ENVIRONMENTAL PERFROMANCE REPORT AND MANAGEMENT PLAN (EPRMP)

NCC Cement Plant and Quarry Operation Expansion Project

Barangay Labayug, Sison, Pangasinan

Submitted by:

NORTHERN CEMENT

Submitted to:
Environmental Management Bureau – Central Office

August 2019

An Environmental Report By:

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DOCUMENT TRACKING

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List of Acronyms

AERMIC	-	American Meteorological Society/EPA Regulatory Model Improvement Committee
BACT	-	Best and Available Control Technology
BFAR	-	Bureau of Fisheries and Aquatic Resources
BMB	-	Biodiversity Management Bureau
BLGU	-	Barangay Local Government Unit
CAA	-	Clean Air Act
CADC	-	Certificate of Ancestral Domain Claim
CADT	-	Certificate Ancestral Domain Title
CALC	-	Certificate of Ancestral Land Claim
CALT	-	Certificate of Ancestral Land Title
CARP	-	Comprehensive Agrarian Reform Program
CBFMA	-	Community-Based Forest Management Agreement
CENRO	-	Community Environment and Natural Resources Office
CMR	-	Compliance Monitoring Report
DENT	-	Department of Environment and Natural Resources
DIA	-	Direct Impact Area
DIV		Dutch Intervention Values
DOLE	-	Department of Labor and Employment
ECC	-	Environmental Compliance Certificate
EGF	-	Environmental Guarantee Fund
EIA	-	Environmental Impact Assessment
EIS	-	Environmental Impact Statement
EMB	-	Environmental Management Bureau
EMP	-	Environmental Monitoring Fund
EMoP	-	Environmental Monitoring Plan
GHG	-	Greenhouse Gas
GLC	-	Ground-Level Concentration
GPS	-	Global Positioning System
IEC	-	Information and Education and Communication
IFMA	-	Integrated Forest Management Agreement
IIA	-	Indirect Impact Area
IRR	-	Implementing Rules and Regulations
KBA	-	Key Biodiversity Area
kW	-	Kilowatts
kWh	-	Kilowatt hour
LCI	-	LCI Envi Corporation
MASL	-	Meters above sea level
MENRO	-	Municipal Environment and Natural Resources Office
MGB	-	Mines and Geoscience Bureau
MHO	-	Municipal Health Officer
MMTPY	-	Million Metric Tons per Year
NAAQS	-	National Ambient Air Quality Standards
NAAQGV	-	National Ambient Air Quality Guideline Values
NCC	-	Northern Cement Corporation
NESSAP	-	National Emission Standard for Source Specific Air Pollutants
NGOs	-	Non-Government Organizations
NIPAS	-	Network of Integrated Protected Areas System
nm	-	Nanometer
NOAH	-	Nationwide Operational Assessment of Hazards
NPCC	-	National Pollution Control Commission
NSCB	-	National Statistical Coordination Board
NWRB	-	National Water Resources Board
PAGASA	-	Philippine Atmospheric, Geophysical, and Astronomical Services Administration

PAR	-	Philippine Area of Responsibility
PAWB	-	Protected Areas and Wildlife Bureau
PBL	-	Planetary Boundary Layer
PDR	-	Project Description Report
PEISS	-	Philippine Environmental Impact Statement System
PENRO	-	Provincial Environment and Natural Resources Office
PHILVOCS	-	Philippine Institute of Volcanology and Seismology
PM	-	Particle Matter
PNSDW	-	Philippine National Standards for Drinking Water
PPS	-	Personal Protective Equipment
PSA	-	Philippine Statistics Authority
PSR	-	Public Scoping Report
RHU	-	Rural Health Unit
SB	-	Sangguniang Bayan
SBCs	-	Sensitive Biological Communities
SDP	-	Social Development Program
SMNCI	-	San Miguel Northern Cement, Inc.
SMR	-	Self-Monitoring Report
SRTM	-	Shuttle Radar Topography Mission
SWMP	-	Solid Waste Management Program
TSP	-	Total Suspended Particles
UN	-	United Nations

EXECUTIVE SUMMARY

Project Fact Sheet

Name of Project	**NCC Cement Plant and Quarry Expansion Project**	
Project Location	Province of Pangasinan, Municipality of Sison, Barangay Labayug	
Project Category & Type (based on Annex A of MC 2014-005 Guidelines)	Cement Plant with Quarrying	
Project Size	**Cement Plant Clinker Production**	
	Existing Line 1 & 2 Production Capacity	Proposed New Line1&2 Production Capacity
	4,000 TPD (1.28 MMTPY) Clinker	5,500 TPD (1.76 MMTPY) Clinker
	Quarry	
	Existing Extraction Rate	Proposed New Extraction Rate
	2.72 MMTPY Limestone 0.672 MMTPY Shale	8.27 MMTPY Limestone 1.83 MMTPY Shale

Summary of Major Project Components

Component	Existing	Proposed Additional
	Quarry	
Limestone crushing system	2 units x 250 TPH Jaw and Impact Crusher	No additional
Storage Bins	42,000 tons	No additional
	Cement Plant	
Coal mill/grinding system	35 TPH coal grinder 2 units 25 TPH vertical mill 17.8 TPH coal mill 40 TPH hammer mill flash dryer 50 TPH coal flash dryer 40 TPH ball mill	No additional
Coal storage	9-bays coal storage	No additional
Raw material Pre-blending	75 TPH Roller Crusher 300 TPH Swing Hammer Crusher	No additional
Raw Mill	2 units 165 TPH hammer mills 2,400 TPH Raw Ball Mill	
Homogenizing silo	4 units 1,300 TPH	Upgrading and rehabilitation of old internal parts and blowers
Pre-heater	2 units 4 stage pre-heater	Upgrading and modification of 2 units preheater with feed points for AFR
Gas Conditioning Tower	Old GCT Single fluid Spraying System	Upgrading of water spraying system of GCT using highly efficient Autojet Gas Cooling System
Kiln feeding system	2 units 100 TPH	No additional
Kiln system	2 units 2,200 TPD	Replacement of old burner pipe to low-

			NOx German FLSmidth burner pipe
	Clinker cooler	2 units	No additional
	Clinker silo	2 units 25,000 MT	Additional 25,000 MT concrete clinker silo Additional steel clinker silo
	Cement grinding	190 TPH finish ball mill 130 TPD finish ball mill	No additional
	Cement silo	39,000 MT	No additional
	Packaging house	3 units 1,600 TPD rotary packing machines 4 units 90 TPH rotary packing machine	No additional
	Bulk loading facility	1 unit 40 TPH 2 units 2,500 MT steel silo	
	Support Facilities	• Medical Clinic • Administration Building • Machine Shop • Warehouse • Access Roads • Guest house/Staff house • Waste heat recovery system • Water Treatment Facility • Explosive Magazine	
Project Cost	**Php 3.5 Billion**		
Construction Period	2019-2020		
Commercial Operation Date	4th quarter 2020		
Proponent Name	**Northern Cement Corporation**		
Proponent Authorized Representative	**Ms. Rodelia A. Sarrosa** AVP and Support Group Manager		
Proponent Address and Contact Details	155 EDSA, Brgy. Wack-Wack, Mandaluyong City, Metro Manila, Philippines		
EIA Preparer (Consultant)	**LCI ENVI CORPORATION**		
Preparer Contact Person	**Engr. Jose Marie U. Lim, MSc.** EIA Team Leader		
Preparer Address and Contact Details	Unit 8L-M Future Point Plaza 3 111 Panay Avenue, South Triangle Quezon City, Metro Manila, Philippines Tel. No.: (632) 442-2830 Fax No.: (632) 961-9226		

Process Documentation

Terms of Reference for the EPRMP Study

1 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.

2 **Northern Cement Corporation (NCC)** is currently operating a cement plant facility in Barangay Labayug, Sison, Pangasinan. The cement plant facility is composed of two lines (Line 1 and Line 2) with a total clinker production capacity of 4,000 metric tons per day (1.20 Million Metric Tons per Year) or about 6,667 metric tons per day of cement. The operation of the cement plant of the NCC is granted with an Environmental Compliance Certificate Ref. No. 9207-032-301C last January 15, 1993. NCC intends to amend the ECC Ref. No. 9207-032-301C to (1) include the quarry operation that was under ECC Ref. No. 9909-106-105, (2) to increase the limestone and shale production capacity of the quarry and (3) to increase the clinker production capacity of Line 1 and Line 2 to 5,500 metric tons per day.

3 The Proponent is required to amend its existing Environmental Compliance Certificate (ECC) from the DENR-EMB prior to any development in the project site. Pre-requisite to the acquisition of amended ECC for the project is the submission of an Environmental Performance Report and Management Plan (EPRMP) as stated on the EMB Memorandum Circular 005-2014 (Revised Guidelines for Coverage Screening and Standardized Requirements under the Philippine EIS System). The EPRMP used the EIS Scoping and Screening Form for Mining Projects as a guide in the impact analysis.

Scope of the EPRMP Study

4 This Environmental Performance Report and Management Plan (EPRMP) documents how the **Northern Cement Corporation** manages the environmental impacts associated with their existing quarry and cement plant operations and presents additional measure necessary to maintain the environmental compliance with the proposed expansion project.

5 This EPRMP documented the prevailing environmental conditions in the project area and in its surrounding environment using recent compliance monitoring reports. This will also serve as binding document where **Northern Cement Corporation** presents its updated environmental commitments through a comprehensive environmental management and monitoring plan.

6 This EPRMP document shall be submitted to the Environmental Management Bureau (EMB) Central Office for review and evaluation. The EPRMP is a prerequisite for the acquisition of the new or amended ECC, that would include the proposed changes of **Northern Cement Corporation**.

EPRMP Team

7 LCI Envi Corporation (LCI) was commissioned by **Northern Cement Corporation** to conduct the EPRMP study for the proposed expansion 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	REGISTRATION NO.
Engr. Jose Marie U. Lim, MSc.	Team Leader/ Environmental Management Specialist	IPCO-029
Kevin Paolo G. Bartolome	Environmental Management Specialist (Air)	IPCO-353
Engr. Patricia Ann Go	Environmental Management Specialist (Water)	IPCO- 352
Jerome B. Leaño	Sociology/ Social Development Specialist (People) Environmental Management Specialist (Land)	IPCO-059
Teodora Haresco-Salvador*	Land Use and Social Modules	IPCO 111
Jose Dennis Regalado*	Terrestrial Flora, Entomology and Benthic Survey	Deceased
Alan Salvador*	Water Quality, Hydrogeology and Hydrology	IPCO-281
*Note: * Envitech Environmental Management Consultancy Services, Inc. (Previous consultants of NCC)*		

EPRMP Study Schedule & Area

EPRMP Study Schedule

8 The timetable for the EPRMP study is shown in the following table:

PROCESS	EIA STUDY MILESTONES	DATE
PUBLIC CONSULTATIONS/ IEC ACTIVITY	Barangay Labayug	September 22, 2015 June 14, 2017
	Barangay Calunetan	September 7, 2015 June 16, 2017
	Barangay Inmalog	September 7,2015 June 17, 2017
	Barangay Paldit	September 8, 2015 June 15, 2017
	Barangay Sugcong	September 2, 2015 June 15, 2017
	Sitio Inmalog	October 1, 2105 June 16, 2017

EPRMP Study Area

9 The proposed project site is situated in Brgy. Labayug in the Municipality of Sison, Pangasinan, Region I (Ilocos Region). Initially, the project impact area generally consisted of the project footprints as the direct impact area (DIA) and the areas in the immediate vicinity of the project site in the host barangay LGU Labayug as the indirect impact area (IIA). In accordance with the guidelines provided in DAO 2017-15, after the completion of the EIA study, the delineation of the direct and indirect impact areas was updated as follows:

- For the Land component, the direct impact area (DIA) pertains to the areas that will be cleared and developed for the construction and operation of the proposed project components, which are identified in **Section 1.4**.

- For the Water component, the DIA refers to the additional deep wells that will be developed within the project site that will be tapped to supply the additional water requirements of the project. Nearby creek and groundwater sources are currently being used by the proponent in its operation.

- For the Air component, the DIA covers the areas within the host barangay of Labayug where the ground-level concentrations (GLC) of total suspended particles (TSP), the criteria pollutant

of potential concern, were projected to exceed 40 µg/Ncm based on 1-hr averaging time. According to the dispersion modelling, the maximum GLC does not exceed the standards stated in DAO 2000-81.

- For the People component, the IIA encompasses the communities in the host Municipality of Sison particularly Brgy. Labayug (host barangay), Brgy. Calunetan, Brgy. Inmalog, Brgy. Paldit and the Municipality of Pozurrubio in Brgy. Sugcong, which are expected to benefit from the employment, business opportunities, taxes, and other potential socio-economic contributions of the project.

EPRMP Methodologies

10 The methods employed in each of the four modules of the EPRMP study are summarized as follows:

EIA MODULE	METHODS	PURPOSE
LAND	• Review of land use plan in the host municipality of Sison, Pangasinan • Soil sampling and quality analysis • Review of relevant geologic maps covering the study area • Assessment of terrestrial ecology in the study area • Review of existing and proposed quarry plans	• 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 site
AIR	• Climatological data from the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) • Review of NCC's self-monitoring reports on ambient air quality, noise level and stack emissions • Air dispersion modeling	• To assess possible impacts of meteorology on the proposed development • To review compliance of NCC to DENR standards • To assess possible impacts of proposed project activities on air quality in the impact area
WATER	• Groundwater and surface water sampling and quality analysis to establish the baseline • Review of available water quality monitoring data covering the study area • Assessment of freshwater ecology in the study area • Review of NCC's self-monitoring report on the quality of effluent discharges • Review of actual water production and consumption data	• To determine existing groundwater and surface water quality in the area • To review compliance of NCC to DENR standards • To assess possible impacts of the project to groundwater and freshwater quality and ecosystem.
PEOPLE	• Socio-economic and perception survey in the project impact areas • Review of socio-economic profile of the communities in the impact area (Barangay Labayug), Stakeholder consultations (focused group discussion, key informant interview with various stakeholders • Review of activities completed for the SDP and SDMP by the company for the past 3 years.	• To assess impacts of the project on the project-affected persons • To hear the opinions of stakeholders on the project. • To ensure that the company provides social development programs suitable for the project-affected community.

Scoping and Public Participation

Information and Education Campaign

11 Information and education campaign (IEC) and focused group discussions (FGDs) were done at the affected barangays last September 2015 and June 2017 by the Envitech Environmental Management Consultancy Services, Inc., the former EPRMP consultant of NCC.

Socio-Economic and Perception Survey

12 As part of the baseline characterization and impact assessment on People, a socio-economic and perception survey was conducted last June 25, 2019. The survey covered the residents of Barangays Labayug, Paldit, inmalog, Calunetan and Sugcong with a total of 295 respondents.

13 Each respondent was asked to fill out a two-page survey form, which was written Tagalog. The perception survey form had two parts. The first part contained 11 questions on the respondent's profile, while the second part had six questions that aimed to gauge the awareness and gather the opinion of the respondent regarding the proposed project.

EPRMP Summary

Summary of Alternatives

Site Selection

14 No alternative sites were suggested for the expansion of the cement plant since only upgrading of the existing facilities and installation of additional equipment will be done to increase its clinker production capacity. There is no need for land clearing if the facility is built within the existing cement plant, which should lessen impacts on land, water, and air. Also, people in the area are already quite receptive regarding the existence of the cement plant in the area.

15 No alternative sites for the quarry expansion were considered since the proposed area for the expansion is located within the MPSA of NCC. Transportation of the minerals will also be easier since the cement plants are also located inside the MPSA.

Technology Selection

16 There are two types of cement production processes: the wet process and the dry process. **NCC** will still be using dry process since this is already being utilized by the existing cement lines. The proposed expansion of the cement plant will only involve upgrading of the existing equipment to accommodate the additional production capacity. Dry process also requires minimal water. The savings in fuel cost by using the dry process as opposed to the wet process is the compelling reason why modern cement plants use the dry process.

Resources and Alternative Fuels

17 The proponent is committed to improve the cement production in its project by seeking energy efficient processes and sustainable alternative energy sources. They are considering the use of alternative fuels, which is well proven and well established in most cement industries in Europe and Asia.

18 Possible alternative fuels that can be used for the proposed cement plant include industrial wastes such as: used tires, waste oils, pet coke, rice husks and refuse derived fuel.

No Project Options

19 If the proposed expansion of the cement plant and the quarry will not be pursued, the cement market will be affected. Cement prices may be higher if the supply does not meet the current demand. The market may also resort to buying of imported cement instead of the local cement if the supply is low. Furthermore, the following impacts will be **avoided** if the proposed expansion will not happen.

- Land: The quarry expansion will cause loss of flora and fauna in the additional quarry areas. More residual wastes will be generated with the proposed expansion.
- Air: With the increased clinker and quarry production, there will be for dust and GHG emissions.
- Water: There will be an increase in the water consumption with the expansion. Additional deep wells be constructed as water source. There will also be increase on the generation of wastewater.
- People: The expansion will provide more job opportunities to the local community. Approximately 2,449 workers are required for the operation of the cement plant and quarry. There will also be an increase on the local taxes and revenues. It is estimated that the project will entail payment of annual business tax of ~Php 14 to 15 Million and real property tax of ~19 to 22 Million. Additional budget will also be allocated for the SDP and SDMP programs of NCC.

Key Findings of the Environmental Baseline Studies

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

MODULE	SUMMARY OF FINDINGS
LAND	
Land Use and Classification	▪ The area where the proposed project is situated is designated as industrial zone. ▪ The proposed project site does not fall within any declared ECA and is not covered by any tenurial instrument.
Geology/Geomorphology	▪ There are three fault lines near the location of the NCC Line 1 and Line 2 cement plant. ▪ The project site has medium to high susceptibility in terms of earthquake-induced landslide. ▪ The project site is not susceptible to liquefaction. ▪ The project site has high to moderate susceptibility to landslide. ▪ The project site is not a flood-prone area. ▪ There are no active volcanoes near the project site. ▪ The project site is not prone to tsunami.
Terrestrial Ecology	▪ From the terrestrial flora survey, 2 species are considered as endangered, one species is vulnerable, and 3 species are critically endangered according to the IUCN Red List of Threatened Species. ▪ On the other hand, based from the DAO 2017-11, there are one species that is endangered, one species is critically endangered and five are vulnerable. ▪ There are no critically endangered fauna species found in the project site based from the IUCN list. However, only the *Python reticulatus* (Reticulated phyton) was listed in the DAO 2004-15 as other threatened species (OTS).
WATER	
Hydrology/Hydrogeology	▪ The project site is located within the catchment area of Aloragat River. There are four creeks near the project site; Buli Creek, Bettac Creek, Sapid Creek and Cabuar Creek.

MODULE	SUMMARY OF FINDINGS
Competition in Water Use	▪ The expansion of the cement plant will increase the required water into 1,250 m^3/day. The quarry operation will also require 80 m^3/day of water. ▪ NCC is reusing its water from the siltation ponds
Water Quality	▪ SW1 and SW3 exceeded the standard for fecal coliform. All the stations have high total coliform content. ▪ All the groundwater samples collected exceeded the standard for fecal coliform.
Freshwater Ecology	▪ Station 1 and Station 2 have the highest number of macroinvertebrate individuals observed with 63 and 50 individuals, respectively. These transects in Sapid creek are located near the spring pond where riparian vegetation thrives like bamboo, figs and other shade trees favorable for macroinvertebrates growth and survival. ▪ Family Culicidae, Family Ampulariidae and Family Gyrinidae are the most abundant species.
AIR	
Meteorology	• The project area mainly belongs to Type I climate under the modified Coronas classification (two pronounced seasons, dry from December to May and wet from June to November). • Temperature is highest in April and lowest in January. • The rainiest month is August with mean monthly rainfall values of 581.3mm. The driest month in the area is January with only 6.7 mm of rainfall. • An average of 5 cyclones pass through the area every three years.
Ambient Air Quality and Noise	▪ All sampling stations showed acceptable ambient air and noise conditions, with the values below the specified NAAQS and NPCC limits, respectively.
PEOPLE	
	▪ Water supply sources in Sison and Pozorrubio include piped connection, deep wells, shallow wells and spring sources. ▪ Sison is served by 2 power supply service providers namely: Benguet Electric Cooperative (BENECO) and La Union Electric Cooperative (LUELCO). ▪ The municipality of Pozorrubio is served by a power supply service provider namely: Pangasinan III Electric Cooperative, Inc. (PANELCO III). ▪ The consistent leading cause of morbidity in Sison (2014-2018) was Hypertension and Upper Respiratory Tract Infection. ▪ Based on the perception survey, (~60%) of all the respondents have prior knowledge about the proposed project. (36.2%) of the respondents believed that the proposed project would be beneficial for their respective communities. ▪ The most cited potential positive impact of the project for the impact Barangays is employment generation (76%), followed by increased local tax revenue collection (28%). ▪ Conversely, the most cited potential negative impact of the project is air pollution (84%), followed by water (45%) and land (33%) pollution.

Integrated Summary of Impacts and Residual Effects After Mitigation

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

POTENTIAL IMPACTS	PROJECT PHASES	FINDINGS/OBSERVATIONS	MITIGATING/ENHANCEMENT MEASURES
LAND			
Devaluation of land value as a result of improper solid waste management and other related impacts	Construction, Operation, Abandonment	Increase in generation of wastes (hazardous, residual, scraps)	NCC implements its waste management procedures which include solid waste management plan, hazardous waste management plan and scraps management
Vegetation removal and loss of habitat due to quarry expansion	Quarry Operation	Loss of flora and fauna in the areas to be developed as quarry sites	• NCC is implementing its approved Environmental Protection and Enhancement Program • NCC is also conducting reforestation activities and greening projects in the project site
Modification of existing terrain	Quarry Operation	Existing terrain will be modified due to earth movement and excavation during quarry operation	• Reforestation of mined-out areas • Mine rehabilitation plan
WATER			
Degradation of ground water / surface water quality	Construction, Operation	Accidental oil spills from heavy equipment Accidental oil spill from delivery trucks	NCC has its oil spill contingency plan
	Construction, Operation	Ground and surface water contamination from improper disposal of wastes, percolated wastewater, sludge and fecal matter	• Sanitation facilities for workers (e.g. toilets, showers, etc.) are provided on-site • Septic tanks are also installed and are regularly desludged • Provision of Sewage Treatment Plant
Degradation of surface water quality	Construction, Operation	Possible siltation and surface runoff Increase in turbidity of surface water	Siltation ponds are constructed in the quarry areas and cement plant and are regularly desilted
AIR			
Impact on Air Quality	Construction	NO_x, SO_2, and CO emissions from heavy equipment that will be used during construction.	Preventive maintenance is regularly conducted to all vehicles and equipment.
	Operation	TSP and PM_{10} emissions from the cement manufacturing facility and quarry sites is of primary concern.	▪ Installation of bag filters that will control at least 99% of the emissions from the cement manufacturing plant of NCC and SMNCI • Road watering within the plant site to control dust
		Gaseous emissions are expected from the kiln and the coal mill.	Proper maintenance of equipment to ensure efficiency
		Heavy metal emissions are expected from the kiln due to use of alternative fuels	• Bag filters can also control up to 92% of heavy metal emissions
Increase in Ambient Noise Level	Construction/ Operation	Noise will be generated by heavy equipment during construction and quarry operation.	• Preventive maintenance is regularly conducted to all vehicles and equipment.

POTENTIAL IMPACTS	PROJECT PHASES	FINDINGS/OBSERVATIONS	MITIGATING/ENHANCEMENT MEASURES
		The cement plant will generate noise.	• Heavy equipment are muffled. • Workers use appropriate PPE. • Noisy activities are performed only during daytime. • Sound barriers and sound proofing are installed
PEOPLE			
Occupational Health and Safety	Construction, Operation	Exposure of workers to occupational health and safety hazards	• NCC is implementing its Safety and Health Policy • NCC has Emergency and Preparedness Response Program
Generation of Local Benefits from the Project	Operation	Higher allocation of fund for social development programs	• NCC is implementing its social development programs that are responsive to local needs in the impact area • NCC conducts yearly IEC activities with various barangay representatives to formulate SDMP activities.
Traffic Congestion	Construction Operation	Increase in traffic generation in the area due to delivery trucks coming in and out of the Plant	• Coordination with LGU on scheduling and handling the flow of traffic near the project area • Traffic Management Plan

Risks and Uncertainties

22 The 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
Air/People	Failure of existing air pollution control devices	Consider redundancy for emergency air pollution control
Land/People	Landslide associated to quarry operations	• Development and strict implementation of the quarry development plan approved by MGB • Coordination with MGB and local authorities for proper management control.

SECTION 1

PROJECT DESCRIPTION

1 **Northern Cement Corporation (NCC)** is currently operating a cement plant facility in Barangay Labayug, Sison, Pangasinan. The cement plant facility is composed of two lines (Line 1 and Line 2) with a total clinker production capacity of 4,000 metric tons per day (1.20 Million Metric Tons per Year) or about 6,667 metric tons per day of cement. The operation of the cement plant of the NCC is granted with an Environmental Compliance Certificate Ref. No. 9207-032-301C last January 15, 1993.

2 NCC also has quarry operation with a different ECC (Environmental Compliance Certificate Ref. No. 9909-106-105) secured last February 24, 2000. The quarry of NCC is under Mineral Production Sharing Agreement (MPSA) No. 106-98-1 with aggregate area of 630 hectares. Under the mentioned ECC, the NCC can use about 163 hectares of the MPSA as quarry area with daily production capacity of 8,500 MT and 2,100 MT of limestone and shale, respectively. The NCC Line 1 and Line 2 cement plant is located within the MPSA area and the quarry supplies its limestone and shale requirement.

3 The ECC Ref. No. 9909-106-105 also covers the proposed Line 3 of the cement plant of the NCC however, it was never constructed due to economic downturns. NCC entered an agreement with San Miguel Northern Cement, Inc. (SMNCI) that SMNCI will be the new owner for the said ECC but will cover the cement plant operation only. SMNCI will amend ECC Ref. No. 9909-106-105 to (1) transfer the ownership of the mentioned ECC to SMNCI, (2) exclude the quarry operations as project component and (3) to expand the clinker production capacity (Line A and Line B in place of Line 3). A separate ECC amendment application is being done for this.

4 On the other hand, NCC intends to amend the ECC Ref. No. 9207-032-301C to (1) include the quarry operation that was under ECC Ref. No. 9909-106-105, (2) to increase the limestone and shale production capacity of the quarry and (3) to increase the clinker production capacity of Line 1 and Line 2.

5 To supply the increasing demand of cement in the country, NCC intends to increase its clinker production capacity from 4,000 TPD to 5,500 TPD. For the expansion of the capacity of the cement plant, no additional cement plant line will be constructed, and no additional area will be required. The expansion will only include upgrading and installation of additional equipment.

6 The quarry production of NCC is also to be increased to 8.27 MMTPY of limestone and 1.83 MMTPY of shale. The increase in quarry production is for the supply of the additional raw material requirements of the expansion of the NCC Line 1&2, to supply the raw materials of the proposed San Miguel Northern Cement, Inc. (SMNCI) Line A and Line B cement plant facility and the limestone requirement of the SMC Global Power.

7 The same MPSA will be utilized for the expansion of the limestone and shale. However, the proponent also intends to use its adjacent property outside the MPSA to supply the additional shale requirement. A quarry permit and a separate ECC will be applied for this. The proponent is currently conducting a study on the said properties.

8 **Table** 1-1 shows the details of the project, the Proponent, and the EIA Preparer.

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

Name of Project	**NCC Cement Plant and Quarry Expansion Project**	
Project Location	Province of Pangasinan, Municipality of Sison, Barangay Labayug	
Project Category & Type (based on Annex A of MC 2014-005 Guidelines)	Cement Plant with Quarrying	
Project Size	**Cement Plant Clinker Production**	
	Existing Line 1 & 2 Production Capacity	Proposed New Line1&2 Production Capacity
	4,000 TPD (1.28 MMTPY) Clinker	5,500 TPD (1.76 MMTPY) Clinker
	Quarry	
	Existing Extraction Rate	Proposed New Extraction Rate
	2.72 MMTPY Limestone 0.672 MMTPY Shale	8.27 MMTPY Limestone 1.83 MMTPY Shale
Proponent Name	**Northern Cement Corporation**	
Proponent Authorized Representative	**Ms. Rodelia A. Sarrosa** AVP and Support Group Manager	
Proponent Address and Contact Details	155 EDSA, Brgy. Wack-Wack, Mandaluyong City, Metro Manila, Philippines	
EIA Preparer (Consultant)	**LCI Envi Corporation**	
Preparer Contact Person	**Engr. Jose Marie U. Lim, MSc.** EIA Team Leader	
Preparer Address and Contact Details	Unit 8L-M Future Point Plaza 3 111 Panay Avenue, South Triangle Quezon City, Metro Manila, Philippines Tel. No.: (632) 442-2830 Fax No.: (632) 961-9226	

1.1 Project Location and Area

1.1.1 Project Location

9 The proposed expansion of the cement plant facility will be within the existing 43.06-hectare NCC plant complex in Brgy.Labayug, Sison, Pangasian. The general location map of the NCC Line 1 & Line 2 is shown in **Figure** 1-1. The geographic coordinates defining the boundary of the proposed project site are provided in the table below.

Table 1-2: Coordinates of the NCC Cement Plant Complex

Point	Latitude	Longitude
1	16° 9'47.73"	120°33'57.32"
2	16° 9'47.89"	120°34'3.29"
3	16° 9'48.51"	120°34'3.23"
4	16° 9'48.37"	120°34'7.74"
5	16° 9'46.47"	120°34'9.35"
6	16° 9'43.66"	120°34'8.99"
7	16° 9'44.38"	120°34'11.39"
8	16° 9'48.05"	120°34'11.87"
9	16° 9'48.33"	120°34'15.90"
10	16° 9'50.47"	120°34'15.82"
11	16° 9'52.04"	120°34'13.82"
12	16°10'3.67"	120°34'9.94"
13	16°10'6.16"	120°34'6.31"
14	16°10'10.87"	120°34'3.76"
15	16°10'10.09"	120°33'54.22"
16	16°10'0.72"	120°33'47.85"
17	16° 9'52.48"	120°33'58.08"
18	16° 9'50.36"	120°33'57.21"

10 The quarry operation of NCC is also located in Brgy. Labayug, Sison, Pangasinan. The location of the MPSA and the limestone and shale quarry areas are also shown in **Figure** 1-1 while the geographic coordinates are shown in **Table** 1-3**.**

Table 1-3: Coordinates of the Exiting Quarry Area

POINT	MPSA No. 106-98-1 LATITUDE	LONGITUDE
1	16º 10' 14.23"	120º 33' 24.43"
2	16º 10' 28.984"	120º 33' 39.631"
3	16º 10' 51.94"	120º 33' 15.776"
4	16º 11' 06.693"	120º 33' 30.978"
5	16º 10' 43.739"	120º 33' 54.833"
6	16º 11' 13.228"	120º 34' 25.24"
7	16º 10' 27.331"	120º 35' 12.946"
8	16º 10' 12.578"	120º 34' 57.743"
9	16º 10' 02.806"	120º 35' 07.895"
10	16º 09' 33.298"	120º 34' 37.49"
11	16º 09' 43.07"	120º 34' 27.338"
12	16º 09' 28.317"	120º 34' 12.136"
Limestone Quarry (Existing)		
1	16°10'6.03"	120°34'8.25"
2	16°10'28.98"	120°33'39.63"
3	16°10'43.73"	120°33'64.83"
4	16°10'20.78"	120°34'18.60"
Limestone Quarry (Expansion)		
1	16°10'13"	120°33'20.54"
2	16°11'0.88"	120°33'37.54"
3	16°10'37.93"	120°33'59.60"
4	16°11'7.42"	120°34'30"
5	16°10'21.52"	120°35'17.71"
6	16°10'6.77"	120°35'2.51"

POINT	MPSA No. 106-98-1 LATITUDE	LONGITUDE
7	16°9'57"	120°35'12.66"
8	16°9'27.49"	120°34'42.25"
9	16°9'37.26"	120°34'32.10"
10	16°10'14.25"	120°34'1.09"
Shale Quarry (Existing)		
1	16°9'51.27"	120°33'48.20"
2	16°10'8.42"	120°33'29.19"
3	16°10'23.17"	120°33'44.39"
4	16°10'0.22"	120°34'8.25"

1.1.2 Project Area

11 The proposed expansion of the NCC cement plant will still occupy a total land area of 43.06 hectares. No additional land area will be used for the expansion since only upgrading and installation of additional equipment will be done to increase the clinker production capacity of the NCC Line 1&2. No additional production line will be constructed for the expansion.

12 The expansion for the limestone production will be utilizing the same MPSA No. 106-98-1 and will cover 483 hectares of mining area. For the shale, the same quarry area will be used.

13 The nearest industrial plants near the proposed facility are listed in the table below:

Table 1-4: Proximity of Other Plants with the Project Area

DIRECTIONAL REFERENCE (FROM THE PROJECT AREA)	TYPE OF PLANT	BRIEF DESCRIPTION
East *(Brgy. Tiblong, San Fabian, Pangasinan)*	LPG Terminal	▪ Pryce Gases Inc. operates a 7.5-hectare liquified petroleum gas (LPG) terminal with a storage capacity of 8,400 MT in Brgy. Tiblong, San Fabian. It is approximately 15 kilometers away from the project site.
Southwest *(Brgy. San Roque, San Manuel, Pangasinan)*	Hydroelectric Power Plant	▪ San Roque Power Corporation operates a hydroelectric power plant with a capacity of 435 MW in the Municipality of San Manuel, Pangasinan. It is approximately 13 kilometers away from the project site.

1.1.3 Project Impact Areas

14 The study area for the EIA includes the direct and indirect impact areas. The project impact area generally consists of the ~568-hectare project footprints of the cement plant complex and quarry areas the direct impact area (DIA) and the areas in the immediate vicinity of the project site in the host barangay LGU Labayug as the indirect impact area (IIA). In accordance with the guidelines provided in DAO 2017-15, the delineation of the direct and indirect impact areas will be updated as follows:

- For the Land component, the direct impact area (DIA) pertains to the areas that will be cleared and developed for the construction and operation of the proposed project components, which are identified in **Section 1.4**.
- For the Water component, the DIA refers to the additional deep wells that will be developed within the project site that will be tapped to supply the additional water requirements of the project. Nearby creek and groundwater sources are currently being used by the proponent in its operation.
- For the Air component, the DIA covers the areas within the host barangay of Labayug where the ground-level concentrations (GLC) of total suspended particles (TSP), the criteria pollutant of potential concern, were projected to exceed 40 µg/Ncm based on 1-hr averaging time.

According to the dispersion modelling, the maximum GLC does not exceed the standards stated in DAO 2000-81.

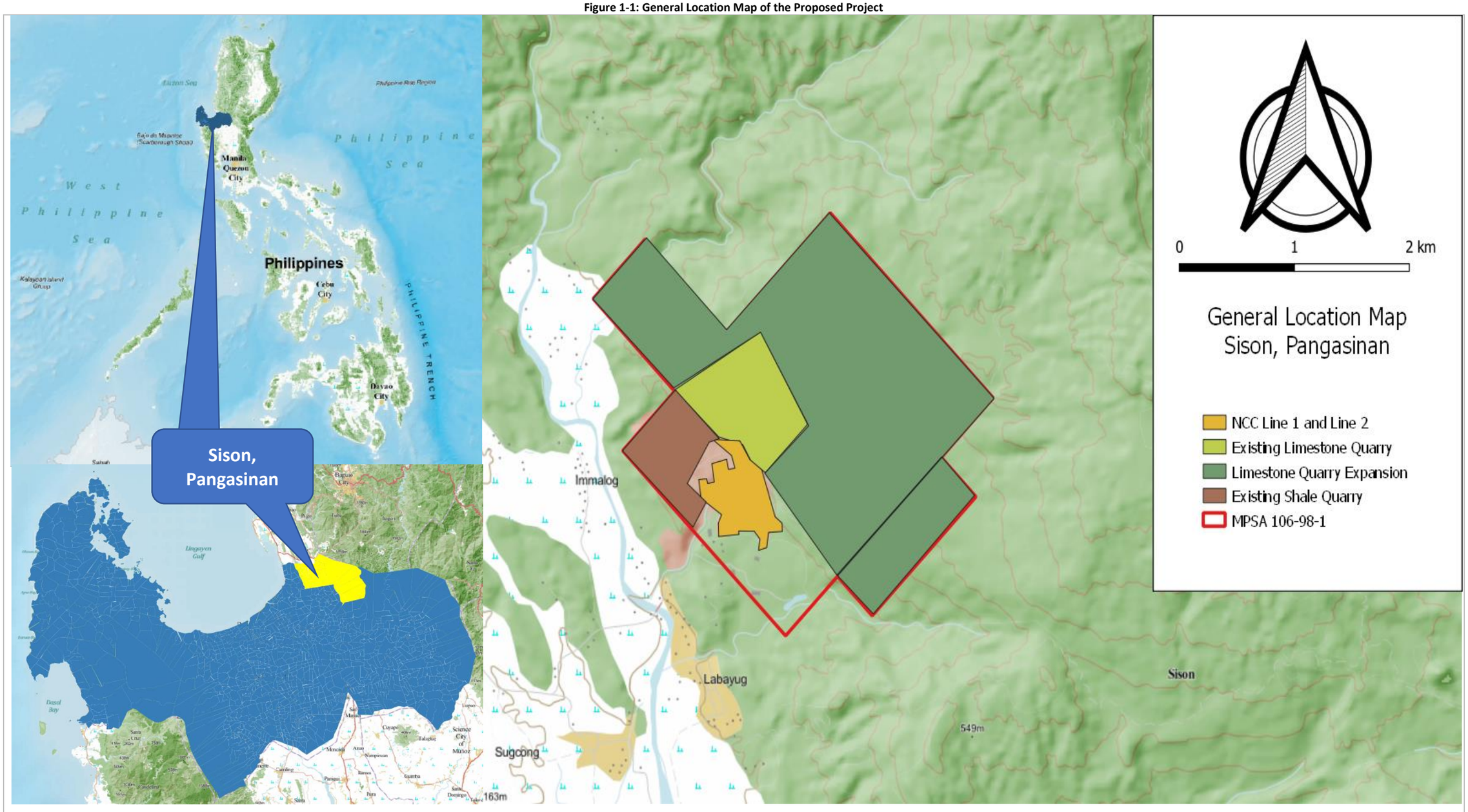
- For the People component, the IIA encompasses the communities in the host Municipality of Sison particularly Brgy. Labayug (host barangay), Brgy. Calunetan, Brgy. Inmalog, Brgy. Paldit and the Municipality of Pozurrubio in Brgy. Sugcong, which are expected to benefit from the employment, business opportunities, taxes, and other potential socio-economic contributions of the project.

15 The impact area delineation for the proposed project is graphically presented in **Figure** 1-2.

1.1.4 Accessibility of the Project Site

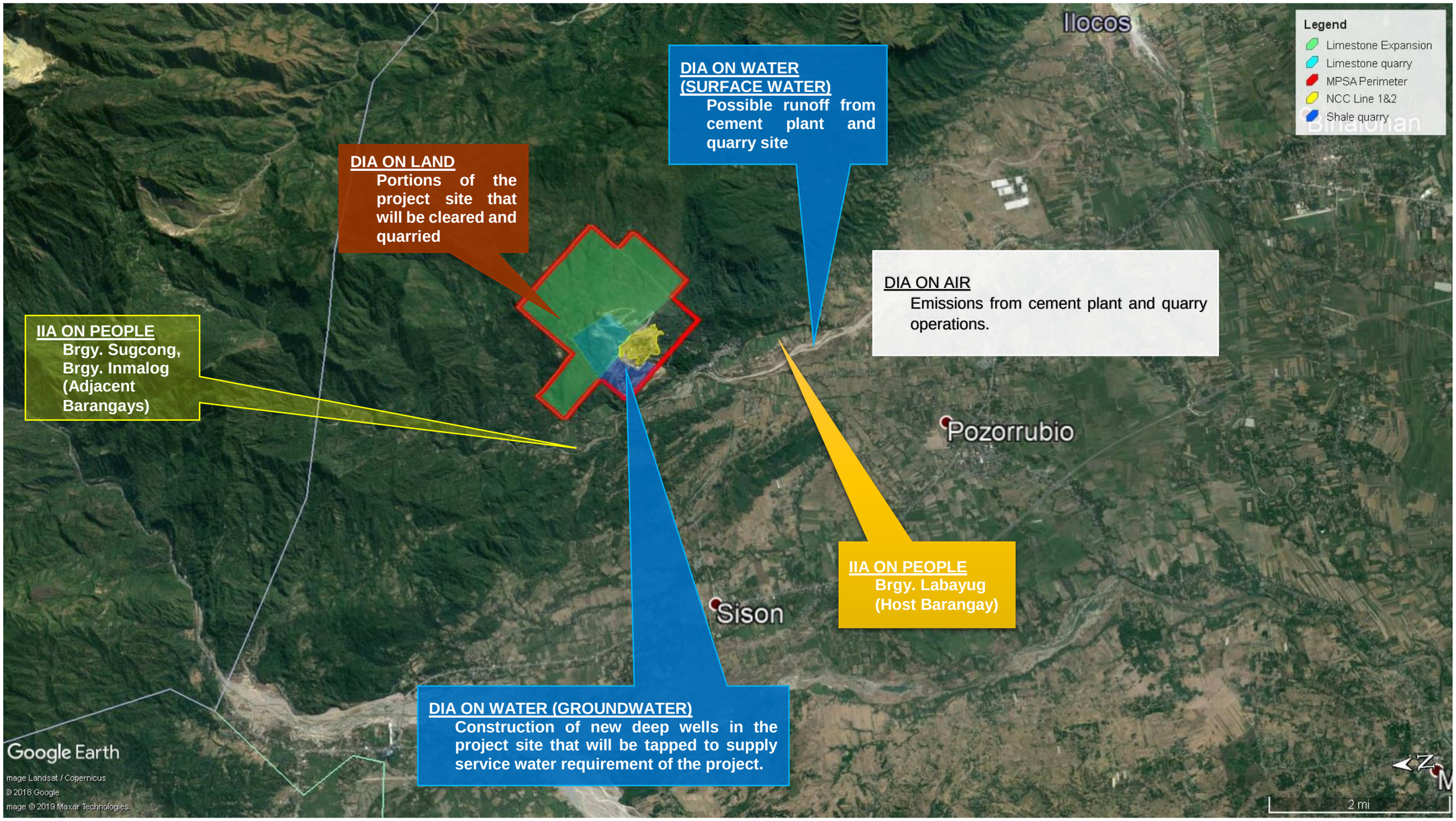
16 The proposed project site is approximately 212 kilometers away (3 hours and 10 minutes) from Kilometer Zero in Manila. It is accessible by any type of land vehicle. The fastest route will traverse the North Luzon Expressway (NLEX) and Tarlac-Pangasinan-La Union Expressway.

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



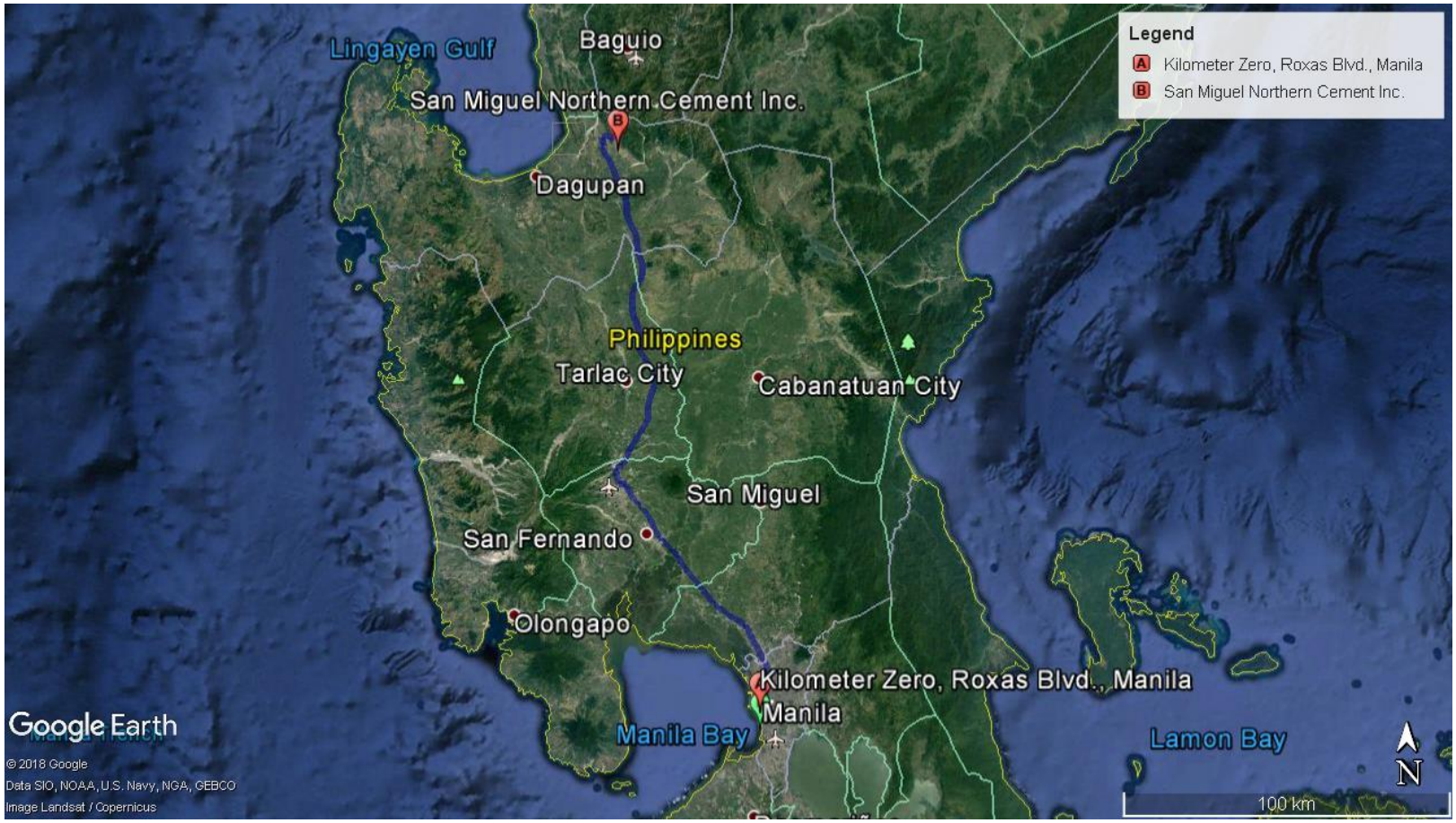
PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **GENERAL LOCATION MAP OF THE PROPOSED PROJECT**	FIGURE NO.: **1-1**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy.Labayug, Sison, Pangasinan	SOURCE: MAP GENERATED IN QGIS BASE MAP: NAMRIA

Figure 1-2: Primary and Secondary Impact Areas



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **PRIMARY AND SECONDARY IMPACT AREAS**	FIGURE NO.: **1-2**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: MAP GENERATED IN GOOGLE EARTH

Figure 1-3: Accessibility Map of the Proposed Project Site



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **ACCESSIBILITY MAP OF THE PROPOSED PROJECT SITE**	FIGURE NO.: **1-3**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: MAP GENERATED IN GOOGLE MAPS

1.2 Project Rationale

17 Expansion of the cement plant is in line with the goal of the national government to build infrastructure, as cement is a major construction material. Public and private developments hinge on the steady supply of cement. Furthermore, higher supply of cement leads to lower prices. Cement is almost universal in terms of building applications—ranging from government projects such as low-cost socialized housing, public elementary schools and hospitals, highways and bridges, and to privately-funded endeavors such as condominiums, commercial centers, and individual housing units.

18 It is important to maintain the supply of cement to maintain its prices. If supply of cement curtails, higher prices of cement may impede the progress of infrastructure projects, which may then lead to cutting of basic social services. A solution to low supply of cement is importation, but this solution undermines the local economy. Establishing cement manufacturing facilities in the country us important to provide a reliable supply of cement, lessen the dependence on imported cement products, and to assure competitive prices that supports local economy.

19 The Philippine Board of Investments (BOI) is looking for investors as it expects demand to bubble to 40 million tons/year by 2020[1]. This increase in demand is aided by the current administration's plan to focus its spending on infrastructure building. According to the Cement Manufacturers' Association of the Philippines, the cement facilities in the country have an installed and operating capacity of 34.5 million tons annually[2]. Based on the reports, a demand of about 5.5 million metric tons must be filled. Additionally, other sources warn that the current shortage of cement may delay construction of new buildings, which in turn will hold back creation of more spaces that can be used for business enterprises[3].

20 Expansion of the cement plant also has effects on the local economy Sison, Pangasinan. The project can contribute to the development of the area by providing local employment, tax contributions, and increased commercial trading.

1.3 Project Alternatives

21 Alternatives analysis is carried out to determine the most favorable alternative considering such factors as economic viability, technical feasibility, magnitude and extent of impacts on environment and people. The project is analyzed as the preferred alternatives while assessing "without the project" alternatives or "do nothing alternatives. Technology employed by the project was also assessed against similar technologies employed in the sector. **Table** 1-5 compares the environmental impacts of constructing and operating a full cement plant as opposed to the no-project scenario.

[1] Manila Bulletin. BOI seeks more cement investments as infra projects lifting demand. 2 June 2017.
[2] Inquirer.net. Cement supply enough for Build, Build, Build. 17 January 2019
[3] Philippine News Agency. Cement shortage seen to delay new construction projects. 10 April 2019

Table 1-5: Comparison of Anticipated Environmental Impacts of Project Alternatives

ALTERNATIVES	ANTICIPATED ENVIRONMENTAL IMPACTS
Full Cement Plant	• **Land:** Solid waste generation may be higher due to use of more resources and employment of more personnel. • **Water:** Construction and operation of larger facilities may have higher water supply requirement that may, in turn, result to higher wastewater generation. • **Air:** Possible increase in dust emissions from the cement processing may also adversely affect ambient air quality in the project area if not properly mitigated. • **People:** Local benefits from the large-scale project (i.e., increased employment, social and economic activities, tax revenues, and basic social services) may be greater. However, dust generated from the cement plant may cause adverse health effects to the community and workers if not properly mitigated.
No-Project Scenario	• **Land:** Quarrying activities to supply raw materials for NCC will continue. Adverse impacts due to quarrying will still be experienced. • **Air:** The ambient air quality in the area, as well as the source emissions from the facilities of NCC Line 1 and 2 are within DENR standards. • **Water:** The current operation will continue to consume water for industrial and domestic uses. • **People:** The no-project scenario entails loss of local employment and service opportunities. If the project is not pursued, the supply of cement will be affected, especially with the Duterte Administration's push for infrastructure development under the "AmBisyon Natin 2040" and the "Build, Build, Build" program.

1.3.1 Site Selection

22 No alternative sites were suggested for the expansion of the cement plant since only upgrading of the existing facilities and installation of additional equipment will be done to increase its clinker production capacity. There is no need for land clearing if the facility is built within the existing cement plant, which should lessen impacts on land, water, and air. Also, people in the area are already quite receptive regarding the existence of the cement plant in the area.

23 For the quarry area, no alternative sites are being considered since the existing quarry areas of NCC contain enough limestone and shale to supply the mineral requirements. Quarry expansion within the existing areas will pose less environmental impacts compared to adding another quarry site. New quarry sites may also result to new associated environmental and social impacts such as significant vegetation removal through site clearing and possible displacement of people in the new mine areas.

1.3.2 Technology Selection

24 There are two types of cement production processes: the wet process and the dry process. **NCC** will still be using dry process since this is already being utilized by the existing cement lines. The proposed expansion of the cement plant will only involve upgrading of the existing equipment to accommodate the additional production capacity. Dry process also requires minimal water. The savings in fuel cost by using the dry process as opposed to the wet process is the compelling reason why modern cement plants use the dry process.

1.3.3 Resources and Alternative Fuels

25 The proponent is committed to improve the cement production in its project by seeking energy efficient processes and sustainable alternative energy sources. They are considering the use of alternative fuels, which is well proven and well established in most cement industries in Europe and Asia.

26 Possible alternative fuels that can be used for the proposed cement plant include industrial wastes such as: used tires, waste oils, pet coke, rice husks and refuse derived fuel. The use of waste as alternative fuel in cement production has numerous environmental benefits such as:

- The use of waste will reduce the use of non-renewable fossil fuels, such as coal, and reduce the environmental impacts associated with coal mining. The use of waste as alternative fuel will contribute towards lowering of greenhouse gases emissions by reducing waste materials to be incinerated in municipal waste incinerators.
- The use of waste as alternative fuel is technically sound, since the process basically destroys the organic components and retains the inorganics, such as insoluble residues, ashes and silicates, and integrates these to the product. Cement kilns have a number of characteristics which make them ideal installations for alternative fuels to be vaporized and burnt safely. The following characteristics are high operating temperature, long residence time, presence of oxidizing atmosphere and alkaline environment, high thermal inertia, retention of ash in clinker and the continuous supply of fuel.
- Concrete made from cement manufactured using alternative fuels will have the same properties as concrete made from cement manufactured using fossil fuel as the heavy metal concentrations in concrete are not significantly changed by the use of alternative fuels. It is expected that quantities of leached metals will be immeasurable and significantly below levels allowed for drinking water.

1.3.4 No Project Option

27 If the proposed expansion of the cement plant and the quarry will not be pursued, the cement market will be affected. Cement prices may be higher if the supply does not meet the current demand. The market may also resort to buying of imported cement instead of the local cement if the supply is low. Furthermore, the following impacts will be avoided if the proposed expansion will not happen.

- Land: The quarry expansion will cause loss of flora and fauna in the additional quarry areas. More residual wastes will be generated with the proposed expansion.
- Air: With the increased clinker and quarry production, there will be for dust and GHG emissions.
- Water: There will be an increase in the water consumption with the expansion. Additional deep wells be constructed as water source. There will also be increase on the generation of wastewater.
- People: People: The expansion will provide more job opportunities to the local community. Approximately 2,449 workers are required for the operation of the cement plant and quarry. There will also be an increase on the local taxes and revenues. It is estimated that the project will entail payment of annual business tax of ~Php 14 to 15 Million and real property tax of ~19 to 22 Million. Additional budget will also be allocated for the SDP and SDMP programs of NCC.

1.4 Project Components

1.4.1 Major Components

28 The list of the existing major components of the NCC cement and quarry operations and the proposed additional equipment for the increase in the capacity of both the cement plant and quarry is shown in **Table** 1-6**.** The plant layout of NCC Line 1 and Line 2 is shown in **Figure** 1-4**.**

Table 1-6: List of Existing and Additional Project Components for NCC Cement Plant and Quarry

Component	Existing	Proposed Additional
	Quarry	
Limestone crushing system	2 units x 250 TPH Jaw and Impact Crusher	No additional
Storage Bins	42,000 tons	No additional
	Cement Plant	
Coal mill/grinding system	35 TPH coal grinder 2 units 25 TPH vertical mill 17.8 TPH coal mill 40 TPH hammer mill flash dryer 50 TPH coal flash dryer 40 TPH ball mill	No additional
Coal storage	9-bays coal storage	No additional
Raw material Pre-blending	75 TPH Roller Crusher 300 TPH Swing Hammer Crusher	No additional
Raw Mill	2 units 165 TPH hammer mills 2,400 TPH Raw Ball Mill	
Homogenizing silo	4 units 1,300 TPH	Upgrading and rehabilitation of old internal parts and blowers
Pre-heater	2 units 4 stage pre-heater	Upgrading and modification of 2 units preheater with feed points for AFR
Gas Conditioning Tower	Old GCT Single fluid Spraying System	Upgrading of water spraying system of GCT using highly efficient Autojet Gas Cooling System
Kiln feeding system	2 units 100 TPH	No additional
Kiln system	2 units 2,200 TPD	Replacement of old burner pipe to low-NOx German FLSmidth burner pipe
Clinker cooler	2 units	No additional
Clinker silo	2 units 25,000 MT	Additional 25,000 MT concrete clinker silo Additional steel clinker silo
Cement grinding	190 TPH finish ball mill 130 TPD finish ball mill	No additional
Cement silo	39,000 MT	No additional
Packaging house	3 units 1,600 TPD rotary packing machines 4 units 90 TPH rotary packing machine	No additional
Bulk loading facility	1 unit 40 TPH 2 units 2,500 MT steel silo	
Support Facilities	• Medical Clinic	

Component	Existing	Proposed Additional
	• Administration Building • Machine Shop • Warehouse • Access Roads • Guest house/Staff house • Waste heat recovery system • Water Treatment Facility • Explosive Magazine	

29 The proposed cement plant of the San Miguel Northern Cement Inc. (SMNCI) will be constructed adjacent to the NCC Line 1 and Line 2. NCC will share some support facilities of the SMNCI plant. These facilities will be owned by SMNCI. The list of the facilities that will be shared by NCC and SMNCI is shown in **Table** 1-7**.**

Table 1-7: Shared Facilities with San Miguel Northern Cement Inc.

Shared Facilities with San Miguel Northern Cement Inc.	
Operational Facilities	**Capacity**
Main Crushing Plant	1400 tph
Coal Storage	60,000 mt
Clinker Silo 3	25,000 mt
Clinker Silo 4	25,000 mt
Cement Silo 10	15,000 mt
Bulk Silo 11	5,000 mt
Cement Silo 12	15,000 mt
Packhouse (Roto packer 8 & 9)	2 x 120 tph
Truck Scale (Motorpool area)	120 mt
Truck scale (Main Crusher area)	120 mt
SUPPORT FACILITIES	
• **Administration Building** • **Machine Shop** • **Sewerage Treatment Plant**	• **Warehouse** • **Access Roads** • **Guest house/Staff house**

1.4.2 Support Facilities

30 Warehouses, administration building and staff house, and parking and truck marshalling area, medical clinic and machine shop are already being used as support facilities for the operation of the Line 1 and Line 2. A water treatment facility is also being operated by NCC.

31 The quarry operation also has Explosives Magazine (warehouse/storage facility) to specifically store explosives that are used in the blasting activities. The storage facility for the ANFO is owned and managed by the NCC's quarry contractor. The storage facility is located 800 meters away from the project site. This facility was constructed based on the guidelines set by the Bureau of Fire Protection (BFP), the Philippine National Police-Firearms and Explosives Division (PNP-FED) and DAO 2000-98 to primarily decrease the risk of accidental explosion to people and property.

1.4.3 Temporary Facilities (During Construction)

32 Temporary facilities during construction includes: (a) re-purposed container vans which will serve as on-site office and accommodation for workers, (b) sanitary facilities with septic tank (will be emptied-out and condemned after construction is completed), (c) temporary sub-station will be installed to provide power supply during construction activities.

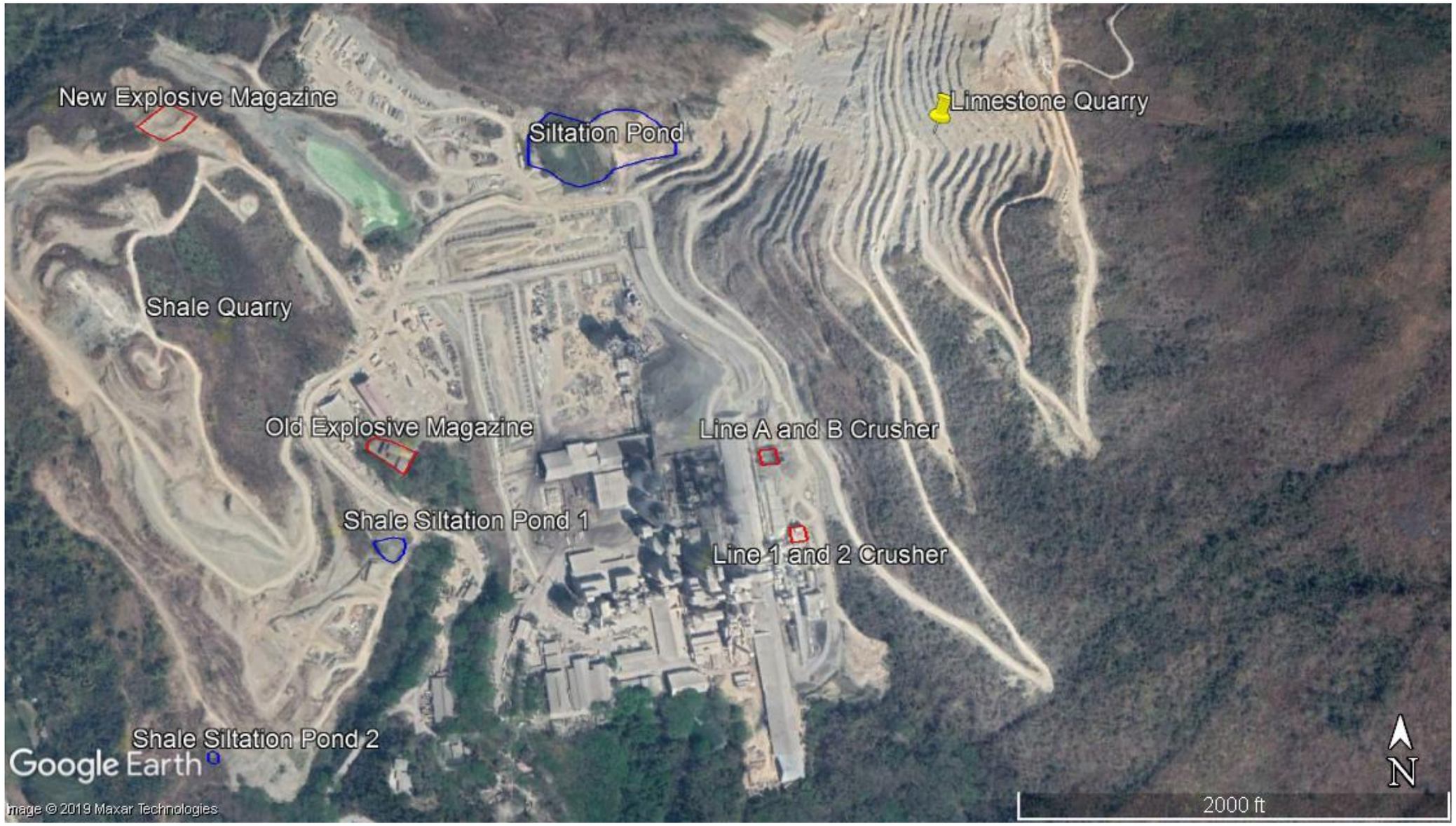
33 To support the construction activities, temporary facilities such as the following will be installed in the project site:

- Re-purposed container vans which shall serve as on-site office and accommodation for workers;
- Sanitary facilities with septic tank that will be emptied-out and condemned after construction is completed;
- Temporary protective fencing and lighting;
- Gatehouse and site security facilities;
- Temporary parking space;
- Temporary and secured equipment and material storage areas (i.e. diesel storage area);
- Temporary site office;
- Emergency spill kits;
- First aid stations;
- Temporary solid and hazardous waste storage areas;
- Portable sanitation facilities;
- Diesel storage tanks;
- Generator sets

Figure 1-4: Plant Layout for the NCC Line 1 and Line 2 Expansion Project

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **PLANT LAYOUT FOR THE PROPOSED PROJECT**	FIGURE NO.: **1-4**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy.Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

Figure 1-5: Support Facilities for Quarry Operation



PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **SUPPORT FACILITIES FOR QUARRY OPERATIONS**	FIGURE NO.: **1-5**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy.Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

1.4.4 Pollution Control Devices

1.4.4.1 Air Pollution Control

Cement Plant Operation

34 The priority in the cement industry is to minimize the increase in ambient particulate levels by reducing the mass load emitted from the stacks, from fugitive emissions, and from other sources. Collection and recycling of dust in the kiln gases is required to improve the efficiency of the operation and to reduce atmospheric emissions. For control of fugitive particulate emissions, ventilation systems should be used in conjunction with hoods and enclosures covering transfer points and conveyors. Drop distances should be minimized using adjustable conveyors. Dusty areas such as roads should be regularly sprinkled with water to reduce dust generation.

35 The main air pollution sources in cement manufacturing are the milling or resizing of cement raw materials and coal; homogenizing of milled materials and kiln-feeding, kiln operation, clinker storage, transport to grinding equipment, packing of cement. Air pollution control devices such as dust collectors, bag filters and electrostatic precipitators are installed in strategic locations within the cement plant as air pollution facilities.

36 The same air pollution control facilities will be utilized for the expansion with additional bag filters that will be installed for the additional equipment. **Table** 1-8 enumerates the existing and additional air pollution source equipment of the NCC Line 1 and Line 2 cement plant and their corresponding air pollution control facility.

Quarry Operation

37 The quarry also generates dust during its operation and transport of the raw materials to the cement plant. To mitigate this, regular watering of the road is being done to lessen the dust generation.

Table 1-8: Existing and New Air Pollution Sources with Corresponding Control Facilities of NCC Line 1 and Line 2

LOCATION	Air Pollution Source Equipment	Air Pollution Control Equipment	CAPACITY (m^3/hr)
Raw Materia Pre-blending	Limestone Crusher	Pulse Jet Type Baghouse	13,000
		Pulse Jet Type Baghouse*	30,000
	Rotary Dryer	Electrostatic Precipitator	342,500
		Pulse Jet Type Baghouse*	80,000
	Hammer Mill	Pulse Jet Type Baghouse	15,000
	Raw Ball Mill	Electrostatic Precipitators & Gas Conditioning Towers	342,500
	Roller Press*	Pulse Jet Type Baghouse*	35,000
Homogenizing & Kiln Feeding	Homogenizing Silos	Row Type Baghouse	49,980
	Kiln Feeding System w/ Bucket Elevators	Pulse Jet Type Baghouse	15,000
		Pulse Jet Type Baghouse	25,000
		Pulse Jet Type Baghouse	15,000
Calcining & Burning	Rotary Kiln	Electrostatic Precipitator & Gas Conditioning Tower	342,500
	Clinker Cooler	Multi-Cyclone Dust Collector	162,000
Clinker Storage and Transport	Enclosed Bucket Elevator	Pulse Jet Type Baghouse	6,000
	Clinker Silo	Pulse Jet Type Baghouse	8,000
	Concrete Clinker Silo*	Pulse Jet Type Baghouse*	36,000
	Steel Clinker Silo*	Pulse Jet Type Baghouse*	15,000
	Enclosed Bucket Elevator and Clinker Bunker	Pulse Jet Type Baghouse	6,000
	Clinker Silo with Discharger and Transport Conveyor	Pulse Jet Type Baghouse	10,000
Cement Grinding and Packing	Polycom Finish Mill	Pulse Jet Type Baghouse	85,000
		Pulse Jet Type Baghouse	55,000
	Finish Ball Mill	Row Type Baghouse	46,000
Cement Transport	Bucket Elevator	Pulse Jet Type Baghouse	16,000
	Rotary Packing Machine	Row Type Baghouse	20,000
	Cement Silos	Pulse Jet Type Baghouse	11,500
		Pulse Jet Type Baghouse	4,000
Bulk Loading	Pneumatic Pump	Pulse Jet Type Baghouse	11,500
Coal Milling	Coal Flash Dryer	Plenum Type Baghouse	40,000
	Raymond Vertical Mill	Pulse Jet Type Baghouse	30,000
	Coal Mill	Pulse Jet Type Baghouse	48,100
	Ball Mill*	Pulse Jet Type Baghouse*	60,000
	Fine Coal Silo	Circular Type Baghouse	5,100
Coal Grinding	Hammer Mill Flash Dryer and Ball Mill	Pulse Jet Type Baghouse	40,000
Quarry Area			

**Additional installation*

1.4.4.2 Water Pollution Control

38 Wastewater generated from the operation of the NCC Line 1 and 2 cement plant and quarry consist of domestic wastewater, wastewater during maintenance activities and surface run-off only. The wastewater flow diagram of NCC is shown in **Figure** 1-6**.**

39 The stormwater drainage systems of quarry and the cement plant are shown in **Figure** 1-7 and **Figure** 1-8**,** respectively**.**

40 **Figure** 1-9 shows the sewer layout of NCC Line 1 and Line 2 while the location of the effluent outfalls is shown in **Figure** 1-10.

Septic tanks and Sewage Treatment Plant

41 Septic tanks are installed in the cement plant to pre-treat the domestic wastewater generated. Effluent of the septic tanks are discharged to the Bagutan Pond. The existing domestic wastewater generation at NCC Line 1 and Line 2 cement plant is 66.5 m^3/day. With the proposed expansion, additional workers will be required, thus the domestic wastewater is estimated to increase to 72 m^3/day.

42 The domestic wastewater from the NCC will be directed to the Sewage Treatment Plant that will be constructed by SMNCI. The STP will treat both the domestic wastewater from NCC and SMNCI cement plant. The estimated design capacity of the STP is 80 m^3/day. The effluent of the STP will be discharged to Aloragat River.

Siltation Ponds

43 Surface run-off are collected in the siltation ponds. Rainwater flows to the existing drainage system inside the plant going to the siltation ponds. Ponds will retain the water until most of the dust particulates and suspended solids settle at the bottom of the pond. In order to maintain the efficiency of the ponds, the ponds are frequently desilted. Silt in the drainage are also be regularly removed. The collected silt will be re-used as raw material for cement manufacture. There are four existing siltation ponds; two are located in the limestone quarry area and two in the shale quarry area.

44 The effluent of the siltation ponds flows to an open channel line and open culvert going to the impounding reservoir. Desilted water from the siltation ponds are reused in the quarry operation. The overflow of the ponds in the limestone quarry area is discharged at the Aloragat River.

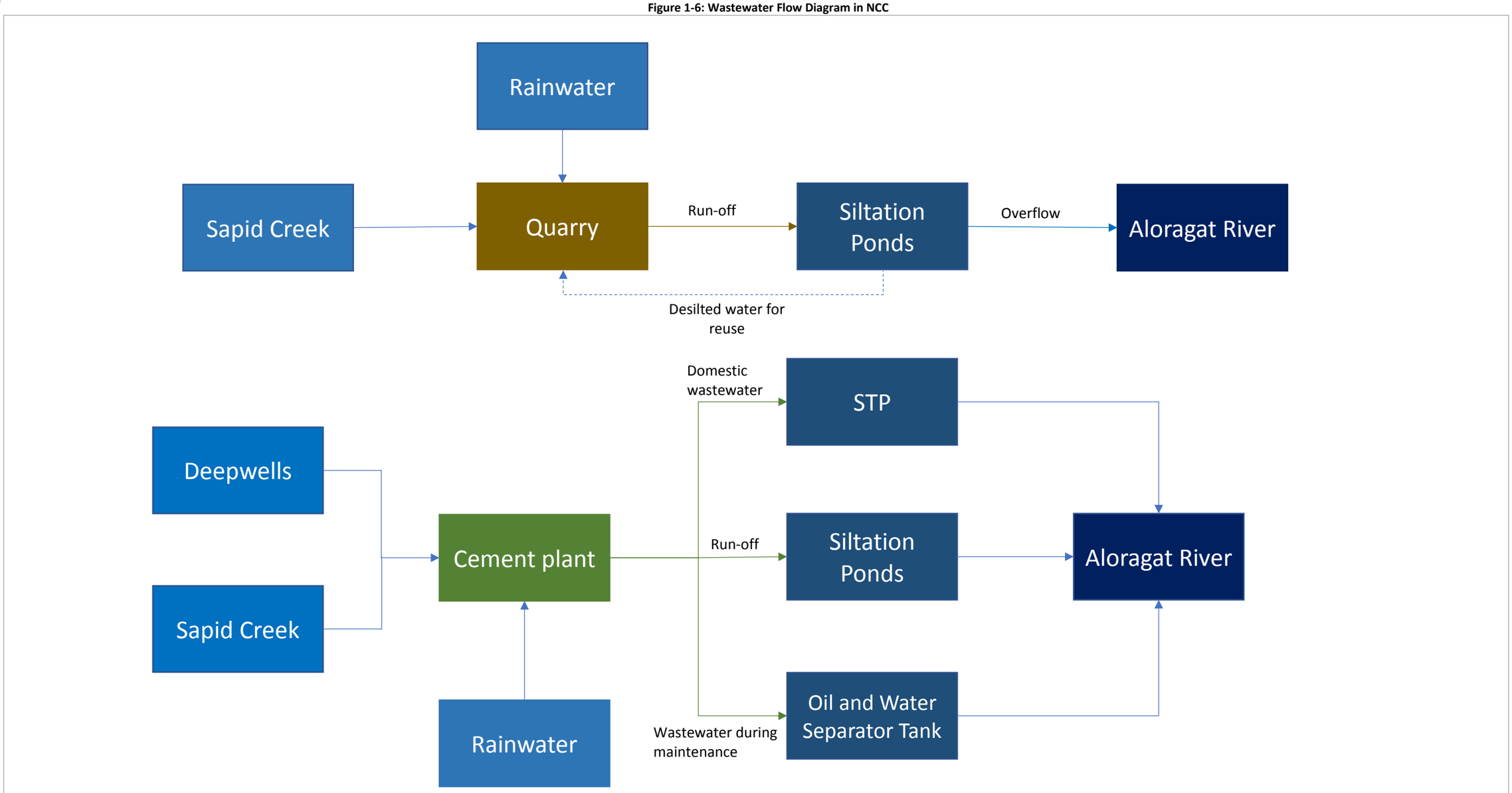
Oil and Water Separator Tanks

45 There are also two oil and water tank separators installed in the cement plant. These tanks are located at the motor pool area and at the coal storage area. These tanks capture oil-contaminated water during operation and maintenance activities of the cement plant. The effluent from these tanks is also discharged in the Aloragat River. The proponent has secured a wastewater discharge permit from the DENR-EMB Region 1, attached as **Annex 10**.

