

Environmental Performance Report and Management Plan (EPRMP)

# Solid North Mineral Corporation Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant Brgy. Akle, San Ildefonso, Bulacan

THE REAL PROPERTY AND ADDRESS

Submitted to: Department of Environment and Natural Resources Environmental Management Bureau

01/19/2018



Leading in Clean Initiatives. An Environmental Report By:



Submitted To:



Department of Environment and Natural Resources Environmental Management Bureau EMB Building, DENR Compound, Visayas Avenue Diliman, Quezon City

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#### 19 January 2018

ENGR. METODIO U. TURBELLA Director Environmental Management Bureau Department of Environment and Natural Resources DENR Compound, Visayas Avenue Quezon City

#### ATTENTION : ATTY. MICHAEL DRAKE MATIAS OIC-Chief, EIA Division

 

 SUBJECT
 :
 Environmental Performance Report and Management Plan (EPRMP) Request for Re-initiation of Application for ECC Amendment (Reference ECC CO-0911-0007) Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant Barangay Akle, San Ildefonso, Bulacan

#### Dear Director Turbella,

We submitted the **Environmental Performance Report and Management Plan (EPRMP)** for the ECC amendment application of **Solid North Mineral Corporation** in San Ildefonso, Bulacan last June 2016. Because of DENR Memorandum Order 2017-01: AUDIT OF ALL OPERATING MINES AND MORATORIUM ON NEW MINING PROJECTS, the review of our EPRMP was not initiated.

We are now requesting the re-initiation of our ECC application in view of the clarification provided by DENR Memorandum Order 2017-01 dated March 10, 2017. It states, *"in view of the need to address the requirements for cement, aggregates and related materials of the construction industry, quarry resources, such as limestone, aggregates, and other materials used in the industry, are hereby excluded from the scope of the moratorium on the acceptance, processing, and/or approval of mining applications and/or new mining projects under Department Memorandum Order No. 2016-01."* 

We hope that this will initiate the review process soon. Should you have query, please contact Mr. Jerome B. Leaño at +632 442-2830 or 0939-920-2435.

Sincerely yours,

Mr. Erdulfo A. Arañas President

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### **EXECUTIVE SUMMARY**

<b>Project Fact She</b>	eet				
Name of	Solid North	Mineral Corp	oration (SNMC)		
Project	Quarry Expa	insion & 1.5 N	/IMTPY Limestone Pulver	rizing Plant	
Project	Province of	Province of Bulacan, Municipality of San Ildefonso, Barangay Akle			
Location					
Project Area	Existing plar	nt site approx	. 14.89 hectares with 75	7-hectare MPSA 161-2	2000-111
Nature of	<ul> <li>Quarrying</li> </ul>	; of limestone	, shale and pozzolan		
Project	Limestone	e pulverizing			
Project Size	Quarry Expansion:         Limestone: 7.1 Million Metric Tons Per Year (MMTPY) from 1.2 MMTPY         Shale: 0.81 MMTPY         Pozzolan: 0.75 MMTPY         Limestone Pulverizing:         Pulverized Limestone: 1.5 MMTPY				
Environmental	CO-0911-00	07 issued Ma	rch 1, 2010		
Compliance					
Certificate					
Summary of Major Project Components	Major Co	mponents	Existing Components (as per ECC)	Components to be Modified	Proposed Updated Components
(Existing &	Quarrying	Limestone	■1.2 MMTPY	Additional 5.9	■ 7.1 MMTPY
Proposed)				MMTPY	
		Shale	■ 0.21 MMTPY	Additional	■0.81
				Shale/Pozzolan	MMTPY
		Pozzolan		Extraction Rate	■0.75
					MMTPY
	Limestone F	Pulverizing	■ 0.75 MMTPY	Removal of kiln	1.5 MMTPY
			(cement)	cement	(pulverized
				production	limestone)
				Retention of	
				limestone	
				crusher and	
				pulverizer	
	Rehabilitati	on	• (a) Power Supply &	• (a) Power Supply	■N/A
			Support Utilities	& Support	
			Upgrade	Utilities Upgrade	
			■ (D) Electromechanical	= (D)	
			Work at the	al Work at the	
			Production Line	Broduction Line	
			$\blacksquare$ (c) Finish Mill &		
			Auxiliaries	Rehabilitation of	
			• (d) Raw Mill	Finish Mill &	
			Upgrade &	Auxiliaries	
			Energization	■(d) Raw Mill	
				Upgrade &	
				Energization	
Project Cost	Php 300,000,000.00				
Construction	2017 to 201	8			
Period					



Commercial	2019
<b>Operation Date</b>	
Proponent	Solid North Mineral Corporation (SNMC)
Name	
Proponent	Mr. Erdulfo A. Arañas
Authorized	President
Representative	
Proponent	Solid North Mineral Corporation
Address and	Unit 3505-B Summit One Tower, 530 Shaw Blvd., Mandaluyong City, NCR, The
<b>Contact Details</b>	Philippines, 1550
	Tel No.: (+632) 535-0245
EPRMP	LCI Envi Corporation
Preparer	
(Consultant)	
Preparer	Engr. Jose Marie U. Lim, MSc.
Contact Person	Managing Director
Preparer	LCI Envi Corporation
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	Fax No.: (+632) 961-9226

#### **Description of the Project's EPRMP Process**

The Philippine Environmental Impact Statement (EIS), under Presidential Decree 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.

#### Scope of the EPRMP

Solid North Mineral Corporation (SNMC) intends to expand its guarry to 7.1 MMTPY of limestone, 0.81 MMTPY of shale, and 0.75 MMTPY of pozzolan. The company also intends to operate a Limestone Pulverizing Plant inside its existing facility in Barangay Akle, San Ildefonso, Bulacan. Since the issuance of the Environmental Compliance Certificate (ECC) in 2010, only the guarry operation has been operational. Some cement plant components, particularly the raw mill, were rehabilitated for the limestone pulverizing facility. Rehabilitation of the kiln was not done since the company will focus on limestone pulverizing instead of cement manufacturing. Rehabilitation of components for the limestone pulverizing facility ended in 2017, but the facility is not yet operational.

