponent who will be responsible in implementing the PPS; (8) proposed monitoring, learning, evaluation and reflection; and finally (9) proposed for culture-based conflict mechanisms that will be used in the IPP.

[533]**Development Action Plan.** Chapter 6 of the IPP contains the proposed Development Action Plan of the ICCs/IPs that derived from the results of the IPP Study. It contains the mitigation for the project's potential social and environmental impacts in form of programs, projects, and services under DPWH's mandate as well as those outside of DPWH's mandate for referral to other agencies.

[534]In terms of lifestyle change, increased local income from the project may introduce and expose workers and the community to vices that tend to undermine the morality of the people. Hostelry areas, such as videoke bars, nightclubs, gambling places, and prostitution, among others may proliferate with demand. If not properly managed, addiction to such vices may contribute to social problems, such as destruction of family and values and an increase in crime rate.

[535]**DPWH** commits to work closely with both the municipal and barangay LGUs and PNP to regulate law to avoid vice-related problems in the community. In addition, **DPWH** and its contractors will strictly implement a drug- and alcohol-free work environment.

[536]Commitment to install closed-circuit televisions (CCTVs) in strategic places/areas within the project alignment and the community areas will be coordinated with respective LGUs.

2.4.4 Impacts on Cultural Resources

[537]The Republic Act No. 10066, otherwise known as the "National Cultural Heritage Act of 2009" was enacted in 2010 to provide protection, preservation, and promotion of the nation's cultural heritage. This enabled the National Commission for Culture and the Arts (NCCA) to establish the Philippine Registry of Cultural Property (PRECUP). The PRECUP is the repository of all culture properties of the Philippines that were deemed important to cultural heritage.

[538]The Municipality of Santa is home to the National Shrine of the Battle of Balete Pass *"Labanan sa Pasong Balete Marker"* in the Balete Pass Tourism Complex located in the summit area of the pass. The Shrine and other monuments and memorials in honor of those who have fallen in battle during World War II were in the highest point of the Dalton Pass.

[539]The Municipality of Carranglan has registered *"Gintong Butil"* Festival as part of its intangible culture.

[540]None of these cultural properties will be affected by the proposed project.

***"Labanan sa Pasong Balete"* Marker**
Source: Google Photos

Table 2-83: Registered Cultural Properties in the Host Municipalities

OFFICIAL NAME	MUNICIPALITY	CLASSIFICATION	TYPE
National Shrine of the Battle of Balete Pass	Santa Fe	Marked Structure, National Historical Commission of the Philippines	Tangible-Immovable
Gintong Butil Festival	Carranglan	Registered Property, Province of Nueva Ecija	Intangible

Source: PRECUP TALAPAMANA (2022)

[541]**Chance Find Procedure.** As the project will involve excavation, civil and earth movement works along the project alignment, there is a chance of encountering artefacts of historical or heritage significance. Hence, **DPWH** shall implement the following chance find procedure:

1. Stakeholder engagement must be undertaken in advance of the construction activities to determine if the site is of cultural heritage or archaeology importance, or if artefacts are likely to be found, or if the area has been/is used as a burial ground. If yes, then a detailed assessment of the site by a heritage expert should be conducted;
2. Despite precautions, if buried artefacts are encountered during the construction activities, all activities in the vicinity of the site must stop. The operators and workers will be briefed about identification of artefacts and other chance find items to help them detect such finds;
3. Once confirmed, delineate the discovered find/feature/site. Record the find location and all remains are to be left in place. Secure the area to prevent any damage or loss of removable objects;
4. The discovery must then be immediately reported to the National Museum, Archaeology Division as required by law in pursuant to *Article 7 Section 30b of the Republic Act 10066 on "Anthropological Research and Archaeological Exploration/Excavation"*; and

5. An archaeologist from the National Museum will conduct a "Salvage/Rescue Archaeology" to ensure the full recovery of the artefact. This will ensure that proper protocol on scientific excavation and interpretation will be carried out to fully understand the importance of the site and its contribution to archaeology in the Philippines.

2.4.5 Threat to Delivery of Basic Services/Resource Competition

[542]If skills are not available in the locality, **DPWH** or its contractors may bring in skilled personnel from outside of the host municipality. Although their residency is temporary, transient workers will have needs that are similar to the permanent residents in the area. Hence, competition for food, shelter, power, water, and other local resources may be expected.

Direct Impact Barangays within Ancestral Domains

[543]For barangays located within ancestral domains, the results of the census conducted by the IPP Team were presented:

[544]**Power Supply.** Electricity for most (81.2%) of the IP households are supplied by Nueva Ecija Electric Cooperative, Inc. (NEECO) I/II/III. Further, (11%) of the respondents have access to solar power. On the other hand, (4.7%) do not have access to electricity.

[545]**Water Supply.** Majority (51.4%) of the respondents obtain their water supply from creeks/rivers/lakes/rain. Further, (13%) of the respondents are connected to local water systems. Around (4.9%) of the respondents have deepwells. The rest of the respondents obtain water from other sources.

[546]**Sanitation.** Most (48%) of the respondents have access to water-flushed toilets. This was followed by (29.4%) of the respondents with access to closed-pit toilets. It can be noted that (7.1%) of the respondents are still using open-pit toilets.

Power Supply

[547]The power supply for the proposed project will be provided by the local power utilities in the area. The Municipalities of Aritao and Santa Fe are connected to the Luzon Grid for electricity through the Nueva Vizcaya Electric Cooperative (NUVELCO).

Municipality of Aritao

Table 2-84: Source of Electricity/Power in the Project Impact Area in Aritao

SOURCE OF ELECTRICITY/POWER	PERCENTAGE DISTRIBUTION				
	DIA		IIA		
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Sta. Clara*
Electricity	Refer to the discussion on Direct Impact Barangays within Ancestral Domains		**96.61%**	**93.33%**	**96.30%**
Generator			-	-	-
Kerosene			1.69%	1.67%	-
Candle			-	1.67%	1.85%
Others			1.69%	3.33%	1.85%
Data not provided			-	-	-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

[548]Based on the Comprehensive Land Use Plan (CLUP) of Aritao, the 22 barangays of the municipality had already been energized. However, there are still sitios that are not served with electricity or households have difficulty accessing electricity because of the topography of the municipality.

Municipality of Santa Fe

Table 2-85: Source of Electricity/Power in the Project Impact Area in Santa Fe

SOURCE OF ELECTRICITY/POWER	PERCENTAGE DISTRIBUTION	
	DIA	IIA
	Brgy. Canabuan	*Brgy. Poblacion*
Electricity	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**98.33%**
Generator		-
Kerosene		-
Candle		1.67%
Others		-
Data not provided		-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.		

[549]From the CLUP of Santa Fe, alternative sources of electricity/ power such as electromechanical generators and renewable types (solar and micro hydro energy) are uncommon in the area.

Municipality of Carranglan

Table 2-86: Source of Electricity/Power in the Project Impact Area in Carranglan

SOURCE OF ELECTRICITY/POWER	PERCENTAGE DISTRIBUTION				
	DIA			IIA	
	Brgy. Burgos	*Brgy. Bunga*	*Brgy. Salazar*	*Brgy. R.A. Padilla*	*Brgy. San Agustin*
Electricity	**95.79%**	**98.84%**	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**96.67%**	**100.00%**
Generator	0.38%	-		-	-
Kerosene	2.68%	-		1.67%	-
Candle	1.15%	1.16%		1.67%	-
Others	-	-		-	-
Data not provided	-	-		-	-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

[550]From the CLUP of Santa Fe, alternative sources of electricity/ power such as electromechanical generators and renewable types (solar and mini-hydro energy) are uncommon in the area.

Water Supply

Municipality of Aritao

[551]The Water Supply System in Aritao had been serviced by Level I, II, and III systems. Level I system which consists of 2,905 Shallow Well and 35 Deep Well served 3,005 households of the 22 barangays. For the Level II system, 233 communal faucets are serving about 2,063 HH.

[552]The Local Water Works System (Level III Water System) of the municipality had been servicing the municipality specifically the urban barangays. The system draws water from the

underground source through submersible pumps. The total number of connections was 1,059 coming from 3 types of consumers – domestic (1,035), commercial (10), and industrial (14). The Average Water Consumption is 12 cu.m. for domestic, 25 cu.m. for commercial, and 15 cu.m. for industrial consumers.

Table 2-87: Source of Drinking Water in the Project Impact Area in Aritao

SOURCE OF DRINKING WATER SUPPLY	PERCENTAGE DISTRIBUTION				
	DIA		IIA		
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Sta. Clara*
Metered/piped connection	Refer to the discussion on Direct Impact Barangays within Ancestral Domains		-	1.67%	1.85%
Shallow well with hand pump			30.51%	11.67%	5.56%
Surface Water (River, lake, rainwater)			-	1.67%	33.33%
Water refilling station			**59.32%**	**83.33%**	**42.59%**
Others			6.78%	-	-
Data not provided			3.39%	1.67%	16.67%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Municipality of Santa Fe

[553]The water supply in Santa Fe is generally classified as Level I (shallow wells or surface waters) water system.

[554]An LGU initiated metered water and sanitation project resembling Level II or Level III water systems called Water and Sanitation (WATSAN), and Kalaw-Tactac Water System Association (KATAWASA) serves 23% of Santa Fe's total households. WATSAN and KATAWASA are servicing low-lying areas in Barangay Poblacion and the adjacent communities of Imugan, Baliling and Villaflores to provide a potable source of water.

Table 2-88: Source of Drinking Water in the Project Impact Area in Santa Fe

SOURCE OF DRINKING WATER SUPPLY	PERCENTAGE DISTRIBUTION	
	DIA	IIA
	Brgy. Canabuan	*Brgy. Poblacion*
Metered/piped connection	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	16.67%
Shallow well with hand pump		**41.67%**
Surface Water (River, lake, rainwater)		6.67%
Water refilling station		33.33%
Others		1.67%
Data not provided		-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.		

Municipality of Carranglan

[555]According to the CLUP of Carranglan, the municipality has had no existing waterworks system for the past 50 years. Currently, there is an on-going construction of a water work system project between Carranglan LGU and Balibago Waterworks through a Public-Private Partnership Agreement (PPP).

[556]Presently, the barangays depend largely on multiple sources of potable water. Pitcher-type, shallow or deep well pumps, and spring water sources are common in the locality.

Table 2-89: Source of Drinking Water in the Project Impact Area in Carranglan

SOURCE OF DRINKING WATER SUPPLY	PERCENTAGE DISTRIBUTION				
	DIA			IIA	
	Brgy. Burgos	*Brgy. Bunga*	*Brgy. Salazar*	*Brgy. R.A. Padilla*	*Brgy. San Agustin*
Metered/piped connection	0.77%	1.94%	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	-	**50.00%**
Shallow well with hand pump	**54.41%**	**83.72%**		**56.67%**	33.33%
Surface Water (River, lake, rainwater)	-	3.10%		1.67%	-
Water refilling station	29.89%	10.85%		41.67%	16.67%
Others	10.73%	-		-	-
Data not provided	4.21%	0.39%		-	-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

[557]The proposed project is not expected to directly compete with the water supply of the host barangays and adjacent communities.

Sanitation

[558]With regards to the access of sanitary toilet facilities in the Aritao, Poblacion has 100% of the population has access to a sanitary facility.

Table 2-90: Access to Sanitary Toilet Facility of HHs in the Project Impact Area, Aritao

SANITARY TOILET FACILITY	PERCENTAGE DISTRIBUTION				
	DIA		IIA		
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Sta. Clara*
Access to sanitary toilet facility	Refer to the discussion on Direct Impact Barangays within Ancestral Domains		**96.62%**	**100.00%**	**94.45%**
Without access to sanitary toilet facility			1.69%	-	3.70%
Data not provided			1.69%	-	1.85%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

[559]With regards to the access of sanitary toilet facilities in the Santa Fe, Poblacion has 88.33% of the population has access to a sanitary facility.

Table 2-91: Access to Sanitary Toilet Facility of HHs in the Project Impact Area in Santa Fe

SANITARY TOILET FACILITY	PERCENTAGE DISTRIBUTION	
	DIA	IIA
	Brgy. Canabuan	*Brgy. Poblacion*
Access to sanitary toilet facility	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**88.33%**
Without access to sanitary toilet facility		11.67%
Data not provided		-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.		

[560]With regards to the access of sanitary toilet facilities in the Carranglan, R.A. Padilla has 100% of the population has access to a sanitary facility.

Table 2-92: Access to Sanitary Toilet Facility of HHs in the Project Impact Area in Carranglan

SANITARY TOILET FACILITY	PERCENTAGE DISTRIBUTION				
	DIA			IIA	
	Brgy. Burgos	*Brgy. Bunga*	*Brgy. Salazar*	*Brgy. R.A. Padilla*	*Brgy. San Agustin*
Access to sanitary toilet facility	**95.02%**	**92.25%**	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**100%**	**95.00%**
Without access to sanitary toilet facility	1.53%	6.59%		-	5.00%
Data not provided	3.45%	1.16%		-	-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Telecommunication

Municipality of Aritao

[561]Aritao's DIGITEL, Telegraph/Telex/Telegraphic Transfer Services by Telof, Postal Service Facilites by PhilPost, Broadcast and Print Media and other Telecommunication Services (Mobile Telephone and Internet) are the major communications in the municipality.

Municipality of Santa Fe

[562]Santa Fe has no existing landline telephone communication based on the province's CLUP. Currently, Santa Fe is being served by two private mobile communication companies namely Globe and Smart.

Municipality of Carranglan

[563]Carranglan's Postal Office, aided by the barangay officials, is the municipality's major communication service provider. Carranglan is also served by two private cell companies, Smart and Globe, providing cellular phone and internet services.

[564]The proposed project Is not expected to affect existing telecommunication and internet lines in the 3 municipalities.

Education

Direct Impact Barangays within Ancestral Domains

[565]For barangays located within ancestral domains, the results of the census conducted by the IPP Team were presented:

[566]**Education.** Most (28.5%) of the respondents from Region 2 and (23.73%) for Region 3, have attended elementary education. For secondary education, (21.3%) and (21.8%) were able to finish high school for Regions 2 and 3, respectively. It can be noted that (7.5%) and (7.10%) of the respondents in Regions 2 and 3 were able to finish college education, respectively.

Municipality of Aritao

[567]Based on the 2015 PSA Census, the literacy rate of Aritao is 98.81%, in which the male population has a 98.94% literacy rate while the female population has 98.66%.

[568]In terms of learning facilities, all the barangays have elementary schools which makes it easier for the pupils to avail complete primary education.

Table 2-93: Highest Educational Attainment of HH Heads in the Project Impact Area in Aritao

HIGHEST EDUCATIONAL ATTAINMENT	PERCENTAGE DISTRIBUTION				
	DIA		IIA		
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Sta. Clara*
Elementary	Refer to the discussion on Direct Impact Barangays within Ancestral Domains		**45.76%**	23.33%	31.48%
High School			38.98%	**43.33%**	**57.41%**
College			16.56%	26.67%	7.41%
Vocational			-	6.67%	3.70%
Others			-	-	-
Data not provided			1.69%	-	-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Municipality of Santa Fe

[569]Based on the 2015 PSA Census, the literacy rate of Santa Fe is 96.92%, in which the male population has a 97.72% literacy rate while the female population has 96.07%.

[570]In terms of learning facilities, there are 19 day care centers, 15 elementary schools, 4 secondary schools (3 public and 1 private), and 1 Alternative Learning System (ALS) in the municipality. Barangay Poblacion, with the lowest elementary enrollees, has been merged with Santa Fe Central School in Barangay Baliling. Currently, there are no tertiary schools located in Santa Fe. Students who wish to pursue college need to study in the nearby municipalities.

Table 2-94: Highest Educational Attainment of HH Heads in the Project Impact Area in Santa Fe

HIGHEST EDUCATIONAL ATTAINMENT	PERCENTAGE DISTRIBUTION	
	DIA	IIA
	Brgy. Canabuan	*Brgy. Poblacion*
Elementary	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	15.00%
High School		**56.67%**
College		13.33%
Vocational		6.67%
Others		5.00%
Data not provided		3.33%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.		

Municipality of Carranglan

[571]Based on the 2015 PSA Census, the literacy rate of Carranglan is 98.97%, in which the male population has a literacy rate of 99.03% while the female population has 98.89%.

[572]In terms of learning facilities, Carranglan has a total of 22 public elementary schools evenly distributed in the different barangays. Providing secondary education are 6 public schools and 1 private school. Currently, the municipality's tertiary level education is co-managed by LGU-Carranglan and Nueva Ecija University of Science and Technology (NEUST) located in Barangay Joson. The college operates as an extension service of NEUST.

Table 2-95: Highest Educational Attainment of HH Heads in the Project Impact Area in Carranglan

	PERCENTAGE DISTRIBUTION

HIGHEST EDUCATIONAL ATTAINMENT	DIA			IIA	
	Brgy. Burgos	*Brgy. Bunga*	*Brgy. Salazar*	*Brgy. R.A. Padilla*	*Brgy. San Agustin*
Elementary	36.02%	**48.84%**	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**80.00%**	**-**
High School	**52.49%**	38.76%		20.00%	30.00%
College	8.05%	8.14%		-	**68.33%**
Vocational	2.30%	3.10%		-	1.67%
Others	-	-		-	-
Data not provided	1.15%	1.16%		-	-
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

[573]The proposed project will not affect the learning facilities and educational activities of the school in the three municipalities.

[574]For barangays located within ancestral domains, the results of the census conducted by the IPP Team were presented:

[575]**Health.** Majority (89.84%) of the respondents had no responses when asked on the type of illness they or their household members has. There were IPs who experienced high blood, fever, mental illness, asthma, stroke, arthritis, diabetes, kidney failure, ulcer, and among others.

2.4.6 Threat to Public Health and Safety

Municipality of Aritao

[576]Acute Respiratory Infection (33.08%) is the leading cause of morbidity in Aritao in 2008.

[577]Pneumonia is the leading cause of mortality in the municipality in 2008 and followed by Hypertensive Vascular Disease as shown in **Table 2-96**. Cancer, renal failure, status asthmaticus, and accidents are also consistent in the top ten leading causes of mortality in Aritao.

[578]Based on the socio-economic and perception survey, fever and headache is the common diseases in Barangays Poblacion (45%) and Sta. Clara (53.70%).

Table 2-96: Top Ten Leading Causes of Morbidity in Aritao

CAUSES		ARITAO 2010	
		Rate/1000 Population	Total
1.	Acute Respiratory Infection	33.08	1,147
	Wounds/ Injuries All Type	12.31	427
	Skin Allergy	10.03	348
4.	Hypertension	8.76	304
	Urinary Tract Infection	7.52	261
6	Influenza	5.71	198
	Gastritis/ Hyper Acidity	5.27	183
	Diarrhea	4.38	152
	Tonsilitis	4.21	146
	Dog Bite/ Rabies	3.86	164
TOTAL		-	3330

SOURCE: MHO, Aritao CLUP, 2008

Table 2-97: Top Ten Leading Causes of Mortality in Aritao

CAUSES		ARITAO 2010	
		Rate/ 1000 Population	Total
1.	Pneumonia	1.32	46
2.	Hypertensive Vascular Disease	1.00	35
3.	Status Asthmaticus	0.28	10
4.	Cancer- all forms	0.46	16
5.	Accidents		-
	Vehicular	0.20	7
	Electrocution	0.02	1
	Stub Wound	0.02	1
6.	Renal Failure/ Kidney Disease	0.20	7
7.	Bleeding Peptic Ulcer	0.14	5
8.	Congestive Heart Failure	0.11	4
9.	Liver Cirrhosis	0.08	3
10.	Cardiomegaly	0.02	1
	TOTAL		

SOURCE: MHO/Hospital Records/ Local Civil Registrar, Aritao CLUP, 2008

Table 2-98: Common Diseases in Aritao

COMMON DISEASE	PERCENTAGE DISTRIBUTION				
	DIA		IIA		
	Brgy. Canabuan	*Brgy. Canarem*	*Brgy. Beti*	*Brgy. Poblacion*	*Brgy. Sta. Clara*
Fever and headache	Refer to the discussion on Direct Impact Barangays within Ancestral Domains		32.20%	**45.00%**	**53.70%**
Cough and colds			**64.41%**	36.67%	37.04%
Diarrhea			-	-	3.70%
Dengue, malaria			1.69%	-	-
Lung diseases			-	-	-
Heart diseases			-	-	3.70%
Others			-	15.00%	-
Data not provided			1.69%	3.33%	1.85%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

Municipality of Santa Fe

[579]Based on the socio-economic and perception survey, Cough and colds is the common disease in Barangay Poblacion (63.33%).

Table 2-99: Common Diseases in Santa Fe

COMMON DISEASE	PERCENTAGE DISTRIBUTION	
	Brgy. Canabuan	*Brgy. Poblacion*
Fever and headache	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	30.00%
Cough and colds		**63.33%**
Diarrhea		1.67%
Dengue, malaria		-
Lung diseases		1.67%
Heart diseases		1.67%
Others		-
Data not provided		1.67%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.		

Municipality of Carranglan

[580]Based on the socio-economic and perception survey, cough and colds is the common disease in Brgy. Burgos.

Table 2-100: Common Diseases in Carranglan

COMMON DISEASE	PERCENTAGE DISTRIBUTION				
	DIA			IIA	
	Brgy. Burgos	*Brgy. Bunga*	*Brgy. Salazar*	*Brgy. R.A. Padilla*	*Brgy. San Agustin*
Fever and headache	33.33%	41.86%	Refer to the discussion on Direct Impact Barangays within Ancestral Domains	**50.00%**	**50.00%**
Cough and colds	**52.87%**	**44.19%**		**50.00%**	23.33%
Diarrhea	8.05%	1.94%		-	16.67%
Dengue, malaria	-	-		-	-
Lung diseases	-	1.16%		-	-
Heart diseases	-	6.00%		-	-
Others	-	5.04%		-	-
Data not provided	5.75%	3.49%		-	10.00%
NOTE: Results are based on the socio-economic & perception survey conducted in November 2021.					

[581]**COVID-19 Pandemic Situation.** With the emergence of the COVID-19 pandemic in the year 2019, the following statistics were taken from the Department of Health (DOH) to examine the pandemic situation in the provinces of Nueva Vizcaya in Region 2 and Nueva Ecija in Region 3 as of 18th of August 2022.

Nueva Vizcaya

Total Cases **22,861**	Active Cases **343**	Recovered **21,895**	Died **623**
Facilities **10**		Bed Occupancy **32.70%** 275 Total	
Accessed from: https://doh.gov.ph/covid19tracker			

[582]The Province of Nueva Vizcaya's total cases from 2020 to 2022 is 22,861 with a 95.77% recovery rate. As of the reporting period, there were 343 active cases in the province of Nueva Vizcaya.

583It can be noted that there are 10 COVID-19 facilities in the province of Nueva Vizcaya equipped with a total of 24 ICU beds and 251 non-ICU beds.

Nueva Ecija

Total Cases **43,368**	Active Cases **691**	Recovered **41,624**	Died **1,053**
Facilities **33**		Bed Occupancy **12.4%** 517 Total	
Accessed from: https://doh.gov.ph/covid19tracker			

584Nueva Ecija's total cases of COVID-19 from 2020 to 2022 is 43,368 with a recovery rate of 95.98%. As of the reporting, there were 691 active cases in Nueva Ecija Province.

585It can be noted that there are 33 COVID-19 facilities in the province of Nueva Ecija equipped with a total of 43 ICU beds and 474 non-ICU beds.

586It is in the interest of **DPWH** that management measures for COVID-19 be followed during the construction and operations of the proposed project:

(a) Avoid physical interaction and maintain physical distancing requirements;
(b) Limit the capacity of common areas;
(c) Regular cleaning and disinfection particularly heavily trafficked areas and common areas;
(d) Promote good personal hygiene such as frequent hand washing with soap and water or alcohol gel;
(e) Provide appropriate personal protective equipment (PPE) such as face mask, face shield, etc.; and
(f) Monitoring of health status of workers and visitors before entering the site.
(g) **DPWH** will also adhere to the issuances from the Philippine Government's National Task Force Against COVID-19 (NTF) and Municipal ordinances and issuances regarding COVID-19 to prevent worsening the pandemic situation in Nueva Vizcaya and Nueva Ecija.

587**Public Safety.** Given the nature of the project, dust may cause negative health effects, especially in the respiratory system, to the community members and workers if not properly mitigated. **DPWH** will conduct medical missions and regular check-ups to its workers and the host barangay. In addition, there will be constant coordination with the Municipal Health Officer (MHO) and barangay health units to address health-related needs of the community.

588Crime incidence may also increase in the local community. With available money at hand, proliferation of vices that tends to undermine the morality of the people in the barangay is potentially expected. Videoke bars, clubs, gambling places, prostitution, and others can rise in due time when workers in the project site could be attracted to such offering and indulge in activities that may destroy family values.

589Further, drinking may result in the commission of crimes if not properly managed. It is anticipated therefore that social problems may arise as an aftermath of a fluid local economy. **DPWH** will regularly coordinate with the barangay officials to ensure peace and order among the workers and the community members. In addition to this, there will be minimal interaction

among the workers and the community members, as most of the time, the workers are in the project premises.

2.4.7 Generation of Local Benefits from the Project

590 **Alignment to Higher Level Plans.** The Philippine Development Plan 2017-2022 prepared by the National Economic and Development Authority (NEDA) is the highest-level National Development Plan in the Philippines. Accelerating infrastructure development is regarded as one of the key-issues in the said plan. To develop foundations for sustainable development, the following transport strategies are presented to implement strategic infrastructure programs and projects:

(a) Enhance efficiency of the transport sector through providing adequate, accessible, reliable, and safe access for people and goods.; and
(b) Improve road-based transport to address traffic congestion through "engineering, enforcement, and education", and upgrade the road network to the highest quality standards.

591 **Regional Development Plan.** Cagayan Valley's Regional Development Plan (RDP) 2017 - 2022 also aligns with the thrust of the country which endeavors to pursue development through Accelerating Infrastructure Development in the region.

(a) Anticipating the need for alternative land transport, Region II endorsed 4 major road projects for the improvement of inter- and intra-regional connectivity. (1) Cagayan Valley East Alternative Road Project; (2) Proposed Cagayan Valley Eastern Seaboard Highway; (3) Northeastern Luzon Expressway; and (4) Cagayan Valley Railway System will provide an alternative route to the Dalton Pass to ensure uninterrupted traffic flow between Cagayan Valley and the rest of Luzon.

592 Central Luzon's RDP 2017-2022 promotes internal access and inter-regional connectivity. The provision of a fast, safe, and efficient transportation system in the region is expected to encourage and accelerate the development of the region.

593 The construction of Dalton Pass East Alignment Road Project is consistent with those strategies in view of enhancement of connectivity between Regions II and III.

594 **Poverty Incidence.** The PSA defines poverty incidence as the proportion of families/individuals with per capita income/expenditure less than the per capita poverty threshold to the total number of families/individuals. From the 2021 First Semester Official Poverty Statistics, the value of poverty threshold in the Philippines was Php 14,498. According to PSA, the poverty incidence of Nueva Vizcaya is 17.2% while Nueva Ecija is 21.8%.

Commercial Establishments and Activities

Municipality of Aritao

595 Wholesale and Retail Trade is the most prominent and active economic activities in Aritao. The least economic activity is real estate renting and business activities.

Municipality of Santa Fe

[596]The municipality of Santa Fe has a total of 153 commercial establishments in 2015. Wholesale and retail trade has the greatest number of registered establishments while other community, social and personal service activities are the least in the municipality.

Municipality of Carranglan

[597]The Municipality of Carranglan has 141 registered establishments. Convenience store is the prominent economic activity in the municipality with 36 registered establishments while Videoke bars are the least at 2 registered establishment.

[598]In terms of generation of local benefits, the proposed project will generate positive impacts. The project will not adversely affect the employment, livelihood, and income of the residents; on the contrary, it may even provide income opportunities.

[599]The positive impacts of the project are the following:

(a) Generation of additional source of income and livelihood;
(b) Additional revenue for the local government;
(c) Increased access to basic social services;
(d) Ensure connectivity between Region II & III during disaster;
(e) Increase income due to potential tourism activities;
(f) Increase mobility and safety of motorists; and
(g) Enhance traffic flow.