Table 1-9: Location and Capacities of Water Pollution Control Facilities

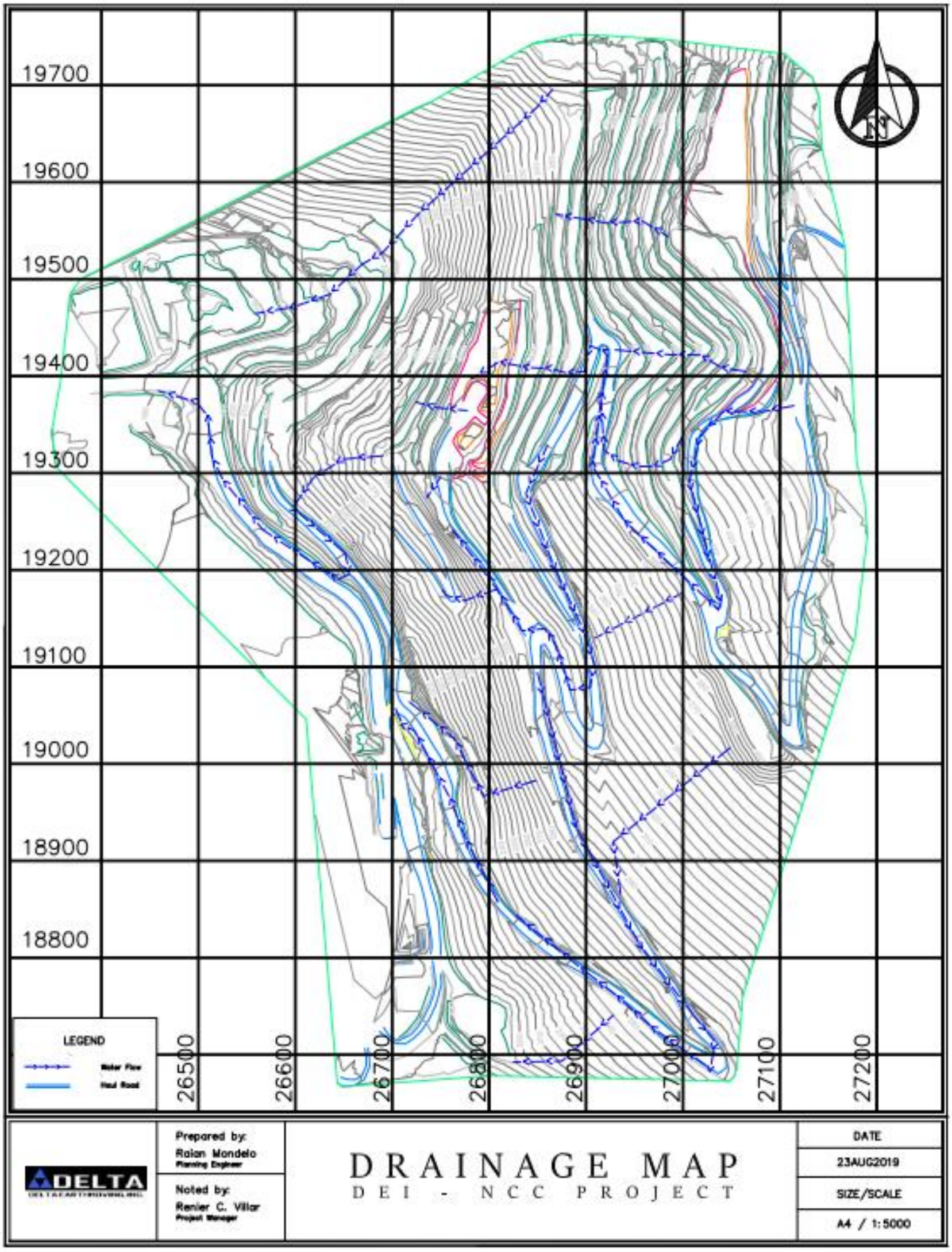
Water Pollution Control	Location	Capacity
Siltation pond	Limestone quarry area	3,940 m^3
Siltation pond	Limestone quarry area	2,250 m^3
Siltation pond	Shale quarry area	2,600 m^3
Siltation pond	Shale quarry area	1,000 m^3
Oil & Water Separator	Coal Storage	1,000 m^3
Oil & Water Separator	Motor Pool Area	600 m^3
Sewage Treatment Plant	SMNCI Cement Plant	80 m^3/day

Figure 1-6: Wastewater Flow Diagram in NCC



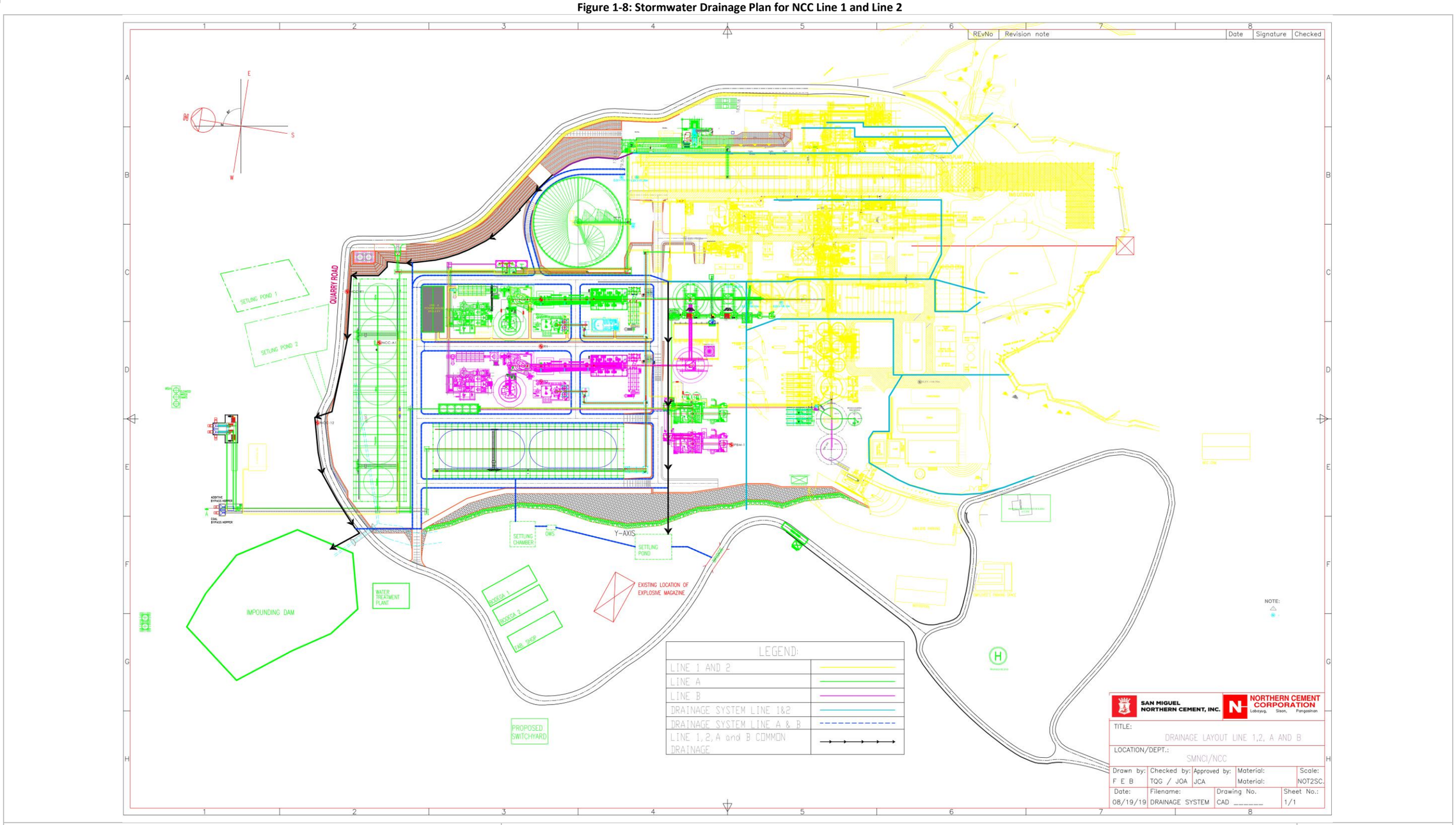
PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **WASTEWATER FLOW DIAGRAM IN NCC**	FIGURE NO.: **1-6**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

Figure 1-7: Drainage Plan for Quarry Area



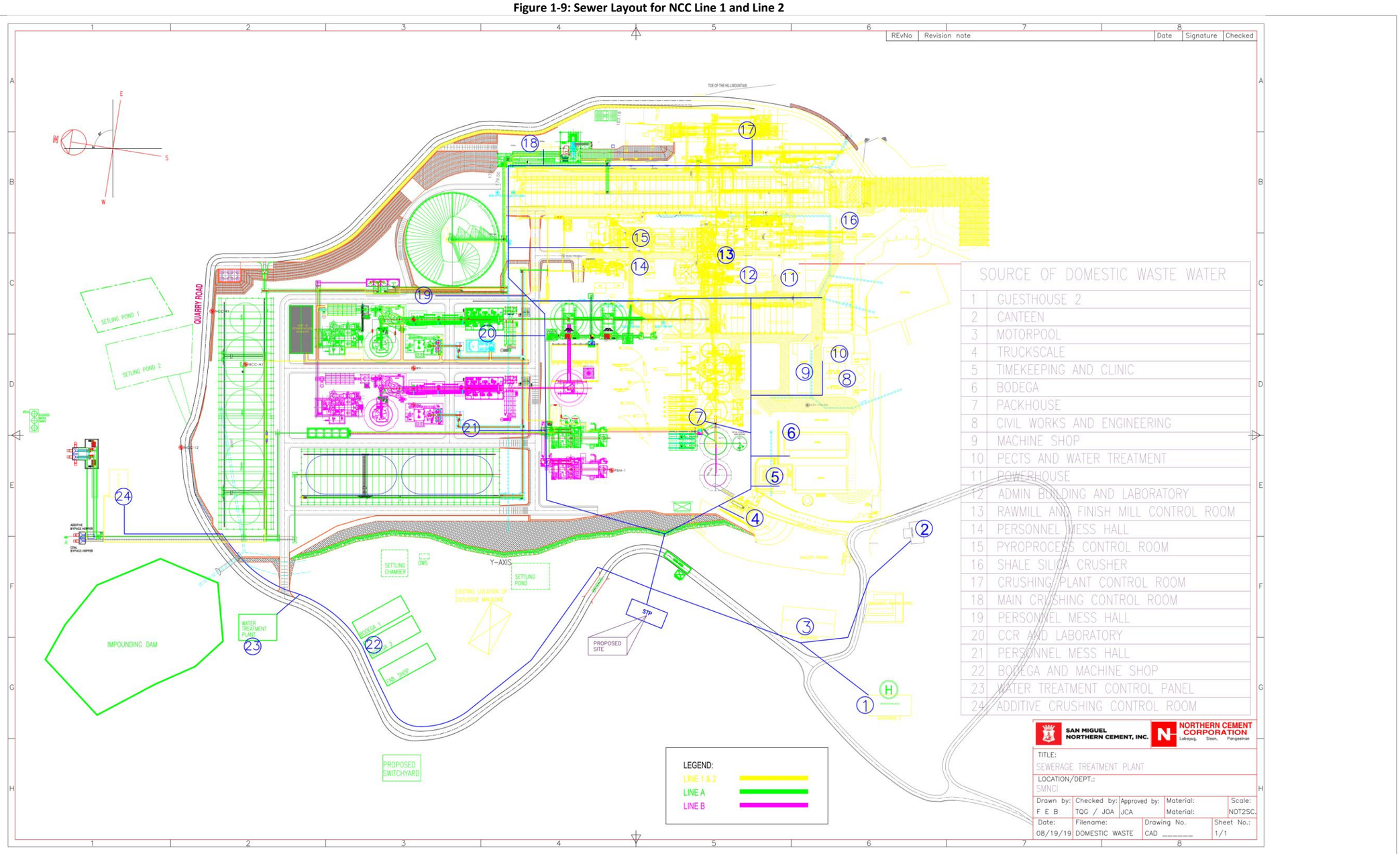
PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **DRAINAGE PLAN FOR QUARRY AREA**	FIGURE NO.: **1-7**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

Figure 1-8: Stormwater Drainage Plan for NCC Line 1 and Line 2



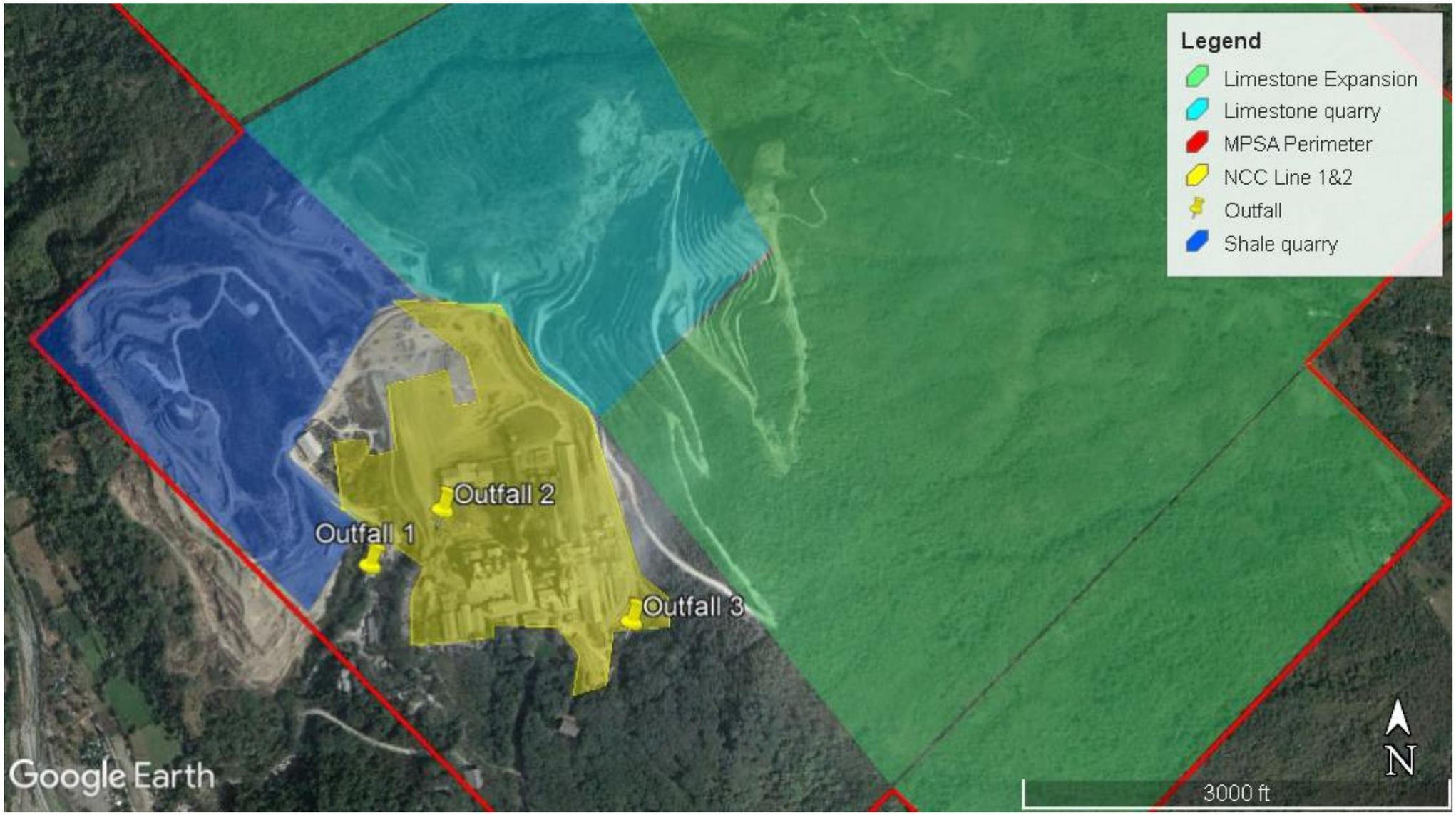
PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **STORMWATER DRAINAGE PLAN IN NCC LINE 1 AND LINE 2**	FIGURE NO.: **1-8**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

Figure 1-9: Sewer Layout for NCC Line 1 and Line 2



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **SEWER LAYOUT OF NCC LINE 1 AND LINE 2**	FIGURE NO.: **1-9**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

Figure 1-10: Location of Effluent Outfalls



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **LOCATION OF EFFLUENT OUTFALLS**	FIGURE NO.: **1-10**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

1.4.4.3 Solid Waste Control

46 A temporary solid waste storage area will be provided in the site during construction. All solid wastes will be properly segregated and disposed. Designated spoil disposal area will also be provided. All of these will be located inside the project site

47 NCC is implementing its solid waste management plan. Solid wastes from the office, dormitory/kitchen and other facilities are segregated as to bio-degradable or not and will be disposed of accordingly with the help of the municipal government. NCC has a Materials Recovery Facility (MRF) and designated scrap yard. Designated solid waste management area is also provided on-site.

1.4.4.4 Chemicals and Hazardous Waste Control

48 NCC Line 1 and 2 are using and generating controlled chemicals wastes and hazardous materials in its operation. NCC has secured necessary permits in accordance to the guidelines under DAO 1992-29, the Implementing Rules and Regulations of Republic Act 6969, the Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990.

49 **Table** 1-10 summarizes the information and volume regarding the controlled chemicals used.

Table 1-10: Controlled Chemicals and Hazardous Wastes to be generated by the Project

Common Name	Chemical Abstract Service No. / Chemical Formula	Trademark	Average Annual Volume
Ammonium Nitrate	NH_4OH_3	ORICA	12,100 kg
Ammonium Hydroxide	1336-21-6/ NH_4OH	Merck JT Baker	1 L
Sodium Hydroxide	1310-73-2/NAOH	Merck JT Baker	40 g
Hydrochloric Acid	76-01-0/ HCL	Merck JT Baker	2.3 L
Ethyl Alcohol	64175 /C_2H_5OH	Merck JT Baker	8 L
Ethelene Glycol	107-21-1 /$C_2H_6O_2$	Merck JT Baker	120 L
Ammonium Nitrate	6484-52-2 /NH_4NO_2	Merck JT Baker	180 g
Ammonium Oxalate	111-38-8/$(NH_4)_2C_2O_4$	Merck JT Baker	40 g
Bromocresol Green Indicator	76-60-8/$C_{21}H_{14}Br_4O_5S$	Merck JT Baker	0.33 L

Source: NCC

50 The following hazardous wastes are being generated by the NCC Line 1 and Line 2 that requires handling and treatment by trained professionals in properly equipped facilities. These wastes are stored on-site prior to hauling out of DENR-accredited hazardous waste transporters.

Table 1-11: Hazardous Wastes Generated by NCC Line 1 and Line 2

HW No.	HW Classification	Physical Property	HW Cataloguing	HW Volume Generated
L101	Waste Oils	Liquid	Flammable / Toxic	9 MT
D406	Battery	Solid	Toxic/Corrosive	309 pcs
D407	Fluorescent	Solid	Toxic	723 pcs
L104	Oil Contaminated Materials (used filters)	Solid	Toxic	1.2 MT
L104	Oil Contaminated Materials (used gloves / rags)	Solid	Toxic	0.24 MT

HW No.	HW Classification	Physical Property	HW Cataloguing	HW Volume Generated
M501	Clinic Waste	Solid	Pathogenic or Infectious Waste	0.04 MT

2.4.7.1 Ash Disposal and Absorption

51 Ash from coal and fuels used in clinkering mix with the materials during the clinkering process and become part of the clinker product. Residual materials of heavy metals in the co-processed industrial wastes such as the heavy fuels adhere to the ash when the fuel is fully combusted and eventually become encapsulated in concrete, away from causing environmental harm or damage. These metallic particulates improve the quality and performance of the resulting cement.

1.4.5 Access Road

52 A private road network, owned by **Northern Cement Corporation**, was already constructed and currently being utilized, leading to and from the National Highway, by **Northern Cement Corporation**. In addition, a new industrial access road will be constructed traversing barangay Sugcong, Nama, Inoman and Bobonan in Pozorrubio town having its road entry right across the exit/entrance of TPLEX Pozorrubio. An ECC was already secured by the proponent for the construction of the new access road last June 20, 2019 with reference no. ECC-OL-R01-2019-0150.

1.4.6 Alternative Fuel

53 There are two types of fuels used in the cement production process; bunker oil for the kiln start-up and coal for the normal kiln operation. As part of their system and facilities improvement, NCC intends to use alternative fuels in their kiln operation. The proponent will submit its technical position on its use of alternative fuels to EMB and secure the necessary permits from appropriate agencies prior to implementation. **Table** 1-12 details the potential alternative fuels that will be used by NCC.

1.4.6.1 Kiln Start-up

54 Used oil can be added to the bunker oil for the kiln start-up at temperature of 1,200 ˚C. The calorific value of used oil to be added to kiln fuel is 10,813 kcal/kg, with sulfur content of 1.19%. It is estimated that about 43,200 liters of used oil will be used annually. This corresponds to about 10% of the bunker oil requirement NCC shall manage the used oil fuel additive in accordance with RA 6969. The waste acceptance criteria will comply with guidance under DAO 2000-81. The used oil will be sourced from the existing operation of the NCC cement plant and quarry.

1.4.6.2 Kiln Calcination

55 There are four alternative fuels that NCC is considering to be added to the coal for kiln operation. These area pet coke, used tires, rice husk and refuse derived fuel.

56 Petroleum coke, or pet coke, is a final carbon-rich solid material derived from a thermo-based chemical engineering process. Fuel-grade pet coke has high sulfur and heavy metals content. Co-processing of pet coke in cement kiln has advantage of sulfur adhesion to the limestone raw material and immobilization of heavy metals into the clinker structure. It is estimated that about 54,161 MT of pet coke will be utilized annually.

57 Used vehicle tires can also be shredded and mixed with low-sulfur coal to fire up the kiln. NCC operations produce 2,400 to 4,800 MT of waste vehicle tires annually and plans to utilize it as source of tire-derived fuel mixed with coal to be burned in kilns.

58 In addition, domestic and industrial wastes can be used as refuse-derived fuel. This is composed of mostly non-recyclables plastic wastes, paper and other combustible wastes.

Table 1-12: Proposed Alternative Fuels for NCC Line 1 and Line 2 Cement Plant

Kiln Operation	TYPE OF FUEL USED	Proposed AFR	Energy Potential (Mcal per MT)	% FUEL Substitution	Total AFR Consumption per Year	Potential Source
Kiln Start-up (Temp @ 1200˚C)	Bunker Oil	Used Oil	10,813	0-10%	43,200 Liters	NCC Cement Plant and Quarry Operation
Kiln Calcination	Coal	Petcoke	8,395	0-30%	54,161 MT	Petron Refinery Plant
		Shredded Tires	8,609	0-10%	15,508 MT	NCC and other cement hauler partners
		Rice Husk	2,400	0-10%	43,200 MT	NCC's partner cement dealers in Isabela, Cagayan, Pangasinan, Nueva Ecija & Nueva Viscaya and other areas in Northern Luzon.
		Refuse Derived Fuel from Municipal Waste	2,957	0-10%	15,508 MT	NCC and local RDF Suppliers

1.5 Process/Technology

59 The cement manufacturing process flow for NCC is shown in **Figure** 1-11. Dry process of cement production is being utilized by NCC. The next subsections further discuss the processes involved in the quarrying and cement production operation of NCC.

Figure 1-11: Process Diagram of Cement Production

PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**PROCESS DIAGRAM OF CEMENT PRODUCTION**	**1-11**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

1.5.1 Raw Materials

60 The amount of raw materials to produce 1.76 MMT of clinker per year is shown in **Table** 1-13**.** The material balance showing the mineral requirement is shown in **Figure** 1-12.

Table 1-13: Annual Raw Material Requirement for NCC Cement Plant

Material	Wet Weight (MT/yr)	Percentage	DRY BASIS (MT/yr)	Lost in Ignition
Limestone	2,208,909	75.92%	2,144,640	2.9%
Shale	566,565	19.47%	492,800	13.0%
Silica	284,800	9.79%	243,520	14.5%
Iron Ore	18,560	0.63%	17,280	4.9%
Bottom Ash	13,760	0.47%	11,520	15.3%
Source: NCC				

1.5.1.1 Limestone

61 Limestone requirement will be sourced from the quarry operations of NCC. The measured limestone resources within NCC MPSA 106-98-1 stands at 720.20 million metric tons as of August 2019 and will be more than sufficient to support the expansion of Line 1 and Line 2.

1.5.1.2 Shale

62 The mineable shale reserved from the currently active quarry in MPSA 106-98-1 is 30.19 million metric tons.

63 Please refer to **Table** 1-19 for the details on the annual extraction rate of limestone and shale in the quarry areas.

1.5.1.3 Pozzolan

64 Pozzolan is used as a cementitious additive for grinding clinker to produce cement. For every ton of clinker produced, 71 kg pozzolan is required to produce cement. NCC has submitted application for exploration and subsequently extraction permit for Pozzolan from an area of 493.6577 hectares straddling Barangay Mangan Dampay in Malasiqui and La Paz in Villasis, both in Pangasinan. Pre-feasibility volumes measured, indicated and inferred amount to 8,416,320 mt., with a Potential Resource amounting to 120,000,000 cubic meters. Using an average bulk density (compact) of 1.28727 MT/m^3, the Geologic Reserve is estimated at 154,440,000 metric tons.

65 The actual land use of the area applied for pozzolan exploration are idle lands, grassland, agriculture, residential areas and less than 20% tree cover. Predominant (60%) land slope is < 18. Almost 100% of the area have surface claimants paying their tax declaration certificates. Fly ash, ash from rice husk and slag be used as substitute for pozzolan. This project will start commercial production in 2021 and by then it will have secured supply agreements for the pozzolan or its substitute.

1.5.1.4 Fly Ash and Bottom Ash

66 Fly ash (F/A) and bottom ash (B/A) will come from Petron refinery in Masinloc or Sual. Petron refineries in Masinloc and Sual are part of the conglomerate that assumed majority holdings in NCC ownership structure and assures NCC and this project of the supply of suitable fly ash and bottom ash. NCC QA department conducts chemical analyses of each raw material or fuel to determine whether the material acceptance standard is met.

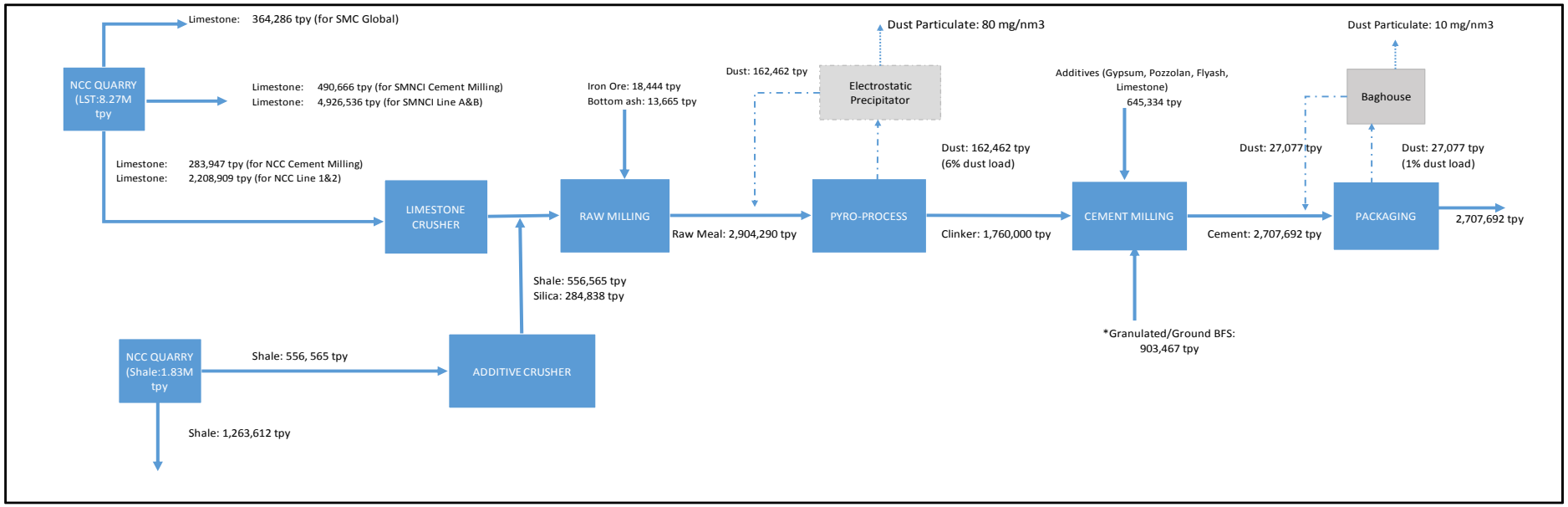
1.5.1.5 Iron Sand

67 The use of Iron Sand in raw mix preparation will correct the iron oxide Fe_2O_3 content of the resulting raw meal. NCC has quality requirements for all materials used in production and all potential supplies are tested by the Quality Assurance laboratory.

1.5.1.6 Granulated Blast Furnace Slag (GBFS)

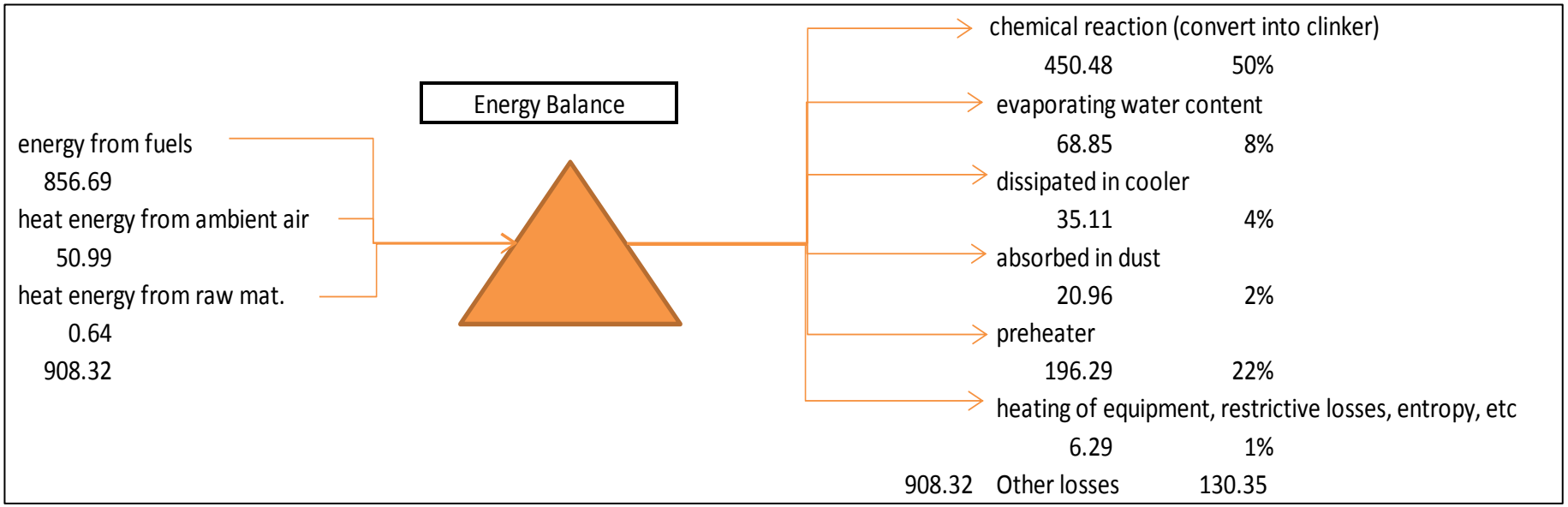
68 The GBFS will enter the cement manufacturing stream at final grinding process and not before or during calcining process and therefore the GBFS will not be subjected to extreme heat of @1,500 during clinkering process. The components of the GBFS are expected to mainly keep their composition and structure unlike raw meal which undergo chemical change during the calcining process.

Figure 1-12: Material Balance for NCC Line 1 and Line 2 Cement Plant and Quarry Operation



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **MATERIAL BALANCE FOR NCC LINE 1 AND LINE 2**	FIGURE NO.: **1-12**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

Figure 1-13: Energy Balance for NCC Line 1 and Line 2



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **ENERGY BALANCE FOR NCC LINE 1 AND LINE 2**	FIGURE NO.: **1-13**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

1.5.2 Quarry Operation

1.5.2.1 Shale and Limestone Excavation

69 At the production or extraction stage, the project's major activities will include drilling and blasting on hard ground and dozing the minerals followed by loading and hauling. The rock fragmentation will be accomplished through drilling and blasting since the limestone deposit is generally hard and massive. Hydraulic drills will be used for drilling production blast-holes. Production drilling is designed on a 4 meter by 6-meter staggered grid pattern. Blasthole diameter will be a minimum of 150 millimeters the total drill hole depth will be 11.2 meters inclusive of the sub-grade. Blasting will be performed daily and will be scheduled on break time. The main explosive ingredient will be a pre-mixed Ammonium Nitrate Fuel Oil (ANFO) primed with dynamite. Detonating cords will be used for down line and trunkline, and the charge will be initiated using No. 6 Ordinary Blasting Cap (OBC) and safety fuse. Controlled blasting will be employed at areas that are near structures by using appropriate delays. Dynamites will be primed with in-hole non-electric (NONEL) detonators, which will be connected to surface delays/connectors. All blasting activities will be supervised by a licensed blaster and shall conform to safety procedures. Limestone will be hauled and carried out by 60-ton off-road mining trucks. Blasted limestone will be loaded by hydraulic shovels into the trucks and transported to the primary crusher and further to the secondary crusher at the cement plant thru a conveyor belt.

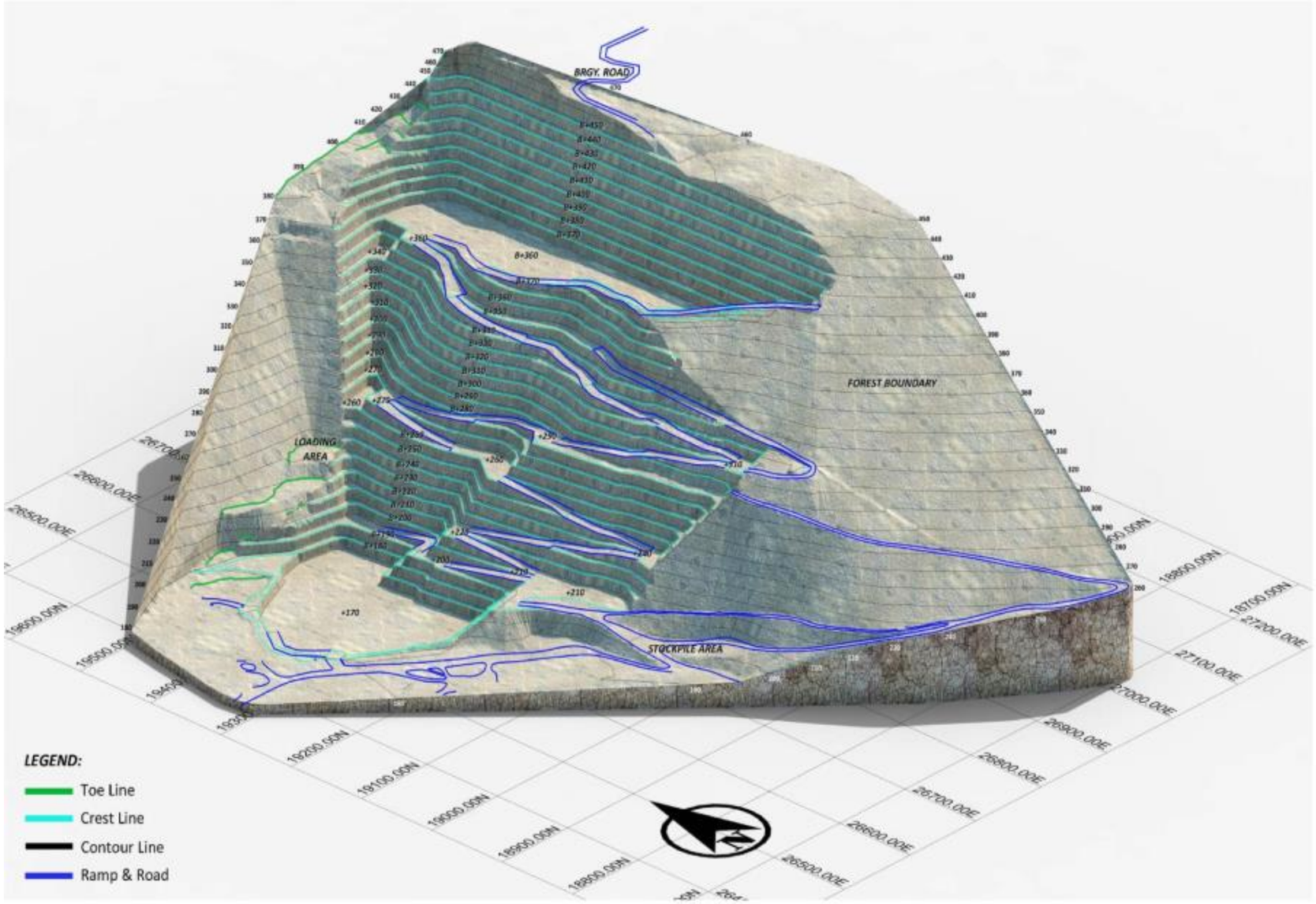
70 The excavation of shale and limestone uses benching method. With this method, the overburden, the soil and rocks that are covering the limestone and shale deposits, will be removed by creating a series of step levels or 'staircases', one top of each other. After the quarry has progressed, the mine site will resemble a terraced surface. This procedure reduces the risks of sudden landslides and uncontrolled erosions. The overburden shall be stored in Plant's holding facility, which then will be returned to the mined surfaces after the deposits have been gathered.

71 The approved quarry slope and contour canal designs for the limestone and shale quarry are summarized in **Table** 1-14**.** Slice plans for the limestone and shale quarry from 2016-2020 within the MPSA are shown in **Figure** 1-14 and **Figure** 1-15, respectively.

Table 1-14: Quarry Slope and Contour Canal Design

	Specifications	
	Limestone Quarry	**Shale Quarry**
Bench height	10m	5m
Bench width	Average 10m, varying	10m, varies
Bench super elevation	1.5%	
Bench slope	70%	50-60%
Main ramp width	15m	10m
Main drainage slope	1.5%	1.5%
Main ramp gradient	10%	10%
Bench outer edge cap height	0.5m	
Contour canal	1m x 0.5m with settling sump every 500m (of 1m x 1m)	1m x 0.5m with sump every 500m (of 1m x 1m)
Final base elevation	171 masl	122 masl

Figure 1-14: Slice Plan for Limestone Quarry (2016-2020)



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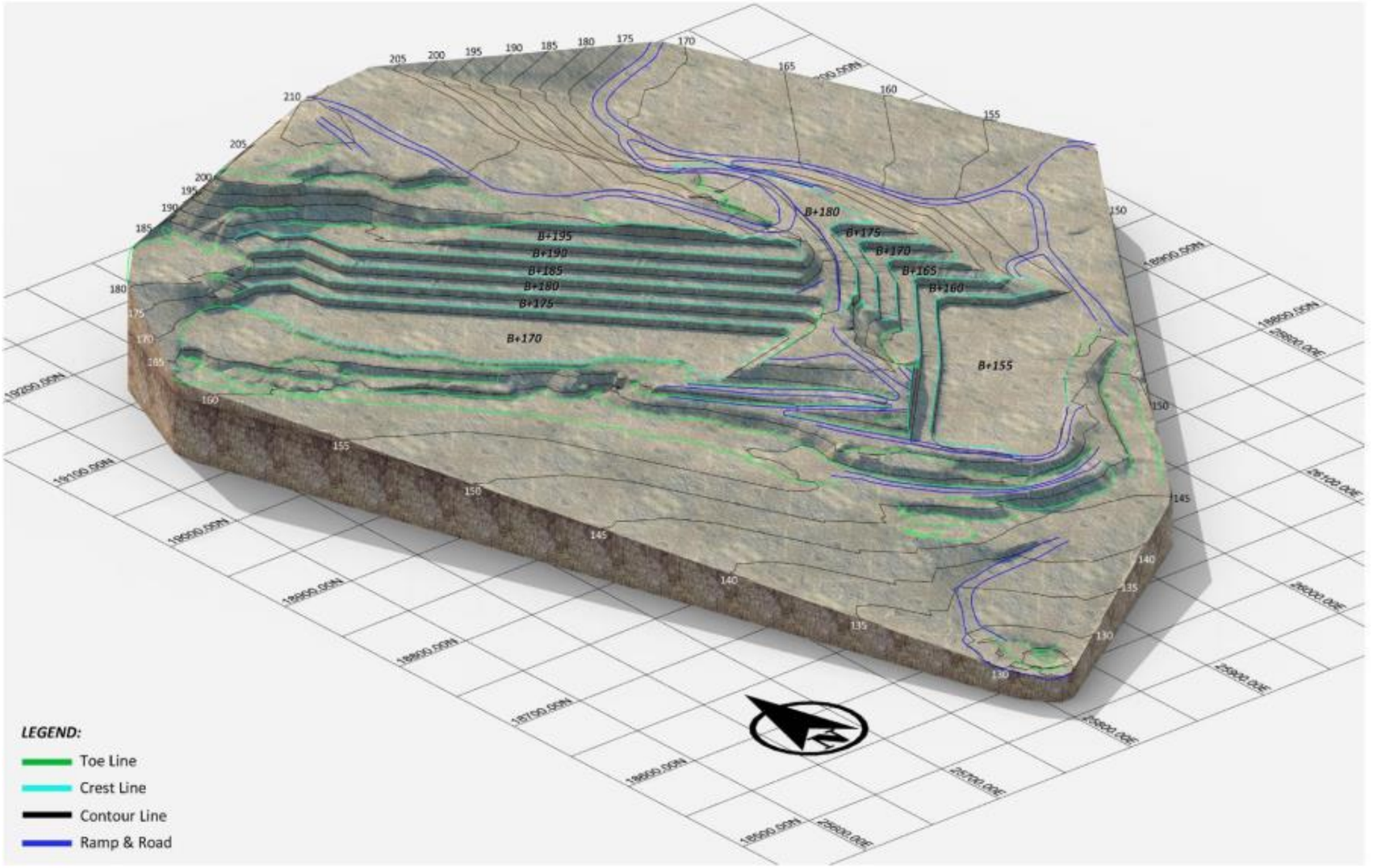
Orthographic 3D View

2020 SLICE PLAN DESIGN - LIMESTONE QUARRY
not to scale

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **SLICE PLAN FOR LIMESTONE QUARRY (2016-2020)**	FIGURE NO.: **1-14**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC

Figure 1-15: Slice Plan for Shale Quarry (2016-2020)



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Orthographic 3D View

2020 SLICE PLAN DESIGN - SHALE QUARRY
not to scale

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **SLICE PLAN FOR SHALE QUARRY (2016-2020)**	FIGURE NO.: **1-15**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC

1.5.2.2 Limestone Crushing and Conveying

72 The mined limestone will be dumped in the two receiving hopper through open trucks. Two heavy-duty apron feeders will be located under every receiving hopper for two grades limestone feeding. Limestone from apron feeder will be fed to Jaw Crusher. Coarse limestone will be fed to crusher and consequently to the secondary Impact crusher. The crushed limestone, fine materials, and spillage from apron feeder will be discharged to the belt conveyor and finally be conveyed to the limestone pre-blending storage.

73 Shale, silica and other raw materials such as for pozzolan, bottom ash on the other hand are dried and reduced to the desired size by means of the Roller and Fam Crushers going to inline Rotary Dryers.

1.5.3 Cement Plant Operation

1.5.3.1 Raw Meal Grinding and Homogenization

74 Crushed materials such as limestone, shale, silica and iron sand are then fed proportionately on apron weigh feeders and ground to powder in a vertical roller mill.

75 The raw mix will be conveyed to the Continuous Homogenizing Silo. The raw mix is stored and blended using adequate aeration system to fluidize the material and attain a consistent homogenizing efficiency ready for feeding to the kiln. The system will be equipped with modern quality control devices such as automatic on-line samplers and cross belt analyzers which will continuously monitor the composition and regulate the weigh feeders to adjust to the target kiln feed chemistry.

1.5.3.2 Pyro-processing

76 The pyro-processing process involves feeding the raw mix into a kiln system where it is gradually heated. Kiln feed (raw mix) are conveyed to the five stages preheater then to the rotary kiln. Typically, a peak temperature of 1400-1450 °C is required to complete the reactions and produce C3S (Alite), the characteristic constituent of Portland cement. Partial melting causes the material to aggregate into lumps or nodules known as clinker which is then cooled with air to 100-200°C. Waste heat from the kiln system is used for drying the raw materials in the raw grinding section of the production process. Approximately 1.60-1.65 MT of raw mix is required to produce 1 MT of clinker, due to the calcination of the limestone component of the raw mix. Clinker product is transported to clinker silo for storage.

77 The kiln was upgraded to accommodate the increased clinker production and was equipped to handle alternative fuels such as petcoke, refuse-derived fuel, used oil, used tires and rice husks.

1.5.3.3 Use of Alternative Fuels in Pyro-Processing

78 Bunker oil is being used for preheating the cement kiln. NCC intends to use alternative fuel such as used oil during the preheating of kiln. Used oil will be fed to the kiln through the normal process of adding bunker oil at the main burner when internal kiln reaches a steady temperature of 1,200 ˚C.

79 When the temperature reaches 1400-1450 °C, alternative fuel such as pet coke, used rubber tires and other combustible domestic wastes will be used in the pyro processing operations. It is important to add the alternative fuels at high temperature to avoid undesirable stack emissions such as dioxin and furans and persistent organic pollutants (POPs).

80 Heavy fuels generate more particulate pollutants when combusted in lower temperate. Pollutants assimilated by previously used materials such as heavy metals and other impurities are fully

destroyed and degenerate into ash, giving particulate filters a longer duty life and creating less opportunity for increased air pollution.

81 **Figure** 1-16 shows the diagram for the entry point of alternative fuel in the kiln.

1.5.3.4 Clinker Cooling

82 Clinker is discharged red-hot from the lower end of the kiln and brought down to handling temperature in various types of coolers. Part of the air that is heated during the clinker cooling is recycled back to the rotary kiln, while the other portion is fed to the coal grinding machine. The waste energy recovered in the recycled air reduce the amount of fuel needed to heat up the raw materials fed into the kiln into the ideal temperature where calcination occurs, as well as clinker grinding is performed. The recycled energy also acts to control coal moisture for better material flow within the grinding subsystem and better coal combustion performance. With lesser fuel to burn per metric ton of clinker produced, gaseous pollutant emissions will also be reduced.

1.5.3.5 Cement Grinding

83 Clinker will be extracted from the bottom of the silos and conveyed to a feed bin from where it will be dosed by a weigh feeder and then further conveyed to an elevator then fed into the grinding mill.

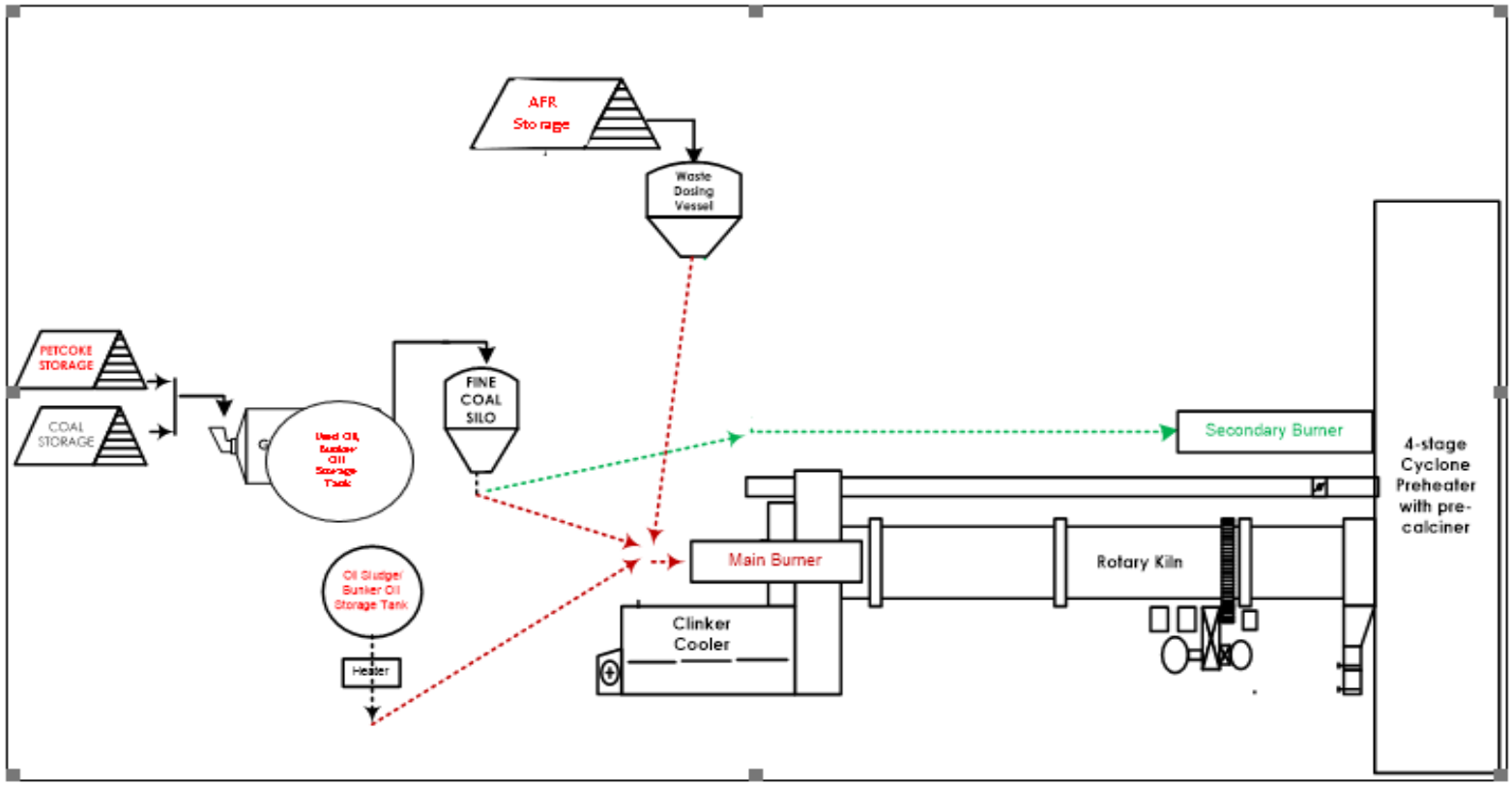
84 The other raw materials will be mechanically reclaimed by a reclaimer and conveyed to feed bins from where it will be dosed by weigh feeders for conveying and feeding into the grinding mill. Fine raw materials such as fly ash will pass thru a weigh feeder before feeding into the mill.

85 The materials will be ground in the ball mills. Hot air is injected from underneath the nozzle ring outside the periphery of the rotating table. This jet of hot air dries the materials and the fine particles are entrained by the gases exiting thru a rotating classifier at the upper portion of the mill body. There is internal recirculation of the particles that could not pass through the internal classifier. The coarse particles are rejected out of the mill and are re-circulated into the mill for re-grinding. The finer particles pass thru the classifier and are carried by the exit gases that will pass thru a bag filter where the finished cement will be separated by the bags and collected at the bottom of the bag filter and subsequently conveyed into the cement silos. There is internal recirculation of the particles that could not pass thru the internal classifier.

1.5.3.6 Cement Storage and Dispatch

86 The product can be purchased either by bulk loading or by packed bags. After grinding, the cement is conveyed to the cement silo for storage prior to packing. The stored cement is then conveyed to the rotary packer that will pack the products into 40-kilo bags or one-tonner bags, depending on market requirements. The packed cement in bags are promptly brought to a temporary storage area or manually loaded onto awaiting delivery trucks. Another storage silo for bulk loading is available to feed cement into bulk carriers.

Figure 1-16: Entry Point of Alternative Fuel in Pyro-Processing



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **ENTRY POINT OF ALTERNATIVE FUEL IN PYRO-PROCESSING**	FIGURE NO.: **1-16**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

1.6 Project Utilities

1.6.1 Water Supply and Demand

87 The total water requirement for the cement plant and quarry expansion of NCC is 1,300 m^3/day. NCC is sourcing its water requirements from three existing deep wells and from the Sapid Creek. NCC has necessary NWRB permits for its water supply as shown in the table below. Desilted water from the siltation ponds are also being reused by NCC. Copy of the NWRB permits is attached in **Annex 10**.

Table 1-15: NWRB permits for NCC's water supply

Water Source	NWRB Permit No.	Allowed Extraction Rate (L/s)	Date Issued
Deepwell 1	18918	5.7	February 19, 2004
Deepwell 2	I-PAN-2018-06-087	1.3	May 17, 2018
Deepwell 3	I-PAN-2018-06-088	1.43	May 17, 2018
Sapid Creek	20536	16.5	November 18, 2005

88 From the water source, the water is stored in the ponds and reservoir and is being treated in the water treatment facility before being used in the cement plant operation.

Table 1-16: Ponds and Reservoir of NCC

Ponds/Reservoir	Volume Capacity (m^3)
Cooling Ponds	22,828
Sapid Main Pond	5,322
Sapid Reservoir	3,492

89 **Table** 1-17 summarizes the anticipated water consumption of the cement plant and quarry expansion project while **Figure** 1-17 shows the water balance of the expansion project.

Table 1-17: Water Requirement for the Proposed Cement Plant and Quarry Expansion Project

Water Use	Water Requirement with Expansion (m^3/day)
Domestic Use	100
Cement Plant Operation (GCT, Dust Control)	800
Make-up water	350
Dust suppression in quarry area	80
Total	1,330
Recirculating Cooling Water	3,500

Cement Plant Operation

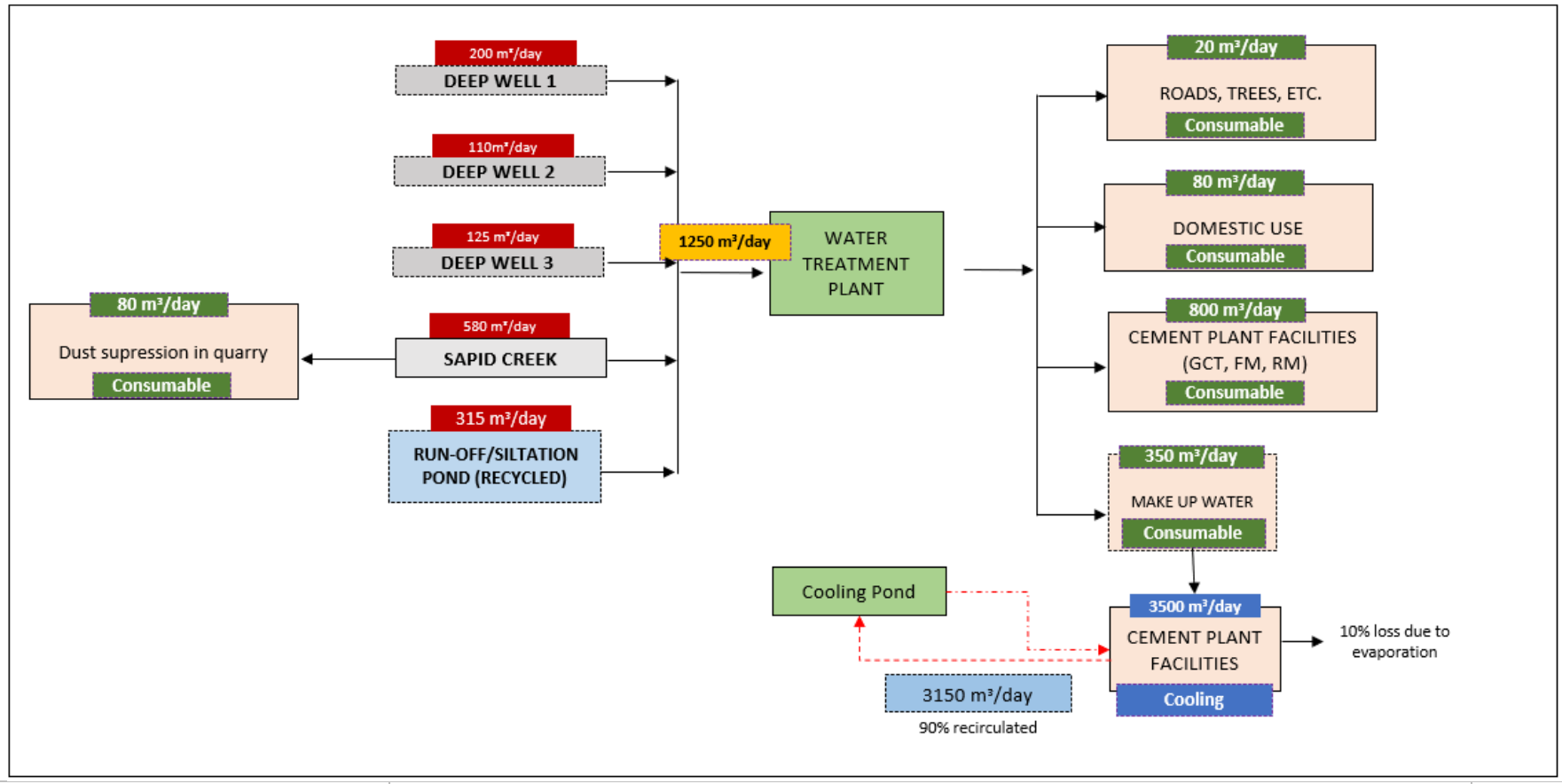
90 The existing operation of the NCC Line 1 and Line 2 is consuming an average of 918 m^3/day of water. This includes the water required for domestic use, make-up water and the water used in the cement plant such as for maintenance, cleaning, for the dust suppression in the crusher and spray water for the pre-heater gases conditioning tower. The expansion of the cement plant will increase the required water into 1,250 m^3/day.

91 For the new capacity of Line 1 and Line 2, the cement plant will initially require 3,500 m^3/day of recirculating water. This cooling water after use is stored in the cooling ponds for recirculation. About 350 m^3/day of make-up water is required to replace water loss due to evaporation.

Quarry Operation

For the quarry operation, water is needed for the constant watering of the quarry road to lessen the dust emissions. The proposed increased of production capacity will increase the water requirement from 40 m^3/day to 80 m^3/day.

Figure 1-17: Water Balance of the Proposed Cement and Quarry Expansion Project



PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**WATER BALANCE OF THE PROPOSED CEMENT AND QUARRY EXPANSION PROJECT**	**1-17**
EIA REPORT PREPARER:	PROJECT TITLE & LOCATION:	SOURCE:
LCI ENVI CORPORATION	**NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	PROJECT PROPONENT

1.6.2 Power Supply and Demand

93 NCC currently sources its power requirement from the Luzon grid. The existing operation of the NCC Line 1 and Line 2 is consuming 180,000 MWH of power per year. With the expansion and upgrading of the cement plant, the new power requirement will only be 190,000 MWH per year. This is due to the maintenance and improvement works that the proponent will do to the existing lines to further increase the system efficiencies.

94 In addition, the Plant Complex is equipped with the following back-up power sources:

- Three (3) units of 536 HP diesel engines coupled to 625 KVA Power System Alternator;
- One (1) unit 798 HP General Motors - Detroit Diesel Engine with 625 KVA coupled to a Siemens Alternator; and

95 During construction of the proposed improvements, additional standby generator set (1x500KVA, 2x 320 KVA) will be provided to prevent work interruptions in the event of power outages.

1.7 Project Size

1.7.1 Cement Production

96 Northern Cement Corporation intends to increase the total clinker production capacity of Line 1 and Line 2 cement plant from 4,000 TPD to 5,500 TPD equivalent to 2,707,692 tons per year of cement. The breakdown of this production is presented in **Table** 1-18.

Table 1-18: New Clinker and Cement Production Capacity of NCC Line 1 and Line 2

	Clinker (TPY)	Additives (TPY)	Total Cement Produced (TPY)	Cement Bags Produced
Line 1	880,000	774,400.5	1,353,846	32,500,000
Line 2	880,000	774,400.5	1,353,846	32,500,000
Total	1,760,000	1,548,801	2,707,692	65,000,000

1.7.2 Allowable Quarry Area

97 NCC is currently quarrying limestone and shale to supply the raw material requirement of the existing operation of the Line 1 and Line 2 cement plant. The NCC quarry is within the MPSA No. 106-98-1 with total area of 630 hectares. Under ECC Ref. No. 9909-106-105, NCC was allowed to quarry 163 hectares within the MPSA with daily production capacity of 8,500 MT and 2,100 MT for limestone and shale, respectively.

98 The NCC plans to increase the limestone and shale production capacity of its quarry operation to supply the additional raw material requirements of the Line 1 and Line 2. NCC will also supply the limestone and shale requirements of the SMNCI Line A and Line B cement facility and the limestone requirement of the SMC Global Power. With this, the new annual extraction rate for the limestone and shale are 8.27 MMTPY and 1.83 MMTPY, respectively.

Table 1-19: NCC Limestone and Shale Quarry Production

Mineral Requirement	Available Mineral Reserve	Extraction Rate (MMTPY)			
		NCC Line 1 and Line 2	SMNCI Line A and Line B	SMC Global Power	Total
Limestone	720.2 MMT	2.49	5.42	0.37	8.27
Shale	30.19 MMT	0.57	1.26	-	1.83

99 A mineral resource assessment was conducted within the MPSA of NCC last August 2019. A copy of the report is attached as **Annex 7.**

100 The available limestone resources within the MPSA based on the assessment is 720,200,000 metric tons. With this, it can supply the annual limestone requirement of 8.27 MMTPY for ~88 years.

101 For the shale, the available resources within the MPSA is 30,190,000 metric tons. The estimated mine life for the shale quarry is ~16.5 years.

1.8 Development Plan, Description of Project Phases and Corresponding Timeframes

1.8.1 Pre-Construction

102 The pre-construction includes geotechnical investigation, feasibility study preparation, detailed engineering design and permitting. As previously discussed, **NCC** is applying for the amendment of ECC 9207-032-301C.

1.8.2 Construction Phase

103 During this phase, additional equipment will be purchased and assembled on site. Proper occupational safety and health procedures would be implemented to ensure the welfare of the workers. As the facility upgrade would proceed along with the operation of the existing facilities for a certain period, additional guidelines on work delineation and management would be implemented to avoid any delays and conflicts of both activities.

1.8.3 Operations

104 Major activity of the plant will involve 24/7 operation of the clinker & cement production and of quarrying of raw materials. Skilled workers will be employed. The same strict observation of occupational health and safety during construction would be followed.

105 **Table** 1-20 shows the indicative timeline of the expansion project of NCC. The target commercial operation of Line 1 and Line 2 with the new production capacity is on 4th quarter of 2020. This is the same for the quarry expansion.

1.8.4 Abandonment

Post-construction Decommissioning

106 After the construction, the project site will be thoroughly cleaned as preparation for the operation. All the temporary facilities installed in the project site will be properly dismantled and removed including the equipment brought in the project site. Heavy equipment will be removed at 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.

107 All the wastes generated will be properly disposed 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 wastes will also be collected by DENR-registered haulers. Human wastes from the portable toilets will be properly siphoned by DENR-register desludgers. No wastes will be left in the project site.

Project Decommissioning

108 The abandonment scenarios being planned for are (a) scheduled closure; (b) temporary closure; and (c) sudden closure. If the cement plant operations shall cease, all plant equipment and

machineries will be disassembled and hauled out and disposed of accordingly by the owners, as these are economic assets. All scrap materials will be re-used or sold to recyclers.

109 At the end of project economic life, in the transition period for other land uses, the plant decommissioning and abandonment plan will aim to meet the following criteria:

- Facilities such as Powerhouse, Water Treatment Plant, QA Lab & CCR building, Preheater building, Spray Tower and Baghouses, Storages, Warehouses, Concrete & Steel Silos, Packing Plant, conveying system facilities, Scale houses, Crushing, Milling & Pyro-processing equipment and auxiliaries are safely and carefully dismantled. Reusable or recoverable materials will be segregated through an accredited third-party material recovery group.
- The area will be cordoned off for public safety;
- Land and facilities are rendered free of chemical contamination and physical hazards;
- Air, water and soil quality in the project environment shall conform to DENR standard;
- Land slopes are stable against erosion-prone;
- No flooding or unplanned water impounding persist in the project site;
- The area does not cause flooding or excessive sedimentation of downstream locations;
- All wastes have been hauled out and properly disposed;
- The area presents a pleasant and aesthetic visual impression;
- Rehabilitation of the mined-out areas.

Table 1-20: Indicative Timeline of Activities

LINE 1 AND 2 PROPOSED ADDITIONAL EQUIPMENT

IT	DESCRIPTION OF WORKS	2019												2020												2021											
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1.0	Homo silo upgrading and rehabilition of old internal parts and blowers																																				
2.0	Replacement of old burner pipe to low-nox german FLSmidth burner pipe																																				
3.0	Uppgrading of water sprayong of GCT using highly efficiency autojet gas cooling system																																				
4.0	Upgrading and modification of preheater with feed points for alternative fuel and raw materials (AFR).																																				
5.0	Introduction of alternative fuel and raw material for cement manufacturing																																				

LEGEND

- Engineering and procurement
- Construction and installation works
- Testing and commisioning
- Operational

1.9 Manpower

110 **Table** 1-21 summarizes the manpower requirements throughout the development phases of the proposed project. As shown, around 86 workers will be employed for the expansion of the NCC Line 1 and Line 2. A total of 306 NCC workers and about 2,143 contractors are expected for the operation of the NCC Line 1 and Line 2 and quarry.

Table 1-21: Manpower Requirement

PROJECT PHASE	ESTIMATED MANPOWER REQUIREMENTS	TASKS TO BE PERFORMED	SKILLS REQUIREMENTS
Construction	86	• Civil works, architectural, and electro-mechanical works	• Engineers, project managers, skilled and non-skilled laborers
Operation	NCC: 306 Contractors: 2,143	• 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 tax payments, 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	~20	• Implement the abandonment plan	• As required

111 **Northern Cement Corporation, Inc.** will prefer hiring of locals whose skills and experience match the specific needs of the project. The proponent will also provide the necessary training of locals for possible hiring as the need arises.

1.10 Project Cost

112 Indicative cost for the proposed project is estimated to be **Php ~3.5 Billion**. These will 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 water treatment facilities; and
- Environmental monitoring activities

SECTION 2

ASSESSMENT OF ENVIRONMENTAL IMPACTS

2.1 The Land

113 This section presents the current baseline conditions of the project site to provide an overview of the existing environment. The key impacts are presented in relation to the current conditions.

2.1.1 Land Use and Classification

114 As indicated in **Section 1.1**, the proposed project site lies within the political jurisdiction of Brgy. Labayug and the Municipal Government of Sison in the Province of Pangasinan in Region 1 (ILOCOS REGION). The respective land area of region, province, municipality, and barangay that cover the proposed project site are presented in **Table** 2-1.

115 The Municipality of Sison is classified as 3rd class municipality. It is divided into 28 barangays, as shown in **Figure** 2-1. It is bounded by the Municipality of Tuba (Benguet Province) on the east, by the Municipality of Rosario (La Union Province) on the north and the Municipalities of Pozzorubio and San Fabian (Pangasinan Province) on the south and west respectively.

Table 2-1: Land Area of Region 1, Province of Pangasinan, Sison, and Brgy. Labayug

JURISDICTION	LAND AREA (HAS.)
Region 1 (ILOCOS REGION)	**1,296,462**
Province of Pangasinan	**545,059**
Municipality of Sison	**13,788**
Barangay Labayug	**330**
Sources: Philippine Statistics Authority 2015	

116 Half (6,936 hectares) of the land in the Municipality of Sison is classified as agricultural area. The agricultural lands are mainly found along the lowlands at the eastern and middle portions of the municipality. About 37.49% of the land on the municipality is used as forest areas. Only 3.1% is being used as built-up area. The distribution of land use in the Municipality of Sison is shown in **Table** 2-2 while the general land use map is shown in **Figure** 2-2.

Table 2-2: Land Use Distribution, Municipality of Sison

Land Use	Area (hectares)	% Total
Built–up Area	**427.21**	**3.1**
Residential	*246.00*	*1.78*
Commercial	*28.00*	*2.20*
Institutional	*35.00*	*0.25*
Industrial	*98.00*	*0.71*
Parks & Playground	*0.65*	*0*
Special Uses	**19.56**	**0.13**
Cemetery	*7.73*	*0.06*
Tourism	*10.83*	*0.08*
Dumpsite/Landfill	*1.00*	*0.01*
Agricultural	**6,936.82**	**50.31**
Sand dunes/Quarry Pit	**219.00**	**1.59**
Pastureland/ Grassland	**204.00**	**1.48**
Forest	**5,168.97**	**37.49**
Roads	**118.76**	**0.81**
Rivers/Creeks/Easement	**713.24**	**5.22**
Total	**13,788.00**	**100.00**

2.1.1.1 Impact in terms of compatibility with existing land use

117 As shown in **Figure** 2-2**,** the area where the NCC Line 1 and Line 2 cement plant is located is classified as industrial area. However, parts of the MPSA is still categorized as agricultural and forest areas. The CLUP of the Municipality of Sison is being updated and the MPSA will be reclassified as mining/quarry area.