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 SNMC presents its updated environmental commitments through a comprehensive environmental management and monitoring plan.

This EPRMP document is 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 SNMC.



#### EPRMP Consultant

**LCI Envi Corporation (LCI)** was commissioned by **SNMC** to conduct an environmental assessment of the project site and document the potential impacts that may be incurred by its future operations. The assessment was documented in an EPRMP. **LCI** was tasked to prepare, document, and submit all the necessary information related to the **SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant** in-behalf of **SNMC** for DENR-EMB.

#### **EPRMP Study Team**

The Study Team is composed of professionals that have extensive experiences in the field of environmental assessment. The list of the personnel involved and their corresponding fields of expertise are listed in the table below.

Study Team Member	EIA Preparer No.	Expertise
Engr. Jose Marie U. Lim, MSc	IPCO-029	Team Leader/Environmental Specialist
Joseph P. Lalo, MA	IPCO-149	Sociologist
Michael Angelo B. Promentilla, PhD	N/A	Air Quality/Modelling Specialist
Virgilio T. Cudera, PhD	N/A	Terrestrial Ecologist
Jerome B. Leaño	IPCO-059	Environmental Specialist
Kevin Paolo G. Bartolome	IPCO-353	Environmental Specialist

#### EPRMP Schedule

An assessment of the baseline environment was conducted at the project site of the **SNMC**. The timetable for the Plant's EPRMP document in pursuant of the ECC is shown in the following table.

Date	Remarks
January 2016	<ul> <li>Gathering of necessary data for PDS</li> </ul>
	<ul> <li>Drafting of PDS, submission to client</li> </ul>
February 2016	Submission of PDS to EMB
March 2016	<ul> <li>Technical Scoping at EMB</li> </ul>
January 2018	<ul> <li>Submission of Draft EPRMP to DENR EMB for review and subsequent issuance of amended</li> </ul>
	January 2016 February 2016 March 2016 January 2018

#### **EPRMP Study Area**

The project site is located in Barangay Akle in the Municipality of San Ildefonso, in the Province of Bulacan. The primary impact area is bounded by the limestone pulverizing mill complex and the quarry area. The secondary impact areas are the surrounding barangays around the project site within San Ildefonso including one barangay in Doña Remedios Trinidad, Bulacan. These impact areas are consistent with the project's initial EIS.

#### **EPRMP Methodology**

The environmental impact assessment was conducted based on the guidelines provided under the Revised Procedural Manual for DAO 2003-30. The scope of and methods for the assessment were agreed upon with the Review Committee at the Technical Scoping meeting that



was conducted on March 30, 2016. The table below presents the methodologies used and its purpose.

Methods	Purpose		
<ul> <li>Review of various geologic maps prepared</li> </ul>	Io assess existing geohazards in the area		
by mandated agencies	and to ensure that activity is in accordance		
<ul> <li>Terrestrial flora and fauna assessment</li> <li>Deview of evisting and proposed guarny</li> </ul>	<ul> <li>To assess tupos of flore and found that will</li> </ul>		
plans	be affected by the operation.		
<ul> <li>Climatological data from the Philippine</li> </ul>	To study possible impacts of meteorology		
Atmospheric, Geophysical, and	on the area		
Astronomical Services Administration	<ul> <li>To review compliance to air quality</li> </ul>		
(PAGASA)	standards set by DENR		
Review of SNMC self-monitoring reports	<ul> <li>To assess possible impact of quarry</li> </ul>		
on ambient air quality and noise emissions	operation on air quality in the impact area.		
<ul> <li>Air dispersion model</li> </ul>			
<ul> <li>Review of SNMC self-monitoring reports</li> </ul>	<ul> <li>To review compliance to water quality</li> </ul>		
on surface water quality	standards set by DENR		
<ul> <li>Groundwater sampling and analysis</li> </ul>	<ul> <li>To determine existing ground water quality</li> </ul>		
Review of actual water production and	<ul> <li>To assess the capability of the ground</li> </ul>		
consumption data	water sources to supply water for the		
- Deview of municipal and homen on multiple	Facility and the community.		
<ul> <li>Review of municipal and barangay profiles</li> <li>of Prov. Aklo</li> </ul>	<ul> <li>To assess impacts of the project on the project affected persons</li> </ul>		
UI DIBY. AKIE Consultations (ECD/KII) with various	To document the opinions of stakeholders		
stakeholders	- To document the opinions of stakeholders		
<ul> <li>Review of activities completed for the SDP</li> </ul>	<ul> <li>To ensure that the company provides social</li> </ul>		
and SDMP by the company for the past 2	development programs suitable for the		
vears.	project-affected community.		
	Methods• Review of various geologic maps prepared by mandated agencies• Terrestrial flora and fauna assessment• Review of existing and proposed quarry plans• Climatological data from the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA)• Review of SNMC self-monitoring reports on ambient air quality and noise emissions• Air dispersion model• Review of SNMC self-monitoring reports 		

#### **EPRMP Summary**

#### **Project Alternatives**

Solid North Mineral Corporation (SNMC) initially intended to operate and rehabilitate its existing 0.75 million metric tons per year (MMTPY) cement plant but this did not push through. However, due to the increasing demand for raw materials for power and cement plants, the company decided to expand the limestone quarrying operations, and restart the limestone pulverizing to supply the said requirements of power and cement plants. Operations will be limited to quarrying and limestone pulverizing; there will be no longer a cement production.

No other sites were considered as the current facility, including MPSA 161-2000-III, is already owned by SNMC. The current plant site is ideal because the existing facilities, such as crushers and storage silos, will be utilized. Since the existing facility is within an area where quarrying activities are prevalent, people in the area are used to these kinds of industries. In addition, most of the residents were previously or currently employed by these industries.