[600]These benefits may be further enhanced through the implementation of social development programs responsive to local needs in the impact area.

[601]**Economic Structure.** The Department of Trade and Industry (DTI) provided the Cities & Municipalities Competitive Index (CMCI) local competitiveness adapted the framework developed by Michael Porter to define the competitiveness based on the idea of productivity. The criteria for assessing the competitiveness were: a) economic dynamism, b) government efficiency, c) infrastructure, and d) resiliency. Through these lenses, local competitiveness can be defined on how a city or municipality knows its resources and on how it uses the said resources to improve the standard of living in their area.

[602]**Figure 2-68** shows the competitiveness index of Aritao, Vizcaya compared to other 1st and 2nd class municipalities. The municipality ranked 307th among the 508 municipalities. Aritao obtained its highest rank in terms of resiliency. On the other hand, the municipality placed 406th in economic dynamism.

Figure 2-68: Competitive Index of Aritao, Nueva Vizcaya

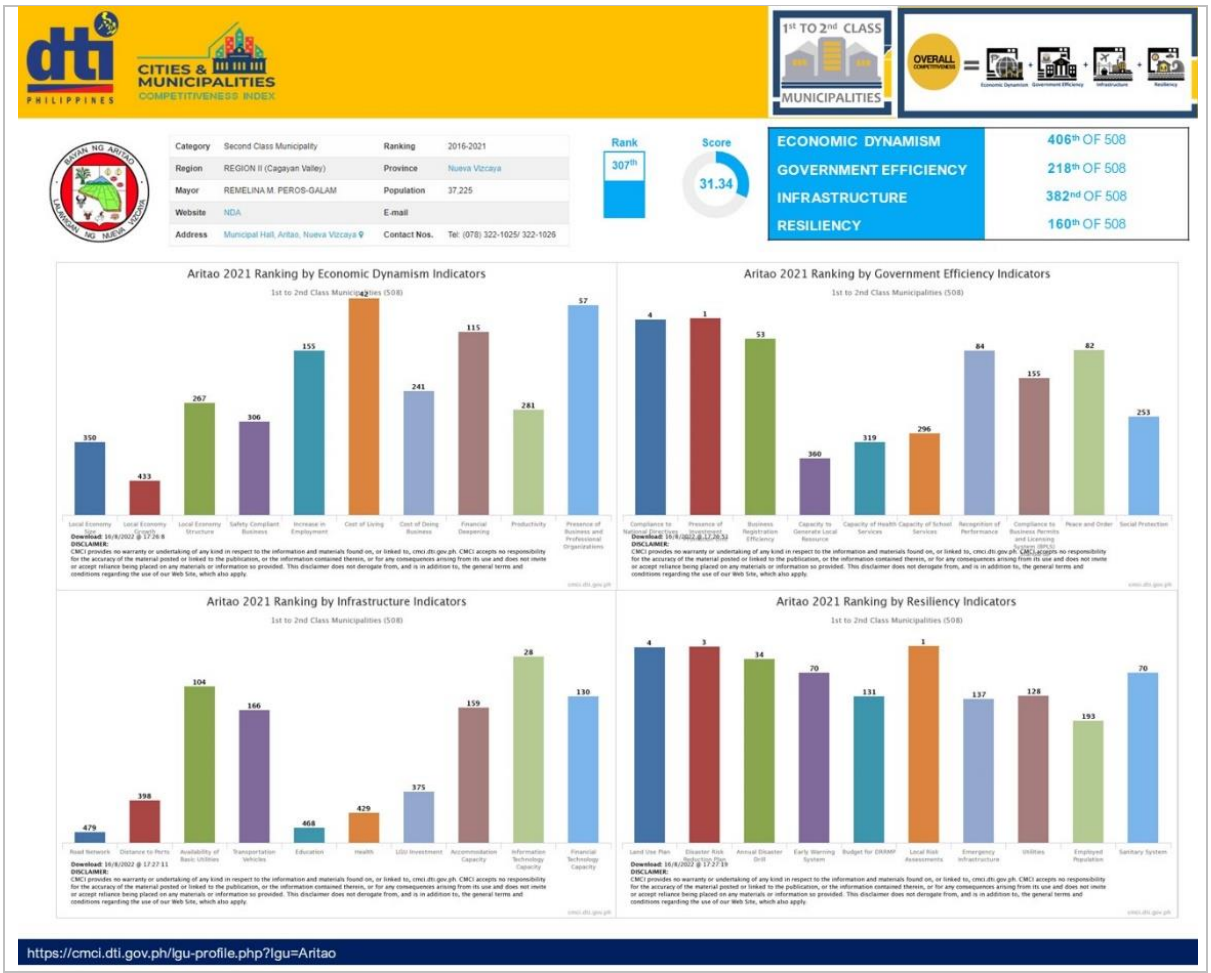


FIGURE TITLE:		
COMPETITIVE INDEX OF ARITAO, NUEVA VIZCAYA		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

[603]**Figure 2-69** shows the competitiveness index of Santa Fe, Nueva Vizcaya compared to other 3rd to 6th class municipalities. The municipality ranked 598th among the 649 municipalities. Santa Fe obtained its highest rank in terms of infrastructures. On the other hand, the municipality placed 615th in resiliency.

Figure 2-69: Competitive Index of Santa Fe, Nueva Vizcaya

FIGURE TITLE:

COMPETITIVE INDEX OF SANTA FE, NUEVA VIZCAYA

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Figure 2-70 presents the competitiveness index of Carranglan, Nueva Ecija compared to other 1st and 2nd class municipalities. The municipality ranked 401st among the 508 municipalities. Carranglan obtained its highest rank in terms of resiliency. On the other hand, the municipality placed 474th in economic dynamism.

Figure 2-70: Competitive Index of Carranglan, Nueva Ecija

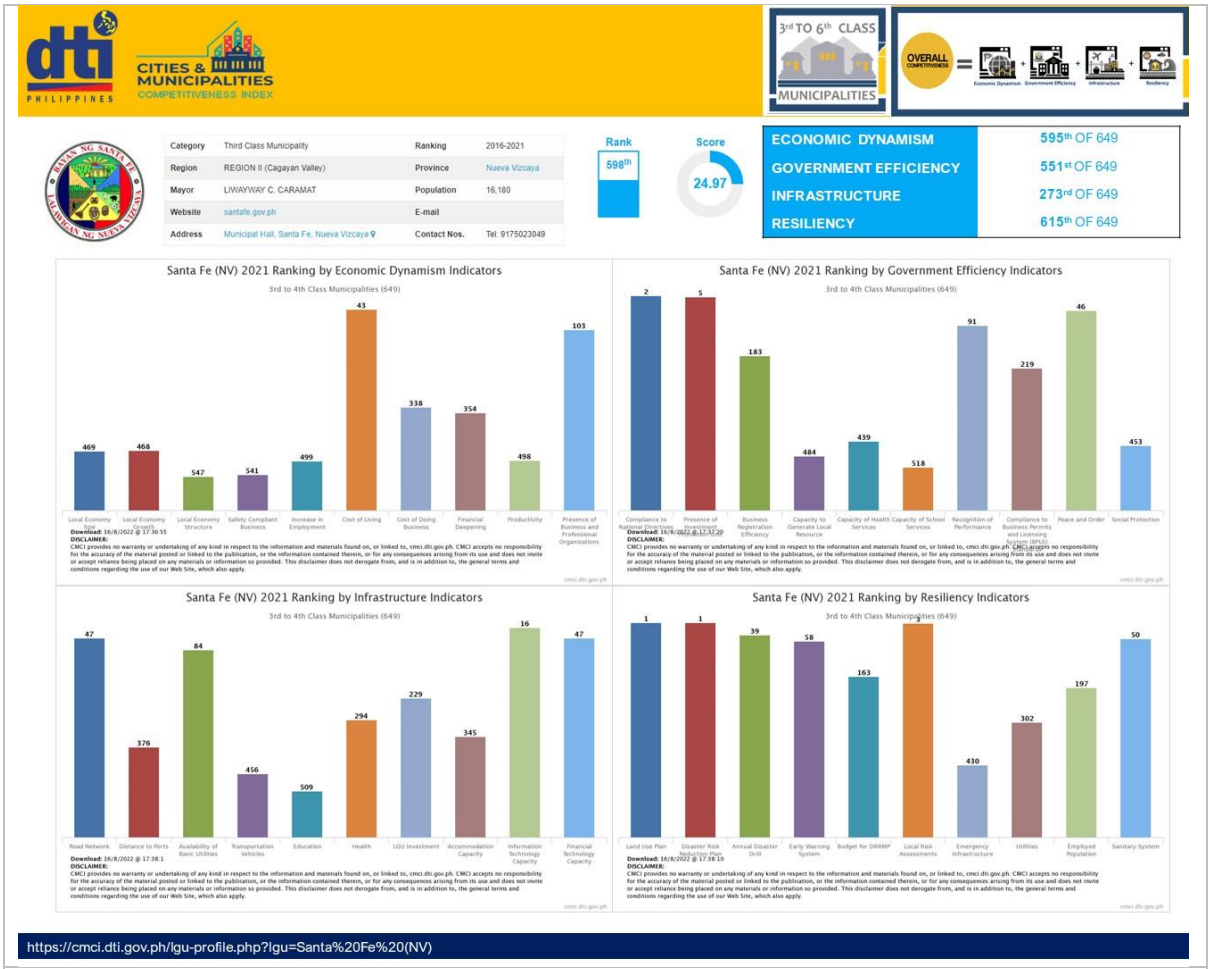


FIGURE TITLE:

COMPETITIVE INDEX OF CARRANGLAN, NUEVA ECIJA

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

2.4.8 Gender and Development and Children's Rights

[604]**Gender and Development.** The promotion of substantive equality between males and females and the elimination of all forms of discrimination are basic principles that are enshrined in the United Nations Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) as well as in the Universal Declaration of Human Rights (UDHR).

[605]The passage of the Magna Carta of Women in 2009 adheres with these principles as it mandates government agencies to "pursue the adoption of gender mainstreaming as a strategy to promote and fulfill women's human rights and eliminate gender discrimination in their systems, structures, policies, programs and processes."

[606]The Magna Carta aims to promote women's rights to representation and participation, including the creation of "temporary special measures to accelerate the participation and equitable representation in the decision-making and policy-making processes." It directs

appointing authorities to ensure the representation of women or women's groups in policymaking and decision-making bodies.

607In 2013, the Philippine Commission on Women (PCW), Department of the Interior and Local Government (DILG), Department of Budget and Management (DBM), and National Economic and Development Authority (NEDA) issued Joint Memorandum Circular No. 2013-01, which prescribes a set of guidelines on the localization of the Magna Carta of Women. It includes provisions on the creation and/or strengthening of the LGU GAD Focal Point System (GFPS) and prescribes the preparation of the annual and performance based LGU GAD Plan and Budget (GPB). The GFPS is an interacting and interdependent group of people in all government instrumentalities tasked to catalyze and accelerate gender mainstreaming. It is a mechanism established to ensure and advocate for, guide, coordinate, and monitor the development, implementation, review and updating of their GAD plans and GAD-related programs, projects, and activities (PPAs).

608**DPWH** and its contractors shall adhere to this policy by ensuring active participation and involvement of women in consultations, support the women on their economic activities and in project development. This will be done in coordination and in line with the affected LGUs GAD policies**.**

609A GAD Plan is being prepared for the proposed project.

610**Women and Children's Rights.** Republic Act No. 9262 otherwise known as "The Anti-Violence Against Women and Their Children Act of 2004" states that the Philippines values the dignity of women and children and guarantees full respect for human rights. Further, there is a need to protect the family and its members, particularly women and children, from violence and threats for their personal safety and security.

611This is also in-line with the fundamental freedoms guaranteed under the Philippine Constitution and the UDHR and as enshrined by the CEDAW.

612As a National Government Agency, **DPWH** and its contractors shall adhere with provisions stipulated in RA 9262.

2.4.9 Traffic Congestion

Transportation and Road Network

Municipality of Aritao

613The total length of the road network in Aritao is 308.516 kilometers, which consists of 40.80 km) of National Road, 30.3009 km of Provincial Road, 14.3456 km of Municipal Road, and 223.07 km pf Barangay Road.

614The Public Utility Vehicles (PUVs) such as buses, jeepneys and tricycles are the options for transportation in the municipality. Parking facilities or terminals were provided and located at strategic places to cater the demand.

Municipality of Santa Fe

615Santa Fe has a total of 86.3 kilometers of road network, which consists of 18.4 km of National Road, 19.8 km of Provincial Road, 7.7 km of Barangay Road, and 40.4 km Municipal Road.

[616]The transportation system in the municipality is by land. Public utility vehicles such as buses, mini-buses and jeepneys, trucks and cars pass through the Poblacion through the major road artery of the municipality.

[617]The access to transport services for inter-barangay travel is limited. Only 9 out of 16 barangays in Santa Fe have direct transport services. People living in the remaining barangays must walk an average of 3.5 kilometers or travel by motorcycle to make it to the nearest point where public utility vehicles are accessible.

Municipality of Carranglan

[618]Carranglan has a total road network of 201.2876 kilometers distributed to 43.8095 km of National Road, 34.5377 km of Provincial Road, 113.2257 km of Barangay Road, and 9.7147 km of Municipal Road.

[619]Public Utility Vehicle (PUJ) and Motorized Tricycles are the 2 modes of intra- and inter-municipality/city public transportation in Carranglan.

[620]Traffic may also increase in the municipalities due to delivery trucks coming in and out of the project alignment. Traffic congestion would be mitigated with the support of the surrounding Local Government Units (LGUs) in terms of scheduling and managing the flow of traffic near the project area.

[621]To mitigate the said impact, **DPWH** commits to develop a traffic management plan with the LGUs of Aritao, Santa Fe and Carranglan. The following measures shall be included in the plan:

(a) Coordination with the LGUs of Aritao, Santa Fe and Carranglan;
(b) Lane designation and speed limit;
(c) Regulation of truck deployment;
(d) Provision of safety barriers, warning signs and lights, traffic marshals within the vicinity of project sites, and adequate parking spaces;
(e) All deliveries of construction materials and heavy equipment, either inbound or outbound of the facility may be done during off-peak hours and at designated delivery hubs located near the Project area to prevent blockage of traffic flow along public roads; and
(f) Assistance of security personnel in directing traffic of vehicles coming in and out of the facility.

2.4.10 Socio-Economic and Perception Survey

[622]**Methodology.** A purposive socio-economic and perception survey was employed to profile the host and adjacent communities of the proposed project.

[623]For direct impact areas (DIA) outside the ADs, the number of households covered was based on the 95% confidence level and 5% margin of error. For the indirect impact areas (IIA), the socio-economic and perception survey obtained the number of respondents based on 90% confidence level and 10% margin of error.

[624]The details of the employed socio-economic and perception survey were presented in **Table 2-101**.

Table 2-101: Details of the Socio-Economic and Perception Survey

BARANGAY	DIA/IIA	NO. OF RESPONDENTS
ARITAO, NUEVA VIZCAYA		
Barangay Beti	IIA	59
Barangay Canabuan*	DIA	-
Barangay Canarem*	DIA	-
Barangay Poblacion	IIA	60
Barangay Santa Clara	IIA	54
Sub-total	-	***173***
SANTA FE, NUEVA VIZCAYA		
Barangay Canabuan*	DIA	-
Barangay Poblacion	IIA	60
Sub-total	-	***60***
CARRANGLAN, NUEVA ECIJA		
Barangay Bunga	IIA	258
Barangay Burgos	DI	261
Barangay R.A. Padilla	IIA	60
Barangay Salazar*	DIA	-
Barangay San Agustin	IIA	60
Sub-total	-	***639***
TOTAL		***872***
NOTE: DIA- Direct Impact Area; IIA- Indirect Impact Area; *-Within IP Communities		

[625]A census (100%) survey was conducted as part of the preparation of the IPP of Kalanguya Ikalahan and Kalanguya ICCs within the project alignment. The total households covered for Region II was 267 while the total households covered for Region III was 729. The total households covered for the census was 996. The results and discussions were presented in the previous sections.

Results and Discussion for the Direct Impact Area (Non-IP Communities)

- **Profile of the Respondents**

[626]**Relationship to Household Heads.** Majority of the respondents from the 2 surveyed barangays are household heads (54.14%).

[627]**Gender.** Majority of the respondents from the 2 surveyed barangays are males (64.71%).

[628]**Religion.** Six out of ten respondents are Roman Catholics.

[629]**Education.** Majority (48.84%) of the respondents from Brgy. Bunga were able to attend or complete elementary education, whereas most (52.49%) of the respondents from Brgy. Burgos were able to attend or complete secondary or high school education.

[630]**Household Source of Income.** Majority (ave. 67.05%) of the households across the two surveyed barangays relies on farming as their primary source of income.

[631]**Estimated Monthly Household Income.** Majority of the respondents across the two (2) surveyed barangays claimed that their household were earning less than or equal to Php 5,000.00.

[632]**Place of Origin.** Majority (89.20%) of the respondents across the two (2) surveyed barangays were originally from the Municipality of Carranglan.

- **Project Awareness and Perception**

633**Awareness of the Proposed Project.** An average of 71.69% of the respondents from the two (2) direct impact barangays are aware of the project, whereas 25.62% were not.

634**Source of Information.** Majority (ave. 82.42%) of the respondents from Brgys. Bunga and Burgos learned the project from their respective barangay/municipal officials.

635**General Perception of the Proposed Project.** The project will be beneficial to their community according to about 85.27% of respondents from Brgy. Bunga, and no one disagreed. There were just 1.5% of respondents who were unsure of the proposed project. For Brgy. Burgos, more than half of the respondents believed that the project will benefit their community, while 1.15% said otherwise. About 45.69% of the respondents were unsure about whether the proposed project will be beneficial or detrimental to their communities.

636**Perceived Positive Effects of the Proposed Project.** For both direct impact barangays, an average of 70.92% of the respondents stated that the proposed project will increase employment opportunities. This was followed by respondents who believed the project will cause an increase of businesses and economic activities in their respective communities (49.33%), increase in local and municipal tax revenues (30.40%), and provide additional projects for their respective barangays (29.90%).

637**Perceived Negative Effects of the Proposed Project.** For both direct impact barangays, an average of 85.14% of the total respondents said that the proposed project will certainly produce noise pollution. This was followed by respondents who believed the project would result in noise pollution (71.67%), additional garbage (12.53%), land pollution (11.17%), and water pollution (10.21%).

Results and Discussion for the Indirect Impact Area

- **Profile of the Respondents**

638**Relationship to Household Heads.** Majority of the respondents from the 5 adjacent barangays are household heads (46.39%).

639**Gender**. Majority of the respondents from the 5 adjacent barangays are males (49.38%)

640**Religion**. Majority of the respondents from the 5 adjacent barangays are Roman Catholics (83.47%).

641**Education**. Four (4) out of ten (10) respondents were able to attend or complete secondary or high school education.

642**Household Source of Income**. Majority of the households in Barangays Beti and Santa Clara (Aritao), and R.A. Padilla (Carranglan) depends on farming as main source of income. While in Barangays Poblacion (Aritao) and Poblacion (Santa Fe), most of the households obtain their income from being a laborer or contractor. The primary source of income for most households in Barangay San Agustin (Carranglan) is driving jeepneys or tricycles.

643**Estimated Monthly Household Income**. Majority of the respondents across the 5 adjacent barangays said that their household were earning less than or equal to Php 5,000.00.

644 **Place of Origin**. Eight (8) out of ten (10) respondents from Barangays Beti, Poblacion (A), and Santa Clara were originally from the Municipality of Aritao. Eighty-five percent of the respondents from Barangay Poblacion (SF) were from the Municipality of Santa Fe. While about 84% of the respondents from Barangays R.A. Padilla and San Agustin were originally from the Municipality of Carranglan.

- **Project Awareness and Perception**

645 **Awareness of the Proposed Project**. About 66.61% of the respondents from the secondary impact barangays in Aritao are unaware of the proposed project, only 31.59% were aware. For Barangay Poblacion in Santa Fe, 91.67% of the respondents are unaware of the proposed project and the remaining respondents did not provide their answer. For the barangays in Carrangalan, 98.33% of the respondents from Brgy. R.A. Padilla are aware of the proposed project, however none of the respondents from Brgy. San Agustin are aware of the project.

646 **Source of Information**. From those respondents who answered that they were aware of the proposed project, most (ave. 38.94%) of the respondents from the 5 adjacent barangays learned about the said project from their respective Municipal/ Barangay Officials. Other information sources were from the project proponent (ave. 28.63%) and meetings about the proposed project (ave. 7.10%).

647 **General Perception of the Proposed Project**. An average of 38.98% of the total respondents across the 5 adjacent barangays believed that the proposed project would benefit them and their local communities. Only 8.39% of the total respondents said otherwise. While 40.39% of the respondents were still undecided about whether the proposed project will be beneficial or detrimental to their communities.

648 **Perceived Positive Effects of the Proposed Project**. In the 5 adjacent barangays, 54.14% of the respondents stated that the proposed project will increase employment opportunities. This was followed by respondents who believed the project would result in additional projects for their respective barangays (33.90%), opening of businesses and economic activities in their respective communities (28.05%), and increase in local and municipal tax revenues (26.21%).

649 **Perceived Negative Effects of the Proposed Project**. Across the 5 adjacent barangays, 43.41% of the respondents stated that the proposed project will certainly produce noise pollution. This was followed by respondents who believed the project would result in air pollution (26.93%), additional garbage (25.31%), and land pollution (21.76%).

650 The **DPWH** shall provide continuous information and communication (IEC) campaign through various channels and platforms to its host and neighboring communities to increase awareness, provide legitimate information, and garner further positive perception to the proposed project. Further, **DPWH** shall continue to maintain good community relations through its Community Relations Office (COMREL) and ensure that project-related grievances would be addressed promptly and properly.

Figure 2-71: Profile of the Respondents

|Results of the Socio-Economic and Perception Survey

Profile of the Respondents

Barangay	Rel. to HH Head	Gender	Civil Status	Religion	Education	HH Source of Income	Est. Monthly HH Income	Place of Origin
Bunga, Carranglan	53.49%	59.30%	84.50%	60.47%	48.84%	66.67%	67.43%	87.21%
	HH Head	Male	Married	Roman Catholic	Elementary	Farmer	5,000 PHP or below	Municipality of Carranglan, N.E.
Burgos, Carranglan	54.79%	70.11%	64.37%	54.02%	52.49%	87.60%	37.93%	91.57%
	HH Head	Male	Married	Roman Catholic	High School	Farmer	5,000 PHP or below	Municipality of Carranglan, N.E.

Barangay	Rel. to HH Head	Gender	Civil Status	Religion	Education	HH Source of Income	Est. Monthly HH Income	Place of Origin
Beti, Aritao	54.24%	74.58%	77.97%	83.05%	45.76%	45.76%	67.80%	93.22%
	HH Head	Female	Married	Roman Catholic	Elementary	Farmer	5,000 PHP or below	Municipality of Aritao, N.V.
Poblacion, Aritao	66.67%	86.67%	83.33%	86.67%	43.33%	26.67%	66.67%	51.67%
	Spouse	Female	Married	Roman Catholic	High School	Laborer/ Contractor	5,000 PHP or below	Municipality of Aritao, N.V.
Santa Clara, Aritao	77.78%	85.19%	79.63%	77.78%	57.41	70.37%	81.48%	85.19%
	Spouse	Female	Married	Roman Catholic	High School	Farmer	5,000 PHP or below	Municipality of Aritao, N.V.
Poblacion, Santa Fe	65%	70%	63.33%	70%	56.67%	43.33%	80%	85%
	HH Head	Male	Married	Roman Catholic	High School	Laborer/ Contractor	5,000 PHP or below	Municipality of Santa Fe, N.V.
R.A. Padilla, Carranglan	45%	91.67%	81.67%	83.33%	80%	35%	90%	80%
	Spouse	Male	Married	Roman Catholic	Elementary	Farmer	5,000 PHP or below	Municipality of Carranglan, N.E.
San Agustin, Carranglan	95%	95%	83.33%	95%	68.33%	56.67%	65%	86.67%
	HH Head	Male	Married	Roman Catholic	College	Tricycle/ Jeepney Driver	5,000 PHP or below	Municipality of Carranglan, N.E.