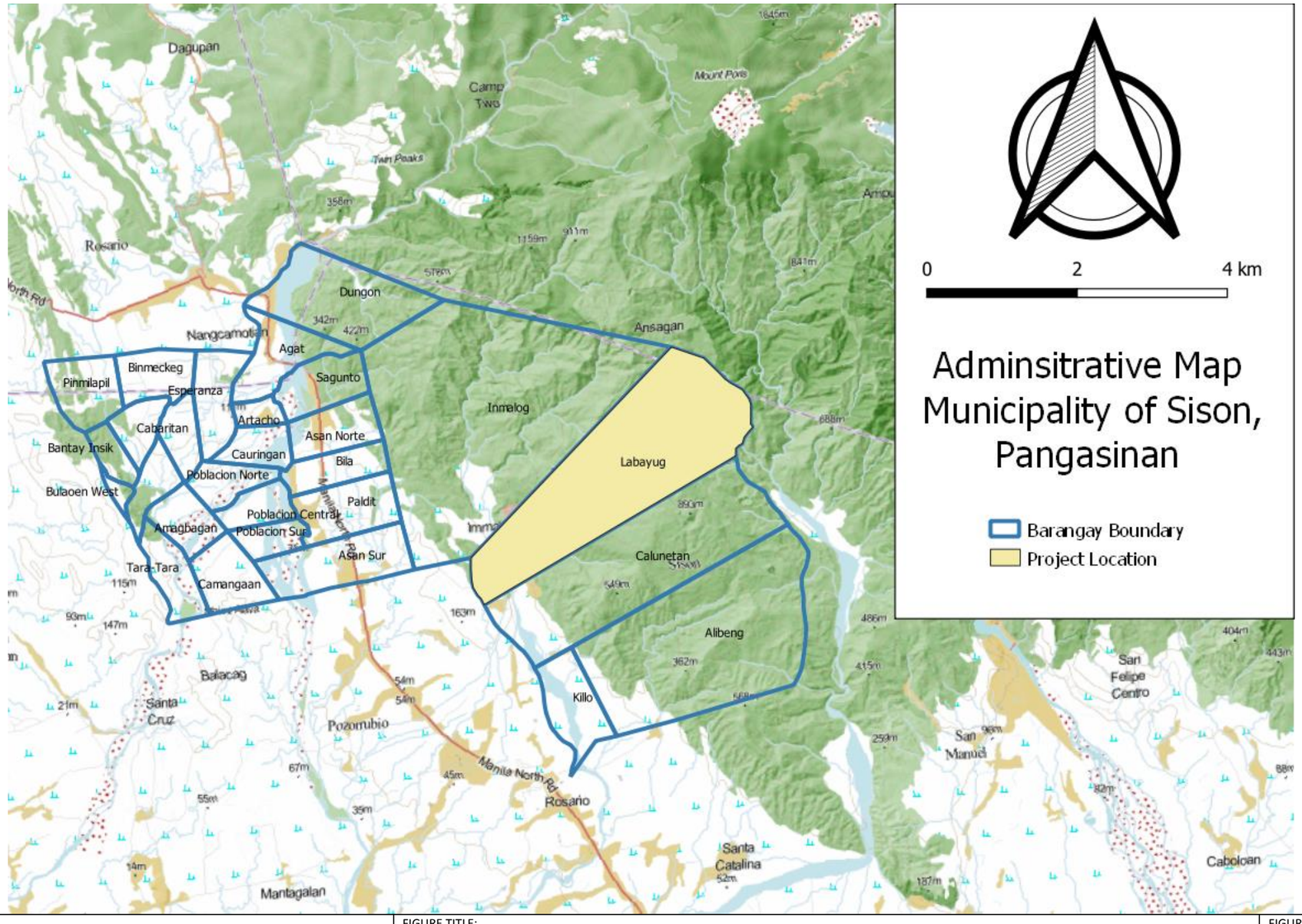
2.1.1.2 Impact on compatibility with classification as an Environmentally Critical Area (ECA)

118 The proposed project site does not fall within any declared environmentally critical area (ECA), defined in the DENR Administrative Order No. (DAO) 2017-15 as *"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."*

2.1.1.3 Impact in existing land tenure issue/s

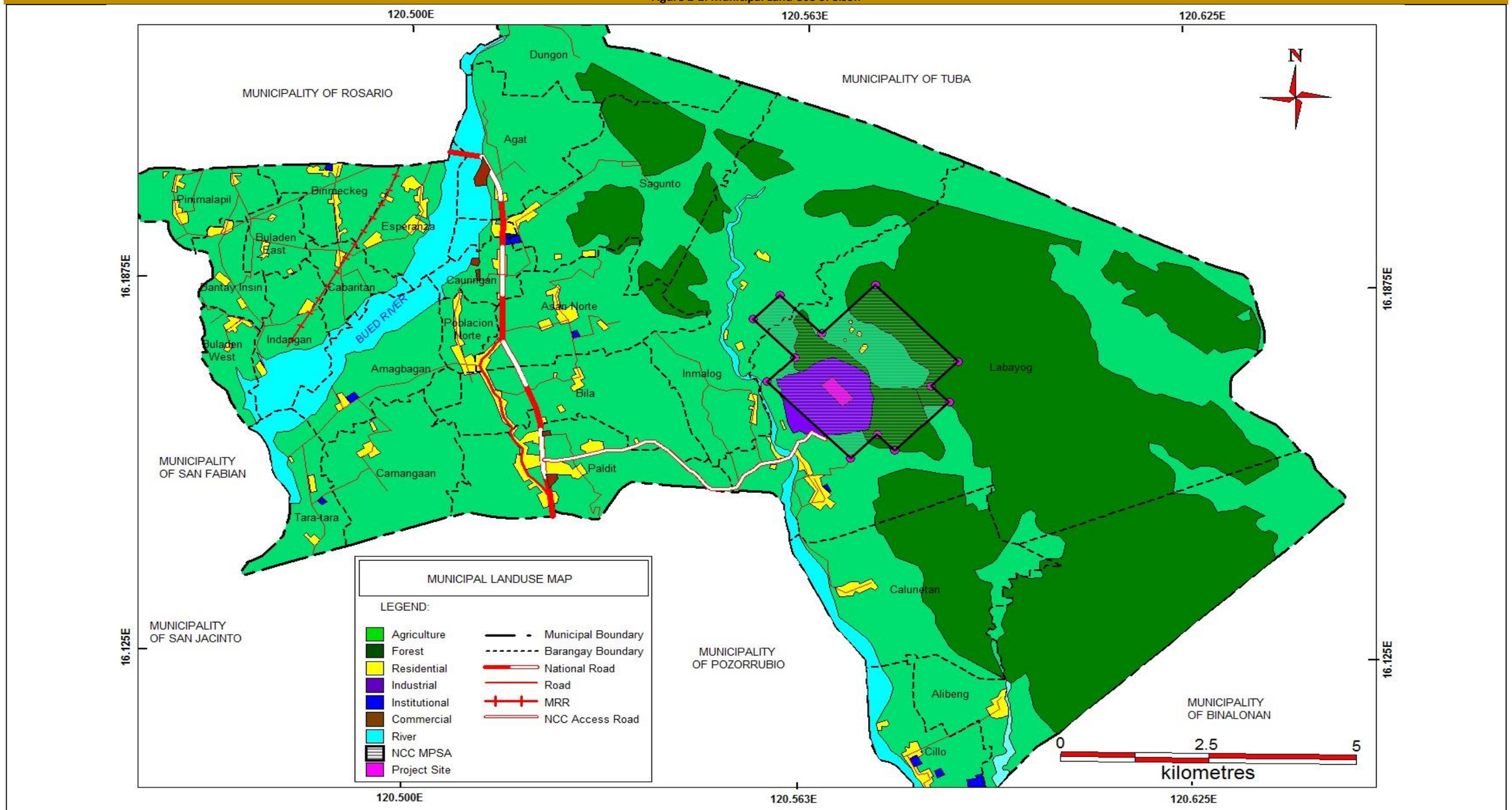
119 The proposed project site is not covered by the Comprehensive Agrarian Reform Program (CARP). It is also not subject to a Certificate of Ancestral Domain Claim (CADC), Certificate of Ancestral Domain Title (CADT), Certificate of Ancestral Land Claim (CALC), Certificate of Ancestral Land Title (CALT), Integrated Forest Management Agreement (IFMA), Community-Based Forest Management Agreement (CBFMA), or any other tenurial instrument.

Figure 2-1: Administrative Map of the Municipality of Sison



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **ADMINISTRATIVE MAP OF MUNICIPALITY OF SISON**	FIGURE NO.: 2-1
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NAMRIA PHILGIS

Figure 2-2: Municipal Land Use of Sison



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **MUNICIPAL LAND USE MAP OF SISON**	FIGURE NO.: 2-2
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: Sison Municipal Government

2.1.1.4 Impairment of Visual Aesthetics

120 The slopes and landscape in the quarry areas are expected to be modified during the operation due to the extraction of soil. This modification will create an unaesthetic view of the natural surroundings. Considerations are made in the proposed project design to preserve and enhance the visual aesthetics in the project area.

2.1.1.5 Devaluation of Land Value as a Result of Improper Waste Disposal

121 Solid waste generation will be limited to construction debris during the construction phase and domestic wastes during the operational phase. Mine wastes are also being generated in the quarry operation. Improper management of solid wastes may cause land pollution in the project site.

122 As a mitigation measure, a Solid Waste Management Plan is being strictly implemented by the NCC based on the local disposal regulations and consistent with the Ecological Solid Waste Management Act of 2000 (Republic Act 9003). The SWMP of NCC is discussed in Section 3 (Environmental Management Plan) of this document. NCC will continue coordinating with the local government for the regular collection and disposal of the solid wastes. NCC is using the mine wastes for backfilling.

2.1.2 Geology/Geomorphology

123 Based from the Geology of the Philippines (2nd ed.) of the Mines and Geosciences Bureau (MGB), Ilocos Region belongs to Stratigraphic Grouping 1 (SG 1), the Ilocos-Central Luzon Basin. The stratigraphy of the Ilocos-Central Luzon Basin is subdivided into Ilocos, Central Luzon Basin- West Side and Central Luzon Basin- East Side. The Ilocos-Central Luzon Basin is structurally controlled by main branches of the northern segment of the Philippine Fault, notably the Vigan-Aggao Fault.

124 Sison belongs to the west side of the Central Luzon Basin and is underlain by three major formations; Amalang Formation, Klondyke Formation and Cataguintingan Formation.

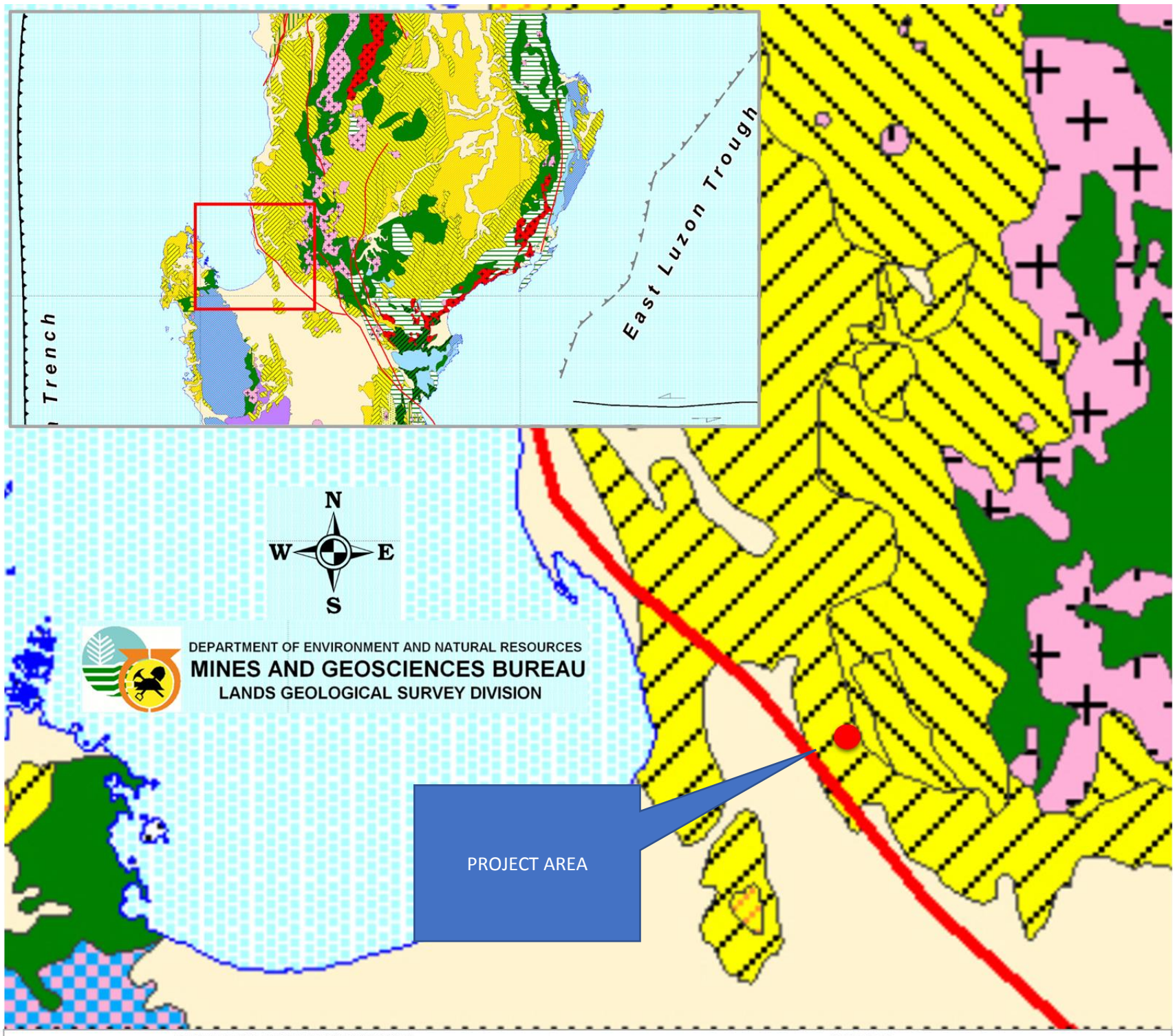
125 Amalang Formation consists of turbiditic sandstones and shale with minor conglomerate. In terms of stratigraphic relations, Amalang Formation overlies the Klondyke Formation and is under the Cataguintingan Formation. Underlying also the Amalang Formation is the Labayug Limestone

126 Underlying the NCC's cement plant and quarry is Labayug Limestone. Its contact with the overlying Amlang Formation at Sapid Creek is gradational. The geologic map covering the Municipality of Sison is shown in **Figure** 2-3.

127 The main limestone quarry area has a maximum elevation of 480 meters above sea level while the shale quarry area has an average elevation of 218 meters above sea level. The elevation where the NCC Line 1 and Line 2 cement plant is located is about 200 meters above sea level. The topographic map of the project area is shown in **Figure** 2-4**.**

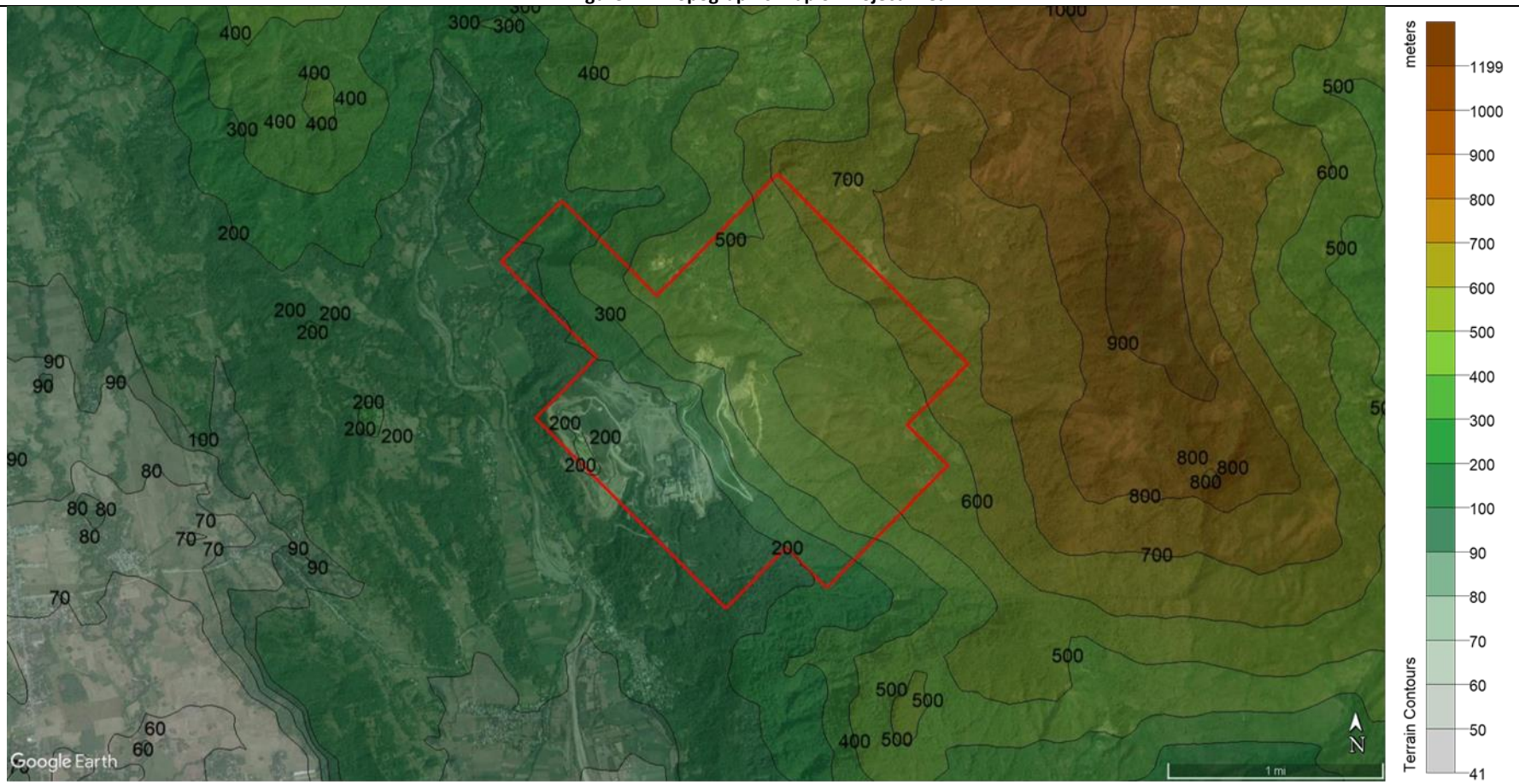
128 The area where the NCC cement plant is located has a slope of 30-50% while some parts of the quarry area has slope of more than 50% , as shown in **Figure** 2-5**.**

Figure 2-3: Geologic Map of Project Area



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **GEOLOGIC MAP OF PROJECT AREA**	FIGURE NO.: 2-3
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: MGB

Figure 2-4: Topographic Map of Project Area



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **TOPOGRAPHIC MAP OF PROJECT AREA**	FIGURE NO.: 2-4
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Figure 2-5: Slope Map of the Project Area

PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**SLOPE MAP OF PROJECT AREA**	2-5
EIA REPORT PREPARER:	PROJECT TITLE & LOCATION:	SOURCE:
LCI ENVI CORPORATION	**NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	NAMRIA PHILGIS

Earthquakes

129 There are three fault lines near the location of the NCC Line 1 and Line 2 cement plant. The closest is the San Miguel Fault, located at the west of the cement plant and passes through the MPSA. Located approximately 10 kilometers north-west of the cement plant is the Pugo Fault while approximately 7 kilometers north-east of the cement plant is the Mirador Fault.

130 Based from the Earthquake-induced Landslide Susceptibility Map of Region 1, the project is prone to PEIS VII and PEIS VII earthquake which are characterized to be destructive to very destructive in terms of intensity. The project site has also medium to high susceptibility in terms of earthquake-induced landslide.

Liquefaction

131 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 to 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 river beds 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.

132 As shown in **Figure** 2-8**,** the cement plant and the quarry areas are not susceptible to liquefaction.

Landslide

133 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. Areas with high risk to landslide are those with steep slopes, high precipitation, highly fractured rocks (sheared zone), scarce vegetation and location close to active faults.

134 Based from the Landslide Susceptibility Map of the Labayug Quadrangle shown in **Figure** 2-9, the project site has high to moderate susceptibility to landslide.

Flooding

135 Flooding in the country is often caused by prolonged rain. As such, 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 preparedness for natural calamities may also cause or even worsen flooding events.

136 The project site is not located in a flood-prone area however, some parts of Brgy. Labayug, located at the south-west of the project site, has moderate to high susceptibility to flood.

Volcanic Events

137 Another geologic hazard is from volcanic events. The Philippine has about 220 volcanoes (PHIVOLCS). Of these, 22 have been recorded in history to have erupted, and five are considered to be the most active namely: Taal, Mayon, Bulusan, Canlaon and Hibok-Hibok. 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 also cause respiratory illnesses.

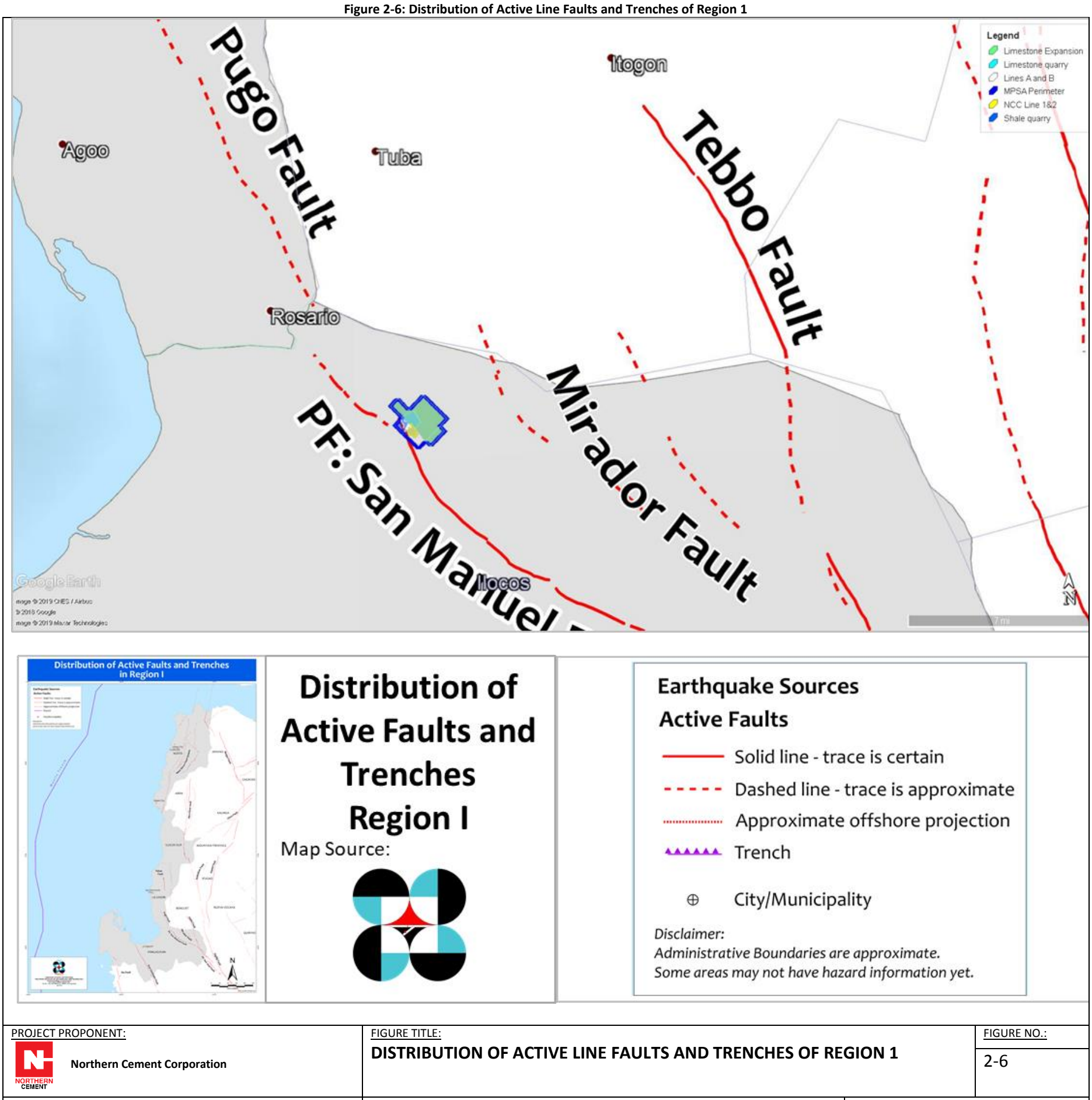
138 As shown in **Figure** 2-10, there are no active volcanoes near the project site.

Tsunami

139 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.

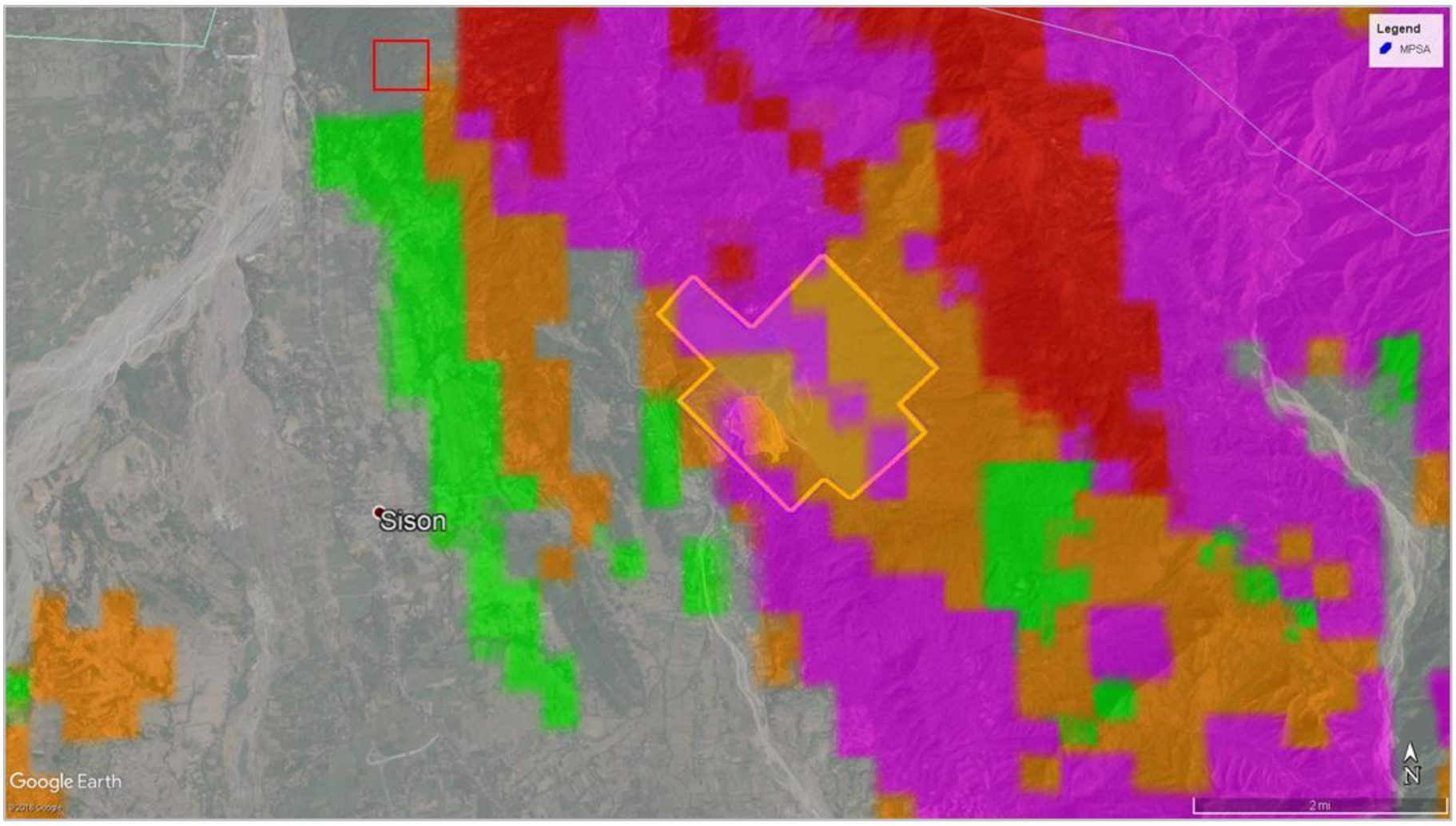
140 Based from the Tsunami Hazard Map of Pangasinan (**Figure** 2-11), the project site is not prone to tsunami.

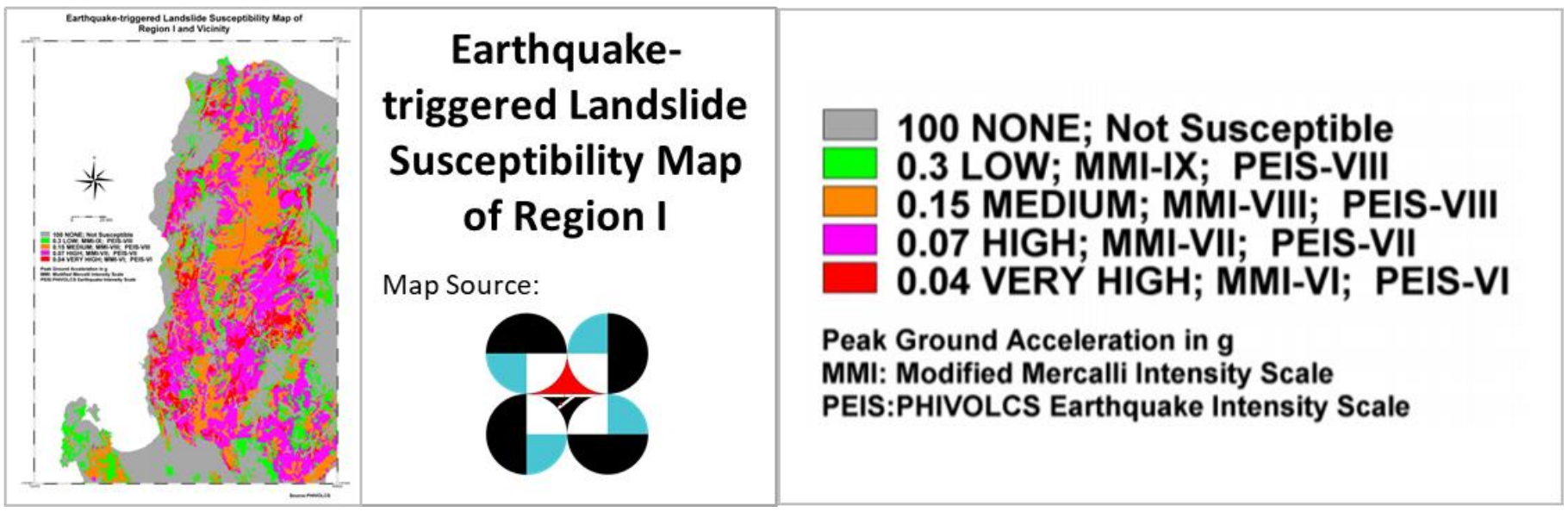
Figure 2-6: Distribution of Active Line Faults and Trenches of Region 1



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **DISTRIBUTION OF ACTIVE LINE FAULTS AND TRENCHES OF REGION 1**	FIGURE NO.: 2-6
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PHIVOLCS

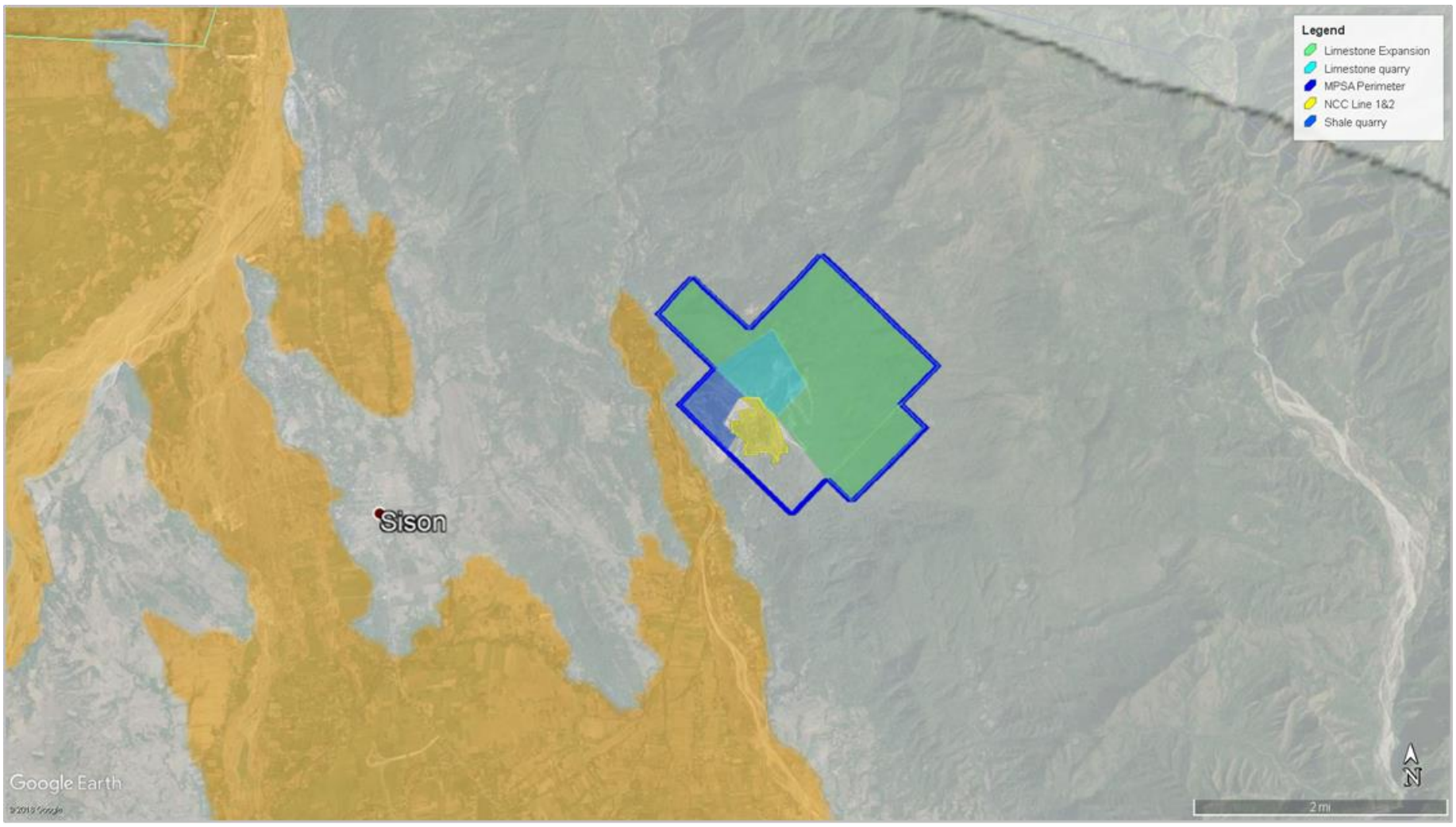
Figure 2-7: Earthquake-induced Landslide Susceptibility Map of Region 1





PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **EARTHQUAKE-INDUCED LANDSLIDE SUSCEPTIBILITY MAP OF REGION 1**	FIGURE NO.: 2-7
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PHIVOLCS

Figure 2-8: Liquefaction Hazard Map of Pangasinan



Liquefaction Susceptibility Map of Region 1

Map Source:

Legend

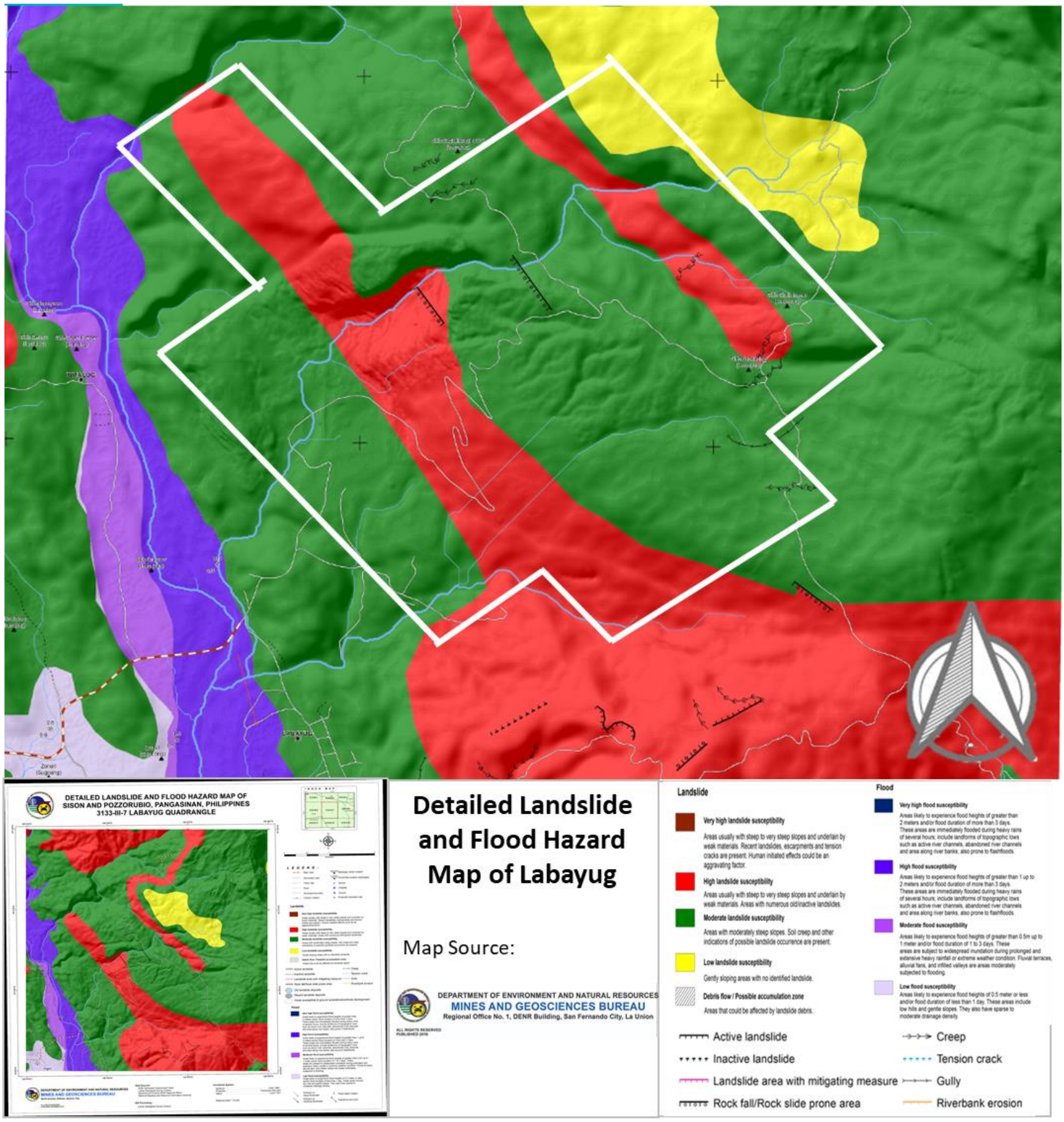
Areas Susceptible to Liquefaction

City/Municipality

Disclaimer:
Administrative boundaries are approximate.
Some areas may not have hazard information yet.

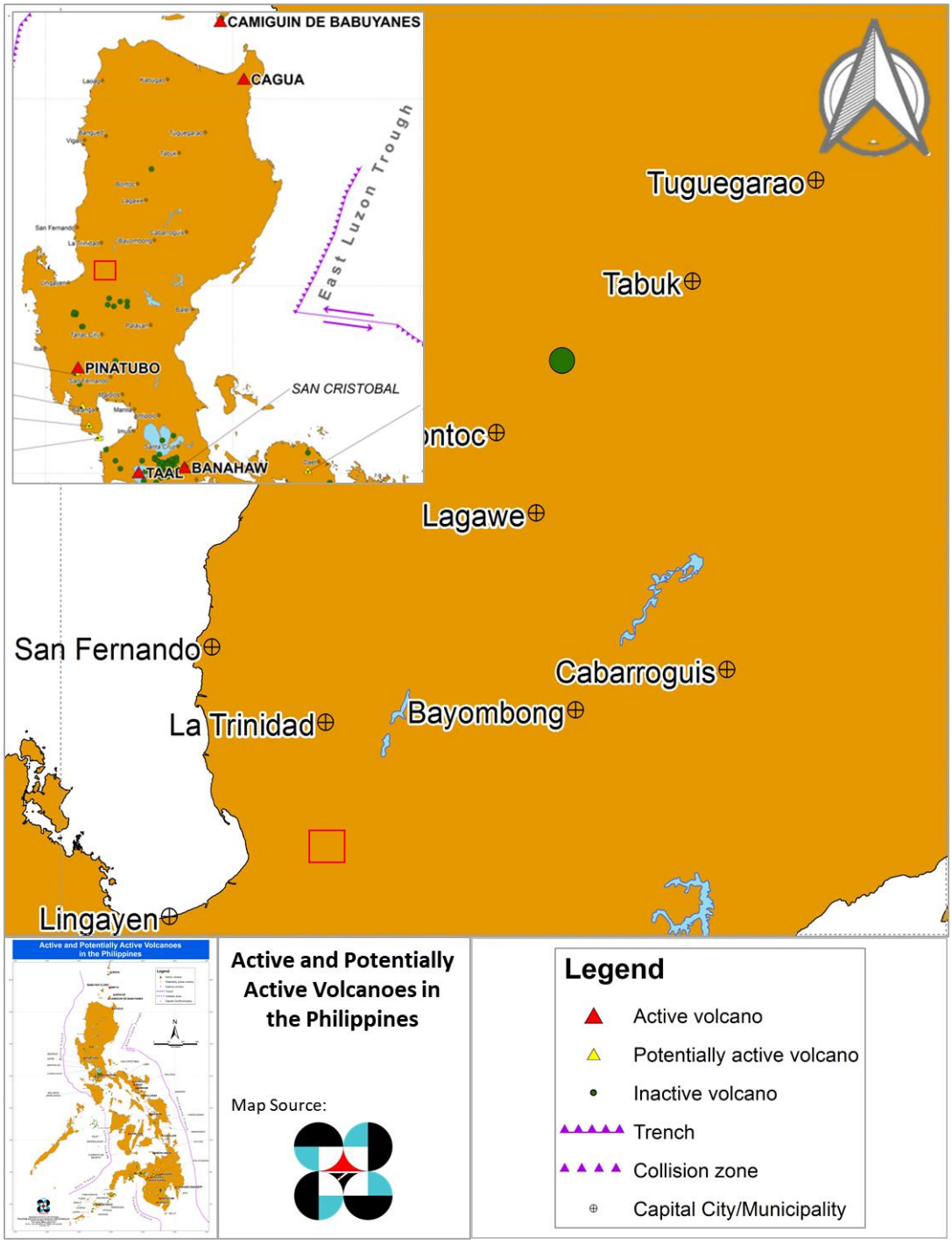
PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**LIQUEFACTION HAZARD OF PANGASINAN**	2-8
EIA REPORT PREPARER:	PROJECT TITLE & LOCATION:	SOURCE:
LCI ENVI CORPORATION	**NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	PHIVOLCS

Figure 2-9: Landslide and Flood Hazard Map of Labayug Quadrangle



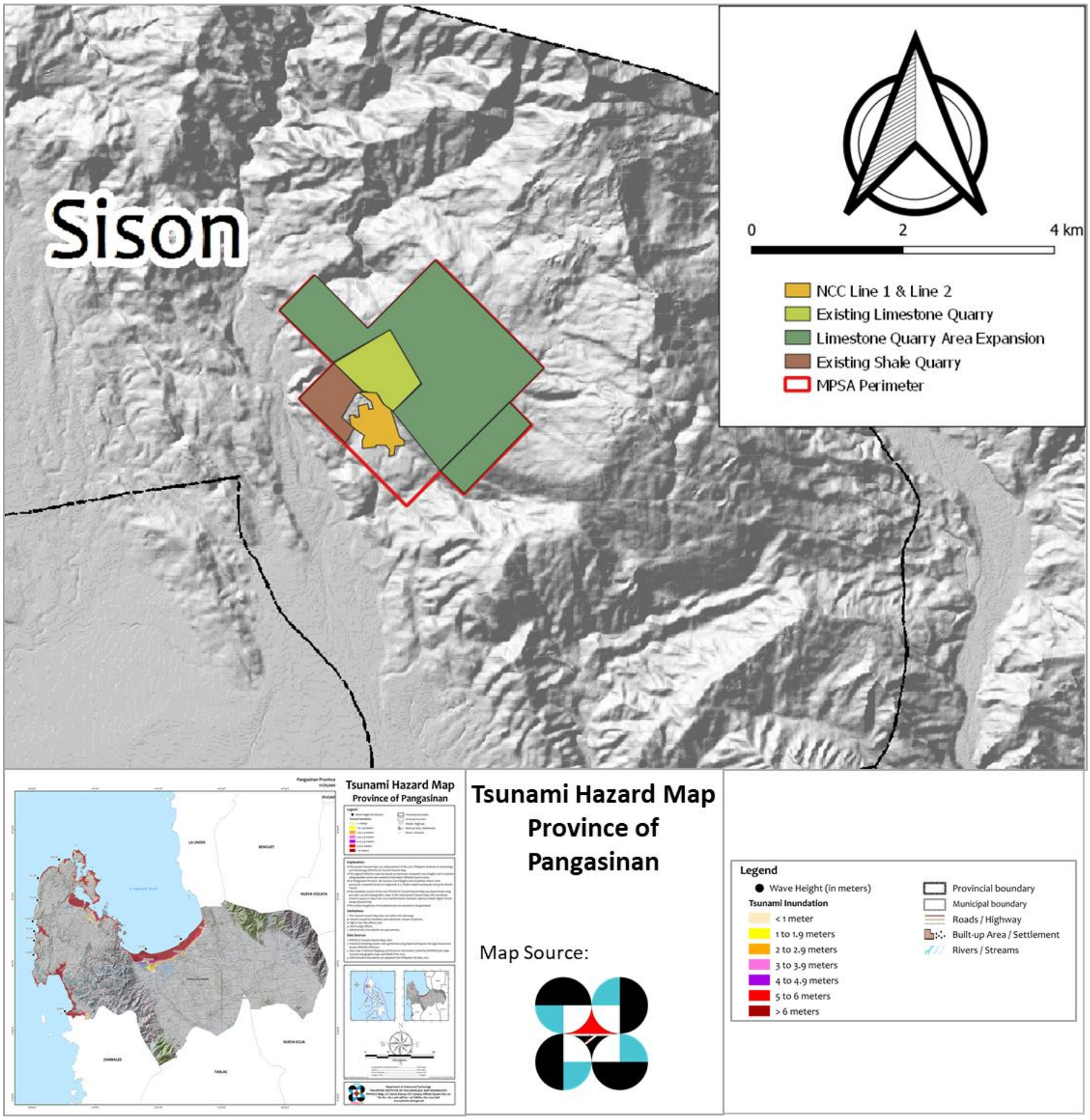
PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **LANDSLIDE AND FLOOD HAZARD MAP OF LABAYUG QUADRANGLE**	FIGURE NO.: 2-9
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: MGB

Figure 2-10: Active and Potentially Active Volcanoes in the Philippines



PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**ACTIVE AND POTENTIALLY ACTIVE VOLCANOES IN THE PHILIPPINES**	2-10
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PHIVOLCS

Figure 2-11: Tsunami Hazard Map of Pangasinan



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **TSUNAMI HAZARD MAP OF PANGASINAN**	FIGURE NO.: 2-11
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PHIVOLCS

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

141 NCC's quarry operation, like any kind of facilities with mining and ore extraction activities, will create a direct impact on the land, specifically the gross modification and alteration of natural slope.

142 The company maintains the bench slopes at 60-70 degrees and an overall quarry slope of 45 degrees to minimize this concern. Moreover, bench slopes are monitored for potential failures. Corresponding engineering interventions such as moderation of angle or bank refurbishment are currently implemented.

2.1.2.2 Change in subsurface geology/underground conditions

143 The proposed project is not expected to cause any change in sub-surface geology or underground conditions in the impact area.

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

144 There might be some concerns on the susceptibility of the quarry sites of the Plant to mass wasting or sudden earth movements. The company currently employs safety guidelines and proper mining procedures to minimize the occurrence of erosions near the quarry area.

2.1.3 Pedology / Soil

145 The soil map in the project area is shown in **Figure** 2-12**.** As shown in the map, the project is underlain by Annam Clay Loam and Umingan Silt Loam. The Annam Clay Loam soil type is characterized as very severely to excessively eroded or shallow for cultivation and suited to pasture or forest with carefree management. On the other hand, the surface soil of Umingan Silt Loam is brown sandy loam and friable. The texture of this layer becomes finer as its depth increases. The substratum is yellowish brown silty clay loam.

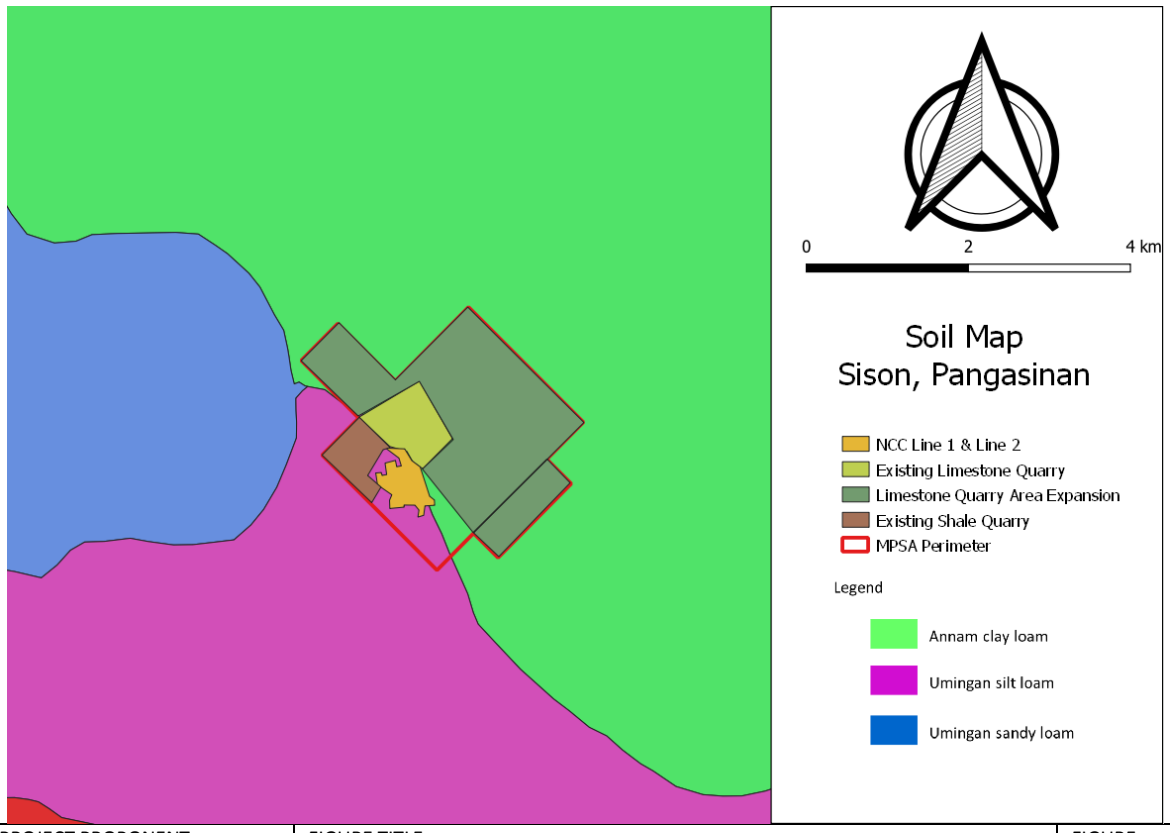
2.1.3.1 Soil erosion/Loss of topsoil/overburden

146 Landslides and erosions are caused by the sudden movement of soils within a slope of a hill or mountain. 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.

147 However, erosion can be greatly minimized 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.

148 Also, as part of their Environmental Protection and Enhancement Program (EPEP), NCC implements progressive rehabilitation which entails backfilling and planting in mined-out areas.

Figure 2-12: Soil Map



PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**SOIL MAP**	2-12
EIA REPORT PREPARER:	PROJECT TITLE & LOCATION:	SOURCE:
LCI ENVI CORPORATION	**NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	PHILGIS NAMRIA

2.1.3.2 Change in Soil Quality/Fertility

149 To determine the organic properties of the soil within the project site, a soil sample was collected last June 16, 2017 and September 28, 2018. The soil sample was analyzed for its organic compounds in terms of total phosphorus, total nitrogen, potassium, oil and grease and pH and heavy metals. The summary of results of the laboratory analysis is shown in **Table** 2-3.

150 Since there are no established soil quality standards in the Philippines, the results were 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 results show that the soil quality in the area is below the prescribed limits.

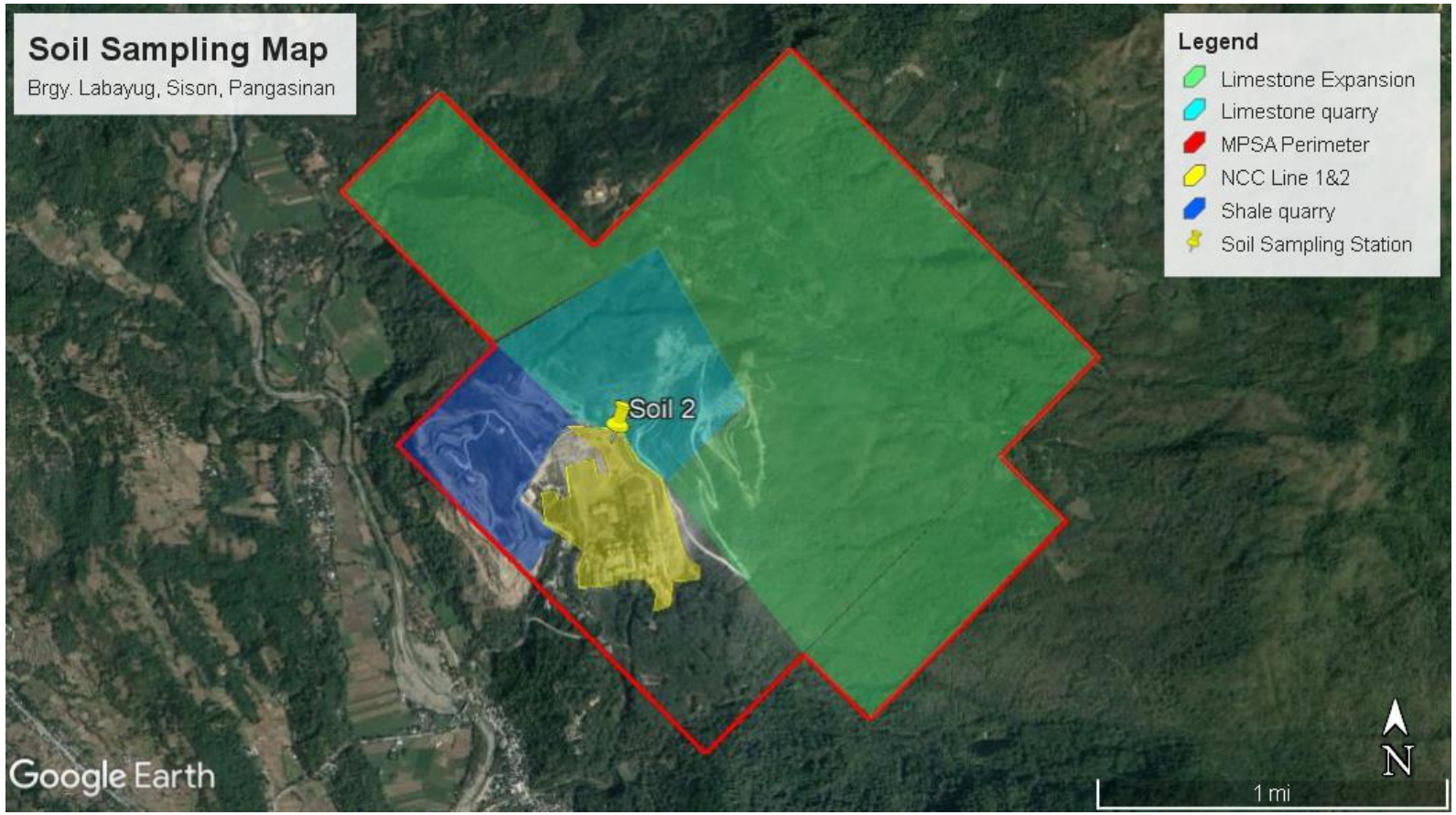
Table 2-3: Soil Analysis Results

PARAMETER	UNIT	DETECTED LEVEL AT THE SAMPLING POINTS BASED ON LABORATORY ANALYSIS *Soil 1*	Dutch Intervention Value ***Dutch Soil Remediation Circular 2013***
Total Nitrogen	mg/kg	**274**	-
Total Phosphorus	mg/kg	**639**	-

PARAMETER	UNIT	DETECTED LEVEL AT THE SAMPLING POINTS BASED ON LABORATORY ANALYSIS *Soil 1*	Dutch Intervention Value ***Dutch Soil Remediation Circular 2013***
Potassium	mg/kg	**856**	**-**
Oil and Grease	mg/kg	**532**	**-**
pH		7.4	-
Antimony	mg/kg	0.8	22
Arsenic	mg/kg	2.4	76
Cadmium	mg/kg	0.8	13
Lead	mg/kg	6.8	530
Thallium	mg/kg	8.0	15
Mercury	mg/kg	ND	-
Zinc	mg/kg	52	720
Potassium	mg/kg	2,170	-
Selenium	mg/kg	ND	100

NOTES: mg/kg = milligrams per kilogram
ND – Not Detected

Figure 2-13: Soil Sampling Map



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **SOIL SAMPLING MAP**	FIGURE NO.: 2-13
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE:

2.1.4 Terrestrial Ecology

151 A terrestrial assessment was conducted in the project site last September 2-5, 2015. The objective of the assessment was to identify existing vegetation cover and prevailing wildlife species in the watershed of the proposed project. This is undertaken to assess the biodiversity composition of the area and link the possible impacts of the project to the watershed. In addition, the study will provide recommendation on the possible mitigating measures to minimize impact of the project to the remaining flora and fauna species.

152 In the terrestrial assessment, plots were established in these particular sites to examine the tree and plant species for vegetational analysis. For faunal dimension, the study is limited on the observed species during the field survey, claims of the local and collected species on the established plots and through netting.

153 The species conservation status and endemicity were also determined. The International Union for Conservation of Nature (IUCN) Red List of Threatened Species 2016 and DENR-AO 2017-11 "Establishing the National List of Threatened Philippine Plant and Their Categories were employed in determining conservation status and endemicity of each species. This is to provide scientifically based information on the status of the species and subspecies 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 (Source: Convention on International Trade of Wild Flora and Fauna, Joint Meeting of the Animals and Plants Committee, Shepherds town, USA., December 2000, retrieved November 2012). The IUCN Red list is set upon precise criteria to evaluate the extinction of thousands of species and sub-species. The aim of the Red List is to convey the urgency of conservation issues to the public and policy-makers, as well as to help the international community to try to reduce species extinction. In addition, the DENR AO 2007-01 was also used pursuant to Section 22 of Republic Act 9147, otherwise known as the Wildlife Conservation and Protection Act of 2001. The following are the conservation categories and their description.

- **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 in the near future.
- **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 in the medium-term future.
- **Near threatened (NT)** - Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
- **Least Concern (LC)** - Taxa which do not qualify for Conservation Dependent or Near Threatened.
- **Other Threatened Species (OTS)-** refers to a species or subspecies 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 in the near future.
- **Not Evaluated (NE) -** A taxon is Not Evaluated when it is has not yet been assessed against the criteria.

2.1.4.1 Terrestrial Flora

Methodology

154 Quadrat sampling method was used during the assessment of the flora in the project site. Ten sampling plots were established in the Sapid Forest for the flora assessment to represent the vegetation cover of the project site. Plants were identified as well as patches of trees located within the project area. Other species of plants encountered outside the sampling plots were photo documented. The collected data were consolidated to form a species checklist indicating common name, scientific name and family name of the plants recorded.

155 Random sampling using 20m x 20m square plots were established. Inside the 20m x 20m square plots, nested 5m x 5m and 1m x 1m subplots were also established using tape measure and plastic twine. In the 20m x 20m plots, all trees with dbh (1.3m from the ground) greater than 10 cm were enumerated and identified. The dbh, and height of each tree were measured for the computation and analysis of species richness, evenness and distribution. Frequencies of shrubs, poles and saplings inside the 5m x 5m quadrant were counted to account for the understorey species while percent coverage of grasses and other ground cover inside the 1m x 1m quadrat were also determined. Tree saplings and seedlings, vines, grass etc. were identified, tallied and recorded. **Figure** 2-14 shows map for the established sampling plots.

156 The following formulas were used to compute the %IV.

$$\boldsymbol{Basal\ Area\ (m^2)} = 0.7854\ (\frac{DBH}{100})^2\ x\ 100$$

$$\boldsymbol{Relative\ Dominance}\ (\%) = \frac{\sum Basal\ area\ of\ species\ (m^2)}{Plot\ area\ (m^2)}\ x\ 100$$

$$\boldsymbol{Density} = \frac{No.\ of\ individuals\ of\ any\ species}{Area\ of\ samples}$$

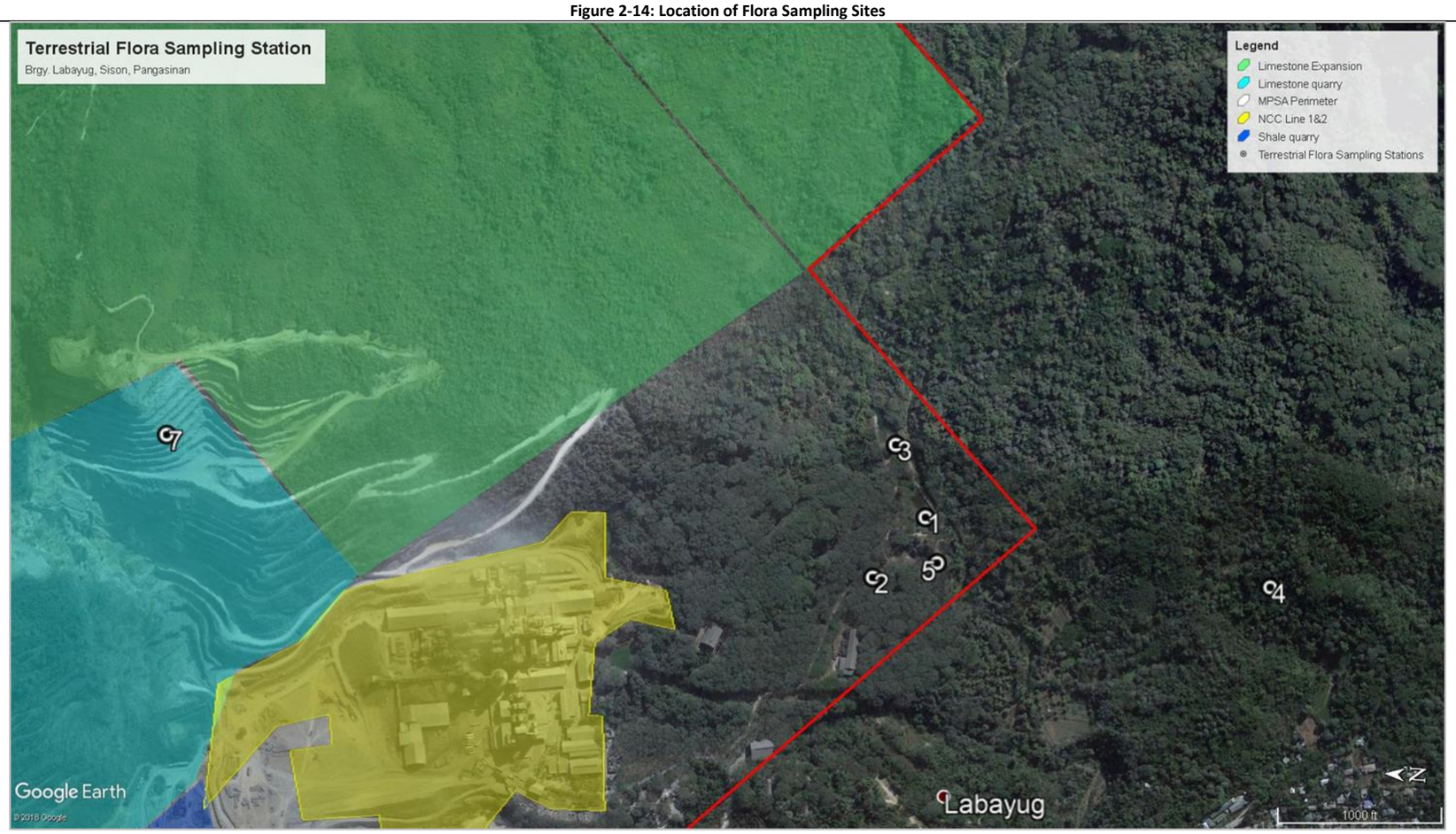
$$\boldsymbol{Relative\ Density}\ (\%) = \frac{Density\ of\ a\ species}{Total\ density\ of\ all\ species} x\ 100$$

$$\boldsymbol{Frequency} = \frac{No.\ of\ plots\ in\ which\ species\ occur}{Total\ number\ of\ plots\ sampled}$$

$$\boldsymbol{Relative\ Frequency}\ (\%) = \frac{Frequency\ of\ a\ species}{Total\ frequency\ of\ all\ species} x\ 100$$

$$\boldsymbol{Importance\ Value}\ (\%) = Relative\ Dominance + Relative\ Density + Relatibe\ Frequency$$

Figure 2-14: Location of Flora Sampling Sites



Quadrant	Location	Elevation (m)	Coordinates	
			NORTH	EAST
1	Sapid Forest: Milagrosa Watershed	180	16° 09′ 29.1″	120° 34′ 17.2″
2	Sapid Forest: Demo Farm	172	16° 09′ 32.0″	120° 34′ 13.2″
3	Sapid Forest: Up Near Nursery	161	16° 09′ 31.2″	120° 34′ 21.6″
4	Sapid Forest: Down Near Dam	145	16° 09′ 8.1″	120° 24′ 14.4″
5	Sapid Forest: Down	149	16° 09′ 28.2″	120° 34′ 14.4″
6	Line Tree - Helipad 1	218	16° 10′ 3.5″	120° 35′ 41.9″
7	Sagitlang: Limestone Quarry 1	430	16° 10′ 15.0″	120° 34′ 18.9″

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **LOCATION OF FLORA SAMPLING SITES**	FIGURE NO.: 2-14
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: Envitecch Environmental Management Consultancy Services, Inc.

Floristic Composition

157 A total of 73 species were observed from the project area. Relative to the plant life-form, trees were the dominant group with 45 species (62%) while the remaining 18 species (38%) are composed of shrubs, palms, herbs, grasses and vines.

Importance Value (IV), Density (ρ), and Frequency (f)

158 Importance value (IV) is the sum of relative density, relative frequency and relative dominance. A high importance value indicates that species is well represented in the stand because of some combination of a) a large number of individuals of species compared with other species in the stand, or b) a smaller number of individuals of species, but the trees are large compared with others in the stand.

159 Ipil-ipil (Afzelia bijuga) has the highest computed IV of 19.27%, followed by rain tree (Samanea saman) with 17.34% IV, gmelina (Gmelina arborea) with 14.99% IV, aratiles (Muntingia calabura) with 12.98% IV and narra (Pterocarpus indicus) with 11.82% IV. Species with the highest %IV were considered to have the highest contribution/impact in the study area. Results of the computed %IV of the trees observed are shown in Table 2-4.

160 Density is defined as a measurement of the individuals' number in an area. This is computed by counting the numbers of any given species over the area of the sample of the sample plot. It is the degree of compactness of a species. It can be used for the thickness description of a particular vegetation, extent regeneration and the extent of standing biomass or ground cover.

161 All the tree species observed have computed relative density of below 10%. Aratiles (Muntingia calabura) and bamboo (Bambusa blumeana) have the highest relative density of 6.55%.

162 Frequency (f) is defined as the number of times the species occurs in a given number of small quadrants or sample points. It is expressed as a fraction of the total relative frequency (RF). It does not matter how many individuals of species occur in each quadrant since a single occurrence carries the same weight.

163 In the intermediate layer, kantutay (Lantana camara) has the highest relative frequency of 10% followed by ipil-ipil (Afzelia bijuga) with 9.35% RF and kakawate (Gliricidia sepium) with 7.19% RF. Table 2-5 presents the computed frequency of the species in the intermediate layer.

164 Nine (9) species of grasses and vines were recorded. Mikania, Imperata cylindrica (cogon) and Saccharum sponaneum (talahib) are invasive weed species in disturbed areas and form dense monocultures over croplands and pasturelands. They possess also allelopathic effects on other plants. These characteristics enabled these weed species to have high relative cover especially in the open marginal areas of the survey area. Computed frequency in the ground cover is shown in Table 2-6.