No other technologies were considered since the facilities to be used for the limestone pulverizing operation is already existing. The limestone pulverizing mill can produce 0.1-1.5mm of pulverized limestone for circulating fluidized bed (CFB) power plants, one of the potential customers of SNMC. This pulverizing mill is efficient because it produces no waste; limestone



greater than 1.5mm will be supplied to the nearby Eagle Cement Corporation as cement raw material.

If the limestone pulverizing mill is cancelled, ground limestone with sized 0.1-1.5mm will not be available for CFB power plants. Moreover, supply of limestone to cement plants will be reduced.

If the project is not pursued, the supply of limestone and related products will be affected. Industries utilizing limestone, shale and pozzolan as raw materials will sell their finished products higher if supply is lower. Local employment opportunities may also be affected as there will be lesser jobs to be created. Local tax contributions, which funds development programs of the barangays and municipalities, will also be lower.

#### **Public Participation Activities**

The community consultations were conducted last 5 February 2016 from 8:00am to 4:00pm. This was also an Information and Education Campaign (IEC) opportunity to introduce formally the project's proposed expansion in their area. Three separate sessions (one session per barangay) were conducted within the day. Allotted time for each session was two hours. The consultations were held at 8 Waves Hotel and Resort in San Rafael, Bulacan.

The queries from the stakeholders were mostly on the project benefits in general, potential impacts of the quarrying activities to the community, potential access to water supply, suggested livelihood activities and possible programs, projects and activities for the community.

In addition, there are several issues and concerns for SNMC raised during the Public Hearing for Eagle Cement (EAGLE) Expansion Project held last 17<sup>th</sup> of November 2017 in the Covered Court of Akle High School, Brgy. Akle, San Ildefonso, Bulacan. One glaring issue which arose during the said Public Hearing was the community mix-up of EAGLE and SNMC. This will be addressed by the conducting Information, Education and Communication (IEC) campaigns to differentiate the activities of EAGLE and SNMC.

#### **Environmental Baseline Updating**

The environmental baseline in this EPRMP was updated using the data presented in the Multi-Partite Monitoring Team (MMT) reports of **SNMC**. The data are comprised of monthly measurements of environmental parameters that determine the plant's accordance to DENR regulations. The secondary data from these reports were analyzed in relation to the Project's proposed changes to its operations. The findings are summarized in the following table:

Module	Analysis				
Land	The Province of Bulacan classified the area where <b>Solid North Mineral Corporation (SNMC)</b> is situated in as a mining area. Current and future operations are confined within MPSA 161-2000-III.				
	The main facility and quarry sites of <b>SNMC</b> are underlain entirely by the Angat and Madlum Formations. Geologic structures in the vicinity of the site are unremarkable with the buff-light colored limestone, and showing no unusual features.				



Module	Analysis		
	Latest Geohazard map from Mines and Geosciences Bureau indicate the project site to be not susceptible to flooding, and have a low susceptibility to landslides.		
	An assessment of the vegetation and associated faunal component <b>SNMC</b> project site was conducted last April 21-23, 2016. All plants and animals recorded in the project site are either common throughout the Philippines and in the island of Luzon. Some species of plants, namely gisok-gisok, kamagong, and narra, which are critically endangered, were found in the area. Meanwhile, katmon is classified as other wildlife species. Some strategies that are enumerated in DAO 2007-01, such as collection of plants and/or by-products and deliverables will be applied as management interventions.		
	Soil fertility of the area will be affected by the quarrying activities due to loss of topsoil. Furthermore, soil fertility is not being monitored by SNMC since it is not required by the MMT. As a mitigating measure for the change in soil fertility, <b>SNMC</b> shall set aside the topsoil for future greening purposes. The topsoil that is set aside will undergo soil conditioning to enhance the soil fertility for future greening and rehabilitation programs. Progressive rehabilitation, which requires land preparation through application of soil on mined-out areas, shall also be part of the Environmental Protection and Enhancement Program (EPEP).		
Water	<b>SNMC</b> currently monitors 1 intermittent creek in the quarry site, and 1 man- made creek in the plant site for a total of 4 surface water stations. In addition to these stations, a siltation pond within the plant site is also being monitored. Parameters being monitored are pH, temperature, COD, and heavy metals. Based on previous monitoring data (October 26, 2017), water quality in all the stations meet the DAO 2016-08 water quality guidelines.		
	Siltation was observed in the area even before <b>SNMC's</b> operation, which can be attributed to other domestic and agricultural activities near the river.		
Air	Existing monitoring reports submitted to DENR were reviewed to assess ambient air quality in the vicinity. Parameters that were analyzed include Total Suspended Solids (TSS), NO <sub>2</sub> , SO <sub>2</sub> , and PM <sub>10</sub> . The latest air monitoring was conducted last October 26, 2017, as stated in the 4 <sup>th</sup> quarter 2017 SMR of <b>SNMC</b> . All parameters were within DENR standards.		
	An air dispersion model simulated the emissions associated with the proposed expansion. With the assumption of uncontrolled scenario, indications suggest that the impact of the quarry operations and limestone pulverizing could result to an increased concentration of criteria air pollutants particularly TSP and PM10 above the prescribed guideline values. Thus, the said major expansion would still be subject to Rule X of DAO 2000-81 which requires the proponent to install and operate "Best and Available Control Technology" (BACT).		
People	Data from the Philippine Statistics Authority (PSA) were utilized to compare demographic indicators from the previous baseline data. In addition, the latest socio-economic profile and Comprehensive Land Use Plan (CLUP) of the Municipality of San Ildefonso were also utilized.		
	Since construction and operation of the limestone pulverizing and quarry expansion will be within <b>SNMC's</b> property, there will be no displacement or		



Module	Analysis		
	disturbance of properties or settlers. In relation to this, there will be no change or conflict in land ownership and change or conflict in right of way.		
	Competition for water resources against the community will not be an issue, as the project will only utilize minimal amount of water. <b>SNMC</b> has been developing water systems for the community and has been in coordination with SIWAD to provide and develop new water sources for the people.		
	With the expansion of the operation, more workers may be exposed to occupational health and safety risks. Crime incidence may also rise as a result of non-assimilation of immigrant workers to the local culture.		
	Health of workers is regularly monitored by an in-house physician. Furthermore, SNMC conducts medical missions as well as providing medicines in local health clinics in the area.		
	Traffic in the area may also increase because of the influx of trucks delivering the finished product of <b>SNMC</b> to its clients.		
	These anticipated impacts will be addressed in the existing social management and development program (SDMP). With this EPRMP, <b>SNMC</b> commits to regularly monitor the compliance to the SDMP commitments and propose adjustments and improvement whenever necessary.		