FIGURE TITLE:		
PROFILE OF THE RESPONDENTS		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Figure 2-72: Results of the Perception Survey (DIA)

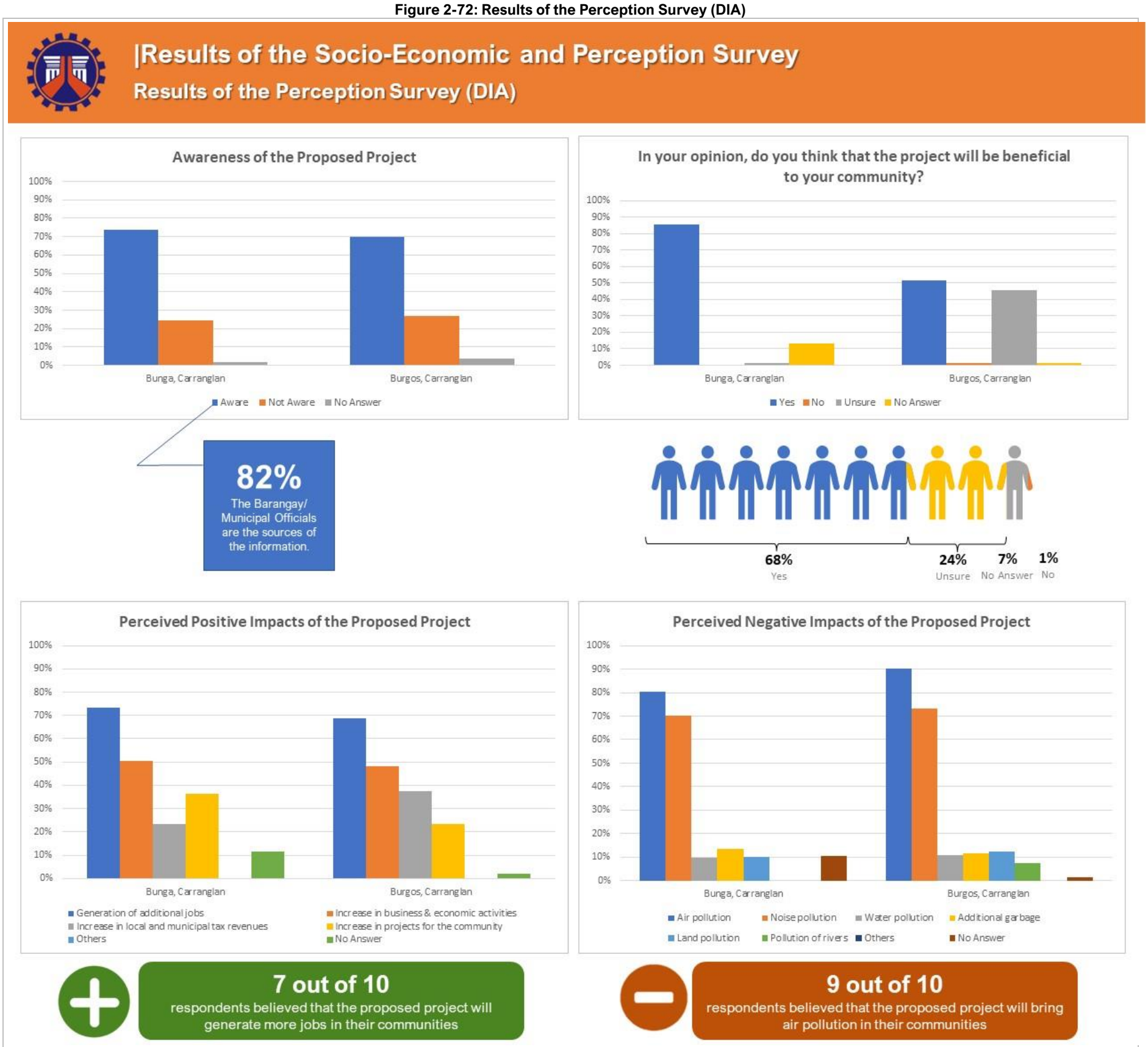


FIGURE TITLE:

RESULTS OF THE PERCEPTION SURVEY (DIA)

PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Figure 2-73: Results of the Perception Survey (IIA)

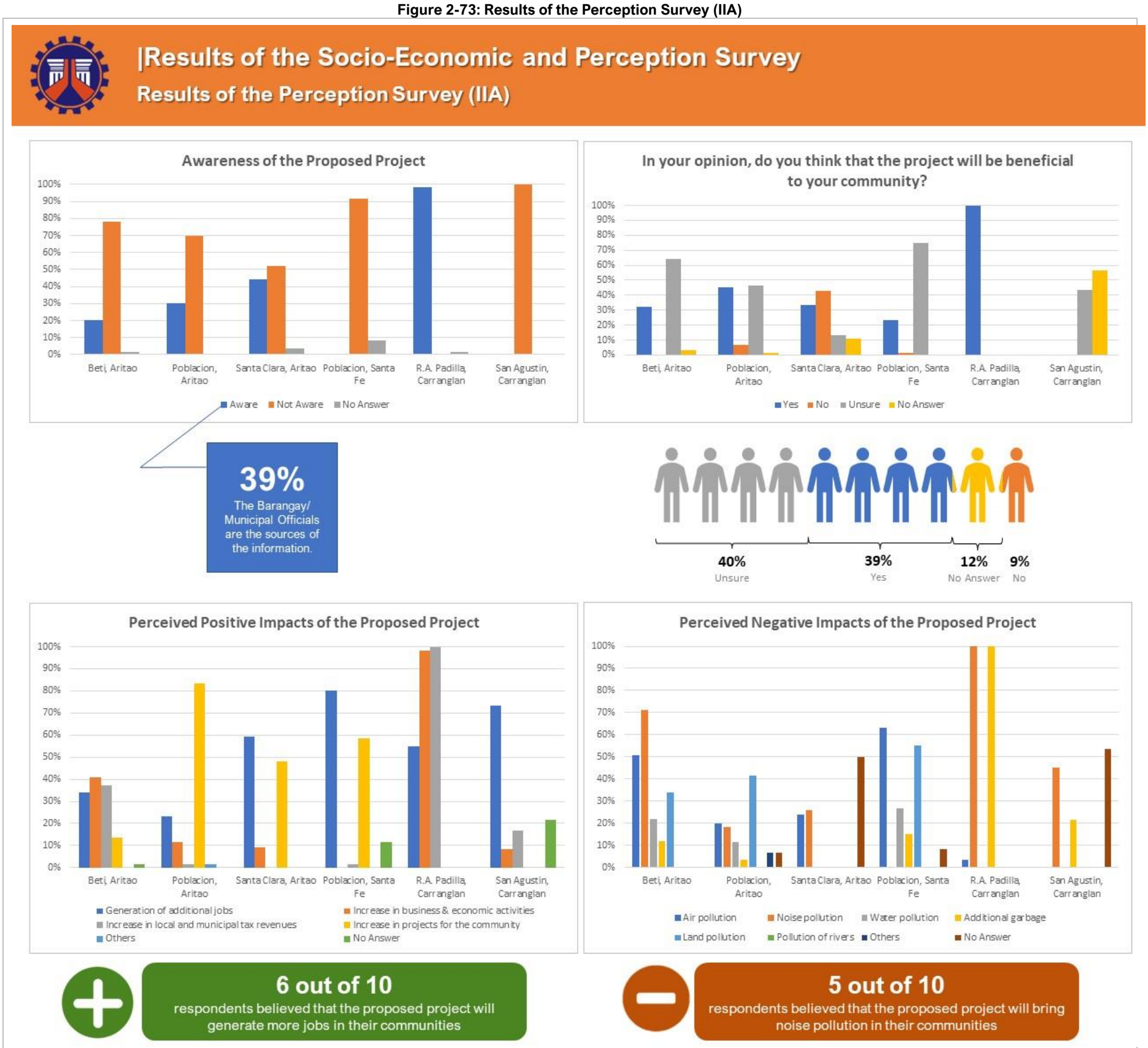


FIGURE TITLE:		
RESULTS OF THE PERCEPTION SURVEY (IIA)		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

2.4.11 Summary of Baseline Findings, Impacts and Mitigation on People

[651]The following table lists the impacts and mitigation on People.

Table 2-102 Summary of Significant Baseline Findings and Potential Impacts and Mitigation on People

SUMMARY OF BASELINE FINDINGS ON PEOPLE:

- Based on 2020 PSA Census, Aritao has a total population of 42,197; Santa Fe has a total population of 18,276; and Carranglan has a total population of 42,420.
- The proposed project is within the Kalanguya Ikalahan and Kalanguya ADs. An Indigenous Peoples Plan (IPP) is currently being prepared by DPWH for the said ICCs/ADs.
- Right-of-Way Acquisition Plan (RAP) will be implemented for identified PAFs and ICCs located within the proposed project alignment and RRoW.
- Electricity in the project area is supplied by NUVELCO (Aritao and Santa Fe) and NEECO-II (Carranglan).
- Water supply is provided by LGUs (Level II & III) and BLGUs (Level II) in the municipalities of Aritao, Santa Fe, and Carranglan.
- There are no water rights permit holders (surface and groundwater) near the project alignment.
- In terms of COVID-19 situation, there were a total of 22,861 cases in Nueva Vizcaya and 43,368 cases in Nueva Ecija.
- Half of the respondents from the direct and indirect impact areas were aware of the proposed project. Most of them knew about the proposed project from municipal and barangay officials.
- Around (58.59%) of the respondents perceived that the proposed project is beneficial. Only (4.58%) of the respondents mentioned that the project is detrimental.
- Increase in job, business, and economic activities were the most cited benefits that the proposed project will bring.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURE
Displacement of settlers	Pre-Construction	Resettlement will be implemented for identified PAFs and ICCs located within the project alignment and RRoW	Preparation and Implementation of Right-of-Way Acquisition Plan (RAP) for PAFs and ICCs Coordination with the MRIC Coordination with concerned LGUs
In-migration	Pre-construction Construction	The project requires 2,000 manpower for construction and 25 for operation	Prioritization of hiring qualified local workers
Cultural/Lifestyle Change	Construction Operation	The sections of the project are within the Kalanguya Ikalahan and Kalanguya ADs. Impacts of the project to the ICCs will be covered in the Indigenous Peoples Plan (IPP) that is currently being prepared Increase in income can introduce and expose workers and community to vices that tend to undermine morality	Preparation and Implementation of IPP Coordination with barangay LGUs and PNP to enforce law to avoid vice-related problems in the community Strict implementation of a drug- and alcohol-free work environment

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURE
Threat to Delivery of Basic Services/ Resource Competition	Construction Operation	The project will have minimal effect in terms of resource competition with nearby households Project's water requirement will be sourced to nearby river during construction Water during operation will be for domestic and maintenance use only The project will be served by local power utilities to power the structures and utilities to be constructed within the project site	N/A
Threat to Public Health and Safety	Construction Operation	Since most activities in the construction phase is short-term, the proposed project will have minimal threat to public health and safety Crime incidence may also increase in the local community during construction and operations phase	Conduct of regular check-ups for workers and nearby community members Coordination with Municipal Health Officers (MHOs) and barangay health units to address health-related needs of the community Coordination with barangay officials to ensure peace and order among workers and community members
Generation of Local Benefits from the Project	Construction Operation	Generation of additional source of income and livelihood Alleviation of worsening traffic situation Increased basic social services Maintain connectivity between Regions II and III during disasters Increased tourism potential for economic gains	Implementation of social development programs that are responsive to local needs in the impact areas
Traffic Congestion	Construction Operation	Increase in traffic congestion during construction and operations	Coordination with LGUs on scheduling and handling the flow of traffic near the project site

SECTION 3

ENVIRONMENTAL MANAGEMENT PLAN

3.1 IMPACTS DURING CONSTRUCTION PHASE

3.1.1 Land

[652]**Generation of Solid Waste.** Accumulation of solid waste, especially of construction debris, is a concern during project construction but can be addressed with the implementation of an effective solid waste management program formulated prior to the construction phase.

[653]Demolition wastes such as aggregate, concrete, wood, paper, and glass will be generation during the site preparation within the project alignment.

[654]Construction wastes such as fill materials, empty cement bags, wood, steel, and other construction spoils are expected to be generated during the construction of the proposed project.

[655]Aside from this, the construction workers will be generating domestic solid wastes. A solid waste management plan shall be developed and implemented by the contractors with the supervision of **DPWH**. A temporary storage area for the solid wastes will be provided on site. All the solid wastes prior to hauling out will be segregated properly.

[656]Solid wastes must be disposed in a duly designated disposal site. An information, education, and communication (IEC) campaign on proper solid waste management shall also be conducted for the personnel.

[657]**Generation of Hazardous Waste.** Hazardous wastes such as used oil, grease, aerosols, paint containers and used bulbs will also be potentially generated during the construction. Hazardous wastes must be managed and disposed in accordance with RA 6969. A temporary hazardous waste storage area will also be provided in the construction site. All hazardous wastes will be properly sealed to ensure that there will be no leakage in the environment. Only DENR-accredited waste service providers must collect the hazardous wastes in the project site.

[658]**Soil Erosion.** Construction of the project components and auxiliary structures and the tunneling activities will require significant amount of soil to be displaced, which may cause soil erosion. To minimize soil erosion, grading and leveling may be restricted to exact locations where earth moving is necessary. Furthermore, to prevent erosion hazard at the onset of rain, it is advised to pile the bulk of excavated soil on low-lying areas and to construct barriers, such as batter boards, that avert soil movement.

[659]During rain, soil may be carried and deposited by stormwater to nearby drains and may cause siltation. Siltation will reduce the drainage capacity and may lead to flooding of nearby areas. Mitigation measures must be undertaken to avoid this impact.

[660]A designated interim storage area in the construction site must also be provided. Excavated soil must be regularly transported to the disposal site approved by the MET/ICCs.

[661]**Soil Contamination.** Since heavy equipment will be used during construction, there is a risk of soil contamination due to possible oil leaks/spills during maintenance and operating activities of the heavy equipment. It is advisable to use sawdust, rice hulls, or coir dusts to absorb accidental oil spills.

[662]The proposed project will also include demolition of structures in the proposed site of the intake facility. This activity will generate solid wastes and construction debris that may contaminate the soil. The excavated soil may also contain hazardous substances (i.e., heavy metals) that may cause soil contamination within the disposal site.

[663]**Change in Geomorphology.** The proposed project is expected to cause changes in sub-surface geology or underground conditions in the impact areas, due to the tunneling component of the proposed project.

[664]**Disturbance in Terrestrial Flora Ecology.** Vegetation clearing may lead to wildlife displacement and the reduction of their foraging areas. Numerous plants are observed in both stations that can be sources of food and shelter for birds, mammals, reptiles, and amphibians. Because of the importance of the remaining vegetation in the area, it is recommended that construction of the construction barracks be established in the more build-up area of the project site so no additional vegetated areas will be cleared.

[665]To avoid or minimize the siltation of the nearby body of water during construction, silt traps and erosion barriers will be installed around the site. Wastewater that will be generated during the excavation activities and the surface run-off will also be treated in the sedimentation pond that will be provided onsite. The suspended solids in the wastewater and run-off will settle in the pond prior to discharge.

[666]**Disturbance in Terrestrial Fauna Ecology.** The construction of the proposed project will involve excavation of existing soils, clearing of existing vegetation, accumulation of dust particles, soil erosion, and possible generation of solid and liquid wastes from the equipment and working personnel. These activities may threaten the existing population of wildlife animals within the project site.

[667]Terrestrial fauna will be greatly affected during the construction phase. Excavation of soil in both proposed stations may result to dust emission that may result to respiratory impairment in wildlife animals and may result to death. These animals include the resident and migratory birds. In addition, excavation may include the use of excavating equipment and large vehicles that may generate dust emissions, smoke, and noise in the project sites.

3.1.2 Water

[668]**Surface Water Pollution.** The generated demolition wastes, construction wastes and domestic solid wastes during the construction phase may cause pollution to the nearby water bodies if not properly managed.

[669]The proposed project will entail excavation activities, surface run-off from these areas may affect the TSS in the Carranglan (Wahig) and Marang rivers, creeks, and tributaries. To mitigate this concern, mitigation measures such as sediment traps and erosion barriers shall be installed prior to any construction activities.

[670]Since heavy equipment will also be used, another concern during the construction is accidental oil spills. An oil spill management plan must be in place.

[671]Domestic wastewater will also be generated by the construction workers. Wastewater, if untreated prior to disposal, can cause water pollution and may pose health hazards to the nearby communities. Temporary sanitation facilities (e.g., toilet, bathing facilities) to be provided by the Contractor at the construction site shall be regularly maintained by assigned construction workers or hired service crew.

[672]**Groundwater Pollution.** Groundwater quality within the project areas might be affected by the construction activities due to accidental oil spills from the use of heavy equipment during construction phase. Another aspect that may affect groundwater quality is the influx of workers in the area. Groundwater quality may be affected due to the discharge of domestic wastewater from the workers.

[673]The tunneling activities may, but are not expected to, contaminate the groundwater sources along the proposed tunnel alignment.

[674]**Disturbance in Freshwater Ecology.** Erosion of unconsolidated sediments during construction is detrimental to soft bottom animals. Erosion can bury soft-bottom animals such as gastropods, bivalves, and crabs, and clog their breathing and feeding apparatus, which may lead to localized mortality. This could change the distribution and frequency of soft-bottom animals and alter the composition of their community structure. One indirect effect of siltation or sedimentation is alteration of habitat quality, particularly the substrate composition which may decrease the potential number of infaunal prey (thrive in- between sediments). However, mobile soft-bottom animals are known to respond behaviorally to siltation through avoidance and emigration to other areas with suitable substrate. Hence, this impact may be localized, minimal and temporary since it is plausible that these animals may migrate back to these areas after the installation of the inlet and outlet structures.

[675]Erosion of sediment and silt can increase water turbidity and significantly decrease light penetration, thereby reducing the quantity of light available for phytoplankton, which they need for photosynthesis. This could potentially decrease their photosynthetic activity and overall primary productivity. As a consequence, zooplankton which would primarily graze/ prey on phytoplankton will also decrease in abundance. In addition, sediments ending up as run-off in nearby surface water areas may contain nutrients which can potentially lead to eutrophication and alter composition of phytoplankton and zooplankton communities.

3.1.3 Air Quality, Noise and Vibration

[676]**Dust Emissions.** Excavation activities will generate dust especially during dry season. Dust can cause nuisance, reduction of visibility and may cause respiratory diseases. Periodic watering and sprinkling of soil piles and of dirt roads being passed by delivery trucks and equipment must be done to lessen re-suspension of dust particles. If water is scarce, alternative soil covering, such as tarpaulin, may be utilized. Furthermore, excavated soil materials must be promptly transferred to and compacted in the designated area.

[677]Wash areas inside the project site will also be provided for the trucks and other equipment before leaving the construction site to avoid the spreading of dust and dirt along the road.

[678]**Gaseous Emissions.** Aside from dust, gaseous emissions from heavy equipment and generators used in the construction site will produce short-term impacts on the ambient air quality. An increased concentration of carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2) may be realized in the ambient air. This impact may not be a primary concern since the construction activities will only be temporary. Nevertheless, heavy

equipment must be kept in prime condition at standard air and fuel ratio in order to limit gaseous emissions, particularly total suspended particulates (TSP). Diesel fuel products emit TSP, SO_2 and nitrogen oxides (NO_x) due to the hydrocarbon and sulfur content. If possible, all heavy equipment shall be fitted with exhaust mufflers.

679 **Noise and Vibration.** Noise and ground vibration may also be generated by construction operations and equipment. Although construction works are expected to occur regularly, these impacts may be considered temporary.

680 Only a few structures may be affected by vibration, it is the people's interest that is of concern. To minimize vibrations, machines should be mounted on shock-absorbing mountings, such as cork or reinforced concrete foundation or a floating isolated foundation set on piles, depending on the machinery. Reduction of working hours and/or introduction of short breaks during working days may also lessen the consequences of vibrations. The vibration may affect habitats of animals, and some animals may show evasive actions from vibration sources. However, negative impacts of vibration are temporary, and their habitats will recover after the vibration.

681 Mitigating measures that can be employed to reduce the impact of noise are: 1) proper maintenance of motor engines and other mechanical parts of heavy equipment; 2) installation of exhaust mufflers to the equipment; and 3) putting up of enclosures at the construction site. As much as possible, construction activities shall be concentrated during normal working hours, particularly at sites near built-up areas.

3.1.4 People

682 **Involuntary Resettlement.** Displacement of settlers is expected to result from the project since there are households within the 60 m road-right-of-way (RRoW). As of reporting period, the proposed project is currently preparing the Right-of-Way Acquisition Plan (RAP) to determine the project-affected families (PAFs) and ascertain the appropriate entitlements (mitigating measures) of the involuntary resettlement.

683 **Traffic Congestion.** The delivery of construction equipment, crossing of heavy vehicles and delivery trucks and the transportation of the excavated materials will affect the traffic condition of the project sites.

684 The public must be given early notice by the contractor for them to be informed. Safety barriers, warning signs and lights must also be installed in the area and adequate parking spaces must be allotted for the trucks to avoid side parking. All deliveries of materials and equipment must be done during off-peak hours at designated delivery hubs to avoid blockage of traffic flow along the public roads. In the instance where roads are starting to deteriorate, the Contractor should immediately provide fillings to the potholes created by hauling trucks and other heavy equipment. Excavated materials shall be placed in a suitable location that will not cause severe disruption to road traffic.

685 **Peace and Order.** Presence of outsiders (i.e., migrant workers) can bring about difference in views and perspectives and new influence changing attitudes and bias, most especially to the Kalanguya Ikalahan and Kalanguya Indigenous Cultural Communities (ICCs). Peace and order may be upheld through strict law enforcement, regular patrolling, and apprehension of erring individuals.

[686]**Health and Safety.** Construction may pose danger to vehicles, equipment, and even people. Accidents can be prevented through the installation of enclosures, early warning devices, and other protective means within and around the working area. The Contractor will be required to submit an Occupational Safety and Health Plan (OSHP), based on the Department of Labor and Employment (DOLE) DO No. 13 Series of 1998, that covers the safety of the workers and the community.

[687]Potential health and safety risks may also arise from dust, pollutants, noise and vibration to be generated from construction activities. Workers, particularly those operating heavy equipment, must be provided with personal protective equipment (PPE), such as earmuffs, gloves, boots, and helmets. The Contractor is also required to have an infirmary.

[688]**Local Economy.** The project is expected to have a positive impact on the local economy of the host community with an increase in business opportunities, such as food retail, housing rental, and other services to the construction workers. This is in addition to the employment opportunities that will be available to the local workforce.

3.2 IMPACTS DURING OPERATION PHASE

3.2.1 Land

[689]**Generation of Solid Wastes.** Floodwater may contain solid wastes. Solid wastes specially in tunnel sections shall be properly managed. Solid wastes may also be generated during maintenance activities of the road and tunnel network. Sediments in the tunnel structures shall also be regularly removed and disposed of properly.

3.2.2 Water

[690]**Change in Water Quality of Rivers, Creeks, and Tributaries.** Once constructed, the project is not expected to change the water quality of rivers, creeks, and tributaries in the area.

3.2.3 Air Quality, Noise and Vibration

[691]The operation of the ventilation system of the tunnel and road traffic will generate noise and ground vibration. Mobile sources, such as vehicles, may have an impact on the ambient air quality in the area. The emission gases of vehicles may affect plants around the proposed project. However, pollutant concentrations that directly affect plants have been shown to be extremely high (NOx > 1ppm). Since the nitrogen oxide (NO2) concentration along the project is expected to be extremely low compared to this, the negative impacts on the plants along the road are expected to be negligible.

3.2.4 People

[692]The main objective of the proposed project is to reduce the travel time between Region II and Region III and ensure the mobility of people, goods, and services during disasters. The road will act as support to the existing Dalton Pass of the Pan-Philippine Road Network.

[693]Tourism potential can also be explored by the LGUs of Aritao, Santa Fe and Carranglan and the Kalanguya Ikalahan and Kalanguya ICCs as means to increase or generate household income in the area.

3.3 SUMMARY/MATRIX OF ENVIRONMENTAL IMPACT AND LEVEL OF SIGNIFICANCE

694 **Table 3-1** details the matrix summary of the mitigating and enhancement measures with the corresponding environmental aspects and impacts for the different phases of its development. This matrix summary also includes the responsible parties, estimated costs, and guarantees involved.

Table 3-1: Summary Matrix of Environmental Impacts and Mitigating Measures

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
A. PRE-CONSTRUCTION PHASE								
Acquisition of applicable permits and licenses	The People	Disclosure of project components and activities	▪ Submission of complete requirements for processing of all permits.	100% compliance to all applicable required permits and clearances.	Prior to construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Pre-construction expenses
Local sourcing of labor	The People	Employment opportunities	▪ Priority hiring within the project affected barangays. ▪ Local labor requirement to be announced and posted in the barangay halls and public areas.	100% compliance with local policy on hiring of workers.	Prior to construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Pre-construction expenses
Land acquisition for the proposed road-right-of-way (RRoW)	The People	Involuntary resettlement of households and establishments	▪ Preparation and implementation of Right-of-Way Acquisition Plan (RAP). ▪ Provision of compensation to affected households based on RA No. 10752. and DPWH DO No. 152 series of 2017 ▪ Coordinate with the barangay LGUs.	100% implementation of RAP.	Prior to construction	To be determined during the DED of the proposed project.	DPHW-UPMO-RMC-I(B)	Pre-construction expenses
Effects to indigenous cultural communities (ICCs)	The People	Involuntary resettlement of IP households	▪ Preparation and implementation of RAP. ▪ Provision of compensation to affected households based on RA No. 10752 and Enforcement of the conditions in the Memorandum of Agreement (MOA) and Certification Precondition (CP). ▪ Preparation and implementation of Indigenous Peoples Plan (IPP).	100% implementation of RAP.	Prior to construction	To be determined during the DED of the proposed project.	DPHW-UPMO-RMC-I(B)	Pre-construction expenses
Clearing and demolition activities in the proposed RRoW	The Land, The Water, The People	Improper management of construction wastes and other solid wastes which may lead to soil contamination, contamination of nearby water bodies, potential health risks and may induce flooding due to clogging of drainage.	▪ Implementation of the solid waste management program by the contractor. ▪ Regular transport of construction debris and other solid waste in the approved designated area by the DENR. ▪ Provision of waste storage area within the site. ▪ Reuse and recycle demolished structures or facilities, whenever applicable.	100% compliance to RA 9003.	Prior to construction	Php 10,000 per hauling activity*	DPHW-UPMO-RMC-I(B) Contractors	Pre-construction expenses
	The Land	Ground vibration	▪ Apply non-vibration techniques during construction, if possible. ▪ Notify nearby residents about use of heavy equipment. ▪ For hauling trucks, comply with road weight limit standards to avoid ground vibration. ▪ Regular monitoring of ground vibration within the project sites.	Ground vibration will not be a nuisance to nearby residents. No complaints from nearby community.	Prior to construction	Php 5 M*	DPHW-UPMO-RMC-I(B) Contractors	Pre-construction expenses
	Terrestrial Ecology	Clearing of vegetation in the proposed site	▪ Apply for a tree cutting permit ▪ Adherence to JMC 2014-01 to replace each tree to be cut with 100 seedlings/ saplings/ propagules. ▪ Limit clearing to the proposed footprint of facilities to avoid unnecessary vegetation and habitat removal. ▪ Off-setting of lost vegetation through rehabilitation of adjacent and suitable planting areas.	100% compliance to TCP conditions	Prior to construction	Php 200,000*	DPHW-UPMO-RMC-I(B) Contractors	Pre-construction expenses
	The Air, The People	Generation of dust which may pose health hazards	▪ Regular watering of construction site. ▪ Implement dust control management. ▪ Proper PPEs to workers.	Results of ambient air monitoring are within DAO 2000-81.	Prior to construction	Covered by contract amount of Contractor	DPHW-UPMO-RMC-I(B) Contractors	Pre-construction expenses