Table 2-4: Importance Value of the trees surveyed

Family Name	Scientific Name	Common Name	Abundance	Rf	Rρ	Rd	IV
Fabaceae	*Acacia auricoliformis*	Acacia	18	4.09222	3.92972	4.09268	12.1146
Leguminaceae	*Bauhinia malabarica*	Alibangbang	19	4.09222	4.14858	2.46914	10.7099
Moraceae	*Streblus asper*	Aludig/sandpaper tree	8	0.80692	1.74722	0.91324	3.46738
Arecaceae	*Saribus rotundifolius*	Anahaw	13	2.47839	2.83786	1.08236	6.39861
Dipterocarpaceae	*Dipterocarpus grandiflorus*	Apitong	1	0.40346	0.21886	0.54118	1.1635
Muntingiaceae	*Muntingia calabura*	Aratiles	30	3.68876	6.54994	2.73973	12.9784
Annonaceae	*Annona squamosa*	Atis	4	1.67147	0.873	2.43531	4.97978
Moraceae	*Ficus benjamina*	Balite	21	4.55331	4.58508	2.50296	11.6414
Poaceae	*Bambusa blumeana*	Bamboo	30	3.2853	6.54994	1.15001	10.9853
Phyllanthaceae	*Antidesma bunius*	Bignay	18	4.09222	3.92972	4.66768	12.6896
Arecaceae	*Corypha elata Roxb.*	Buri	6	1.67147	1.3095	1.58972	4.57069
Malvaceae	*Theobroma cacao L.*	Cacao	3	1.21037	0.65536	0.74412	2.60986
Rutaceae	*Citrus microcarpa*	Calamansi	4	1.67147	0.873	3.34855	5.89302
Anacardiaceae	*Anacardium occidentale*	Cashew	2	0.80692	0.4365	0.77795	2.02136
Rutaceae	*Manilkara zapota*	Chico	1	0.40346	0.21886	2.16472	2.78704
Rubiaceae	*Coffea liberica*	Coffee	2	0.80692	0.4365	0.7103	1.95372
Myrtaceae	*Syzygium cumini*	Duhat	8	2.47839	1.74722	2.30002	6.52562
Lamiaceae	*Gmelina arborea*	Gmelina	23	4.55331	5.02158	5.4118	14.9867
Myrtaceae	*Psidium guajava*	Guava	9	2.47839	1.96486	1.15001	5.59325
Annonaceae	*annona muricata*	Guyabano	4	1.67147	0.873	1.4206	3.96507
Fabaceae	*Afzelia bijuga*	Ipil – ipil	50	3.68876	10.9174	4.66768	19.2738
Artocarpaceae	*Artocarpus heterophyllus*	Jackfruit	5	1.67147	1.09186	1.38677	4.15011
Moraceae	*Artocarpus altilis*	Kamansi	13	3.2853	2.83786	1.58972	7.71288
Fabaceae	*Parkia javanica (Lam.) Merr.*	Kupang	13	3.68876	2.83786	4.87062	11.3972
Ebenaceae	*Diospyros blancoi*	Mabolo	3	1.21037	0.65536	3.28091	5.14664
Myrtaceae	*Syzygium samarangense*	Macopa	1	0.80692	0.21886	0.7103	1.73608
Meliaceae	*Toona calantas*	Mahogany	29	4.95677	6.3323	2.87502	14.1641
Anacardiaceae	*Mangifera indica*	Mango	9	3.68876	1.96486	3.24708	8.9007

Family Name	Scientific Name	Common Name	Abundance	Rf	Rρ	Rd	IV
LAMIACEAE	*Vitex parviflora*	Molave	3	1.21037	0.65536	2.16472	4.03046
Dipterocarpaceae	*Pterocarpus indicus*	Narra	16	4.55331	3.49322	3.77135	11.8179
Rutaceae	*Citrus X sinensis*	Orange	1	0.40346	0.21886	0	0.62232
Dipterocarpaceae	*Shorea palosapis*	Palosapis	3	1.21037	0.65536	0.40589	2.27162
Caricaceae	*Carica papaya*	Papaya	11	2.07493	2.40136	1.4206	5.89689
Rutaceae	*Citrus maxima*	Pomelo	1	0.40346	0.21886	1.82648	2.4488
Fabaceae	*Samanea saman*	Raintree	27	4.55331	5.89458	6.90005	17.3479
Sapindaceae	*Nephelium lappaceum*	Rambutan	1	0.40346	0.21886	2.87502	3.49734
Dipterocarpaceae	*Shorea negrosensis*	Red lawaan	2	0.80692	0.4365	1.04854	2.29195
Meliaceae	*Sandoricum koetjape*	Santol	5	1.67147	1.09186	0	2.76333
Fabaceae	*Biancaea sappan*	Sappan	1	0.40346	0.21886	2.90884	3.53116
Sapotaceae	*Chrysophyllum cainito*	Star apple	8	2.47839	1.74722	1.89413	6.11974
Combretaceae	*Terminalia catappa*	Talisay	3	1.21037	0.65536	0.94707	2.8128
Fabaceae	*Tamarindus indica*	Tamarind	6	2.07493	1.3095	0.7103	4.09473
Lamiaceae	*Tectona grandis*	Teak	18	4.55331	3.92972	1.9956	10.4786
Dipterocarpaceae	*Shorea contorta*	White lawaan	1	0.40346	0.21886	3.04414	3.66646
Dipterocarpaceae	*Shorea astylosa*	Yakal	4	1.67147	0.873	3.24708	5.79155
		TOTAL	**457**	**100**	**100**	**100**	**300**

Table 2-5: Computed Frequency (f) in the Intermediate Layer

Scientific Name	Species Name	Common Name	f	Rf
Fabaceae	*Acacia auricoliformis*	Acacia	8	5.76%
Leguminaceae	*Bauhinia malabarica*	Alibangbang	8	5.76%
Moraceae	*Streblus asper*	Aludig	5	3.60%
Moraceae	*Ficus benjamina*	Balite	6	4.32%
Poaceae	*Dracaena braunii*	Chinese Bamboo	3	2.16%
Myrtaceae	*Syzygium cumini*	Duhat	7	5.04%
Lamiaceae	*Gmelina arborea*	Gmelina	9	6.47%
Poaceae	*Phyllostachys aurea*	Golden bamboo	5	3.60%
Asteraceae	*Chromolaena odorata*	Hagonoy	8	5.76%
Fabaceae	*Afzelia bijuga*	Ipil-Ipil	13	9.35%
Fabaceae	*Gliricidia sepium*	Kakawate	10	7.19%
Verbenaceae	*Stachytarpeta jamaicensis*	Kandikandilaan	7	5.04%
Verbenaceae	*Lantana camara*	Kantutay	14	10.07%
Poaceae	*Bambusa blumeana*	Kawayan Tinik	8	5.76%
Meliaceae	*Toona calantas*	Mahogany	7	5.04%
Anacardiaceae	*Mangifera indica*	Mango	9	6.47%
Myrtaceae	*Syzygium polycephaloides*	Panglumbuyen	2	1.44%
Caricaceae	*Carica papaya*	Papaya	4	2.88%
Lamiaceae	*Hyptis suaveolens*	Suob Kabayo	6	4.32%

Table 2-6: Computed Frequency in the Ground Cover

Family Name	Species	Common Name	Rf	Relative Cover (%)
Amaranthacea	*Amaranthus spinosus*	Uray	8.3	20
Fabaceae	*Mimosa pudica*	Makahiya	5.0	34
Poaceae	*Eleusine indica*	Paragis	10.7	18
Asteraceae	*Mikania mikania*		31.1	24
	Oxales sp.		2.5	18
Portulacaceae	*Portulaca oleracea*	Kolasiman	3.2	7
Poaceae	*Saccharum spontaneum*	Talahib	8.3	52
Asteraceae	*Ageratum conyzoides*	Bulak-manok	6.1	44
Poaceae	*Imperata cylindrica*	Kogon	16.3	61
	Litter		8.5	32

Biodiversity Index

165 Species richness and evenness are the important factors in determining biodiversity of an area. Richness is defined as the total number of species present in a sample while evenness is the relative abundance of the species in a sample. Richness' takes on diversity is - the more different the species in a community, the more diverse the area. Evenness considers the number of the individual belonging to the same species (www.countrysideinfo.co.uk). It expresses how evenly the individuals in the community are distributed over the different species.

166 Based from the assessment conducted, the project area has moderate diversity with the computed average Shannon H' of 2.83 for all the transects. Transects 1 and 2 have high biodiversity while only Transect 6 has low diversity.

167 Majority of the trees, bamboos and shrubs were observed in Transects 1 and 2. Moreover, transect 1 and 2 (Sapid Forest) are the site for reforestation of forest and fruit bearing trees. Transects 6 and 7 are located near the helipad and limestone and shale quarry where the soil condition is infertile, and majority of the vegetation is composed of invasive vines and allelopathic grasses and bushes resulting to less plant diversity in the said transects

168 Please see **Table** 2-7 for the results of the computed biodiversity indexes per transect.

Table 2-7: Biodiversity Indexes based from Shannon-Wiener diversity H'

Transect	Shannon (H')	Remarks
T1	3.058	High
T2	3.181	High
T3	2.688	Moderate
T4	2.994	Moderate
T5	2.729	Moderate
T6	2.353	Low
T7	2.803	Moderate

Flora Conservation Status and Endemicity

169 **Table** 2-8 shows the conservation status and endemicity of the observed species. According to the The IUCN Red List of Threatened Species version 2019-1, two species are under endangered (EN), one species is vulnerable (VU) and three species are considered critically endangered (CR). Based on the DAO 2017-11, there is one species considered as critically endangered (CR), one species is under endangered (EN) and five species are vulnerable (VU).

170 There were also three species that were observed to be endemic as shown in the table below.

Table 2-8: List of Flora Species and its corresponding Conservation Status

FAMILY NAME	SPECIES NAME		CONSERVATION STATUS		ENDEMI-CITY
	SCIENTIFIC NAME	COMMON NAME	IUCN (version 2019-1)	DAO 2017-11	
DIPTEROCARPACEAE	*Shorea contorta*	White	**CR**	**VU**	Endemic
DIPTEROCARPACEAE	*Shorea astylosa*	Yakal	**CR**	**CR**	Endemic
FABACEAE	*Pterocarpus indicus*	Narra	**EN**	**VU**	-
DIPTEROCARPACEAE	*Shorea negrosensis*	Red lawaan	**CR**	**VU**	Endemic
DIPTEROCARPACEAE	*Dipterocarpus grandiflorus*	Apitong	**EN**	**VU**	-
MELIACEAE	*Toona calantas*	Kalantas	**DD**	**VU**	-
VERBENACEAE	*Vitex parviflora*	Molave	**VU**	**EN**	-

Economic Importance

171 Majority of the plant species that were identified in study area have commercial and aesthetic/ornamental values while some have food, commercial and medicinal properties. Most of the large tree species can be utilized for lumber, furniture, heavy construction uses, and light construction purposes. Although many of the lower species are considered weeds, they can be utilized for medicinal purposes, construction materials and ornamental plants. Others can be utilized for handicrafts, agricultural implements, fibers, ground cover, dyes and forage.

2.1.4.2 Mining Forest Program and National Greening Program

172 In pursuant to the Section 171 of the Chapter 16 if the revised implementing rules and regulation of R.A. No. 7942, NCC is implementing its Mining Forest Program (MFP). Since 2001, NCC has been conducting reforestation activities within its mined-out areas.

173 NCC also supports the National Greening Program (NGP) of the national government in coordination with the Community Environment and Natural Resources Office (CENRO) and in partnership with the local communities.

Nurseries

174 NCC is operating five nurseries located inside its compound and has a total seedlings production capacity of 191,000. NCC has been producing its own seedlings for their tree planting activities and are also being donated to the community as part of their seedling donation program.

Table 2-9: Nurseries in NCC

Name of Nursery	Location	Area (sq. m)	Capacity (No. of seedlings produced)
Nursery 1 (Main Nursery)	NCC Compound, Sapid Mini Forest, Brgy. Labayug, Sison, Pangasinan	236.58	60,000
Nursery 2 (Main nursery extension)		294.34	8,000
Nursery 3 (Fruit Bearing Trees)		404.41	40,000
Nursery 4 (Bamboo nursery)		294.34	10,000
Nursery 5 (Demo farm)		364.1	1,000
	Total	**1,593.77**	**191,000**

175 NCC established a clonal nursery where plants are produced using material from a single parent. This focused on trials on the propagation of critically endangered Philippine Dipterocarps such as White and Red Lauan, Palosapis, Apitong, and Yakal. When wildlings are not available to collect, bulbs, tip layers, rhizomes and runners, cuttings are collected to provide genetic stock for cloning. The NCC clonal nursery successfully propagated viable planting materials from cuttings of endangered tree species.

176 NCC also built a nursery for fruit-bearing trees to help create income generating activities for their partner farmers. Herbal garden was also established by NCC at the sapid area wherein medicinal plants such as banana, tsaang-gubat, sambong lagundi, oregano, kutsay, ginseng, and others are being planted.

177 **Table** 2-10 shows the inventory of the seedlings that are in stock at the NCC nurseries as of March 2019. The plants are propagated and grown to viable size and out transplanted in partnership with the local farmers. Biodegradable wastes from their offices and canteen are being composted with the aid of African night crawler earthworms and are used in the nurseries.

Table 2-10: Seedlings inventory in NCC (March 2019)

Common name	Scientific Name	No. of Seedlings in Stock
Forest Trees		
Mahogany Seedlings (old stock)	Toona calantas	63,460
Acacia	Acacia mangium	5,300
Acacia Auri	Acacia auriculiformis	250
Balite	Ficus benjamina	30
Gmelina	Gmelina asiatica Blanco	2,060
Fruit Bearing Trees		
Atis	Annona asiatica	448
Pomelo	Citrus maxima	150
Lemon		75
Guava	Psidium guajava	1000
Cacao	Theobroma cacao	360
Chico		8
Guyabano	Annona muricata	340
Coffee	Coffea liberaca	517
Jackfruit	Artocarpus heterophyllus	320
Mabolo	Diospyros blancoi	650
Rambutan	Nephelium lappaceum	50

Common name	Scientific Name	No. of Seedlings in Stock
Sampalok	Tamarindus indica	160
Star Apple	Chrysophyllum bicolor	100
Mango		500
Papaya		110
Palm Tree		15
Bamboo		200
Bamboo (Kawayang Tinik)	Bambusa arundo	675
Bikal	Schizostachyum diffusum (Blanco)	215
Total		76,993

178 NCC also have the "Gulayan sa Minahan" project, located also inside the NCC compound, where different varieties of lowland and highland crops were planted. This is to show that exposure of the crops to the cement dusts does not affect the productivity. The project resulted to high yield of production with proper care and management.

Mining Forest Program (MFP)

179 NCC has been conducting reforestation activities for its mine-out areas since 2001 under its Mining Forest Program. As of March 2019, the total area that the NCC has planted within the MPSA is 230.85 hectares.

180 The seedlings from the nurseries are transferred to the reforestation areas of NCC to let it fully grow. From 2001 to 2018, NCC was able to plant a total of 174,440 seedlings for its mining forest program with a total of 98.32% survival rate. In 2018, NCC also donated about 21,185 seedlings to the communities. The accomplishment report on mining forest program of NCC is attached as **Annex 10**. NCC was awarded 3rd runner up for the implementation of its mining forest program last 2015.

Table 2-11: Survival Rate of MFP Reforestation Activities (as of December 2018)

Year	No. of Seedlings Planted	No. of Surviving Trees	% Survival Rate
2001-2014	142,690	141,907	99.45
2014-2016	25,500	24,927	97.75
2016-2017	3,000	2,950	98.34
2017-2018	3,250	2,450	75.38
Total	174,440	171,513	98.32

National Greening Program (NGP)

181 In 2012, NCC also started tree planting and reforestation activities to support the National Greening Program (NGP) of the DENR. Under the NGP, the NCC donates seedlings to the host communities, provides manpower during tree planting activities and monitors the survival of the seedlings planted.

182 Since 2012, NCC has already planted in a total area of 309.29 hectares outside its mining area. Under this program, NCC was able to plant a total of 278,560 seedlings with survival rate of 98.44%. The accomplishment report of NCC regarding national greening program is attached in **Annex 10**.

Table 2-12: Survival Rate of NGP Reforestation Activities

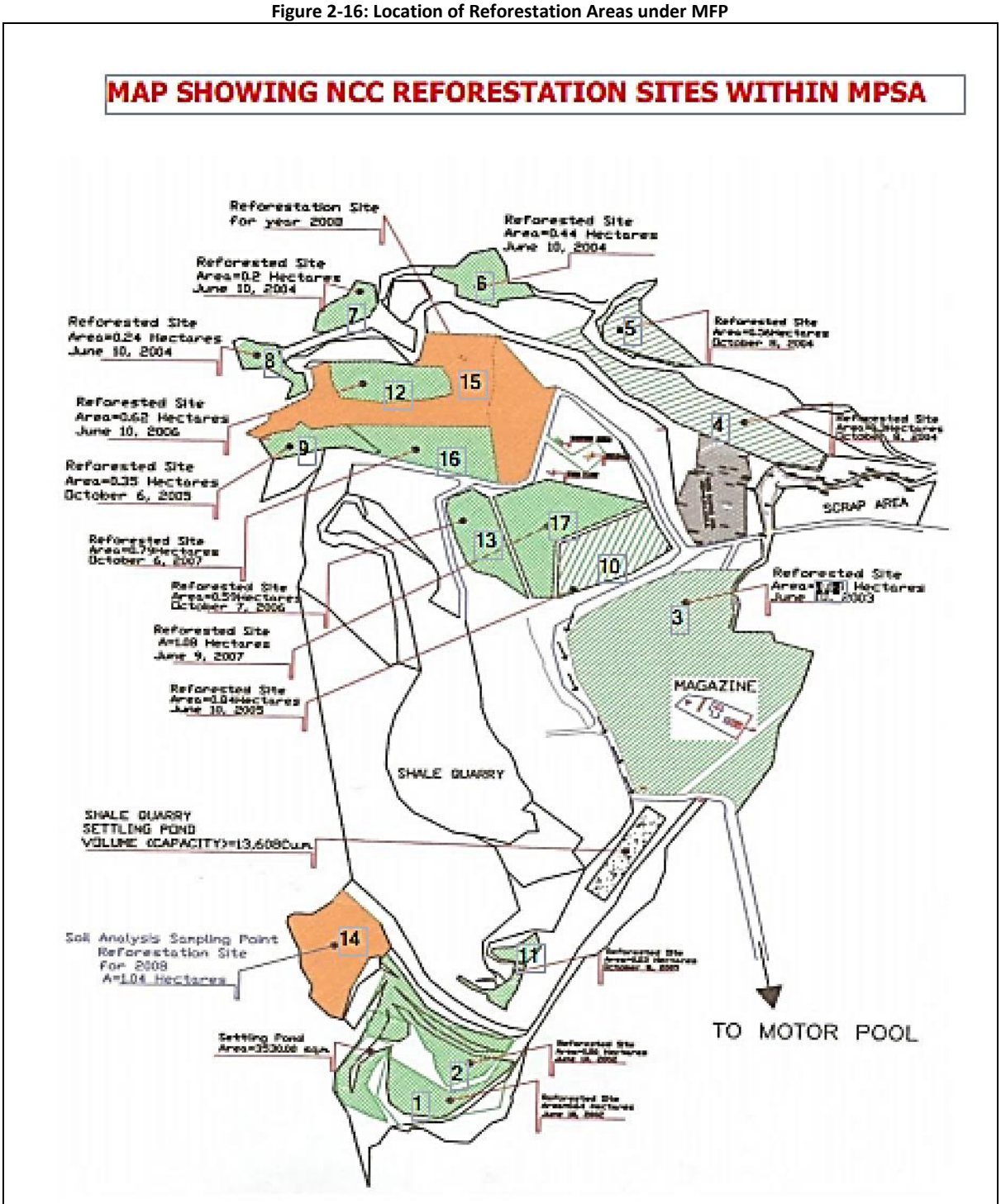
Year	No. of Seedlings Planted	No. of Surviving Trees	% Survival Rate
2012-2014	63,410	62,976	99.0

Year	No. of Seedlings Planted	No. of Surviving Trees	% Survival Rate
2014-2017	193,700	190,294	98.24
2017-2018	20,750	20,250	97.59
2018-2019	700	700	100
Total	278,560	274,220	98.44

Figure 2-15: NCC Nurseries Photos

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **NCC NURSERIES PHOTOS**	FIGURE NO.: 2-15
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC

Figure 2-16: Location of Reforestation Areas under MFP



PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**LOCATION OF REFORESTATIONS AREAS WITHIN MPSA**	2-16
EIA REPORT PREPARER:	PROJECT TITLE & LOCATION:	SOURCE:
LCI ENVI CORPORATION	**NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	NCC

2.1.4.3 Terrestrial Fauna

Methodology

183 The fauna survey was conducted last September 2-5, 2015. The survey covers the four groups of wildlife-vertebrates which include the avi-fauna and herpetofauna species. Rapid survey was employed in the conduct of faunal assessment within the project area. Species not encountered during the period of field assessment is generated through ethnobiological interview with local informants to obtain other important information on the presence of other wildlife species not encountered throughout the survey. Photo documentation of observed wildlife was also undertaken for further species verification when necessary.

184 A total of five (5) observation sites was selected within the study area representing different ecosystem types and elevations. This is to be able to determine faunal composition and diversity in each ecosystem and in relation to elevation. Figure 2-17 shows the locations of faunal sampling sites while summarized in **Table** 2-13 are the corresponding habitat types and geographical coordinates of the five observation sites.

Table 2-13: Description and geographic location of selected observation sites

Transect	Location	Elevation (m)	Coordinates	
			North	East
1	Sapid Forest: Milagrosa Watershed	180	16° 09’ 29.1”	120° 34’ 17.2”
2	Sapid Forest: Demo Farm	172	16° 09’ 32.0”	120° 34’ 13.2”
3	Sapid forest: Up near nursery	161	16° 09’ 31.2”	120° 34’ 21.6”
4	Limestone & Shale Quarry Area- Helipad	218	16° 10’ 3.5”	120° 33’ 41.9”
5	Saguitlang Area	430	16° 10’ 15”	120° 34’ 19”

185 *Birds*. Transect lines were established along existing roads/trails at 1-kilometer survey distance per transect. Techniques employed during the survey includes ocular and aural observation, identification through wildlife calls, foot prints and droppings, if any. All the bird species seen and heard by the observer at the sampling site.

186 Reptiles and Amphibians. Active search for reptiles and amphibians was done systematically within the 5 transect lines and in its immediate vicinity especially in areas with the presence of suitable habitats like underneath of decaying logs, uprooted trees and bamboos. For each species observed and heard, the name of the species, number of individuals and the type of habitat where it was found were recorded. Double counting of the individuals of the same species was definitely avoided. Photos of species encountered at the sampling sites was also undertaken.

187 Mammals. For non-volant mammals such as rodents, cage traps (10) was employed baited with dried fish as alternative for coconut meat with peanut butter. Cage traps are laid on strategic sites within the observation sites. Interview with local informants was also undertaken to generate significant information relative to the presence/absence of mammal species in the area. Mist nets were used to sample bat species and were set across river/creek, parallel to trails, and potential flyways.

Biodiversity Measurement

188 Biodiversity measurements were computed and analyzed using the Shannon-Wiener Diversity with formula illustrated below:

Shannon-Wiener Diversity =

$H' = -\sum p_i \ln (p_i)$, where,

"H'"- represents the symbol for the amount of diversity in ecosystem (species diversity)

"p_i"- represents the proportion or relative abundance of each individual species to the total (measured from 0 to 1)

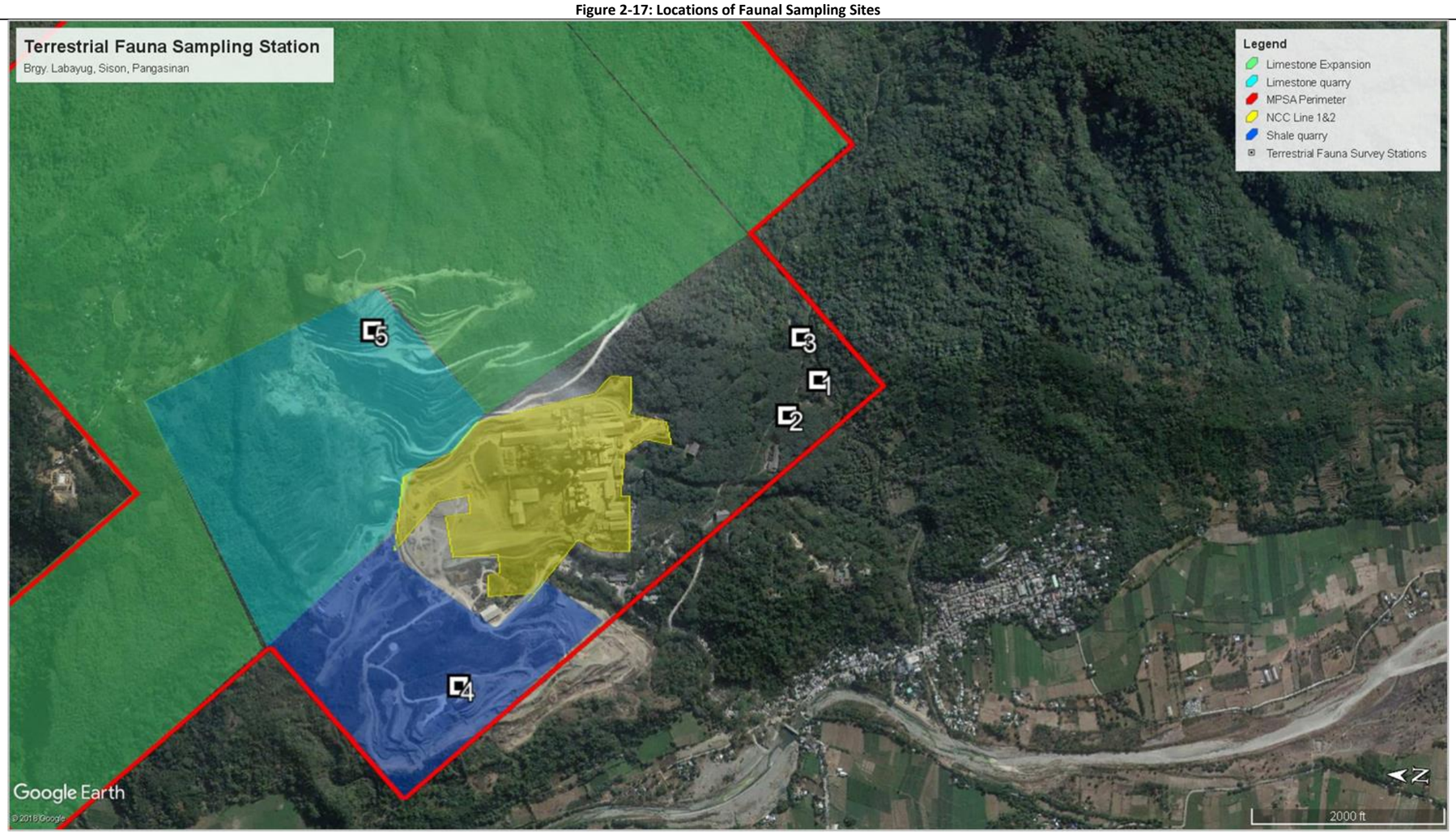
"ln p_i" - represents the natural logarithm of p_i

189 The interpretation of the values obtained using the above formulas will be based on the Fernando Biodiversity Scale (1998) shown in the table below.

Table 2-14: The Fernando Biodiversity Scale (1998)

Relative Values	Shannon –Wiener Biodiversity (H') Index
Very High	3.5 and above
High	3.0 – 3.49
Moderate	2.5 – 2.99
Low	2.0 – 2.49
Very Low	1.9 and below

Figure 2-17: Locations of Faunal Sampling Sites



Transect	Location	Elevation (m)	Coordinates	
			North	East
1	Sapid Forest: Milagrosa Watershed	180	16° 09' 29.1"	120° 34' 17.2"
2	Sapid Forest: Demo Farm	172	16° 09' 32.0"	120° 34' 13.2"
3	Sapid forest: Up near nursery	161	16° 09' 31.2"	120° 34' 21.6"
4	Limestone & Shale Quarry Area- Helipad	218	16° 10' 3.5"	120° 33' 41.9"
5	Saguitlang Area	430	16° 10' 15"	120° 34' 19"

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **LOCATION OF FAUNA SAMPLING SITES**	FIGURE NO.: 2-17
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: Envitecch Environmental Management Consultancy Services, Inc.

Fauna Composition and Richness

Birds

190 A total of 13 species belonging to 12 avi-fauna families and a total of 70 individuals were recorded during the fauna survey. Some of the observed bird species were known to thrive in open areas or grassland, agricultural areas while majority subsist on the fruits, macroinvertebrates and other food source that abound in the riparian vegetation of Sapid Forest.

191 Among the bird species observed, the Eurasian tree sparrow (Passer montanus) has the highest relative abundance with 34% followed by Philippine maya (Lonchura articapilla) and yellow–vented bulbul (Pycnonotus goiavier) with relative abundance of 24% and 13%, respectively. They are commonly found in household and agricultural areas feeding on grains. Other species have relatively low abundance and are known to occur in patches of forested and riverbank areas in Sapid Forest.

192 List of the bird species observed, and their corresponding abundance and relative abundance are summarized in **Table** 2-15**.**

Table 2-15: Abundance and Frequency of Bird Species observed within the Sampling Sites

FAMILY	SCIENTIFIC NAME	SPECIES NAME	TOTAL ABUNDANCE	RELATIVE ABUNDANCE
PYCNONOTIDAE	*Pycnonotus goiavier*	Yellow-vented bulbul	9	0.128
RALLIDAE	*Gallirrallus torquatus*	Barred rail	7	0.100
COLUMBIDAE	*Loriculus philippensis*	Parakeet	1	0.014
COLUMBIDAE	*Treron vernans*	Pink necked green pigeon	1	0.014
HALCYONIDAE	*Halcyon chloris*	White collared ear kingfisher	1	0.014
LOCUSTELLIDAE	*Megalurus palustris*	Striated grassbird	1	0.014
ACCIPITRIDAE	*Haliastur indus*	Brahminy kite	1	0.014
PYCNONOTIDAE	*Hypsipetes p. philippinus*	Philippine bulbul	2	0.028
CUCULIDAE	*Centropus bengalensis*	Lesser coucal	1	0.014
ESTRELDIDA	*Lonchura atricapilla jagori*	Philippine Maya	17	0.242
APODIDAE	*Collocalia troglodytes*	Swallow/ Pygmy swiftlet	4	0.057
PASSERIFORMIDAE	*Passer montanus*	Eurasian Tree sparrow	24	0.342
LANIIDAE	*Lanius cristatus*	Brown Shrike	1	0.014

Mammal

193 Only *Rattus exulans* (Polynesia rat) was observed in the project site. There were no volant mammals (bats) observed or captured during the survey. According to the local guides, the roosting and nesting sites of fruit bats are currently situated outside the NCC mining area. Their nesting sites were located above the Saguitlang area (430masl) near Tuba, Benguet. Noise

disturbance generated by blasting and heavy equipment operation can affect their foraging activities and nesting sites.

Amphibian and Reptiles

194 Only *Rhinella marinus* (cane toad) was observed during the assessment along the creek's vegetation in Transect 3. *Gekko gecko* (tuko) was observed in Transect 1.

195 According to the local guides, they sighted 3 species of snakes within the Sapid Forest. These are the Elaphe erythrura (Philippine rat snake), *Python reticulatus* (Reticulated python) and viper. Two of these snakes are endemic to the Philippines.

Fauna Endemism and Conservation Status

Birds

196 Endemism of recorded bird species showed that 5 species or 38% are endemic in the country and the rest are non-endemic species.

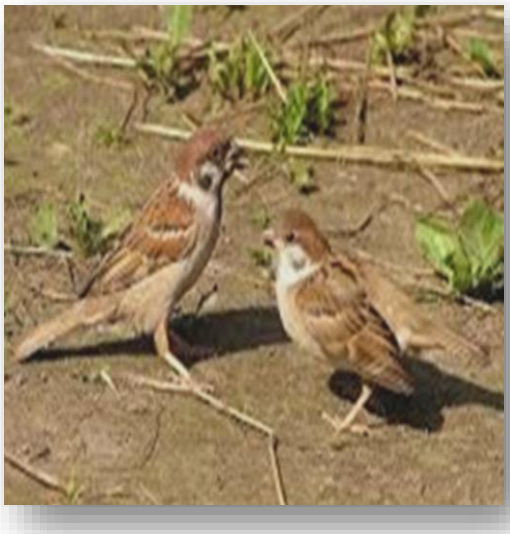
197 Based on the International Union for Conservation of Nature (IUCN) (2019), all the recorded bird species are under least concern (LC) category. However according to the list of threatened species of DAO 2004-15, there are two endangered species (EN) namely Loriculus philippensis (Parakeet) and Haliastur indus (Brahminy kite).

198 Photos of the observed fauna species were presented in **Figure** 2-18.

Table 2-16: Conservation Status and Endemicity of Observed Birds

FAMILY	SCIENTIFIC NAME	SPECIES NAME	Endemicity	Conservation Status (IUCN)
PYCNONOTIDAE	*Pycnonotus goiavier*	Yellow-vented bulbul	-	LC
RALLIDAE	*Gallirallus torquatus*	Barred rail	Endemic	LC
COLUMBIDAE	*Loriculus philippensis*	Parakeet	Endemic	LC EN (DAO 2004-15)
COLUMBIDAE	*Treron vernans*	Pink necked green pigeon	-	LC
HALCYONIDAE	*Halcyon chloris*	White collared ear kingfisher	-	LC
LOCUSTELLIDAE	*Megalurus palustris*	Striated grassbird	-	LC
ACCIPITRIDAE	*Haliastur indus*	Brahminy kite	-	LC EN (DAO 2004-15)
PYCNONOTIDAE	*Hypsipetes philippinus*	Philippine bulbul	Endemic	LC
CUCULIDAE	*Centropus bengalensis*	Lesser coucal	-	LC
ESTRELDIDA	*Lonchura atricapilla jagori*	Philippine Maya	Endemic	LC
APODIDAE	*Collocalia troglodytes*	Swallow/ Pygmy swiftlet	Endemic	LC
PASSERIFORMIDAE	*Passer montanus*	Eurasian Tree sparrow	-	LC
LANIIDAE	*Lanius cristatus*	Brown Shrike	-	LC

Figure 2-18: Photos of Avifauna Species Observed within the Project Area



Passer montanus

Lonchura articapilla

Treron vernans

Haliastur indus Brahmini

PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **PHOTO OF AVIFAUNA SPECIES OBSERVED WITHIN THE PROJECT AREA**	FIGURE NO.: 2-18
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: Envitecch Environmental Management Consultancy Services, Inc.

Mammal

199 Based on the International Union for Conservation of Nature (IUCN) (2019), the mammal species observed were under least concern (LC) and none were listed under the DAO 2004-15. There were also no endemic mammal species observed during the survey.

Table 2-17: List of Mammal Species observed within the Study Area

Family	Scientific Name	Species Name	Conservation Status (IUCN)	Endemicity
Pteropodidae		Fruit bat	LC	-
Muridae	*Rattus exulans*	Polynesian Rat	LC	-

Amphibian and Reptiles

200 All the amphibian and reptile species recorded were considered as least concern (LC) by the IUCN 2019 and only the *Python reticulatus* (Reticulated phyton) was listed in the DAO 2004-15 as other threatened species (OTS). Three of the amphibian and reptile species observed are endemic.

Table 2-18: List of Herpetofauna Species observed within the Study Area

Family	Scientific Name	Species Name	Conservation Status (IUCN)	Endemicity
Amphibian				
Bufonidae	*Rhinella marina*	Cane Toad	LC	Endemic
Reptiles				
Boidae	*Python reticulatus*	Reticulated phyton	LC OTS (DAO 2004-15)	Endemic
Pythonidae	*Elaphe erythrura*	Philippine rat snake	LC	Endemic
Gekkonidae	*Gekko gecko*	Tokay gecko	LC	

Computed Biodiversity Index

201 Shannon-Wiener Diversity Index (H') was computed for this survey using the bird sampling data. The overall computed biodiversity index of the project site by getting the average biodiversity index of the 5 sampling sites has a computed value of 1.351 which means that the biodiversity in the area is very low. All the sampling sites have very low biodiversity with computed Shanon-Wiener Biodiversity index of below 1.9.

Table 2-19: Computed Biodiversity Index of Each Sampling Sites

Transects	Abundance	Shannon-Wiener Biodiversity index (H')	Fernando's Biodiversity Scale (1998)
TRANSECT 1	11	1.799	**Very Low**
TRANSECT 2	6	1.561	**Very Low**
TRANSECT 3	13	1.22	**Very Low**
TRANSECT 4	20	1.094	**Very Low**
TRANSECT 5	20	1.132	**Very Low**

2.1.4.4 Vegetation removal and loss of habitat

202 The expansion of the quarry operation will require removal of vegetation communities and associations. The removal of vegetation will also result to reduction in the population of the plant species growing within the disturbance area. However, vegetation clearing will be limited to the quarry areas only. The surrounding vegetation will be preserved to act as natural air and noise buffers. The NCC also conducts reforestation activities in its mined-out areas.

2.1.4.5 Threat to existence and/or loss of important local species

203 The project will require land clearing, in the new quarry areas, resulting to the removal of portions of remaining vegetation's to give way for the operation of the quarry. This entails to disturbance of wildlife, loss of habitats and reduction to biodiversity composition of the area.

2.1.4.6 Threat to abundance, frequency and distribution of important species

204 Continuous loss of faunal habitats due to degradation of forest cover are brought by land clearing, conversion of remaining sites into settlements and other land uses. Though faunal species are mobile in nature, this situation will force them to migrate in other areas to search for new habitat. Migration of other wildlife to new territories or ecosystem will pose threat to their existence. They can be further exposed to hunting, persecution and trading. Continuous destruction of faunal habitats and disturbance will threaten the remaining species population and survival in the near future if not prevented. Decrease of population to some species in this area will be expected to happen while others may not significantly be affected.

2.1.4.7 Hindrance to wildlife access

205 Wildlife disturbance due to noise generated during construction brought about by the operation of heavy equipment's will force faunal species to migrate in other or nearby areas/habitat where disturbance is less.

206 Wildlife may find habitat to the erected structures recognized by species within and around built structures and or canals in the long run. Animals sighted within and around the facilities may be allowed to habituate unless they pose danger, damage and/or malfunction to the structure.

2.1.5 Summary of Baseline Findings, Impacts and Mitigation on Land

207 The following table summarizes the impacts and mitigating measures on Land.

Table 2-20: Summary of Significant Baseline Findings and Potential Impacts and Mitigation on Land

SUMMARY OF BASELINE FINDINGS ON LAND

- **Land Use and Classification**
  - The area where the proposed project is situated is designated as industrial zone.
  - The proposed project site does not fall within any declared ECA and is not covered by any tenurial instrument.
- **Geology and Geomorphology**
  - There are three fault lines near the location of the NCC Line 1 and Line 2 cement plant.
  - The project site has medium to high susceptibility in terms of earthquake-induced landslide.
  - The project site is not susceptible to liquefaction.
  - The project site has high to moderate susceptibility to landslide.
  - The project site is not a flood-prone area.
  - There are no active volcanoes near the project site.
  - The project site is not prone to tsunami**.**
- **Pedology**
  - The project is underlain by Annam Clay Loam and Umingan Silt Loam.
- **Terrestrial Ecology**
  - From the terrestrial flora survey, 2 species are considered as endangered, one species is vulnerable, and 3 species are critically endangered according to the IUCN Red List of Threatened Species. On the other hand, based from the DAO 2017-11, there are one species that is endangered, one species is critically endangered and five are vulnerable.
  - There are no critically endangered fauna species found in the project site based from the IUCN list. However, only the *Python reticulatus* (Reticulated phyton) was listed in the DAO 2004-15 as other threatened species (OTS).

POTENTIAL IMPACTS	PROJECT PHASES	FINDINGS/OBSERVATIONS	MITIGATING MEASURES
Geology and Geomorphology			
Modification of existing terrain	Operation	Existing terrain will be modified due to earth movement and excavation during quarry operation	• Reforestation of mined-out areas • Mine rehabilitation plan
Devaluation of land value a result of improper solid waste management	Construction, Operation	Generation of construction spoils and debris and solid wastes from operations	• Provision of disposal area • Segregation of debris according to recyclable and non-recyclables • Hauling of debris items by duly-licensed traders • Implementation of a solid waste management plan
PEDOLOGY			
Change in soil quality/fertility	Construction, Operation, Abandonment	There is a risk of soil contamination due to the maintenance of heavy equipment	• Collect, store and dispose wastes in safe and sealed containers • Treatment and dispose wastes through accredited treaters • Use sawdust, rice hulls, or coir dusts to absorb the oil spills
Soil erosion / loss of topsoil	Construction/Operation	The removal of vegetation cover will lead to loss/removal of topsoils resulting from excavation activities. Erosion and siltation of the nearby surface water may occur due to occasional rains	• Establish buffer zones with vegetation • Avoid unnecessary earth movement and removal of vegetation

POTENTIAL IMPACTS	PROJECT PHASES	FINDINGS/OBSERVATIONS	MITIGATING MEASURES
		and during movement of heavy equipment passing over unpaved roads and soil stockpile area.	
TERRESTRIAL BIOLOGY			
Vegetation removal and loss of habitat	Operation	Disturbance and/or displacement of flora and fauna	• Prepare management plans and protection/conservation strategies • Perform earth-balling for trees when necessary • Avoidance of unnecessary tree-cutting • Establishment of plant nurseries • Retaining and managing viable habitat units within and surrounding the project's development block areas • Mining Forest Program • National Greening Program activities • Conduct trainings, seminars and field demonstrations on company personnel on how to identify, care, propagate these threatened native tree species

2.2 The Water

2.2.1 Hydrology/Hydrogeology

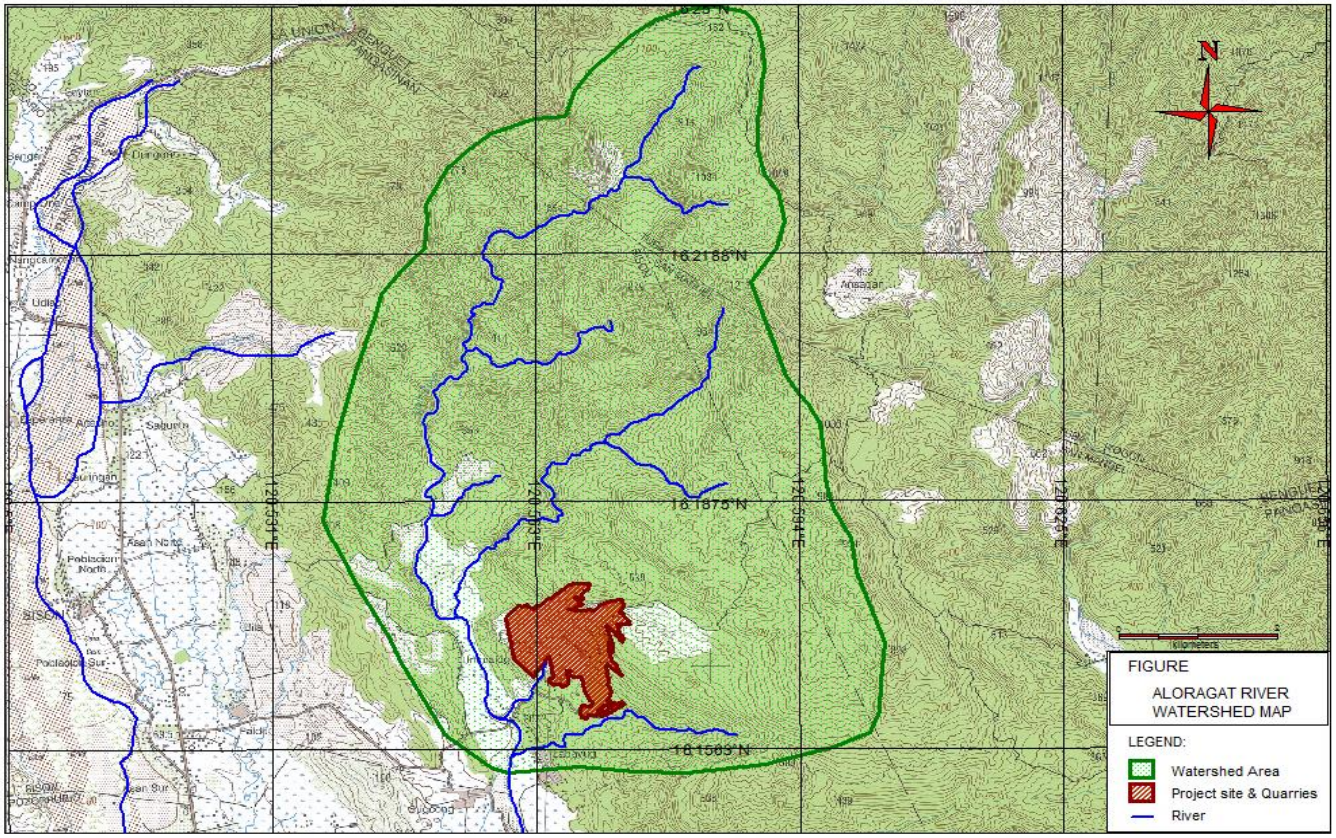
208 There are two rivers that passes the Municipality of Sison, the Bued river and Aloragat river. Brgy. Labayug, where the NCC compound is located, is within the catchment area of Aloragat river.

209 Bued river is formed at the southeastern portion of Baguio City then transverses the Municipality of Tuba, Sison, down to the Municipality of Mangaldan where it merges with the Angalacan River and discharges to the Lingayen Gulf.

210 The catchment area of Aloragat river has a total area of 5,217 hectares. Its headwaters are formed from the Lipit River, in the upper slopes of the southern Cordillera mountain range in the Municipality of Tuba. Aloragat River traverses Barangay Labayug and is the major receiving water body near the NCC cement plant.

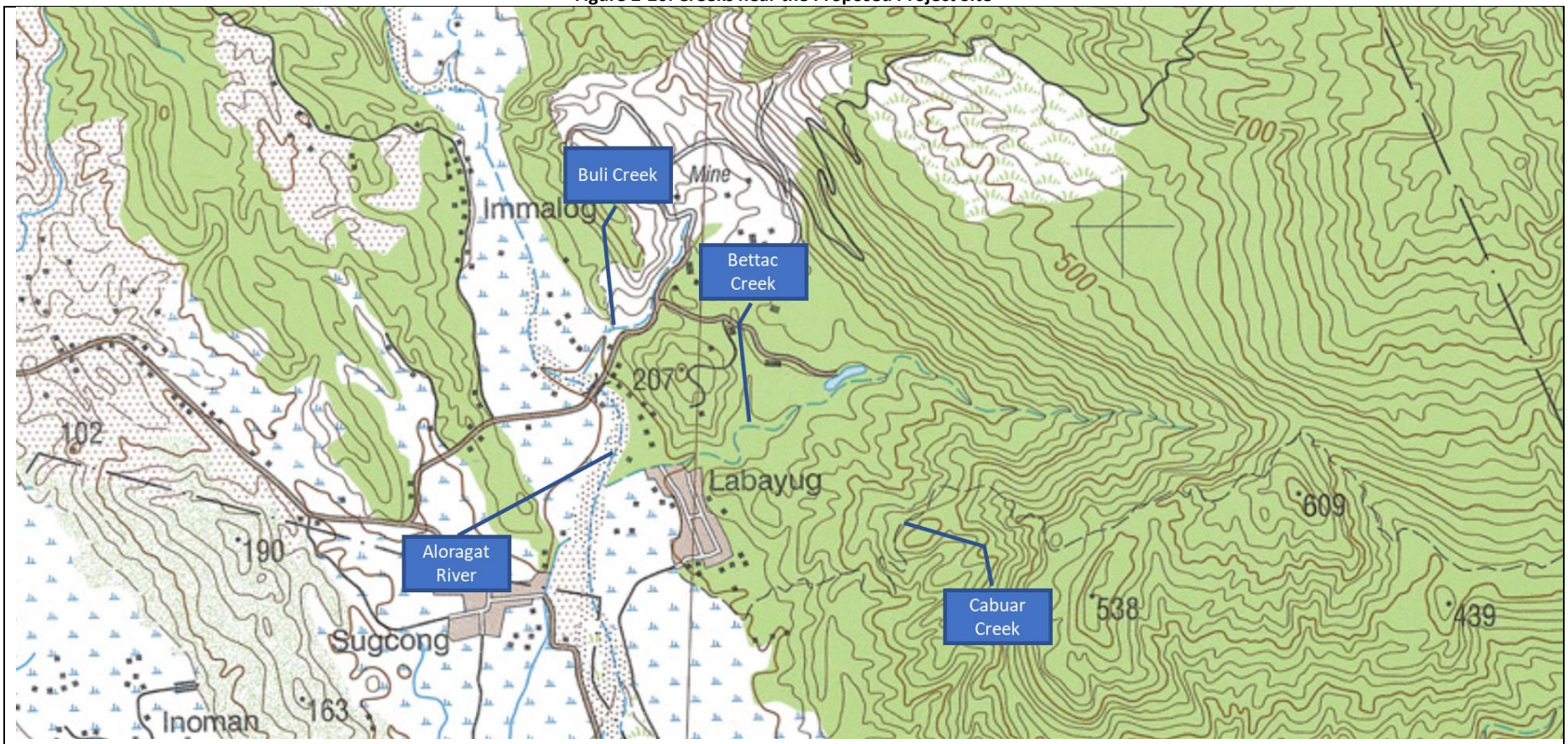
211 There are four creeks that are near the proposed project site. Bettac creek transverses inside the the site. Buli creek is located at the far north of the project site while the Sapid creek and Cabuar creek are at the south portion. All these creeks discharges to the Aloragat River.

Figure 2-19: Watershed Catchment Area of Aloragat River



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **WATERSHED CATCHMENT AREA OF ALORAGAT RIVER**	FIGURE NO.: 2-19
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: Envitecch Environmental Management Consultancy Services, Inc.

Figure 2-20: Creeks near the Proposed Project Site



PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**CREEKS NEAR THE PROPOSED PROJECT SITE**	2-20
EIA REPORT PREPARER:	PROJECT TITLE & LOCATION:	SOURCE:
LCI ENVI CORPORATION	**NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	NAMRIA

2.2.1.1 Change in drainage morphology/inducement of flooding/reduction in stream volumetric flow

212 Change in drainage morphology is inevitable given the nature of the project. Furthermore, removal of vegetation may reduce the water holding capacity of the watershed, which may result to higher discharges during heavy rainfall. NCC already constructed drainage system in the cement plant and in the quarry areas to minimize the impact to the natural drainage of the area.

213 The project will not also induce flooding in the area since there is a stormwater drainage system in the project site. Sedimentation ponds were also constructed in strategic areas around the plant site and in the quarry areas to catch the run-off, wastewater and rainwater. Water from these ponds are reused in the operation of the project. Discharges in the project site is limited only to the overflows of these ponds.

2.2.1.2 Change in stream, lake water depth

214 Surface run-off from the quarry areas may contain high amount of sediments that may cause siltation to the nearest creeks and river and may affect the stream depth. However, NCC has already constructed several siltation ponds in the quarry area to catch the surface run-off and allow settling of the silts. These ponds are regularly desilted.

215 Soil erosion may also happen in the area due to the quarry operation. This may cause aggradation and shallowing of nearby streams if not properly mitigated. NCC has been conducting reforestation activities in its mined areas as part of the rehabilitation program. The increased tree cover can significantly reduce and eventually minimize soil erosion in the area.

2.2.1.3 Depletion of water resources/competition in water use

216 The expansion of the cement plant and quarry will be utilizing 1,330 m^3 of water per day wherein 1,015 m^3/day will be sourced from the deepwells and Sapid Creek and about 315 m^3/day of water is reused from the desilted water from the siltation ponds.

217 The proposed expansion project is not expected to cause depletion of water resources and competition in water use. In the past, NCC did not experience water shortage during its operation. NCC is also practicing water reuse in its operation.

218 Furthermore, there were no recorded complaints from the community specifically on water resource competition. In fact, according to a geo-resistivity study commissioned last July 2019, several deep wells in the vicinity, specifically in Brgy. Calunetan, Brgy. Inmalog, Brgy. Labayug, Brgy. Sugcong and Brgy. Paldit can be constructed[4].

2.2.2 Oceanography

219 Since there will be no jetty/port and/or subsea structures component of the project that can change the bathymetry in the area, this section is not applicable.

2.2.3 Water Quality

2.2.3.1 Degradation of groundwater quality

220 Five groundwater samples were collected last July and September 2019 at the deep wells of NCC and at the groundwater sources of Brgy. Labayug. The samples were sent to the laboratory of CRL

[4] Gatdula A.R. "Geo-resistivity Survey to Detect Aquifers at Six Barangays in the Municipality Sison Province of Pangasinan" July 2019

Environmental Corporation for the analysis. The results were then compared to the Philippine National Standards for Drinking Water (PNSDW) based on the DOH Administrative Order No. 2017-01 and to the ambient water quality for Class A water body according to the DENR AO No. 2016-08.

221 As shown in **Table** 2-21, only the fecal coliform of all the water samples exceeded the standard limits. The contamination of the groundwater samples can be due to the seepage from the septic tanks of the households in the community.

222 The ground water quality may be affected by accidental oil spills due to the influx of heavy equipment during the construction phase. Maintenance of these equipment must be limited in an area lined with cement.

223 Accidental oil spills may also happen during the operation phase since there will be trucks that will deliver the products. The trucks shall not have access to areas that are not lined with cement. The proponent has a truck marshaling area within the project site.

224 Diesel oil will also be stored in the area. Storage of fuel in the area increases the risk of accidental oil spills. Bund walls and secondary containment areas are part of the design of the fuel storage.

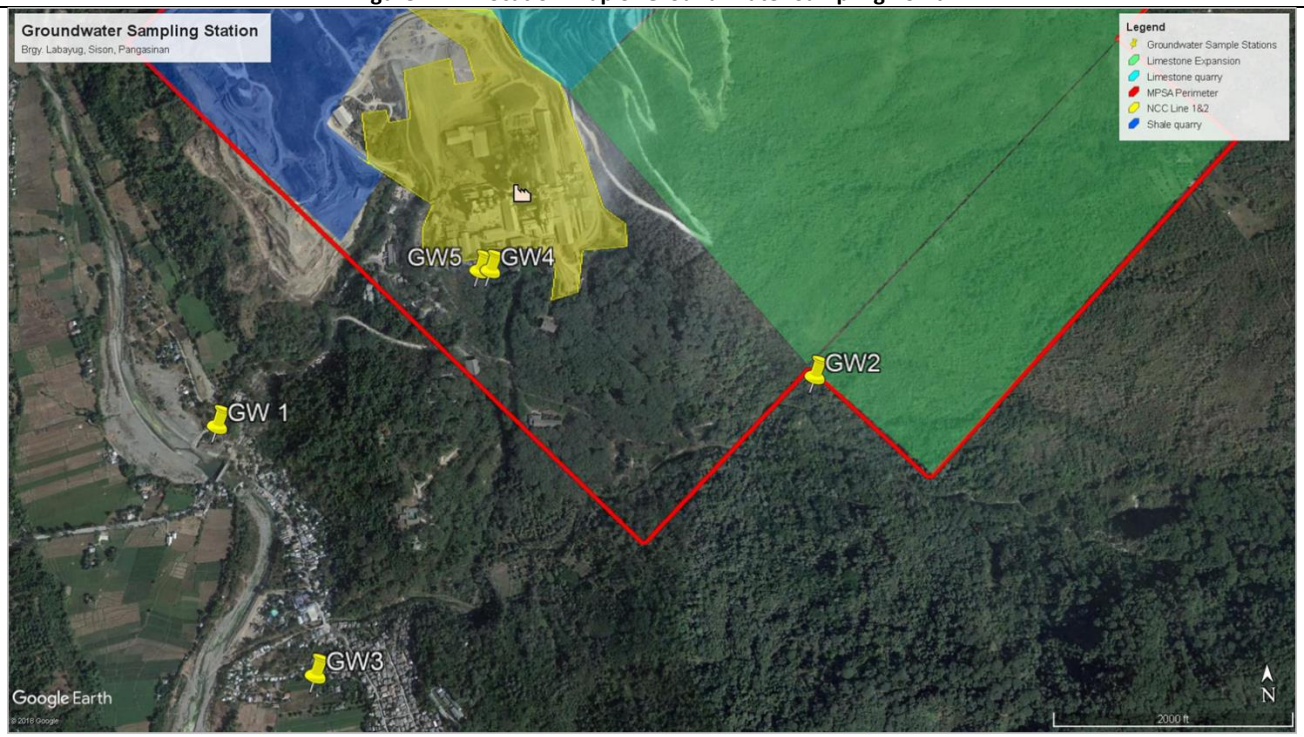
225 Another aspect that may affect ground water quality is the influx of workers in the area. Ground water quality may be affected by domestic wastewater. Proper sanitation facilities were already installed in the project site and septic tanks are regularly desludged.

Table 2-21: Results of Ground Water Quality Analysis

PARAMETER	UNIT	DETECTED LEVEL AT THE SAMPLING POINTS BASED ON LABORATORY ANALYSIS (values in RED exceed the reference standard/s)					GUIDELINE VALUE FOR DRINKING WATER QUALITY	GUIDELINE VALUE FOR CLASS A WATER BODY
		GW 1	*GW 2*	*GW 3*	*GW 4*	*GW 5*	*(DOH AO No. 2017-10)*	*(DENR AO No. 2016-08)*
Total Suspended Solids	mg/L	**<2.5**	**<2.5**	**<2.5**	**<2.5**	**<2.5**	*	**50**
Oil & Grease	mg/L	**<0.41**	**0.63**	**0.63**	**0.43**	**0.44**	*	**1**
Total Coliform		**>8.0**	**8.0**	**8.0**	**>8.0**	**4.6**	*	*
Fecal Coliform	MPN/100mL	**>8.0**	**8.0**	**8.0**	**4.6**	**4.6**	**<1.1**	**<1.1**
Arsenic	mg/L	**<0.008**	**<0.008**	**<0.008**	**<0.008**	**<0.008**	**0.01**	**0.01**
Cadmium	mg/L	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**0.003**	**0.003**
Chromium	mg/L	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**0.05**	**0.01**
Lead	mg/L	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**<0.005**	**0.01**	**0.01**
Mercury	mg/L	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**0.001**	**0.001**

NOTES: mg/L = Milligrams per liter | MPN/100mL = Most probable number per 100 milliliters
(*) No guideline value at present

Figure 2-21: Location Map of Ground Water Sampling Point



Location		Coordinates	
		North	East
GW1	Deepwell 1	16° 9'31.86"N	120°33'38.74"E
GW2	Milagrosa	16°9'35" N	120°34'32" E
GW3	Labayug	16°9'11" N	120°33'48" E
GW4	Deepwell 2	16°9'45" N	120°34'3" E
GW5	Deepwell 3	16°9'45" N	120°34'2" E

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **LOCATION MAP OF GROUND WATER SAMPLING POINT**	FIGURE NO.: 2-21
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC

2.2.3.2 Degradation of surface water quality

226 Three water samples were collected from the creeks within the project site last August 11, 2015, April 25, 2016 and July 10, 2019. The water samples were analyzed by the CRL Environmental Corporation. Details of the location of the surface water sampling site are shown in **Figure** 2-22**.**

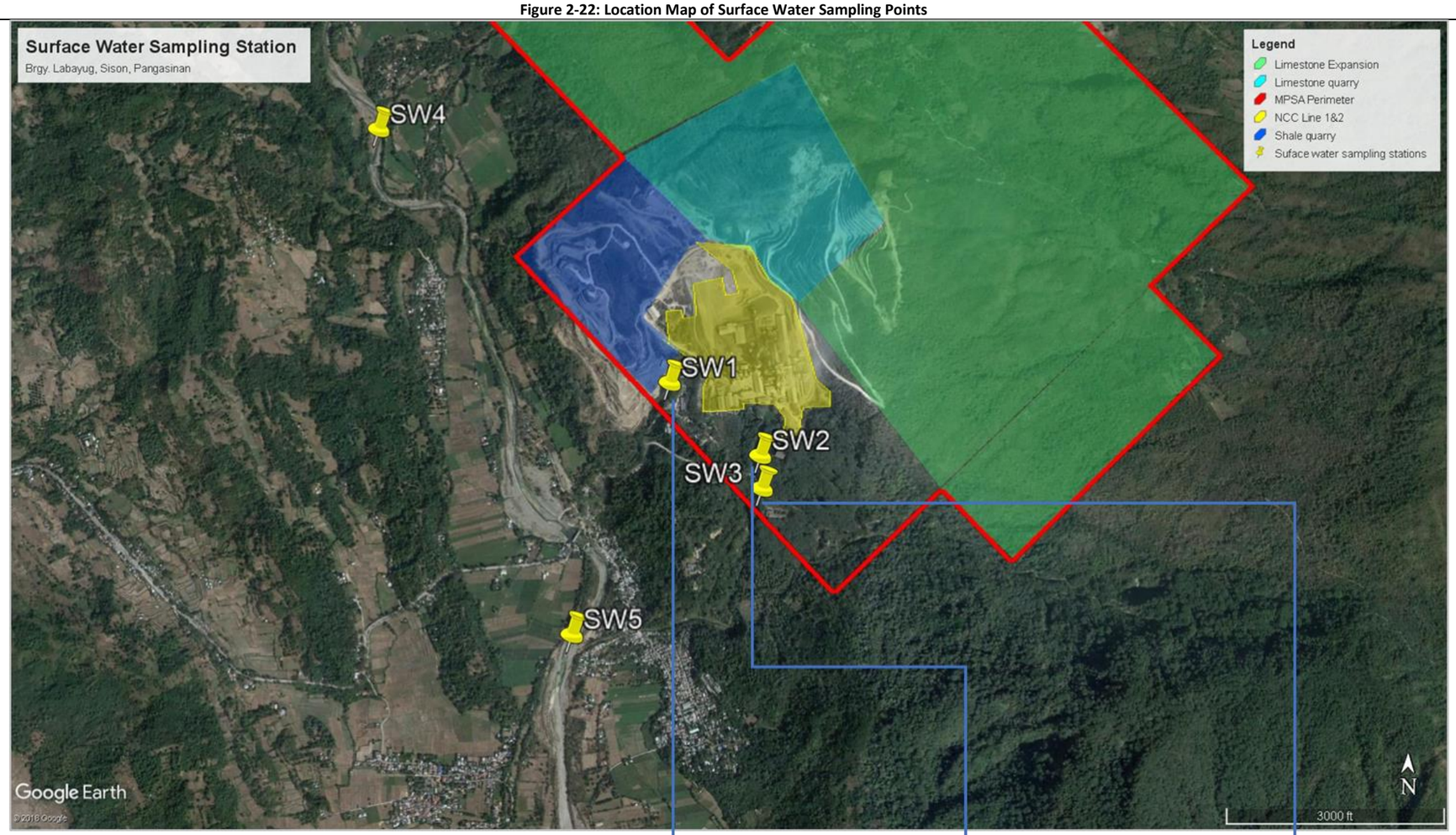
227 The results of the laboratory analysis were compared to the ambient water quality for Class C water based on DAO 2016-08. As shown in **Table** 2-22, all the parameters are within the standards except for the fecal coliform at SW1, SW3, SW4 and SW5. Also, all the five stations have high total coliform content. This can be due to the disposal of untreated domestic wastewater of the nearby communities to the creeks and due to agricultural run-offs. Gold panning activities were also observed in the Aloragat River

Table 2-22: Results of Surface Water Quality Analysis

PARAMETER	UNIT	DETECTED LEVEL AT THE SAMPLING POINTS BASED ON LABORATORY ANALYSIS (values in RED exceed the reference standard/s)					GUIDELINE VALUE FOR CLASS C WATER BODY
		SW1	*SW 2*	*SW 3*	*SW 4*	*SW 5*	*(DENR AO No. 2016-08)*
pH	pH	**7**	**7.2**	**7.4**	**-**	**-**	**6.5 – 9.0**
BOD_5	mg/L	**1**	**1**	**1**	**1**	**<1**	**7**
COD	mg/L	**18**	**10**	**814**	**20**	**18**	**-**
DO	mg/L	**1**	**9**	**8.5**	**8**	**8**	**5**
Oil & Grease	mg/L	**0.4**	**0.5**	**0.4**	**0.93**	**0.60**	**2**
Total Suspended Solids	mg/L	**33**	**84**	**2.5**	**-**	**-**	**80**
Total Coliform	MPN/100mL	**24,000**	**2,400**	**1,600**	**9,200**	**16,000**	**-**
Fecal Coliform	MPN/100mL	**2,400**	**78**	**920**	**3,500**	**16,000**	**200**
Mercury	mg/L	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**<0.0002**	**0.002**
Lead	mg/L	**<0.05**	**<0.05**	**<0.05**	**<0.005**	**<0.005**	**0.05**
Cadmium	mg/L	**<0.006**	**<0.006**	**<0.006**	**<0.001**	**<0.001**	**0.005**
Arsenic	mg/L	**<0.01**	**<0.01**	**<0.01**	**<0.008**	**<0.008**	**0.02**
Chromium	mg/L	**<0.003**	**<0.003**	**<0.003**	**<0.005**	**<0.005**	**0.01**

NOTES: mg/L = Milligrams per liter | MPN/100mL = Most probable number per 100 milliliters

Figure 2-22: Location Map of Surface Water Sampling Points



LOCATION		COORDINATES	
		NORTH	EAST
SW1	Bagutan Creek	16° 9'48.51"N	120°33'51.72"E
SW2	Cabuar Creek	16° 9'35.03"N	120°34'5.69"E
SW3	Sapid Creek	16° 9'28.99"N	120°34'5.48"E
SW4	Upper Aloragat River	16°10'23.80"N	120°33'7.26"E
SW5	Lower Aloragat River	16° 9'13.41"N	120°33'38.96"E

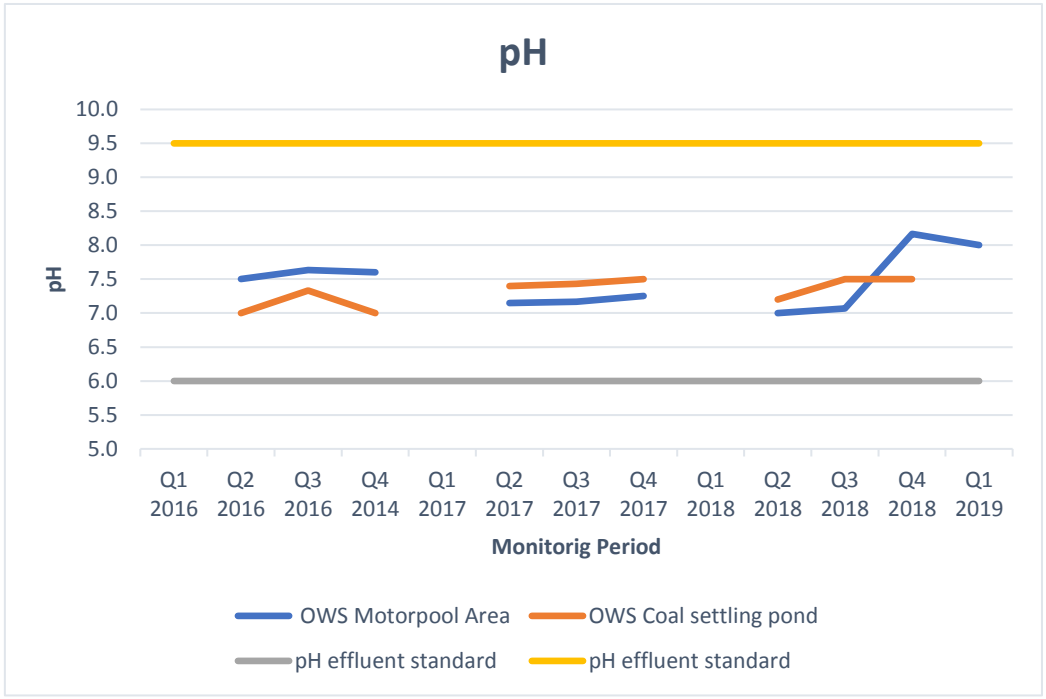
PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **LOCATION MAP OF SURFACE WATER SAMPLING POINTS**	FIGURE NO.: 2-22
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: Envitecch Environmental Management Consultancy Services, Inc.

228 NCC is also monitoring the effluent discharged from their motorpool wash bay and coal settling pond area in terms of pH, oil & grease and total suspended solids. NCC installed oil and water separator tanks in these areas to avoid the discharge of oil in the drainage during maintenance activities. The effluent from these tanks are discharged to the Aloragat River.

229 The results were compared to the effluent standards of DAO 2016-08 for Class C water. The monitoring results from 2016 until 1st quarter of 2019 are shown in **Figure** 2-23 to **Figure** 2-25**.** There are some monitoring periods that have no data because there were no discharges from the OWS at the time the samples were collected.

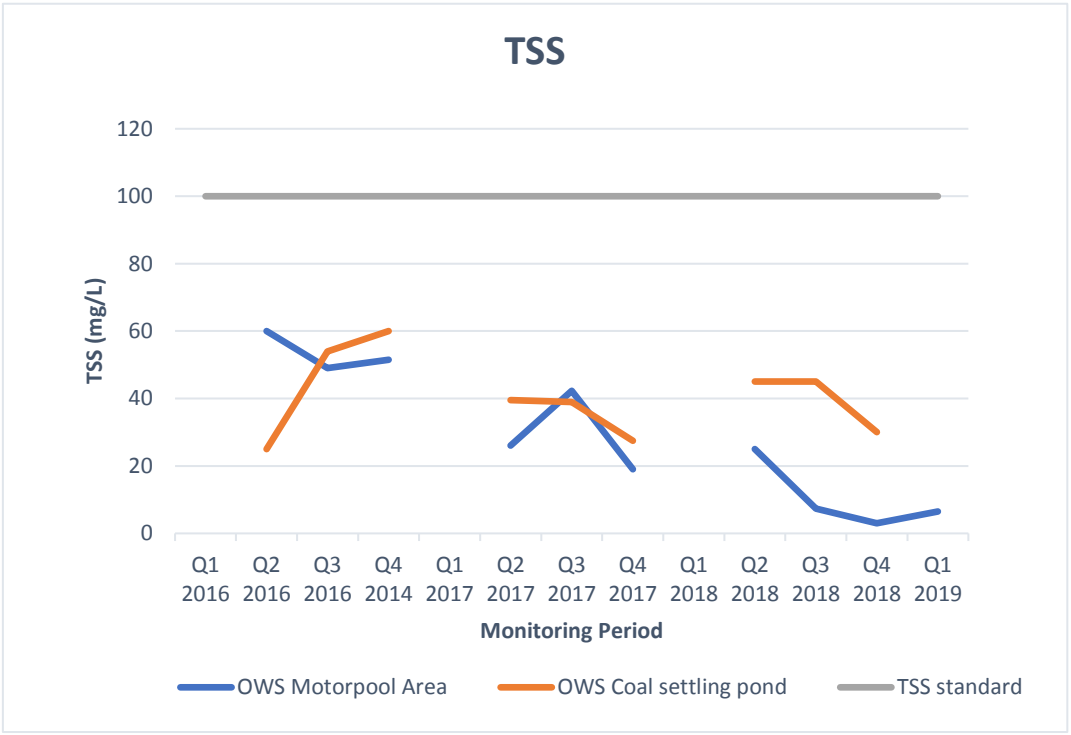
230 As shown in the results, all the measured parameters are complying with the general effluent standards of DAO 2016-08.

Figure 2-23: pH Monitoring Results (OWS effluent, 2016 - 1st quarter 2019)



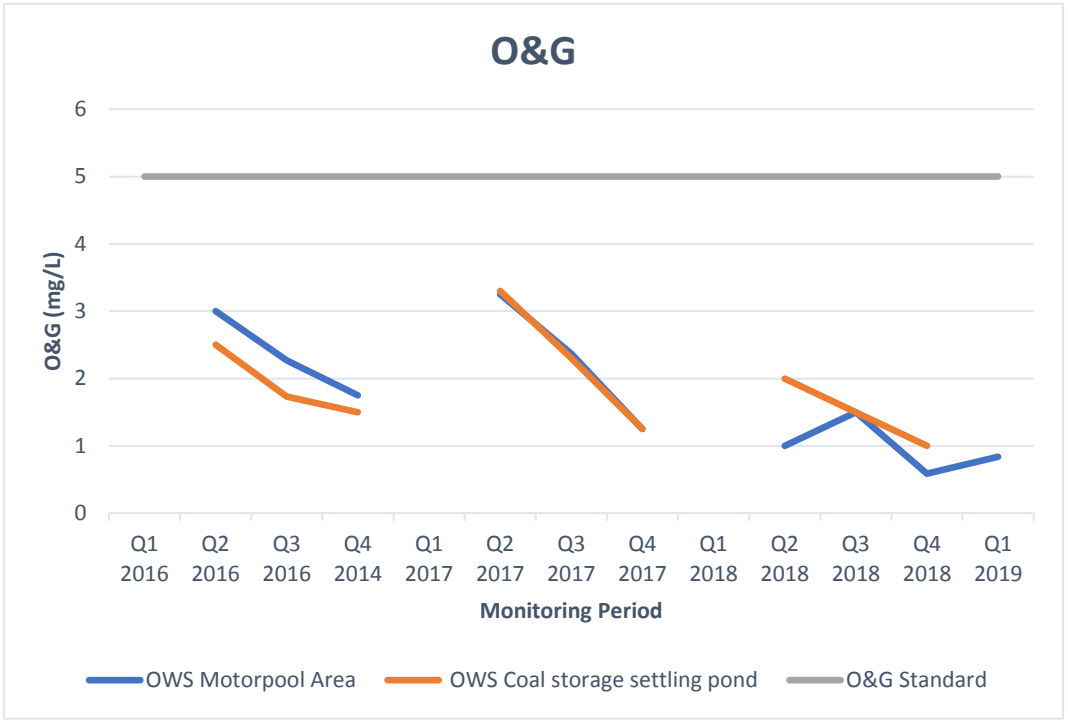
PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**pH MONITORING RESULTS (OWS EFFLUENT, 2016 – 1ST QUARTER 2019)**	2-23
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC SMR

Figure 2-24: TSS Monitoring Results (OWS effluent, 2016 - 1st quarter 2019)



PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**TSS MONITORING RESULTS (OWS EFFLUENT, 2016 – 1ST QUARTER 2019)**	2-24
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC SMR

Figure 2-25: Oil and Grease Monitoring Results (OWS effluent, 2016 - 1st quarter 2019)



PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**O&G MONITORING RESULTS (OWS EFFLUENT, 2016 – 1ST QUARTER 2019)**	2-25
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC SMR

2.2.4 Freshwater Ecology

231 Four stations within the Sapid creek were established for the assessment of the freshwater ecology in 2016. Benthos were sampled using a surber sampler laid along the streambed. The substrate was agitated while rocks and stones are washed to dislodge the benthos and captured in the net. All samples were stored in polyethylene bottles and preserved with Ethyl Alcohol. Samples are bought to the laboratory for analysis. Location of the stations are is shown in **Figure** 2-26.