#### Assessment of Environmental Performance

The following documents the environmental performance of **SNMC** by reviewing various environmental management procedures that are currently implemented by the company to mitigate environmental impacts of the operation.

Module	Analysis
Land	Soil fertility of the area will be affected by the quarrying activities due to loss of topsoil. As a mitigating measure, <b>SNMC</b> shall set aside the topsoil for future greening purposes. Progressive rehabilitation, which requires land preparation through application of soil on mined-out areas, shall also be part of the Environmental Protection and Enhancement Program (EPEP).
	The land forms and elevation will change due to the quarry operations. <b>SNMC</b> continuously monitors the angles of slopes and applies proper quarrying practices to avoid potential slope failures.
	Various measures for solid waste management such as waste prevention, reduction, reuse, and recycling are outlined on the procedure. Waste segregation is also applied. <b>SNMC</b> will construct its own Materials Recovery Facility (MRF) where waste is held prior to disposal. <b>SNMC</b> spends between Php 30,000 to Php 40,000 per month for the disposal of solid waste to the Metro Clark Sanitary Landfill.
	<b>SNMC</b> also implements a hazardous waste management as part of its waste management procedure. Proper segregation, labeling, collection, storage, transport, treatment, and final disposal is outlined by the method. Moreover, hazardous wastes specified under the procedure are empty chemical containers, chemical contaminated rags, papers, and PPE that have been used in the warehouse. It also consists of Used Lead Acid Batteries

Module	Analysis			
	(ULABs), Busted Fluorescent Lamps (BFL), and damaged containers previously containing chemicals that are or may be generated in the maintenance areas/processes. Grease from the canteen and Waste Electrical and Electronic Equipment (WEEE) that may be produced by the MIS are also included. Pathological, pathogenic, and contagious waste including tools from the clinic and all other hazardous waste specified under DAO 2013-22 is included in hazardous waste.			
	The Final Mine Rehabilitation and Decommissioning Plan (FMRDP) and Environmental Protection and Enhancement Program (EPEP) of <b>SNMC</b> is still being reviewed by MGB.			
	<b>SNMC</b> commits to prepare and submit an amended version of the FMRDP 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.			
Water	<b>SNMC</b> applies a dry process; water consumption of the pulverizing plant is relatively low compared to cement facilities.			
	To address some complaints of competing use of water resource, <b>SNMC</b> is now working with the San Ildefonso Water District (SIWAD) to develop new deep well outside of the host barangay (some 2.5 kilometer upstream of Akle) to increase production capacity of the water utility in providing water to the community surrounding <b>SNMC</b> .			
	Possible siltation from the quarry operations are managed by the siltation ponds within the quarry site. Siltation ponds within the limestone pulverizing plant are used to retain run-off water to minimize siltation. <b>SNMC</b> regularly monitors the quality of the ponds. Based on previous MMT monitoring data, water quality of the siltation ponds meet the DAO 2016-08 general effluent standards.			
Air	The major impact on air that is prevalent in the area is fugitive dust emissions from quarrying and pulverizing operations, as well as from vehicles passing through the community. The company manages dust by conducting periodic watering in the area. The company will install bag filters to control fugitive dust emissions from the limestone pulverizing facility.			
People	Noise will inevitably be emitted by the operations. To minimize noise, heavy equipment is 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 <b>SNMC</b> . <b>SNMC</b> commits to fostering a safe environment for workers and for residents within the			
	impact area.			
	The company has established a number of policies and guidelines regarding occupational health and safety, which includes training and orienting workers regarding safe work practices, and use of personal protective equipment. To protect workers who are working with explosives in the quarry site, a handling and blasting procedure is being implemented.			
	<b>SNMC</b> ensures that residents within the impact areas reap the benefits of the operations. The company has multiple social development programs under its SDMP, including			



Module	Analysis				
	programs for education, livelihood, and health. The company conducts yearly sessions				
	with barangay representatives to further improve SDMP programs and to ensure that				
	these programs are tailored to the needs of the community.				

### Summary of Impacts and Residual Effects After Mitigation

	The following is a concise summary of environmental impacts caused by the operation,	as well
as <sup>.</sup>	the corresponding mitigating measures and residual impacts	