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
	The Air	Generation of air emissions and noise	▪ Regular maintenance of heavy equipment. ▪ Perform noisy activities during daytime.	Results of ambient noise monitoring is within the applicable standards.	Prior to construction	Covered by contract amount of Contractor	DPHW-UPMO-RMC-I(B) Contractors	Pre-construction expenses
	The People	Traffic congestion	▪ Provide early warning devices/road signs. ▪ Implement Traffic Management Plan. ▪ Coordinate with the barangay LGUs.	100% implementation of traffic management plan.	Prior to construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Pre-construction expenses
B. CONSTRUCTION PHASE								
Road Construction	The Land	Accumulation of construction debris and other solid waste	▪ Implementation of the solid waste management program by the contractor. ▪ Regular transport of construction debris and other solid waste in the approved designated area by the DENR.	100% compliance to RA 9003.	During construction	Php 10,000 per hauling activity*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Land	Generation of hazardous wastes	▪ Collect, store, and dispose of hazardous wastes in accordance with RA 6969. ▪ Treatment and dispose of hazardous wastes through DENR-accredited waste treaters.	100% compliance to RA 6969.	During construction	Php 10,000 per hauling activity*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Land	Damages on trees and other vegetation	▪ Ensure construction activities to be within the project footprint. ▪ Confine movement activities in cleared areas only.	-	During construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	Terrestrial fauna	Wildlife displacement due to dust and noise pollution	▪ Operation of high noise-emitting tunneling equipment must be scheduled to prevent unnecessary noise and dust accumulation. ▪ Regular water sprinkling to minimize dust resuspension. ▪ Schedule drilling activities in accordance with the migration and breeding schedule of birds. Activities that will generate high level noise should not coincide with the breeding season of birds.	Results of ambient noise monitoring is within the applicable standards. Results of ambient air monitoring are within DAO 2000-81.	During construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Water	Possible siltation and surface runoff in nearby bodies of water Possible clogging of drainage due to siltation	▪ Establishment of mitigation measures such as sediment traps, erosion barriers, and silt curtains. ▪ Regular removal of silt and sediments.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	Aquatic ecology	Erosion of sediment and silt can increase water turbidity and significantly decrease light penetration, thereby reducing the quantity of light available for phytoplankton and overall primary productivity, further leading to decrease in zooplankton abundance	▪ Stockpiles should be bundled or covered especially during heavy rains which can potentially erode and carry sediments to rivers and creeks. ▪ If possible, construction activities should be scheduled during the dry or summer months to avoid downpour of heavy rain which can potentially erode and deposit sediment and silt to the immediate marine and freshwater environment.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	Aquatic ecology	Pollution from domestic wastes may generally decrease the frequency and abundances of phytoplankton, zooplankton, and soft-bottom animals	▪ Implement proper segregation, re-use, recycle and disposal. ▪ Adequate number of garbage bins and containers should be strategically located at all construction sites. ▪ Prompt and regular collection of wastes as well as removal of non-recyclable wastes from the site	100% compliance to RA 9003.	During construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
			▪ Natural organic debris should be gathered and disposed of in a designated area away from the rivers and other waterbodies.					
	The Air, The People	Generation of dust which may pose health hazards	▪ Minimization of unnecessary earth-movement. ▪ Regularly water construction sites that will generate dust. ▪ Avoid long exposure of excavated soil piles to strong winds by applying canvas covers. ▪ Proper PPEs to workers.	100% compliance to RA 9003.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
Bridge Construction	The Land	Accumulation of construction debris and other solid waste	▪ Implementation of the solid waste management program by the contractor ▪ Regular transport of construction debris and other solid waste in the approved designated area by the DENR.	100% compliance to RA 9003.	During construction	Php 10,000 per hauling activity*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Land	Generation of hazardous wastes	▪ Collect, store, and dispose of hazardous wastes in accordance with RA 6969. ▪ Treatment and dispose of hazardous wastes through DENR-accredited waste treaters.	100% compliance to RA 6969.	During construction	Php 10,000 per hauling activity*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Land	Damages on trees and other vegetation	▪ Ensure construction activities to be within the project footprint. ▪ Confine movement activities in cleared areas only.	-	During construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	Terrestrial fauna	Wildlife displacement due to dust and noise pollution	▪ Operation of high noise-emitting tunneling equipment must be scheduled to prevent unnecessary noise and dust accumulation. ▪ Regular water sprinkling to minimize dust resuspension. ▪ Schedule drilling activities in accordance with the migration and breeding schedule of birds. Activities that will generate high level noise should not coincide with the breeding season of birds.	Results of ambient noise monitoring is within the applicable standards. Results of ambient air monitoring are within DAO 2000-81.	During construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Water	Possible siltation and surface runoff in nearby bodies of water	▪ Establishment of mitigation measures such as sediment traps, erosion barriers, and silt curtains ▪ Regular removal of silt and sediments	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	Aquatic ecology	Erosion of sediment and silt can increase water turbidity and significantly decrease light penetration, thereby reducing the quantity of light available for phytoplankton and overall primary productivity, further leading to decrease in zooplankton abundance	▪ Stockpiles should be bundled or covered especially during heavy rains which can potentially erode and carry sediments to the rivers and other waterbodies. ▪ If possible, construction activities should be scheduled during the dry or summer months to avoid downpour of heavy rain which can potentially erode and deposit sediment and silt to the immediate marine and freshwater environment.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	Aquatic ecology	Pollution from domestic wastes may generally decrease the frequency and abundances of phytoplankton, zooplankton, and soft-bottom animals	▪ Implement proper segregation, re-use, recycle and disposal. ▪ Adequate number of garbage bins and containers should be strategically located at all construction sites. ▪ Prompt and regular collection of wastes as well as removal of non-recyclable wastes from the site.	100% compliance to RA 9003.	During construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
			▪ Natural organic debris should be gathered and disposed of in a designated area away from the rivers and other waterbodies.					
	The Air, The People	Generation of dust which may pose health hazards	▪ Minimization of unnecessary earth-movement. ▪ Regularly water construction sites that will generate dust. ▪ Avoid long exposure of excavated soil piles to strong winds by applying canvas covers. ▪ Proper PPEs to workers.	100% compliance to RA 9003.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
Tunnel Construction	The Land	Accumulation of construction debris and other solid waste	▪ Implementation of the solid waste management program by the contractor. ▪ Regular transport of construction debris and other solid waste in the approved designated area by the DENR.	100% compliance to RA 9003.	During construction	Php 10,000 per hauling activity*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Land	Generation of hazardous wastes	▪ Collect, store, and dispose of hazardous wastes in accordance with RA 6969. ▪ Treatment and dispose of hazardous wastes through DENR-accredited waste treaters.	100% compliance to RA 6969.	During construction	Php 10,000 per hauling activity*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Water	Possible siltation and surface runoff in nearby bodies of water	▪ Establishment of mitigation measures such as sediment traps, erosion barriers, and silt curtains. ▪ Regular removal of silt and sediments.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Air, The People	Generation of dust which may pose health hazards	▪ Minimization of unnecessary earth-movement. ▪ Regularly water construction sites that will generate dust. ▪ Avoid long exposure of excavated soil piles to strong winds by applying canvas covers. ▪ Proper PPEs to workers.	100% compliance to RA 9003.	During construction	Php 100,000*	The Air, The People	Generation of dust which may pose health hazards
Earthwork activities (tunneling, excavation)	The Land	Alteration of topography Possible slope failure, ground subsidence or landslide during tunneling activities	▪ Application of excavating techniques giving few or no impacts on landslide and surface conditions. ▪ Application of proper reinforcement of excavation and tunneling sections. ▪ Implementation of construction management plan and best engineering practices.	Ground vibration will not be a nuisance to nearby residents. No complaints from nearby community.	During construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Land	Generation of excavated soil	▪ Provision of temporary storage on-site ▪ Regularly haul excavated soil ▪ Reuse excavated soil as backfill	-	During construction	To be determined*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Water	Potential impact on groundwater level and groundwater quality	▪ Implementation of best engineering practices during construction. ▪ Installation of monitoring wells.	-	During construction	Php 2 M*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Water	Possible siltation and surface runoff	▪ Establishment of mitigation measures such as sediment traps, erosion barriers, and silt curtains. ▪ Regular removal of silt and sediments.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Air	Generation of Air Emissions and Noise	▪ Regular maintenance of heavy equipment. ▪ Perform noisy activities during daytime. ▪ Maintain green zone (existing vegetation surrounding the project site) to serve as natural noise barrier and/or install a purpose-built barrier around the construction site.	Results of ambient noise monitoring is within the applicable standards.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
	The Air	Generation of dust	▪ Minimization of unnecessary earth-movement. ▪ Regularly water construction sites that will generate dust. ▪ Avoid long exposure of excavated soil piles to strong winds by applying canvas covers.	-	During construction	Php 50,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The People	Traffic congestion	▪ Provide early warning devices/road signs. ▪ Implementation of traffic management plan. ▪ Provide parking spaces within project site. ▪ Coordinate with barangay LGU.	100% implementation of traffic management plan.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The People	Possible damage of nearby properties due to ground vibration during tunneling activities	▪ Apply non-vibration and/or vibration-avoiding techniques during construction, if possible. ▪ Notify nearby residents about use of heavy equipment. ▪ Regularly monitor vibrations. ▪ For hauling trucks, comply with road weight limit standards to avoid ground vibration.	Ground vibration will not be a nuisance to nearby residents. No complaints from nearby community.	During construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
Use of heavy equipment, during construction works	The Land	Ground vibration	▪ Apply non-vibration and/or vibration-avoiding techniques during construction, if possible. ▪ Notify nearby residents about use of heavy equipment. ▪ Regularly monitor vibrations. ▪ For hauling trucks, comply with road weight limit standards to avoid ground vibration.	Ground vibration will not be a nuisance to nearby residents. No complaints from nearby community.	During construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Land, The Water	Accidental oil spills/leaks which may cause soil contamination and contamination of nearby water bodies	▪ Use sawdust, rice hulls, or coir dusts to absorb the oil spills. ▪ Implement oil spill management plan. ▪ Maintain canal in the maintenance and repair area of vehicles and equipment.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.	During construction	Minimal*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Air	Generation of air emissions and noise	▪ Regular maintenance of heavy equipment. ▪ Perform noisy activities during daytime ▪ Maintain green zone (existing vegetation surrounding the project site). to serve as natural noise barrier and/or install a purpose-built barrier around the construction site.	Ambient noise is within the applicable standards.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The People	Traffic congestion	▪ Provide early warning devices/road signs ▪ Implement traffic management plan ▪ Provide parking spaces within project site	100% implementation of traffic management plan.	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
Influx of workers	The Land	Generation of solid waste	▪ Implement solid waste management plan ▪ Hauling of discarded items by accredited haulers	100% compliance to RA 9003.	During construction	Php 10,000 per hauling activity*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The Water	Ground and coastal water contamination from improper disposal of domestic wastewater	▪ Provision of sanitation facilities for workers (e.g. toilets, showers, etc.) ▪ Follow basic housekeeping policies	1 toilet for every 25 male workers and 1 toilet for every 20 female workers.	During construction	Php 250,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report
	The People	Occupational health and safety	▪ Proper training on construction safety ▪ Provision of PPE. ▪ Proper supervision by trained professionals during construction activities. ▪ Implementation of Occupational Health and Safety Policy.	-	During construction	Php 100,000*	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP, Site Inspection Report, OSH report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	TARGET PERFORMANCE/ EFFICIENCY	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
	The People	Employment opportunities	▪ Priority in hiring should be given to residents of host communities.	-	During construction	-	DPHW-UPMO-RMC-I(B) Contractors	SDP
C. OPERATION PHASE								
	The Land	Generation of solid waste	▪ Implement solid waste management plan. ▪ Provision of interim solid waste storage area in the intake and drainage facility.	100% compliance to RA 9003.	Operation phase	Php 10,000 per hauling activity*	DPHW-UPMO-RMC-I(B) Contractors	EMP
	The Water	Generation of wastewater from cleaning of the facilities	▪ Provision of sedimentation ponds outside the tunnel areas. ▪ Regular desilting of sedimentation ponds. ▪ Collected sediments must be disposed in the designated disposal site.	Results of water quality monitoring are within DAO AO 2016-08 and 2021-19.	Operation phase	Php 200,000*	DPHW-UPMO-RMC-I(B) Contractors	EMP
	The Air	Generation of road traffic noise	▪ Installation of sound insulation measures in the guardrails and fences.	-	Operation phase	Covered by contract amount of Contractor	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP
	The People	Occupational health and safety	▪ Proper training on construction safety. ▪ Provision of PPE. ▪ Proper supervision by trained professionals during construction activities. ▪ Implementation of Occupational Health and Safety Policy.	-	Operation phase	Php 200,000*	DPHW-UPMO-RMC-I(B) Contractors	EMP, OSH report
	The People	Road safety	▪ Safety measures in road design, guardrails, and road markings.	-	Operation phase	Covered by contract amount of Contractor	DPHW-UPMO-RMC-I(B) Contractors	Contractor's EMP
D. ABANDONMENT/DECOMMISSIONING PHASE								
Pull-out of equipment	The Air	Generation of air emissions and nose	▪ Regular maintenance of heavy equipment. ▪ Perform decommissioning during daytime.	-	Decommissioning/ Abandonment	Covered by contract amount of Contractor	DPHW-UPMO-RMC-I(B) Contractors	EMP
Abandonment of offices and other facilities	The People	Abandonment of facilities	▪ Possible donation to LGU.	-	Decommissioning/ Abandonment	Minimal	DPHW-UPMO-RMC-I(B) Contractors	EMP
Termination of employment	The People	Loss of employment	▪ Provide 6 months' notice of impending termination of employment. ▪ Provide compensation to affected personnel. ▪ Provide training of personnel in preparation for other jobs.	-	Prior to decommissioning/ abandonment	To be determined	DPHW-UPMO-RMC-I(B) Contractors	EMP
NOTE: * - Covered by contract amount of the contractor during project implementation. The National Pollution Control Commission No. 1980-002 defines daytime as 0900H to 1800H.								

3.4 CONSTRUCTION ENVIRONMENTAL PROGRAM

[695]A construction environment program will be always implemented to avoid, mitigate, and minimize the environmental and social impacts associated with the construction activities. The designated contractor for the Project shall implement and be responsible for the implementation of the construction environmental program, under the supervision of DPWH UPMO-RMC-I(B). The designated contractor will also be required to implement the EMP, in accordance with the ECC conditions. It shall include specific actions and measures such as:

(a) Provision of temporary lodging and sanitation amenities for workers, and liquid and solid waste handling/disposal facilities;
(b) Avoidance of unnecessary earth-movement;
(c) Worker and project site safety programs, including emergency response plans;
(d) Proper storage and disposal of hazardous wastes (i.e., used oils, oil-contaminated material, BFL etc.);
(e) Establishment of silt traps and erosion barriers around the project site;
(f) Regular removal of silts and sediments or as necessary;
(g) Worker and project site safety programs and emergency response plans;
(h) Provision of portable sanitation facilities to the workers and ensure safe disposal of wastewater generated;
(i) Proper segregation, storage, disposal of solid and hazardous wastes (i.e., used oils, etc.);
(j) Reduction or elimination of pollution sources by using pollution control measures (i.e., watering of project site, installation of noise reduction equipment such as mufflers, scheduling of work during daytime, installation of septic tanks)
(k) Elimination/Reduction of occupational safety and risks through strict implementation of safety plans and procedures (i.e., use of PPEs, provide health stations and first aid kits, regular monitoring of workstations if still meet work standards).
(l) Proper demobilization procedures (i.e., clean-up of construction sites, replacement/re-planting of removed trees).

[696]As mentioned, the structures in the project site for the intake facilities will be demolished as part of the site preparation. As preparation for the actual decommissioning activities, the following will be done:

(a) Secure necessary permits for the demolition activities;
(b) Perform environmental site assessment, if necessary;
(c) Protect existing structures, appurtenances, and landscaping which are not to be demolished and/or which are to be salvaged;
(d) Make inventory of equipment, machines and structures which are to be decommissioned;
(e) Temporary fencing may be used to enclose the demolition site. Unauthorized personnel will be restricted from entering the premises;
(f) Verify the location of existing above and below ground utilities prior to the start of any demolition. This includes, but is not limited to, electric and water lines. Coordinate with utility personnel when disconnecting, removing, capping or relocating a utility within the demolition area;

(g) Drain or flush all pipelines and tanks;
(h) A thorough examination and inspection of the current electrical system will be performed for safe decommissioning;
(i) Remove all electrical conduit and appurtenances from the tanks, machines and equipment prior to dismantling of the equipment and tanks. This will be performed by a licensed electrical contractor only.

3.5 CONSTRUCTION SAFETY GUIDELINES DURING THE COVID-19 PUBLIC HEALTH CRISIS

[697]With the COVID-19 public health crisis, the proponent shall implement the following measures to ensure the protection and safety of the workers and the communities during the construction phase of the project.

A. Prior to Deployment

(a) Any person below twenty-one (21) years old, those who are sixty (60) years old and above, those with immune deficiencies, comorbidities, or other health risks, and pregnant women, including those who reside with the aforementioned, shall not be part of the workforce for construction projects except as may be allowed under the Revised Omnibus Guidelines issued by the IATF.
(b) Construction personnel shall undergo quarantine for fourteen (14) days prior to deployment; or in the alternative, the employee may undergo any available Food and Drug Administration (FDA) - approved COVID-19 test, as may be prescribed by the Department of Health (DOH) and be retested as the need arises. In this regard, consultation with medical doctors (duly accredited by DOH, if possible) prior to the conduct of COVID-19 test shall be made. Further, COVID-19 test procedures and return-to-work policies of the contractors should comply with DOH Circular No. 2020-0160 dated 31 March 020, Department Memorandum No. 2020-0220 dated 11 May 2020, and other pertinent issuances of the DOH on the matter.
(c) The concessionaires, contractors, subcontractors, and suppliers shall provide for their personnel/workers the necessary welfare facilities and amenities, such as employees' quarters for board and lodging, ensuring compliance with social distancing, proper hygiene, etc.
(d) Concessionaires, contractors, and subcontractors shall ensure that their projects are in compliance with DOLE D.O. No. 13, Series of 1998, and the DTI and DOLE Interim Guidelines on Workplace Prevention and Control of COVID-19. Contractors shall provide their personnel and workers continuous supply of vitamins, particularly vitamin C, other over-the-counter medicines, quarantine facilities, and oxygen tanks for emergency purposes.
(e) Concessionaires, contractors, and subcontractors shall provide disinfection facilities at their respective project sites in compliance with pertinent DOH and IATF Guidelines, to be placed at strategic locations to ensure the safety and welfare of all personnel.
(f) Proper information dissemination regarding COVID-19 construction protocols, on top of existing construction safety practices, shall be conducted by Safety Officers to all personnel.

B. During Deployment

(a) Conduct an inventory of works for the construction sequencing to be followed and undertaken to uphold the required social distancing. Break times shall be conducted in a staggered manner.

(b) Employees shall be housed in their respective quarters for the entire duration of the project covered by the ECQ, MECQ, GCQ, and MGCQ. In case there is a need to leave the said quarters during the project duration, "Prior to Deployment" procedures shall be conducted at every instance of re-entry.

(c) Errands to be conducted outside the construction site premises shall be kept to a minimum. Number of personnel running errands shall be limited and shall be properly disinfected and closely monitored for symptoms within fourteen (14) days upon re-entry.

(d) Field offices, employees' quarters, and other common areas shall be regularly maintained, including the daily disinfection of such facilities.

(e) Adequate food, safe/potable drinking water, disinfectants, and hand soaps shall be made available by the concessionaires, contractors, subcontractors, and suppliers to their inhouse personnel.

(f) Daily monitoring of the pre- and post-work health conditions of workers shall be undertaken by the concessionaires, contractors, subcontractors, and suppliers, including but not limited to temperature, health, and exposure monitoring, as preventive measures. Personnel with manifestations or symptoms relative to COVID-19 shall be immediately isolated and quarantined for fourteen (14) days and if necessary, brought to the nearest DOH COVID-19 treatment facility under strict confidentiality and privacy. Proper protocols in accordance with the DTI and DOLE Interim Guidelines on Workplace Prevention and Control of COVID-19 shall likewise be strictly observed.

(g) Work activities shall be strictly monitored daily by the Safety Officer on site to ensure compliance with safety standards and quarantine protocols.

(h) There shall be a full-time Safety Engineer/Officer assigned at the site who shall strictly monitor work activities. Said Safety Engineer/Officer shall ensure strict compliance with DOLE D.O. No. 13, Series of 1998 and the DTI and DOLE Interim Guidelines on Workplace Prevention and Control of COVID-19 with regard to the wearing of additional personal protective equipment (PPE) required such as, but not limited to, face masks, safety glasses/goggles, face shields, and long sleeve T-shirts, and other measures to contain the spread of COVID-19 in the workplace, as provided in these Guidelines.

(i) For off-site employees' quarters, transport service, duly disinfected before and after use, shall be provided, and social distancing shall likewise be observed therein at all times in accordance with DOTr guidelines.

(j) Sharing of construction and office equipment is discouraged. However, if necessary, the shared equipment must be disinfected in between transfers amongst personnel.

(k) All material and equipment delivery and disposal shall be conducted by a specific team of personnel on an isolated loading/unloading zone while limiting contact with the delivery/disposal personnel. All material and/or equipment entering the construction site shall be duly disinfected as much as possible.

(l) Non-essential personnel, visitors, and the general public shall be restricted to enter the construction site, employees' quarters, and field offices. Otherwise, all personnel entering the construction site premises on a temporary basis (e.g. delivery truck drivers, inspectors, etc.) shall be properly logged and checked for symptoms. Gatherings, liquors, and/or merry-making are strictly prohibited within the construction site premises.

(m) Clustered and staggered deployment of employees within the construction site shall be observed to minimize personnel contact and for easier contact tracing.

(n) Proper waste disposal shall be provided for infectious waste such as PPEs and other waste products coming from outside the construction premises.

3.6 SOLID WASTE MANAGEMENT

[698]Solid wastes will inevitably be generated during the construction and operation phase of the project. To address this concern, the **DPWH** will implement a solid waste management program (SWMP), which will target to reduce the solid waste generation. Details of the SWMP which will be used in the proposed project are as follows:

(a) Concept of Waste Hierarchy Scheme, Principle of 3R's (reduce, reuse & recycle) and solid waste color coding scheme;

(b) Implementation of a waste segregation (biodegradable and non-biodegradable) policy for all construction personnel;

(c) Installation of solid waste handling and storage facilities, such as dumpsters, trash cans in common areas and strategic locations in the project sites;

(d) Implementation of paper usage reduction program in the construction site offices by re-using paper for other similar purposes;

(e) The non-biodegradable wastes, such as paper, plastics, and metals, must be sorted accordingly and sold to waste service providers; and

(f) The residual and other general solid wastes must be in their appropriate bins and disposed in accordance with the schedule of the municipality's solid waste collection system.

[699]For hazardous wastes, proposed programs of **DPWH** were as follow:

(a) Provision of hazardous waste storage area;

(b) Sorting of hazardous wastes per type and storing in sealed and proper containers with labels;

(c) Regular monitoring and reporting of hazardous wastes in the Self- Monitoring Report (SMR); and

(d) Hauling, transporting, and treating of hazardous wastes by DENR-EMB accredited haulers, transporters and treaters.

[700]As mentioned in first 2 items above solid waste, the solid waste management plan can be implemented through waste segregation schemes where solid wastes are separated by type of wastes: Recyclables, Biodegradables, Residual Waste, and Toxic or Special Waste segregation scheme commonly used is

the principle of 3R's – Reduce, Re-use and Recycle. Figure on the right shows the concept of the 3Rs.

[701]A color-coding scheme will be applied for the segregation of wastes as shown in the table below. The waste bins or containers must be properly maintained and always covered. This scheme makes it easier for the waste collectors to identify wastes to be collected.

TYPE OF WASTE	DESCRIPTION	COLOR
Recyclables	Paper, metal, plastic, glass, PET	
Biodegradable	Kitchen and garden wastes	
Residuals	Dirty plastic bags, used tissue paper, foil wrappers, disposable batteries, pens, cotton swabs, and spray cans	

[702]Monitoring activities regarding waste management should include the monitoring of the weight of the generated solid waste and keeping an inventory for each kind of waste, regular audits of waste segregation and collection practices, tracking of waste generation trends by type and amount of waste generated by section, characterizing waste at the beginning of generation of a new waste stream and periodically documenting the characteristics and proper management of waste, and all related retained information regarding solid waste shall be kept by the PCO.

3.7 HAZARDOUS WASTE MANAGEMENT

[703]Hazardous waste such as used oils, empty chemical (i.e., paint, pesticide) cans, busted bulbs and others are expected to be generated during construction and operation phase. Proper storage and disposal of these hazardous materials shall be ensured by the proponent in accordance with RA 6969. Also, under RA 6969, the proponent will apply for a Hazardous Waste Generator ID to DENR prior to its construction.

[704]The PCO should ensure appropriateness of the labelling and segregation of hazardous waste at the Hazardous Waste Storage Area and accumulated hazardous waste shall be stored for not more than a year. Only DENR-registered hazardous waste transporter and TSD facility will be allowed to collect and treat the hazardous wastes. The transport, treatment, and final disposal will be arranged by the PCO through the online hazardous waste manifest system.

[705]All personnel directly handling hazardous waste shall be trained/oriented on this procedure. Topics shall include: waste identification (types and characteristics), hazards and risks in handling hazardous wastes, labelling and placarding, proper storage, waste minimization, types of potential emergencies arising from wastes handling, storage and treatment disposal, Spill Management Plan, Personal Protective Equipment (PPE), laws and regulations concerning hazardous waste management, and monitoring requirements.

3.8 OCCUPATIONAL SAFETY AND HEALTH

[706]The occupational health and safety policy of **DPWH** shall be implemented in all the project phases. Occupational health and safety policy is necessary since it will not just reduce the likelihood of injuries/fatalities that may affect its personnel, but also protect valuable equipment and properties against damages.

[707]The following details are basic occupational health and safety guidelines that **DPWH** will be applying for the Project:

(a) All management, technical, and non-technical personnel shall undergo specialized training courses to familiarize themselves to the operations and maintenance of the Project's various facilities;
(b) All construction workers shall undergo construction safety and health training;
(c) Form a Construction Safety and Health Organization which shall include a safety engineer/officer and health personnel;
(d) Emergency response plan shall be updated regularly, and emergency drills shall be performed regularly to improve personnel's response technique and time;
(e) Audits shall be conducted by the management and personnel, with possible assistance from various safety consultants;
(f) Personnel shall undergo scheduled annual health check-ups;
(g) Safety signage, adequate illumination, anti-skid steps and guard rails, fire extinguishers, first-aid kits, and other safety features shall be established throughout the Project's facilities; and
(h) Personal protective equipment (PPE), which includes safety boots, hard hats, gloves, safety goggles (in some instances) shall be mandatory for construction workers (during Construction phase) and personnel (during Operations phase) working on the Project.

3.9 VEHICULAR TRAFFIC MANAGEMENT

[708]Traffic impacts along the said roads are expected due to the crossing of heavy equipment vehicles and delivery trucks from the proposed project sites. To manage the traffic, **DPWH** will implement the following measures:

(a) Coordination with the Municipal LGUs;
(b) Provide safety barriers, warning signs and lights, within the vicinity of proposed project site, and adequate parking spaces;
(c) Movement of all heavy equipment, either inbound or outbound within the site will be done during off-peak hours and at designated areas located in open areas to prevent blockage of traffic flow along public roads;
(d) Assistance of security personnel in directing traffic of vehicles coming in and out of the proposed project; and
(e) For the construction activities, the designated contractor will implement these traffic management schemes to minimize the effects of traffic.

3.10 DISASTER RISK REDUCTION (DRR) AND CLIMATE CHANGE ADAPTATION (CCA)

[709]Climate change can affect the frequency of geohazards in the country. Higher temperatures will result in water shortages and droughts while increased rainfall may induce flooding and landslide. Considering these figures, appropriate precautionary climate change measures and adaptation strategies must be employed during the construction and operation phases of the project to avoid any complications in the long-run.

[710]The main objective of the DRR and CCA activities is to minimize or reduce the risk and impact of the hazards to the project and to the community. The project included climate change

mitigating measures in the design and construction and during its operation. The project was designed to be resistant to natural disasters such as earthquake, typhoons and flooding. The following are the DRR and CCA mitigating measures that will be implemented by the project.

(a) Green and open areas is part of the features of the project;
(b) Waste reduction and recycling will also be observed during the construction and operation of the project. All the wastes will be properly handled and disposed;
(c) The proponent will also be implementing water and energy saving practices during construction and operation;
(d) The proponent will also ensure that there will always be enough safe water supply and basic sanitation facilities provided even during the event of a disaster;
(e) Conduct IEC activities to the community regarding disaster response preparedness and mitigating measures.

[711]DRR and CCA activities will also be included in the SDP and IEC plan to highlight that the success of the programs will be dependent on the community support and participation.

SECTION 4

ENVIRONMENTAL RISK ASSESSMENT & EMERGENCY RESPONSE POLICY AND GUIDELINES

4.1 METHODOLOGY

[712]The general guidelines and outline for an Environmental Risk Assessment (ERA) preparation are prescribed in Annex 2-7e of DAO 2003-30. However, the guidelines focused more on the risks and hazards posed by activities and/or manufacturing methods that involve chemical storage, processing, and use. Although this is applicable for the proposed Project, this shall only form part of the overall ERA. Major environmental risks identified were the geological hazards posed on the proposed Project.

4.2 RISK SCREENING LEVEL

[713]A risk screening level exercise refers to specific facilities or the use of certain processes that has the potential to pose significant risks to people and its surrounding environment. The proposed project is covered by the risk screening level exercise, as indicated in **Table 4-1**.

Table 4-1: Risk Screening Matrix

ACTIVITIES REQUIRING RISK SCREENING EXERCISE*	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 of 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
7) Installations for the loading and unloading of hazardous materials as defined by RA 6969 (or DAO 1992-29)	Applicable
CONCLUSION	**Risk screening level exercise is applicable.**
NOTE: *- Based on Annex 2-7e of DAO 2003-30 Revised Procedural Manual	

4.3 RISK IDENTIFICATION AND ANALYSIS

[714]The proposed Project entails risks that are natural, man-made, or a combination of both. Natural risks are hazards caused by phenomena such as earthquakes, geological instability (e.g., sink holes, landslides), and typhoons. Meanwhile, man-made risks are caused by accidents such as fires, structural/equipment failure, spillages, and human error. Man-made risks could also be aggravated as a direct consequence of natural risks.

4.3.1 Operational Risks

4.3.1.1 Hazards from Ammonium Nitrate Fuel Oil (Hazardous Material)

[715]Ammonium Nitrate Fuel Oil (ANFO), as potential blasting magazine poses the following hazards:

(a) Explosive; mass explosion hazard;
(b) Causes eye irritation;
(c) Suspected of causing cancer;
(d) Harmful to aquatic life with long lasting effects.

[716]There are no identified health effects under normal use of ANFO. Proper handling and storage are being should be followed by **DPWH** and its contractors to avoid any adverse health effects. **DPWH** and its contractors must prepare a detailed blasting procedure to avoid misfires. The said procedure includes proper pattern design, charging of shots, priming, loading of blast holes, fencing, personnel restrictions, tying in of shots, and firing procedures. In addition, it is recommended to implement safe practices during priming and charging of shots. Further, misfire procedures must be prepared accordingly.

[717]The proposed project will hold ANFO in 4 m^2 storages, away from the construction offices and unauthorized personnel. At any given time, the explosives to be utilized by the proposed project will not exceed 10 tons.

4.3.2 Natural Hazards

4.3.2.1 Seismicity

[718]The Philippine Fault System, approximately 11 kilometers west of the proposed project site. Further, the project site is susceptible to Philippine Earthquake Intensity Scale (PEIS) VIII – characterized as very destructive to devastating groundshaking. Intense or strong seismic activities may cause damage to the high-rise residential building. The construction and operational phase of the proposed project should then factor the potential for earthquake induced risks. Any structures that will be built within the proposed project site should be able to withstand the effects of the movement of the Philippine Fault System in the future.