232 Sampling for benthic organisms in Cabuar and Bagutan were not pursued due to steep and unsafe access to the streams and unfavorable initial assessment. Cabuar creek is structurally limited with very shallow water not expected to host a healthy benthic community. Bagutan creek was dry during the time of sampling.

233 A total of 190 individuals belonging to 9 orders and 16 families (taxa) were recorded during the survey. Among the 4 stations, Station 1 and Station 2 have the highest number of macroinvertebrate individuals observed with 63 and 50 individuals, respectively. These transects in Sapid creek are located near the spring pond where riparian vegetation thrives like bamboo, figs and other shade trees favorable for macroinvertebrates growth and survival. The list of the macroinvertebrate individuals observed in the stations is shown in **Table** 2-23**.**

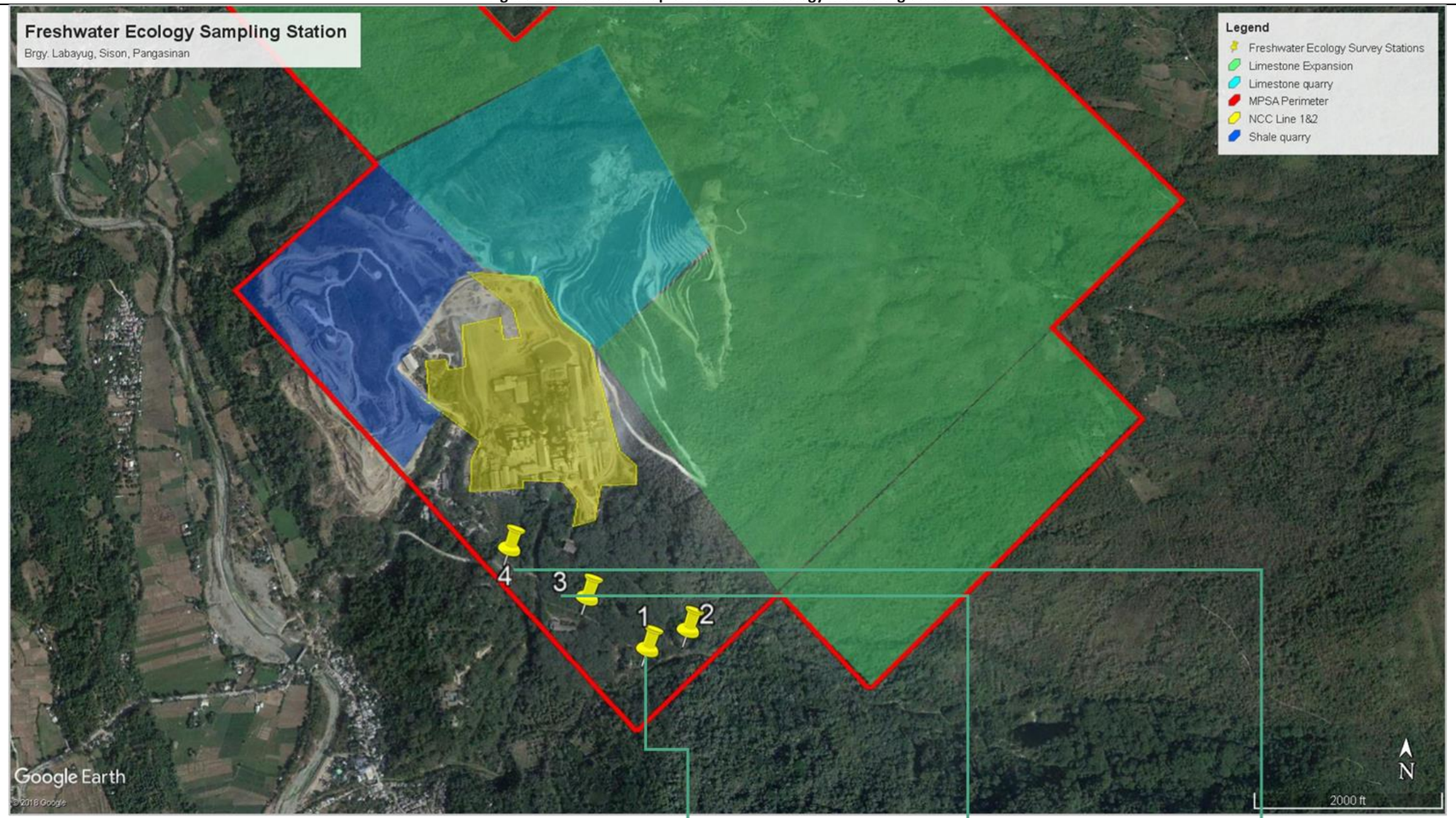
234 In terms of %relative abundance, Family Culicidae with 29% is the highest followed by Family Ampulariidae and Family Gyrinidae with both 20% relative abundance. **Figure** 2-27 shows the relative abundance of the macroinvertebrates.

Table 2-23: Taxonomic Listing, Abundance and Distribution of Freshwater Benthic Macroinvertebrates

Freshwater Benthos Taxa	Sampling Station				TOTAL ABUNDANCE
	1	2	3	4	
Phylum Arthropoda					
Class Insecta					
Order Trichoptera-caddisflies					
Family Hydropsychidae	12	5	-	-	17
Order Ephemeroptera-mayflies					
Family Baetidae	5	8	-	2	15
Family Caenidae	10	2	1	1	14
Family Leptophlebiidae	1	-	-	-	1
Family Heptageniidae	3	1	-	1	5
Order Odonata-dragonfly;damselfy					
Family Libellulidae	3	1	-	1	5
Family Coenagrionidae	1	2	1	-	4
Order Coleoptera-water beetles					
Family Gyrinidae	2	8	3	7	20
Family Dytiscjdae	1	-	-	-	1
Order Hemiptera-water bugs					
Family Mesoveliidae	1	2	1	5	9
Family Gerridae	2	1	5	3	11
Order Diptera-flies, gnats					
Family Chironomidae	1	-	2	5	8

Freshwater Benthos Taxa	Sampling Station				TOTAL ABUNDANCE
	1	2	3	4	
Family Simuliidae	3	8	-	-	11
Family Culicidae	7	5	10	4	26
Class Malacostracea					
Order Decapoda-crabs	11	7	-	1	19
PHYLUM ANNELIDA					
Class Oligochaeta-bloodworms	-	-	2	2	4
PHYLUM MOLLUSCA- snails					
Family Ampulariidae	-	-	7	13	20
GRAND TOTAL	63	50	32	45	190

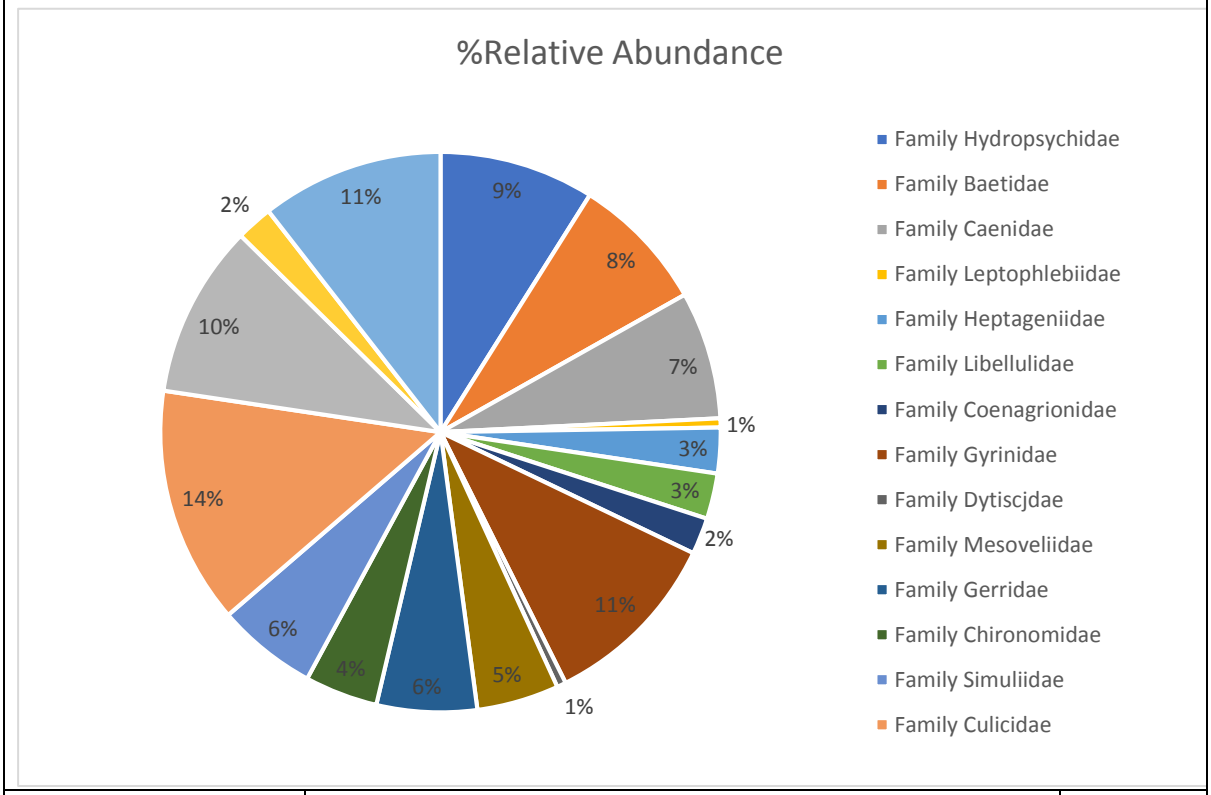
Figure 2-26: Location Map of Freshwater Ecology Monitoring Stations



Station	Location	Elevation (m)	Coordinates	
			North	East
1	Sapid Forest: Milagrosa Watershed	180	16° 09' 29.1"	120° 34' 17.2"
2	Sapid Forest: Up near nursery	161	16° 09' 31.2"	120° 34' 21.6"
3	Sapid forest: Down near dam	145	16° 09' 8.1"	120° 34' 14.4"
4	Sapid forest: Down	149	10° 09' 28.2"	120° 34' 14.4"

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **LOCATION MAP OF FRESHWATER ECOLOGY MONITORING STATIONS**	FIGURE NO.: 2-26
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: Envitecch Environmental Management Consultancy Services, Inc.

Figure 2-27: Relative Abundance of Benthic Macroinvertebrates



PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**RELATIVE ABUNDANCE OF BENTHIC MACROINVERTEBRATES**	2-27
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: Envitecch Environmental Management Consultancy Services, Inc.

2.2.4.1 Threats to existence and/or loss of important local species and habitat

235 Activities in the watershed can impact populations of biotic macroinvertebrate in the study area. Cutting of vegetation eliminates leaves and woody debris which are important primary food sources of the species.

236 Quarry operation may cause increase in turbidity of the nearby creek due to stormwater run-off. Sediment runoff will have a potential impact to river organisms as well as flora and may be a potential source of threat to existence of locally important species.

237 Domestic wastewater will also be generated during the construction and operation of the proposed project. Discharge of untreated domestic wastewater in the creeks may cause deterioration of its water quality making it unsuitable habitat for aquatic species.

2.2.4.2 Threat to abundance, frequency and distribution of species

238 Impact of the construction activities within the project area and the quarry operation is the expected increased siltation/sedimentation (water turbidity) in the nearby creeks resulting from earth -moving activities (clearing or removal of groundcover and vegetation, excavation, leveling, and filling). Turbidity would tend to limit light penetration in the water column, which is essential in photosynthesis, a vital process in the ecosystem.

239 The expansion project is expected to have a minimal effect the abundance, frequency and distribution of species in the nearby creeks. Siltation ponds are installed in the project area to catch the surface run-off from the quarry areas.

2.2.5 Marine Ecology

240 The project site is located far from any marine or coastal area.

2.2.6 Summary of Baseline Findings, Impacts and Mitigation on Water

241 The following table lists the impacts and mitigation on Water:

Table 2-24: Summary of Significant Baseline Findings and Potential Impacts and Mitigation on Water

Summary of Baseline Findings on Water:

- **Hydrology/Hydrogeology**
  - The project site is located within the catchment area of Aloragat River. There are four creeks near the project site; Buli Creek, Bettac Creek, Sapid Creek and Cabuar Creek.
- **Groundwater Quality**
  - All the groundwater samples collected exceeded the standard limit for fecal coliform.
- **Surface Water Quality**
  - SW1 and SW3 exceeded the standard for fecal coliform.
  - All the stations have high total coliform content.
- **Freshwater Ecology**
  - Station 1 and Station 2 have the highest number of macroinvertebrate individuals observed with 63 and 50 individuals, respectively. These transects in Sapid creek are located near the spring pond where riparian vegetation thrives like bamboo, figs and other shade trees favorable for macroinvertebrates growth and survival.
  - Family Culicidae, Family Ampulariidae and Family Gyrinidae are the most abundant species.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
WATER QUALITY			
Degradation of ground water / surface water quality	Construction/Operation	Accidental oil spills from heavy equipment 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. Installation of oil and water tank separator
	Construction/ Operation	Ground and surface water contamination from improper disposal of wastes, percolated wastewater, sludge and fecal matter	Provision of sanitation facilities for workers (e.g. toilets, showers, etc.) Provision of Sewage Treatment Plant
Degradation of surface water quality	Construction	Possible siltation and surface runoff Increase in turbidity of surface water	Establishment of sediment traps and erosion barriers Regular removal of silt and sediments
	Operation	Runoff from plant and quarry operations	Installation and maintenance of drainage

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
			system within the plant and quarry areas. Provision of siltation ponds in the quarry areas.
HYDROLOGY/HYDROGEOLOGY			
Competition in water use	Construction/ Operation	Construction and operation activities of the project may cause water competition with the communities	NWRB permits were secured for the operation of deep wells. Implementation of water conserving measures Reuse of water
FRESHWATER ECOLOGY			
Threat to existence and/or loss of important local species and habitat	Construction/ Operation	Possible siltation that may disturb species	Installation of silt curtain Establishment of sediment traps and erosion barriers Regular removal of silt and sediments.

2.3 The Air

2.3.1 Meteorology/Climatology

242 The coverage of the EIA study on Air Module includes the host barangay Labayug, particularly the residential areas in the vicinity. It is important to consider in this study the cumulative impacts of the current and future operations of NCC and SMNCI on air quality.

2.3.1.1 Change in the local micro-climate

243 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.

244 The Municipality of Sison falls under the Type I Climate under the Modified Coronas Climate Classification System. Type 1 Climate is characterized as having two (2) pronounced seasons: dry from November to April and wet the rest of the year **Figure** 2-28.

Temperature

245 April is the hottest month of the year, with a recorded mean temperature of 29.5 degrees Celsius (°C), while January is the coldest month, with an average temperature of 25.8°C (**Table** 2-25).

246 According to the climatological extremes (**Table** 2-26), the highest temperature recorded in the area is 39.9°C on April 12, 1915, while the lowest recorded temperature is 14.3°C on January 8, 1907.

Rainfall

247 According to the Climatological Normals in Dagupan City, the area may experience about 2,380.9mm of rainfall annually, with 119 rainy days. The highest amount of rainfall is experienced in August (581.3mm), while the lowest amount of rainfall is experienced in January (6.7mm).

248 The climatological extremes is presented in Error! Reference source not found.. According to the d ata, the greatest daily rainfall experienced in the area was on May 27, 2003 at 722.6 millimeters.

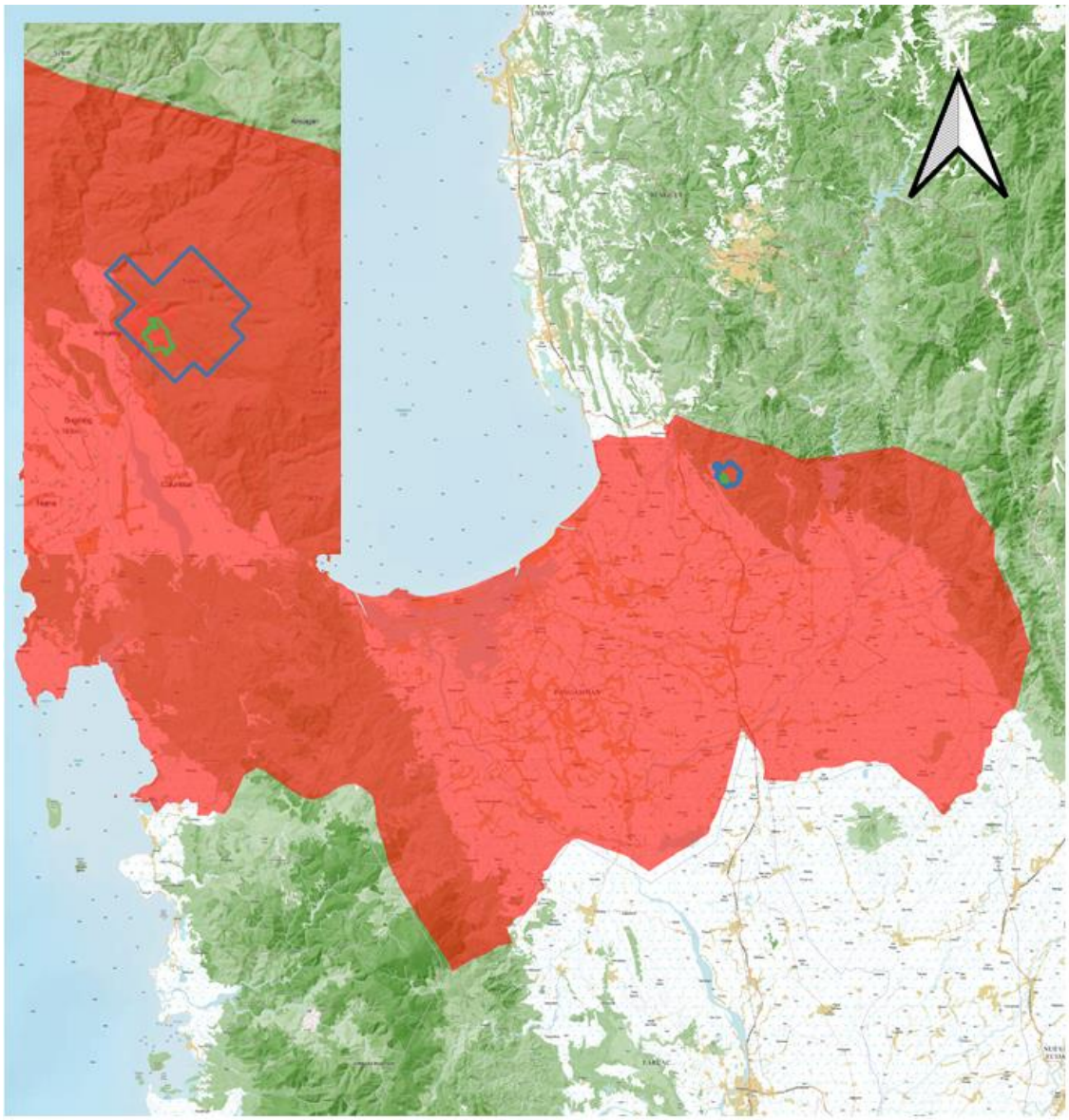
Surface Wind

249 Wind directions in Pangasinan are southward from October to June and southeastward July to September.

Tropical Cyclones

250 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** 2-29, an average of five cyclones pass by Pangasinan every 3 years.

Figure 2-28: Climate Map of the Philippines



Climate Map of the Philippines based on the Modified Coronas Classification

Map Source:

Legend	
Type I	Two pronounced season, dry from November to April and wet during the rest of the year. Maximum rain period is from June to September.
Type II	No dry season with a very pronounced maximum rain period from December to February. There is not a single dry month. Minimum monthly rainfall occurs during the period from March to May.
Type III	No very pronounced maximum rain period with a dry season lasting only from one to three months, either during the period from December to February or from March to May. This type resemble Type I since it has a short dry season.
Type IV	Rainfall is more or less evenly distributed throughout the year. This type resembles type 2 since it has no dry season.

PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**CLIMATE MAP OF THE PHILIPPINES**	**2-28**
EIA REPORT PREPARER:	PROJECT TITLE & LOCATION:	SOURCE:
LCI ENVI CORPORATION	**NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	Basemap: NAMRIA Climate Map: DOST

Table 2-25: Mean Historical Monthly Temperature and Rainfall Data (1981-2010)

STATION: **DAGUPAN CITY, PANGASINAN**
PERIOD: **1981 - 2010**

LATITUDE: **16º05'12.75"N**
LONGITUDE: **120º21'08.10E**
ELEVATION: **2m**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16a)	(16b)
	RAINFALL		TEMPERATURE									WIND			NO. OF DAYS W/	
MONTH	AMOUNT (mm)	NO. OF RD	MAX (°C)	MIN (°C)	MEAN (°C)	DRY BULB (°C)	WET BULB (°C)	DEW POINT (°C)	VAPOR PRESS. (mbs)	RH (%)	MSLP (mbs)	DIR (16pt)	SPD (mps)	CLOUD AMT. (okta)	TSTM	LTNG
JAN	6.7	1	30.8	20.7	25.8	25.7	23	21.9	26.2	79	1012	S	2	4	0	0
FEB	10.7	1	31.8	21.2	26.5	26.4	23.5	22.4	26.9	78	1012	S	3	3	0	0
MAR	22.2	2	33.2	22.6	27.9	27.6	24.5	23.4	28.6	77	1011	S	3	3	1	1
APR	60.4	5	34.7	24.4	29.5	29.1	25.8	24.7	30.9	77	1010	S	3	4	5	6
MAY	209.8	10	34.1	24.8	29.4	29.1	26.2	25.3	32	79	1008	S	3	5	14	17
JUN	337.9	17	33.1	24.7	28.9	28.4	26.1	25.3	32.2	83	1008	S	2	6	17	15
JUL	499.6	21	32	24.4	28.2	27.8	25.9	25.3	32.1	86	1007	SE	2	6	17	15
AUG	581.3	22	31.3	24.3	27.8	27.4	25.7	25.1	31.8	87	1007	SE	2	7	14	12
SEP	368.4	20	31.6	24.2	27.9	27.6	25.7	25	31.7	86	1008	SE	2	6	14	14
OCT	215.9	11	31.9	24	27.9	27.8	25.6	24.8	31.3	84	1009	S	2	5	8	9
NOV	53.9	5	31.8	23	27.4	27.3	24.9	24.1	29.8	82	1010	S	2	4	2	2
DEC	14.1	2	30.9	21.4	26.2	26.2	23.6	22.6	27.3	80	1012	S	2	4	1	1
ANNUAL	**2380.9**	**119**	**32.3**	**23.3**	**27.8**	**27.5**	**25.1**	**24.2**	**30.1**	**82**	**1009**	**S**	**2**	**5**	**93**	**92**

Definition of Terms:

Climatological Normals - Period averages computed for a uniform and relative long period comprising at least three (3) consecutive10-year period.
Rainfall Amount (column 2) - The amount of precipitation (rain, hail, etc.) expressed in millimeters depth of the layer of the water which has fallen.
Number of Rainy Days (column 3) - A rainy day is defined as a period of 24 hours beginning at 8AM to 8 AM of the next day during which at least 0.1 mm of rain is recorded.
Maximum Temperature (column 4) - The maximum temperature in °C recorded for the day, usually occurring in the early afternoon.
Minimum Temperature (column 5) - The minimum temperature in °C recorded for the day, usually occurring during early hours of the morning (before sunrise).
Mean Temperature (column 6) - The average of the maximum and minimum temperature in °C recorded for the day. Mean Temperature = Maximum + Minimum / 2
Dry Bulb Temperature (column 7) - It gives the air temperature in °C at the time of observation.
Wet Bulb Temperature (column 8) - It gives the temperature in °C that an air parcel would have if cooled adiabatically to saturation at constant pressure by evaporating water in it.
Dew Point Temperature (column 9) - The temperature in °C at a given pressure, to which the air must be cooled to become saturated. It is the temperature when atmospheric moisture begins to condense to liquid forming "dew" upon objects.
Vapor Pressure (column10) - Denotes the partial pressure of water vapor in atmosphere in millibars (mbs). As the water evaporates, additional water vapor is introduced into space above and pressure increases slightly as the new vapor is added. The increasing pressure is due to an increase in the partial pressure of water vapor.
Relative Humidity (column 11) - The ratio of the amount of water vapor actually in the air to the maximum amount the air can hold at that temperature.
Mean Sea Level Pressure (column 12) - The force exerted by the weight of the atmosphere on a unit area at the mean sea level. It is also the atmospheric pressure at mean sea leve measured in millibars (mbs).
Prevailing Winds (column 13 & 14) - The prevailing wind direction expressed using the 16 compass points which is most frequently observed during a given period while the average wind speed in meters per second is the arithmetic average of the observed wind speed.
Cloud Amount (column 15) - The amount of cloud present in the sky, expressed in oktas of the sky cover. Okta is the function used in denoting cloud amount and is equal to 1/8 of the whole sky.
Days with Thunderstorm (column 16a) - A thunderstorm day is defined as an observational day during which thunder is recorded at the station.
Days with Lightning (column 16b) - A day with lightning is reported whenever lightning is observed.

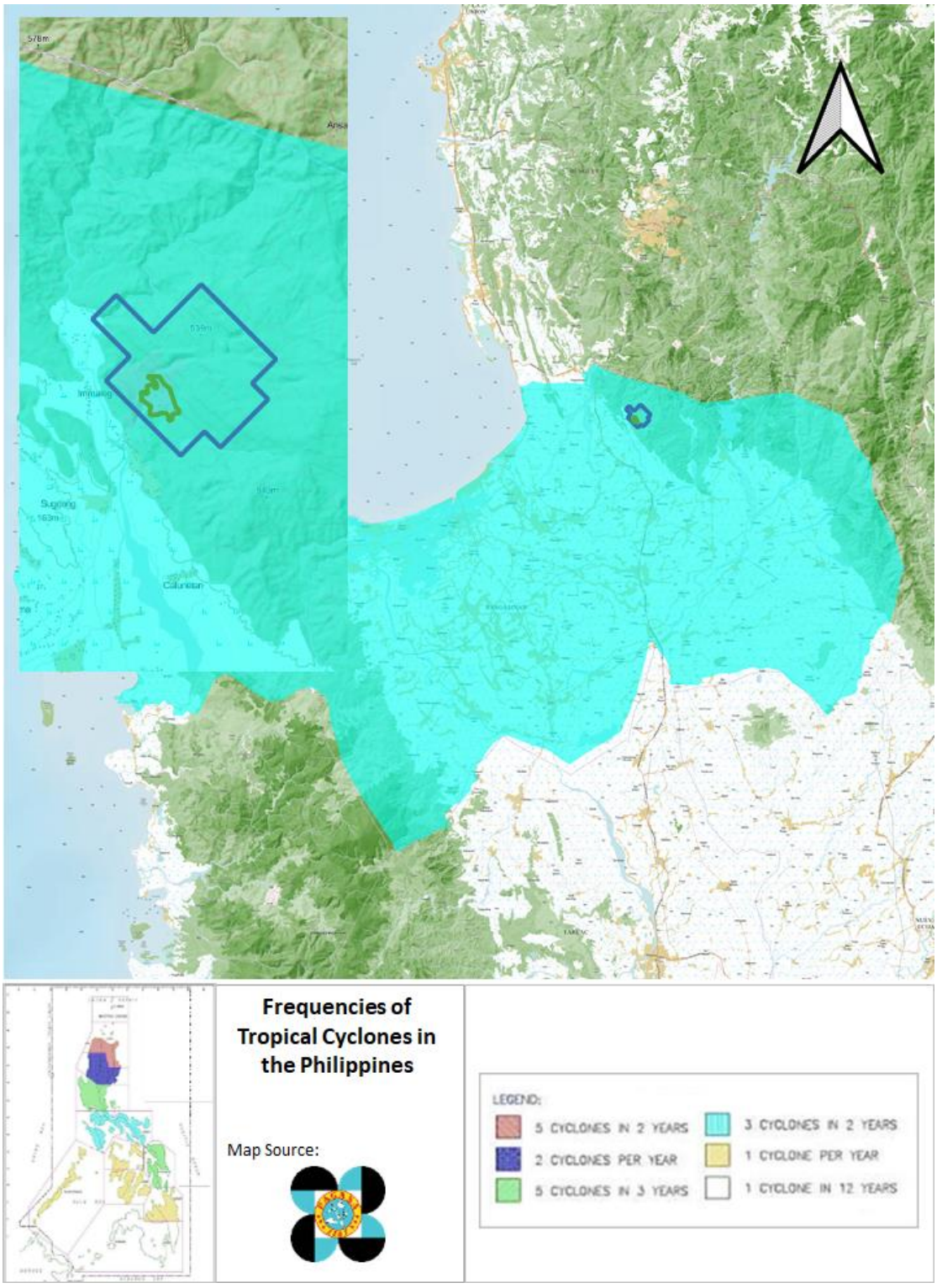
Table 2-26: Climatological Extremes Dagupan City, Pangasinan (as of 2018)

STATION: **DAGUPAN CITY, PANGASINAN**
YEAR: **AS OF 2018**

LATITUDE: **16º05'12.75"N**
LONGITUDE: **120º21'08.10E**
ELEVATION: **2m**

MONTH	TEMPERATURE (ºC)				GREATEST DAILY RAINFALL (mm)		STRONGEST WINDS (mps)			SEA LEVEL PRESSURES (mbs)			
	HIGH	DATE	LOW	DATE	AMOUNT	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE
JAN	36.0	01-14-1989	14.3	01-08-1907	78.0	01-25-2006	18	S	01-24-2000	1022.2	01-18-1959	1001.3	01-01-1950
FEB	37.0	02-25-1927	16.3	02-07-1971	64.8	02-19-2009	18	NNW	02-11-1993	1022.0	02-01-1962	1003.2	02-07-2000
MAR	38.7	03-24-1921	16.7	03-05-1971	71.9	03-29-1938	19	NNW	03-20-1981	1020.8	03-30-1958	1002.0	03-13-1949
APR	39.9	04-12-1915	19.7	04-01-1973	195.0	04-18-1998	23	SE	04-21-1979	1019.0	04-07-1968	999.4	04-21-1956
MAY	39.6	05-12-1924	19.0	05-25-2004	722.6	05-27-2003	35	E	05-17-2008	1015.5	05-12-1960	986.9	05-23-1976
JUNE	38.7	06-05-1987	20.2	06-30-1978	306.0	06-21-1990	27	SE	06-22-2008	1016.0	06-06-1966	987.3	06-29-1964
JULY	38.2	07-07-1915	20.4	07-14-1911	376.8	07-08-1986	33	W	07-04-2001	1016.7	07-05-1951	984.6	07-22-2003
AUG	36.4	08-10-1906	19.0	08-03-1999	342.0	08-22-2003	35	SSE	08-24-1982	1016.0	08-18-1963	991.2	08-24-1982
SEP	36.6	09-21-1983	20.5	09-06-1984	374.3	09-14-2014	30	ESE	09-18-1998	1016.2	09-01-1971	985.7	09-14-1998
OCT	37.2	10-22-1990	19.5	10-26-1990	443.5	10-08-2009	56	WNW	10-11-1974	1017.7	10-27-1968	978.3	10-26-1978
NOV	36.9	11-20-2000	17.2	11-13-1905	229.1	11-17-1935	41	NNW	11-24-1981	1019.3	11-04-1958	983.4	11-24-1981
DEC	36.9	12-30-1978	15.2	12-14-1988	69.4	12-04-1936	27	N	12-02-2004	1021.0	12-08-1960	989.0	12-02-2004
ANNUAL	**39.9**	**04-12-1915**	**14.3**	**01-08-1907**	**722.6**	**05-27-2003**	**56**	**WNW**	**10-11-1974**	**1022.2**	**01-18-1959**	**978.3**	**10-26-1978**
Period of Record	**1903 - 2018**				**1903 - 2018**		**1966 - 2018**			**1949 - 2018**			

Figure 2-29: Frequencies of Tropical Cyclones in the Philippines



PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **FREQUENCIES OF TROPICAL CYCLONES IN THE PHILIPPINES**	FIGURE NO.: **2-29**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: Basemap: NAMRIA Climate Map: DOST

PAG-ASA Climate Projection

251 In November 2011, Department of Environment and Natural Resources - Environmental Management Bureau (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" (DENR-EMB, 2011). The circular aims to provide information on changes that may happen to the area based on projections made by the Philippine Atmospheric, Geophysical, and Astronomical services Administration (PAGASA). The projections include temperature increases, rainfall change, and frequency of extreme events in 2020 and 2050 under medium range emission scenario. The PAGASA projections are shown **Figure** 2-30 and **Table** 2-27**.**

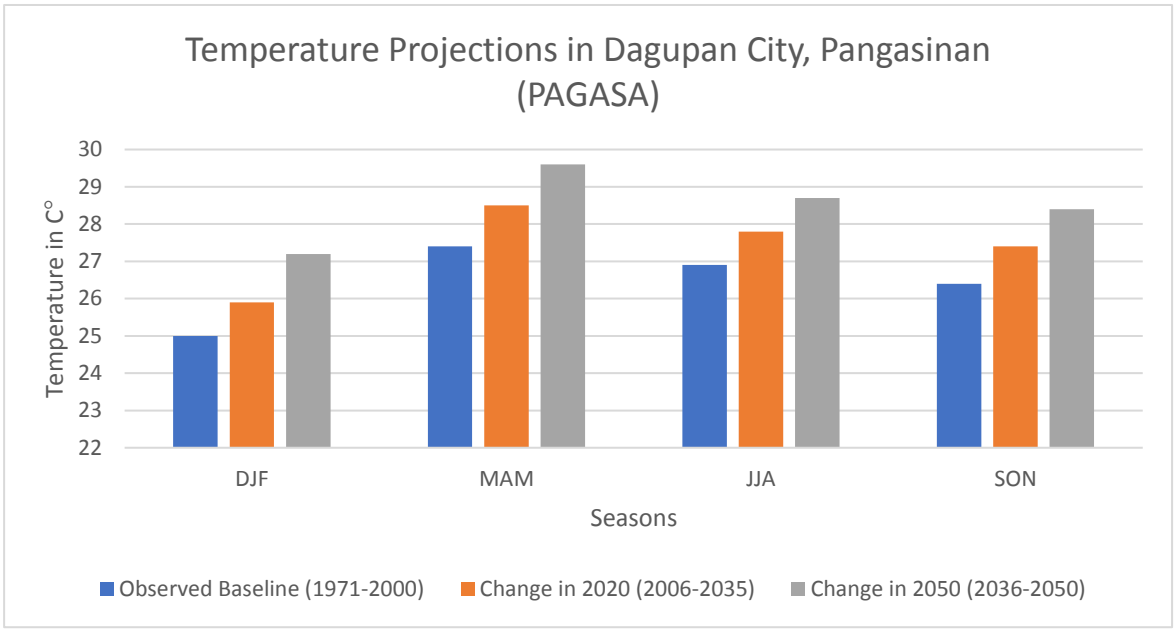
252 According to the PAGASA 2020 and 2050 projections, Region 1 will experience higher temperatures throughout the year. Higher temperatures will be experienced during the months of March, April, and May, according to the 2020 and 2050 projections, which is consistent with the observed baseline (1971-2000).

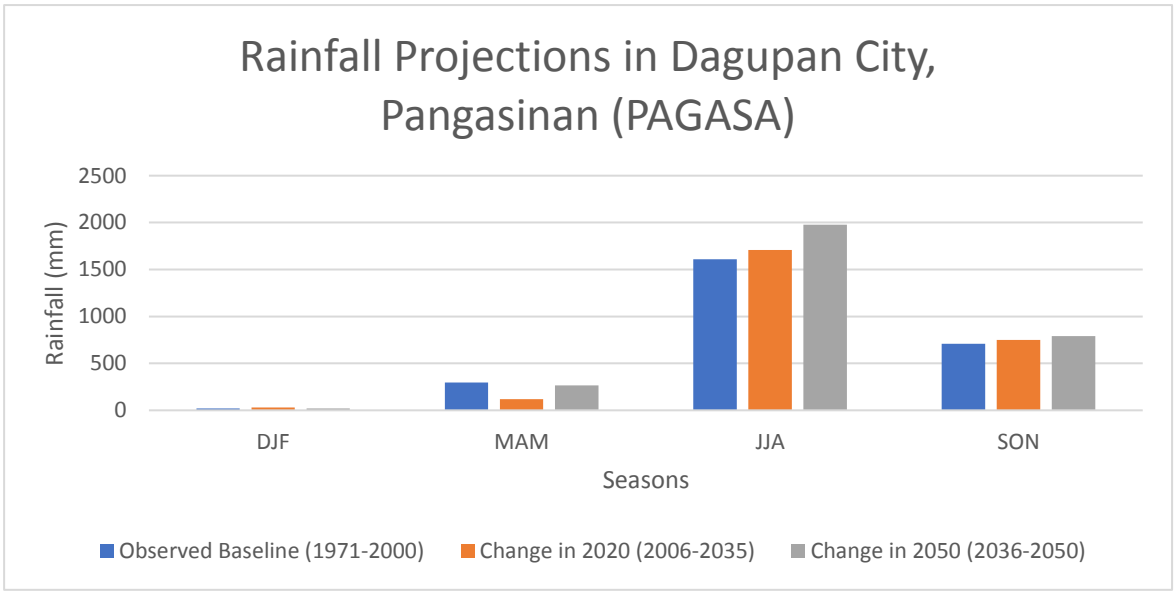
253 PAGASA also projects the amount of rainfall change in 2020 and 2050. The data shows that Pangasinan will experience greater rainfall from June to February, while less rainfall will be experienced in the remaining months.

254 Frequency of extreme events under medium-range emission scenario will increase in 2020 and 2050. The number of days with temperatures above 35°C will increase from 1,280 days (1971-2000) to 2,265 days (2020 projections), and 3,728 days (2050 projections). Although there will be a rise in temperature, the number of dry days is anticipated to decrease from 8,303 days (1971-2000), to 6,443 (2020 projections), and 6,419 (2050 projections). Days with rainfall greater than 150mm is expected to increase from 2 days (1971-2000), to 13 days (2020 projections), and 20 days (2050 projections).

255 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 and operation phases of the project to avoid any complications in the long run.

Figure 2-30: PAGASA Climate Projection for 2020 and 2050





PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **PAGASA CLIMATE PROJECTION FOR 2020 AND 2050**	FIGURE NO.: **2-30**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PAGASA

Table 2-27: PAGASA Climate Projection for 2020 and 2050

Pangasinan	Observed Baseline (1971-2000)				Change in 2020 (2006-2035)				Change in 2050 (2036-2050)			
	DJF	**MAM**	**JJA**	**SON**	**DJF**	**MAM**	**JJA**	**SON**	**DJF**	**MAM**	**JJA**	**SON**
Temperature (C°)	25	27.4	26.9	26.4	0.9	1.1	0.9	1	2.2	2.2	1.8	2
Rainfall (mm)	19.4	298	1608.9	707.8	0.543	-0.6	0.061	0.059	0.011	-0.112	0.229	0.119
No. of days with max temperature >35 C°	1,280				2,265				3,728			
No of dry days	8,303				6,443				6,419			
No. of days with rainfall > 200 mm	2				13				20			

2.3.1.2 Contribution to greenhouse gas emissions

256 Volumes 2 and 3 of the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories was used to quantify the greenhouse gas emissions of the proposed project.

257 To consider all potential GHG emission sources, the following emission scopes were considered:

- Scope 1 Emission Sources: CO_2 emissions from clinker production
- Scope 2 Emission Sources: Power requirement (to be purchased)
- Scope 3 Emission Sources: Delivery Trucks, Heavy Equipment for Quarrying

258 The Tier 1 equation was used to compute for the potential Scope 1 CO_2 emissions due to the clinker production. **Table** 2-28 shows the input data, as well as the potential CO_2 emissions (Tons CO_2/year). The cement plant will produce 2,707,692 tons of cement per year, 60% of which is clinker. The emission factor of 0.52 ton CO_2/ton clinker was taken from Chapter 2, Volume 3 of the IPCC Guidelines. An estimated 844,800 tons of CO_2 will be emitted by the clinker production per year.

Tier 1 Equation for Greenhouse Gas Emissions from Cement Production

$$Emissions_{CO_2} = Mass\ of\ Cement\ Produced\ x\ Clinker\ Fraction\ of\ Cement\ Type\ x\ Emission\ Factor\ for\ Clinker$$

Table 2-28: Scope 1 Potential Emission Data

Input Data			Potential Emissions (ton CO_2 per year)
Mass of Cement Produced[1] (Ton cement/year)	**Clinker Fraction of Cement Type[1] (Ton clinker/ton cement)**	**Emission Factor for Clinker[2] (ton CO_2/ton clinker)**	
2,707,692	0.60	0.52	844,800
[1] – Data provided by NCC [2] – Default Emission factor taken from Chapter 2, Volume 3 of Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas			

259 The emission factor from the World Bank Greenhouse Gas Emissions Inventory Management Plan for Internal Business Operations (2010) was used to compute for the Scope 2 Emission Sources. The given country-based emission factor for the Philippines is 989.34 lb CO_2/MWh, which is equal to 0.45 kg CO_2/kWh. According to NCC, the power requirement of the upgraded cement facility is 190,000,000 kWh per year. Given these data, the Scope 2 CO_2 emissions from the cement grinding facility is 85,500,000 kg CO_2 per year

Equation for Estimating Potential Scope 2 Emissions

$$Emissions_{CO_2\ Purchased\ Electricity} = Power\ Requirement\ x\ Emission\ Factor$$

Table 2-29: Scope 2 Potential Emissions

Input Data		Potential Emissions per year (kg CO_2/year)
Power Requirement[1] (kWh) per year	**Emission Factor[2] (kg CO_2/kWh)**	
190,000,000	0.45	85,500,000
[1] – Data provided by NCC [2] – Emission Factor taken from taken from World Bank Greenhouse Gas Emissions Inventory Management Plan for Internal Business Operations (2010)		

260 Volume 2, Chapter 3 of the IPCC Guidelines was used to estimate Scope 3 emissions. Tier 1 equation for road transportation was used to estimate emissions from the diesel-powered heavy equipment used for quarrying.

261 To compute for the Scope 3 emissions of NCC, it is important to know the amount of fuel consumed by the company. NCC consumes about 1,594,512 L of diesel fuel to extract a combined 3.39 MMTPY of limestone and shale per year. NCC anticipates the need for an estimated 10.05 MMTPY of limestone and shale to sustain the operations of NCC and SMNCI. With the increase of extraction capacity, fuel consumption is also expected to increase to about 2,132,680 L of diesel fuel per year. It can also be assumed that there are about 100 delivery vehicles that serve the company per day.

262 The fuel consumption of the quarry equipment is assumed to be 0.2 TJ/day, while the estimated fuel consumption of 100 delivery trucks was 0.13 TJ/day. The data shows that the project may potentially emit an estimated 8,295,345 kg of CO_2 per year.

Equation for Estimating CO_2 Emissions from Road Transport

$$Emissions_{CO_2} = Fuel\ Consumed\ x\ Emission\ Factor$$

Table 2-30: Phase 1, Scope 3 Potential Emission Data

POTENTIAL EMISSION SOURCE	INPUT DATA		POTENTIAL EMISSIONS PER YEAR (kg CO_2/year)
	Fuel Consumed[1] (TJ/day)	**Emission Factor[2] (kg CO_2/TJ)**	
Quarry Equipment	0.2	74,100	5,409,300
100 Delivery Trucks	0.13		3,516,045
		Total	**8,925,345**

[1] – Power consumption data provided by NCC
[2] – Emission factor taken from Chapter 2, Volume 2 of Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas

2.3.1.3 Emission Inventory

263 Chapter 11.6 of the Fifth Edition of US EPA AP-42 Compilation of Air Pollutant Emission Factors was used to estimate the particulate and gaseous emissions from the NCC cement plant.

264 **Table** 2-31 lists the particulate emission sources from the cement plant, as well as the corresponding US EPA AP-42 emission factors (kg/ton) and the estimated emissions (kg/year). The highest possible estimated particulate emissions is 689,528 kg/year.

265 The cement plant will also produce gaseous emissions from the kiln and the preheater/precalciner (**Table** 2-32). It is expected that the cement plant will produce 9,504,000 kg SO_2, 5,280,000 kg NO_x, and 193,600 kg CO per year.

Table 2-31: Estimated Particulate Emissions

	Emission Factor (kg/ton)	Total Output (tons/year)	Estimated Emissions (kg/year)
Primary limestone crushing with fabric filter	0.0005	2,208,909	1,104
Primary limestone screening with fabric filter	0.0001	2,208,909	221

	Emission Factor (kg/ton)	Total Output (tons/year)	Estimated Emissions (kg/year)
Limestone transfer with fabric filter	0.000002	2,208,909	3
Secondary limestone screening and crushing	0.0002	2,208,909	353
Raw mill with fabric filter	0.0062	2,904,290	18,007
Raw mill feed belt with fabric filter	0.0016	2,904,290	4,647
Raw mill weigh hopper with fabric filter	0.0100	2,904,290	29,043
Raw mill air separator with fabric filter	0.0160	2,904,290	46,469
Dry process kiln with fabric filter	0.1000	1,760,000	176,000
Preheater kiln with fabric filter	0.1300	1,760,000	228,800
Clinker cooler with fabric filter	0.0680	1,760,000	119,680
Finish grinding mill with fabric filter	0.0042	2,707,692	11,372
Finish grinding mill feed belt fabric filter	0.0012	2,707,692	3,249
Finish grinding mill weigh hopper fabric filter	0.0047	2,707,692	12,726
Finish grinding mill air separator fabric filter	0.0140	2,707,692	37,908
			689,582

Table 2-32: Estimated Gaseous Emissions

	Output (tons/year)	SO_2		NOx		CO	
		EF (kg/ton)	EE (kg/year)	EF (kg/ton)	EE (kg/year)	EF (kg/ton)	EE (kg/year)
Kiln	1,760,000	4.9	8,624,000	3.0	5,280,000	0.11	193,600
Preheater/ precalciner with spray tower	1,760,000	0.5	880,000	ND	-	ND	-
Total			9,504,000		5,280,000		193,600
EF - Emission Factor							
EE - Estimated Emissions							

2.3.2 Air Quality (& Noise)

2.3.2.1 Degradation of air quality

Ambient Air Quality

266 Presented in the following are the results of the ambient air quality monitoring done by NCC over the last 4 years (2015-2018), until the first quarter of 2019. They are currently monitoring total suspended solids (TSP) in Barangay Labayug, Barangay Inmalog, and Sitio Saguitlang (**Figure** 2-31). As shown in **Figure** 2-32, the TSP in the area is consistently below the DENR standard of 300 µg/Ncm.

267 Ambient air quality sampling was also conducted last September 19-21, 2016 and July 25, 2019 in the monitoring stations. The results of the ambient air quality test are shown in **Table** 2-33**.** All parameters measured from the three monitoring stations are within the national ambient air quality standards.

Table 2-33: Ambient Air Quality Laboratory Results (2016, 2019)

	Location	Date of Sampling	TSP	As	Cd	Cr^{+6}	Hg
A1	Labayug National Highschool	Sept 19,2016	85.5	ND	ND	ND	0.00003
A2	Inmalog Elementary School	Sept 21,2016	46.4	ND	ND	ND	0.00004
A3	Sitio Saguitlang Elementary School	Sept 20, 2016	56.0	ND	ND	ND	0.00003
NAAQS (µg/Ncm)			300	0.02	0.01	-	-

	Location	Date of Sampling	PM_{10}	NO_2	SO_2	Pb
A1	Labayug National Highschool	July 25, 2019	7.2	ND	ND	ND
A2	Inmalog Elementary School	July 25, 2019	10.1	ND	25.5	ND
A3	Sitio Saguitlang Elementary School	July 25, 2019	15.0	ND	ND	ND
NAAQS (µg/Ncm)			200	260	340	20

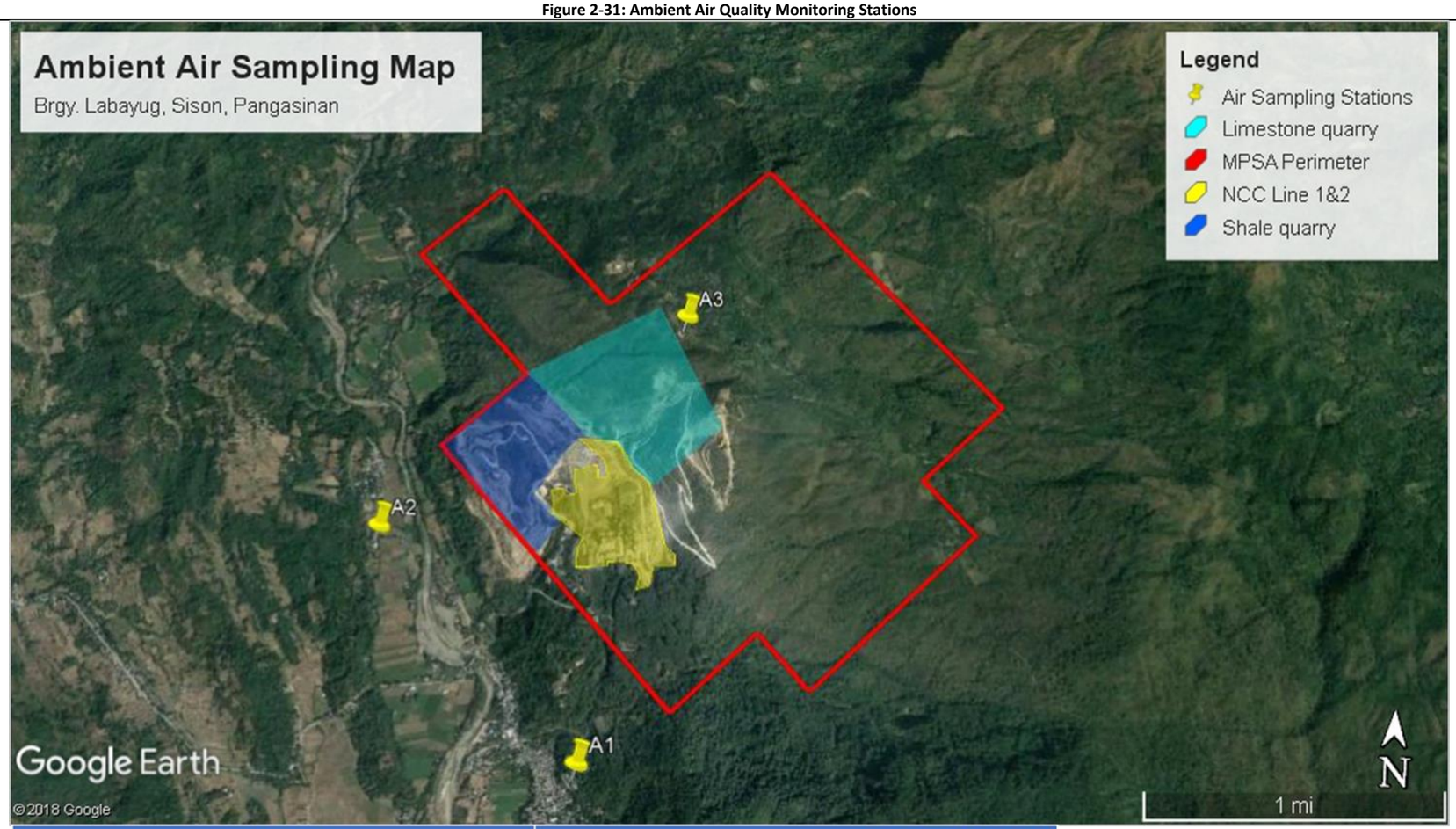
268 To minimize air pollution in the area, NCC has implemented pollution control management such as regular maintenance of vehicles and monitoring of ambient air quality. To minimize dust, unnecessary earth movement is prevented. Also, regular watering of the areas that generate dust is also being done by the proponent. It is seen to it that long exposure of excavated soil piles is avoided. Pollution control devices such as electrostatic precipitators, bag filters, dust collectors, and ventilations are also installed within the plant site.

Source Emissions

269 Air emissions from the kilns of NCC pass through electrostatic precipitators before the air is released. Parameters recorded are TSP, NO_x, SO_2, and CO. All parameters are consistently below source specific emissions standards (**Figure** 2-33). The monitoring method employed by NCC is Continuous Opacity Monitoring Systems (COMS).

270 It was also observed that there was a sudden spike of NO_2 emission (**Figure** 2-33**c**) from 4th quarter of 2016 until 3rd quarter of 2017, although the emission was still within the limit. This was due to the commissioning and process adjustment made on the new FlSmidth Burner pipe as a replacement of the heavily worn-out old burner. An intense and strong flame momentum which resulted to higher NO_2 Emission. Adjustment was made in the 2nd half of 2017 on the rawmix design and burner pipe settings to lower temperature and manageable flame momentum & shape which resulted in better clinker product, lower NOx emission and lower heat rate.

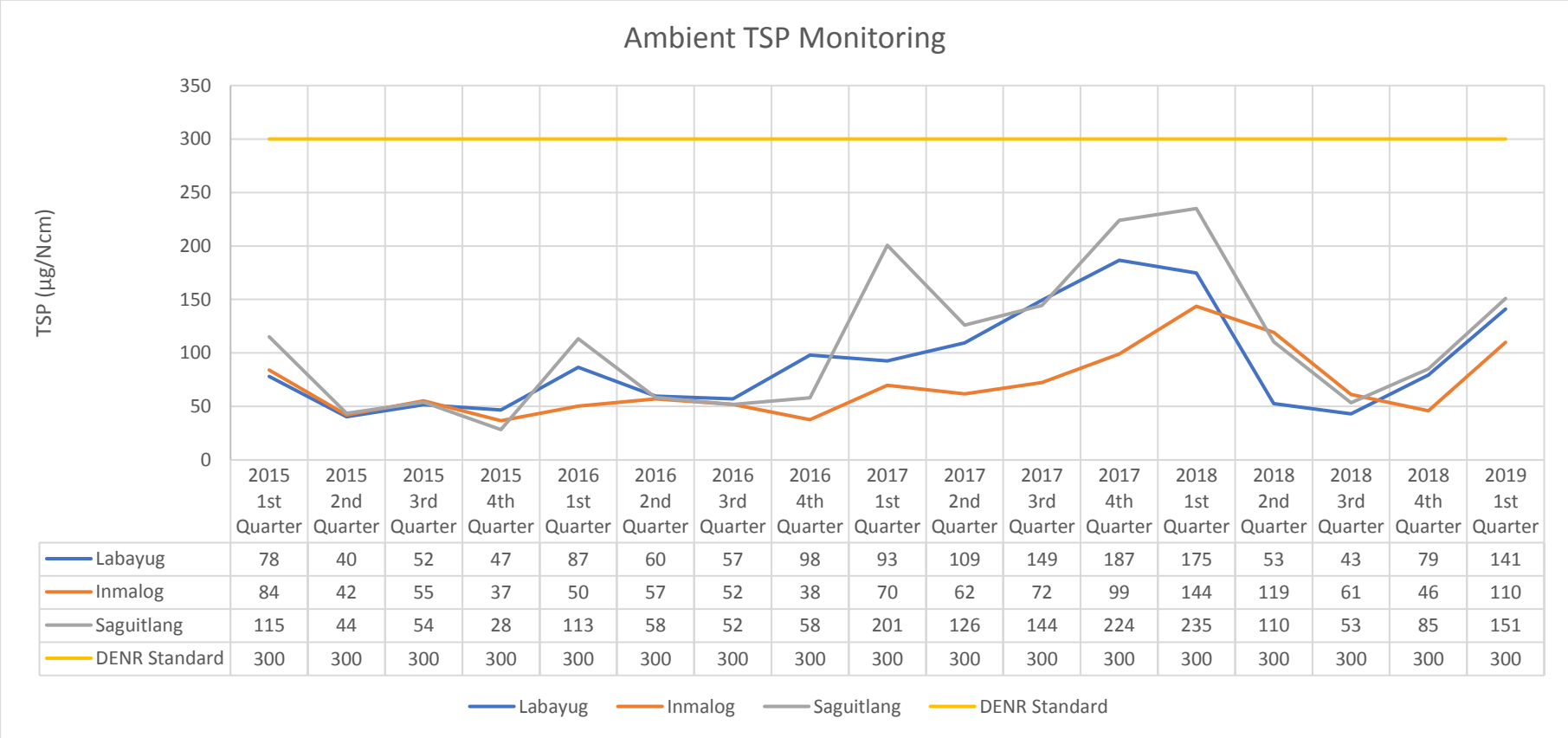
Figure 2-31: Ambient Air Quality Monitoring Stations



LOCATION		COORDINATES	
		NORTH	EAST
A1	Labayug National Highschool	16° 9'9.82"N	120°33'59.90"E
A2	Inmalog Elementary School	16° 9'49.45"N	120°33'18.73"E
A3	Sitio Saguitlang Elementary School	16°10'32.84"N	120°34'14.35"E

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **AMBIENT AIR QUALITY MONITORING STATIONS**	FIGURE NO.: 2-31
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC

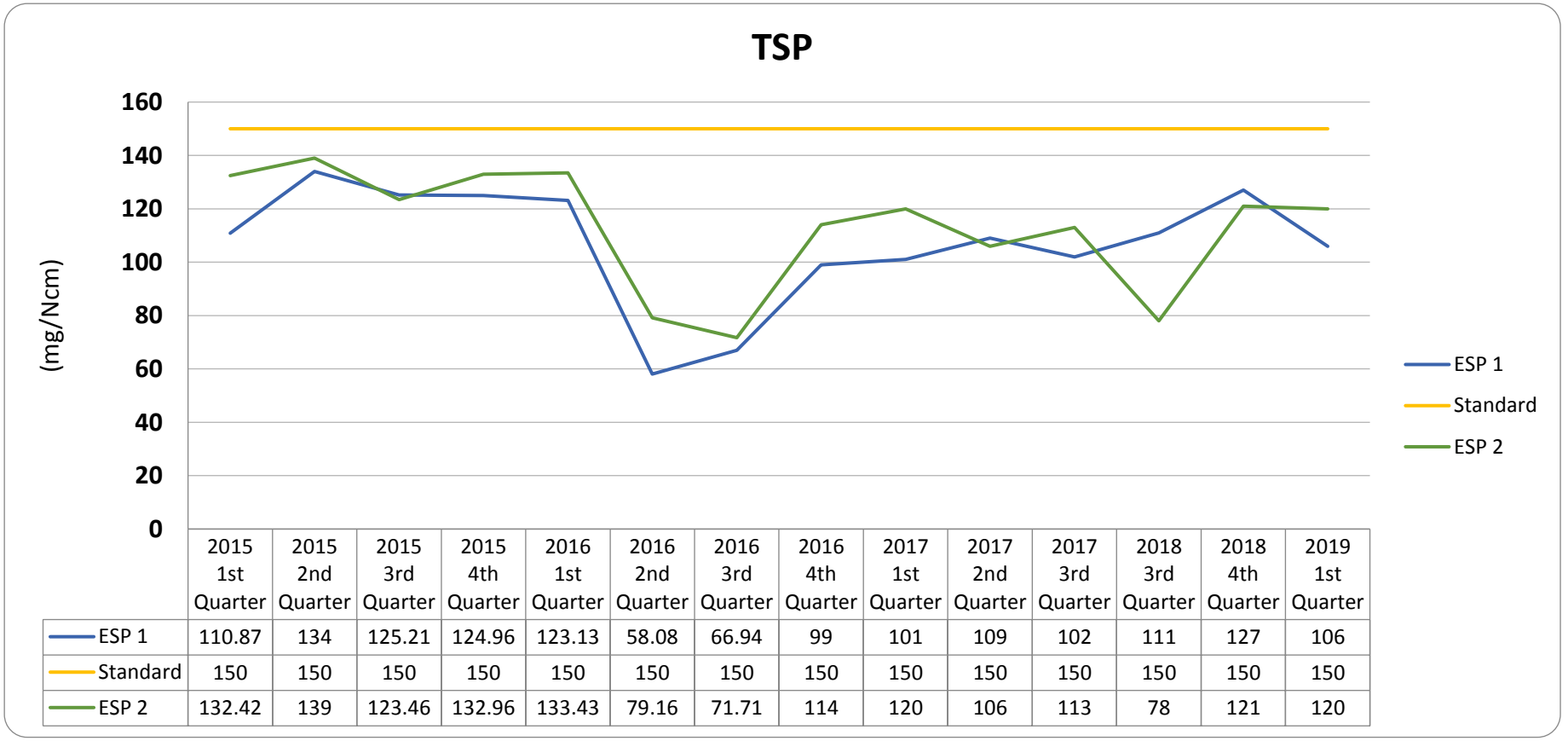
Figure 2-32: Ambient TSP Monitoring Results



	2015 1st Quarter	2015 2nd Quarter	2015 3rd Quarter	2015 4th Quarter	2016 1st Quarter	2016 2nd Quarter	2016 3rd Quarter	2016 4th Quarter	2017 1st Quarter	2017 2nd Quarter	2017 3rd Quarter	2017 4th Quarter	2018 1st Quarter	2018 2nd Quarter	2018 3rd Quarter	2018 4th Quarter	2019 1st Quarter
Labayug	78	40	52	47	87	60	57	98	93	109	149	187	175	53	43	79	141
Inmalog	84	42	55	37	50	57	52	38	70	62	72	99	144	119	61	46	110
Saguitlang	115	44	54	28	113	58	52	58	201	126	144	224	235	110	53	85	151
DENR Standard	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **AMBIENT TSP MONITORING RESULTS**	FIGURE NO.: 2-32
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC SMR

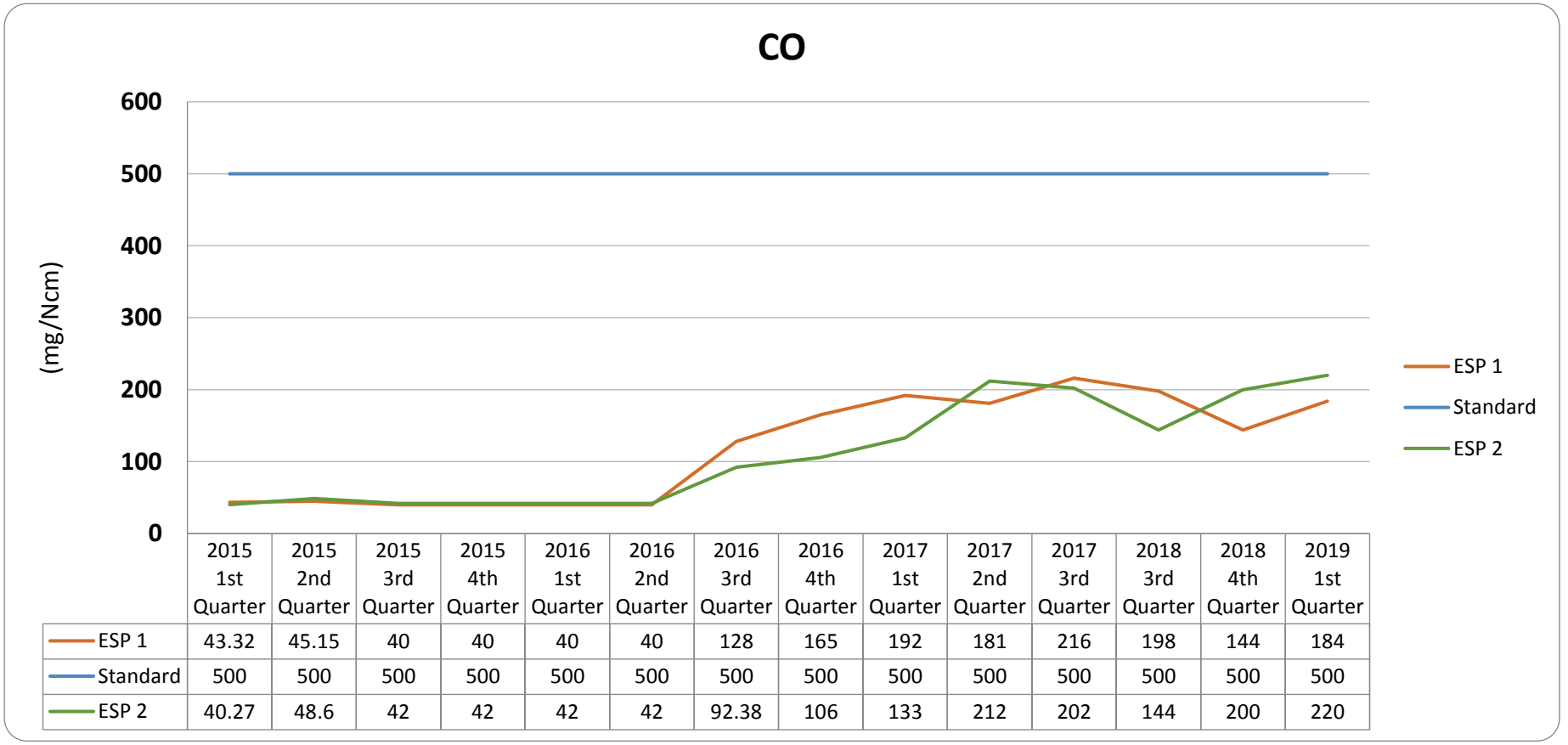
Figure 2-33: Source Emissions Monitoring Results (TSP)



	2015 1st Quarter	2015 2nd Quarter	2015 3rd Quarter	2015 4th Quarter	2016 1st Quarter	2016 2nd Quarter	2016 3rd Quarter	2016 4th Quarter	2017 1st Quarter	2017 2nd Quarter	2017 3rd Quarter	2018 3rd Quarter	2018 4th Quarter	2019 1st Quarter
ESP 1	110.87	134	125.21	124.96	123.13	58.08	66.94	99	101	109	102	111	127	106
Standard	150	150	150	150	150	150	150	150	150	150	150	150	150	150
ESP 2	132.42	139	123.46	132.96	133.43	79.16	71.71	114	120	106	113	78	121	120

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **SOURCE EMISSIONS MONITORING RESULTS (TSP)**	FIGURE NO.: 2-33
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC SMR

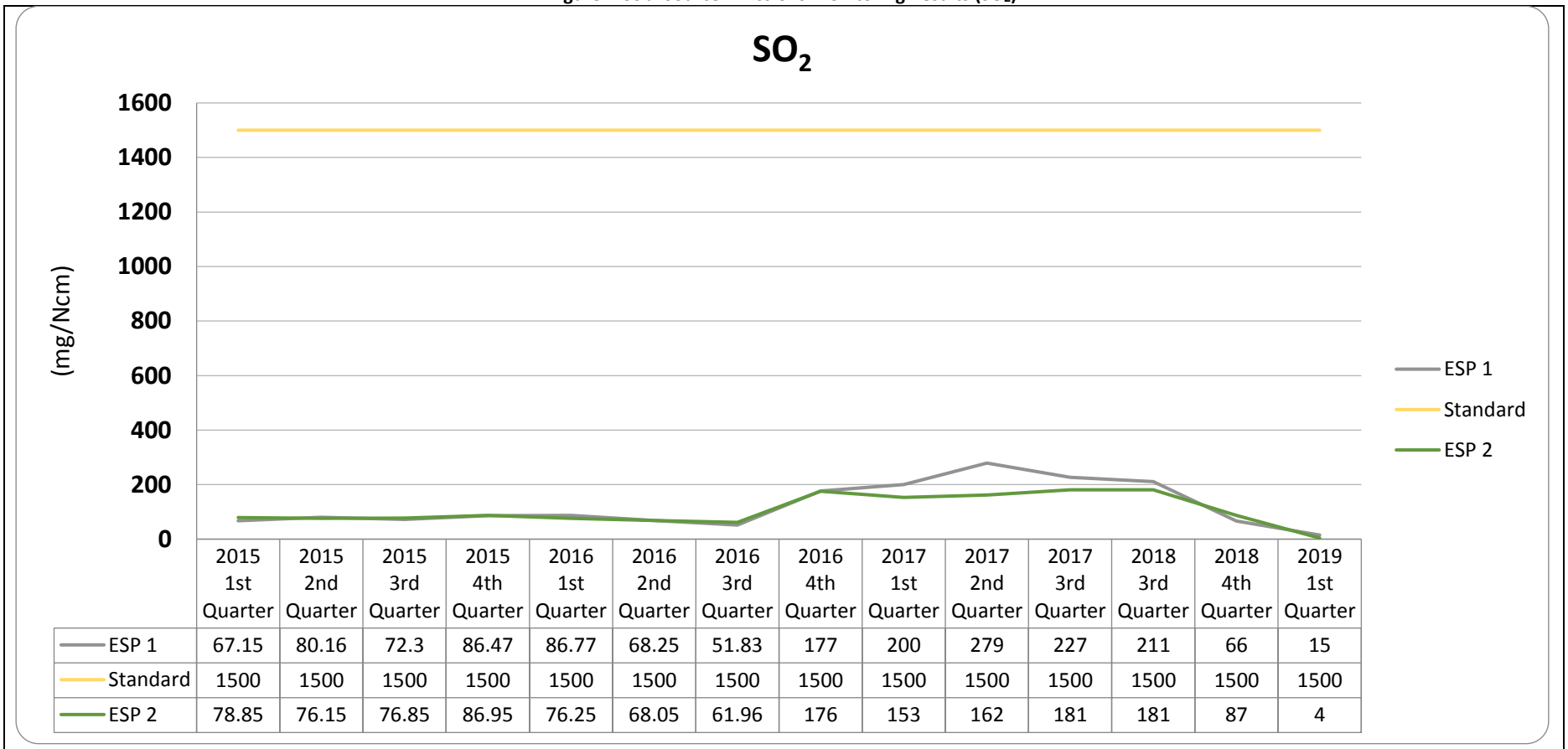
Figure 2-33a: Source Emissions Monitoring Results (CO)



	2015 1st Quarter	2015 2nd Quarter	2015 3rd Quarter	2015 4th Quarter	2016 1st Quarter	2016 2nd Quarter	2016 3rd Quarter	2016 4th Quarter	2017 1st Quarter	2017 2nd Quarter	2017 3rd Quarter	2018 3rd Quarter	2018 4th Quarter	2019 1st Quarter
ESP 1	43.32	45.15	40	40	40	40	128	165	192	181	216	198	144	184
Standard	500	500	500	500	500	500	500	500	500	500	500	500	500	500
ESP 2	40.27	48.6	42	42	42	42	92.38	106	133	212	202	144	200	220

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **SOURCE EMISSIONS MONITORING RESULTS (CO)**	FIGURE NO.: 2-33a
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC SMR

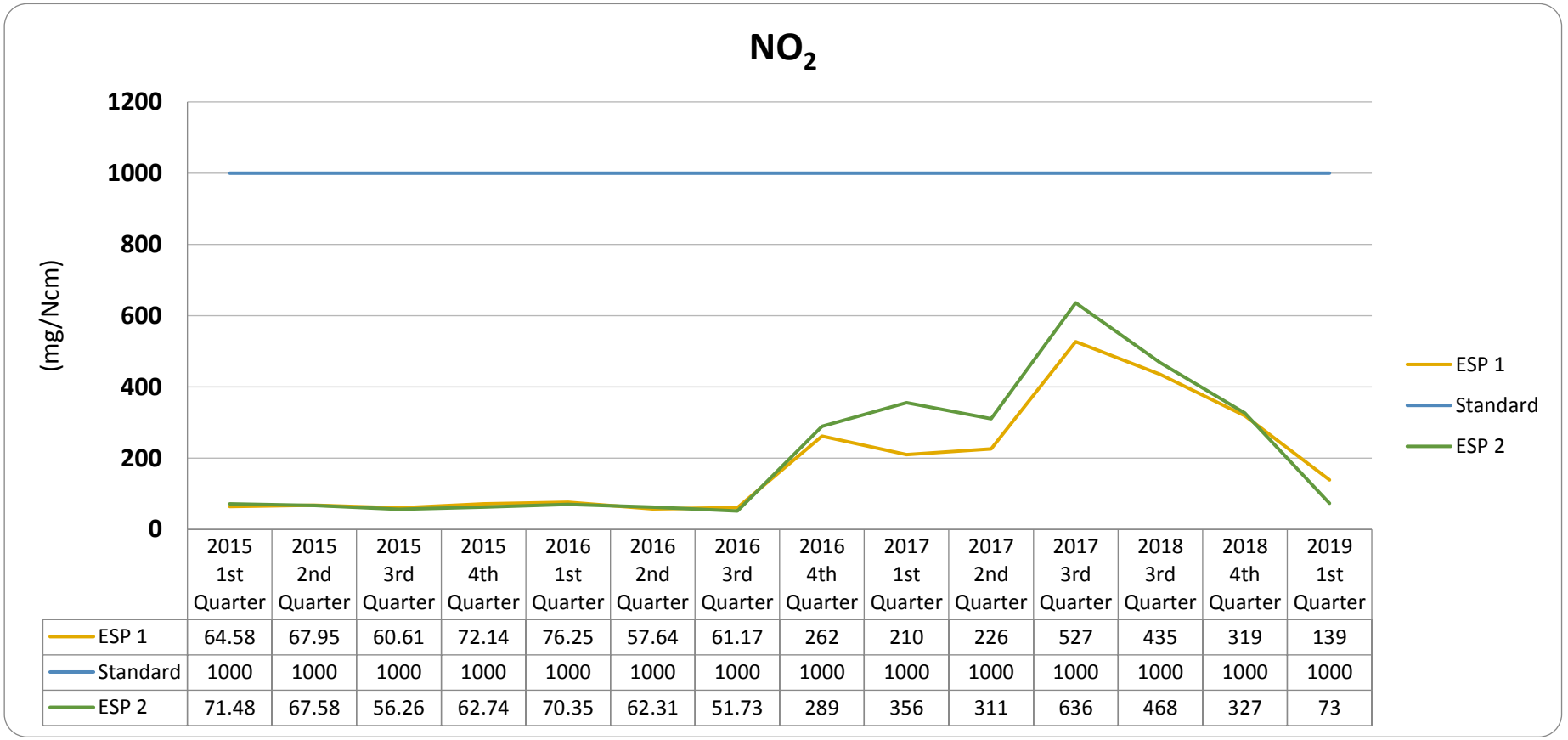
Figure 2-33b: Source Emissions Monitoring Results (SO_2)



	2015 1st Quarter	2015 2nd Quarter	2015 3rd Quarter	2015 4th Quarter	2016 1st Quarter	2016 2nd Quarter	2016 3rd Quarter	2016 4th Quarter	2017 1st Quarter	2017 2nd Quarter	2017 3rd Quarter	2018 3rd Quarter	2018 4th Quarter	2019 1st Quarter
ESP 1	67.15	80.16	72.3	86.47	86.77	68.25	51.83	177	200	279	227	211	66	15
Standard	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
ESP 2	78.85	76.15	76.85	86.95	76.25	68.05	61.96	176	153	162	181	181	87	4

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **SOURCE EMISSIONS MONITORING RESULTS (SO_2)**	FIGURE NO.: 2-33b
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC SMR

Figure 2-33c: Source Emissions Monitoring Results (NO_x)



	2015 1st Quarter	2015 2nd Quarter	2015 3rd Quarter	2015 4th Quarter	2016 1st Quarter	2016 2nd Quarter	2016 3rd Quarter	2016 4th Quarter	2017 1st Quarter	2017 2nd Quarter	2017 3rd Quarter	2018 3rd Quarter	2018 4th Quarter	2019 1st Quarter
ESP 1	64.58	67.95	60.61	72.14	76.25	57.64	61.17	262	210	226	527	435	319	139
Standard	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
ESP 2	71.48	67.58	56.26	62.74	70.35	62.31	51.73	289	356	311	636	468	327	73

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **SOURCE EMISSIONS MONITORING RESULTS (NO_x)**	FIGURE NO.: 2-33c
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC SMR

Air Dispersion Model

271 A steady state Gaussian plume dispersion model was applied to evaluate the air pollution impact on the local air quality from the quarry and cement plant operations of Northern Cement Corporation and San Miguel Northern Cement, Inc. The modeling domain that contains the study area is 10 km by 10 km grid centered on the stack locations (Lat 16.165000°, Lon 120.568319°) as shown in **Figure** 2-34.