Module Impact		Mitigating/Enhancement Measures	Residual Impact	
Land	More waste (hazardous and residual) will be produced with the construction and operation of Limestone Pulverizing Plant	<b>SNMC</b> applies a waste management procedure as part of its environmental management plan. This procedure encompasses solid waste management, hazardous waste management, and scrap management.	Residual and hazardous waste are hauled off by accredited off-takers. Wastes will not be stocked in the area.	
	Loss of flora and fauna in the areas to be developed as quarry sites.	As part of the EPEP, <b>SNMC</b> commits to monitoring and evaluation of species survival within identified habitat. <b>SNMC</b> will also establish buffer zones around the quarry areas. These areas will be allocated for planting of fast growing indigenous tree species such as acacia and ipil-ipil and fruit bearing trees. A nursery will also be established to provide required seedlings for the buffer	Flora and fauna within the quarry areas are expected to be lost. However, vegetation within buffer zones is expected because of the efforts of <b>SNMC</b> . Furthermore, <b>SNMC</b> will diligently follow progressive rehabilitation plans as outlined in the EPEP and FMRDP. The company will set aside enough funds for rehabilitation.	
Water	Water consumption	zones. Since a dry process will be applied, less water will be consumed by the pulverizing facility. <b>SNMC</b> may opt to adopt a water sustainability program or a water reuse program to further reduce water consumption.	Water will still be consumed by the facility. Water is also allotted for domestic purposes and for watering to mitigate fugitive emissions.	
	Siltation in water bodies. Water contamination due to oil spills and leaks.	Installation of siltation ponds in plant and quarry areas. Proper maintenance of siltation ponds. <b>SNMC</b> implements spill management procedures.	The siltation due to the operations of <b>SNMC</b> will be minimized. Implementation of spill management procedure shall greatly minimize the risk of contamination due to oil spills and leaks.	
Air	Fugitive dust	Regular road watering is conducted. Bag filters will be installed as part of the limestone pulverizing facility.	Fugitive dust, while still prevalent, will significantly be lessened.	
	Noise	Heavy equipment is muffled. Workers use appropriate PPE. Noisy activities are performed only during daytime. Sound	Noise from the facility will still be emitted.	



Module	Impact	Mitigating/Enhancement Measures	Residual Impact	
		barriers and sound proofing are installed.		
People	Blasting may cause ground vibration and presence of fly rocks.	Optimum blasting design through optimum blast holes pattern and optimum explosives	Vibration and noise will be eliminated.	
	Exposure of workers to occupational hazards	<b>SNMC</b> currently follows a Safety and Health Program, which is observed throughout the operation of the plant.	Accidents may still occur, but the safety and health guidelines currently in place significantly lowers the exposure of workers to occupational hazards.	
	Higher fund allocation for social development programs	<b>SNMC</b> conducts yearly IEC activities with various barangay representatives to formulate SDMP activities.	The community will continue to reap benefits of social development programs	
	Job opportunities	The company continues to prioritize local hiring.	Higher employment rates in the community	
	Higher local tax to be paid owing to higher revenue of company	<b>SNMC</b> will continue to pay taxes.	Higher local tax.	



## SECTION 1 **PROJECT DESCRIPTION**

#### Introduction

In January 10, 2000, Bacnotan Cement Corporation (BCC) were issued Environmental Compliance Certificates (ECCs) for its proposed 1.65 million metric tons per year (MMTPY) Cement Plant Complex (ECC No. 9802-002-105) and for its Limestone and Shale Quarry Project (ECC No. 9702-004-102C) with a declared production capacity of 2.48 MMTPY of limestone and 0.21 MMTPY of shale.

However, the plan was not implemented due to economic downturns. The facility was forced to be mothballed and was later sold by BCC to Holcim Cement. Holcim did not proceed with the proceed with the upgrading as well, and it was able to sell the property along with its Mineral Production Sharing Agreement (MPSA 161-2000-III) to Solid North Mineral Corporation (SNMC) in 2008.

Since most of the equipment are still in good condition, SNMC intended to continue the rehabilitation works for the said cement plant complex and operate with a smaller production capacity of 0.75 MMTPY. The proposed upgrading and rehabilitation of the cement plant complex, cement production operation of 0.75 MMTPY, and quarrying of 1.2 MMTPY of limestone was issued an (ECC CO-0911-0007) in March 2010.

SNMC currently operates a limestone guarry (covered by ECC CO-0911-007 issued last March 1, 2010) and shale quarry (covered an ECC 9702-004-102C previously held by Bacnotan Cement Corporation). SNMC intends to modify the components indicated in the March 2010 ECC by removing the cement plant component into a limestone pulverizing facility and by expanding the quarry operations. Some cement plant components such as the kiln were already removed, and some components such as the raw mill were rehabilitated to accommodate the limestone pulverizing facility. SNMC will operate the limestone pulverizing plant inside its existing facility, while the areas for quarry expansion are all within the current approved MPSA No. 161-2000-III.

ECC Reference No.	Issuance Date	Issued to	Coverage
9802-002-105	10 January 2000	Bacnotan Cement	<ul> <li>1.65 million metric tons per year</li> </ul>
		Corporation	(MMTPY) Cement Plant Complex
9702-004-102C	10 January 2000	Bacnotan Cement	2.48 MMTPY Limestone
		Corporation	<ul> <li>0.21 MMTPY Shale/Pozzolan</li> </ul>
CO-0911-0007	1 March 2010	Solid North Mineral	<ul> <li>0.75 MMTPY cement production</li> </ul>
		Corporation	<ul> <li>1.2 MMTPY Limestone</li> </ul>
			<ul> <li>Rehabilitation of (a) Power Supply</li> </ul>
			& Support utilities upgrade (b)
			Electromechanical Work at the
			Production Line (c) Finish Mill &
			Auxiliaries and (d) Raw Mill
			Upgrade & Energization

The history of the ECC issuances in the project area are shown below:

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



Project	Solid North Mineral Corporation (SNMC)					
Name	Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant					
Project	Brgy. Akle, San Ildefonso, Bulacan					
Location						
Type of	<ul> <li>Quarrying of limestone, shale and pozzolan</li> </ul>					
Project	Limestone pulverizing					
Project	Major Components Existing Components Components to be Proposed New					
Size	Quarrying Limestone		(as per ECC)	Modified	Components	
			• 1.2 MMTPY	Additional 5.9 MMTPY	■ 7.1 MMTPY	
Shale		0.21 MMTPY	<ul> <li>Additional</li> </ul>	■0.81 MMTPY		
	Pozzolan			Shale/Pozzolan Extraction Rate	■0.75 MMTPY	
	Limestone Pulverizing Rehabilitation		<ul> <li>0.75 MMTPY (cement)</li> </ul>	<ul> <li>Removal of kiln cement production</li> <li>Retention of limestone crusher and pulverizer</li> </ul>	<ul> <li>1.5 MMTPY (pulverized limestone)</li> </ul>	
			<ul> <li>(a) Power Supply &amp; Support Utilities Upgrade</li> <li>(b) Electromechanical Work at the Production Line</li> <li>(c) Finish Mill &amp; Auxiliaries</li> <li>(d) Raw Mill Upgrade &amp; Energization</li> </ul>	<ul> <li>(a) Power Supply &amp; Support Utilities Upgrade</li> <li>(b) Electromechanical Work at the Production Line</li> <li>(c) No Rehabilitation of Finish Mill &amp; Auxiliaries</li> <li>(d) Raw Mill Upgrade &amp; Energization</li> </ul>	• N/A	
Project	Solid North	Mineral Cor	oration			
Proponent	Mr. Erdulfo A. Arañas President Unit 3505-B Summit One Tower, 530 Shaw Blvd., Mandaluyong City, NCR, The Philippines, 1550 Tel No.: (+632) 535-0245					
EPRMP	LCI Envi Corporation					
Preparer	Engr. Jose Marie U. Lim, MSc. EIA Team Leader Unit 8LM Future Point Plaza 3 111 Panay Avenue, South Triangle Quezon City, NCR, The Philippines, 1103 Telephone no.: (+632) 442-2830 Fax No.: (+632) 961-9226					

#### Table 1-1: Proposed Project, Proponent and EPRMP Preparer Details

### 1.1 Project Location and Area

#### 1.1.1 Project Area

The project and quarry sites are located in Barangay Akle in the Municipality of San Ildefonso, in the Province of Bulacan. The limestone pulverizing plant will be constructed within the existing plant of **SNMC**. A small portion of the exiting plant is currently leased to Armstrong Fly-ash and Logistics Company, Incorporated, a fly-ash processing facility. The construction and operation of this facility is covered by a separate ECC. The impact of its operation was considered particularly on the cumulative impact on air quality.

### 1.1.2 Project Location

The general location map of the project is shown in **Figure 1-1**, while **Figure 1-2** shows the main access route to **SNMC** plant site. **Table 1-2** presents the geographic coordinates of MPSA No. 161-2000-III containing Parcels 1 and 2 as the designated quarry areas of **SNMC**. In addition, **Table 1-3** shows the geographic coordinates of the plant site of **SNMC**.

Point	Latitude (N)	Longitude (E)		
Parcel 1				
1	15°04'00"	121°03′30″		
2	15°04'30"	121°03′30″		
3	15°04'30"	121°03′19.02″		
4	15°06'00"	121°03′19.02″		
5	15°06'00"	121°04′30″		
6	15°04'00"	121°03′30″		
7	15°04'00"	121°04'00"		
8	15°04'00"	121°04′30″		
9	15°03'30"	121°04′30″		
10	15°03'05.14"	121°04′30″		
11	15°03'02.44"	121°04′14.27″		
12	15°03'08.22″	121°04′13.11″		
13	15°03'08.22″	121°04′13.11″		
14	15°03′18.39″	121°04'21.02"		
15	15°03′18.39″	121°04′11.34″		
16	15°03′21.67″	121°04'10.78"		
17	15°03′19.41″	121°03'57.59"		
18	15°04'00"	121°03′50.23″		
Parcel 2				
1	15°03'00"	121°03′00″		
2	15°03′30″	121°03′00″		
3	15°03'30"	121°03′36.30″		
4	15°03'00"	121°03′36.30″		

#### Table 1-2: Geographic Coordinates of SNMC MPSA

#### Table 1-3: Geographic Coordinates of SNMC Plant Site

Point	Latitude (N)	Longitude (E)
1	15°03′24.05″	121°04′12.24″
2	15°03′24.06″	121°04′11.91″
3	15°03′23.42″	121°04′10.34″
4	15°03'22.91"	121°04'7.66"
5	15°03'22.95"	121°04'7.59"
6	15°03'23.00"	121°04'7.55"



Point	Latitude (N)	Longitude (E)
7	15°03′26.84″	121°04'7.30"
8	15°03′27.57″	121°04′6.37″
9	15°03'29.99″	121°04′2.03″
10	15°03′30.55″	121°04′1.21″
11	15°03′32.87″	121°04′1.31″
12	15°03′33.02″	121°04′1.85″
13	15°03′33.70″	121°04′2.04″
14	15°03′34.10″	121°04′1.68″
15	15°03′39.19″	121°04′3.43″
16	15°03'40.24″	121°04′4.59″
17	15°03′40.31″	121°04′4.71″
18	15°03'40.34″	121°04′4.83″
19	15°03′40.36″	121°04′5.10″
20	15°03'40.12″	121°04′7.32″
21	15°03'40.08"	121°04'7.70"
22	15°03′39.85″	121°04'9.70"
23	15°03′39.74″	121°04'9.78"
24	15°03′39.48″	121°04′9.80″
25	15°03′39.42″	121°04′10.01″
26	15°03′39.23″	121°04′10.32″
27	15°03′38.03″	121°04′11.24″
28	15°03′36.17″	121°04′12.60″
29	15°03′34.71″	121°04′13.84″
30	15°03′34.36″	121°04′14.13″
31	15°03′33.67″	121°04′14.78″
32	15°03′32.79″	121°04′15.74″
33	15°03'29.48"	121°04′15.41″

#### 1.1.3 Accessibility to the Project Site

The project site is strategically located and accessible by land from its markets. It is proximate to the Metro Manila and Central Luzon cement markets and where there is a demand for constant supply of raw materials in the surrounding areas which offers production advantage.

Using the City of Manila as point of reference, the project area is accessible mainly through the northbound direction of the North Luzon Expressway (NLEX). From NLEX, the main access route to the site is through Plaridel Bypass Road, then passing through General Alejo G. Santos Highway. Turn left and continue onto M. Valte Rd. and right to Narra Rd. as this eventually leads to SNMC.