4.3.2.2 Typhoons

[719]The mean annual number of typhoons that pass through the Philippine Area of Responsibility (PAR) is about 20, of which around 9.2 cross the country. If a typhoon directly hits the project facilities, it could possibly bring extensive wind and rain hazards (i.e., strong wave currents and flooding). Regular weather monitoring should be done so that safety protocols can be done.

4.3.2.3 Flooding

[720]The proposed project site and its immediate vicinity have experienced flooding events in the past. Effects of flooding to the proposed project site should also be considered, particularly flooding events similar to the Typhoon Ondoy and Habagat, which caused massive and extensive floods in Luzon during the rainy season. Emergency responses must be considered for possible occurrences.

4.3.3 Man-Made Hazards

4.3.3.1 Occupational Accidents

[721]The project involves a variety of equipment and facilities which may possibly injure personnel and/or damage property if handled/operated improperly. These risks can be greatly reduced with scheduled maintenance checks. Also, personnel handling such equipment and operating the facilities will be properly trained and supervised and re-trained periodically.

[722]The following are the risks that may be encountered during construction include but are not limited to:

(a) Falls from height;
(b) Injury from falling materials;
(c) Uncontrolled collapse of the structure;
(d) Interruption or damage to essential services such as water, sewerage, telecommunications, electricity, pipes, cables, etc. and;
(e) Possible contamination on site from hazardous materials such as oils, paints, flammable liquids, and other chemicals.

4.3.3.2 Accidental Spills (e.g., fuel, engine lubrication oil, coolant)

[723]Oil spillage that may come from engine maintenance or storage failure may be caused by several reasons such as faulty operational procedures, pipe deterioration, sabotage, and force majeure. It may result to anaerobic conditions since large spills may form a film on water surfaces impairing oxygen transfer. This scenario may be harmful to aquatic organisms. The fuel may be decomposed by micro-organisms, but degradation is selective and can result in sediment becoming enriched with aromatic hydrocarbons. Proper oil spill protocols should then be observed should this happen.

4.3.4 Air Pollutants Hazards

[724]Considering the nature of the project, air pollution is not a major concern. However, in order to further minimize the effect of air pollutants, regular maintenance of equipment and other air mitigating measures should be strictly done to avoid these risks. Potential air pollutants associated with project are TSP and PM_{10} during the construction phase.

4.4 IDENTIFICATION OF POTENTIAL EMERGENCIES

[725]Emergencies are unforeseen events or episodes that are caused by natural forces and circumstances that may result to negative effects to people, property, and the surrounding environment. As a preliminary step in developing an effective emergency response policy, it is important to identify the potential emergency scenarios that would most likely occur.

[726]Table 4-2 lists the most probable emergencies that could happen during the constriction and in the future operation of the Project.

[727]Emergency situations may also require different levels of classification and response procedures, depending on the degree of situations. These levels will be referred to as: 1) Incident; 2) Emergency; and 3) Crisis.

[728]Incident situations present minor events that may require partial or total mobilization of the proposed Project's resources to effectively deal with an accident. An episode may present very minimal injuries and/or partial damages to property.

[729]Emergency situations require the utilization of all resources, with the assistance of local emergency responders, and additional resources from **DPWH**. This episode may present serious injuries and some fatalities and could result to severe or total damage to the property.

[730]Crisis situations are the worst conditions, which require the utilization of full resources, and possibly, assistance from the national government to address the event. An episode may present multiple fatalities, destruction of facilities, and severe/total damage to the surrounding community.

Table 4-2: Emergency Scenarios for the Project

TYPE OF EMERGENCY SITUATION	POSSIBLE CAUSES	POTENTIAL EFFECTS
Construction Phase		
Fire	▪ Electrical short-circuits, overloading of equipment ▪ Accidental ignition of combustible materials	▪ Partial or total loss of equipment and property ▪ Injuries and fatalities to personnel
Earthquakes	▪ Movement/rupture of nearby fault lines ▪ Volcanic eruption	▪ Failure of concrete structures (i.e., collapse) ▪ Injuries and fatalities to personnel and downstream communities
Flooding	▪ Heavy rainfall ▪ Clogged drainage	▪ Damage to property ▪ Stop operation
Release of toxic substances	▪ Equipment malfunction ▪ Accidental spillage ▪ Man-made errors	▪ Health hazards to the employees, workers, and nearby communities ▪ Degradation of affected parameter (i.e., contamination of soil and water)
Structural collapse	▪ Poor structural design ▪ Man-made errors ▪ Earthquake	▪ Partial or total loss of equipment and property ▪ Injuries and fatalities to personnel
Vehicular accidents	▪ Improper training and supervision of personnel ▪ Poor traffic management plan ▪ Man-made errors	▪ Injuries and fatalities to personnel and nearby communities ▪ Damage to property
Occupational safety accidents	▪ Improper training and supervision of personnel ▪ Equipment and facility failure ▪ Unplanned collapse of structure ▪ Lack of full understanding regarding the surrounding environment	▪ Injuries and fatalities to personnel ▪ Partial and total loss of equipment
Operation Phase		
Fire	▪ Electrical short-circuits, overloading of equipment ▪ Accidental ignition of combustible materials ▪ Malfunctioning of electro-mechanical devices	▪ Partial or total loss of equipment and property ▪ Injuries and fatalities to personnel
Explosion	▪ Power outage ▪ Equipment malfunction	▪ Partial or total loss of equipment and property ▪ Injuries and fatalities to personnel
Earthquake	▪ Movement/rupture of nearby fault lines ▪ Volcanic eruption	▪ Failure of concrete structures (i.e., collapse) ▪ Injuries and fatalities to personnel and downstream communities
Structural collapse	▪ Poor building design ▪ Weak foundation ▪ Man-made error	▪ Partial or total loss of equipment and property ▪ Injuries and fatalities to personnel
Occupational safety accidents	▪ Improper training and supervision of personnel ▪ Equipment and facility failure ▪ Unplanned collapse of structure ▪ Lack of full understanding regarding the surrounding environment	▪ Injuries and fatalities to personnel ▪ Partial and total loss of equipment

4.5 EMERGENCY PLAN

[731]The Emergency Plan is a management structure that is intended as a guide for the personnel during emergency situations. This structure may or may not be similar to the existing organizational/management hierarchy of the Project, although comparison on roles and responsibilities can be used as reference.

[732]The implementation of the Emergency Plan is a standard practice that is currently being integrated as part of company policies. Its objective is to establish an orderly and systematic approach in addressing an emergency, and in turn, decrease further injuries/fatalities and loss of property.

[733]Forming the Emergency Plan requires the Proponent to select among the different skills and knowledge of its personnel at the Project. The selection process will involve background checks, training and skills learning, and voluntary application of selected personnel. The proposed project will follow the schematic diagram and procedures presented in **Figure 4-1** and **Table 4-3**. The roles and responsibilities of each personnel involved in the Emergency Plan are listed in **Table 4-4**.

[734]The designation of the personnel and their corresponding responsibilities may be changed during different types of emergency scenarios that were previously identified in this section. Therefore, if such case exists, **DPWH** and its contractors will train and designate personnel appropriately to deal with each type of emergency.

Figure 4-1: Emergency Response Plan

PREPARATION - development of actual plans should an emergency happen and elimination or avoidance of hazards from happening or occurring.

RESPONSE - execution of the plans and procedures during an actual emergency plan.

RECOVERY - retrieval of important assets and restoration of the site prior to the emergency.

FIGURE TITLE:		
EMERGENCY RESPONSE PLAN		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

Table 4-3: Emergency Response Procedures for Different Scenarios

PREPARATION	RESPONSE	RECOVERY
A. Fire		
▪ Orientation and training of personnel on fire safety ▪ Conduct of regular fire drills ▪ Installation and regular testing of firefighting devices (i.e., fire hoses, fire extinguishers, smoke detectors, sprinkler system) ▪ Regular inspection of electrical equipment and lines for any defect or malfunction,	▪ Notice for personnel to keep calm and alert to prevent further injuries; to follow emergency evacuation procedures; and to report immediately any presence of smoke, spark, or open flame to authorized personnel ▪ Immediate use of fire extinguishers, only if the fire can still be contained	▪ Prohibition of returning to the fire scene, as long as necessary, unless declared for safe entry ▪ Checking for personnel that may be trapped, injured, or needs further assistance ▪ Reporting of any important incident that require immediate attention ▪ Securing of important items and equipment from

PREPARATION	RESPONSE	RECOVERY
and replacement, as necessary ▪ Securing of all flammable items in proper containers and storage facilities ▪ Strict implementation of "No Smoking" policy in tunnel facilities ▪ Placement of emergency numbers and communication equipment in conspicuous areas for easier notification ▪ Designation of emergency exits (free from obstruction) and evacuation procedures ▪ Regular maintenance of equipment	▪ Disconnection of electrical or fuel connections and shutdown of all affected equipment ▪ Removal of all flammable materials from the fire scene to avoid further contact, if possible ▪ Wearing of proper fire protection attire (i.e., fire suit, boots, breathing apparatus) by responders ▪ Prohibition of using or pouring of water over fuel or alcohol fires, and electrical fires	unauthorized access from outsiders, after the building is declared safe for re-entry ▪ If fire damage is minimal, or if facility is recoverable, implementation of necessary corrective measures to prevent the accident from re-occurring
B. Earthquakes		
▪ Conduct of necessary preparations, including equipment and facility checks, to prevent injuries in an event of an earthquake ▪ Securing of all loose items to prevent falling ▪ Placement of heavy materials near the ground ▪ Storage of flammable items in designated safe areas ▪ Orientation of personnel on safe locations, emergency response equipment, and evacuation routes	▪ Notice for personnel to keep calm and alert to prevent further injuries; to protect themselves by getting under sturdy structures and stay away from sharp, flammable, or heavy items; and to prepare for immediate evacuation of the facility, if necessary ▪ Shutdown of all gas and electric equipment	▪ If there are no threats of aftershocks, checking for personnel that may be trapped, injured, or needs further assistance ▪ Prohibition of returning to the facility if it is deemed structurally unstable, or declared unsafe ▪ Thorough inspection of the facility premises for any unusual crack/gap in the ground or walls ▪ Checking for possible fires and advise authorities for appropriate response ▪ Securing of important items and equipment from unauthorized access from outsiders, after the building is declared safe for re-entry ▪ Inspection of the facility for any major structural defect, crack, unstable item, and other potential hazards ▪ If earthquake damage is minimal or facility is recoverable, implementation of corrective measures to prevent the further hazards

PREPARATION	RESPONSE	RECOVERY
		from affecting personnel and property.
C. Release of Toxic Substances (e.g., fuel)		
▪ Regular visual inspection for potential leaks and corrosion ▪ Inspection of facilities, containers, and equipment for any sign of leaks or spills	▪ Notice for personnel to report the occurrence immediately to supervisor; to follow strictly instructions of supervisor in charge of cleaning operations ▪ Ceasing of operations in the area affected by spillage and stop appropriate source ▪ Stop vehicles' engines in the affected area ▪ Ceasing of operations or any movement until clearance is given	▪ Immediate clean-up of all spills using proper conditions, including stoppage and containment of spill or leak ▪ Implementation of measures to prevent re-occurrence of the incident
D. Occupational Hazards		
▪ Provision of basic PPEs. ▪ Formation of an emergency response team for each department ▪ Provision of first-aid kits and emergency equipment on critical workstations ▪ Training of personnel on proper equipment handling and other safety practices ▪ Posting of safety reminders on workstations ▪ Provision of safety features, such as adequate lighting, guide rails, and safety signage	▪ Immediate reporting of any accident, especially those considered life-threatening ▪ Immediate application of first aid ▪ Removal of affected personnel from the accident site ▪ Bringing of affected personnel to the nearest first aid station or hospital if necessary	▪ Performing of corrective measures on equipment and procedures ▪ Provision of additional safety procedures, equipment, and training
E. Flooding		
▪ Securing of all loose items (i.e., lamp post, roofs, loose planks, and other light materials) by adding extra guy wires or reinforcing materials ▪ Removal of obstructions to the drainage system ▪ In case of storm warning from PAGASA, monitoring of important weather forecast/ parameters, such as path and intensity of the storm	▪ Notice for personnel to avoid staying outdoors; to stay away from items that may be blown away by strong winds and from electrical mains ▪ Continuous monitoring of the weather conditions ▪ Shutdown of all gas and electric equipment	▪ Inspection of facility for any major structural defect, crack, unstable item, and other potential hazards ▪ Repair of broken power lines, fuel lines, and other utilities, if necessary ▪ Securing of important items and equipment from unauthorized access from outsiders, after the building is declared safe for re-entry
F. Structural Collapse		
▪ Conduct of detailed design prior to construction and to	▪ Immediate reporting of the accident.	▪ Prohibition of returning to the facility if it is deemed

PREPARATION	RESPONSE	RECOVERY
consider in the design the event of natural calamities and other external factors that may affect the erection of the building ▪ Implementation of best practices during construction ▪ Implementation of strong foundation of the building ▪ Use of high-quality construction materials. ▪ Regular inspection of the building. ▪ Orientation of personnel on safe locations, emergency response equipment, and evacuation routes ▪ Development of evacuation plan	▪ Implement evacuation plan ▪ Survey the scene if it is safe to enter. If yes, check for people that may be trapped, injured or needs further assistance and provide safe evacuation. ▪ Immediate application of first aid to injured people. ▪ Shutdown of all gas and electrical equipment. ▪ Coordinate with other agencies for appropriate response and assistance	structurally unstable, or declared unsafe ▪ Assess and investigate the damage in the property. ▪ Assess the site for other potential hazards such as air contamination, water flooding, spillage of hazardous wastes, etc.

Table 4-4: Roles and Responsibilities in the Emergency Plan

EMERGENCY RESPONSE PERSONNEL	ROLES AND RESPONSIBILITIES
Incident Commander	▪ Overall in-charge of operations during an event of an emergency ▪ Gives direction and orders to the response teams in managing the emergency
Safety Officer	▪ Supervises the daily safety performance of operations and maintenance procedures, including emergency response procedures
Liaison Officer	▪ Secures the necessary permits and training certification for the personnel
Public Information Officer	▪ Performs communication duties in behalf DPWH to the media, government officials, and the local population ▪ Issues relevant warnings and advisories to concerned authorities
Operations Team	▪ Performs the actual response, rescue, and retrieval of personnel and equipment during an event of an emergency
Planning/Intelligence Team	▪ Devices programs and policies for proper response procedures ▪ Informs the operations team regarding the nature and type of response procedure for the Operations Team ▪ Identifies potential hazards and performs recommendations to authorities
Logistics Team	▪ Provides the necessary supplies and equipment for the Operations Team ▪ Provides additional support/assistance to the Operations Team
Finance and Administration Team	▪ Provides the assessment of expenses and allocates the necessary financial resources for the other Teams ▪ Performs the disbursement of claims and compensation for affected personnel, property, and the community

4.6 SAFETY AND HEALTH PROGRAM

[735]**DPWH** gives priority on the safety of its employees and their working environment. It developed this program for accident and injury prevention through the implementation of appropriate rules and guidelines that shall involve management, supervisors, and employees in identifying and eliminating hazards that may develop during work process.

4.6.1 Leadership and Administration

[736]The management will spearhead in the formation of a safety committee, develop a system for identifying/correcting hazards, prepare for foreseeable emergencies, provide appropriate trainings, and establish a disciplinary policy to ensure strict compliance.

4.6.1.1 Safety policy

[737]It is basic policy that no task is so important that an employee must take a risk of injury/illness or violate a safety rule. Active involvement in safety practices is then encouraged to make the area a safe place to work.

[738]It is the daily duty of every employee to be cautious of unsafe conditions. In addition to this, supervisors or accountable managers are responsible in overseeing the actions of employees and to take prompt action in eliminating unsafe practices and hazards in the workplace.

4.6.2 Accident/Incident Investigation Reporting

[739]It is very advantageous for every employee to be prepared for any emergency to prevent further injury, property damage, and loss of limb or even life. An emergency preparedness plan must then be prepared and strictly implemented.

[740]Prevention of accidents by eliminating potential threats/hazards and anticipating other probable causes is an effective way of creating a safe and healthy environment.

[741]**Emergency Response Program.** The emergency response program shall be implemented by an emergency response team composed of equipped and trained personnel who will be tasked to handle and manage the program, assist other employees to safety, and to prevent any damage or injury. Proper training and orientation of concerned team members will be accorded to prepare them in responding appropriately in any emergency they may encounter.

[742]**Personal Protective Equipment.** The personal protective equipment (PPE) is a set of safety gear worn by personnel that is designed to provide enough safeguard against occupational-related illnesses and to prevent life-threatening injuries.

[743]PPE, such as safety hats, safety shoes, gloves, dust mask, and ear plugs, will be provided as necessary. This is to ensure safe and protected personnel working in safe working environment. **DPWH** will make the usage of PPE a mandatory policy for personnel working inside the Project premises. Guests and visitors will also be required to wear PPE as necessary.

4.6.2.1 Incident response procedure

[744]Any accident, injury, or work-related illness should be reported and investigated on immediately to determine the appropriate action to be conducted.

[745]**Recording and Review.** It is mandatory that employees are to report any injury or work-related illness to their immediate supervisor regardless of how serious. Minor injuries, such as cuts and scrapes, can be entered on the first aid only log. More serious injuries are to be reported and recorded properly for future review.

[746]**Incident Investigation.** It is imperative that an incident scene should not be disturbed except to aid in rescue or make the scene from further incidence. In case of an incident resulting in death or serious injuries, a preliminary investigation will be conducted by the immediate supervisor of the injured person(s), a person designated by management, an employee representative of the safety committee, and any other person whose expertise would help the investigation.

[747]The investigating team will obtain written statements from witness, photograph the incident scene and machines/equipment involved. The said team will also document, as soon as possible after the incident, the condition of equipment and anything that may be relevant in the work area. A written "Incident Investigation Report" is necessary. The report should include a sequence of events leading up to the incident, conclusions derived from the incident and any recommendation to prevent a similar incident in the future.

[748]**Damage Control.** Damage cost because of accident is unquantifiable, especially when damage to life and limb is involved. Cost of properties, structure, and equipment including its effect on existing productivity is quantifiable.

[749]Any employee may be subject to on-the-spot termination when a safety violation places the employee or co-workers at risk of permanent disability or death.

SECTION 5

SOCIAL DEVELOPMENT PLAN (SDP) FRAMEWORK AND IEC FRAMEWORK

5.1 SOCIAL DEVELOPMENT PROGRAM

[750]An indicative community-based Social Development Plan (SDP), as presented in **Table 5-1**, was developed through a series of consultation with various stakeholder representatives in the project impact areas.

[751]The objectives of the SDP include the following:

(a) Identify the basic needs and welfare of the host community as basis for the framework of social development program of the proposed project; and
(b) Establish a working relation with **DPWH** and the various community stakeholders with the goal of improving the quality of life of the project-affected communities by instilling self-reliance.

[752]The community-based consultation during the development of the SDP also provides an opportunity for identifying the following:

(a) Addressing key issues and concerns by the various stakeholders;
(b) Identifying and designing the recommend measures in response to the issues and concerns that were raised;
(c) Identifying the lead agency or organization responsible in implementing the measures; and
(d) Setting of timelines in implementing these measures consistent with the plans and programs of the lead agencies.

5.2 INDIGENOUS PEOPLES PLAN

[753]The SDP for IPs will be based on the agreements stipulated in the respective MOA between Ikalahan Kalanguya ICCs and Kalanguya ICCs. Further, an Indigenous Peoples Plan (IPP) for the 2 ICC groups were being prepared as part of the proposed project.

Table 5-1: Matrix of Social Development Plan

CONCERN	PROGRAM/PROJECT/ACTIVITY	RESPONSIBLE COMMUNITY MEMBER/ BENEFICIARY	GOVERNMENT AGENCY/ NON-GOVERNMENT AGENCY AND SERVICES	PROPONENT	INDICATIVE TIMELINE	SOURCE OF FUND
Livelihood and Employment	On-the-Job Training (OJT) Program Junior Cadetship	Brgy. Kagawad for Education Students of higher-level academic institutions in and nearby barangays	CHEd Region II CHEd Region III Host Municipal LGUs Host Brgy. LGUs Neighboring Brgys.	DPWH	Pre-Construction	DPWH/ Contractor
Environment	Climate Change Adaptation and Disaster Risk Reduction Management training	Host community and nearby barangays	MDRRMO Host Municipal LGUs Host Brgy. LGUs	DPWH	Construction	DPWH/ Contractor
Safety	Provision of traffic signage and early warning device in strategic areas in host barangays	Host barangays	Host Municipal LGUs Host Brgy. LGUs	DPWH	Construction	DPWH/ Contractor
NOTE: Based on the Revised Procedural Manual for DAO 2003-30						

5.3 INFORMATION AND EDUCATION CAMPAIGN

[754]The Information and Education Campaign (IEC) for the proposed project will be conducted in all phases of its development, which also allows for a regular feedback/ grievance mechanism of issues and concerns. The contents of the IEC are based on the action or plans of **DPWH** and its designated contractors and will be monitored by a multipartite group for evaluation.

[755]A feedback/grievance mechanism is a very important tool to educate people regarding the project's development and to check whether the project has negative or positive effects or perception. It will strengthen the knowledge of the people with regards to the positive impacts of the project, as well as the effort of the monitoring team together with the proponent in resolving unfavorable events, if any.

[756]Integral to the IEC is the regular reporting of the **DPWH** on the progress of the proposed project's operations. In general, the proponent shall update the host LGUs on a regular basis on the: a) progress of the project; b) how the agreements are being followed; c) any minor or major changes done or to be made; d) any problems, concerns, and issues that might occur or have occurred and the corresponding actions undertaken by the **DPWH** and its contractor; and e) appropriate actions conducted by the **DPWH** and its contractor to avoid or mitigate any negative impact of the project. The proponent will implement the IEC activities to establish transparency and to develop a partnership with the host communities and the LGU.

[757]IEC activities envisioned for the project would include several and regular interactions between the proponent, the host communities, and the local government officials. **Table 5-10** presents the indicative IEC plan, which will be further improved after the series of consultations and future developments details of the project. Throughout the different phases of the proposed project, the Proponent will continue to inform the stakeholders about the status of the social development plan (SDP) to prevent any speculations, anxiety, and miscommunication.

5.3.1 Public Consultation

[758]The DENR Administrative Order (DAO) No. 2017-15 (Guidelines on Public Participation under the Philippine Environmental Impact Statement System) requires early involvement of stakeholders at the onset of the EIA process. The **DPWH** ensured early involvement of stakeholders when it initiated the conduct of IEC campaigns with the stakeholders before the conduct of the public scoping.

[759]With the emergence of the Corona Virus Disease 2019 (COVID-19) in the Philippines, the DENR Environmental Management Bureau (DENR-EMB) released last 29 July 2020 the Memorandum Circular No. 2020-30 (Interim Guidelines on Public Participation of the Philippine Environmental Impact Statement System (PD 1586) during the State of National Public Health Emergency.

[760]The conduct of IEC meetings and public scoping were done with minimal interaction and adhered to guidelines and protocols for mass gatherings set by the Inter-Agency Task Force for the Management of Emerging Infectious Diseases (IATF).

[761]In compliance with EMB MC 2020-30, the public scoping was conducted using online video conferencing via zoom.us platform. The notice of online public scoping was posted last 4 November 2021 in the EMB website (http://eia.emb.gov.ph/?page_id=4611).

5.3.1.1 Information and Education Campaign (IEC)

[762]**Table 5-2** presents the schedule and the gender disaggregated number of participants during IEC meetings. The meetings were conducted in the respective Municipal Halls of the host municipalities. The total number of participants who participated in the IEC meetings was 41.

Table 5-2: Schedule and Number of Participants for the IEC Meetings

LGU	DATE & TIME	MALE PARTICIPANTS	FEMALE PARTICIPANTS	TOTAL PARTICIPANTS
Aritao, Nueva Vizcaya	30 June 2021 9:00-11:00AM	8	4	12
Santa Fe, Nueva Vizcaya	1 July 2021 9:00-11:00AM	8	4	12
Carranglan, Nueva Ecija	2 July 2021 9:00-11:00AM	11	6	17
	TOTAL	**27**	**14**	**41**

[763]The issues, concerns, and suggestions raised by the participants during the open forum and the corresponding responses of **DPWH**, and the EIA preparer were summarized in the matrix below.

Table 5-3: Matrix of Issues and Concerns raised during the IEC Meetings

ISSUES/CONCERNS/QUERIES	RESPONSIBLE PERSON	ACTION/RESPONSE
F. IEC FOR ARITAO, NUEVA VIZCAYA		
Which of the four alternatives has been chosen for the project?	**Municipal Planning and Development Coordinator**	**EIA Study Team:** Alternative D was chosen based on the Route Analysis conducted by JICA Study Team.
The Indigenous Peoples' (IPs') Memorandum of Agreement (MOA) should be updated to consider change from 2-lanes to 4-lanes.	**Indigenous Peoples Mandatory Representative**	**Engr. Ronel Bulan (DPWH):** No need to amend MOA since 4 lanes will be constructed within the agreed road right-of-way (RRoW) of 60 meters.
In your study, kindly put emphasis on mitigation and effects to the indigenous peoples.	**Municipal Planning and Development Coordinator**	The EIA study team noted the comments from the Municipal Planning and Development Coordinator.
Kindly consider the fault line near Dalton and check if it will affect the project.	**Municipal Planning and Development Coordinator**	The EIA study team noted the comments from the Municipal Planning and Development Coordinator. The study team will look into the said fault line and include discussions in the Environmental Impact Assessment (EIA) Report
Where will the drilled materials from tunneling be disposed?	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** Spoils disposal areas have been identified near the portals of the tunnels, subject for finalization and approval. Some of the spoils may be used as fill materials for the project.

ISSUES/CONCERNS/QUERIES	RESPONSIBLE PERSON	ACTION/RESPONSE
Should there be hindrances against the construction of the tunnel, will there be a chance for the tunnel alignment to change?	**Indigenous Peoples Mandatory Representative**	**Engr. Ronel Bulan (DPWH):** This is the reason why we are conducting feasibility studies and detailed engineering design (DED) to know how and where the tunnel will be constructed.
Will you incorporate the tourism potential and features in the project design?	**Municipal Agriculture Officer**	**EIA Study Team:** The tourism potential and features will be brought up to DPWH and JICA.
Will there be resettlement in the project?	**Municipal Social Welfare and Development Officer**	**EIA Study Team:** Resettlement considerations are part of the JICA study for the project. A separate study team will be preparing a Right-of-Way Acquisition Plan (RAP) for the project.
We have an IP policy in Aritao, which states that IPs must be given priority for livelihood and employment.	**Indigenous Peoples Mandatory Representative**	**EIA Study Team:** Both locals and IPs have a chance to be employed if they are qualified. The LGU can prepare the locals and IPs in undergoing Technical Education and Skills Development Authority (TESDA) accredited trainings in anticipation of the manpower requirements for the project.
Suggestion for joint RAP consultations in the Municipalities of Aritao and Santa Fe	**Indigenous Peoples Mandatory Representative**	**EIA Study Team:** The EIA study team noted the comments from the Indigenous Peoples Mandatory Representative. The consultation for RAP is different from the consultation for the EIA process. We also need to consider Covid-19 and the limitations set by the local government and IATF on mass gatherings.
Will there be agricultural areas that will be affected by the proposed project?	**Municipal Agriculture Officer**	**EIA Study Team:** The project-affected lands (agriculture and non-agriculture) and structures will be discussed during the RAP study team.
Will there be compensation for people who will be affected/need to be relocated?	**Municipal Environment and Natural Resources Officer**	**EIA Study Team:** The compensation for project-affected persons/families (PAP/Fs) will be discussed thoroughly by the RAP study team.
One of DPWH's contractors did not comply with the MOA	**Indigenous Peoples Mandatory Representative**	**Engr. Ronel Bulan (DPWH):** Ms. Lalaine Catulong of DPWH has advised the IPs to submit Letter to DPWH Region regarding this matter.