272 The primary air pollutants in the study area will be particulates emitted from the cement line production and the quarrying sites. Gaseous air pollutants will also include Carbon Monoxide (CO), Nitrogen Dioxide (NO_2) and Sulfur Dioxide (SO_2) primarily from cement line production. Heavy metals, such as arsenic, cadmium, cobalt, copper, mercury, nickel, antimony, and zinc are also expected to be emitted by the cement plant due to the use of alternative fuels.

273 AERMOD, the US EPA's recommended model for most small scale regulatory applications, was then used for predicting the ground-level concentrations (GLC) of the said air pollutants. AERMOD, also known as the AERMIC (American Meteorological Society/EPA Regulatory Improvement Committee) Regulatory Model, is an advanced next-generation air dispersion model that incorporates concepts such as planetary boundary layer (PBL) theory and advanced methods for handling complex terrain. Such model has undergone thorough model evaluation procedures yielding reasonably accurate modeling results provided that the appropriate input data are used.

274 In this first level of analysis, it is assumed that the pollutants do not undergo any physico-chemical transformations and that there is no pollutant removal by dry deposition. The emission rate of the pollutants from a stack (point source) in a reasonable worst-case scenario was estimated based from the following equation:

$$\textit{Emission rate (g/s)} = \textit{Concentration (mg/Nm}^3\textit{)} \times \textit{Stack volumetric flowrate (Nm}^3\textit{/s)} \times 10^{-3}$$

275 The heavy metals (As, Cd, Co, Cu, Hg, Ni, Sb, and Zn) from the stack in the cement line production are listed on **Table** 2-34. The point sources of these pollutants will be primarily from the kiln. Note that these maximum concentrations are based on the limits indicated in the National Emissions Standards for Source Specific Air Pollutants (NESSAP) (Table 2, Sect.1, Rule XXV of DAO 2000-81). Concentrations from the source monitoring data of NCC, as well as typical concentrations from the prospective equipment of SMNCI were also considered.

276 As for particulates, typical concentrations from equipment of NCC and the prospective equipment of SMNCI were used (**Table** 2-34). It is also assumed that sixty five percent of the Total Suspended Particulates (TSP) will be PM_{10} for the worst-case scenario. Another potential source of particulates as fugitive dust is from the crushing plant, finish mill, and roads. The quarry is another major source of TSP. As in most model runs, the emission rate of area source used in the report was taken from EPA AP-42. The value was calculated based on emission factor from quarries and massive drilling and construction sites, which is 1×10^{-4} g/s-m^2.

Table 2-34: Concentrations of Pollutants

Pollutant	Max Concentrations (mg/Ncm)	Concentrations specifications of SMNCI equipment (mg/Ncm)	Concentration (mg/Ncm) of NCC equipment From SMR – 1Q2019	
			ESP 1	ESP 2
TSP		8.2	106	120
PM_{10}		5.3	70	103
CO		40.6	184	220
NO_2		302.1	139	73
SO_2		7.9	15	4
As	10			
Cd	10			
Sb	10			
Pb	10			

277 As suggested by Emission Inventory Improvement Program (EIIP) of the US EPA, there are several activities that have impacts on the emission rates in quarry. Some activities that were considered during quarrying are blasting, truck loading, transport through haul roads, and truck unloading. The fugitive dust emissions from crushing plant and quarry site are modeled as a 30m-length volume source and a 10m-radius circular area source, respectively.

278 The proposed facility is in an area where regional meteorological condition and terrain would have a significant effect on the predicted ground-level concentration (GLC) of its air emissions. The meteorological data used for the model was derived from a 3-year mesoscale regional meteorological model (MM5) for the said area. The summarized wind frequency data for the three-year MM5 data as shown in the wind rose diagram (Figure 2-35) indicates that the prevailing wind direction in the area is in northeasterly, southwesterly, and southeasterly sectors with a wind speed range between two to eleven meters per second. The MM5 data was processed by AERMET, the meteorology data processor for AERMOD. The terrain elevation data was obtained from high resolution database of Earth's topography collected during the Shuttle Radar Topography Mission (SRTM). The elevation data was then processed (Figure 2-36) by AERMAP, the terrain preprocessor for AERMOD air dispersion study, to calculate the hill height scale and elevations for receptors within the model domain of 10 km x 10 km grid with a 500 m resolution of the uniform Cartesian grid receptor.

279 On the other hand, physical stack parameters of the identified point sources used in the model including the stack volumetric flowrate are summarized in **Table** 2-35. The volumetric flow rate is based on typical values of the plant equipment.

Table 2-35: Description of the stacks from the proposed project (from SMR 1Q2019)

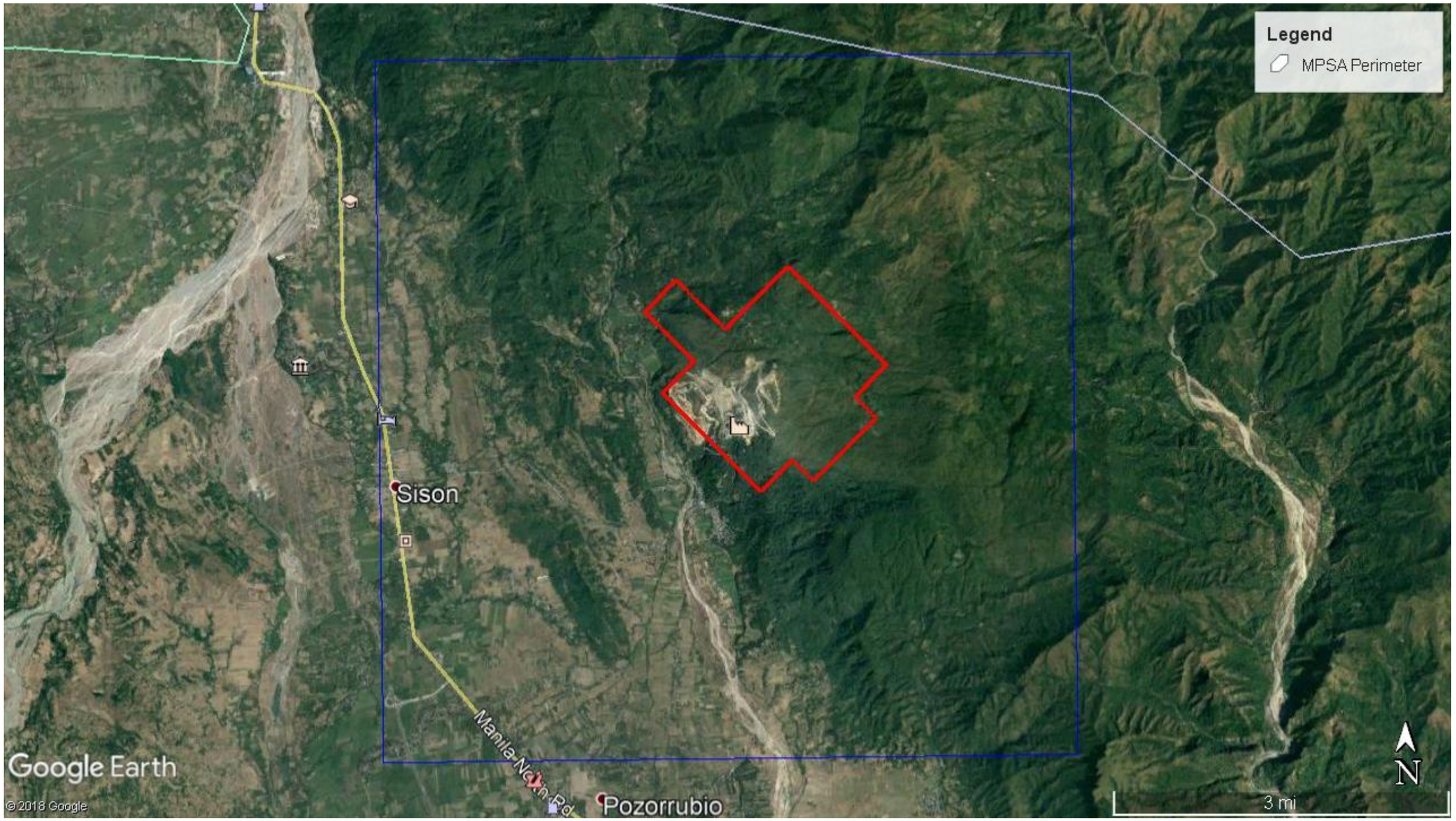
Point source	Stack height (m)	Stack Diameter (m)	Exit Stack Gas Temp (K)	Actual volumetric flow rate (m^3/min)	Corrected volumetric flow rate (Nm^3/s)	Number of Stacks	Mitigating Measures
Kiln	46	4.5	393.15	4,236.19	52.2	NCC – 2	ESP
Kiln	60	3.5	423		195.7	SMNCI – 2	Bag Filters

280 The estimated emission rates in g/s are shown in **Table** 2-36.

Table 2-36: Emission rates (g/s) from the Cement Plant and Quarry Operations

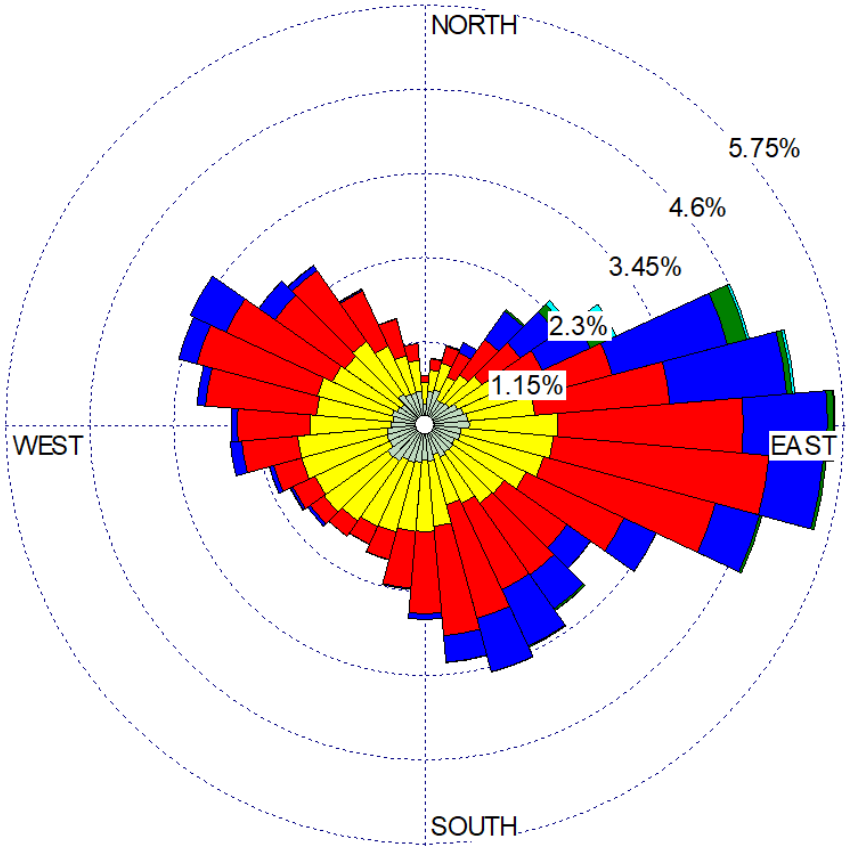
Parameters	Kiln (NCC Line 1)	Kiln (NCC Line 2)	Kiln (SMNCI Line A)	Kiln (SMNCI Line B)	Limestone Crushing 1 (Shared)	Limestone Crushing 2 (Shared)	Finish Mill 1 (NCC Line 1)	Finish Mill 2 (NCC Line 2)	Finish Mill 3 (SMNCI Line A)	Finish Mill 4 (SMNCI Line B)	Quarry Areas (g/s-m^2)	Quarry Roads
TSP	7.9	7.9	11.1	11.1	0.05	0.05	1.3	0.9	1.8	1.8	$1x10^{-4}$	2.7
NO_2	10.3	5.4	37.3	37.3								
SO_2	1.1	0.3	52.2	52.2								
CO	13.7	16.4	37.3	37.3								
PM_{10}	5.2	7.6	7.3	7.3							$6.5x10^{-6}$	0.7
As	0.7	0.7	0.7	0.7								
Cd	0.7	0.7	0.7	0.7								
Sb	0.7	0.7	0.7	0.7								
Pb	0.7	0.7	0.7	0.7								

Figure 2-34: Model Domain of the Study Area



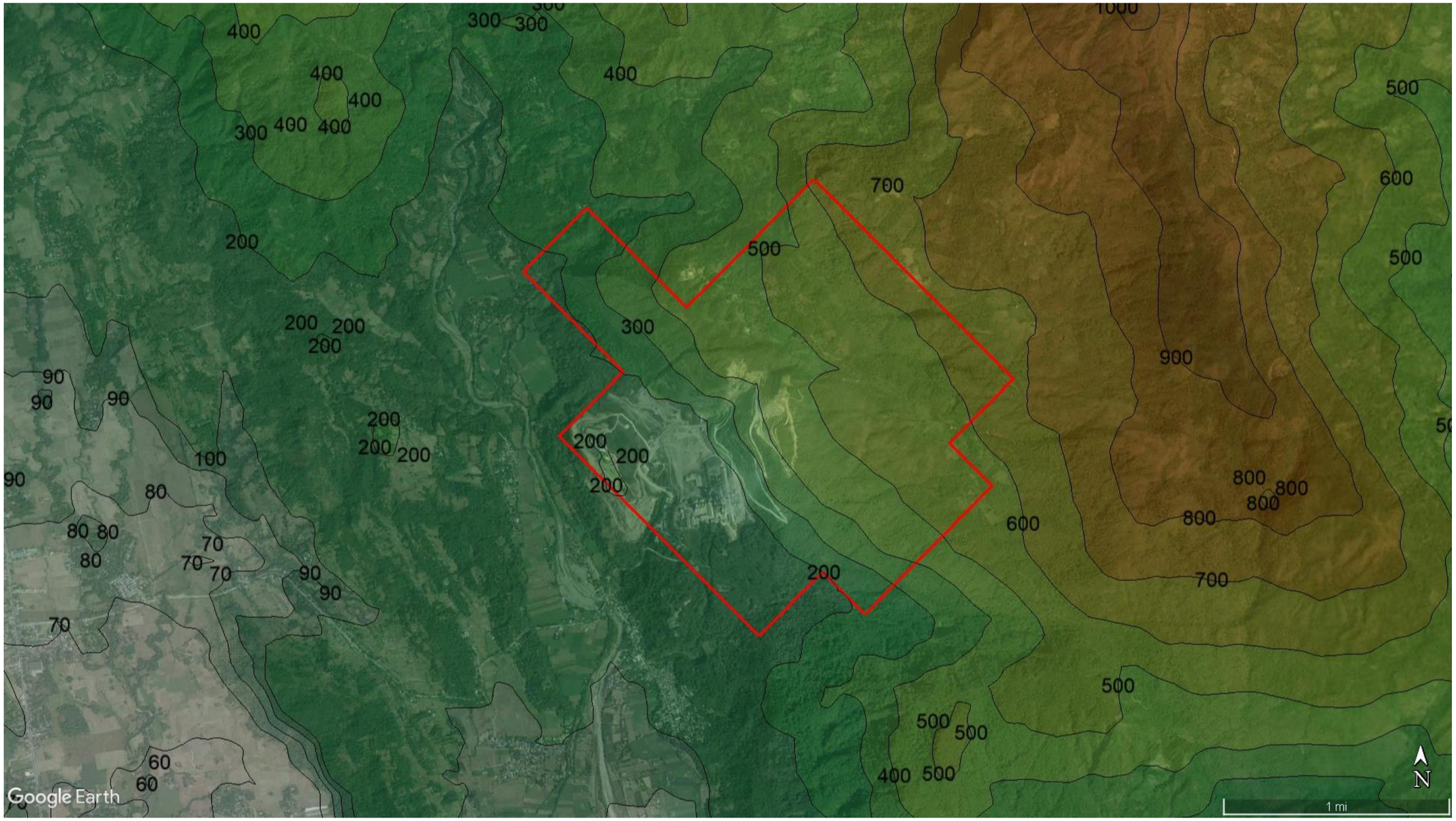
PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **MODEL DOMAIN OF THE STUDY AREA**	FIGURE NO.: 2-34
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Figure 2-35: Wind Rose Diagram in Project Area



PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**WIND ROSE DIAGRAM OF THE STUDY AREA**	2-35
EIA REPORT PREPARER:	PROJECT TITLE & LOCATION:	SOURCE:
LCI ENVI CORPORATION	**NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	LCI ENVI CORPORATION

Figure 2-36: Digitized Terrain Map of the Study Area



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **DIGITIZED TERRAIN MAP OF THE STUDY AREA**	FIGURE NO.: 2-36
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Air Dispersion Modeling of Suspended Particulates

281 The following sources were considered for the air dispersion modeling of particulates:

Table 2-37: Suspended Particulates Sources

Sources	Type	Capacity	Company
Cement Line 1	Point Source	1.28 MMTPY Clinker	NCC
Cement Line 2	Point Source	1.76 MMTPY Clinker	NCC
Cement Line A	Point Source	1.84 MMTPY Clinker	SMNCI
Cement Line B	Point Source	1.84 MMTPY Clinker	SMNCI
Limestone Crushing	Volume Source	1,400 TPH	NCC/SMNCI
Finish Mill Line 1	Volume Source	190 TPH	NCC
Finish Mill Line 2	Volume Source	130 TPH	NCC
Finish Mill Line A	Volume Source	270 TPH	SMNCI
Finish Mill Line B	Volume Source	270 TPH	SMNCI
Limestone/Shale Quarry	Area Source	8.27 MMPTY Limestone 1.83 MMPTYH Shale	NCC
Quarry Roads	Line Volume Source	4 km	NCC

282 **Figure** 2-37 shows the estimated location of the point, volume, line, or area source of particulates from the stacks, crushing operation, and quarrying area.

283 **Table** 2-39 summarizes the modeling results for each scenario describing the predicted incremental maximum ground level concentration (GLC) of particulates at different averaging times. Moreover, the isopleths for the long-term annual incremental GLC of the said criteria pollutant are also shown in **Figure** 2-37 to **Figure** 2-39. It should be noted that these concentrations are the predicted maximum increase in the existing ambient air levels.

284 The predicted concentrations of emissions from the sources exceeded the National Ambient Air Quality Guideline Values (NAAQGV) stipulated in DAO 2000-81, the Implementing Rules and Regulation (IRR) of RA 8749, the Philippine Clean Air Act (CAA) of 1999. Assuming the worst-case scenario, indications suggest the uncontrolled fugitive dust emissions from the quarry site have significant impact on the air quality of the study area in particular to suspended particulates. **Figure** 2-37 to **Figure** 2-39 suggest the major impact of the plume is in northeasterly direction as influenced by the predominant wind condition and terrain in the area.

285 The proponent must install and operate “Best and Available Control Technology” (BACT) including the continuous opacity monitoring system (COMS) to reduce the emission rate of particulates and ensure that the impact of the operation will not be detrimental to air quality of the area. Table 2-38 also presents the predicted scenarios if the emissions are controlled using different air pollution control devices such as bag filters. Assuming that the equipment used are at 90% efficiency, all parameters in all scenarios will be well below the standards stipulated in DAO 2000-81.

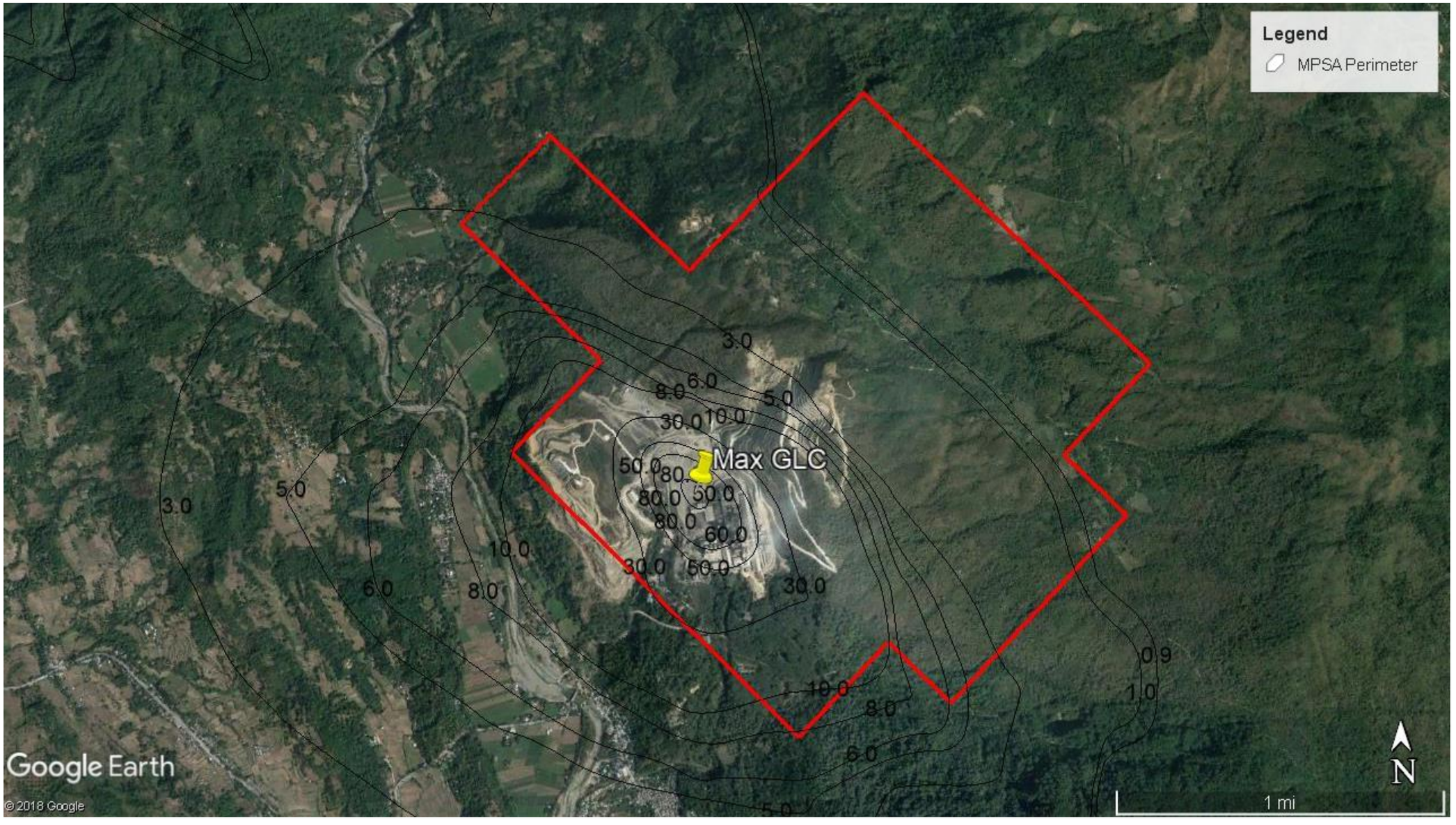
Figure 2-37: Sources of Particulate Matter in the Study Area

PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **SOURCES OF PARTICULATE MATTER IN THE STUDY AREA**	FIGURE NO.: 2-37
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Table 2-38: Predicted incremental maximum GLC of particulates in the study area

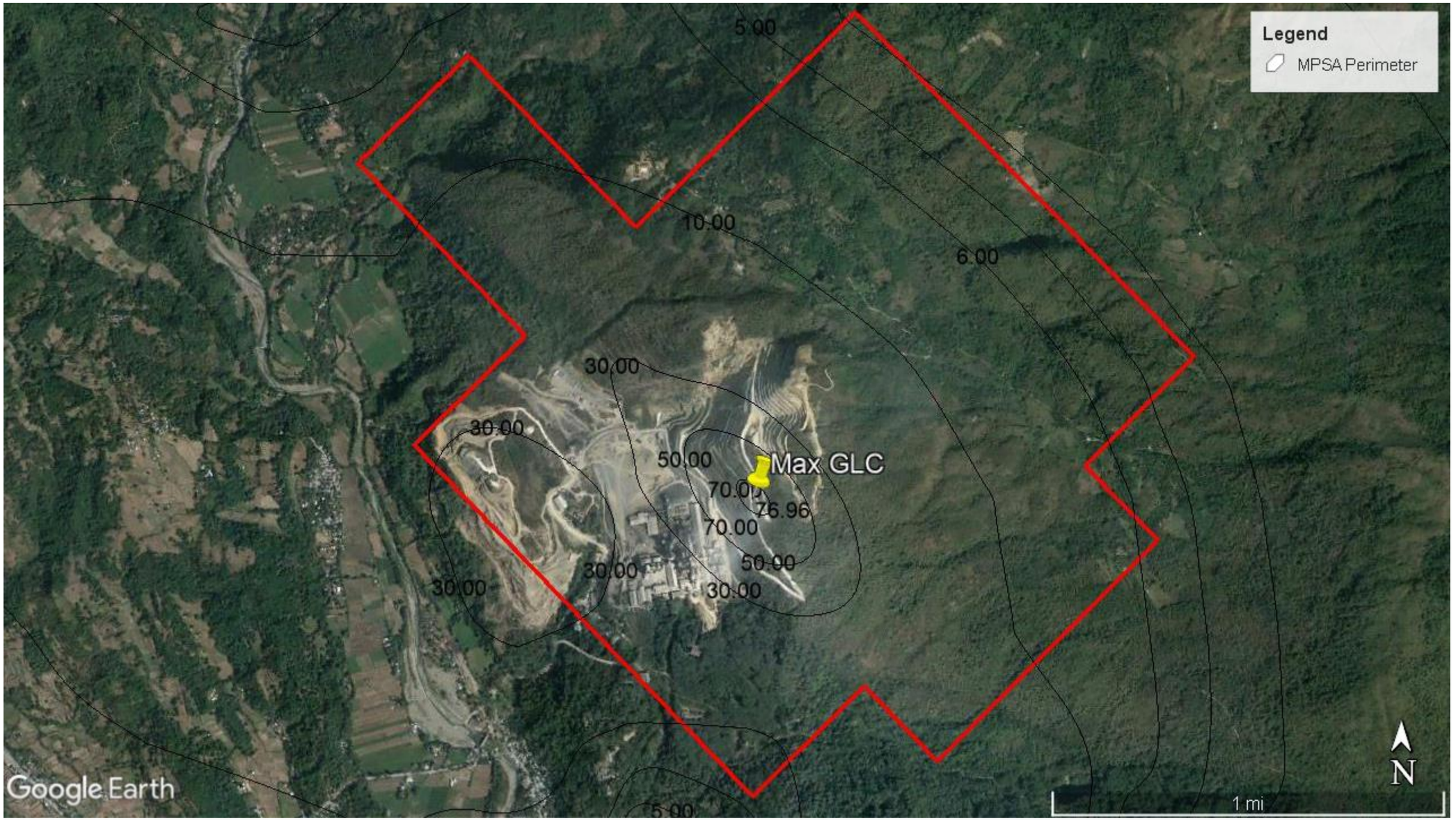
Averaging time	Uncontrolled Scenario (cement plant and quarry)		Uncontrolled Scenario (road)		Controlled Scenario (90% efficiency) + Road (Uncontrolled)		NAAQSGV		UTM East	UTM North
	TSP Max GLC[a] ($\mu g/m^3$)	PM_{10} Max GLC[a] ($\mu g/m^3$)	TSP Max GLC[a] ($\mu g/m^3$)	PM_{10} Max GLC[a] ($\mu g/m^3$)	TSP Max GLC[a] ($\mu g/m^3$)	PM_{10} Max GLC[a] ($\mu g/m^3$)	TSP ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)		
1-hr	**779**	76.96	47.43	30.8	55.1	38.4	300	200	239801.15	1788965.14
24-hr	226	51.7	20.6	13.39	43.2	18.59	230	150	239801.15	1788965.14
Annual	88.9	11.2	13.8	8.97	22.7	10.1	90	60	239801.15	1788965.14

Figure 2-38: Isopleth of the incremental 98th percentile annual average TSP concentration (µg/m³)



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **ISOPLETH OF THE INCREMENTAL 98TH PERCENTILE ANNUAL AVERAGE TSP CONCENTRATION (µg/m³)**	FIGURE NO.: 2-38
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Figure 2-39: Isopleth of the incremental 98th percentile annual average PM10 concentration (µg/m³)



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **ISOPLETH OF THE INCREMENTAL 98TH PERCENTILE ANNUAL AVERAGE PM10 CONCENTRATION (µg/m³)**	FIGURE NO.: 2-39
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Air Dispersion Modeling of Gaseous Emissions

286 Operation of gaseous emissions sources, which are the kiln and the coal mill, was considered for the air dispersion modeling of CO, NO_2, and SO_2.

287 **Table** 2-39 summarizes the modeling results for each scenario describing the predicted incremental maximum ground level concentration (GLC) of these criteria air pollutants at different averaging time. The isopleths for the 24-hr average GLC of CO and annual average GLC of SO_2, and NO_2 are also shown in **Figure** 2-40**, Figure** 2-41**,** and **Figure** 2-42. It should be noted that these concentrations are the predicted maximum increase in the existing ambient air levels.

Table 2-39: Predicted incremental maximum GLC of gaseous emissions in the study area

Pollutant	Averaging time	Maximum GLC[d] ($\mu g/m^3$)	UTM East (m)	UTM North (m)	CAA Standards ($\mu g/m^3$)
CO	1-hr	101	240300.07	1788965.74	35,000[a]
	8-hr	187	240300.07	1788965.74	10,000[b]
NO_2	1-hr	64.8	240300.07	1788965.74	260[a]
	24-hr	32.0	240300.07	1788965.74	150[b]
	Annual	7.9	240300.07	1788965.74	40[c]
SO_2	1-hr	4.8	240300.07	1788965.74	340[a]
	24-hr	4.8	240300.07	1788965.74	180[b]
	Annual	0.8	240300.07	1788965.74	80[b]

[a] Section 1, Rule XXVI Source Specific Ambient Air Quality Standards (DAO 2000-81)
[b] Section 1, Rule VII National Air Quality (DAO 2000-81)
[c] WHO guidelines
[d] 98th percentile value

288 Results from both scenarios indicate that these predicted incremental GLC of CO, NO_2, and SO_2 are well below the prescribed limit stipulated in DAO 2000-81, the Implementing Rules and Regulation (IRR) of RA 8749, the Philippine Clean Air Act (CAA) of 1999.

289 The pattern of 98th percentile isopleth shown in **Figure** 2-40 to **Figure** 2-42 also suggests the impact of the plume is in northeasterly direction as influenced by the predominant wind condition in the area. The predicted maximum GLCs of pollutants were also observed to be within the MPSA.

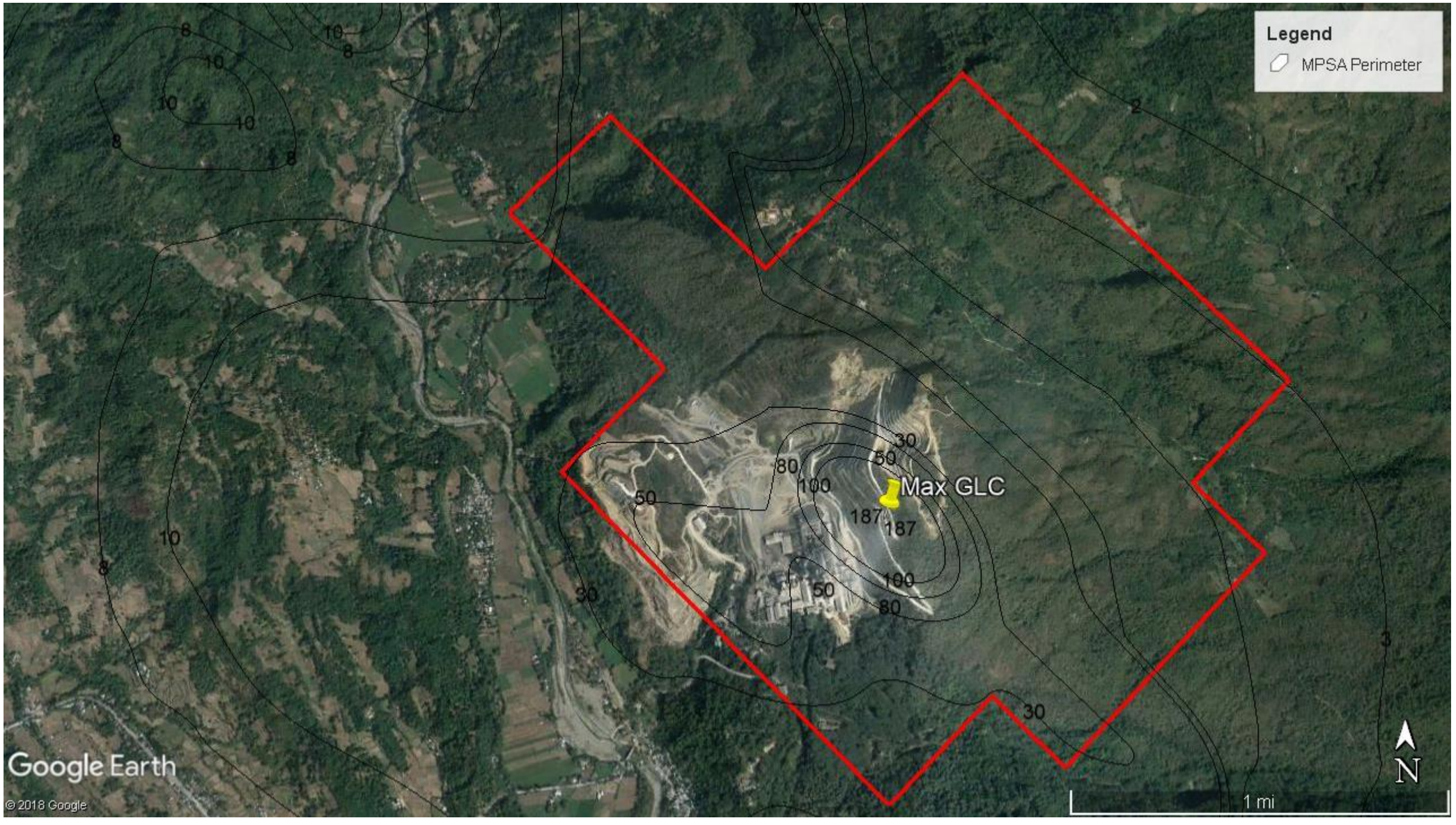
290 The existing operation of the cement plant does not warrant control devices for CO, NO_2, and SO_2. It was anticipated that the environmental limits of these gaseous pollutants will not be exceeded as the sources are minimal. As predicted by the model GLCs are within CAA Standards.

291 To ensure that pollutant concentrations in the area are kept below standards, **Table** 2-40 lists the best available control technology (BACT) that should be applied by NCC and SMNCI.

Table 2-40: Best Available Control Technology (BACT) for each pollutant

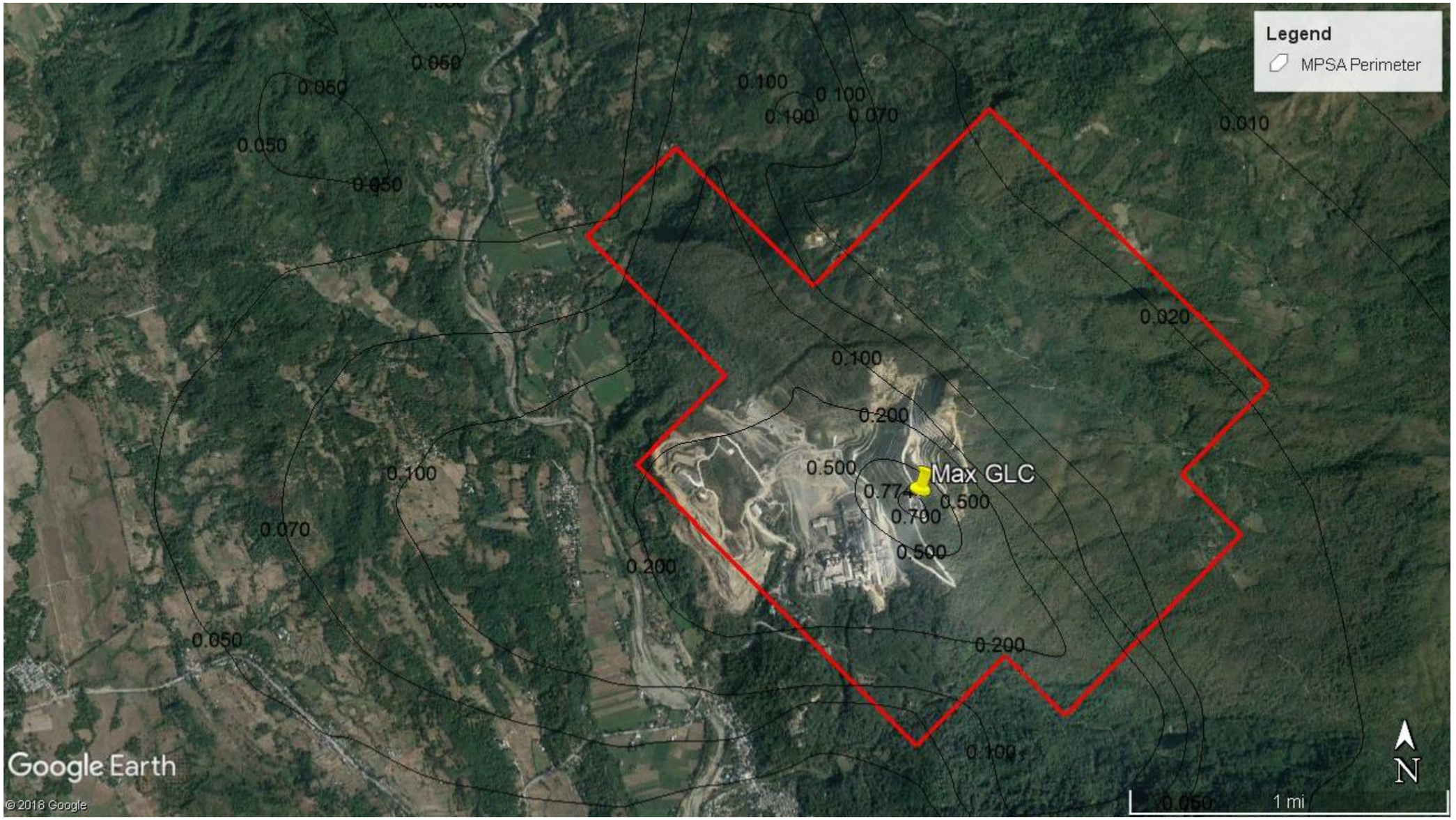
Pollutant	BACT
SO_2	Highly alkaline conditions in cement kiln is maintained to enable it to capture up to 95% of the possible SO_2 emissions
CO	Ensures complete combustion to reduce CO emissions by regular monitoring and continuous auto regulation of fuel and air by automatic combustion control system
NO_2	Reduced through stable kiln operation, as this reduces long term NO_2 emissions.

Figure 2-40: Isopleth of the incremental 98th percentile 8-hour average CO concentration (µg/m³)



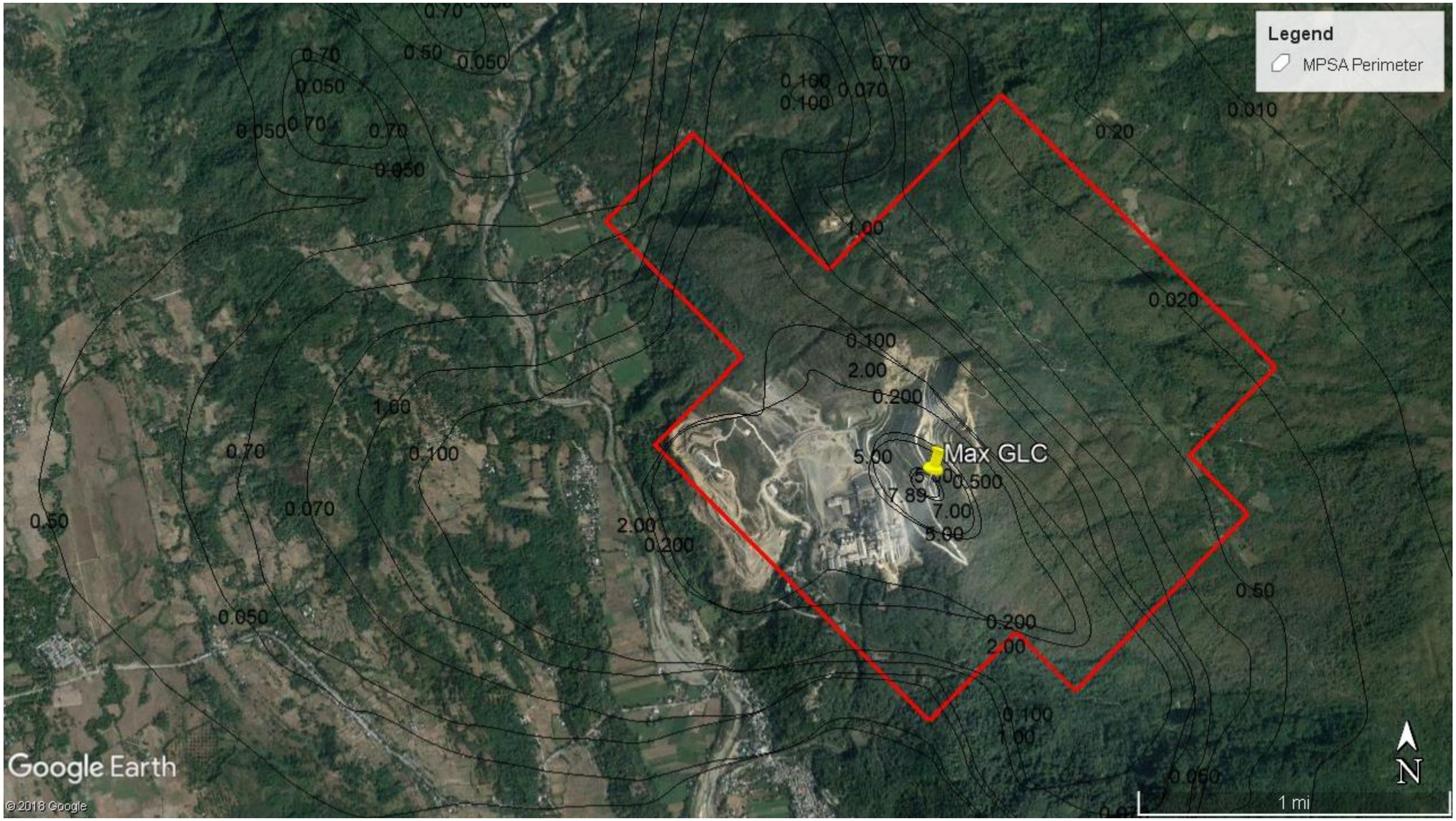
PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **ISOPLETH OF THE INCREMENTAL 98TH PERCENTILE 8-HOUR AVERAGE CO CONCENTRATION (µg/m³)**	FIGURE NO.: 2-40
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Figure 2-41: Isopleth of the incremental 98th percentile annual average SO_2 concentration (µg/m³)



PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **ISOPLETH OF THE INCREMENTAL 98TH PERCENTILE ANNUAL AVERAGE SO_2 CONCENTRATION (µg/m³)**	FIGURE NO.: 2-41
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Figure 2-42: Isopleth of the incremental 98th percentile annual average NO_2 concentration (µg/m³)



PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **ISOPLETH OF THE INCREMENTAL 98TH PERCENTILE ANNUAL AVERAGE NO_2 CONCENTRATION (µg/m³)**	FIGURE NO.: 2-42
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Air Dispersion Modeling of Heavy Metals

292 The cement plant is expected to emit heavy metals since it will use alternative fuels such as used oil, petroleum coke, shredded tires, refuse-derived fuel from municipal solid waste, and rice husk. The main sources of heavy metals are the kilns of NCC and SMNCI during start-up and calcination.

293 **Table** 2-41 summarizes the modeling results describing the predicted incremental maximum ground level concentration (GLC) of the heavy metals at different averaging time. The isopleths for the annual average GLC of Pb and 30-minute averaging time GLC of As, Cd, Sb, and Pb are also shown in **Figure** 2-43 and **Figure** 2-44.

Table 2-41: Predicted incremental maximum GLC of gaseous emissions in the study area

Pollutant	Averaging time	Maximum Uncontrolled GLC[b] (µg/m³)	Maximum Controlled GLC[b] 90% Efficiency (µg/m³)	UTM East	UTM North	CAA Standards [a] (µg/m³)
As	30 mins	8.67	0.09	240300.07	1788965.74	20
Cd	30 mins	8.67	0.09	240300.07	1788965.74	10
Sb	30 mins	8.67	0.09	240300.07	1788965.74	20
Pb	30 mins	8.67	0.09	240300.07	1788965.74	20
	Annual	0.98	0.0098	240300.07	1788965.74	1.0

[a] **Section 1, Rule XXVI Source Specific Ambient Air Quality Standards (DAO 2000-81)**

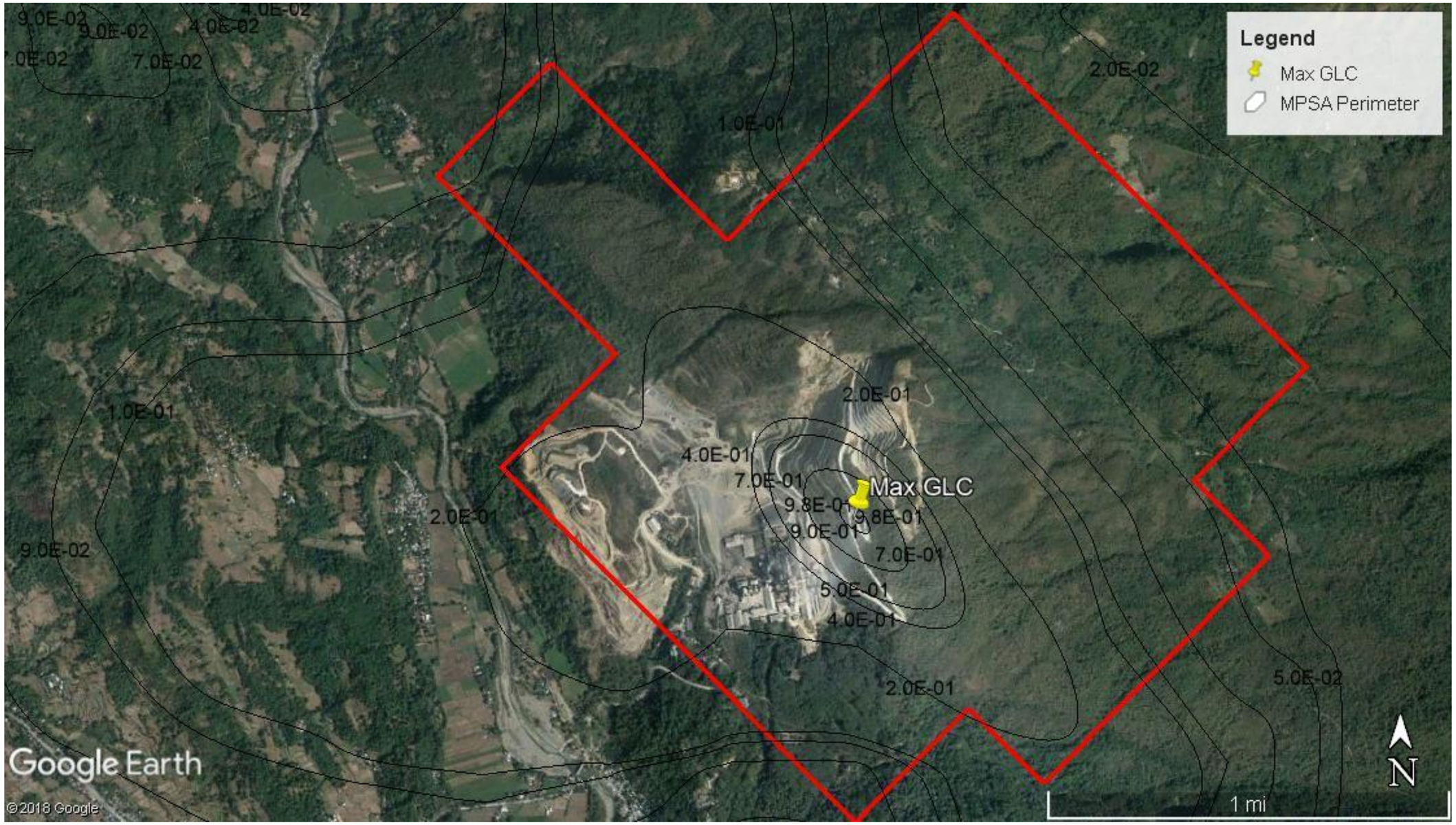
[b] **98th percentile value**

294 Results indicate that these predicted incremental GLCs of As, Cd, Sb, and Pb are below the prescribed limit stipulated in DAO 2000-81, the Implementing Rules and Regulation (IRR) of RA 8749, the Philippine Clean Air Act (CAA) of 1999. Emissions can be reduced further given that the bag filters will capture 90% of the heavy metal emissions.

295 The pattern of 98th percentile isopleth shown in **Figure** 2-43 and **Figure** 2-44 also suggests the impact of the plume is in northeasterly direction as influenced by the predominant wind condition in the area. The predicted maximum GLCs of pollutants were also observed to be within the MPSA.

296 To ensure that pollutant concentrations in the area are kept below standards, bag filters will be installed by both companies to mitigate the heavy metal emissions. According to the specifications of the bag filters, it can control heavy metal emissions by up to 92%.

Figure 2-43: Isopleth of the incremental 98th percentile annual average lead concentration (µg/m³)



PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **ISOPLETH OF THE INCREMENTAL 98TH PERCENTILE ANNUAL AVERAGE LEAD CONCENTRATION (µg/m³)**	FIGURE NO.: 2-43
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Figure 2-44: Isopleth of the incremental 98th percentile 30-minute average arsenic, cadmium, antimony, and lead concentration (µg/m³)

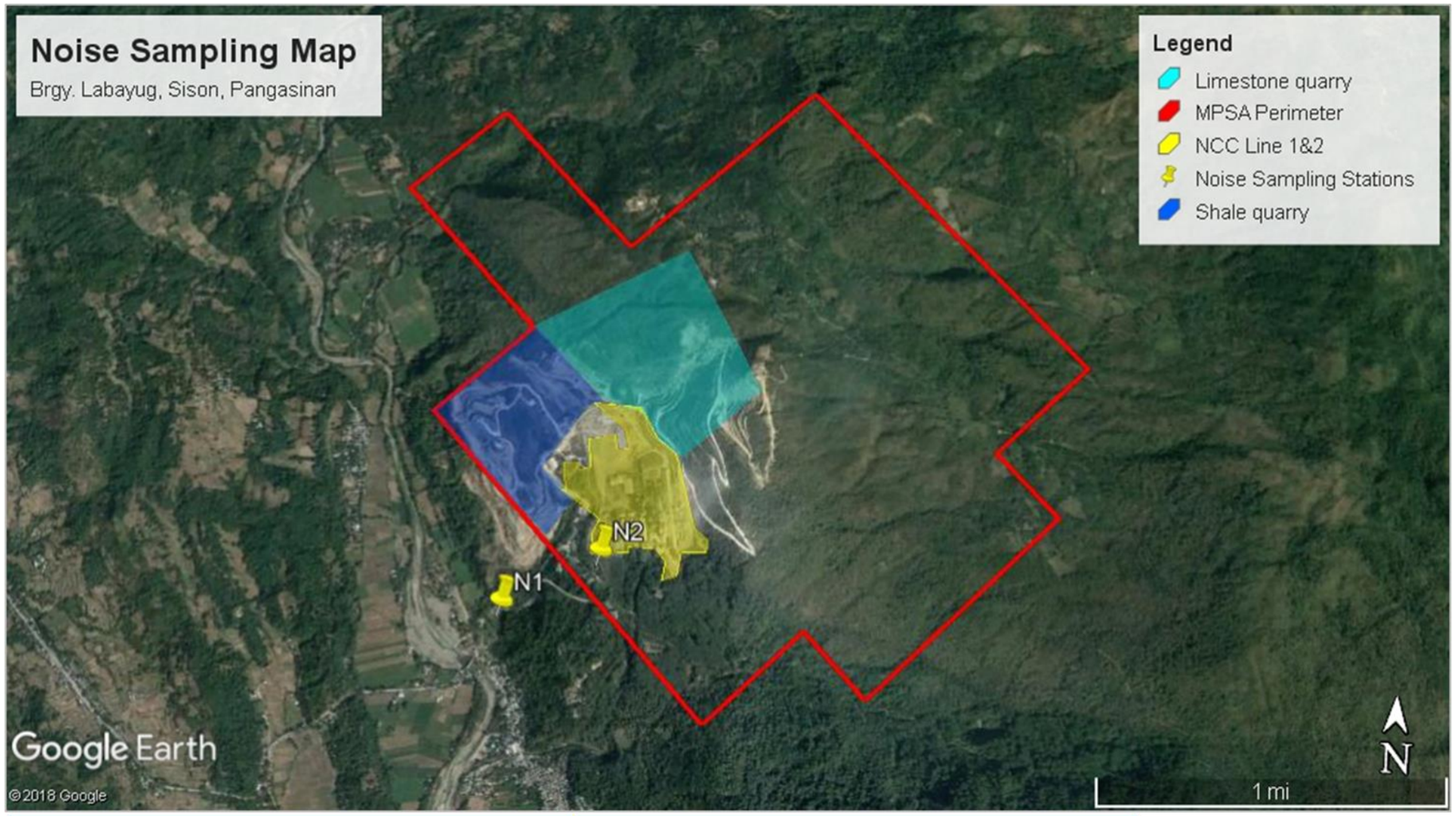
PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **ISOPLETH OF THE INCREMENTAL 98TH PERCENTILE ANNUAL AVERAGE ARSENIC, CADMIUM, ANTIMONY, AND LEAD CONCENTRATION (µg/m³)**	FIGURE NO.: 2-44
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

2.3.2.2 Increase in ambient noise level

297 Review of ambient noise level was based on Northern Cement Corporation's Self-Monitoring Reports from 2016 to 2019. NCC is monitoring noise level during morning, daytime, evening and nighttime in the two sampling stations (see **Figure** 2-45). Based from the results, noise levels at both sampling stations are complying with the correspond standard limits of the NPCC. The average of the results of the noise level monitoring of NCC is shown in **Figure** 2-46.

298 To minimize noise, heavy equipment are appropriately muffled. Workers operating heavy equipment are provided with appropriate PPE, as necessary. Another measure taken by the company to minimize ambient noise is performing noisy activities only during daytime. Noise barriers and sound proofing are already installed in areas that generate loud noises. Installation of mufflers on equipment was also done to help mitigate concerns on noise. These noise mitigating measures have proven to be effective, as seen in the monitoring of **Northern Cement Corporation.**

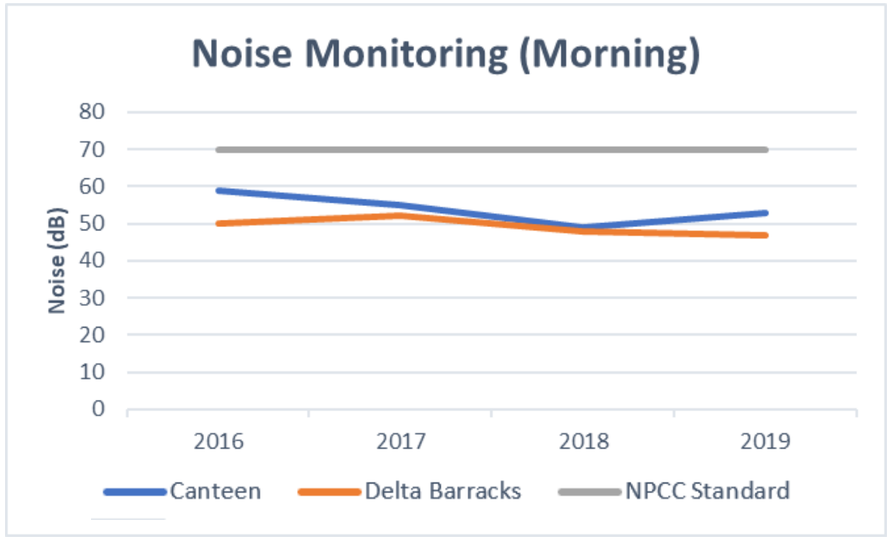
Figure 2-45: Ambient Noise Level Sampling Map

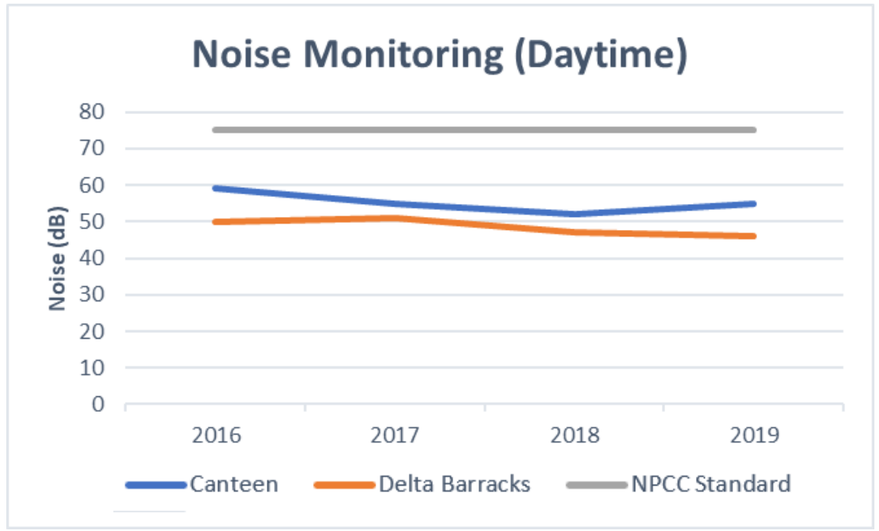


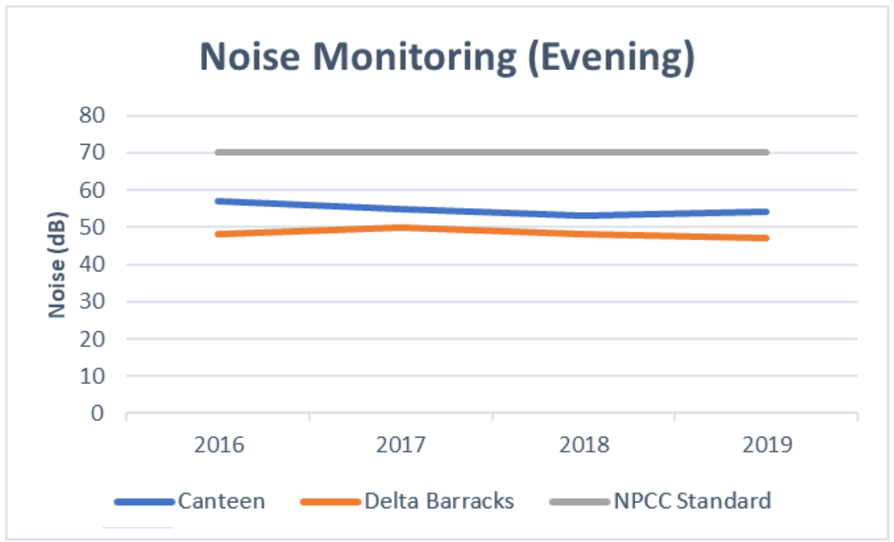
LOCATION		COORDINATES	
		NORTH	EAST
N1	Delta Barracks	16° 9'36.50"N	120°33'43.10"E
N2	NCC Canteen	16° 9'45.10"N	120°33'58.20"E

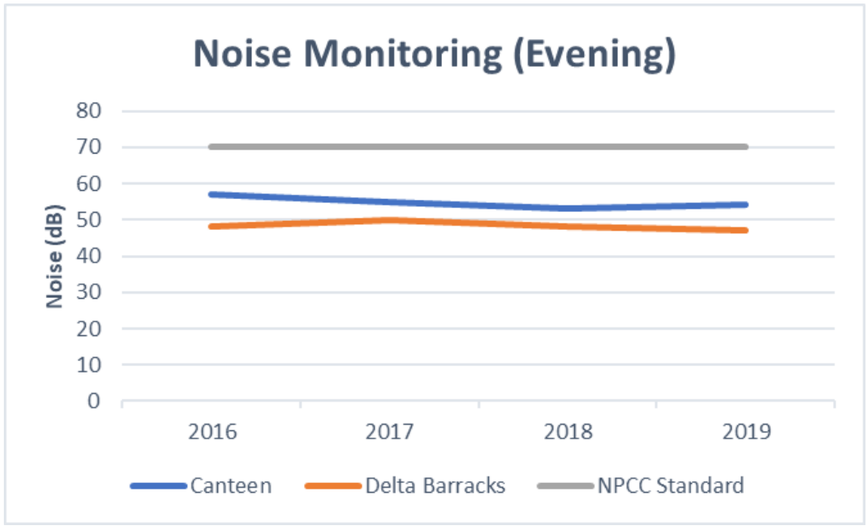
PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **AMBIENT NOISE LEVEL SAMPLING MAP**	FIGURE NO.: 2-45
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC

Figure 2-46: Ambient Noise Level Monitoring Results









PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **AMBIENT NOISE LEVEL MONITORING RESULTS**	FIGURE NO.: 2-46
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC SMR

2.3.3 Summary of Baseline Findings. Impacts and Mitigation on Air and Noise

299 The following table lists the impacts and mitigation on Air and Noise.

Table 2-42: Summary of Significant Baseline Findings and Potential Impacts and Mitigation on Air and Noise

Summary of Baseline Findings on Air:

- **Meteorology**
  - The project area mainly belongs to Type I climate under the modified Coronas classification (two pronounced seasons, dry from December to May and wet from June to November).
  - Temperature is highest in April and lowest in January.
  - The rainiest month is August with mean monthly rainfall values of 581.3mm. The driest month in the area is January with only 6.7 mm of rainfall.
  - An average of 5 cyclones pass through the area every three years.
- **Ambient Air Quality and Noise**
  - All sampling stations showed acceptable ambient air and noise conditions, with the values below the specified NAAQS and NPCC limits, respectively.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
AMBIENT AIR QUALITY AND NOISE			
Impact on Air Quality	Construction	NO_x, SO_2, and CO emissions from heavy equipment that will be used during construction	Proper maintenance on heavy equipment.
	Operation	TSP and PM_{10} emissions from the cement manufacturing facility and quarry sites is of primary concern	Installation of bag filters that will control at least 99% of the emissions from the cement manufacturing plant of NCC and SMNCI Road watering within the plant site to control dust
		Gaseous emissions are expected from the kiln.	Proper maintenance of equipment to ensure efficiency
		Heavy metal emissions are expected from the kiln due to use of alternative fuels	Bag filters can also control up to 92% of heavy metal emissions
Increase in Ambient Noise Level	Construction/ Operation	Noise will be generated by heavy equipment during construction The cement plant will generate noise	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 Quarry operations limited during daytime

2.4 The People

Land Area

300 Sison is a 3rd Class Municipality in the Philippines and has a land area of 13,788 Has., which is 1.5% of the total land area of the Province of Pangasinan. The municipality is bounded by Rosario, La Union on the north, Pozzorubio, Pangasinan on the south, San Manuel and Binalonan, Pangasinan on the southeast, Tuba, Benguet on the northeast and San Fabian, Pangasinan on the west.

301 Pozorrubio is a 1st Class Municipality in the Philippines and has a land area of 8,965 Has., which is 1.64% of the total land area of the Province of Pangasinan. The municipality is bounded San Jacinto, Pangasinan on the west, southwest by the Municipality of Manaoag, southeast by the Municipalities of Laoac and Binalonan, northwest by the Bued River and the Municipality of San Fabian, and on the east by the Aloragat River and a portion of the Municipality of Sison.

Demography

302 The Municipality of Sison has a total population of 47,518 people with an estimated number of households of 10,659 at an average household size of 4-5 as of the 2015 census by the Philippine Statistics Authority (PSA).

303 As summarized in **Table** 2-43, the municipality is comprised of 28 (5 urban and 23 rural) barangays. The data presented shows that rural population greatly outnumbers the population of urban barangays. Barangay Labayug has the highest number of population in the municipality with 4,078 people.

304 Majority of the population (75.47%) and households (74.52%) are living in the rural areas in Sison.

Table 2-43: Population of Sison per Barangay, 2015

NO.	BARANGAY	POPULATION	HOUSEHOLDS
A.	**URBAN BARANGAY**		
1	Poblacion Central	1,596	352
2	Poblacion Norte	1,984	421
3	Poblacion Sur	1,137	255
4	Labayug	2,859	702
5	Paldit	4,078	986
	Sub-Total	**11,654**	**2,716**
B.	**RURAL BARANGAY**		
1	Agat	1,310	315
2	Alibeng	1,422	325
3	Amagbagan	751	148
4	Artacho	1,305	279
5	Asan Norte	2,425	530
6	Asan Sur	2,826	639
7	Bantay Insik	1,416	333
8	Bila	1,686	418
9	Binmeckeg	1,734	394
10	Bulaoen East	1,031	234
11	Bulaoen West	1,046	215

NO.	BARANGAY	POPULATION	HOUSEHOLDS
12	Cabaritan	1,619	356
13	Calunetan	817	189
14	Camangaan	1,185	234
15	Cauringan	1,649	329
16	Dungon	1,588	346
17	Esperanza	1,891	452
18	Inmalog	1,673	391
19	Killo	1,764	395
20	Pindangan	1,562	300
21	Pinmilapil	1,867	391
22	Sagunto	2,064	436
23	Tara-tara	1,233	294
	Sub-Total	**35,864**	**7,943**
	TOTAL	**47,518**	**10,659**

Source: 2015 Philippine Statistics Authority Census
2018 Philippine Standard Geographic Code

305 The Municipality of Pozorrubio has total population of 69,555 people with an estimated number of households of 16,856 at an average household size of 4-5 as of the 2015 census by the PSA.

306 As summarized in **Table** 2-44, the municipality is comprised of 34 (1 urban and 33 rural) barangays. Similarly, the data presented shows that rural population greatly outnumbers the population of urban barangays. Barangay Alipangpang has the highest number of population in the municipality with 5,634 people.

307 Majority of the population (92.90%) and households (91.38%) are living in the rural areas in Pozorrubio.

Table 2-44: Population of Pozorrubio per Barangay, 2015

NO.	BARANGAY	POPULATION	HOUSEHOLDS
A.	**URBAN BARANGAY**		
1	Alipangpang	5,634	1,453
	Sub-Total	**5,634**	**1,453**
B.	**RURAL BARANGAY**		
1	Amagbagan	2,480	594
2	Balacag	806	196
3	Banding	996	260
4	Bantugan	1,046	290
5	Batakil	2,770	629
6	Bobonan	2,645	608
7	Buneg	1,914	520
8	Cablong	1,791	411
9	Casanfemandoan	1,137	261
10	Castano	1,010	256
11	Dilan	3,714	911
12	Don Benito	1,397	144
13	Haway	628	344
14	Imbalbalatong	2,200	536
15	Inoman	2,372	578

NO.	BARANGAY	POPULATION	HOUSEHOLDS
16	Laoac	1,207	311
17	Maambal	1,315	336
18	Malasin	2,021	496
19	Malokiat	1,136	271
20	Manaol	1,435	309
21	Nama	3,095	709
22	Nantangalan	1,742	459
23	Palacpalac	2,871	695
24	Palguyod	3,043	679
25	Poblacion I	2,578	520
26	Poblacion II	1,299	349
27	Poblacion III	1,510	331
28	Poblacion IV	1,621	359
29	Rosario	5,187	1,381
30	Sugcong	1,906	449
31	Talogtog	2,303	615
32	Tulnac	885	191
33	Villegas	1,861	405
	Sub-Total	**63,921**	**15,403**
	TOTAL	**69,555**	**16,856**

Source: 2015 Philippine Statistics Authority Census
2018 Philippine Standard Geographic Code

Population Density

308 Given the total land area and 2015 population of Sison, every square kilometer is inhabited by more or less 580 people. Based from this density, it can be said that the municipality is not crowded. In addition, the population density of Sison is higher than the population density of Pangasinan which is pegged at 542 people per square kilometer.