There is an alternative route which does not require toll fees. From the City of Manila, take Espana Blvd. and Quezon Ave going to Commonwealth Ave, which leads to Regalado Hwy. Turn right to Quirino Hwy, then left to Del Monte-Norzagaray Rd. This leads to General Alejo G. Santos Hwy. Continue through M. Valte Rd. and right to Narra Rd. to get to SNMC.

The travel time to the plant site is approximately 2 to 3 hours from Manila by land transportation.



#### 1.1.4 Vicinity and Impact Areas

The Project Site is bounded on the west by the Municipality of Candaba in Province of Pampanga, on the east by Doña Remedios Trinidad, Bulacan, on the north by the Municipality of San Miguel in Bulacan, and on the south by the Municipality of San Rafael also in Bulacan. Figure **1-3** presents the direct and indirect impact areas.

The direct impact area (DIA) includes the entire block with MPSA No. 161-2000-III. In addition to this, areas outside the block such as office buildings and the SNMC plant site are considered as DIAs as well. The identified DIA are supported by the current locations of the monitoring stations for the existing operations (quarrying) and the environmental assessments conducted for the expanded operations (quarrying and limestone pulverizing), particularly by the runs of the air quality model, which predicted the possible areas to be affected by the emissions from area sources.

The indirect impact areas (IIA), on the other hand, are the areas surrounding the plant facilities and quarry areas. This area covers as well the multi-partite monitoring team stations, which were accurately established for the post-ECC monitoring of the existing plant. In addition to this, the adjacent communities are considered as IIA as well since "these are the areas from the outer boundary of the mixing or buffer zone to the point or area where the baseline environmental quality is calculated or monitored to be met" (DAO 2003-30).



#### Figure 1-1: General Location Map of the SNMC Project Site











#### Figure 1-3: Direct and Indirect Impact Areas



	DIRECT IMPACT EAGLE CEMENT CORPORATION MPSA 161-2000-III		2	3	4 Kilometers
2.2.1.MC-2	121°2'30"E	121°3'45"E		121°5'0"E	
JRCE: NAMRIA					
FIGURE NO.:		FIGURE TITLE:			
1-3		Direct and Indirect Impact Areas			
PROJECT PR	ROPONENT:	PROJECT NAME & LOCATION:			
Solid North Mineral Corporation SNMC Quarry Expansion & 1.5 N		on & 1.5 MMTPY I	imestone Pulveriz	ing Plant	
		Brgy.	Akle, San Ildefons	o, Bulacan	





### 1.2 Project Rationale

**SNMC** is a local company which aims to promote countryside development through provision of local employment and business opportunities. Taxes to be collected by both the local and national government shall provide for the improved social services in the host communities and better infrastructure development.

A 0.75 MMTPY cement plant, with an existing ECC issued last 2010, was not utilized is currently within the property of **SNMC**. However, due to the increasing demand for raw materials for power and cement plants, the company decided to expand the limestone, shale, and pozzolan quarrying operations, and restart the limestone crushing. In addition to limestone quarrying and crushing operations, a limestone pulverizing mill will be added to produce pulverized limestone. Operations will be limited to quarrying, crushing and pulverizing; there will be no cement production.

SNMC will utilize its existing plant site which covers approximately 14.89 hectares. The quarrying activities will be done within parcels 1 & 2 of the 757-hectare MPSA 161-2000-III. SNMC will extract 7.1 MMTPY of limestone (an increase of 5.9MMTPY from the existing ECC), 0.81 MMTPY of shale, and 0.75 MMTPY of pozzolan.

In addition, this project aims to produce pulverized limestone with 0.1 - 1.5 mm in size. Ground limestone will be supplied to Petron Corporation (PETRON) Circulating Fluidized Bed (CFB) Power Plant which is necessary for the flue gas de-sulfurization process.

Limestone (CaCO<sub>3</sub>) is one important component of emerging technologies for flue gas desulfurization systems. Limestone reacts with the sulphur dioxide (SO<sub>2</sub>) to create insoluble calcium sulphite (CaSO<sub>3</sub>) which is separated from gas released in the stack. Power plants using this technology need constant supply of ground limestone, thus, **SNMC** aims to supply the required quantity and quality of limestone as specified by customer.

The completion of this project will stand as additional source of Eagle Cement Corporation, a cement plant project adjacent to SNMC which will have an ultimate capacity of 7.1 MMTPY. Existing silos and raw material storage at **SNMC** will also be utilized to reduce investment cost.

Social acceptance is expected to be high because surrounding communities are already aware about the quarrying operations of **SNMC**. The company shall use the facilities previously operated to produce cement. Furthermore, most of the residents are former employees of Central Cement Corporation.

### 1.3 Project Alternatives

**Solid North Mineral Corporation** (SNMC) initially intended to operate and rehabilitate its existing 0.75 million metric tons per year (MMTPY) cement plant but this did not push through. However, due to the increasing demand for raw materials for power and cement plants, the company decided to expand the limestone quarrying operations, and restart the limestone pulverizing to supply the said requirements of power and cement plants. Operations will be limited to quarrying and limestone pulverizing; there will be no longer a cement production.

No other sites were considered as the current facility, including MPSA 161-2000-III, is already owned by **SNMC**. The current plant site is ideal because the existing facilities, such as crushers and storage silos will be utilized. Since the existing facility is within an area where quarrying activities are prevalent, people in the area are used to these kinds of industries. In addition, most of the residents were previously or currently employed by these industries.

No other technologies were considered since the crushing facilities to be used for the limestone pulverizing operation is already existing. Furthermore, the limestone pulverizing mill was chosen because it can produce 0.1-1.5mm of pulverized limestone for circulating fluidized bed (CFB) power plants, one of the potential customers of **SNMC**. This pulverizing mill is efficient because it produces no waste; limestone greater than 1.5mm will be supplied to the nearby Eagle Cement Corporation.

If the limestone pulverizing mill is cancelled, ground limestone with sized 0.1-1.5mm will not be available for CFB power plants. Moreover, supply of limestone to cement plants will be reduced.