ISSUES/CONCERNS/QUERIES	RESPONSIBLE PERSON	ACTION/RESPONSE
Will there be a resolution regarding the boundary dispute of Canabuan, Aritao and Canabuan, Santa Fe?	**Indigenous Peoples Mandatory Representative**	**EIA Study Team:** The EIA study team noted the comments from the Indigenous Peoples Mandatory Representative. The study team will look into the said issue and include discussions in the Environmental Impact Assessment (EIA) Report
On Japanese Burial Sites	**JICA Study Team**	The participants mentioned that there were no known Japanese Burial Sites in the municipality.
G. IEC FOR SANTA FE, NUEVA VIZCAYA		
Clarification about the tunnel – how many will be constructed?	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** A route selection was conducted. As presented, there were two tunnels that will be constructed for the project.
This is a good project. How about the road issues of the existing Dalton Pass?	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** The proposed alternative road will allow for DPWH to address the issues and implement rehabilitation of the existing Dalton Pass. There is also an ongoing road widening across the Pan Philippine Highway.
What about the economic impact of the proposed project to our municipality? Will DPWH have a plan for the next 9 years (project completion) to address the economic impacts of the proposed project to our municipality? The number of vehicles will be reduced, hence the number of potential sources of income (transients/motorist) will also be reduced, if DPEAR will be completed.	**Municipal Administrator**	**Engr. Ronel Bulan (DPWH):** This issue will be carefully studied and will be part of the analysis.
May we use this opportunity to request to urge DPWH Region II to address the "poorly maintained" road of the existing Dalton Pass passing the municipality of Santa Fe.	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** We have noted your concern and we will relay this to our Project Director for appropriate guidance and action.
Is the project part of the North-East Luzon Expressway (NELEX)?	**Municipal Administrator**	**Engr. Ronel Bulan (DPWH):** The project is not part of NELEX.
Why not widen the existing expressway in San Nicolas, Pangasinan?	**Indigenous Peoples Mandatory Representative**	**Engr. Ronel Bulan (DPWH):** San Nicolas, Pangasinan was originally envisioned as the alternate route but was strongly opposed by the IPs during

ISSUES/CONCERNS/QUERIES	RESPONSIBLE PERSON	ACTION/RESPONSE
Our concern is on the economic impact once traffic is diverted from existing Dalton Pass to the alternative road.		the Free and Prior Informed Consent (FPIC). DPWH did not push through with the alignment/project due to opposition. The economic implications of the project to the municipality of Santa Fe will be part of the study. The project will undergo evaluation by the National Economic and Development Authority (NEDA).
Will the IPs in Brgy. Bantina, adjacent to Brgy. Canabuan, be affected? They are also an IP community. In the next consultations, kindly involve more stakeholders.	**Municipal Mayor**	**EIA Study Team:** The EIA study team noted the comments from Hon. Tidong A. Benito. More stakeholders will be invited in the succeeding consultations.
On Japanese Burial Sites.	**JICA Study Team**	The participants mentioned that there were Japanese Burial Sites in Barangay Tactac/Balete Pass/Barangay Malico area in 1970s. Some of the Japanese remains were already returned to the Japanese Government.
H. IEC FOR CARRANGLAN, NUEVA ECIJA		
In the previously presented alignment, there were few farmlands that will be affected. As it was changed, there were a lot of farmlands that were affected. Can the project alignment be changed to avoid the said farmlands?	**Barangay Captain of Brgy. Salazar**	**EIA Study Team:** There will be a RAP to be prepared for the project to identify the extent of the impacts of the project to project-affected lands. **Municipal Engineer:** As per Road Right-of-Way (RRoW) Act, affected private landowners will be compensated - if land titled only. **Engr. Bill Ponce (DPWH):** Republic Act No. 10752 states that there will be just compensation for affected landowners.
During the initial meetings for the project, some of the landowners inquired if the project alignment can be adjusted.	**Sangguniang Bayan Member**	**EIA Study Team:** The current proposed alignment is selected based on route analysis. A separate study team will be preparing a RAP for the project.
The on-going study on NELEX:	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** NELEX is under DPWH-UMO-RMCII (Multilateral).

ISSUES/CONCERNS/QUERIES	RESPONSIBLE PERSON	ACTION/RESPONSE
Private domains (including agricultural areas) and ancestral lands that will be affected. Both NELEX and DPEAR projects can affect agricultural areas in Carranglan. Agriculture is the main source of livelihood in the municipality.		The project cost was higher than economic internal rate of return, therefore not economically feasible. Regarding the effects to agriculture (food security and economy), this will be included in the study being conducted for the proposed project.
The existing segment already has damages. Who will undertake the operations and maintenance (O&M) of the existing segments?	**Municipal Planning and Development Coordinator**	**Engr. Ronel Bulan (DPWH):** The O&M for the existing segments is within jurisdiction of the DPWH Regional Office and District Engineering Offices (DEOs).
The value of property in Carranglan, especially near the road, will become higher and will benefit the generations of people in the municipality.	**Municipal Engineer**	**EIA Study Team:** The EIA study team noted the comments from the Municipal Engineer.
It is important that all those who will be affected by the project will be properly compensated and supported.	**Municipal Mayor**	**EIA Study Team:** The EIA study team noted the comments from Hon. Mary B. Abad. Consultations will be conducted by EIA Team, RAP Team, IP Team for all stakeholders.
Please have a list of project-affected farmers.	**Municipal Agriculture Officer**	**EIA Study Team:** A separate study team will be preparing a RAP for the project. They will ensure that project-affected farmers will be listed and documented.
On Japanese Burial Sites	**JICA Study Team**	The participants mentioned that there were no known Japanese Burial Sites in the municipality.

5.3.1.2 Public Scoping

[764]**Table 5-4** presents the schedule and the gender disaggregated number of participants during the public scoping. To provide better connectivity and access to the participants, online public scoping stations were set up for each Municipal Halls. The total number of participants who participated in the public scoping via zoom conference was 68.

Table 5-4: Schedule and Number of Participants for the Public Scoping

LGU	DATE & TIME	MALE PARTICIPANTS	FEMALE PARTICIPANTS	TOTAL PARTICIPANTS
Aritao, Nueva Vizcaya	16 November 2021 1:00pm to 3:00pm	2	0	**2**
Santa Fe, Nueva Vizcaya		16	8	**24**
Carranglan, Nueva Ecija		9	7	**16**
Zoom Registration		20	6	**26**
TOTAL		**47**	**21**	**68**

[765]The issues, concerns, and suggestions raised by the participants during the open forum and the corresponding responses of **DPWH**, and the EIA preparer were summarized in the matrix below.

Table 5-5: Matrix of Issues and Concerns raised during the Public Scoping

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
A. PROJECT DESCRIPTION		
Are there alternative routes for the proposed project?	**Municipal Engineering Officer of Sta. Fe**	**Engr. Ronel Bulan (DPWH):** We have considered alternate routes, such as the North Luzon East Expressway (NELEX), before. However, the NELEX economic feasibility failed. There were no other alternatives for DPEAR Project.
Will there be maintenance and improvement work in the existing roads like Dalton Pass and others?	**Municipal Administrator of Sta. Fe**	**Engr. Ronel Bulan (DPWH):** We have regional and district engineering offices implementing various maintenance projects along the Pan Philippine Highway Network.
B. LAND		
The tunnel sections of the proposed project contain minerals like quartz based on the previous studies conducted in the area. What will DPWH do with the mined minerals, if any?	**Municipal Engineering Officer of Sta. Fe**	**LCI Envi Corporation:** This comment was noted. This will form part of the EIA study for the proposed project.
Will there be disposal sites of the excavated materials for the proposed project?		**Engr. Ronel Bulan (DPWH):** We have identified disposal sites for the proposed project. If the materials excavated were found to be suitable for construction, the project will utilize them. If unsuitable, we will transport them in the identified disposal sites.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
C. AIR		
No issues and concerns raised for the air module.		
D. WATER		
No issues and concerns raised for the water module.		
E. PEOPLE		
What are your plans for the indigenous peoples (IPs)? Will the IPs be affected?	**Municipal Environment and Natural Resources Officer of Sta. Fe**	**Engr. Ronel Bulan (DPWH):** We have secured the certification precondition (CP) from the National Commission on Indigenous Peoples (NCIP), which contains the commitments of DPWH to the ADs and IPs affected by the proposed project.
Will DPWH consider getting laborers in the affected LGUs to work for the proposed project?	**Municipal Administrator of Sta. Fe**	**Engr. Ronel Bulan (DPWH):** As part of the compliance to the Department of Labor and Employment (DOLE) requirements of hiring, DPWH, through its qualified contractors will prioritize hiring of the qualified skilled laborers in the proposed project.
We are supportive of the proposed project. We will wait for further consultations for the proposed project for the implementation of the development projects for the affected barangays, especially on indigenous peoples.	**Municipal Mayor of Carranglan**	**Lalaine Catulong (DPWH):** An Indigenous Peoples Plan (IPP) will be prepared to address the impacts, mitigation, and development programs/projects/activities (P/P/As). **LCI Envi Corporation:** This comment was noted. This will form part of the EIA study for the proposed project. We will integrate the IPP and RAP in the EIA study.

5.3.1.3 Public Consultation Meeting

[766]Public Consultation Meetings were held for each of the directly affected municipalities for the proposed project was held last 24 November 2022 (Thursday) from 9:00am to 11:30am in Aritao Municipal Covered Court covering the host barangays of Canabuan and Canarem, and from 1:30pm to 4:00pm in Santa Fe Municipal Covered Court covering the host barangay of Canabuan. Moreover, another session was held on 25 November 2022 (Friday) from 9:00am to 11:30am in Carranglan Municipal (Pag-asa) Covered Court covering the host Barangays of Bunga, Burgos, and Salazar.

[767]A total of 161 participants (93 males and 68 females) participated in the said consultation meetings (**Table 5-6**).

Table 5-6: Schedule and Number of Participants for the Public Consultation Meeting

DATE & TIME	ATTENDEES	PARTICIPANTS		
		MALE	FEMALE	TOTAL
Aritao, Nueva Vizcaya				
23 November 2022 9:00 – 11:30 AM	**LGU Aritao** • Municipal Vice Mayor • SB Member • MENRO • Municipal IPMR	6	3	**9**
	Barangay Canabuan • Barangay Officials • Barangay IPMR • Women's Association • Non-Government Office • Indigenous People	13	13	**26**
	Barangay Canarem • Barangay Officials • Youth Representative • Women's Association • BACDI Association • Abot-Palad (Women's Group)	5	3	**8**
	DENR-EMB Region II	1	1	**2**
	DENR-PENRO Nueva Vizcaya	2	1	**3**
	DENR-CENRO	0	1	**1**
	DPWH Representatives	1	2	**3**
	LCI (Local Consultant)	3	1	**4**
	SUB-TOTAL	***31***	***25***	***56***
Santa Fe, Nueva Vizcaya				
23 November 2022 9:00 – 11:30 AM	**LGU Santa Fe** • Municipal Mayor • Municipal Administrator • Municipal Planning and Development Coordinator • Municipal Engineer • Municipal Health Officer • SB Member • Staff	8	3	**11**
	Santa Fe Office of the Senior Citizens Representative	1	0	**1**
	Transport Cooperative Representative	2	0	**2**
	Barangay Canabuan • Barangay Officials • Barangay IPMR • IP Elder • Women's Association (BATWA & Baracbac)	5	3	**8**
	Barangay Poblacion • Barangay Officials	2	0	**2**
	DENR-EMB Region II	1	1	**2**
	DENR-PENRO Nueva Vizcaya	2	1	**3**
	DENR-CENRO	0	1	**1**
	DPWH Representatives	1	2	**3**
	LCI (Local Consultant)	3	1	**4**
	SUB-TOTAL	***25***	***12***	***37***

DATE & TIME	ATTENDEES	PARTICIPANTS MALE	FEMALE	TOTAL
Carranglan, Nueva Ecija				
23 November 2022 9:00 – 11:30 AM	**LGU Carranglan** • Municipal Administrator • Municipal Planning and Development Coordinator • Municipal Engineer • MENRO • Tourism Officer • Clerk	5	1	**6**
	Barangay Bunga • Barangay Officials and staff • PAPs (Sitio Laat) • Women's Association • Senior Citizens' Representative • Barangay IPMR	12	10	**22**
	Barangay Burgos • Barangay Officials and staff • Youth Representative • Sitio Leader • Barangay IPMR • IP Elder	4	6	**10**
	Barangay Salazar • Barangay Officials • Senior Citizens' Representative • People's Organization Representative • BMPAI Organization	7	6	**13**
	Barangay R.A. Padilla • Barangay Officials • Bantay Bayan • Women's Group	2	5	**7**
	DENR-CENRO	3	0	**3**
	DPWH Representatives	1	2	**3**
	LCI (Local Consultant)	3	1	**4**
	SUB-TOTAL	***37***	***31***	***68***
	TOTAL	**93**	**68**	**161**

[768]The main objective of the consultation meetings was to inform the host communities about the development of the proposed DPEAR Project and to give them the opportunity to express their opinions on the presented potential impacts and mitigation measures of the project. This activity allowed **DPWH** to examine and respond to such comments to avoid potential conflicts or complaints in the future, and in preparation for the upcoming Public Hearing for the proposed project as part of the PEISS.

[769]The issues, concerns, and suggestions raised by the participants during the open forum and the corresponding responses of **DPWH**, and the EIA preparer were summarized in the matrix below.

Table 5-7: Matrix of Issues and Concerns raised during the Public Consultation Meeting

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
Aritao, Nueva Vizcaya		
Project Description		
Does the presented 60-meter span of the project encompass both road and tunnel designs?	**Mr. Reynaldo Pugsong, Chairman, Barangay Canabuan**	**EIA Preparer** Yes, based on the latest design of the project. To achieve the 60 meters, measure 30 meters to the left and right of the centerline of the project.
As previously stated, the Project may become a tourist destination; is there a difference in traffic safety between the proposed project and the existing tunnel?	**Mr. Bernel A. Prado, SB Member, LGU-Aritao**	**EIA Preparer** The Tunnel Operations Center (TOC) is what makes this project distinctive. CCTVs will be installed along the length of the tunnel, and emergency and firefighting facilities are included into the design of the tunnel to ensure the safety of the road users.
Does the project qualify as an expressway? If so, will there be a toll? If yes, would a sum be allocated to assist the community?	**DENR-CENRO**	**DPWH** There will, indeed, be a toll. This suggestion was acknowledged by the Proponent.
Will there be road fencing if this project is classified as an expressway?	**Mr. Bernel A. Prado, SB Member, LGU-Aritao**	**DPWH** To avoid accidents from crossing humans and animals, fence will be built along the side of the road. During the DED Phase of the Project, this topic will be discussed in greater depth.
Land		
When was the tree inventory conducted in relation to the given number of trees affected along the project alignment? The DENR also oversees a National Greening Program in Barangays Canarem and Canabuan.	**For. Marlon Bayag, DENR-PENRO Nueva Vizcaya**	**EIA Preparer** The Resettlement Action Plan (RAP) Team conducted a preliminary tree inventory survey in 2022. Aerial/Remote Satellite Photos were utilized to estimate the number of trees. The affected trees covered by the National Greening Project was considered in the report. Furthermore, the EIA Study Team has previously spoken with Forest Management Plan-Project Management. During the DED Stage of the project, the team will conduct a full tree inventory survey and will cooperate with DENR during validation.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
It was indicated in the presentation that for every tree that is cut down, 100 saplings would be planted. Is it feasible to substitute fruit-bearing tree saplings?	**Kagawad, Barangay Canarem**	**EIA Preparer** We will adhere to the process of the Tree Cutting Permit. The replacement seedlings will be given to the DENR-PENRO or CENRO in charge of the area. They will also decide which tree species are required in the region and who will get seedlings.
Water		
What are the specific names of the waterbodies sampled to acquire the baseline data along the project alignment? In which stations or barangays did the Fecal Coliform findings exceed the DENR standards?	**For. Steve Esguerra, DENR-EMB Region II**	**EIA Preparer** The complete EIA report for the Project includes a more detailed discussion and presentation of data on the baseline assessment. Following the first Technical Review, it will be posted to the EMB website. Once the EIA Report is posted online, we will send a copy to your office.
We appreciate the information presented in the EIA Report, which might serve as a benchmark for the LGU. We request to obtain a copy of the study as well as the IP Development Plan (IPDP).	**Mr. Joseph Opena, MENRO, LGU-Aritao**	**EIA Preparer** We are obligated to send a copy of the report to the local governments. The report will be available for download from the Official EMB website. Concerning the IPDP, the consultation findings and report will be completed before being shared with the LGU.
Air		
This module received no comments.		
People		
What will happen to the structures (houses) impacted by the project alignment? Will they be moved or paid before the project construction begins? We hope that the settlement with the affected households will be completed before the commencement of construction in 2026.	**Mr. Manric Gaynat, Chairman, Barangay Canarem**	**DPWH** As a policy of the DPWH, the project will not commence if the right-of-way is not yet cleared or settled. During the Project's Detailed Engineering Design Phase, the optimal alignment will be established, and negotiations with individuals inside the alignment's 60-meter width will begin. Rest confident that public engagement will continue during the DED, and appropriate compensation will be provided prior to the commencement of the project. **EIA Preparer** JICA will also monitor the implementation of RAP and ensure that impacted individuals are compensated prior to the start of the project.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
What types of project-related works are appropriate for women?	**Carmelita Pugsong, Women's Association Representative, Barangay Canabuan**	**EIA Preparer** As stated in the law, there shall be no discrimination in the workplace. Individuals are permitted to work in any occupation if they are willing and have an able body. There will also be a posting of manpower requirements, and the proponent will coordinate with the LGU's Public Employment Service Office (PESO) to discuss this matter.
What relevant livelihood programs can you provide to our constituents, particularly women?	**Hon. Jason Ferrer, Vice Mayor, LGU-Aritao**	**EIA Preparer** The RAP discusses livelihood rehabilitation (skills training) for those whose livelihoods may be impacted by the project. LGUs may collaborate with TESDA to secure the manpower requirements of the project.
The LGU of Aritao can enter into a Memorandum of Agreement (MOA) with the DPWH to ensure that residents of Aritao can apply for job in the TOC.	**Hon. Jason Ferrer, Vice Mayor, LGU-Aritao**	**EIA Preparer** We will take note of your suggestion and will discuss it once the specifics of the Tunnel Operation's manpower have been finalized.
Santa Fe, Nueva Vizcaya		
Project Description		
Previously, the road and tunnel design were only two lanes; however, in today's presentation, it was altered to four lanes. Could you kindly specify which is which?	**Mr. Benjamin Baguyo, Municipal IPMR**	**EIA Preparer** The latest design is being developed for the 60-meter right-of-way, regardless of the number of lanes. **DPWH** The change from two to four lanes has no major impact on the current environment as long as it stays within the 60-meter road-right-of-way.
Land		
A Memorandum of Agreement (MOA) was recently signed between DPWH Region 2 and DENR Regional Executive Director about the seedling replacement. Based on the MOA there is a new guideline regarding seedling establishment and replacement.	**For. Marlon Bayag, DENR-PENRO Nueva Vizcaya**	**EIA Preparer** We will investigate that guideline and check its applicability to the project.
In terms of the Tree Cutting Permit procedure, what steps	**Mr. Benjamin Baguyo, Municipal IPMR**	**EIA Preparer** A tree inventory will be performed to determine whether a tree has been planted.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
will it take if the tree is within a CADT?		Trees that are planted will be tagged to their owner (e.g., IP). According to the project's RAP, persons who own a certain number of trees would be compensated. This procedure is distinct from the application for a tree cutting permission. **DPWH** The individual who planted the tree will receive compensation for the trees that will be cut down. The DPWH will get a certification from the barangay to verify who owns the tree.
Where are we going to dispose of the excavated soil during tunnel works?	**Mr. Aries Valderama, OIC Municipal Engineer, LGU-Santa Fe**	**EIA Preparer** A designated soil disposal site will be established. As of now, possible disposal sites have been identified at the tunnel section's entrance and exit points, which are still subject to IP approval (for locations areas inside a CADT). There is also prior discussion that if the excavated soil may be utilized as a construction material, compensation would be provided.
What are the findings on the minerals that can be extracted during the excavation?	**Engr. Kennedy Baluyan Jr., MPDC**	**EIA Preparer** A tunnel boring survey was carried out, although it was only conducted to the tunnel entrance and exits. We also consulted DENR-MGB about the minerals that may be discovered in the region. They confirmed that the proposed area is not designated as mineral land (no valuable minerals).
Water		
Did the study address the implications of tunnel boring on local water sources?	**Mr. Aries Valderama, OIC Municipal Engineer, LGU-Santa Fe**	**EIA Preparer** It should be noted that the New Austrian Tunneling Method (NATM) use a drill jumbo rather than a tunnel boring equipment. The alignment of the tunnel is intended to avoid crossing any bodies of water or subsurface water, as this might jeopardize the structural stability of the tunnel.
If the project is completed by 2030, there is a good chance it will become a tourist attraction.	**Mr. Aries Valderama, OIC Municipal Engineer, LGU-Santa Fe**	**EIA Preparer** Yes, the tunnel in this project has the potential to be a tourist destination given that it will be the longest tunnel in the country.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
What measures does the government do to ensure that the livelihood along the existing Dalton Pass will not be severely affected by the alternate route?		This concern is being considered. In fact, not all vehicles will be able to use the Dalton Pass East Alignment Road. Many vehicles will still use the existing one. These things are still being studied and subject to NEDA approval.
Considering the project's stated design and its potential as a tourist attraction, we recommend providing a parking space for individuals who wish to appreciate the structure while also considering their safety.	**Engr. Kennedy Baluyan Jr., MPDC**	**EIA Preparer** The suggestion is great and has been taken into consideration. These are the details that may be addressed further during the project's DED Stage. As of now, emergency bays are one of the safety features of this project. We underline that the highway's design speed is 60 kph. It may endanger individuals who stop in the middle of the road.
Air		
Dust might be present during the construction. Does it have an effect to our Barangay Constituents? And how will we address this?	**Mr. Alejo Talapi, Brgy. Canabuan IPMR**	**EIA Preparer** To reduce the spread of dust, mitigating measures include using coverings and dampening the roadways. Morbidity and mortality rate of the project area is also incorporated in the report as a baseline. If there is an increase in respiratory diseases and there is construction going on, it might be ascribed to the activities. You can file a complaint with the GRM and request that the proponent address your concerns.
People		
As previously agreed during the earlier consultations, manpower will be sourced from Barangay Canabuan.	**Mr. Ben Balalong, Chairperson, Barangay Canabuan**	**EIA Preparer** Yes, it is the commitment of the proponent to hire manpower from the impact barangays. We presented DPWH hiring policies to underline that there will be no discrimination while applying for project work. We also presented the project timeline to ensure that the workers from barangays will be able to prepare and equipped themselves for the work.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
How can we be certain that the workers will receive the correct compensation/rate?	**Engr. Kennedy Baluyan Jr., MPDC**	**EIA Preparer** The fact that this project is foreign assisted is a plus. JICA guarantees that the social safeguards will be enforced. A Grievance Redress Mechanism will also be established to address grievances, such as wage difficulties and the like.
As shown in the presentation, what will be the composition of the monitoring team for the project?	**Benjamin Baguyo, Municipal IPMR**	**EIA Preparer** The DENR will require the project to establish a Multi-Partite Monitoring Team (MMT) once the proponent has acquired the ECC. The MMT will be composed of the municipal officials, IPs, and DPWH. A separate MOA will be formulated by the DENR. **DPWH** The MMT that will be formed is required by the DENR to monitor the environmental impact of the project There is another Monitoring Evaluation Team initiated by NCIP for the RAP. It was mentioned in the previous MOA, and it undergone the FPIC process. Representatives from affected families will also be part of the Monitoring Team. The DPWH also has a monitoring team called "Municipal Resettlement Implementation Committee". This committee will monitor the process on how to acquire the road right-of-way. The monitoring of DPWH and on the MOA is being conducted prior to the start of the constructions.
Since the project has a 60-meter span, many households will be affected. Will they be compensated?	**Mr. Romeo, ME Office**	**EIA Preparer** Since the alignment of the project has been identified, a team was sent to identify the households or individuals affected by the project. The study is ongoing for this and the list of individuals that will be affected will be finalized during the DED Stage of the project. Rest assured that the process is documented, and all project affected individuals will be compensated before the start of the construction.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
		DPWH Clarification, the compensation for the affected lands inside a CADT area will be given to People's Organization and not to a certain individual.
Will a consultation meeting take place even at the DED stage of the project?	**Mr. Aries Valderama, OIC Municipal Engineer, LGU-Santa Fe**	**EIA Preparer** Consultation with the stakeholders will be continuous.
Others		
We request a copy of the MOA with DPWH so that we may monitor the agreements indicated in the Agreement.	**Benjamin Baguyo, Municipal IPMR**	**EIA Preparer** On behalf of the DPWH, we can send a copy of the MOA to the LGU through email.
The present Dalton Pass in Santa Fe is quite narrow. We are optimistic that the DPWH will be able to expand the current road by 2031.	**Engr. Kennedy Baluyan Jr., MPDC**	**EIA Preparer** We will take note of this and will discuss this on another forum.
The existing Dalton Pass Road is usually broken. We hope that the DPWH would investigate this and come up with an appropriate solution.	**Hon. Liwayway Caramat, Municipal Mayor**	**DPWH** If the DPWH performs a project, all materials that will be utilized in the construction are tested. We guarantee everyone that the materials and design for Dalton Pass East Alignment Road Project meets all standards and requirements. Regarding the concerns with the existing Dalton Pass, you may submit a letter to the DPWH CO.
We hope that we can name the tunnels/ roads/ bridges that will be constructed after our culture.	**Engr. Kennedy Baluyan Jr., MPDC**	**EIA Preparer** This suggestion is highly appreciated, and we will take note of this.
Carranglan, Nueva Ecija		
Will the affected farmlands in Barangay Bunga be compensated?	**Betty Bankial, Brgy. Salazar**	**EIA Preparer** We are still determining the extent of the project's impact. The amount of compensation for properties will be disclosed prior to the start of the project.
Since most of the affected households in Barangay Burgos are tenants, would they also be compensated?	**Espino Bagsic, Zone 1 President, Barangay Burgos**	**EIA Preparer** If the survey starts, the owner of the structure/s and land/s are entitled for compensation.
We have had the experience of not getting paid even after the road project was done. When will the compensation be settled?	**Mr. Faustino Natividad, Chairman, Barangay Bunga**	**EIA Preparer** Since the project is foreign-funded and managed by the DPWH Central Office, construction will not begin until compensation for project-affected persons is finalized.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPONSE TO ISSUES/CONCERNS
Before or after the completion of the project? What are the requirements for presenting to DPWH to claim the compensation?		The requirements will be coordinated with the local government. To be eligible for compensation, you must have a Land Title and a Tax Declaration.
We hope that the worth of our properties will not be as low as the official price suggests.	**Ms. Annaliza Inway, BHW and IP, Barangay Salazar**	**DPWH** (in Ilokano) We went through the FPIC process with the NCIP to explore property agreements for the Barangays within an Ancestral Domain. We agreed that compensation for properties inside CADT would be based on the BIR Zonal Value. The compensation amount will be given to the People's Organization. Private properties in non-IP areas will be compensated depending on market value. Consultation meetings will be continuous throughout the DED.
Does this meeting fall under the purview of the Feasibility Study Stage?	**For. Alfredo Kimayong, CENRO Munoz**	**EIA Preparer** Yes, we intend to complete the FS Stage by early next year.
Will a fence be built to avoid accidents (for animals)?	**CENRO Munoz**	**EIA Preparer** Based on the discussions yesterday, it is possible that a fence will be built on some sections of the road.
I would like to follow up the results of the concerns discussed during our meeting with the RAP Team.	**Barangay Bunga**	**DPWH** (in Ilokano) The initial RAP was conducted this year and the report will be submitted to us by the RAP Team this month. The final RAP will be validated and based during the DED stage of the project.

5.3.1.4 Public Hearing

[770]**Public Hearing for Nueva Vizcaya.** The public hearing for Nueva Vizcaya for the proposed Dalton Pass East Alignment Road Project was held last 3 May 2023 (Wednesday) from 9:00am to 12:00nn at the Covered Court of the Municipal Hall of Aritao, Aritao, Nueva Vizcaya.