309 For Pozorrubio, every square kilometer is inhabited by more or less 517 people. Based from this density, it can be said that the municipality is not crowded. In addition, the population density of Pozorrubio is lower than the population density of Pangasinan which is pegged at 542 people per square kilometer.

Population Growth Rate

310 Based from the 2010 census, the population of Sison was only 43,979. Over the span of 5 years, the population increased by 3,539 (est. annual increase: 708) with +1.48% annual growth rate.

311 Based from the 2010 census, the population of Pozorrubio was only 66,111. Over the span of 5 years, the population increased by 3,444 (est. annual increase: 689) with +0.97% annual growth rate.

Population by Sex

312 Based on the CLUP of Sison, in terms of population by sex ratio in Sison, there are more males than females with a total population of 21,679 (50.88%) to 20,929 (49.12%) with ratio of 104 males to 100 females.

Housing

313 Based from the 2015 PSA Housing Characteristics in the Philippines, there are 10,532 occupied housing units in the municipality compared to 10,659 households. Majority of the housing units in the municipality are single houses (91.27%).

314 For the municipality of Pozorrubio, there are 15,789 occupied housing units in the municipality against 16,856 households. Majority of the housing units in the municipality are single houses (92%).

315 The details of the housing characteristics for both the Municipalities of Sison and Pozorrubio are found in **Table** 2-45.

Table 2-45: Housing Characteristics for Sison and Pozorrubio, 2015

MUNICIPALITY	OCCUPIED HOUSING UNIT	NO. OF HOUSEHOLDS	HOUSEHOLD POPULATION	AVE. HOUSEHOLD SIZE
MUNICIPALITY OF SISON				
Single house	9,613	9,736	43,490	4.47
Duplex	639	642	2,827	4.40
Multi-unit residential	270	271	938	3.46
Commercial/industrial/agricultural	8	8	16	2.00
Institutional living quarter	2	2	9	4.50
Others	-	-	-	-
Not Reported	-	-	-	-
TOTAL	**10,532**	**10,659**	**47,280**	**4.44**
MUNICIPALITY OF POZORRUBIO				
Single house	14,527	15,556	64,434	4.14
Duplex	908	933	3,714	3.98
Multi-unit residential	314	320	1,219	3.81
Commercial/industrial/agricultural	22	28	111	3.96
Institutional living quarter	-	-	-	-
Others	-	-	-	-
Not Reported	18	19	63	3.32
TOTAL	**15,789**	**16,856**	**69,541**	**4.13**

Source: 2015 Philippine Statistics Authority Census

2.4.1 Displacement of settler/s

316 Displacement of settlers is not expected to result from the project, since the proposed project site was located within the existing **Northern Cement Corporation** cement plant complex. Further, there are no formal and informal settlers that are inhabiting near proposed project area.

Land Tenure Profile

317 In terms of the land tenure of the household respondents (**Table** 2-46), in all 5 impact barangays, majority of the respondents mentioned that they own the land that they were currently occupying. Further, a good percentage of the respondents mentioned that the land that they were occupying were rented and/or free occupancy with permission from the owner. However, there were a few respondents who mentioned that they occupy the land without permission from the owner.

Table 2-46: Land Tenure in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
Own land	**33**	**72%**	**14**	**74%**	**35**	**58%**	**39**	**65%**	**25**	**50%**	**47**	**78%**
Rented land	3	7%	0	0%	2	3%	7	12%	0	0%	0	0%
Free occupancy with permission from owner	6	13%	2	11%	13	22%	5	8%	7	14%	8	13%
Free occupancy without permission from owner	2	4%	0	0%	1	2%	4	7%	0	0%	0	0%
Others	2	4%	2	11%	3	5%	2	3%	15	30%	5	8%
No Answer	0	0%	1	5%	6	10%	3	5%	3	6%	0	0%

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

318 In terms of the house tenure of the household respondents (**Table** 2-47), in all 5 impact barangays, majority of the respondents mentioned that they own the house that they were currently occupying. Further, a small percentage of the respondents mentioned that the house that they were occupying were rented and/or free occupancy with permission from the owner.

Table 2-47: Housing Tenure in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
Category	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
Own house	**41**	**89%**	**17**	**89%**	**40**	**67%**	**46**	**77%**	**39**	**78%**	**52**	**87%**
Rented house	2	4%	1	5%	4	7%	3	5%	0	0%	0	0%
Free occupancy with permission from owner	1	2%	1	5%	11	18%	6	10%	4	8%	6	10%
Free occupancy without permission from owner	0	0%	0	0%	2	3%	2	3%	0	0%	0	0%
Others	2	4%	0	0%	2	3%	1	2%	1	2%	2	3%
No Answer	0	0%	0	0%	1	2%	2	3%	6	12%	0	0%

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

319 In terms of the house structure or make, the household respondents (**Table** 2-48), in all 5 impact barangays, majority of the respondents mentioned that they have a fully-concrete house. Followed by those with semi-concrete houses. It can be noted that a small percentage of the houses in the impact barangays were still using nipa, cogon, bamboo or wood and even recycled materials.

Table 2-48: Type of Housing Structure/Make in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
Category	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
Full concrete	**30**	**65%**	**6**	**32%**	**36**	**60%**	**38**	**63%**	**26**	**52%**	**44**	**73%**
Semi-concrete	10	22%	5	26%	5	8%	16	27%	7	14%	8	13%
Nipa, cogon, bamboo, wood	5	11%	4	21%	10	17%	6	10%	11	22%	8	13%
Recycled materials	1	2%	0	0%	1	2%	0	0%	5	10%	0	0%
Others	0	0%	4	21%	1	2%	0	0%	0	0%	0	0%
No Answer	0	0%	0	0%	7	12%	0	0%	1	2%	0	0%

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

2.4.1.1 Displacement/disturbance of properties

320 The project will not displace nor cause disturbance to nearby properties, as the project area is located in acquired private and titled lands by **Northern Cement Corporation**. Regulations on buffer zones/areas will be maintained and adhered to by the project. Further, the project is also located in an industrial zone designated by the Municipality of Sison.

2.4.1.2 Change/conflict in land ownership

321 **Northern Cement Corporation** owns the 567 Has., were the proposed project is located. Hence, the project will not result to any change or conflict in land ownership.

2.4.1.3 Change/conflict on Right-of-Way

322 A private road network, owned by **Northern Cement Corporation**, was already constructed and currently being utilized, leading to and from the National Highway, by Northern **Cement Corporation**. Hence, the project will not cause any change or conflict on right-of-way (ROW).

2.4.1.4 Impact to Public Access

323 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 the existing barangay road networks near the project area and cement plant complex nor will it avoid or prevent the community from accessing and using public roads and facilities.

2.4.2 In-migration

324 A total of 86 manpower will be required during the project construction and 306 during operation. Northern Cement Corporation commits to prioritize employment of qualified workers from the host communities in the Municipalities of Sison and Pozorrubio in the Province of Pangasinan to mitigate the negative effects of in-migration.

325 If migrant workers are hired, Northern Cement Corporation will coordinate with the host LGU for the issuance of certificates containing pertinent information about the new employees. Furthermore, employees who are not from the host barangay or municipality will be housed within the cement plant complex to ensure their safety.

Place of Origin

326 In terms of place of origin of the respondents, in all 5 impact barangays, majority were originally from Sison. It can be noted that in Barangay Sugcong, Pozorrubio, (67%) of the respondents mentioned that they were originally from Sison.

Table 2-49: Place of Origin of Household Heads in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
Category	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
Sison, Pangasinan	**24**	**52%**	**11**	**58%**	**30**	**50%**	**41**	**68%**	**30**	**60%**	**40**	**67%**
Pozorrubio, Pangasinan	5	11%	1	5%	6	10%	1	2%	1	2%	0	0%
Other towns in Pangasinan	2	4%	1	5%	3	5%	2	3%	1	2%	0	0%
Metro Manila	1	2%	0	0%	5	8%	1	2%	0	0%	0	0%
Others	14	30%	6	32%	16	27%	15	25%	18	36%	20	33%

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

Religious Affiliation

327 In terms of religious affiliation, all 5 impact barangays were pre-dominantly Roman Catholic. While there was a high percentage of respondents that were affiliated with Born Again Christians.

Table 2-50: Religious Affiliations of the Household Heads in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
Category	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
Roman Catholic	**18**	**39%**	**8**	**42%**	**50**	**83%**	**30**	**50%**	**34**	**68%**	**49**	**82%**
Iglesia ni Cristo	0	0%	1	5%	1	2%	6	10%	5	10%	4	7%
Born Again Christian	**19**	**41%**	2	11%	4	7%	3	5%	3	6%	4	7%
Islam	0	0%	1	5%	1	2%	0	0%	0	0%	0	0%
Others	9	20%	3	16%	1	2%	21	35%	8	16%	3	5%
No Answer	0	0%	4	21%	3	5%	0	0%	0	0%	0	0%

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

2.4.2.1 Proliferation of informal settlers

328 Proliferation of informal settlers is not expected to result from the project as Northern Cement Corporation prioritizes employment of qualified workers living within the host communities in the Municipalities of Sison and Pozorrubio in the Province of Pangasinan.

329 To date, there were no known instances of informal settlers proliferating near the cement plant complex.

2.4.3 Cultural/Lifestyle Change (especially on Indigenous People, if any)

330 There are no known indigenous peoples residing near or within the project area. Hence, cultural and lifestyle changes that may affect the indigenous peoples are not expected to result from the proposed project.

331 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 handled, addiction to such vices may contribute in social problems, such as destruction of family and values and increase in crime rate.

332 **Northern Cement Corporation** continuously commits to work closely with the both the municipal and barangay LGUs and PNP to regulate and enforce law to avoid vice-related problems in the community. In addition, **Northern Cement Corporation** strictly implements a drug- and alcohol-

free work environment. Commitment to install closed circuit televisions (CCTVs) in strategic places in the plant and the community will be prioritized.

2.4.4 Impacts on Physical Cultural Resources

333 There are no literature or national/international publications found in the project area that have archaeological, paleontological, historical, aesthetical, or cultural, both tangible and intangible, significance, or immovable objects, below ground or underwater, sites, structures, groups of structures, and natural features.

2.4.5 Threat to Delivery of Basic Services/Resource Competition

334 If skills are not available in the locality, **Northern Cement Corporation** 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.

335 To mitigate this, Northern Cement Corporation will continue to provide priority employment/hiring to deserving and qualified residents living in the host and nearby communities. Various livelihood and skills training seminars and workshops were being conducted to capacitate and increase the number of skilled persons within the community where the cement plant complex is currently operating.

Power Supply

336 Based from the 2007 CLUP of the municipality, Sison is served by 2 power supply service providers namely: Benguet Electric Cooperative (BENECO) and La Union Electric Cooperative (LUELCO).

337 The municipality of Pozorrubio is served by a power supply service provider namely: Pangasinan III Electric Cooperative, Inc. (PANELCO III).

338 Based from the Province of Pangasinan official website, as of 2009, all of the municipalities and barangays are electrified, however, only (82%) of the households have service connections with the respective power supply providers. In the CLUP of Sison, it was mentioned that more than (90%) of the households have access to electricity.

Water Supply

339 In terms of access to drinking water supply sources (**Table** 2-51**)**, almost all of the respondents in all 5 barangays answered that they source their drinking water from water refilling stations. Further, there are still households who were using hand/pumps and jetmatic wells for their drinking water supply. A small percentage of the respondents answered that they source their drinking water supply from metered connections (Level III).

Table 2-51: Drinking Water Supply Sources of Surveyed Households in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
Category	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
Metered connection	2	4%	0	0%	8	13%	9	15%	0	0%	13	22%
Handpump/well	5	11%	0	0%	15	25%	16	27%	0	0%	16	27%
Surface water (river, lake, rain-water)	1	2%	7	37%	1	2%	12	20%	6	12%	0	0%
Water refilling station	**36**	**78%**	**9**	**47%**	**33**	**55%**	**19**	**32%**	**43**	**86%**	**37**	**62%**
Others	2	4%	2	11%	2	3%	3	5%	1	2%	0	0%
No Answer	0	0%	1	5%	1	2%	1	2%	0	0%	0	0%

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

Sanitation

340 With regards to access to sanitary toilet facilities (**Table** 2-52), almost all the households in the 5 barangays have access to water-sealed and pour-flush toilet. It can be noted that in Sitio Saguitlang in Barangay Labayug, none of the households surveyed have access to sanitary toilet facilities are using communal toilets for their sanitary needs.

Table 2-52: Sanitary Toilet Facility of Households in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
Category	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
None	3	7%	**19**	**100%**	20	33%	21	35%	1	2%	3	5%
Private Toilet	**43**	**93%**	0	0%	**37**	**62%**	**36**	**60%**	**41**	**82%**	**54**	**90%**
Communal	0	0%	0	0%	3	5%	3	5%	8	16%	3	5%
Type of toilet												
Water-sealed	**41**	**95%**	0	0%	**32**	**80%**	5	13%	**38**	**78%**	3	5%
Pour-flush	2	5%	0	0%	8	20%	**34**	**87%**	11	22%	**54**	**95%**

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

Existing Roads Networks

341 According to the CLUP of Sison and as presented in **Table** 2-53, the municipality is traversed by 118.76 kilometers of overall road network. In which, 5.0 kilometers are national road; 11.20 kilometers are provincial roads, 8.44 kilometers are municipal roads, and 94.11 kilometers are barangay roads.

Table 2-53: Existing Road Network in Sison

TYPE	CONCRETE	ASPHALT	GRAVEL	EARTH	TOTAL (KM.)
National	5.00	-	-	-	**5.00**
Provincial	4.50	6.700	-	-	**11.20**
Municipal	8.44	-	-	-	**8.44**
Barangay	39.80	3.062	51.26	-	**94.11**
TOTAL	**59.07**	**7.062**	**52.63**	**-**	**118.75**

Source: Comprehensive Land Use Plan of Sison

Literacy Rate and Educational Facilities

342 The literacy rate, based on the CLUP, in the municipality of Sison was estimated at (95.62%) in 2015.

343 The number of both private and public academic institutions spread throughout Sison are: 30 pre-school centers, 28 day-care centers, 29 primary/elementary schools, 11 secondary/high school and 1 tertiary institution. The detailed breakdown of the academic institutions is presented in **Table** 2-54.

Table 2-54: Academic Institutions in Sison

ACADEMIC INSTITUTIONS	PRIVATE	PUBLIC	TOTAL
Pre-School	2	28	**30**
Day Care Center	0	28	**28**
Elementary	2	27	**29**
Secondary	2	9	**11**
Tertiary	1	0	**1**
TOTAL	**7**	**92**	**99**

Source: Comprehensive Land Use Plan of Sison

344 In Pozorrubio, the literacy rate in 2015 was at (95.66%). The proportion of household population who were able to read and write a simple message was registered at (95.45%). It can be noted that the female literacy rate of (95. 67%) was slightly higher that among male of (95.65%).

345 In terms of educational attainment (**Table** 2-55), in 4 out of 5 impact barangays, most of the respondents were able to reach or finish high school education. It can be noted that in Barangay Labayug, majority of the respondents were able to reach or graduate college.

Table 2-55: Educational Profile of the Household Heads in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
Category	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
Elementary	5	11%	4	21%	5	8%	11	18%	13	26%	19	32%
High School	14	30%	4	21%	**31**	**52%**	**32**	**53%**	**33**	**66%**	**30**	**50%**
College	**15**	**33%**	2	11%	17	28%	8	13%	3	6%	5	8%
Vocational	11	24%	2	11%	5	8%	8	13%	0	0%	5	8%
Others	0	0%	**6**	**32%**	0	0%	1	2%	1	2%	1	2%
No Answer	1	2%	1	5%	2	3%	0	0%	0	0%	0	0%

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

2.4.6 Threat to Public Health and Safety

346 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. **Northern Cement Corporation** will conduct medical missions and provide regular check-ups to its workers and the host communities. In addition, there will be constant coordination with the Municipal Health Officers (MHOs) and barangay health units (BHUs) to address health-related needs of the community.

347 Crime 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.

348 Furthermore, drinking may result to the commission of crimes if not properly handled. It is anticipated therefore that social problems may arise as an aftermath of a fluid local economy. Northern Cement Corporation will continue to 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 times, the workers are in the plant premises.

Health Facilities

349 The Municipality of Sison currently has 1 Rural Health Unit (RHI) located near the Municipal Hall and 28 Barangay Health Stations to cater to the health needs of the people. In terms of the number of medical professionals complimenting the available health facilities in the area, the municipality has a Municipal Health Officer (MHO), dentist, nurses, population officer, sanitary inspector, medical technologist and 10 midwives.

Morbidity

350 **Table** 2-56 presents the leading causes of morbidity in the Municipality of Sison from 2014 to 2018. In 2014 to 2017, hypertension leads the cause of morbidity in the municipality. Further, in 2018, it was second only to urinary tract infection (URTI) by 241 cases. Majority of the morbidity cases are related to respiratory diseases, with some lifestyle diseases. Based from the CLUP, it was noted that the respiratory diseases experienced in Sison was attributed to the changing weather condition and poor health status of the people.

Table 2-56: Leading Causes of Morbidity in Sison (2014-2018)

2014			2015			2016			2017			2018		
CAUSE	**NO.**	**RATE**	**CAUSE**	**NO.**	**RATE**	**CAUSE**	**NO.**	**RATE**	**CAUSE**	**NO.**	**RATE**	**CAUSE**	**NO.**	**RATE**
Hypertension	542	11.98	**Hypertension**	720	15.81	**Hypertension**	825	17.99	**Hypertension**	1,343	26.49	**Upper Respiratory Tract Infection**	778	15.12
Pneumonia	521	11.51	**Pneumonia**	635	13.94	**Pneumonia**	807	17.6	**Pneumonia**	699	13.79	**Hypertension**	537	10.43
Acute Respiratory Infection	226	4.99	**Acute Respiratory Infection**	337	7.4	**Acute Respiratory Infection**	755	16.47	**Acute Respiratory Infection**	311	6.13	**Pneumonia**	296	5.75
Influenza	213	4.7	**Influenza**	287	6.3	**Influenza**	366	7.98	**Influenza**	306	6.03	**Bronchitis**	183	3.55
Iron Deficiency Anemia	127	2.8	**Diarrhea**	140	3.07	**Diabetes Mellitus**	234	5.1	**Bronchitis**	196	3.86	**Influenza**	96	1.86
Acute Gastroenteritis	117	2.58	**Tuberculosis**	107	2.34	**Bronchitis**	196	4.27	**Iron Deficiency Anemia**	139	2.74	**Acute Gastro Enteritis**	89	1.73
Tuberculosis	91	2.14	**Iron Deficiency Anemia**	104	2.28	**Tuberculosis**	149	3.18	**Tuberculosis**	102	2.01	**Urinary Tract Infection**	66	1.28
Bronchitis	55	1.21	**Animal Bite**	34	0.74	**Iron Deficiency Anemia**	144	3.14	**Diarrhea**	95	1.08	**Rhinitis**	49	0.95
Animal Bite	41	0.9	**Diabetes Mellitus**	17	0.37	**Diarrhea**	73	1.59	**Diabetes Mellitus**	40	0.78	**ATP**	45	0.87
Chicken Pox	31	0.68	**Asthma**	9	0.15	**Animal Bite**	32	0.69	**Animal Bite**	19	0.37	**Bronchial Asthma**	34	0.66

Source: Comprehensive Land Use Plan of Sison
Municipal Health Office of Sison

351 In line with the municipal health data of Sison, the health reports (**SEE: Table** 2-57), from period 2014 to 2018, from the Barangay Local Government Units (BLGUs) of Labayug, Calunetan and Inmalog reported similar causes of morbidities reflected on the municipal health data. Common illnesses such as fever, cough, colds, diarrhea and influenza are observed in the 3 barangays. Further, there were also reported cases of pulmonary tuberculosis, hypertension, animal bites and chickenpox in the barangays.

Table 2-57: Leading Causes of Morbidity in NCC Impact Barangays (2014-2018)

2014		2015		2016		2017		2018	
BRGY. LABAYUG									
CAUSE	**NO.**	**CAUSE**	**NO.**	**CAUSE**	**NO.**	**CAUSE**	**NO.**	**CAUSE**	**NO.**
Fever	490	Fever	505	Cough	579	Cough	416	Cough	576
Cough	315	Cough	487	Fever	311	Fever	398	Fever	439
Colds	35	Colds	23	Colds	105	Colds	92	Colds	85
				Diarrhea	42	Diarrhea	83	Diarrhea	41
				Pulmonary Tuberculosis	8			Pulmonary Tuberculosis	4
BRGY. CALUNETAN									
CAUSE	**NO.**	**CAUSE**	**NO.**	**CAUSE**	**NO.**	**CAUSE**	**NO.**	**CAUSE**	**NO.**
Colds	40	Cough	27	Cough	37	Cough	38	Fever	37
Cough	39	Headache	15	Colds	32	Colds	37	Cough	27
Fever	15	Colds	14	Fever	22	Hypertension	15	Colds	25
Headache	11	Hypertension	12	Hypertension	13	Fever	10	Headache	20
Hypertension	10	Fever	10	Headache	10	Headache	4	Hypertension	11
BRGY. INMALOG									
2014		**2015**		**2016**		**2017**		**2018**	
CAUSE	**NO.**	**CAUSE**	**NO.**	**CAUSE**	**NO.**	**CAUSE**	**NO.**	**CAUSE**	**NO.**
Fever	101	Cough	103	Colds	112	Fever	91	Colds	116
Cough	98	Fever	98	Cough	110	Colds	81	Cough	111
Colds	75	Influenza	86	Fever	97	Cough	76	Influenza	105
Diarrhea	60	Colds	81	Influenza	15	Pulmonary Tuberculosis	4	Pulmonary Tuberculosis	6
Chicken Pox	7	Animal Bite	6	Diarrhea	6				

Source: Barangay Local Government Unit of Labayug, Calunetan and Inmalog

Mortality

352 **Table** 2-58 presents the leading causes of mortality in the Municipality of Sison from 2014 to 2018. In 2014 to 2017, senility or old age was the leading cause of mortality in the municipality. However, in 2018, It was taken over by Cerebrovascular Accident with 11 cases. As with the morbidity cases, most of the deaths were related to respiratory and lifestyle diseases.

Table 2-58: Leading Causes of Mortality in Sison (2014-2018)

2014					2015					2016				
CAUSES	**MALE**	**FEMALE**	**TOTAL**	**RATE (%)**	**CAUSES**	**MALE**	**FEMALE**	**TOTAL**	**RATE (%)**	**CAUSES**	**MALE**	**FEMALE**	**TOTAL**	**RATE (%)**
Senility	26	41	67	1.48	Senility	20	38	58	1.27	Senility	14	25	39	0.85
Cerebrovascular Accident	22	15	37	0.81	Cancer	18	11	29	0.63	Cancer	10	19	29	0.63
Cancer	17	13	30	0.66	Cerebrovascular Accident	13	13	26	0.57	Pneumonia	13	10	23	0.5
Pneumonia	13	3	16	0.35	Pneumonia	9	13	22	0.59	Accident	5	8	13	0.28
Myocardial Infraction	8	4	12	0.26	Myocardial Infraction	8	8	16	0.35	Cerebrovascular Accident	8	4	12	0.26
Hypertension	5	7	12	0.26	Cardiovascular Accident	11	3	14	0.3	Hypertension	3	6	9	0.19
Pulmonary Tuberculosis	4	5	9	0.19	Pulmonary Tuberculosis	6	4	10	0.21	Myocardial Infraction	3	5	8	0.17
Asthma	4	4	8	0.17	Asthma	5	4	9	0.19	Diabetes Mellitus	3	5	8	0.17
Chronic Obstructive Pulmonary Disease	7	0	7	0.15	Diabetes Mellitus	2	5	7	0.15	Pulmonary Tuberculosis	4	2	6	0.13
Renal Disease	4	5	9	0.13	Septicemia	3	3	6	0.13	Anemia	2	2	4	0.08

2017					2018				
CAUSES	MALE	FEMALE	TOTAL	RATE (%)	CAUSES	MALE	FEMALE	TOTAL	RATE (%)
Senility	29	37	**66**	1.3	**Cerebrovascular Accident**	5	6	**11**	0.21
Pneumonia	17	12	**29**	0.57	**Cancer**	6	0	**6**	0.11
Cerebrovascular Accident	18	10	**28**	0.55	**Acute Debilitating Disease**	3	2	**5**	0.09
Myocardial Infraction	19	5	**24**	0.47	**Accident**	4	0	**4**	0.7
Cancer	12	10	**22**	0.43	**Pneumonia**	1	2	**3**	0.5
Cardiovascular Disease	9	5	**14**	0.27	**Bronchial Asthma**	1	2	**3**	0.5
Chronic Obstructive Pulmonary Disease	7	1	**8**	0.15	**Myocardial Infraction**	2	0	**2**	0.03
Accident	6	1	**7**	0.13	**Diabetes Mellitus**	0	2	**2**	0.03
Severe Malnutrition	2	4	**6**	0.11	**Pulmonary Tuberculosis**	1	1	**2**	0.03
Pulmonary Tuberculosis	4	1	**5**	0.09	**Severe Malnutrition**	0	1	**1**	0.02

Source: Comprehensive Land Use Plan of Sison
Municipal Health Office of Sison

353 **Table** 2-59 presents the common diseases that affect the households in the project impacts area. Based on the respondents, almost all of the respondents from the 5 impact barangays were able to experience having cough or flu, and in Brgy. Labayug, 45 or (98%) have experienced it. This was followed by fever or headache, with all 5 impact barangays having experienced it.

354 Further, a good percentage of the respondents mentioned that they or their family members had diarrhea.

355 It can be noted that respiratory illnesses or diseases were relatively low in all 5 impact barangays.

Table 2-59: Common Diseases that Affect the Households in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
Category	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
Fever, headache	31	67%	10	53%	32	53%	39	65%	27	54%	28	47%
Cough, flu	**45**	**98%**	**15**	**79%**	**37**	**62%**	**46**	**77%**	**44**	**88%**	**38**	**63%**
Diarrhea	20	43%	2	11%	5	8%	21	35%	21	42%	11	18%
Dengue, malaria	1	2%	1	5%	1	2%	3	5%	2	4%	1	2%
Respiratory diseases	1	2%	1	5%	0	0%	0	0%	4	8%	3	5%
Heart diseases	1	2%	0	0%	1	2%	4	7%	2	4%	4	7%
Others	1	2%	1	5%	0	0%	5	8%	1	2%	11	18%
No Answer	0	0%	1	5%	3	5%	4	7%	1	2%	5	8%

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

Safety Statistics of NCC

356 **Table** 2-60 and **Table** 2-61 present the safety statistics of **Northern Cement Corporation** and its service contractors for the years 2018 to 2019, respectively. For 2018, a total of 1,119,896 man-hours were rendered by NCC employees with only 5 non-loss time accidents (NLTA) and 3 non-fatal loss time accidents (LTA). In addition, for 2019 (June), a total of 550,316 man-hours were rendered by NCC employees with only 3 non-fatal LTAs.

357 For **Northern Cement Corporation's** service contractors, a total of 4,589,330 man-hours were rendered in 2018 with only 6 non-LTAs and 5 non-fatal LTAs. Further, in 2019 (June), a total of 3,053,652 man-hours were rendered by the service contractors, with only 11 non-LTAs.

Table 2-60: Safety Statistics of NCC and its Contractors (2018)

MONTHS	ACCIDENTS				MANHOURS WORKED
	NON-LOST TIME	LOST TIME		DAYS LOST	
		NON-FATAL	FATAL		
A. NORTHERN CEMENT CORPORATION					
January	0	0	0	0	90,579
February	1 (Male)	0	0	0	90,038
March	0	0	0	0	92,467
April	0	0	0	0	91,592
May	0	1 (Male)	0	3	91,498
June	0	0	0	0	95,267
July	0	1 (Males)	0	0	102,339
August	2 (Males)	0	0	5	90,986
September	0	0	0	0	99,965
October	0	0	0	0	89,659
November	0	0	0	0	91,524
December	2 (Males)	1 (Male)	0	22	93,982
TOTAL	**5**	**3**	**0**	**30**	**1,119,896**
B. SERVICE CONTRACTORS					
January	3 (Males)	0	0	0	323,713
February	1 (Male)	0	0	0	335,018
March	2 (Males)	0	0	0	335,515
April	0	0	0	0	293,096
May	0	1 (Male)	0	12	313,577
June	0	4 (Males)	0	9	370,671
July	0	0	0	0	380,803
August	0	0	0	0	405,383
September	0	0	0	0	394,694
October	1	0	0	0	443,409
November	0	0	0	0	503,602
December	0	0	0	0	489,849
TOTAL	**6**	**5**	**0**	**21**	**4,589,330**

Source: Northern Cement Corporation

Table 2-61: Safety Statistics of NCC and its Contractors (2019)

MONTHS	ACCIDENTS				MANHOURS WORKED
	NON-LOST TIME	LOST TIME		DAYS LOST	
		NON-FATAL	FATAL		
A. NORTHERN CEMENT CORPORATION					
January	0	0	0	0	93,456
February	0	0	0	0	90,896
March	0	0	0	0	87,780
April	0	0	0	0	96,488
May	0	1 (Male)	0	7	88,725
June	0	2 (Males)	0	39	92,971
TOTAL	**0**	**3**	**0**	**46**	**550,316**
B. SERVICE CONTRACTORS					
January	1 (Male)	0	0	0	479,772
February	5 (Males)	0	0	0	528,329
March	0	0	0	0	538,744
April	3 (Males)	0	0	0	515,306
May	2 (Males)	0	0	0	515,306
June	0	0	0	0	476,195
TOTAL	**11**	**0**	**0**	**0**	**3,053,652**

Source: Northern Cement Corporation

2.4.7 Generation of Local Benefits from the Project

358 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.

359 The positive impacts of the project are the following:

- generation of additional source of income and livelihood;
- additional revenue for the local government;
- increased basic social services; and
- addition and improvement of local residential dwellings.

360 These benefits were further enhanced through the implementation of various social development programs responsive to local needs in the impact area.

Livelihood

361 Based on the Comprehensive Land Use Plan of Sison, the primary drivers of the economy in the municipality are agriculture and quarrying/mining.

362 For the Municipality of Pozorrubio, the municipality is primarily engaged in agricultural activities.

Income Sources

363 In terms of income sources of the households (**Table** 2-62) in 3 out of 5 impact barangays, majority are from farming. In Barangay Paldit, most of the respondents were earning their living by being a private employee (30%). A good percentage of the respondents were engaged in the transportation and labor services.

Table 2-62: Income Sources of Households in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
Category	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
Barangay Official	2	4%	0	0%	4	7%	7	12%	3	6%	4	7%
Government Employee	2	4%	1	5%	2	3%	1	2%	1	2%	1	2%
Private Employee	7	15%	0	0%	**18**	**30%**	2	3%	0	0%	4	7%
Laborer/Contractor	2	4%	0	0%	15	25%	8	13%	13	26%	6	10%
Tricycle/Jeepney Driver	5	11%	2	11%	6	10%	10	17%	3	6%	3	5%
Farmer	10	22%	**14**	**74%**	4	7%	**20**	**33%**	**22**	**44%**	15	25%
Fisherfolk	0	0%	0	0%	0	0%	1	2%	0	0%	0	0%
Own Business	2	4%	0	0%	0	0%	5	8%	0	0%	2	3%
None	1	2%	0	0%	3	5%	1	2%	3	6%	1	2%
Others	**11**	**24%**	1	5%	5	8%	5	8%	4	8%	**23**	**38%**
No Answer	4	9%	1	5%	3	5%	0	0%	1	2%	1	2%

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

Average Monthly Income

364 In terms of income profile of the households (**Table** 2-63), in all impact barangays, majority of the respondents mentioned that they were just earning, on the average, between Php 0.00 to 5,000.00 a month. There were below (20%) of the respondents in all impact barangays who mentioned that they were earning between Php 5,001.00 to 15,000.00 a month.

365 Based on the PSA average family income in 2015, the estimated average family income for the Filipino families is Php 22,000.00 or Php 267,000.00 per year. Given the responses, most of the

families in the impact barangays were earning way below the national average family income. It can be noted that in the average family expenditure was pegged at Php 215,000.00 pesos per year.

Table 2-63: Income Profile of Households in the Project Impact Area

Municipality	Sison		Sison		Sison		Sison		Sison		Pozorrubio	
Barangay	Labayug		Labayug S. Saguitlang		Paldit		Inmalog		Calunetan		Sugcong	
Respondents	46		19		60		60		50		60	
Category	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total	No.	% total
0-5,000 PHP	**23**	**50%**	**13**	**68%**	**26**	**43%**	**35**	**58%**	**44**	**88%**	**39**	**65%**
5,001-10,000 PHP	6	13%	1	5%	10	17%	12	20%	3	6%	10	17%
10,001-15,000 PHP	8	17%	2	11%	7	12%	7	12%	0	0%	2	3%
15,001-20,000 PHP	0	0%	1	5%	5	8%	0	0%	1	2%	0	0%
More than 20,000 PHP	3	7%	1	5%	5	8%	0	0%	0	0%	1	2%
No Answer	6	13%	1	5%	7	12%	6	10%	2	4%	8	13%

Note: Based on the Socio-Economic and Perception Survey conducted on July 2019

Employment Statistics of NCC

366 **Table** 2-64 presents the number of **Northern Cement Corporation** living in the host municipality, Sison, Pangasinan. As indicated in the table, there are around 327 employees living in Sison and 258 (78.9%) of which are living within the SDMP barangays of **Northern Cement Corporation**. Further, Barangay Paldit is home to (67%) of the employees living in Sison, while only (12%) are living in Barangay Labayug (Host Barangay).

367 At present, the total number of employees working in the cement operations of **Northern Cement Corporation** is 486.

Table 2-64: Barangay Residences of NCC Employees (Sison, Pangasinan)

NO.	BARANGAYS	NO. OF EMPLOYEES LIVING IN SISON
1	**Paldit**	**218**
2	**Labayug**	**38**
3	**Inmalog**	**1**
4	Gorgordion	10
5	Pindangan	5
6	Cauringan	3
7	Asan Sur	27
8	Bila	14
9	**Saguitlang**	**1**
10	Landingan	1
11	Asan Norte	2
12	Poblacion Norte	4
13	Poblacion Sur	2
14	Amagbagan	1
	TOTAL	**327**

Source: Northern Cement Corporation

368 There are 23 service contractors of **Northern Cement Corporation** working on the cement plant operations, as presented in **Table** 2-65. From the table, there are around 2,143 contractor personnel, which is disaggregated by 76 females and 2,067 males.

Table 2-65: NCC Contractors (with Employees)

NO.	NAME OF CONTRACTORS	FEMALE	MALE	TOTAL
1	ALL ASIA	3	131	134
2	ALLEN ENG'G	0	53	53
3	AMPANI	1	30	31
4	ANTA	4	133	137
5	ARCHEN	3	13	16
6	CATHAY INDUSTRIAL	0	34	34
7	DELTA CONSTRUCTION	3	67	70
8	DELTA QUARRY	13	84	97
9	DISSCOR	6	45	51
10	EBATECH	1	12	13
11	E.C.D.I.	5	68	73
12	E.E.I.	7	386	393
13	GBH CONSTRUCTION	4	86	90
14	HAYAMA	0	31	31
15	LAWIN	2	26	28
16	M.E.B.	2	170	172
17	PIEDRA	1	21	22
18	PNWLC	1	13	14
19	POSITIF	4	163	167
20	SANTA CROCE	11	273	284
21	SD PLATOON	0	22	22
22	TEKTON	1	18	19
23	UNIMAN	4	188	192
	TOTAL	**76**	**2,067**	**2,143**

Source: Northern Cement Corporation

369 **Table** 2-66 presents the geographic demographics of the service contractors manpower living in the municipalities of Sison and Pozorrubio, Pangasinan. From the table, around 1,231 contractors are situated in the abovementioned municipalities. Around (71%) of which are from Sison and 592 (68%) are living in the SDMP barangays in Sison. For Pozorrubio, around (35%) of the contractors are residing in the impact barangay (Barangay Sugcong).

370 These information and employment statistics indicate that a good portion of the employees, both **Northern Cement Corporation** and its contractors, are employed within the host municipality and nearby municipalities in Pangasinan.

Table 2-66: Barangay Residences of NCC Contractors (Sison and Pozorrubio, Pangasinan)

SISON			POZORRUBIO		
NO.	BARANGAYS	NCC CONTRACTORS	NO.	BARANGAYS	NCC CONTRACTORS
1	Agat	2	1	Alipangpang	13
2	Alibeng	8	2	Amagbagan	7
3	Amagbagan	13	3	Balacag	2
4	Artacho	1	4	Banding	0
5	Asan Norte	5	5	Bantugan	0
6	Asan Sur	101	6	Batakil	10
7	Bantay Insik	0	7	Bobonan	12
8	Bila	74	8	Buneg	15
9	Binmeckeg	1	9	Cablong	2
10	Bulaoen East	1	10	Casanfernandoan	0
11	Bulaoen West	1	11	Castaño	1
12	Cabaritan	6	12	Dilan	6
13	**Calunetan**	**19**	13	Don Benito	0
14	Camangaan	6	14	Haway	1

SISON			POZORRUBIO		
NO.	BARANGAYS	NCC CONTRACTORS	NO.	BARANGAYS	NCC CONTRACTORS
15	Cauringan	11	**15**	Imbalbalatong	24
16	ECJ Housing	6	**16**	Inoman	15
17	Dungon	0	**17**	Laoac	4
18	Esperanza	2	**18**	Maambal	2
19	**Inmalog**	**72**	**19**	Malasin	2
20	Killo	10	**20**	Malokiat	2
21	**Labayug**	**214**	**21**	Manaol	1
22	**Paldit**	**287**	**22**	Nama	9
23	Pindangan	0	**23**	Nantangalan	0
24	Pinmilapil	1	**24**	Palacpalac	11
25	Poblacion Central	9	**25**	Palguyod	4
26	Poblacion Norte	6	**26**	Poblacion I	2
27	Poblacion Sur	14	**27**	Poblacion II	0
28	Sagunto	3	**28**	Poblacion III	4
29	Tara-tara	1	**29**	Poblacion IV	2
	TOTAL	**874**	**30**	Rosario	15
			31	**Sugcong**	**125**
			32	Talogtog	3
			33	Tulnac	0
			34	Villegas	63
				TOTAL	**357**

Source: Northern Cement Corporation

2.4.8 Traffic Congestion

371 Public transportation options in the area include buses, jeepneys and tricycles that travel to neighboring barangays and neighboring cities/municipalities. Residents also have private vehicles ranging from cars, vans, tricycles and motorcycles.

372 An estimated 25% increase in additional trucks per day will come in and out of the plant site, on top of the existing plant operations. However, traffic congestion will not be a concern given that the access road to and from the plant site is private. Furthermore, Northern Cement Corporation will allocate additional parking area to complement the existing truck marshalling area within existing cement plant complex.

373 Traffic may also increase in the National Road (Maharlika Highway) due to delivery trucks coming in and out of the cement complex. Traffic congestion shall be mitigated with the support of the surrounding Local Government Units (LGUs) in terms of scheduling and handling the flow of traffic near the project area.

374 To mitigate the said impact, **Northern Cement Corporation** shall develop a traffic management plan with the LGU of Sison. The following measures were included in the plan:

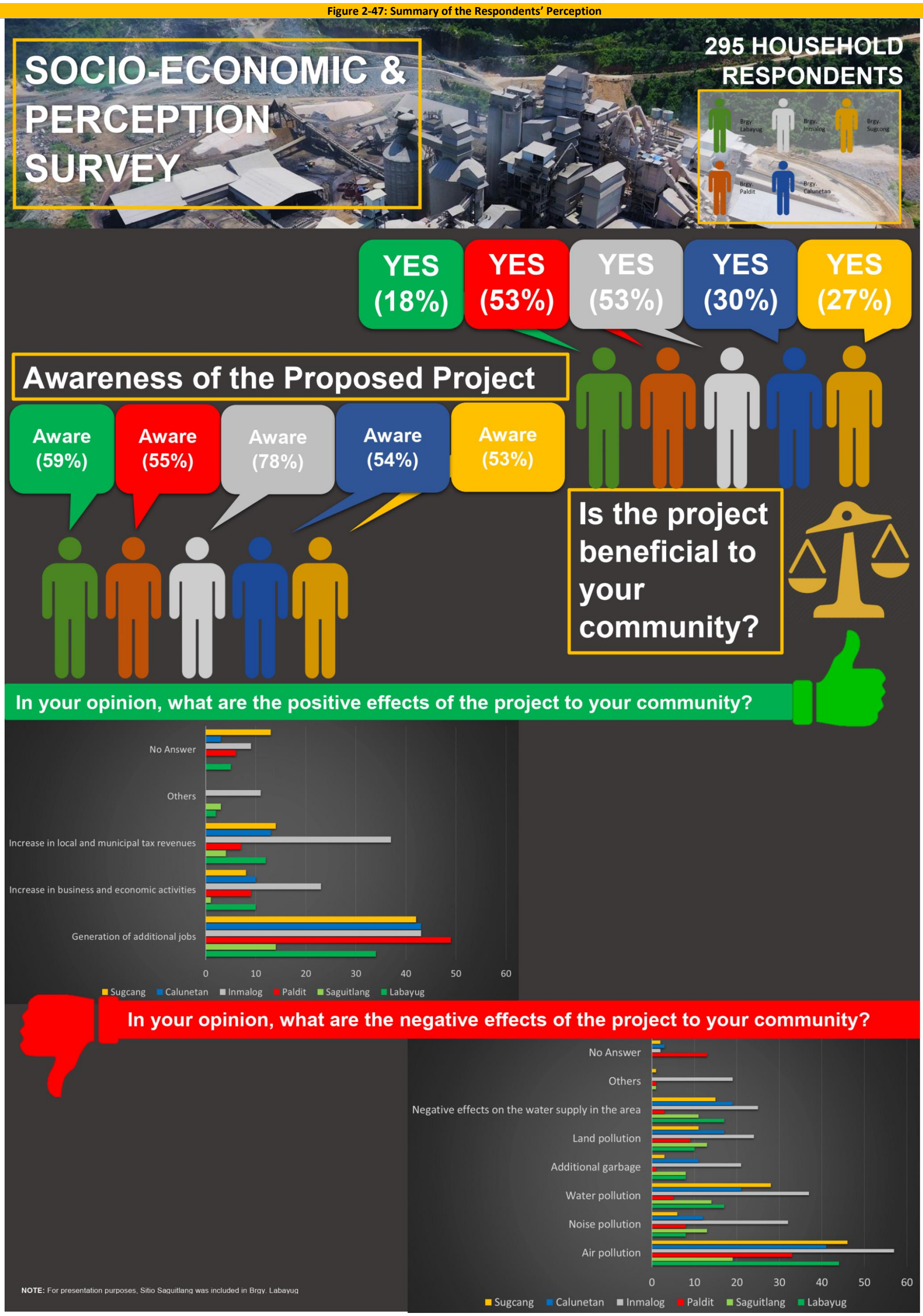
- Coordination with LGU of Sison and surrounding LGUs;
- Lane designation and speed limit;
- Regulation of truck deployment;
- Provision of safety barriers, warning signs and lights, traffic marshals within the vicinity of project sites, and adequate parking spaces;
- All deliveries of construction materials 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

- Assistance of security personnel in directing traffic of vehicles coming in and out of the facility.

2.4.9 Social Acceptability and Perception

375 **Figure** 2-47 summarizes the social acceptability and perception of the 295 respondents from Barangays Labayug, Paldit, inmalog, Calunetan and Sugcong regarding the proposed expansion project.

Figure 2-47: Summary of the Respondents' Perception



PROJECT PROPONENT:	FIGURE TITLE: **SUMMARY OF THE RESPONDENT'S PERCEPTION**	FIGURE NO.: **2-47**
EPRMP REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI Envi Corporation Perception Survey

2.4.10 Summary of Baseline Findings, Impacts and Mitigation on People

376 The following table lists the impacts and mitigation on People.

Table 2-67: Summary of Significant Baseline Findings and Potential Impacts and Mitigation on People

Summary of Baseline Findings on People:

- Water supply sources in Sison and Pozorrubio include piped connection, deep wells, shallow wells and spring sources.
- Sison is served by 2 power supply service providers namely: Benguet Electric Cooperative (BENECO) and La Union Electric Cooperative (LUELCO).
- The municipality of Pozorrubio is served by a power supply service provider namely: Pangasinan III Electric Cooperative, Inc. (PANELCO III).
- The consistent leading cause of morbidity in Sison (2014-2018) was Hypertension and Upper Respiratory Tract Infection.
- Based on the perception survey, (~60%) of all the respondents have prior knowledge about the proposed project. (36.2%) of the respondents believed that the proposed project would be beneficial for their respective communities.
- The most cited potential positive impact of the project for the impact Barangays is employment generation (76%), followed by increased local tax revenue collection (28%).
- Conversely, the most cited potential negative impact of the project is air pollution (84%), followed by water (45%) and land (33%) pollution.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURE
In-migration	N/A	The project only requires 86 manpower for construction and 306 manpower in operation	Prioritization of hiring qualified local workers
Cultural/Lifestyle Change	Operation	No known IPs residing near or within the project area, hence no perceived cultural and lifestyle changes (for IPs) expected to result from the project Increase in income can introduce and expose workers and community to vices that tend to undermine morality	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 Installation of CCTVs in strategic places
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 is for maintenance and domestic use. There will be a construction of a new deep well for the project. The project will be served by the NCC substation to power the offices and utilities to be constructed within the project area	N/A
Threat to Public Health and Safety	Construction Operation	Dust may cause negative health effects (i.e., respiratory) to the community and workers if not properly mitigated	Conduct of medical missions and regular check-ups to workers and host barangay

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURE
		Crime incidence may also increase in the local community	Coordination with Municipal Health Officer (MHO) 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	Operation	Generation of additional source of income and livelihood Additional revenue for the local government Increased basic social services Addition and improvement of local residential dwellings	Implementation of social development programs that are responsive to local needs in the impact area
Traffic Congestion	Construction Operation	Increase in traffic generation in the area due to delivery trucks coming in and out of the cement plant complex	Coordination with LGU on scheduling and handling the flow of traffic near the project area

SECTION 3

ENVIRONMENTAL MANAGEMENT PLAN

3.1 Impacts during Construction Phase

3.1.1 Physical Environment

3.1.1.1 Land

377 The major impacts during construction phase are solid waste production and possible soil contamination.

Generation of Solid Wastes

378 Construction wastes such as fill materials, empty cement bags, wood, steel and other construction spoils are expected to be generated during the construction phase of the expansion project. Aside from this, the construction workers will be generating domestic solid wastes. A solid waste management plan will be developed and implemented by the contractors with the supervision of NCC.

379 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. Hauling-out of the solid wastes for disposal will be done by accredited service providers. Details that shall be considered in the development of the waste management plan are discussed in Section 3.5.

Generation of Hazardous Wastes

380 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 to RA 6969. A temporary hazardous waste storage area will also be provided in the 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.

Soil Contamination

381 Since heavy equipment will be used during construction, there is a risk of soil contamination due to possible oil spills during maintenance activities of the heavy equipment. It is advisable to use sawdust, rice hulls, or coir dusts to absorb accidental oil spills.

3.1.1.2 Water

Groundwater and Surface Water Contamination

382 Domestic wastewater will 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.

3.1.1.3 Air and Noise

Gaseous Emissions

383 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 phase will only take several months until project completion. 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.

Noise Generation

384 Noise may also be generated by construction operations and equipment. Although construction works are expected to occur regularly, the impacts may be considered temporary.

Table 3-1: Expected Noise Levels from Heavy Equipment, db(A)

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

Table 3-2: DENR Standards for Noise Levels in General Areas, db(A)

TIME	CATEGORY AREA				
	AA	A	B	C	D
Day Time (9am-6pm)	50	55	65	70	75
Morning/Evening (5am-9am) & (6pm-10pm)	45	50	60	65	70
Night Time (10pm-5am)	40	45	55	60	65
Note: Area AA:	Section or contiguous area which requires quietness, such as an area within 100 meters from school sites, nursery school, hospitals, and special homes for the aged.				
Area A:	Section or contiguous area which is primarily used for residential purposes.				
Area B:	Section or contiguous area which is primarily a commercial area.				
Area C:	Section primarily reserved as a light industrial area.				
Area D:	Section which is primarily reserved as a heavy industrial area.				
Source: UP NCTS Environmental Text Series					

3.1.2 Biological Environment

385 The expansion of the NCC Line 1 and Line 2 will not involve removal of vegetation since the expansion will be situated in a developed area already.

386 However, anthropogenic movements, noise, and vibrations may drive wildlife away from the ecosystem and may cause temporary or permanent migration of the faunal species in other or nearby areas/habitat where disturbance is less. Ecosystem conservation and rehabilitation are recommended prior to and after construction and operation.

3.1.3 Socio-Economy

Accessibility and Circulation Concerns

387 Traffic is not an issue in the project area at present. However, heavy equipment mobilization may affect travel time and road condition. Early notice to the public of upcoming activities is an obligation of the Contractor. Installation of early warning device installations is a part of this mitigating measure. 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.

Local Economy

388 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.

Population

389 A temporary increase in population may occur during the construction phase as workers are brought into the area. Local labor will be sourced to meet the work force required by the construction. However, there may be cases were transient settlers may opt to stay in Barangay Labayog permanently (e.g. marriage, work opportunities, and etc.), thus increase in population may be realized. Consequently, there may be need for improved basic social services in the area.

Peace and Order

390 Presence of outsiders (i.e., migrant workers) can bring about difference in views and perspectives and new influence changing attitudes and bias. Peace and order may be upheld through strict law enforcement, regular patrolling, and apprehension of erring individuals.

3.1.4 Health and Safety

391 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.

392 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.

3.2 Impacts during Operational Phase

3.2.1 Physical Environment

3.2.1.1 Land

Generation of Solid Wastes

393 The operation of the cement plant is generating domestic solid wastes from its workers. With the expansion project, it is expected that the generated solid wastes will be increased. NCC is implementing its Solid Waste Management Program in its operation. It also has a materials recovery facility and practices composting in its nurseries. The quarry also generates mine wastes which are being used for backfilling.

Generation of Hazardous Wastes

394 Hazardous wastes generated by the project are used bulbs, oil and grease, empty chemical containers and others. These wastes are handled and disposed in accordance to RA 6969.

3.2.1.2 Water

Oil Spill

395 Oil spills from vehicle and equipment repair and maintenance may impact the ambient quality of the nearby surface water and groundwater during the operational phase. As a preventive measure, repair and maintenance are being done in a designated area with concrete flooring and canals constructed to channel any oil spills. Oil and water separator tanks are also installed in these areas.

Siltation

396 The quarry operation, especially during blasting, are also generating soil sediments that may be carried to the nearby creeks during heavy rain. This may increase the sediment yields of the receiving body of water. Siltation ponds are constructed in strategic areas within the cement plant and quarry area to pre-treat the surface run-off. These ponds are regularly maintained and desilted to prevent water pollution.

Domestic Wastewater Generation

397 Workers of the cement plant are also generating domestic wastewater. It is expected that with the expansion project, there will also be an increase on the number of workers thus, increase in the generation of domestic wastewater. Untreated domestic wastewater when discharged may cause water pollution., affecting the ecosystem of the nearby river.

398 On-site sanitation facilities with septic tanks are provided in the project site. The effluent of the septic tanks is discharged to the ponds.

Ground subsidence

399 The quantity of water supply may also be affected with the expansion project. Additional deep wells will be constructed to supply the additional water requirements of the project. Since the water supply is mainly from deep wells, ground subsidence may occur from excessive pumping, especially during dry seasons where lowering of groundwater table is normally experienced.

3.2.1.3 Air and Noise

Dust Generation

400 Dusts are generated during the quarry operation, the transport of quarried minerals to the cement plant and the operation of the cement plant specially in the bagging section. Too much exposure to dusts presents serious risks to human health. Dusts may cause irritation of the eyes, coughing and sneezing. Particulate matters when inhaled can also cause respiratory and cardiovascular diseases.

401 To minimize the dust emissions, covers are provided to the delivery trucks and regular sprinkling of the dirt roads is being done. As installed in its Line 1 and Line 2 cement production facilities, NCC will continue to utilize high-efficient equipment with baghouse filters and electrostatic precipitators to minimize and contain the fugitive dusts generated in its operation.

Gaseous emissions

402 Combustion of diesel fuel from the operation of heavy equipment for the quarry as well as cement plant equipment may emit pollutants such as CO, SO_2 and NO_x. All heavy equipment must be properly and regularly maintained to minimize their potential pollution emissions.

Noise and vibration

403 Noise and vibration maybe observed during the blasting activity in the quarry area. However, this impact will only be temporary because the noise will only occur for a split second during the blasting and a few seconds after the blasting due to the falling of rocks.

404 The operation of the heavy equipment and the machines may also generate noise and vibration. Continuous exposure to high noise intensity can cause hearing impairment which is irreversible. To reduce the occurrence and intensity of the noise and vibration, suppressers or mufflers will be installed.

3.2.2 Biological Environment

Vegetation

405 Areas that have been cleared of its natural vegetation may either regenerate original or similar species from residual plant parts. Vegetation succession about the project site shall sporadically grow with or without anthropogenic assistance.

406 Vegetation may be allowed to grow in the vicinity or structures unless they may promote system malfunction or are hazardous to people. Plant species with intrusive roots, moss, molds, lichens, and others that can cause damage to the structures installed for the excellent operation of the facilities should be removed and re-planted to a designated location if these species have economic, aesthetic, and ornamental importance.

Wildlife

407 Wildlife may find habitat in built structures in the long run. Unless the animals sighted pose danger, damage, or malfunction to the facility, structures must be maintained to encourage biological diversity succession. Constant monitoring and evaluation of species survival within identified habitat and those residing in the project site shall be conducted.

3.2.3 Socio-Economy

Local Economy

408 The expansion project may provide employment opportunities to qualified local residents which may become their source of income. The expansion project may also create various opportunities for retailing, services, buy and sell, and others. The basic needs of the community continue to grow, and these needs must be met. This is where the law of supply and demand comes in. Enterprising residents of the surrounding barangays can therefore look at the needs of the new occupants of the project and their dependents so that they can prepare what appropriate investment response will they adopt to earn some income.

409 The expansion project will also continually provide additional revenues for the local government in terms of taxes and dues. Laws and ordinances on tax collection and land registration must be properly implemented.

Population

410 Transient settlers may opt to stay permanently thus increase in population may be realized. Continuous improvement of infrastructures and support services for local constituents and in coming visitors is advised.

Peace and Order

411 Partiality between local residents and newcomers or migrant workers may occur. Peace and order may be upheld through strict law enforcement, regular patrolling, and apprehension of erring individuals

3.3 Unavoidable and Residual Impacts

412 Implementation of the proposed mitigating measures discussed in previous sections is expected to leave residuals, which should not adversely affect the people and the vicinity. Noise and vibration generated by the machines and equipment are attendant consequences. However, these can be reduced to tolerable levels by the use of suppressers or mufflers and other measures identified in the preceding pages. Noise and vibration residuals should be as low as possible so as not to cause nuisance to workers and the public.

413 Stacks of the cement plant also emit air pollutants. However, with proper design of the stack and the installation of air emission control devices, the impacts will be reduced.

3.4 Summary Matrix of Environmental Impact and Level of Significance

414 The summary of identified environmental impacts and its corresponding mitigating measures is presented in **Table** 3-3**.** The table also shows the validation of the effectiveness of the mitigating measures implemented by **Northern Cement Corporation**. In-house procedures are established and being implemented to ensure that the environmental management plans are able to mitigate the impacts of the project.

415 Waste management procedures are in place to manage all the wastes generated during the operation and to promote waste prevention, reduction and reuse. Proper segregation of the wastes is observed and are properly stored on-site prior to disposal. NCC also operates a materials recovery facility within the cement plant and also has a composting facility on-site.

416 To prevent water logging and water pollution, an effective drainage system is already in place that can also accommodate the expansion of the project. Siltation ponds are also installed in strategic

areas within the cement plant and quarry to catch the surface run-off that will be generated in the project site. The siltation ponds and the drainage system are regularly maintained and desilted. Sanitation facilities and septic tanks are installed to prevent groundwater pollution due to percolation of domestic wastewater. To mitigate water pollution brought about by oil spills, a spill management plan is already in place. Fortunately, there are no recorded oil spills within the cement plant to date.

417 To minimize water drawn from the creeks and deep wells, NCC is reusing desilted water from the siltation ponds for dust suppression and irrigation. Cooling water used in the cement plant is also being reused by NCC.

418 Fugitive dust emission is also a main concern in the operation of the cement plant and quarry. NCC has installed bag filters and electric precipitators in areas that generates dusts. Regular watering of the roads is also being done by NCC to prevent fugitive dust emissions caused by the vehicles. Results of ambient air monitoring prove that particulate matter and total suspended solids are being controlled and are within DENR standards.

419 The operation of the cement plant also emits air pollutants such as carbon monoxide, sulfur oxide and nitrogen oxide that are caused various machineries in the plant. Proper maintenance of the equipment and installation of air emission control devices were done by NCC to mitigate these emissions. Continuous Opacity Monitoring Systems (COMS) are being utilized by the plant to monitor emissions. The stack monitoring shows that particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide are being controlled by the various mitigating measures that are already in place.

420 Northern Cement Corporation prioritizes the health and safety of all its workers. The company has its Safety and Health Policy in place to ensure the implementation of its occupational health and safety plan. The policy includes the conduct of regular safety meetings, provision of PPEs, safety inspections and regular health check-up of the workers.

Table 3-3: 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	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
Construction Phase								
Construction and installation, including site facilities	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.	• NCC implements waste management procedures which include solid waste management procedure and scrap management procedure. • NCC operates an MRF. Waste is temporarily held in this area before disposal.	During the entire duration of construction activity	Covered by contract amount of Contractor Php40,000	Northern Cement Corporation	Contractor's EMP, Site Inspection Report
	The Land	Generation of hazardous wastes	• Collect, store and dispose hazardous wastes in accordance to RA 6969 • Treatment and dispose of hazardous wastes through DENR-	• NCC implements hazardous waste management procedure.	During the entire duration of construction activity	Covered by contract amount of Contractor	Northern Cement Corporation	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	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
			accredited waste treaters					
	The Water	• Possible siltation and surface runoff • Possible clogging of drainage due to siltation	• Establishment of sediment traps, erosion barriers, and silt curtains • Regular removal of silt and sediments	• NCC already constructed siltation ponds in the cement plant and quarry areas • NCC conducts regular maintenance of drainage system	During the entire duration of construction activities	Covered by the contract cost of the contractor	Northern Cement Corporation	Contractor's EMP, Site Inspection Report
	The Air	• Generation of dust	• Regular watering of construction site • Apply canvas cover on construction materials to avoid long exposure to strong winds	• NCC conducts regular watering of the roads. Water is allotted for watering	During the entire duration of construction activities	Covered by the contract cost of the contractor	Northern Cement Corporation	Contractor's EMP, Site Inspection Report
	The People	• Health hazards from dust emissions	• Implement dust control management • Proper PPEs to workers	• NCC implements Safety and Health Policy	During the entire duration of construction activities		Northern Cement Corporation	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	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
Use of heavy equipment, during construction works	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		During the entire duration of construction activities		Northern Cement Corporation	Contractor's EMP, Site Inspection Report
	The Land/The Water	Surface and groundwater contamination due to accidental oil spills/leaks	• Use sawdust, rice hulls, or coir dusts to absorb the oil spills • Maintain canal in the maintenance and repair area of vehicles and equipment	• NCC implements oil spill management procedures • Oil and water separator tanks are installed in the cement plant	During the entire duration of construction activities		Northern Cement Corporation	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	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	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 • Establish and maintain green zone to serve as natural noise barrier.	• Regular maintenance of equipment and vehicles are being done. • NCC maintains the Sapid Forest that serves as natural buffer zone of the cement plant.	During the entire duration of construction activities		Northern Cement Corporation	Contractor's EMP, Site Inspection Report
	The People	Traffic congestion	• Provide early warning devices/road signs • Provide parking spaces within project site	• Parking spaces are available inside the cement plant	During the entire duration of construction activities	Covered by the contract cost of the contractor	Northern Cement Corporation	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	• NCC implements waste management procedures which include solid waste management procedure and scrap	During the entire duration of construction activity	Covered by contract amount of Contractor Php40,000	Northern Cement Corporation	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	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
				management procedure. • NCC operates an MRF. Waste is temporarily held in this area before disposal.				
	The Water	Ground and surface water contamination from improper disposal of wastes, percolated wastewater, sludge and fecal matter.	• Provision of sanitation facilities for workers (e.g. toilets, showers, etc.)	• Sanitation facilities and septic tanks are installed in the cement plant	During the entire duration of construction activities	Covered by the contract cost of the contractor	Northern Cement Corporation	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	• NCC implements Safety and Health Policy • NCC has in-house physician	During the entire duration of construction activities		Northern Cement Corporation	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	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
	The People	Employment opportunities	Priority in hiring should be given to residents of host communities	Residents in the host barangay are given priority	Construction Stage	-----	Northern Cement Corporation	SDP
		Increased crime rate	Coordinate with barangay regarding imposition of laws and apprehension of erring individuals/groups of people	According to FGD conducted, residents do not have complaints regarding peace and order in the barangay	Construction stage	------	Northern Cement Corporation	SDP
Operation Phase								
Operation of cement plant	Air quality	Dust generation during cement processing	• Operate and maintain filter bags and electric precipitators in the equipment. • Assign sweepers to regularly remove dust in areas such as roads, parking areas, and other paved areas. • Implement speed limit in the vicinity of	• Results of ambient air monitoring are within DAO 2000-81 National Ambient Air Quality Values.	Operational stage	~P300,000	Northern Cement Corporation	Environmental Monitoring Report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
			the plant site to avoid re-suspension of dust. • Raw material and product storage areas are enclosed					
		Increased levels of CO, TSP, SO_2, NO_x brought about by vehicle and equipment emissions	• Operate and maintain electric precipitators, bag filters in the equipment • Proper maintenance should be done for the vehicles and equipment	Results of ambient air monitoring are within DAO 2000-81 National Emission Standards for Source Specific Air Pollutants	Operational stage	~P300,000	Northern Cement Corporation	Environmental Monitoring Report
	The Water	Runoff from plant operations	• Installation and maintenance of drainage system within the plant • Operate and maintain sedimentation ponds	• Rainwater drainage is constructed and maintained in the cement plant. • Sedimentation ponds are in place. NCC conducts maintenance of	Operational stage	~P200,000	Northern Cement Corporation	Environmental Monitoring Report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
				sedimentation ponds.				
	The Water	Ground and surface water contamination from improper disposal of wastes, percolated wastewater, sludge and fecal matter.	• Provision of sanitation facilities for workers (e.g. toilets, showers, etc.)	• Sanitation facilities and septic tanks are provided in the cement plant • Regular desludging of septic tanks is observed	Operational stage	~P30,000	Northern Cement Corporation	Environmental Monitoring Report
	The Water	Ground and surface water contamination due to oil spill from vehicles and equipment	• Use sawdust, rice hulls, or coir dusts to absorb the oil spills • Maintain canal in the maintenance and repair area of vehicles and equipment	• Oil spill management procedures is being implemented • Oil-water tanks separators are installed in the cement plant	Operational stage	~P50,000	Northern Cement Corporation	Environmental Monitoring Report
	The People	Occupational Health and Safety	• Proper training on safety • Provision of PPE	• NCC implements Safety and Health Policy	Operational stage		Northern Cement Corporation	Environmental Monitoring Report
Quarry Operations	The People	Increased occupational health and	• Proper storage of magazines	• NCC contractor stores explosives approximately	Prior to and during blasting operations	Covered by contract	Northern Cement Corporation	Handling and Blasting Procedure

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
		safety risks because of explosives use	• Extensive training for selected personnel in handling and operating explosives • Issuance of alarms and warning devices prior to and during blasting operations	800 meters away from the cement plant. • No recorded accidents involving explosives to date • NCC implements Safety and Health Policy		amount of contractor		
	The Land	Wildlife habitat formation	Monitoring and evaluation of species survival within identified habitat and those residing in the project site	• NCC conducts greening projects in adjacent barren areas and conducts progressive rehabilitation of quarry site • Mining Forest Program • National Greening Program	Operational stage	P100,000	Northern Cement Corporation	Environmental Monitoring Report/AEPEP
	The Air	Dust generation during	• Watering of quarry site and road.	Results of ambient air monitoring are within DAO 2000-81	Operational stage	~P300,000	Northern Cement Corporation	Environmental Monitoring Report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
		quarrying and transport of limestone	• Provision of covers of the trucks.	National Ambient Air Quality Values.				
	The Water	Run-off from quarry operations	• Provision of siltation ponds • Regular desilting	• NCC already constructed siltation ponds in the cement plant and quarry areas • NCC conducts regular maintenance of the siltation ponds	Operational stage		Northern Cement Corporation	Environmental Monitoring Report
Effect of operations on local economy	The People	Increased employment opportunities	Priority in hiring of personnel shall be given to the directly affected residents.	ECC contractors hire most of their workers from Brgy. Labayug. Workers from Sison and Pangasinan are also hired.	Operational stage		Northern Cement Corporation	SDP
		Increased tax revenue	Proper registration, tax contribution, land registration and other laws/ordinances shall be followed	ECC pays proper taxes	Operational stage		Northern Cement Corporation	Tax collection certificate
Influx of delivery trucks in the area	The Air	GHG emissions from delivery trucks	Implement carbon sink programs such as tree planting to mitigate GHG emissions	ECC conducts reforestation activities and greening projects.	Operational stage	~P100,000	Northern Cement Corporation	SDP

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	VALIDATION ON THE EFFECTIVENESS OF MITIGATING MEASURE (EQPL AS REFERENCE)	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
		Traffic congestion in Barangay Labayug	Ensure that delivery trucks are parked in the parking space provided by **NCC** Follow traffic management implemented by LGU. Provide early warning devices/road signs	NCC has a motorpool in front of the cement plant where trucks are parked NCC coordinates with local barangay regarding implementation of traffic rules	Operational stage		Northern Cement Corporation	Municipal / Barangay Development Plan

3.5 Construction Environmental Program

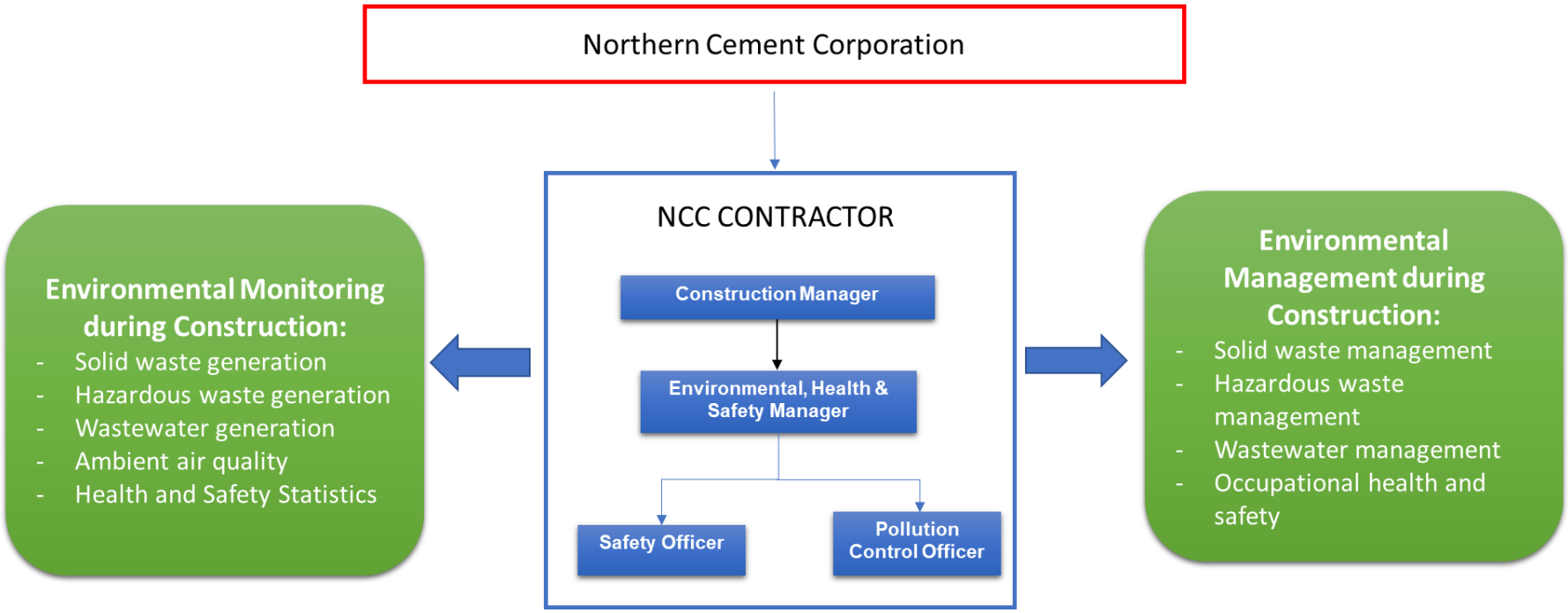
421 During the construction phase of the Project, the designated contractor for the Project shall implement and be responsible for its environmental program, under the supervision of Northern Cement Corporation. The designated contractor will be required to implement the EMP, in accordance to the ECC conditions.

422 The implementation of the Construction Environmental Program will be part for the scope of work of its contractor in accordance with the conditions stipulated in the ECC and will be supervised by the NCC. It shall include specific actions and measures such as:

- Provision of temporary lodging and sanitation amenities for workers, and liquid and solid waste handling/disposal facilities;
- Avoidance of unnecessary earth-movement;
- Worker and project site safety programs, including emergency response plans;
- Proper storage and disposal of hazardous wastes (i.e., used oils, oil-contaminated material, BFL etc.);
- Establishment of silt traps and erosion barriers around the project site;
- Regular removal of silts and sediments or as necessary;
- Worker and project site safety programs and emergency response plans;
- Provision of portable sanitation facilities to the workers and ensure safe disposal of wastewater generated;
- Proper segregation, storage, disposal of solid and hazardous wastes (i.e., used oils, etc.);
- 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)
- 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).
- Proper demobilization procedures (i.e. clean-up of construction sites, replacement/re-planting of removed trees).

423 Service contractors are strictly complying with all the requirements and mandates of the company related to implementation and continuous monitoring of hazardous waste management as part of their contract. Safekeeping of generated hazardous wastes are stored and secured in a specialized storage. Containment of hazardous wastes are labelled accordingly in compliance to R.A. 6969. Chemical and oil spill kits are available in the hazardous waste storage for emergency purposes. Generated hazardous wastes of service contractors are being disposed and treated by a DENR accredited waste treaters and transporters. Inventory and reporting are also being undertaken by service contractors thru the Environmental Management Bureau Regional Office.

Figure 3-1: Construction Management Framework



PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **CONSTRUCTION MANAGEMENT FRAMEWORK**	FIGURE NO.:
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

3.6 Solid Waste Management

424 The solid waste management plan of the NCC includes guidelines for solid waste avoidance and volume reduction through source reduction and waste minimization measures including composting, recycling, reuse, recovery, and other measures before collection and disposal in appropriate and environmentally sustainable development principle. It also presents guidelines on proper segregation, collection, storage and disposal of solid waste by adopting practical and environmentally sound practices that addresses minimization, generation, transport, disposal, and monitoring.

425 The Pollution Control Officer (PCO) of the NCC cement plant ensures the compliance of the operation to RA 9003 or the Ecological Solid Waste Management Act by strictly implementing their solid waste management program. The following practices are observed as part of their solid waste management program:

- Implementation of waste segregation (biodegradable and non-biodegradable) policy for all construction and operations personnel;
- Provision of solid waste handling and storage facilities, such as dumpsters, trash cans in common areas and strategic locations in the facility;
- The biodegradable wastes, such as discarded kitchen wastes and yard trimmings shall be composted;
- Implement a paper usage reduction program in the administration office by re-using paper for other similar purposes;
- The recyclable wastes, such as paper, plastics, and metals, shall be sorted accordingly and sold to waste service providers; and
- The residual and other general solid wastes shall be disposed in their appropriate bins and in accordance with the local solid waste collection schedule.

426 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

427 The hazardous waste management of the NCC complies with the requirement of RA 6969 or the Toxic Substances and Nuclear Waste Control Act of 1990. It covers the generation, segregation, labeling, collection, storage, transport, treatment, and final disposal of the hazardous wastes.

428 Hazardous wastes generated during the cement and quarry operation include waste oils, power transformers, used lead acid batteries (ULABs), busted fluorescent lamp (BFL) and oil-contaminated materials such as used gloves and rags. Spent and expired laboratory chemicals, under classification specified in DAO 2013-22, are also generated. Clinical wastes are also included.

429 All hazardous wastes are stored on-site prior to transport and treatment. These wastes are properly segregated and stored in containers in accordance to DAO 2013-22. Incompatible materials are not be stored near each other while waiting for pick-up. The segregation shall be in accordance with chemical properties, hazardous waste type, and hazardous waste state. All hazardous waste containers are properly labelled in reference to the requirements of DAO 2013-22.

430 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 is arranged by the PCO through the online hazardous waste manifest system.

431 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 Scraps Management

432 Scrap Management does not include defective or damaged material to be returned to supplier and those fully depreciated assets of the company but still have the operational benefit to the company. It includes assets that has been identified for disposal and for when management approval has been secured. Scrap materials as defined are materials that consists of recyclable materials left over, discarded but has monetary value.

433 Scrap is identified, in this procedure, as materials that are no longer useful and has no benefit to the normal operation of a department. They are leftover or fragments that are deemed invaluable after significant parts are already used for a specific purpose. In fabrication area, scrap material are metal plates that are too small in size where the use of the said material may compromise the quality of fabricated projects. Scrap during construction and modification works are leftover materials after the projects are completed. The Logistics Department is in-charged in the management of scrap materials of the company.

434 Designated areas for collected scarps are provided within the facility. Scarps are collected daily by the team in-charged and are brought in the designated areas for sorting and segregation according to its type, usage and size. The disposal of metal scrap is under the discretion of the management. The rest of the scrap can either be sold, donated, or recycled. Tender sales can be adopted for items such as worn out conveyor belts, wastepaper, and used wood.

3.9 Occupational Health and Safety

435 The Northern Cement Corporation implements its occupational health and safety policy to ensure the safety of its workers and to protect its valuable equipment and properties against damages. The company's safety and health policies are based on DAO 2000-98 or the Mine Safety and Health Standards. The following details are basic guidelines that is being implemented as part of the occupational health and safety policy of NCC:

- Conduct of regular safety meetings on different departments and service contractors;
- Conduct of pre-employment orientation on new employees including service contractors, OJT students, school tours and visitors informing them about the Company's safety measures, rules and regulations before entering or visiting the plant or engaging to work;
- All management, technical, and non-technical personnel undergo various training courses and seminars to enhance and improve their capabilities and knowledge;
- Regular updating of emergency response plan updated regularly, and emergency drills is performed regularly to improve personnel's response technique and time;

- Conduct of regular audits by the management and personnel, with possible assistance from various safety consultants;
- Annual health check-ups for all personnel;
- Provision of safety signage, adequate illumination, anti-skid steps and guard rails, fire extinguishers, first-aid kits, and other safety features throughout the Project's facilities; and
- Promoting cleanliness and orderliness and application of the 5S of good housekeeping in all working areas;
- Provision of personal protective equipment (PPE), which includes safety boots, hard hats, gloves, safety goggles (in some instances) for construction workers (during Constructions phase) and personnel (during Operations phase) working on the Project.

3.10 Handling and Blasting Procedure

436 The blasting activities of the quarry operation is being done by a third-party contractor of NCC. A proper handling and blasting procedure is being implemented by the third-party contractor with the supervision of NCC. The procedure is consistent to the rules and procedure for any NACl blasting operation. The detailed procedure is attached as **Annex 17**.

3.11 Air Emission Management

437 Air emissions come from the operation activities such as processing operations, and repair and maintenance of vehicles and equipment. In order to reduce the air emissions associated with the Project, **Northern Cement Corporation** employs the following measures:

- Installation of bag filters and electrostatic precipitators to prevent introduction of suspended particles in the air;
- Regular maintenance of standby generators to ensure efficient combustion of diesel fuel (includes emissions sampling);
- Equipping the generator set with mufflers to lessen noise levels during operation;
- Reminding of delivery trucks/visitors not to leave parked vehicles on long periods of idling; and;
- Regular maintenance of equipment and vehicles.

438 Air emissions are expected during the construction phase as well. **NCC** will also employ air emissions management program to mitigate concerns on air emissions during construction of the expansion project.

3.12 Vehicular Traffic Management

439 Traffic impact along the road is expected due to the increase of vehicles coming from in and out of the proposed Project. To mitigate the said traffic, **Northern Cement Corporation** implements the following measures:

- Coordination with the Sison LGU;
- Provision of safety barriers, warning signs and lights, traffic marshals within the vicinity of project sites, and adequate parking spaces;
- 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
- Assistance of security personnel in directing traffic of vehicles coming in and out of the facility.

3.13 Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA)

440 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.

441 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.

- Green and open areas is part of the features of the project;
- A stormwater drainage is constructed in the project site to avoid flooding during heavy rainfall;
- Rainwater harvesting is practiced in the project;
- 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;
- The proponent will also be implementing water and energy saving practices during its operation;
- 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;
- A medical clinic is provided in the project site to respond to emergency situations;
- Conduct IEC activities to the community regarding disaster response preparedness and mitigating measures.

442 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

443 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

444 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 Plant 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, Condenstation, 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
NOTE: *- Based on Annex 2-7e of DAO 2003-30 Revised Procedural Manual	

445 The study requires **Level 1 of the threshold inventory** since NCC stores approximately 29 tons of Ammonium Nitrate Fuel Oil per week; Level 1 threshold of explosives storage is 10 tons, while Level 2 threshold is 50 tons. Preparation of emergency/contingency plan is required.

4.3 Risk Identification and Analysis

4.3.1 Hazards from Ammonium Nitrate Fuel Oil (Hazardous Material)

446 Ammonium Nitrate Fuel Oil, or ANFO, poses the following hazards:

- Explosive; mass explosion hazard;
- Causes eye irritation;
- Suspected of causing cancer;
- Harmful to aquatic life with long lasting effects.

447 There are no identified health effects under normal use of ANFO. Proper handling and storage are being followed by NCC to avoid any adverse health effects. The transport, storage and handling procedure for ANFO by the third-party contractor of NCC is attached as **Annex 17**.

448 NCC follows a detailed blasting procedure to avoid misfires. The procedure includes proper pattern design, charging of shots, priming, loading of blast holes, fencing, personnel restrictions, tying in of shots, and firing procedures. NCC also implements safe practices during priming and charging of shots. Misfire procedures are already in place.

4.3.2 Natural Hazards

4.3.2.1 Seismicity

449 Intense or strong seismic activities may cause damage to the cement plant infrastructures. The construction and operational phase of the proposed project should then factor the potential for earthquake induced risks.

4.3.2.2 Typhoons

450 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 plant 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 cement plant safety protocols can be done.

4.3.2.3 Flooding

451 The proposed project area is not prone to flooding. However, heavy rains may occur in times of extreme precipitation volume and intensity. During heavy rains, flooding may occur which may affect the cement plant operations. Emergency responses must be considered for possible occurrences.

4.3.3 Man-Made Hazards

4.3.3.1 Occupational Accidents

452 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.

4.3.3.2 Accidental Spills (e.g. fuel, engine lubrication oil, coolant)

453 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

454 Considering the nature of the project, exposure to pollutants associated with cement plant may lead to potential health effects and other hazards. Regular maintenance of equipment and other air mitigating measures should be strictly done to avoid these risks. Potential air pollutants associated with cement plant are particulate (TSP and PM_{10}) and gaseous (CO, NO_x, SO_x) emissions.

4.3.4.1 Particulate Matter

455 Particle matter (PM) is the term for a mixture of solid particles and liquid droplets found in the air. Airborne particulate matter varies in size and may be in different chemical constituents. Airborne particles can range in size from a few nanometers (nm) to around 100 micrometers (µm) in diameter. PM_{10} is the concentration of particles that are less than or equal to 10 µm in diameter; similarly, $PM_{2.5}$ describes the concentration of particles that are less than or equal to 2.5 µm in diameter.

456 Particulate matter comes from a variety of sources and contains primary components, which are emitted directly into the atmosphere, and secondary components, which are formed within the atmosphere because of chemical reactions. Primary sources include combustion sources (road vehicles and power stations), mechanical processes (e.g. quarrying and agricultural harvesting), and natural processes (e.g. entrainment of soil by the wind and generation of marine aerosol particles). Secondary particles form in the atmosphere because of chemical reactions that lead to the formation of substances of low volatility, which consequently condense into the solid or liquid phase, thereby becoming particles. The formation of secondary particulate matter takes hours or days and the air containing the pollution can travel long distances.

457 The “coarse particles” (such as those found near roadways and dusty industries) with diameters between 2.5 and 10 micrometers and “fine particles” (such as those found in smoke and haze) that are 2.5 micrometers in diameter or less are of concern due to their effect on human health. Both short and long-term exposure to these can cause increased respiratory symptoms (e.g., irritation of the airways, coughing, or difficulty breathing); decreased lung function; aggravated asthma; development of chronic bronchitis; irregular heartbeat; nonfatal heart attacks; and premature death in people with heart or lung disease.

458 The most serious health problems occur among susceptible groups with pre-existing lung or heart disease and the elderly and children. However, even healthy individuals may experience temporary symptoms from exposure to elevated levels of particle pollution.

4.4 Identification of Potential Emergencies

459 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. **Table** 4-2 lists the most probable emergencies that could happen in future operation of the Project.

460 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.

461 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.

462 Emergency situations require the utilization of all resources, with the assistance of local emergency responders, and additional resources from Northern Cement Corporation’s main

office. This episode may present serious injuries and some fatalities and could result to severe or total damage to the property.

463 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, dam breach, etc.) • Injuries and fatalities to personnel and downstream communities
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)
Occupational safety accidents	• Improper training and supervision of personnel • Equipment and facility failure • Lack of full understanding regarding the surrounding environment	• Injuries and fatalities to personnel • Partial and total loss of equipment
Flooding	• Heavy rainfall • Clogged drainage	• Damage to property • Stop operation
Operation Phase		
Fire	• Blasting procedure malpractice • Electrical short-circuits, overloading of equipment • Accidental ignition of combustible materials	• Partial or total loss of equipment and property • Injuries and fatalities to personnel
Explosion	• Blasting procedure malpractice • Power outrage • Equipment malfunction	• 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, dam breach, etc.) • Injuries and fatalities to personnel and downstream communities
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)
Occupational safety accidents	• Improper training and supervision of personnel • Equipment and facility failure	• Injuries and fatalities to personnel • Partial and total loss of equipment

TYPE OF EMERGENCY SITUATION	POSSIBLE CAUSES	POTENTIAL EFFECTS
	• Lack of full understanding regarding the surrounding environment	
Flooding	• Heavy rainfall • Clogged drainage	• Damage to property • Stop operation
Landslide	• Heavy rainfall • Man-made errors	• Damage to property • Injuries and fatalities to personnel and downstream communities • Stop operation

4.5 Emergency Plan

464 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. The general emergency preparedness and response procedure of NCC is attached as **Annex 16**.

465 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.

466 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

467 **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.

468 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 will exist, NCC 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.

PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**EMERGENCY RESPONSE PLAN**	4-1
EIA REPORT PREPARER:	PROJECT TITLE & LOCATION:	SOURCE:
LCI ENVI CORPORATION	**NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	LCI ENVI CORPORATION

Table 4-3: Emergency Response Procedures for Different Scenarios

PREPARATION	RESPONSE	RECOVERY
A. Fire or Explosion		
• 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, and replacement, as necessary • Securing of all flammable items in proper containers and storage facilities • Strict implementation of "No Smoking" policy in plant 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 plant equipment	• 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 • 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	• 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 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

PREPARATION	RESPONSE	RECOVERY
		• 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 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/	• 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

PREPARATION	RESPONSE	RECOVERY
parameters, such as path and intensity of the storm		outsiders, after the building is declared safe for re-entry
F. Landslide		
• Formation of an emergency response team for each department • Training of personnel on proper equipment handling and other safety practices • Orientation of personnel on safe locations, emergency response equipment, and evacuation routes	• Notice for personnel to avoid staying outdoors; to stay away from items that may have been affected by the event • Notice for personnel to keep calm and alert to prevent further injuries; and to prepare for immediate evacuation of the facility, if necessary • Shutdown of all gas and electric equipment • Bringing of affected personnel to the nearest first aid station or hospital if necessary	• 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 site is declared safe for re-entry • Assess damage from the incident. Conduct geotechnical investigation if necessary.

Table 4-4: Roles and Responsibilities in the Emergency Working Teams

EMERGENCY PREPAREDNESS AND RESPONSE TEAM	ROLES AND RESPONSIBILITIES
EPR Chairman	• Responsible for the overall organization and strategy of emergency response, coordinates logistics efforts and has authority for final decision in any emergency action.
EPR Coordinating Committee	• Provides direction to all personnel and continue direct operation until replaced by higher authority
Security and Crowd Control Team	• Ensure crow and traffic control • Secure perimeter • Assist evacuation team during evacuation
Fire Brigade Team	• Responding immediately and safety to emergency calls and requests for assistance • Attending emergency incidents involving fire in the plant
Medical/First Aid Team	• Responding immediately on accident and providing first aid as needed
Evacuation Rescue Team	• Responding immediately and safety to emergency calls and request for assistance in providing rescue on individual or personnel in case of accident, natural disasters and trapped on fire, confined spaces, damaged structures and evacuation cave-ins.
Salvage Team	• Responding immediately and safely to emergency calls and request for assistance in providing rescue or salvage on impacted assets in case of fire, collapsing building or structure, or natural disasters like earthquakes and typhoons.
Chemical and Oil Spill Team	• Provide assistance in response to chemical and oil spills.

4.6 Safety and Health Program

469 **Northern Cement Corporation** 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 plant 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

470 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 Company Safety Policy

471 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.

472 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

473 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.

474 Prevention of accidents by eliminating potential threats/hazards and anticipating other probable causes is an effective way of creating a safe and healthy environment.

Emergency Response Program

475 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. The emergency preparedness and response program of NCC is attached as **Annex 16**.

Personal Protective Equipment

476 The personal protective equipment (PPE) is a set of safety gear worn by personnel that is designed to provide sufficient safeguard against occupational-related illnesses and to prevent life-threatening injuries.

477 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. NCC 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

478 Any accident, injury, or work-related illness should be reported and investigated on immediately so as to determine the appropriate action to be conducted.

Recording and Review

479 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.

Incident Investigation

480 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.

481 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.

Damage Control

482 Damage cost because of accident, in reality, 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.

483 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/FRAMEWORK AND IEC FRAMEWORK

484 The following project stakeholders have been identified based on the stakeholder groups indicated in Section 5 of DENR Administrative Order No. 2017-15:

- **LGUs in areas where all project facilities are proposed to be constructed/situated and where all operations are proposed to be undertaken (a)**
  - Municipal LGU of Sison, Pangasinan (host municipality)
  - Municipal LGU of Pozorrubio, Pangasinan (adjacent municipality)
  - Brgy. Calunetan, Sison (SDMP barangay)
  - Brgy. Inmalog, Sison (SDMP barangay)
  - Brgy. Labayug, Sison (host barangay)
  - Brgy. Paldit, Sison (SDMP barangay)
  - Brgy. Sugcong, Pozorrubio (SDMP barangay)

- **Government agencies with related mandate on the type of project and its impacts (b)**
  - DENR Region I (Ilocos Region)
  - DENR EMB Region I (Ilocos Region)
  - DENR MGB Region I (Ilocos Region)
  - DOH Region I (Ilocos Region)
  - Provincial Environment and Natural Resources Office (PENRO Pangasinan)
  - Community Environment and Natural Resources Office (CENRO Dagupan City)

- **Interest groups, preferably those with mission/s specifically related to the type and impacts of the proposed undertaking (c)**
  - Sison Senior Citizens Association
  - Women Sector
  - Youth Sector

- **Local institutions (f)**
  - Labayug Elementary & High School

485 No "households, business activities, industries that will be displaced" (d) and "people whose socio-economic welfare and cultural heritage are projected to be affected by the project especially vulnerable sectors and indigenous populations" (e) have been identified for the project.

486 Other stakeholders for the proposed project include the local peace-and-order groups (i.e., PNP, Brgy. Police) and concerned non-government organizations (NGOs).

5.1 Social Development Program (SDP)

487 An indicative community-based Social Development Plan (SDP) for the expansion project, as presented in **Table 5-1**, will be developed by Northern Cement Corporation through a series of consultation with various stakeholder representatives in the project impact area.

488 The objectives of the SDP include the following:

- Identify the basic needs and welfare of the host community as basis for the framework of social development program of the Project;

- Prepare an indicative sustainable plan based on the Barangay Development Plans and the mandated support of **Northern Cement Corporation**; and
- Establish a working relation with **Northern Cement Corporation** and the various community stakeholders with the goal of improving the quality of life of the project-affected communities by instilling self-reliance.

489 The community-based consultation and survey during the development of the SDP also provides an opportunity for identifying the following:

- Addressing key issues and concerns by the various stakeholders;
- Identifying and designing the recommend measures in response to the issues and concerns that were raised;
- Identifying the lead agency or organization responsible in implementing the measures; and
- Setting of timelines in implementing these measures consistent with the plans and programs of the lead agencies.

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	Brgy. Kagawad for Education Bonafide students of academic institutions in Labayug and SDMP Barangays	CHEd Region I Sison LGU Pozorrubio LGU Brgy. Labayug LGU SDMP Barangays	Northern Cement Corporation	Pre-Construction Operation	Northern Cement Corporation
	Handicraft skills training (cross-stitch, rug making, beauty care and hair dressing, cooking, etc.) Food processing training Skills training (welding, machinery and auto-mechanics, etc.) Provision of relevant tools and trainings for farmers	Brgy. Kagawad for Education Unemployed members of the host community Women Farmer organization/cooperative Out-of-school youth	TESDA Region I Sison LGU Pozorrubio LGU Brgy. Labayug LGU SDMP Barangays MAO	Northern Cement Corporation	Operation	Northern Cement Corporation
Infrastructure	Support in the development of water supply system for Brgy. Labayug and SDMP barangays	Brgy. Kagawad for Infrastructure Host Community SDMP Barangays	Sison LGU Pozorrubio LGU Brgy. Labayug LGU SDMP Barangays MEO	Northern Cement Corporation	Operation	Northern Cement Corporation
Health and Nutrition	Provision of various medicines/medical and dental services	Brgy. Kagawad for Health and Education Host Community SDMP Barangays	DOH Region I MHO Sison LGU Pozorrubio LGU Brgy. Labayug LGU SDMP Barangays	Northern Cement Corporation	Construction Operation	Northern Cement Corporation

CONCERN	PROGRAM/PROJECT/ACTIVITY	RESPONSIBLE COMMUNITY MEMBER/ BENEFICIARY	GOVERNMENT AGENCY/NON-GOVERNMENT AGENCY AND SERVICES	PROPONENT	INDICATIVE TIMELINE	SOURCE OF FUND
Education	Provision of scholarships and financial assistance to students (both formal and informal education)	Qualified students of the host barangay	CHEd Region I DepEd Region I TESDA Region I Brgy. Labayug LGU SDMP Barangays	Northern Cement Corporation	Construction Operation	Northern Cement Corporation
Peace and Order	Financial support on closed circuit television (CCTV) installation in strategic areas in Brgy. Sugcong	Brgy. Kagawad for Peace and Order Brgy. Sugcong	Brgy. Sugcong LGU	Northern Cement Corporation	Operation	Northern Cement Corporation
Environment	Climate Change Adaptation and Disaster Risk Reduction Management training	Host community and SDMP Barangays	MDRRC Sison LGU Pozorrubio LGU Brgy. Labayug LGU SDMP Barangays	Northern Cement Corporation	Operation	Northern Cement Corporation
Safety	Provision of traffic signage and early warning device in strategic areas in Brgy. Labayug and Brgy. Sugcong	Host community and nearby barangays	Sison LGU Brgy. Labayug LGU Brgy. Sugcong LGU	Northern Cement Corporation	Construction Operation	Northern Cement Corporation
Cultural Heritage	Financial support to sports, recreation, town fiesta, and cultural activities	Residents of Sison Residents of Pozorrubio Host community and nearby barangays	Sison LGU Brgy. Labayug LGU SDMP Barangays	Northern Cement Corporation	Operation	Northern Cement Corporation
Spiritual	Financial support to religious institutions maintenance and construction works	Religious sector Ecumenical (pastors, priests, ministers, etc.)	Brgy. Labayug LGU SDMP Barangays	Northern Cement Corporation	Operation	Northern Cement Corporation
Note: Based on the Revised Procedural Manual for DAO 2003-30						

5.2 Social Development and Management Program (SDMP)

490 In accordance to DAO 2010-21, **Northern Cement Corporation** will allot a minimum of one point five percent (1.5%) of the direct mining costs annually, that will be divided into 3 different components; of which seventy-five percent (75%) shall be appropriated to implement the SDMP, fifteen-percent (15%) shall be allocated for IEC campaign implementation, and ten-percent (10%) for the development of mining technology and geosciences, as well as the corresponding manpower training and development.

491 **Northern Cement Corporation**, through its Community Relations Office (COMREL), has just recently completed its 3rd SDMP cycle covering the years 2013 to 2017 which had a planned and committed amount of **Php 21,814,791.90**. However, based on the annual SDMP (ASDMP) budget for the same period, the spending was only **Php 16,110,180.97** or **Php 5,704,610.93** lower than what was declared in the 5-year SDMP.

492 According to the DENR Administrative Order No. 2010-21, with subject: "Providing for a consolidated Department Environment and Natural Resources Administrative Order for the Implementing Rules and Regulation of Republic Act No. 7942, otherwise known as the "PHILIPPINE MINING ACT OF 1995" under Section 134: Development of Mining Community, Mining Technology and Geosciences and Institutionalization of Public Awareness and Education on Mining and Geosciences: Any unspent amount and/or savings, for any given year, allotted for the implementation of the various programs shall be added to the succeeding year's allotment and may be re-programmed after consultations with host and neighboring communities.

493 At present, Northern Cement Corporation has been implementing its 4th SDMP cycle covering the years 2018 to 2022. The total budgeted amount for the 4th SDMP cycle is **Php 20,324,710.00**.

494 The SDMP allocation per barangay is presented in **Table** 5-2 while the rational distribution of the SDMP fund is presented in **Table** 5-3. The comparison between the budgeted (mother SDMP) and the actual spending (ASDMP) is presented in **Table 5-4**.

Table 5-2: Allocation per Barangay (2013-2017)

SDMP BARANGAY	SDMP % ALLOCATION
Labayug	27%
Inmalog	22%
Sitio Saguitlang	18%
Sugcong	18%
Calunetan	10%
Paldit	5%

Source: Northern Cement Corporation

Table 5-3: Rationalization of SDMP

SDMP COMPONENT	AREA	SDMP % ALLOCATION
Social Development and Management Program (75%)	Infrastructure and utilities	35%
	Education	13%
	Health	10%
	Livelihood	17%
Information, Education and Communication (15%)	Institutionalization of public awareness and education on mining and geosciences.	15%

SDMP COMPONENT	AREA	SDMP % ALLOCATION
Development of Mining Technology and Geosciences (10%)	For development of mining technology and geosciences.	10%

Source: Northern Cement Corporation

Table 5-5-4: SDMP and ASDMP of NCC (2013-2017)

SDMP COMPONENT		SDMP BUDGET (MOTHER SDMP)	ACTUAL BUDGET (ASDMP)					ASDMP TOTAL	DIFFERENCE (PROJECTED-ACTUAL)
			2013	2014	2015	2016	2017		
SDMP (75%)	Infrastructure and Utilities	7,633,956.05	1,526,088.43	820,933.62	871,901.17	943,247.38	1,476,392.77	5,638,563.37	1,995,392.68
	Education	2,842,456.00	566,832.85	304,918.20	323,849.00	350,349.02	548,374.45	2,094,323.52	748,132.48
	Health	2,181,160.05	436,025.27	234,552.46	249,114.62	269,499.23	421,826.51	1,611,018.09	570,141.96
	Livelihood	3,706,904.05	741,242.96	398,739.18	423,494.85	458,148.73	717,105.05	2,738,730.77	968,173.28
	Sub-total	**16,364,476.15**	**3,270,189.51**	**1,759,143.46**	**1,868,359.64**	**2,021,244.36**	**3,163,698.78**	**12,082,635.75**	**4,281,840.40**
IEC (15%)	**Sub-total**	**3,270,189.45**	**654,037.89**	**351,828.69**	**373,671.93**	**404,248.87**	**632,739.75**	**2,416,527.13**	**853,662.32**
DMMT (10%)	**Sub-total**	**2,180,126.30**	**436,025.26**	**234,552.46**	**249,114.62**	**269,499.25**	**421,826.50**	**1,611,018.09**	**569,108.21**
	GRAND TOTAL	**21,814,791.90**	**4,360,252.66**	**2,345,524.61**	**2,491,146.19**	**2,694,992.48**	**4,218,265.03**	**16,110,180.97**	**5,704,610.93**

Source: Northern Cement Corporation

5.2.1 SDMP Implementation Highlights for 2013 to 2017

495 It is a policy of **Northern Cement Corporation** that its host and neighboring communities, Barangay Labayug, Inmalog, Calunetan, Sugcong, Paldit and Sitio Saguitlang shall develop together with the progress and development of the company.

496 Below are the highlights of the implemented projects from 2013 to 2017:

A. <u>Infrastructure and Utilities</u>

Multi-Purpose Vehicle

- Provided to the SDMP barangays to improve availability of service transportation and quick response specially during emergency cases.

Irrigation for Farmers

- Provided to the SDMP barangays to improve their agricultural production capacity.

B. <u>Education</u>

- Support for various construction, rehabilitation and improvement of schools to improve the educational environment and promote safe & conducive learning centers.
- Various scholarship programs for deserving residents of the SDMP barangays.

C. <u>Health</u>

- Medical supplies and equipment for the Brgy. Health centers.
- Medicines and vitamins for young and old ages particularly in the SDMP barangays.

D. **<u>Livelihood Activities</u>**

- Sewing machines distributed to selected individuals.
- Sustainable livelihood programs for 4Ps.
- Flexible hose was also provided to improve water systems and irrigation (domestic and agriculture use)

5.3 Information and Education Campaign (IEC)

497 The Information, Education, and Communication (IEC) campaign 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 operation plans of **Northern Cement Corporation** and will be monitored by a multipartite group for evaluation.

498 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.

499 Integral to the IEC is the regular reporting of **Northern Cement Corporation** on the progress of the proposed Project's operations. In general, the Proponent shall update the host LGUs if the agreements are followed or if there are minor or major changes to be made, and if there are problems that might occur and advice the LGU on appropriate preparations that are necessary to avoid or mitigate negative results. The Proponent will conduct IEC activities to establish transparency and to develop a partnership with the host communities.

500 IEC activities envisioned for the Project are numerous interactions between the Proponent, the host communities, and the local government officials on various topics involving the cement plant operations and the general welfare of the community through **Northern Cement Corporation's** initiatives and programs.

501 **Table 5-5** presents the IEC campaigns conducted by **Northern Cement** Corporation for the year 2017 to 2019.

502 **Table 5-6** presents the indicative IEC plan, which can be further improved after the series of consultations and future developments 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.

Table 5-5-5: IEC Implemented by NCC (2017 to 2019)

IEC CAMPAIGN	DATE	VENUE	STAKEHOLDERS
Public participation meeting for NCC operations (MMT Presentation)	2017	▪ Brgy. Paldit, Sison	▪ Brgy. Paldit community members
Public participation meeting for NCC operations (MMT Presentation)	28 July 2017	▪ Sitio Saguitlang, Brgy. Labayug, Sison	▪ Sitio Saguitlang community members
Meeting for I-MINE Organization (Region I)	13 December 2017	▪ NCC Plant Office, Sison	▪ Officers & members of I-MINE organization
Public participation meeting for NCC operations (MMT Presentation)	26 June 2018	▪ Brgy. Bobonan, Pozzorubio	▪ Brgys. Nama, Inoman, Bobonan & Sugcong community members
Public participation meeting for NCC operations (MMT Presentation)	2018	▪ Sitio Saguitlang, Brgy. Labayug, Sison	▪ Sitio Saguitlang community members
Public participation meeting for NCC operations (MMT Presentation)	2018	▪ Brgy. Inmalog, Sison	▪ Brgy. Inmalog community members
Public participation meeting for NCC operations (MMT Presentation)	2018	▪ Brgy. Calunetan, Sison	▪ Brgy. Calunetan community members
Mining, Environment/Pollution Control, Safety and SDMP accomplishments and programs of NCC	28 March 2019	▪ Pangasinan State University – Urdaneta	▪ Civil Engineering Students
Mining, Environment/Pollution Control, Safety and SDMP accomplishments and programs of NCC	28 June 2019	▪ University of Luzon – Dagupan City	▪ Civil Engineering Students
"SDMP Responsible & Sustainable" campaign	18 July 2019	▪ Brgy. Labayug, Sison	▪ Brgy. Labayug community members ▪ TESDA graduates
SDMP Health Awareness Program	19 July 2019	▪ Brgy. Calunetan, Sison	▪ Brgy. Calunetan community members
International Day against drug abuse and illicit drug trafficking	26 July 2019	▪ Brgy. Labayug, Sison	▪ Brgy. Labayug community members

Source: Northern Cement Corporation

Table 5-5-6: Matrix of the Project's 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)
Residents of Brgy. Labayug **Residents of SDMP Barangays**	▪ Personnel requirements and announcement of job opening for potential workers/employees/contractors	▪ Group Consultation ▪ Multi-media	▪ Invitation letter ▪ Multi-sectoral cluster meetings ▪ Newspaper publication ▪ Radio broadcast ▪ Posters	At least, two months prior to start of construction	PHP 50,000.00
Municipality of Sison **Municipality of Pozorrubio** **Residents of Brgy. Labayug** **Farmer Groups** **NGOs** **Residents of SDMP Barangays**	▪ Presentation of construction works/activities ▪ Potential impacts and proposed mitigation measures during construction works	▪ Group Consultation ▪ Multi-media	▪ Invitation letters ▪ Focus Group Discussion ▪ Multi-sectoral cluster meetings ▪ Handouts ▪ Audio-visual presentations on EIA ▪ Posters and flyers	At least 1 month prior to start of construction and quarterly during the entire construction phase	PHP 50,000.00
Municipality of Sison **Municipality of Pozorrubio** **Brgy. Labayug** **NGOs** **Residents of SDMP Barangays**	▪ Report on project's compliance to ECC and EMP during construction period	▪ Group Consultation ▪ Grievance mechanism	▪ Invitation Letters ▪ Handouts ▪ Multi-sector cluster meeting ▪ Grievance box (comments, suggestions) at the municipal and barangay halls	1 month prior to completion of construction works	PHP 25,000.00
Municipality of Sison **Brgy. Labayug**	▪ 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 25,000.00
Municipality of Sison **Municipality of Pozorrubio** **Brgy. Labayug** **NGOs** **Residents of SDMP Barangays**	▪ Project operation phase ▪ Highlight of the project's environmental control measures ▪ Compliance to ECC conditionality's and the EMP ▪ Actual impacts during construction and control measures implemented	▪ Group Consultation ▪ Grievance mechanism	▪ Invitation letter ▪ Handouts ▪ Posters ▪ Grievance box (comments, suggestions) at the municipal and barangay halls	Priority to operation phase and yearly thereafter	PHP 40,000.00
Schools **NGOs**	▪ Plant tour and highlight of project's environmental control	▪ Group Consultation	▪ Educational tour to project site	Throughout the operation phase	PHP 50,000.00

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)
LGUs	measures, SDP, and environmental projects				
Northern Cement Corporation employees	▪ Awareness and Safety ▪ Disaster Risk Reduction and Management ▪ Climate Change awareness and adaptation	▪ Group Consultation ▪ Multi-media	▪ Climate change adaptation and disaster risk reduction and management seminar ▪ Hazard identification and risk assessment training ▪ First aid training	Once a year	PHP 50,000.00
Brgy. Labayug & SDMP Brgy. Schools	▪ Climate Change awareness and adaptation ▪ Disaster Risk Reduction and Management	▪ Group Consultation ▪ Multi-media	▪ Climate change adaptation and disaster risk reduction and management seminar	Once a year	PHP 50,000.00

5.4 Grievance Redress Mechanism (GRM)

503 Grievances are any major or complicated issues which require deeper, and sometimes, 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.

504 **Northern Cement Corporation**, through its Community Relations Office (COMREL) will establish a grievance recording and redress mechanism to efficiently and effectively record and redress any concern, complaint or grievances arising out during the (a) construction and (b) operations phases of the Project.

505 The redress of the grievances will be coordinated with the COMREL.

506 Once the construction of the project begins, the designated grievance officer of **Northern Cement Corporation** 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

507 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.

508 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. Protection of privacy of the complainant will also be prioritized.

5.4.2 Levels of Grievance Redress Mechanism

509 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 **Northern Cement Corporation** COMREL to their complaints.

Figure 5-1: Levels of Grievance Redress Mechanism

PROJECT PROPONENT:	FIGURE TITLE: **LEVELS OF GRIEVANCE REDRESS MECHANISM**	FIGURE NO.: **5-1**
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **PROJECT** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC

510 Irrespective of the choice of the complainant on the level of grievance management system, **Northern Cement Corporation** will demonstrate a culture of non-retaliation and respect for a community's choice to seek alternative avenues for raising complaints.

5.4.3 Grievance Redress Mechanism Steps

511 The Grievance Redress Mechanism that will be employed for the project is detailed in 6 steps. The GRM is presented in Table **5-4**.

Table 5-5-7: Grievance Redress Mechanism

GRM STEP	DESCRIPTION OF THE PROCEDURE
Step 1	▪ Affected person lodges the complaint.
Step 2	▪ **Northern Cement Corporation** COMREL will document and register received complaints during construction and operation of the project.
Step 3	▪ Two days upon the receipt of the complaint, a meeting will be called between the affected person and **Northern Cement Corporation** COMREL. 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 **Northern Cement Corporation** COMREL 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.

GRM STEP	DESCRIPTION OF THE PROCEDURE
Step 4	▪ If the affected person is satisfied with the resolution of the complaint, **Northern Cement Corporation** COMREL shall obtain a written confirmation of satisfaction from the affected person.
Step 5	▪ For at least a week after closure of grievance, the Grievance Officer, shall monitor the effectiveness of the resolution.
Step 6	▪ If the issue/impact persists, the affected person can lodge an appeal at the barangay level. The Barangay Chairman 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 Municipal Government. A total of two weeks is given to process, address and monitor a grievance that will arise due to the project implementation.

SECTION 6

ENVIRONMENTAL COMPLIANCE MONITORING

6.1 Environmental Performance

512 **Table** 6-1 shows the ECC conditions of ECC Reference No. 9207-032-301C and the compliance of **Northern Cement Corporation** from these conditions.

513 NCC is also ISO-certified and implements the Integrated Management System (IMS) that consists ISO 9001(2008), ISO 14001(2004) and 18001(2007).

Table 6-1: Compliance of NCC to ECC Compliance

ECC Conditions	NCC Compliance
Production capacity should not exceed Four Thousand (4,000) metric tons of clinker per day	Based from the SMRs that NCC is submitting, the daily production output of the cement plant does not exceed the allowable limit. 1st quarter 2019: 1,827 MT/day clinker 4th quarter 2018: 2,785 MT/day clinker 3rd quarter 2018: 2,953 MT/day clinker 2nd quarter 2018: 2,803 MT/day clinker 1st quarter 2018: 2,798 MT/day clinker
Limited to cement manufacturing project using dry process operation only.	The process used for the cement production is dry process.
Adequate air pollution control devices shall be installed, operated and maintained in accordance with the DENR Region 1 approved plans and specifications.	Bag filters and electric precipitators are installed in the cement plant. PTO No. POA-14L-01PA39-001
No amount of liquid wastes shall be discharged by the plant operation to nearby water bodies.	A wastewater discharge permit (WWDP-16J-01PA39-001) was secured by the proponent from the DENR-EMB Region 1. NCC has three effluent outfalls, all are discharging in the Aloragat River.
Air and noise emissions generated by the operation shall conform with the standards set by EMB-DENR.	As discussed in Section 2.3.2, air and noise emissions generated in the cement plant are within the DENR standards.
All raw materials, coal and bunker oil shall be properly kept in a safe storage facility.	Compliant. Photos of the storage facilities are presented in **Figure** 6-1**.**.
Maintenance of all process equipment and pollution control facilities shall be effected at all times to obtain maximum efficiency.	Regular maintenance of all equipment is being done.
An Environmental Unit shall be created to handle the environmental-related aspects of the plant and shall report to EMPAS- DENR Region 1/EMB-EIA Monitoring Unit on a regular basis.	Pollution Control and Environmental Compliance group was established. MEPEO: Russel Dan Dictag Jr. PCO: Engr. Bernardino O. Narciza
On the even emissions exceed the standards as determined by DENR monitoring team, plant operation shall be temporarily stopped until	As discussed in Section 2.3.2, air and noise emissions generated in the cement plant are within the DENR standards.

ECC Conditions	NCC Compliance
such time that appropriate remedial measures are undertaken.	
Adequate safety gadgets shall be provided for the workers to prevent health and occupational hazards posed by the workers.	PPEs are provided to all workers as part of the Occupational Safety and Health policy of NCC at no cost.
All mitigating measures as contained in the submitted document shall be strictly implemented.	NCC is submitting its CMR to EMB.
Regular medical check-up shall be provided for the workers.	Annual physical examination is conducted to the workers as part of the Occupational Safety and Health policy of NCC.
Quarterly monitoring report regarding the plant's operation shall be submitted to EMB/DENR 1 for evaluation.	NCC is submitting its SMR report to EMB Region 1.
On the spot monitoring and inspections can be initiated by the EMB-DENR Region 1 anytime in coordination with the concerned groups.	NCC is always open for DENR – EMB inspection at any time. The MMT regularly conduct quarterly monitoring/compliance report verification activities.
That an Environmental Guarantee Fund shall be initiated by Northern Cement Corporation, the amount and mechanics of which shall be determined by EMB and NCC representatives within 60 days from receipt of this ECC	EGF is established and being maintained by the proponent.
That reforestation shall be undertaken by the management at the mined-out areas to replace cut trees.	NCC has been conducting reforestation activities for its mine-out areas since 2001 under its Mining Forest Program. As of March 2019, the total area that the NCC has planted within the MPSA is 230.85 hectares.
Transfer of ownership of this project carries the same conditions in this ECC for which written notification to the EMB must be made within 15 days from such transfer.	Not applicable

514 A notice of violation was given to NCC last August 23, 2017 for violating ECC condition no. 9 of ECC-CO-9207-032-01. Shale extraction was done by NCC outside the MPSA with approximate area of 11.5 hectares. However, quarry operation in the said area was already stopped and rehabilitation activities were already started. Presently, the said areas are subject to continuing re-vegetation and already included in the company's Progressive Rehabilitation Program. The very recent tree planting activity on the area was on June 11, 2019 covering an area of approximately 1 hectare.

Figure 6-1: Storage Facilities Within NCC Cement Plant

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **STORAGE FACILITIES WITHIN NCC CEMENT PLANT**	FIGURE NO.: 6-1
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: LCI ENVI CORPORATION

Figure 6-2: Photos of Rehabilitation Activities within the Shale Quarry Area outside the MPSA

Photo taken last June 2019

PROJECT PROPONENT: **Northern Cement Corporation**	FIGURE TITLE: **STORAGE FACILITIES WITHIN NCC CEMENT PLANT**	FIGURE NO.: 6-2
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC

6.2 Self-Monitoring Plan

515 The Environmental Monitoring Plan (EMoP) presents a set of critical environmental parameters that will allow the Northern Cement Corporation to ensure environmental compliance and sustainability of its operations. 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.

516 **Table** 6-2 presents the EMoP that is being implemented by NCC. Shown in the matrix are the concerns, parameters, 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).

517 **Northern Cement Corporation** monitors its compliance through regular submission of Self-Monitoring Report (SMR) and Compliance Monitoring Report (CMR) to DENR-EMB. A copy of monitoring reports is annexed to this report (**Annex 10**).

Table 6-2: Matrix of 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*			*EQPL Range*			*Management Measures*		
								Alert	*Action*	*Limit*	*Alert*	*Action*	*Limit*
PRE-CONSTRUCTION/CONTRUCTION PHASES													
Local Sourcing of Labor	People: Employment Opportunities	No. of employees from host barangays	Record no. of employees from host barangays	During pre-construction	Administration Office of the Project	Northern Cement Corporation	Minimal	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Construction and installation of plant and support facilities	Solid Waste Generation	Weight of waste generated	Weighing/ log-book recording	Daily/weekly	Waste storage facility	Northern Cement Corporation	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	Maximum storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.
	People: Occupational health and safety	No. of work-related illnesses/ injuries, No. of safety man-hours	Log-book/ database registration	Daily	Administration office of the project site	Northern Cement Corporation	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.; Stricter implementation of health and safety guidelines
	Water Quality: Impact on surface water quality	pH	Refer to EMB MC 2016-12	Quarterly	Refer to Figure 6-1	Northern Cement Corporation	PHP 10,000 per parameter	6.5-7.5	8.0-8.5	6.5-9.0	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
		TSS						60 mg/L	65 mg/L	80 mg/L			
		Fecal Coliform						180 MPN/100mL	190 MPN/100mL	200 MPN/100mL			
		Oil & Grease						1 mg/L	1.5 mg/L	2 mg/L			
	Water Quality: Impact on ground water quality	pH	Refer to EMB MC 2016-12	Quarterly	Refer to Figure 6-1 (new GW sampling point along aloragat)	Northern Cement Corporation	PHP 10,000 per parameter	6.5-8.0	8.0-8.5	6.5-9.0	Investigate, identify non-point sources	Investigate, identify non-point sources; Conduct maintenance of septic tanks and drainage	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
		Fecal Coliform						8.0 MPN/100mL	9.0 MPN/100mL	10.0 MPN/100mL			
		Oil & Grease						0.5 mg/L	0.75 mg/L	1.0 mg/L			
		NO_2		Quarterly				105 µg/NCM	135 µg/NCM	150 µg/NCM			

Use of Heavy Equipment	Air Quality: Impact on Ambient Air Quality and Noise	SO_2 TSP PM_{10}	DAO 2000-81 Analysis Methods		Refer to Figure 6-1	Northern Cement Corporation	PHP 20,000 per station per event	125 µg/NCM 180µg/ NCM 500 mg/NCM	160 µg/NCM 200µg/ NCM 550 µg/NCM	180 µg/NCM 230µg/ NCM 600 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
Use of Heavy Equipment	Hazardous Waste Generation (used oil)	Volume of wastes generated	Number of drums/log-book recording; Weighing/ log-book recording	Weekly	Waste storage facility (Refer to DAO 1992-29)	Northern Cement Corporation	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	Maximum 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)
OPERATION PHASE													
Operation of cement plant and quarry	Air Quality: Impact on Ambient Air Quality	NO_2 CO SO_2, TSP PM_{10} As Cd Sb Pb	DAO 2000-81 Analysis Methods	Quarterly	Refer to **Figure 6-1.**	Northern Cement Corporation	PHP 50,000 per station per event	80 µg/NCM 25 mg/NCM 120 µg/NCM 180µg/ NCM 120 mg/NCM 0.01 mg/NCM 0.005 mg/NCM 0.01 mg/NCM 10 µg/NCM	120 µg/NCM 30 mg/NCM 150 µg/NCM 200µg/ NCM 150 µg/NCM 0.015 mg/NCM 0.008 mg/NCM 0.015 mg/NCM 15 µg/NCM	150 µg/NCM 35 mg/NCM 180 µg/NCM 230µg/ NCM 200 µg/NCM 0.02 mg/NCM 0.01 mg/NCM 0.02 mg/NCM 20 µg/NCM	Continuous maintenance of engines	Continuous maintenance of engines; Investigate, identify non-point sources	Investigate condition of engines; Repair damages/ defects, repeat analysis
Operation of cement plant and quarry	Noise	Noise	Digital sound level meter	Quarterly	Refer to **Figure 6-1.**			65 dB	70 dB	75 dB	Continuous maintenanc e of engines	Continuous maintenance of engines; Investigate, identify non-point sources	Investigate condition of engines; Repair damages/ defects, repeat analysis
Operation of cement plant	Stack Monitoring	CO NO SOx PM As Cd Sb Pb	COMS	Continuous	EP 1 and EP 2	Northern Cement Corporation		300 mg/NCM 300 mg/NCM 100 mg/NCM 80 mg/NCM 5 mg/Ncm 5 mg/Ncm 5 mg/Ncm 5 mg/Ncm	400 mg/NCM 400 mg/NCM 150 mg/NCM 100 mg/NCM 8 mg/Ncm 8 mg/Ncm 8 mg/Ncm 8 mg/Ncm	500 mg/NCM 500 mg/NCM 200 mg/NCM 150 mg/NCM 10 mg/Ncm 10 mg/Ncm 10 mg/Ncm 10 mg/Ncm	Continuous maintenance of equipment. Continuous monitoring.	Investigate, identify non-point sources	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
Operation of cement plant and quarry	Water Quality: Impact on surface water quality	pH TSS Fecal Coliform	Refer to EMB MC 2016-12	Quarterly	Refer to Figure 6-1	Northern Cement Corporation	PHP 10,000 per parameter	6.5-7.5 60 mg/L 180 MPN/100mL	8.0-8.5 65 mg/L 190 MPN/100mL	6.5-9.0 80 mg/L 200 MPN/100mL	Continuous maintenance of treatment system.	Investigate, identify non-point sources	Investigate, identify non-point sources, repair damages/

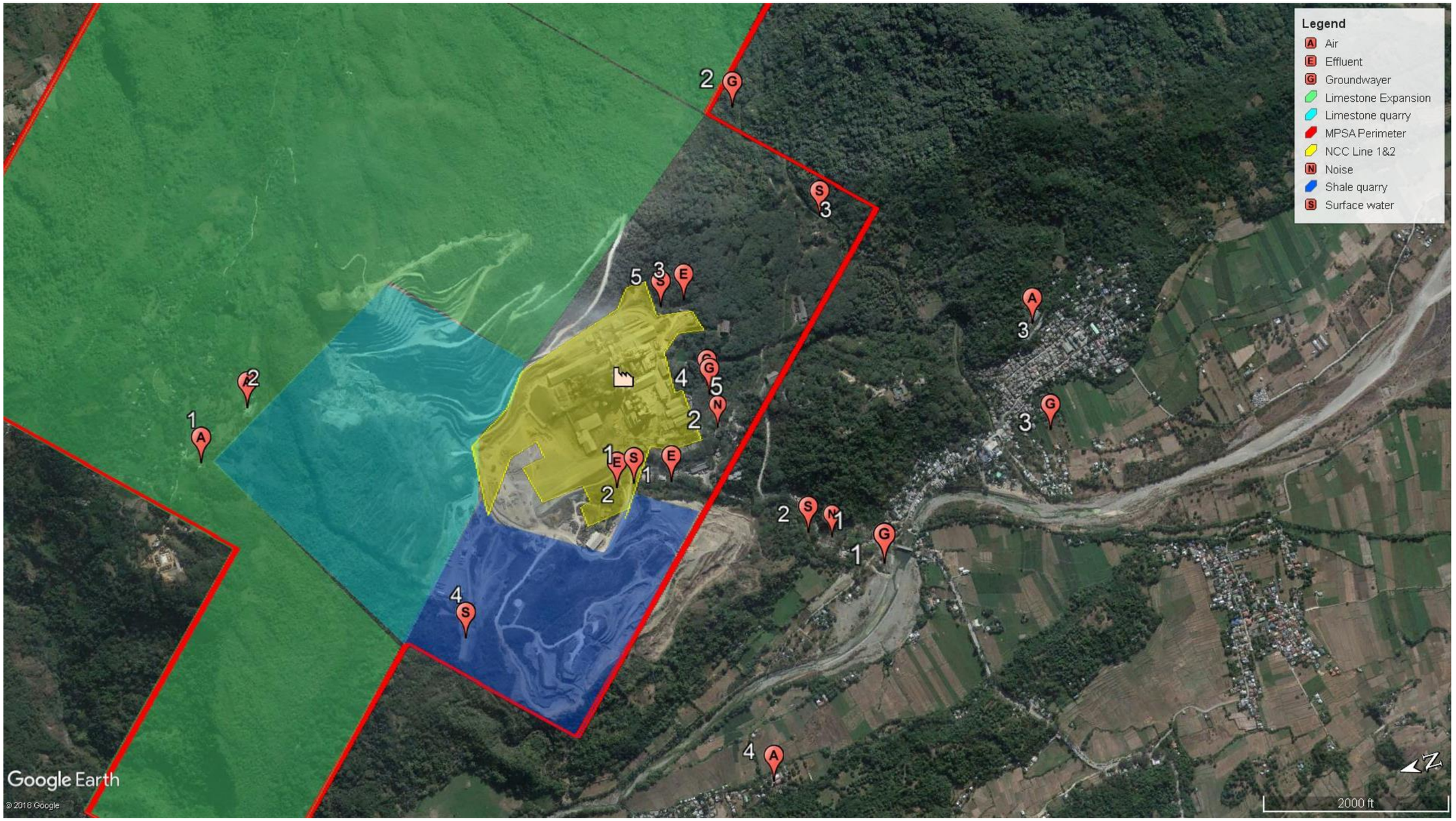
		Oil & Grease						1 mg/L	1.5 mg/L	2 mg/L	Continuous monitoring.	Conduct maintenance of septic tanks, drainage and siltation ponds	defects, repeat analysis
Operation of cement plant and quarry	Water Quality: Impact on Groundwater quality	pH Fecal Coliform Oil & Grease	Refer to EMB MC 2016-12	Quarterly	Refer to Figure 6-1	Northern Cement Corporation	PHP 10,000 per parameter	6.5-8.0 8.0 MPN/100mL 0.5 mg/L	8.0-8.5 9.0 MPN/100mL 0.75 mg/L	6.5-9.0 10.0 MPN/100mL 1.0 mg/L	Continuous maintenance of treatment system. Continuous monitoring.	Investigate, identify non-point sources	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
Operation of cement plant and quarry	People: Occupational health and safety	No. of work-related illnesses/ injuries, No. of safety man-hours	Log-book/ database registration	Daily	Administration office of the project site	Northern Cement Corporation	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. Stricter implementation of health and safety guidelines	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines. Stricter implementation of health and safety guidelines
Operation of cement plant and quarry	People: Potential negative Public Perception	No. of valid complaints	Consultation with local officials and residents	Upon official request /summon of the local barangay office	Host Municipality	Northern Cement Corporation	Minimal	1 minor complaint, such as nuisance complaints (e.g. noise caused by operation)	Multiple minor complaints such as nuisance complaints (e.g. noise caused by operation)	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 measures taken to solve major complaints. Get feedback from community regarding acceptability or adequacy of actions taken to mitigate major concerns.
Operation of cement plant and quarry	Solid Waste Generation	Weight of waste generated	Weighing/ log-book recording	Daily/ weekly	Waste storage facility	Northern Cement Corporation	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	Maximum storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.

Operation of cement plant and quarry	Hazardous Waste Generation (used oil, oil-contaminated materials, BFLs)	Volume of wastes generated	Number of drums/log-book recording Weighing/ log-book recording	Weekly	Waste storage facility (Refer to DAO 1992-29)	Northern Cement Corporation	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	Maximum 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)
Effluent from plant site	Water Quality: Degradation of water quality due to effluent discharge	Oil and Grease pH TSS	Refer to EMB MC 2016-12	Quarterly	Refer to Figure 6-1	Northern Cement Corporation	PHP 10,000 per parameter	3 6.0-9.5 90 mg/L	4 6.0-9.5 95 mg/L	5 6.0-9.5 100 mg/L	Continuous maintenance of treatment system. Continuous monitoring.	Investigate, identify non-point sources	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
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/ log-book recording	Daily/ weekly	Project Site	Northern Cement Corporation	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	Host Municipality	Northern Cement Corporation	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 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 6-3: Monitoring Stations for NCC



PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **MONITORING STATIONS FOR NCC**	FIGURE NO.:
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC

Table 6-3: Monitoring Stations for NCC

Environmental Component	Station	Location	Coordinates	
			Latitude	**Longitude**
Ground water	GW1	Deepwell 1	16° 9'31.86"N	120°33'38.74"E
	GW2	Milagrosa Spring	16°9'35'' N	120°34'32'' E
	GW3	Deepwell in Brgy. Labayug	16°9'11'' N	120°33'48'' E
	GW4	Deepwell 2	16°9'45'' N	120°34'3'' E
	GW5	Deepwell 3	16°9'45'' N	120°34'2'' E
Noise	N1	Delta Barracks	16° 9'36.50"N	120°33'43.10"E
	N2	NCC Canteen	16° 9'45.10"N	120°33'58.20"E
Effluent	E1	OWS	16° 9'51.40"N	120°33'53.80"E
	E2	New Coal Settling pond	16° 9'57.18"N	120°33'54.72"E
	E3	Cabuar Limestone Siltation Pond	16° 9'47.50"N	120°34'12.80"E
Surface Water	S1	Upper Bagutan Creek	16° 9'55.31"N	120°33'54.71"E
	S2	Lower Bagutan Creek	16° 9'38.80"N	120°33'44.30"E
	S3	Sapid Creek	16° 9'28.60"N	120°34'17.70"E
	S4	Buli Creek	16°10'17.00"N	120°33'43.20"E
	S5	Cabuar Creek	16° 9'47.50"N	120°34'12.80"E
Air	A1	Sitio Saguitlang	16°10’39.17”N	120°34’9.80”E
	A2	Sitio Saguitlang Elementary School	16°10'32.84"N	120°34'14.35"E
	A3	Labayug National High School	16° 9'9.82"N	120°33'59.90"E
	A4	Inmalog Elementary School	16° 9'49.45"N	120°33'18.73"E

6.3 Multi-Sectoral Monitoring Framework

518 The Monitoring Framework, as stated in Annexes 3-2 and 3-4 of DAO No. 2003-30, presents a proposed program wherein the proposed Project’s environmental compliance will be verified and reported to concerned stakeholders. These stakeholders are composed of government regulators and recognized non-governmental organizations (NGOs) that have valid issues and concerns on the proposed Project. NCC, together with the stakeholders, form a Multi-partite Monitoring Team (MMT).

519 The MMTs objective is to provide a venue to discuss the important concerns of the Project. These concerns may involve the following items:

- Verify the compliance of NCC in its ECC and EMP;
- Validate the proposed Project’s conformance to government standards, and NCC’s submission of necessary post-ECC documentation requirements;
- Identify the legitimate concerns of the host community, in relation to the implementation of the proposed 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.

520 The MMT members and their corresponding roles and regulations for the quarry operations are presented in **Table** 6-4 **.** The Region 1 Office of the MGB heads the MMT of the proposed project. Other members are the DENR Region 1 Office, NCC and representatives from the affected communities.

Table 6-4: List of Members and Respective Roles of the MMT for NCC quarry

Member	Role/Responsibility
MGB Region 1 Office	• Presides as the head of the MMT • Oversees NCC's compliance to environmental regulations
DENR Region 1 Office	Oversees NCC's compliance to environmental regulations
Environment and Natural Resources Office- Natural Resources Regulatory Group (ENRO-NRRG)	Oversees NCC's compliance to environmental regulations
Northern Cement Corporation	• Provide budget for MMT activities • Submission of related information
Brgy. Labayug LGU	Member
Brgy. Inmalog LGU	Member
Brgy. Pladit LGU	Member
Brgy. Calunetan LGU	Member
Brgy. Sugcong LGU	Member
NGO Representative	Member
Indigenous Community Representative	Member

521 For the MMT of the NCC cement plant, a Memorandum of Agreement between DENR and NCC is being finalized. 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. The list of the MMT for the NCC cement plant is shown in **Table** 6-5**.**

522 **Northern Cement Corporation** 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.

Table 6-5: Proposed Composition of the MMT for the NCC Cement Plant

COMPOSITION	MEMBER	ROLE/RESPONSIBILITY
LGU representatives	(1) representative from the Municipal Environment and Natural Resources Office (MENRO) of Sison	▪ Serve as the MMT chair ▪ Oversee Proponent's compliance to environmental regulations ▪ Issue/revoke the ECC of the Project as mandated
	(1) Rural Health Unit (RHU) Chief or Municipal Health Officer (MHO) of Sison	▪ Exercise local authority and knowledge on environmental and social conditions in the project impact area
One representative from an LGU-accredited local NGOs with mission/s specifically related to environmental management	Labayug Mountain Base Agro-forestry Association Inc.	▪ Represent the mission/s of the NGO

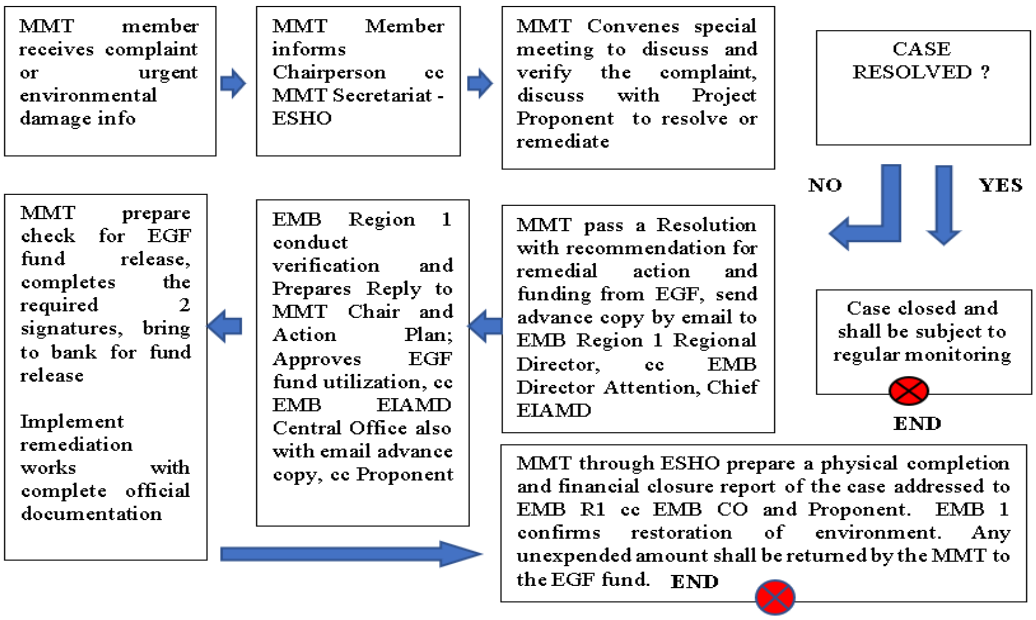
COMPOSITION	MEMBER	ROLE/RESPONSIBILITY
Maximum of 2 community leaders selected in accordance with the procedures described in the MOO	(1) Indigenous People Mandatory Representative (IPMR) (2) Women and Head Office of Senior Citizen Affairs	▪ Represent vulnerable sectors in the project impact area
Other government agencies	DENR	▪ Carry out mandate considering the project type and its expected impacts
Reference: DENR Administrative Order No. 2017-15		

6.4 Complaints Management

523 The MMT shall establish an environmental emergency communication system and complaints-receiving mechanism which shall include systems for transmitting recommendations for regulatory action to EMB in a timely manner to prevent adverse environmental impacts. An MMT Complaints and Grievance Committee shall be part of the MMT Organization. The Project Compliance Officer shall serve as support secretariat.

524 An indicative process flow for environmental emergency communication and complaints management is shown in the diagram below:

Figure 6-4: MMT Complaints and Grievance Mechanism



PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **MMT COMPLAINTS AND GRIEVANCE MECHANISM**	FIGURE NO.: 6-4
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: PROJECT PROPONENT

6.5 Environmental Guarantee and Monitoring Fund Commitments

525 The **Environmental Trust Fund (ETF)** 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 projects including, but not limited to, information and education and emergency preparedness programs.

526 The **Monitoring Trust Fund (MTF)** is the fund that will cover the expenses of the monitoring program approved by the MTF committee. The minimum amount for this fund is Php 150,000 to cover the maintenance and other operating budget incurred by the monitoring team. Replenishment of this amount shall be done quarterly to correspond to the expenses incurred by the monitoring team.

527 The **Rehabilitation Cash Fund (RCF)** is the fund reserved to ensure the compliance of the proponent to the approved rehabilitation activities and schedules. The fund will be annually replenished to maintain the minimum amount required.

528 The **Final Mine Rehabilitation and Decommissioning Fund (FMRDF)** ensures the availability of the full cost contained in the approved Final Mine Rehabilitation and/or Decommissioning Plan (FMR/DP). This fund will only be utilized for the implementation of all the decommissioning and/or rehabilitation activities presented in the FMR/DP for the succeeding years until the objectives of the mine closure have been achieved.

Table 6-6: Various Fund Commitments of Northern Cement Corporation

Fund	Deposited Amount as of June 7, 2019
Environmental Trust Fund	55,154.93
Monitoring Trust Fund	200,089.96
Rehabilitation Cash Fund B	5,115,965.62
Final Mine Rehabilitation Fund	17,851,619.73
Total	**23,222,830.24**

SECTION 7

DECOMMISSIONING/ABANDONMENT/REHABILITATION POLICY

7.1 Post-Construction Decommissioning

529 After the construction, the project site will be thoroughly cleaned as preparation for the operation. All the temporary facilities installed in the project site will be properly dismantled and removed including the equipment brought in the project site. Heavy equipment will be removed at 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.

530 All the wastes generated will be properly disposed 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 wastes will also be collected by DENR-registered haulers. Human wastes from the portable toilets will be properly siphoned by DENR-register desludgers. No wastes will be left in the project site.

7.2 Project Decommissioning/Abandonment

531 **Northern Cement Corporation** will allocate sufficient time and available resources if the decommissioning, abandonment, and/or rehabilitation of the Project will be necessary. Depending on the nature and reasons for abandonment, some facilities, such as the containers used as offices, may not be necessarily demolished or removed from the site, since some of these can be useful for other applications. Otherwise, proper dismantling, removal, and transportation of the structures, equipment, and machineries from the existing site will be conducted to minimize possible or further threats to the surrounding environment. 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.

532 Some plant facilities, such as office and accommodation buildings, can be repurposed by the community. Cement manufacturing facilities such as crushing plant, kilns, etc. will be removed while storage facilities can be repurposed. Siltation ponds will be backfilled and re-vegetated. The limestone quarry will be stabilized and re-vegetated. The proposed final land use of the cement plant complex and quarry areas after the decommissioning or rehabilitation is presented in **Table 7-1.**

Table 7-1: Proposed Final Land Use of Project Site After Decommissioning and/or Rehabilitation

Process/Component	Proposed Final Land Use
Cement Plant Complex	
• **Cement Plant and Facilities**	• Stable and re-vegetated area. • Removal of structures and possibly transferred to other projects or sold. • Retained storages for other useful purpose.
• **Office and accommodation buildings**	• Retained facilities for other useful purpose.

Process/Component	Proposed Final Land Use
	• Laboratory and motor pool equipment and other items will be removed and transferred to another project or sold.
• **Silt traps/ponds and drainage system**	• Silt traps/ponds backfilled and re-vegetated. • Water reservoir retained as recreation/picnic area. • Drainage system retrofitted to conform to proposed final land use.
Limestone Quarry	
• **Active/Un-rehabilitated Quarry Areas**	• Stable and re-vegetated area.
• **Siltation traps/ponds and drainage system**	• Stable and re-vegetated area. • Drainage system retrofitted to conform to proposed final land use.

533 The Final Mining Rehabilitation and Decommissioning Plan (FMRDP) of the Northern Cement Corporation is attached in the **Annex 11**. This was already submitted to the MGB. Northern Cement Corporation already started its rehabilitation activities to the mined-out areas within its MPSA. As of 2018, NCC already conducted reforestation to 230.85 hectares of land inside the MPSA.

534 **Northern Cement Corporation** commits to prepare and submit an amended version of the FMRDP three (3) months after the issuance of the Environmental Compliance Certificate. The amendments should include (but not limited to) updated fund commitments owing to higher operation expenses and a graphic presentation of the proposed rehabilitation programs of the FMRDP.

SECTION 8

INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

535 The institutional organization of the cement plant as shown in

536 **Figure** 8-1 contains people with their assigned responsibilities that require interaction between **Northern Cement Corporation's** different departments. The objective of this organization is to achieve the following:

- Economical and safety operations and maintenance of the proposed project's components;
- Implementation of company policies;
- Environmental compliance and sustainability; and
- Promotion and enhancement of the social acceptability of the proposed project.

537 The institutional organization will involve **NCC's** top-level management, since this group is responsible for providing the corporate direction and policies of the company. The policies shall then be disseminated to department heads and managers for implementation of the company personnel, including those who will be working on the operations of the proposed project.

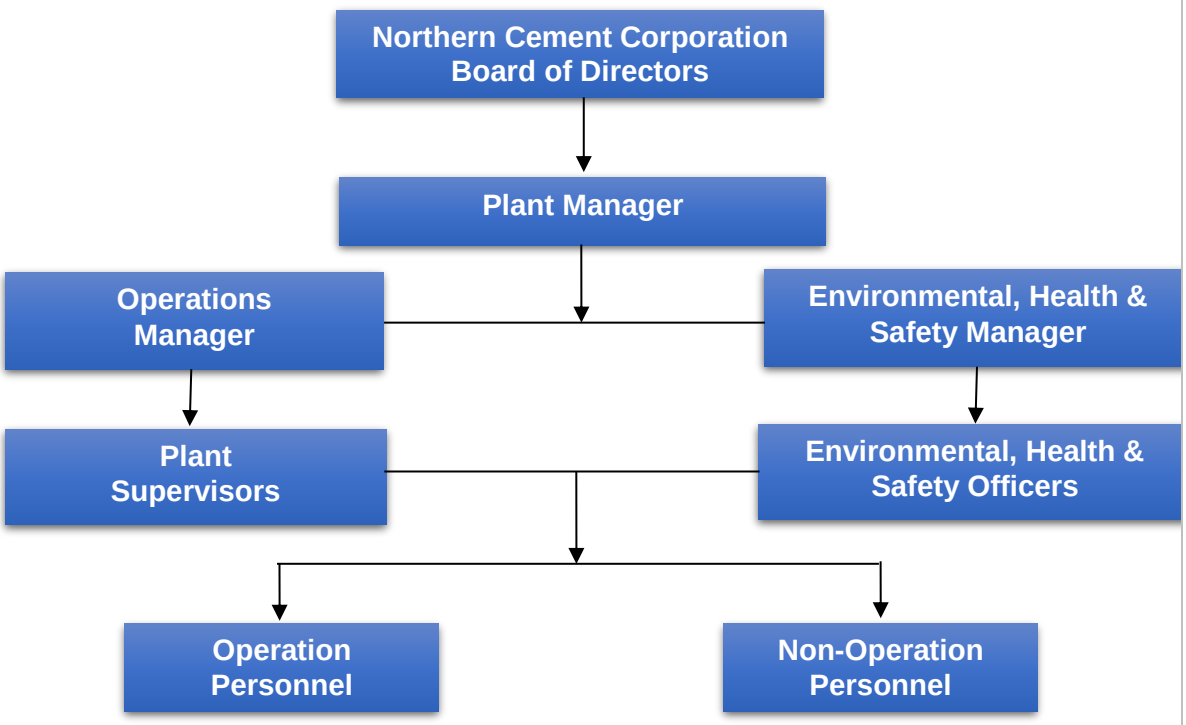
538 **Northern Cement Corporation** will also continue to establish a partnership with relevant government agencies, various stakeholders and local host communities in relation to the project. This partnership is necessary to maintain a transparent and positive relationship for the proposed project and its stakeholders, as well as to ensure that the environmental protection and enhancement measures are complied with. The following are the identified key stakeholders of the project:

- Municipal LGU of Sison, Pangasinan (host municipality)
- Municipal LGU of Pozorrubio, Pangasinan (adjacent municipality)
- Brgy. Calunetan, Sison (SDMP barangay)
- Brgy. Inmalog, Sison (SDMP barangay)
- Brgy. Labayug, Sison (host barangay)
- Brgy. Paldit, Sison (SDMP barangay)
- Brgy. Sugcong, Pozorrubio (SDMP barangay)
- Residents and community organizations that will be affected by the proposed project;
- Farmers' organizations;
- Chamber of Commerce;
- Various industry organizations;
- Local peace-and-order councils (i.e., PNP, Barangay Police); and
- Other concerned non-government organizations.

539 **Northern Cement Corporation** commits 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;
- Promote sustainable use and responsible development of resources by adopting appropriate technologies;
- Develop livelihood programs and upgrade skills of host communities to contribute and enhance the quality of life; and
- Develop training programs for its employees which will ensure that they will be continually prepared for the tasks assigned to them.

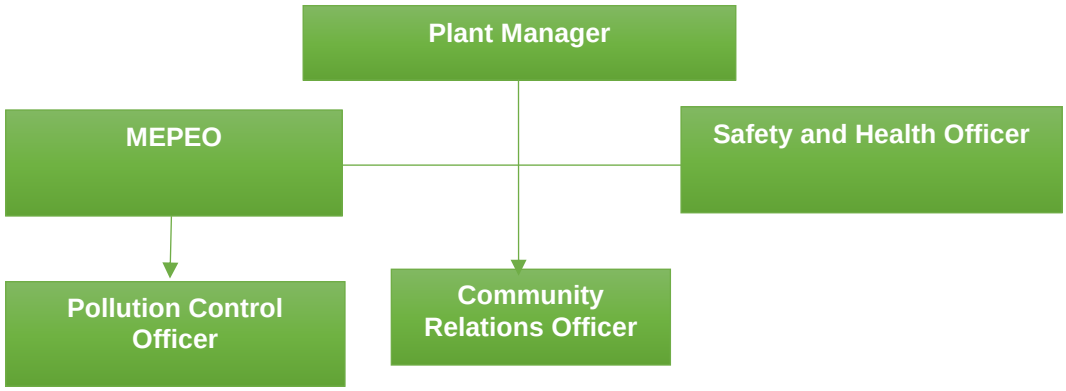
Figure 8-1: Organizational Chart for the Institutional Plan



PROJECT PROPONENT: Northern Cement Corporation	FIGURE TITLE: **ORGANIZATIONAL CHART FOR THE INSTITUTIONAL PLAN**	FIGURE NO.: 8-1
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC

540 Northern Cement Corporation has established its Pollution Control and Environmental Group to manage environmental concerns and to monitor the compliance of the cement plant and quarry operation to environmental laws. Members of the team are composed of the Mine Environmental Protection and Enhancement Office (MEPEO), Pollution Control Officer, Safety and Health Officer and the Community Relations Officer.

Figure 8-2: Framework of Organizational Set-up for Environment Concerns



PROJECT PROPONENT:	FIGURE TITLE:	FIGURE NO.:
Northern Cement Corporation	**FRAMEWORK OF ORGANIZATIONAL SETUP FOR ENVIRONMENT CONCERNS**	8-2
EIA REPORT PREPARER: LCI ENVI CORPORATION	PROJECT TITLE & LOCATION: **NCC Cement Plant and Quarry Expansion Project** Brgy. Labayug, Sison, Pangasinan	SOURCE: NCC