[771]The number of participants who attended the public hearing for Nueva Vizcaya was 84 (21 females and 63 males).

[772]**Public Hearing for Nueva Ecija.** The public hearing for Nueva Ecija for the proposed Dalton Pass East Alignment Road Project was held last 4 May 2023 (Thursday) from 9:00am to 12:00nn at the PAG-ASA Gymnasium of the Municipal Hall of Carranglan, Carranglan, Nueva Ecija.

[773]The number of participants who attended the public hearing for Nueva Ecija was 88 (23 females and 65 males).

Table 5-8: Schedule and Number of Participants for the Public Hearing

DATE & TIME	ATTENDEES	PARTICIPANTS		
		MALE	FEMALE	TOTAL
Nueva Vizcaya				
03 May 2023 (9:00AM – 12:00NN)	**Provincial Government of Nueva Vizcaya** • Provincial Environment and Natural Resources Office • Provincial Planning and Development Office • Provincial Engineering Office	3	0	**3**
	LGU Aritao • Municipal Engineer • MPDO Representative • MENRO • Municipal Administrator • PESO Manager • Municipal IPMR	5	3	**8**
	Barangay Canabuan, Aritao • Barangay Officials • Barangay IPMR • Non-Government Office • Indigenous People	6	5	**11**
	Barangay Canarem, Aritao • Barangay Officials • Sangguniang Kabataan (Youth)	7	3	**10**
	Barangay Beti 2. Barangay Officials	1	0	**1**
	LGU Santa Fe • Municipal Administrator • Municipal Planning and Development Coordinator • OIC- Municipal Engineer • MENRO • SB Members	8	0	**8**
	Barangay Canabuan, Santa Fe • Barangay Officials • Barangay IPMR • IP Elder/ Chieftain • Senior Citizens • Sangguniang Kabataan (Youth)	14	4	**18**
	Barangay Bantinan, Santa Fe • Barangay Officials	1	0	**1**
	Residents of Nueva Vizcaya	1	0	**1**
	Carranglan LGU	2	0	**2**
	DENR-EMB Central Office	2	1	**3**
	EIA Review Committee	1	0	**1**
	DENR-MGB Region II	1	5	**6**
	DENR-EMB Region II	1	0	**1**
	DENR-PENRO Nueva Vizcaya	1	0	**1**
	DENR-CENRO Aritao	1	0	**1**
	DPWH Representatives	4	0	**4**
	LCI (Local EIA Consultant)	4	0	**4**

DATE & TIME	ATTENDEES	PARTICIPANTS		
		MALE	FEMALE	TOTAL
	SUB-TOTAL	***63***	***21***	***84***
Nueva Ecija				
04 May 2023 (9:00AM – 12:00NN)	**Provincial Government of Nueva Ecija** • Provincial Engineering Office • Provincial Environment and Natural Resources Office	4	0	**4**
	LGU Carranglan • Municipal Mayor • Municipal Engineer • MENRO • Municipal Health Office Representative	5	1	**6**
	Barangay Bunga, Carranglan • Barangay Officials • Residents	9	3	**12**
	Barangay Burgos, Carranglan • Barangay Officials • Barangay IPMR • IP Elders • Zone Leaders	7	2	**9**
	Barangay Salazar, Carranglan • Barangay Officials • Sangguniang Kabataan (Youth) • Senior Citizens • People's Organization Representative/ IP • Residents	18	9	**27**
	Barangay RA Padilla, Carranglan • Barangay Official	1	0	**1**
	Residents of Nueva Ecija	4	2	**6**
	DENR-EMB Central Office	1	1	**2**
	EIA Review Committee	1	0	**1**
	DENR-EMB Region III	1	2	**3**
	DENR-PENRO Nueva Ecija	2	0	**2**
	DENR-CENRO Munoz	1	0	**1**
	NCIP- Nueva Ecija Provincial Office	3	2	**5**
	DPWH Representatives	4	1	**5**
	LCI (Local EIA Consultant)	4	0	**4**
	SUB-TOTAL	***65***	***23***	***88***
	TOTAL	**128**	**44**	**172**

[774]The issues, concerns, and suggestions raised by the participants during the open forum and the corresponding responses of **DPWH**, and the EIA preparer were summarized in **Table 5-9**.

Table 5-9: Matrix of Issues and Concerns raised during the Public Hearing

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
A. NUEVA VIZCAYA		
Project Description		
What decommissioning and restoration plans are the proponent proposing? What plans does the proponent have for people who will lose their livelihood because of the project?	**Engr. Aries Valderama, OIC-Municipal Engineer, Santa Fe, NV**	**EIA Consultant:** To be clear, the study includes the different phases of the project which are pre-construction, construction, and operation phases. Perhaps you mean demobilization after the construction phase rather than "decommissioning." The existence of temporary facilities in the area may provide the locals with a source of income. However, following construction, the demobilization and clearance of the temporary facilities will take place, leaving the residents without a source of income. This will be considered in our report. Compensation will be provided to those who may be displaced and/or lose their livelihoods as a result of the project's development. This will be expanded upon in a separate document titled Resettlement Action Plan and Right-of-Way Acquisition.
Could you perhaps clarify why the title of the project changed so abruptly?	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**EIA Consultant:** In 2021, we used the "Dalton Pass East Alternative Road Project" in all our presentations. However, in 2023, the project was included to the list of the new national government's flagship infrastructure programs, resulting in a name change to "Dalton Pass East Alignment Project." To accommodate the rapid shift, we revised all project-related documentation and reports.
Is the project classified as High Standard Highway 1 or 2?	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**DPWH (Engr. Ponce):** Regarding the category of the project, whether High Standard Highway 1 or 2, will be clarified in the Detailed Engineering Design of the project. **DPWH (Engr. Bulan):** The project is part of the High Standard Highway. The 23-kilometer length is constructed with a 60-meter road right of way and a speed limit of 60 kilometers per hour since these are the criteria for a High-Standard Highway (HSH).

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
		The main objective of this project is to have an alternate route for the existing Dalton Pass.
Will the OCC, operation and maintenance of the project be outsourced/ contracted or handled directly by DPWH?	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**DPWH (Engr. Bulan):** Recently, JICA conducted a fact-finding mission for this project. Since we are still in the project preparation stage, these kinds of discussions or questions are still being finalized. The JICA team is presently assessing the capabilities of DPWH to manage the operations and maintenance of the project. This question will be addressed at the project evaluation stage because preliminary designs will be available during that time.
Does the project (tunnel) have emergency exits, particularly for usage during earthquakes or other emergencies?	**Mr. Jerry Tan, Assistant Provincial Engineer, NV**	**DPWH (Engr. Bulan):** The conceptual design of the project was shown in the audio-video presentation. During the project's operation, the Operation Control Center will ensure that the facility is equipped with safety features. The proposal includes two tunnels so that they may use the second tunnel to redirect traffic or as an evacuation place during crises. There are other emergency exits in the tunnels such as cross passages. CCTV cameras will be installed to monitor what is going on within the tunnels and other safety features such as lightings, ventilation and among others as presented in the video
Since the project is not yet in the DED phase, may we incorporate a service bay provision? May we also construct a platform where tourists may snap pictures outside the tunnel to encourage tourism?	**Representatives from Canabuan, Aritao**	**EIA Consultant:** This proposal has been taken into consideration. These will also be included in our documentation of this public hearing, as well as recommendations in the final report.
Land		
It will create a significant amount of garbage during the project. What are your plans for solid waste management? Is it feasible that the DPWH will build its own sanitary landfill?	**Forester John D. Simeon, MENRO, Santa Fe, NV**	**EIA Consultant:** Construction waste will be generated during the development of the project. As mentioned in the report, temporary facilities such as the Material Recovery Facility (MRFs) will be built. It is also mentioned that the contractor is obliged to coordinate with the municipality regarding how to dispose of the solid waste.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
		DPWH (EnP. Del Mundo): Usually, the construction waste created throughout the development of the project is minimal. The volume of excavated soil will account for most of the waste. Excavated materials will be subjected to material/soil testing, if found suitable, DPWH will utilize these suitable materials as embankment for the road construction. The notion of building our own sanitary landfill will incur additional expenditures for the project. Rest assured that the volume of garbage created by the project will be disclosed in the plan.
What will your approach or alternative be if you come across critical flora and fauna during construction?	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**EIA Consultant:** For the Tree Cutting Permit, the proponent and CENRO will have their full inventory for the project. Flora and fauna found along the alignment will be documented. If the team comes across any critical flora or fauna, the CENRO guidelines for dealing with it shall apply. We will emphasize the recommended process and include it in the mitigation actions. In addition to this, we will update the institutional plan on how this will operate. **PENRO:** The procedure before we conduct construction is 100% inventory. We also have guidelines for replacement and rehabilitation. All species discovered along the alignment will be reported and submitted to the Undersecretary for Field Operations' Office.
Where will the trees that will be chopped down end up, and is it possible to request any of the cut down trees?	**Hon. Ben Balalong, Punong Barangay, Brgy. Canabuan, Santa Fe, NV**	**PENRO:** There is a joint memorandum policy with DPWH regarding this. The chopped trees will be turned over to the bureau for suitable storage. Barangays may seek to use the trees, which must be approved by the DENR Office.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
Water		
According to the presentation, the tunnel is rather lengthy. Will the tunnel construction have an impact on the water supply in the lowlands?	**Hon. Bautista, SB Member, Santa Fe NV**	**EIA Consultant:** During the initial discussions with the JICA Study Team, the effect of the project on the groundwater resource in the area was considered. A groundwater assessment was conducted to ensure that the project will not affect the existing water resource in the area. The results of the assessment were considered in designing the location or alignment of the tunnels.
Air		
How will the proponent meet the provided baseline (pre-construction) for noise during project operation? I suggest planting trees on the on-grade portion of the project as a natural noise barrier.	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**EIA Consultant:** We are now comparing the baseline noise data to the existing DENR Standards while taking into account the present usage of the site (residential, commercial, industrial, etc.). Once the project is completed, the existing usage of the site will be updated, and appropriate standards will be used to compare future monitoring results. Your idea to put trees as natural noise barriers will be considered further in the Detailed Engineering Design.
People		
Given that a portion of the project is in ancestral domain, why is NCIP not present? Some information in the presentation is not included or disclosed in our Memorandum of Agreement.	**Mr. Bayani Larosa, Municipal IPMR, Aritao NV**	**EIA Consultant:** We invited NCIP by sending the Public Hearing Notice and an invitation letter. For any further issues raised in our presentation, you can contact NCIP directly or request a special session with DPWH to address the IPs' concerns.
If a conflict arose within the ancestral domain, who would govern, the ancestral domain boundary or the political boundary?	**Mr. Bayani Larosa, Municipal IPMR, Aritao NV**	**EIA Consultant:** The MOA signed by DPWH and the IPs mentioned a Grievance Redress Mechanism for the project. The GRM discusses how the team will resolve the IP issues. **DPWH (Engr. Bulan):** In addition, it was also mentioned in the GRM that if there is a concern or problem, it will be resolved first in the locality which is the IP Groups. If it is not resolved there, it will be escalated to the next level.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
In case of emergencies within the tunnels, what are the protocols?	**Representatives from Nueva Vizcaya Provincial LGU**	**DPWH (Engr. Ponce):** Emergency responders, fire trucks, and a generator will be stationed near the tunnels during the operation phase of the project. **EIA Consultant:** For the OCC, we will highlight the importance of having good coordination with the LGUs.
Do we have a Memorandum of Agreement for recruiting laborers who prioritize affected households?	**Mr. June, Radio Aritao**	**DPWH (Engr. Ponce):** The DPWH already has a policy which mandates contractors to utilize local labor - 60% for unskilled workers and 40% for skilled labors. It is required that the applicant be qualified for the position.
Can we consider the IP First Policy while hiring workers?	**Mr. Bayani Larosa, Municipal IPMR, Aritao NV**	**EIA Consultant:** We will take note of this suggestion and will compare your suggestion to existing policies of DPWH. The context of the policy of DPWH is to hire people from the locality. If the IP community is located there, then you will also be prioritized. **DPWH (Engr. Ponce):** Regarding the suggestion on IP First Policy, it is better to coordinate with the barangay so that they will also be prioritized during hiring of workers for the project.
Regarding the IP First Policy recommendation, I believe it is preferable that the contractor collaborate with the PESO of the municipality. Because we have a collection of profiles of barangay inhabitants that includes their skills in PESO.	**Representatives from Santa Fe, Nueva Vizcaya**	The PH Officer took note of the suggestion.
Highlight the application of RA 11291 or the Magna Carta of the Poor in the agreement with the IPs when recruiting workers.	**Representatives from Nueva Vizcaya Provincial LGU**	**EIA Consultant:** This is noted.
Others		
In the presentation, the MMT was only mentioned during the construction phase. What about the operation and maintenance of the project?	**Mr. Edgardo Sabado, Provincial Planning and Development Coordinator, NV**	**DENR-EMB:** For the MMT, if the validity of the ECC is continuous, MMT will be present. The termination of the MMT during the operation and maintenance phase will be requested. EMB will nevertheless assess the request.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
Who will also monitor the mitigation measures during the operation phase of the project? I still propose to continue the operation of the MMT even after the construction to still monitor the project.		The affected municipalities will be a part of the MMT, and they will decide whether the MMT should continue to operate during the project's operating period. The MMT is distinct from the monitoring team of EMB. Hence, EMB will still monitor the project even if the MMT was discontinued or not. **EIA Consultant:** We will take note of all your suggestions. **DPWH (Engr. Ponce):** During the implementation of the project, DPWH and the Contractors are preparing an Environmental Compliance Report (monthly or semi-annually) to highlight our compliance with the conditions stated in the ECC.
B. NUEVA ECIJA		
Project Description		
May we request to discuss the project alignment again?	**Representatives from Nueva Ecija Provincial LGU**	Engr. Bulan (DPWH) discuss again the slides pertaining to the project alignment.
Land		
Structures and farmlands with land titles in Sitio Baratwill be directly affected by the road alignment. What benefits will they receive?	**Mr. Espino Bagsic, Brgy. Burgos, Carranglan, NE**	**DPWH (EnP. Del Mundo):** We have the Road-Right-of-way Acquisition Plan, and we will comply with RA 10752. Rest assured that DPWH will coordinate and compensate the affected land and structure owners.
We propose modifying the alignment such that it will not directly affect our lands. We have a land title, but we were unable to register it again since it was designated within a protected area and ancestral domain. Will it have an impact on the amount of compensation we receive?	**Ms. Annaliza Inway, IP, Barangay Salazar**	**DPWH (Engr. Ponce):** We have a checklist of documents that the landowner must submit as proof of their authority over the land for them to be properly compensated provided that the lot owner will cooperate by showing/submitting on time the proof of ownership and other documentary requirements listed in the checklist for compensation based on law. **DENR-APASu (Mr. Udasco):** I think that this issue regarding the land within a protected area and ancestral domain can only be addressed by the NCIP. **DPWH (Engr. Bulan):** Since the land you were mentioning belongs to the CADT, the ownership of the

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
		land is under the CADT and not for an individual. According to RA 10752 and indicated in our MOA, if the project-affected land belongs to the CADT, the mode of payment mentioned in the Road-Right-of-way Acquisition is easement mode of acquisition. This means that the land will be priced based on the BIR Zonal Value and the payment will be given to the CADT. If the land is not part of a CADT, current market value will prevail.
Water		
This module received no comments.		
Air		
This module received no comments.		
People		
What are the proponent's plans for those who were not listed to the project-affected persons during our first list consolidation?	**Resident from Brgy. Bunga**	**DPWH (Engr. Ponce and EnP. Del Mundo):** We will update the master list of the project-affected individuals as of the FS stage. Hence, for those who are not listed in the master list per FS stage, they will be included in the final RAP updating and validation during the DED stage. Moreover, there is a 'cut-off' date wherein it will determine who will be included in the final master list of PAPs.
Is it also on the proponent's agenda to provide TESDA training to IPs in order to prepare them for prospective project work?	**Ms. Annaliza Inway, IP, Barangay Salazar**	**DPWH (Engr. Bulan):** We will coordinate with the LGUs in providing the skills training. The RAP also discussed the provision of providing livelihood to those who will lose their livelihood because of the project.
Others		
Is it still possible to change the MOA to incorporate new conditions?	**Hon. Andres Bucasan, Punong Barangay, Salazar, Carranglan NE**	**DPWH (Engr. Bulan):** If the IPs offer modifications, we encourage that they communicate first with the NCIP to make such changes since we are all aware that the MOA is signed among NCIP, DPWH, and ICCs/IPs representatives. For NCIP to assess and evaluate your request. Following that, you can share your concerns with DPWH.
Is the project's provided EIS part of the feasibility study mentioned in the Resolution with DPWH?	**Mr. Leonardo Udasco, APASu** **DENR-CENRO Munoz/ DENR- PAMB PCWFR**	**EIA Consultant:** This EIA Study is part of the resolution you mentioned, together with the RAP and the IPP.

ISSUES AND CONCERNS RAISED ON THE FOLLOWING MODULES	SECTOR OR PERSONS WHO RAISED THE ISSUES/CONCERNS	PROPONENT RESPOND TO ISSUES/CONCERNS
As previously stated, there will be a spoil zone. Is it located in a protected area?	**Mr. Leonardo Udasco, APASu DENR-CENRO Munoz/ DENR- PAMB PCWFR**	**EIA Consultant:** The spoils area is part of the tunnel area. Probably, it is within the CADT areas and PCWFR. However, the location of the spoils area is still subjected to finalization.
After reviewing the conducted studies for the project, we can certify that the proponent properly researched the proposal and its environmental impact. We encourage everyone to voice their opinion through their representatives so their opinions can be heard.	**Mr. Leonardo Udasco, APASu DENR-CENRO Munoz/ DENR- PAMB PCWFR**	The PH Officer and the EIA preparers took note of the statements.
I encourage my fellow Carranglan and Nueva Ecija citizens to embrace and support the project since it will bring us forward.	**Engr. Bernardo, Municipal Engineer, Carranglan NE**	The PH Officer and the EIA preparers took note of the statement.

Table 5-10: Matrix of IEC Plan

TARGET 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 (PHP)
Project Affected Families of the Kalanguya Ikalahan and Kalanguya Indigenous Cultural Communities (ICCs)	▪ Results of the Right-of-Way Acquisition Plan (RAP) ▪ Resettlement options	▪ Public Consultation ▪ Stakeholders Meeting	▪ Invitation Letters ▪ Public Consultation	Prior to implementation of RAP	PHP 300,000.00
Host Municipal LGUs Host Brgy. LGUs	▪ Personnel requirements and announcement of job opening for potential workers/employees/contractors	▪ Group Consultation ▪ Multi-media	▪ Invitation Letters ▪ Multi-sectoral cluster meetings	At least, two months prior to start of construction	PHP 100,000.00
Host Municipal LGUs Host Brgy. LGUs	▪ Presentation of construction works/activities ▪ Potential impacts and proposed mitigation measures during construction works	▪ Group Consultation ▪ Multi-media	▪ Invitation letters ▪ Focus Group Discussion	At least 1 month prior to start of construction and quarterly during the entire construction phase	PHP 100,000.00
Host Municipal LGUs Host Brgy. LGUs	▪ Report on project's compliance to ECC and EMP during construction period	▪ Group Consultation ▪ Grievance mechanism	▪ Invitation Letters ▪ Handouts	1 month prior to completion of construction works	PHP 50,000.00
Host Municipal LGUs Host Brgy. LGUs	▪ Presentation of completion of construction works and preparation for operation	▪ Group Consultation	▪ Invitation Letters ▪ Multi-sectoral meeting	1 month prior to completion of construction phase	PHP 50,000.00
National Media/Press	▪ Presentation of project	▪ Media conference ▪ Press Articles ▪ Social Media	▪ News articles (printed and/or online)	Three months before construction phase	PHP 300,000.00

5.4 INDICATIVE GRIEVANCE REDRESS MECHANISM (NON-IPS)

[775]Grievances are any major or complicated issues which require deeper understanding which can be resolved through complex, time-consuming and may often involve large expenditures solutions. Hence, different levels of responses are required to register, classify, and redress these issues.

[776]**DPWH** will establish a grievance recording and redress mechanism to record and redress any concern, complaint or grievances arising out during the construction phase of the project efficiently and effectively.

[777]The redress of the grievances will be coordinated with the Multi-Partite Monitoring Team (MMT) as per Section 17 of DENR Administrative Order No. 2017-15. For resettlement implementation grievances, these will be lodged with the Municipal Resettlement Implementation Committee (MRIC).

[778]Once the construction of the project begins, the designated grievance officer of **DPWH**'s designated contractors shall coordinate with the responsible units/departments about any possible complaints, issues and concerns lodged on the project.

5.4.1 General Principles of the Grievance Redress Mechanism

[779]A credible grievance mechanism is necessary for the community, especially the stakeholders, to have confidence that if they lodge a complaint, it will be treated in a fair and objective manner. The fairness of the process is to be understood in the context of the imbalances of power that may exist. The grievance registration or communication process should present no barriers in terms of access (e.g., geographic location/educational attainment/language/ access to communication/technology) by the stakeholders.

[780]Registering a complaint can pose risks for the stakeholders, especially if it concerns issues such as corruption, misconduct, or monetary compensation, or if it interferes with local social and gender norms. Hence, the grievance mechanism should be free of retribution and should proactively consider potential dangers and risks to complainants and incorporate ways to prevent harm. The protection of privacy of the complainant will also be prioritized.

5.4.2 Levels of Grievance Redress Mechanism

[781]The stakeholders must be fully informed of the proper venue to lodge their complaints or grievances, and of their rights to use alternative measures if they choose to do so if they are not satisfied with the response of the **DPWH** designated contractor's COMREL as well as the MRIC for their complaints.

[782]Irrespective of the choice of the complainant on the level of grievance management system, **DPWH** as well as its designated contractors will demonstrate a culture of non-retaliation and respect for a community's choice to seek alternative avenues for raising complaints.

Figure 5-1: Levels of Grievance Redress Mechanism

FIGURE TITLE:		
LEVELS OF GRIEVANCE REDRESS MECHANISM		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION

5.4.3 Grievance Redress Mechanism Steps

783The Grievance Redress Mechanism that will be employed for the project is detailed in 6 steps. The GRM is presented in **Table 5-11**.

Table 5-11: Grievance Redress Mechanism

GRM STEP	DESCRIPTION OF PROCEDURE
A. Project Implementation	
Step 1	▪ Affected person lodges the complaint.
Step 2	▪ **DPWH** and MMT will document, and register received complaints during construction of the project.
Step 3	▪ Two days upon the receipt of the complaint, a meeting will be called among the affected person, DPWH, and MMT. The affected person will be immediately informed if the grievance is within, or outside, the purview of the mechanism. ▪ If the scope is outside, the affected person will be referred to the proper institution and/or proper mechanism for the complaint. If the complaint is within the scope of the project, the resolution of the complaint shall be discussed during the meeting. Investigation will be immediately scheduled for proper resolution of the complaint. After the investigation, the MMT will immediately decide on the most suitable internal measure to reduce the impact the source of the complaint while working on the final measure not later than 5 days from the day when the meeting for the complaint was held.
Step 4	▪ If the affected person is satisfied with the resolution of the complaint, MMT shall obtain a written confirmation of satisfaction from the affected person.
Step 5	▪ For at least a week after closure of grievance, the MMT/Grievance Officer, shall monitor the effectiveness of the resolution.
Step 6	▪ If the issue/impact persists, the affected person can lodge an appeal to the MMT. The MMT/Grievance Officer shall immediately record the appeal, contact the grievance to discuss the immediate resolution of the issue. If the issue persists despite the second action, the affected person can seek assistance from the Barangay or Municipal Government. A total of two weeks is given to process, address and monitor a grievance that will arise due to the project implementation.
B. Resettlement Implementation	
Step 1	▪ The affected residents shall submit their grievances to the Municipal Resettlement Implementation Committee (MRIC) to be established in each municipality pertaining

GRM STEP	DESCRIPTION OF PROCEDURE
	to the project site and the MRIC shall respond within 15 days of receipt of the grievance. ▪ The MRIC will respond within 15 days of receipt of the complaint. However, complaints and grievances specifically related to the valuation of affected properties will be adjudicated by the appropriate court.
Step 2	▪ If a mutual understanding or an amicable solution cannot be reached, or if the affected population does not receive a response from MRIC within 15 days of registering a complaint, the affected population may file a complaint with the **DPWH** Regional Office (II or III) that has jurisdiction over the area. ▪ The Regional Office will respond within 15 days from the date of such declaration.
Step 3	▪ If the affected residents are not satisfied with the decision of the **DPWH** Regional Office, they may eventually file a complaint with the court.

5.5 GRIEVANCE REDRESS MECHANISM (IPS)

5.5.1 GRM for Kalanguya-Ikalahan Ancestral Domain

[784]Article E: Redress Mechanism of the Memorandum of Agreement (MOA) between **DPWH**, NCIP and Kalanguya-Ikalahan ICCs presented the approved GRM and stated the following:

[785]Issues and concerns connected with the implementation of the project shall be initially resolved by the Project Engineer of his duly authorized representative. Otherwise, the problem shall be brought to the Monitoring and Evaluation Team (MET) for the resolution of the same.

[786]Article C provides the composition of the MET:

1) 2 representatives from NCIP Provincial Office;
2) 2 representatives from DPWH;
3) 1 representative from the Contractor;
4) 1 representative from Aritao and Sta. Fe LGUs;
5) 1 representative from each Brgy. Councils of the Ancestral Domain;
6) 1 representative from each Cluster People Organization; and
7) 1 representative from CADT Holders Federation.

5.5.2 GRM for Kalanguya Ancestral Domain

[787]Article VII: MOA Monitoring and Evaluation, Grievance and Redress Mechanisms of the MOA between **DPWH**, NCIP and Kalanguya ICCs presented the approved GRM.

Section 1. Joint Monitoring and Grievance Team

(a) Within 15 days from the effectivity of this MOA, the parties shall form a Joint Monitoring and Grievance Team (JMGT) composed of 4 members, 1 member of the Kalanguya ICC/IP, 1 DPWH representative, 1 member from NCIP-Nueva Ecija Provincial Office, and 1 member from the NCIP Regional Office.

[788]The JMGT shall serve 2 functions:

1) As a monitoring body to ensure the Parties' compliance with the terms of this MOA; and

2) As a grievance and conciliation body to undertake joint review of issues relating to a Party's performance of its obligations under this MOA.

[789]Item D of Article VII stipulated the following:

(d) Both **DPWH** and the Kalanguya ICC/PS agree that any conflict between the parties must first be raised with the JMGT for resolution before elevating it to the other third parties or institutions.

SECTION 6

ENVIRONMENTAL COMPLIANCE MONITORING

6.1 SELF-MONITORING PLAN

790 The Environmental Monitoring Plan (EMoP) presents a set of critical environmental parameters that will allow **DPWH-UPMO-RMC-I(B)** to ensure environmental compliance and sustainability of the operation of the roads, bridges, and tunnels. The EMoP allows monitoring, verification, and performance of the necessary corrective measures towards the mitigation of the identified environmental impacts. Information obtained during the EMoP implementation can be used in examining the short and long-term effects of the proposed Project's various environmental aspects, from which future strategies on environmental enhancement measures can be formulated.

791 **Table 6-1** presents the proposed EMoP that will be implemented by **DPWH** during the different phases of the proposed Project's development. Shown in the matrix are the concerns, parameters to be monitored, as well as the corresponding sampling and measurement plan (method, frequency, location), lead person, annual estimated cost, and environmental quality performance level (EQPL) range (i.e., Alert, Action, Limit).

Table 6-1: Environmental Monitoring Plan (EMoP)

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
			Method	Frequency	Location			Alert	EQPL Range Action	Limit	Management Measures Alert	Action	Limit
PRE-CONSTRUCTION/CONTRUCTION PHASES													
Local Sourcing of Labor	People: Employment Opportunities	No. of employees	Record no. of employees	During pre-construction	Administration Office of the Project	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Minimal	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Road Construction	Solid Waste Generation	Weight of waste generated	Weighing/ logbook recording	Daily	Waste storage facility	DPWH-UPMO-RMC-I(B)/	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.
	Hazardous Waste Generation	Weight of waste generated	Weighing/ logbook recording	Daily	Waste storage facility (Refer to DAO 1992-29)	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Ensure proper storage of hazardous waste, as stipulated in HW ID. Prepare hazardous waste for treatment/ disposal by third party (Refer to DAO 1992-29)	Ensure proper storage of hazardous waste, as stipulated in HW ID. Contact third party for hazardous waste for treatment/ disposal (Refer to DAO 1992-29)	Treatment/disposal of hazardous waste by third party. (Refer to DAO 1992-29)
	Occupational health and safety	No. of work-related illnesses/ injuries, No. of safety man-hours	Logbook/ database registration	Daily	Administration office of the project site	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Minimal	1 Non-Lost Time Accident	Multiple Non-Lost Time Accident	1 Lost Time Accident	Investigate, Do necessary actions. Re-training of staff regarding health and safety guidelines	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.
	Generation of excavated soils	Volume of soil generated	Weighing/ logbook recording	Daily	Interim storage area	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs		50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.
	Impact on water quality	TSS	Refer to EMB MC 2016-12	Quarterly	Marang, Wahig/ Carranglan River 16°10'46.60"N / 121° 3'32.62"E	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Php 10,000 per station per sampling	70 mg/L	75 mg/L	80 mg/L	Investigate, identify non-point sources	Investigate, identify non-point sources; Conduct maintenance of septic tanks, drainage, and siltation ponds	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
		BOD						5 mg/L	6 mg/L	7 mg/L			
		Oil and Grease						1 mg/L	1.5 mg/L	2 mg/L			
		Fecal coliform						100 MPN/100 mL	150 MPN/100 mL	200 MPN/100 mL			
		Oil and Grease						1 mg/L	1.5 mg/L	2 mg/L			

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN Method	Frequency	Location	LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME Alert	EQPL Range Action	Limit	Management Measures Alert	Action	Limit
					16°10'11.55"N / 121° 3'0.98"E 16° 9'31.33"N / 121° 3'2.62"E 16° 5'46.96"N / 121° 3'45.33"E 16° 3'41.73"N / 121° 3'8.20"E 16° 2'49.46"N / 121° 3'35.96"E								
Bridge Construction	Solid Waste Generation	Weight of waste generated	Weighing/ logbook recording	Daily	Waste storage facility	DPWH-UPMO-RMC-I(B)/	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.
	Hazardous Waste Generation	Weight of waste generated	Weighing/ logbook recording	Daily	Waste storage facility (Refer to DAO 1992-29)	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Ensure proper storage of hazardous waste, as stipulated in HW ID. Prepare hazardous waste for treatment/ disposal by third party (Refer to DAO 1992-29)	Ensure proper storage of hazardous waste, as stipulated in HW ID. Contact third party for hazardous waste for treatment/ disposal (Refer to DAO 1992-29)	Treatment/disposal of hazardous waste by third party. (Refer to DAO 1992-29)
	Occupational health and safety	No. of work-related illnesses/ injuries, No. of safety man-hours	Logbook/ database registration	Daily	Administration office of the project site	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Minimal	1 Non-Lost Time Accident	Multiple Non-Lost Time Accident	1 Lost Time Accident	Investigate, Do necessary actions. Re-training of staff regarding health and safety guidelines	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.
	Generation of excavated soils	Volume of soil generated	Weighing/ logbook recording	Daily	Interim storage area	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs		50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.
	Impact on water quality	TSS BOD Oil and Grease	Refer to EMB MC 2016-12	Quarterly	Nearby water body	DPWH-UPMO-RMC-I(B)/	Php 10,000 per station per sampling	70 mg/L 5 mg/L 1 mg/L	75 mg/L 6 mg/L 1.5 mg/L	80 mg/L 7 mg/L 2 mg/L	Investigate, identify non-point sources	Investigate, identify non-point sources;	Investigate, identify non-point sources, repair

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN Method	Frequency	Location	LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME EQPL Range Alert	EQPL Range Action	EQPL Range Limit	Management Measures Alert	Management Measures Action	Management Measures Limit
		Fecal coliform			16°10'46.60"N / 121° 3'32.62"E 16°10'11.55"N / 121° 3'0.98"E 16° 9'31.33"N / 121° 3'2.62"E 16° 5'46.96"N / 121° 3'45.33"E 16° 3'41.73"N / 121° 3'8.20"E 16° 2'49.46"N / 121° 3'35.96"E	RO II & III/ DEOs		100 MPN/100 mL	150 MPN/100 mL	200 MPN/100 mL		Conduct maintenance of septic tanks, drainage, and siltation ponds	damages/ defects, repeat analysis
		Oil and Grease						1 mg/L	1.5 mg/L	2 mg/L			
Tunnel Construction	Solid Waste Generation	Weight of waste generated	Weighing/ logbook recording	Daily	Waste storage facility	DPWH-UPMO-RMC-I(B)/	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.
	Hazardous Waste Generation	Weight of waste generated	Weighing/ logbook recording	Daily	Waste storage facility (Refer to DAO 1992-29)	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Ensure proper storage of hazardous waste, as stipulated in HW ID. Prepare hazardous waste for treatment/ disposal by third party (Refer to DAO 1992-29)	Ensure proper storage of hazardous waste, as stipulated in HW ID. Contact third party for hazardous waste for treatment/ disposal (Refer to DAO 1992-29)	Treatment/disposal of hazardous waste by third party. (Refer to DAO 1992-29)
	Occupational health and safety	No. of work-related illnesses/ injuries, No. of safety man-hours	Logbook/ database registration	Daily	Administration office of the project site	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Minimal	1 Non-Lost Time Accident	Multiple Non-Lost Time Accident	1 Lost Time Accident	Investigate, Do necessary actions. Re-training of staff regarding health and safety guidelines	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.
	Generation of excavated soils	Volume of soil generated	Weighing/ logbook recording	Daily	Interim storage area	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs		50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.

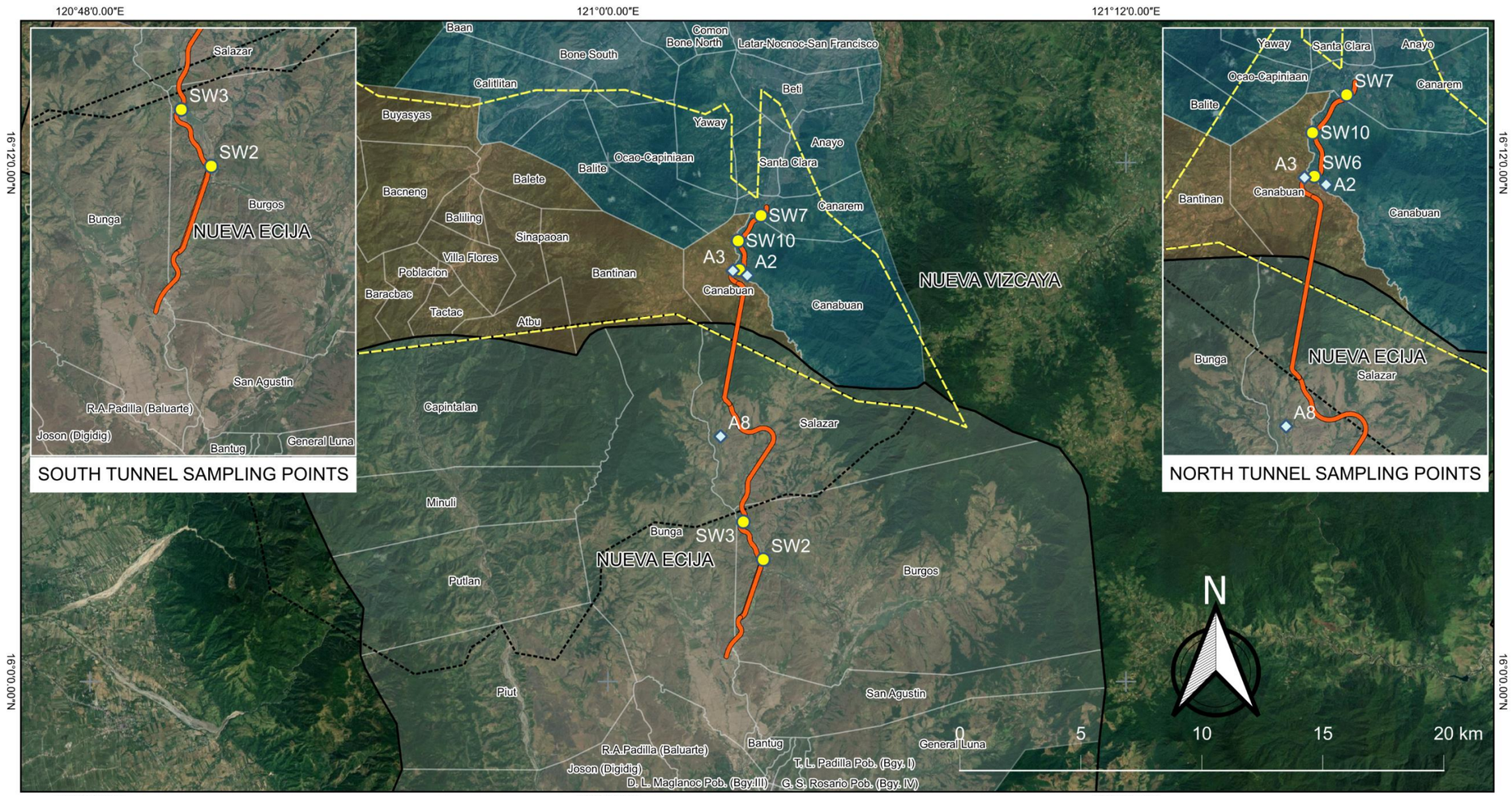
KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN Method	Frequency	Location	LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME EQPL Range Alert	EQPL Range Action	EQPL Range Limit	Management Measures Alert	Management Measures Action	Management Measures Limit
Use of Heavy Equipment	Hazardous Waste Generation (used oil)	Volume of wastes generated	Number of drums/logbook recording; Weighing/ logbook recording	Weekly	Waste storage facility (Refer to DAO 1992-29)	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Ensure proper storage of hazardous waste, as stipulated in HW ID. Prepare hazardous waste for treatment/ disposal by third party (Refer to DAO 1992-29)	Ensure proper storage of hazardous waste, as stipulated in HW ID. Contact third party for hazardous waste for treatment/ disposal (Refer to DAO 1992-29)	Treatment/disposal of hazardous waste by third party. (Refer to DAO 1992-29)
	Impact on ambient air quality	NO_2 CO SO_2 TSP PM_{10}	DAO 2000-81 Analysis Methods	Quarterly	Project alignment 16° 5'40.32"N / 121° 2'36.55"E 16° 9'23.56"N / 121° 3'13.61"E 16° 9'30.10"N / 121° 2'53.59"E	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Php 20,000 per station per event	80 µg/Ncm 25 µg/Ncm 120 µg/Ncm 180 µg/Ncm 120 µg/Ncm	120 µg/Ncm 30 µg/Ncm 150 µg/Ncm 200 µg/Ncm 150 µg/NCM	150 µg/Ncm 35 µg/Ncm 180 µg/Ncm 230 µg/Ncm 200 µg/Ncm	Continuous maintenance of heavy equipment	Continuous maintenance of heavy equipment; Investigate, identify non-point sources	Investigate condition of equipment; Repair damages/ defects, repeat analysis
	Generation of noise	Noise level	DAO 2000-81 Analysis Methods	Quarterly	Project alignment	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Php 5,000 per station per event	45 dB	50 dB	55 dB	Continuous maintenance of heavy equipment	Continuous maintenance of heavy equipment; Investigate, identify non-point sources	Investigate condition of equipment; Repair damages/ defects, repeat analysis
	Generation of vibration	Ground vibration level	Acceptable ground vibration monitoring	Quarterly	Project alignment	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Php 10,000 per station per event	65 dB	70 dB	80 dB	Continuous maintenance of heavy equipment	Continuous maintenance of heavy equipment; Investigate, identify non-point sources	Investigate condition of equipment; Repair damages/ defects, repeat analysis
OPERATION PHASE													
Operation and maintenance of the tunnel	Generation of wastewater from maintenance activities	TSS	Refer to EMB MC 2016-12	Annual	Siltation ponds	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Php 5,000 per station per sampling	50 mg/L	60 mg/L	70 mg/L	Investigate, identify non-point sources	Investigate, identify non-point sources; Conduct maintenance of siltation ponds	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
	Air emission from gensets	CO CO_2 SO_2 NO_2 PM	DAO 2000-81 Analysis Methods	Annually	Generator set	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	PHP 10,000 per parameter	450 µg/Ncm 160 µg/Ncm 1,400 µg/Ncm 1,900 µg/Ncm 160 µg/Ncm	480 µg/Ncm 180 µg/Ncm 1,450 µg/Ncm 1,950 µg/Ncm 180 µg/Ncm	500 µg/Ncm 200 µg/Ncm 1,500 µg/Ncm 2,000 µg/Ncm 200 µg/Ncm	Continuous maintenance of treatment system	Investigate, Do necessary actions	Investigate, Do necessary actions.

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN Method	Frequency	Location	LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME Alert	EQPL Range Action	Limit	Management Measures Alert	Action	Limit
	People: Occupational health and safety	No. of work-related illnesses/ injuries, No. of safety man-hours	Logbook/ database registration	Daily	Administration office of the project site	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Minimal	1 Non-Lost Time Accident	Multiple Non-Lost Time Accident	1 Lost Time Accident	Investigate, Do necessary actions. Re-training of staff regarding health and safety guidelines	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.
	Solid Waste Generation	Weight of waste generated	Weighing/ logbook recording	Daily	Waste storage facility	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.
	Hazardous Waste Generation (used oil, oil-contaminated materials, BFLs)	Volume of wastes generated	Number of drums/ logbook recording Weighing/ logbook recording	Weekly	Waste storage facility (Refer to DAO 1992-29)	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	90% storage capacity	Ensure proper storage of hazardous waste, as stipulated in HW ID. Prepare hazardous waste for treatment/ disposal by third party (Refer to DAO 1992-29)	Ensure proper storage of hazardous waste, as stipulated in HW ID. Contact third party for hazardous waste for treatment/ disposal (Refer to DAO 1992-29)	Treatment/disposal of hazardous waste by third party. (Refer to DAO 1992-29)
ABANDONMENT PHASE													
Pull-out of equipment, decommissioning of fuel storage, abandonment of offices	Generation of Demolition spoils and solid wastes	Weight (kg); no. of items	Weighing/ logbook recording	Daily	Project Site	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	To be deter-mined	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Potential negative public perception	No. of valid complaints	Consultation with local officials and residents	Variable	Project Site	DPWH-UPMO-RMC-I(B)/ RO II & III/ DEOs	PHP 40,000 per consultation	1 minor complaint, such as nuisance complaints (e.g., noise caused by decommissioning, inconvenience and traffic caused by trucks)	Multiple minor complaints such as nuisance complaints (e.g., noise caused by decommissioning, inconvenience and traffic caused by trucks)	1 major complaint (incidents causing loss of life, damage to private property, adverse effects to health an economics)	Investigate, address issue accordingly	Investigate, address issue accordingly. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.	Investigate, address issue accordingly. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines. Increase community IEC regarding

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
			Method	Frequency	Location			Alert	EQPL Range Action	Limit	Management Measures Alert	Action	Limit
													measures taken to solve major complaints. Get feedback from community regarding acceptability or adequacy of actions taken to mitigate major concerns.

Notes: EQPL = Environmental Quality Performance Level
Alert or Red Flag: early warning
Action Level: point where management measures must be employed so as not to reach the regulated threshold or limit level, or to reduce deterioration of affected environmental component to pre-impact or optimum environmental quality
Limit Level: regulated threshold of pollutant (standard that must not be exceeded); point where emergency response measures must be employed to reduce pollutants to lower than standard limit.

Figure 6-1: Proposed Environmental Monitoring Locations



MAP SOURCE/S:

JICA STUDY TEAM

MAP INFORMATION:
Map Scale : 1 : 1 8 0 , 0 0 0
Administrative Boundaries: UN OCHA
Base Map: Google Earth Satellite
Geographic Coordinate System: EPSG:4326
Datum: WGS 1984
Mapping Software: QGIS 3.16
Prepared by: LCI Envi Corporation

NOTE: This map has been prepared for the Environmental Impact Assessment (EIA) of the proposed Dalton Pass East Alternative Road (DPEAR) Project of the Department of Public Works and Highways. The boundaries reflected herewith are not authoritative.

Map Legend

- DPEAR Project Alignment

Administrative Boundaries

- Province of Nueva Vizcaya
- Municipality of Aritao
- Municipality of Santa Fe
- Province of Nueva Ecija
- Municipality of Carranglan

Ancestral Domain

- Kalanguya Ikalahan AD
- Kalanguya AD

Sampling Station

- Surface Water
- Ambient Air, Noise, & Vibration

PROJECT PROPONENT:	PROPOSED PROJECT:	FIGURE TITLE:	SOURCE:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	**PROPOSED ENVIRONMENTAL MONITORING LOCATIONS**	LCI Envi Corporation	LCI ENVI CORPORATION

6.2 MULTI-SECTORAL MONITORING FRAMEWORK

[792]The Monitoring Framework, as stated in Annexes 3-2 and 3-4 of the RPM for DENR Administrative Order No. 2017-15, presents a proposed program wherein the proposed project's environmental compliance will be verified and reported to concerned stakeholders.

[793]The MMT will be composed of government regulators (LGU representatives) and recognized non-governmental organizations that have valid issues and concerns on the proposed project. The proponent shall provide appropriate funding for the MMT activities based on the Annual Work and Financial Plan approved by EMB. DENR-EMB must provide guidance to the MMT and shall conduct performance audits of the MMT.

[794]The MMT's objective is to provide a venue to discuss the important concerns of stakeholders regarding the project. These concerns may involve the following items:

- Verify the compliance of **DPWH** in its ECC and EMP;
- Validate the proposed project's conformance to government standards, **DPWH's** submission of necessary post-ECC documentation requirements;
- Identify the legitimate concerns of the host community, in relation to the implementation of the project;
- Determine the extent and scale of the environmental impacts generated by the Project;
- Provide additional information, education, and communication (IEC); and
- Integration/documentation of complaints, suggestions, and compromise agreements.

[795]The MMT members and their corresponding roles and responsibilities are presented in **Table 6-2**.

Table 6-2: Proposed Composition of the MMT for the Project

COMPOSITION	MEMBER	ROLE/RESPONSIBILITY
LGU representatives	▪ Representative from the Municipal Environment and Natural Resources Office (MENRO) of Aritao, Santa Fe and Carranglan	▪ Serve as the MMT chair ▪ Oversee Proponent's compliance to environmental regulations ▪ Issue/revoke the ECC of the Project as mandated
	▪ Rural Health Unit (RHU) Chief or Municipal Health Officer (MHO) of Aritao, Santa Fe and Carranglan	▪ Exercise local authority and knowledge on environmental, health and social conditions in the project impact areas
	▪ Barangay Captains of Canabuan (Aritao), Canabuan (Santa Fe), Canarem, Bunga, Burgos, and Salazar	
One representative from an LGU-accredited local NGOs with mission/s specifically related to environmental management	▪ To be determined	▪ Represent the mission/s of the NGO
Maximum of 2 representatives from	▪ Indigenous Peoples Mandatory Representative	▪ Represent vulnerable sectors in the project impact area

COMPOSITION	MEMBER	ROLE/RESPONSIBILITY
locally recognized community leaders	(IPMR) of Aritao, Santa Fe and Carranglan ▪ Senior Citizens Association Representative of Aritao, Santa Fe and Carranglan	
Maximum of 3 representatives from government agencies	▪ DENR Regional Office No. 2 ▪ DENR Regional Office No. 3 ▪ Forest Management Bureau (FMB)	▪ Carry out mandate considering the project type and its expected impacts
Reference: DENR Administrative Order No. 2017-15		

The DENR Administrative Order No. 2018-18 provides for the roles and responsibilities of DENR Regional Offices in relation to EMB Regional Offices. Under IV.A, the Provincial Environment and Natural Resources Office (PENRO) and Community Environment and Natural Resources Office (CENRO) shall participate in the MMT formed pursuant to Section 9.1, Article II of DAO 2003-30, which tasked the said offices to undertake monitoring of compliance with ECC and EMP conditions.

[796]The DENR Central Office oversees compliance to environmental regulations. Further, it has the power to revoke the ECC if deemed necessary. Further stipulated in DAO 2018-18, the DENR Regional Executive Director (RED) is also authorized to issue Cease and Desist Order under Section 16, Article IV of DAO 2003-30 based on the violations under the Philippine EIS System to prevent grave or irreparable damage to the environment. It was further stipulated that the authority shall be exercised in cases where there is inaction or refusal to act on the part of the EMB RD, which would warrant intervention by the DENR RED.

[797]As the proponent, **DPWH** must comply with environmental regulations by providing mitigation and enhancement measures. Lastly, representatives from the host municipal and barangay LGUs provide the consensus of the local community and has jurisdiction over the project site.

[798]**DPWH** will continue to regularly conduct consultations/meetings with the MMT members. These meetings shall be conducted quarterly and annually. Special meetings may also be held, if necessary, most especially during emergency situations or other important occasions that require immediate resolution.

6.3 ENVIRONMENTAL GUARANTEE AND MONITORING FUND COMMITMENTS

6.3.1 Environmental Guarantee Fund (EGF)

[799]The Environmental Guarantee Fund (EGF) pertains to the fund to be set up by a project proponent which shall be readily accessible and disbursable for the immediate clean-up or rehabilitation of areas affected by damages in the environment and the resulting deterioration of environmental quality as a direct consequence of a project's construction, operation, or abandonment. It shall likewise be used to compensate parties and communities affected by the negative impacts of the project, and to fund community-based environment related project including, but not limited to, information and education and emergency preparedness programs.

[800]The indicative allocation for the EGF for the proposed project is **PHP 5,000,000.00 (Five Million Pesos)**. The said amount will be subject to review and approval of the MMT. The fund shall be replenished if the amount falls below 50%.

[801]The EGF shall be established and used for the following risk-management related purposes:

- The immediate rehabilitation of areas affected by damage to the environment and the resulting deterioration of environmental quality as a direct consequence of project construction, operation, and abandonment;
- The conduct of scientific or research studies that will aid in the prevention or rehabilitation of accidents and/or risk-related environmental damages; or
- For contingency clean-up activities, environmental enhancement measures, damage prevention program including the necessary IEC and capability building activities to significantly minimize or buffer environmental risk-related impacts.

[802]The EGF can be used for, but not limited to, the following project-specific purposes:

- Environmental enhancement measures such as greening programs in the area,
- Support development and implementation of coastal resource management in area,
- Support development and implementation of water conservation plan, and
- Oil spill clean-up.

6.3.1.1 Environmental Guarantee Cash Fund

[803]The indicative allocation for the Environmental Guarantee Cash Fund is **PHP 3,000,000.00 (Three Million Pesos)**. The said fund shall be allocated for immediate rehabilitation and compensation of affected communities in case of damage or accidents. Further, the said fund shall cover the operational costs of the EGF committee.

[804]The abovementioned amount will be subject to review and approval of EMB Central Office. The fund shall be replenished if the amount falls below 50%.

6.3.2 Environmental Monitoring Fund (EMF)

[805]The Environmental Monitoring Fund (EMF) refers to the fund that a project proponent shall allocate to support the activities of the multi-partite monitoring team for the compliance monitoring. It shall be immediately accessible and easily disbursable.

[806]As stated in Annex 3-5 of the Revised Procedural Manual of DAO 2003-30, the EMF shall cover the costs for the following activities:

- Cost of transportation, board and lodging;
- MMT meetings rental of equipment;
- Documentation;
- Sampling;
- Hiring of outside experts or subcontracting monitoring work;
- Training of MMT;
- Preparation and distribution of monitoring reports; and
- Public information campaign/dissemination.

[807]The indicative allocation for the EMF of the proposed project is **PHP 500,000.00 (Five Hundred Thousand Pesos)**. An annual work and financial plan (AWFP) shall be submitted to the EMB Central Office for approval.

SECTION 7

ABANDONMENT/DECOMMISSIONING/REHABILITATION POLICY

7.1 POST-CONSTRUCTION DECOMMISSIONING

[808]After the construction, the project site will be thoroughly cleaned as preparation for the operation. All the temporary facilities installed on the project site will be properly dismantled and removed, including the equipment brought in the project site. Heavy equipment will be removed from the site during nighttime so that it will not affect the traffic in the project site. It will be ensured that there will be no oil spills during the decommissioning of the equipment.

[809]All the waste generated will be properly disposed of or recycled. Construction debris and domestic wastes will be segregated, and all residual wastes will be hauled out by the municipal waste collectors. All hazardous waste will also be collected by DENR-registered haulers. Human waste from the portable toilets will be properly siphoned by DENR-register desludgers. No waste will be left in the project site.

7.2 PROJECT DECOMMISSIONING/ABANDONMENT

[810]Depending on the nature and reasons for abandonment, the buildings, equipment, and other related facilities may not be necessarily demolished or removed from the site since some of these can be useful for other applications. Otherwise, proper dismantling, removal or transportation of the structures and equipment from the existing site will be conducted to minimize possible or further threats to the surrounding environment.

[811]In generator decommissioning, there will be certain reminders for successful output which are listed below:

- All on-site equipment, such as generators, transfer switches, transformers and conduit and electrical wiring, will be documented for inventory accuracy.
- A thorough examination and inspection of the current electrical system will be performed for safe decommissioning.

[812]Other activities that will be done during this Phase are:

- Proper advice and compensation to all affected personnel;
- Securing of necessary government clearances related to the abandonment of the existing Project (including request for the relief of ECC conditions and commitment);
- Removal of solid, liquid, and hazardous wastes within the site through DENR-certified waste transporter/treater; and
- Clean-up and possible remediation of the site, if future evaluations and testing suggest that such activity is applicable.

SECTION 8

INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

[813]The institutional organization of **DPWH**, under the Unified Project Management Office-Roads Management Cluster I - Bilateral (UPMO-RMC-I(B)) and its designated contractors, is shown in **Figure 8-1**. The organization is formed to achieve the following:

- Economical and safety operations and maintenance of the project's components;
- Implementation of **DPWH's** mandate and policies;
- Environmental compliance and sustainability; and
- Promotion and enhancement of the social acceptability of the proposed project.

[814]The institutional organization will involve **DPWH UPMO-RMC-I(B)'s** and the designated contractors' top-level management, since this group is responsible for providing the public works program and implementation direction and policies. The policies shall then be disseminated to department heads and managers for implementation of the contractors' personnel, including those who will be working on the operations of the proposed project.

[815]DPWH will also establish a partnership with relevant government agencies, various stakeholders, and local host communities in relation to the proposed project. This partnership is necessary to maintain a transparent and positive relationship for the project and its stakeholders, as well as to ensure that the environmental protection and enhancement measures are complied with. The stakeholders of the proposed project will be identified as the following:

- Municipalities of Aritao and Santa Fe, Nueva Vizcaya & Municipality of Carranglan, Nueva Ecija;
- Barangays Canabuan (Aritao), Canabuan (Santa Fe), Canarem, Bunga, Burgos, and Salazar;
- Residents and community organizations that will be affected by the proposed project;
- Local peace-and-order councils (i.e., PNP, Barangay Police); and
- Other concerned non-government organizations.

[816]**DPWH** and its designated contractors commit to:

- Comply with the conditions that will be stipulated in the ECC and other related environmental laws;
- Foster mutually beneficial partnership and cooperation with host communities; and
- Develop training programs for its employees which will ensure that they will be continually prepared for the tasks assigned to them.

Figure 8-1: Institutional Plan for EMP Implementation

FIGURE TITLE:		
INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION		
PROJECT PROPONENT:	PROPOSED PROJECT:	EIA PREPARER:
Department of Public Works and Highways	DALTON PASS EAST ALIGNMENT ROAD PROJECT Provinces of Nueva Vizcaya & Nueva Ecija	LCI ENVI CORPORATION