If the project is not approved, the supply of limestone and related products will be affected. Industries utilizing limestone, shale and pozzolan as raw materials will sell their finished products higher if supply is lower. Local employment opportunities may also be affected as there will be lesser jobs to be created. Local tax contributions, which funds development programs of the barangays and municipalities, will also be lower.

### 1.4 Project Components

### 1.4.1 Major Components

The proposed project will have two components: (a) quarry expansion and (b) limestone pulverizing. Enumerated in **Table 1-4** are the components of the proposed project, together with its corresponding specifications.

**SNMC** has acquired the right to hold the Mineral Production Sharing Agreement (MPSA) Permit No. 161-2000-III previously held by Bacnotan Cement Corporation (BCC) then by Holcim. The MPSA, covering 757.0420 hectares, was issued by the Mines and Geosciences Bureau (MGB) and gave **SNMC** a permit to explore, mine, and process cement raw materials within the premises of San Ildefonso and DRT in Bulacan. The coordinates of **SNMC**'s MPSA are listed in **Table 1-2**.

Component	Specifications		
Quarry Operations			
Quarrying	EQUIPMENT	NO. OF UNITS	
<ul> <li>Excavation</li> <li>Explosives Blasting</li> <li>Extraction of limestone, shale and pozzolan</li> <li>Transfer of limestone, shale, and pozzolan from quarry area to plant site</li> </ul>	Hydraulic drills	2	
	Bulldozers, D9 or equivalent	2	
	Rock breaker	1	
	Loaders, 2 m <sup>3</sup> capacity	4	
	10-wheeler trucks	9	
	Road grader	2	
	Water truck	2	
	Road compactor	2	

#### **Table 1-4: Project Components**



Component	Specifications		
	Hydraulic excavator, 1 m <sup>3</sup> capacity	1	
	Fuel lorry	1	
	Utility trucks	3	
	Service vehicles	6	
Limestone Pulverizing			
Limestone Crushing and	3 units 250 tons per hour (TPH) Double-Stage Reduction System		
Conveying	composed of Jaw Crusher and Impact Hammer		
Limestone Grinding	<ul> <li>MTW215 European Type Trapezium Mill composed of 4 units with</li> </ul>		
	a rated capacity of 40 TPH each		
Limestone Storage	<ul> <li>9,953 MT capacity</li> </ul>		
Pulverized Limestone Storage	ulverized Limestone Storage 900 x 4 MT capacity		
& Bulk Loading			

#### 1.4.2 **Support Facilities**

#### 1.4.2.1 Water Resources

The water requirement for the operations of SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant is estimated at about 72 m<sup>3</sup>/day. Two deepwell facilities with a combined capacity of 27 m<sup>3</sup>/hr shall supply the cooling water requirement of the system. There is also a stand-by lagoon that can deliver a water a capacity of 30 m<sup>3</sup>/hr in case the deepwell facilities are not available. According to the water balance of the project (Figure 1-4), the facility requires 24 m<sup>3</sup>/day for the limestone crushing cooling system, 24 m<sup>3</sup>/day for domestic use, and another 24 m<sup>3</sup>/day for the fly-ash plant (operated by another entity and will have a separate ECC). Given that the total water delivery of the two SNMC deep wells totals to 648 m<sup>3</sup>/day, water supply should not be a problem.

Water in the area is more than enough given that the operation involves a dry process. Water will mainly be used for watering of roads and quarry areas, as well as cleaning equipment. The existing lagoon was already there even before the project. It is a good facility for water impoundment and SNMC intends to take advantage of this. Aside from water impoundment, the lagoon also serves as runoff/rain water catchment.

Since, **SNMC** constitutes mainly a dry process operation, there will be very minimal wastewater discharge.

For the domestic wastewater, the Plant shall install septic tanks or appropriate sewage treatment system to treat discharges from toilets and sinks within the administration office. Compliance to DENR effluent standards shall be primarily considered on the type of system that will be installed.

#### 1.4.2.2 Power Demand

Manila Electric Company (MERALCO) has a substation power house that supplies the electricity requirement of the plant with 483,000 kW/hr.

#### 1.4.2.3 Solid Waste Management

The primary sources of solid waste for **SNMC** are the excavation spoils. The facility will allocate sufficient open space to accommodate the debris that will be generated from the quarrying activities. Debris produced during quarrying are either collected periodically by private



haulers or returned to the quarried sites. Additionally, buffer zones, silt traps, and drainages shall be constructed within this space to handle run-off.

For the general wastes (i.e. office and administrative solid wastes, canteen wastes), the Plant has colored bins to facilitate waste reduction and segregation. Housekeeping personnel will be in charge of the cleanliness of the office and Plant premises. The segregated wastes are stored temporarily in the Materials Recovery Facility, then collected by a private contractor.



#### Figure 1-4: Water Balance for SNMC





#### 1.5 Process/Technology

Figure 1-6 presents the schematic diagram for SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant. While the material balance of the project is presented in Figure 1-7.

#### 1.5.1 **Quarry Operations**

The excavation of shale, pozzolan and limestone will be done by using hydraulic excavators and dozers, and applying the quarrying technique called 'benching'. 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.

Explosives blasting will be carried out for quarry sites that are too difficult to extract by conventional drilling and excavation methods. The explosive force breaks large boulders into smaller and more manageable sizes that can be transported by trucks. This method hastens the ore extraction process, and while also decreasing the wear and tear on major quarrying equipment.

However, this method of quarry will be done in an exceptionally calculated, secured, and carefully-handled procedure. To prepare a quarry site for blasting, holes will be drilled in the soil, evenly-spaced, where the explosives will be placed in. After the explosives are settled, electrical detonators will be placed, and wired to the main control switch. Prior to the blasting, all systems shall be double-checked, then an alarm will be ensued and all personnel near the blast zone will be evacuated. A duly-trained blasting operator, with direct supervision, shall induce an electrical current to detonate the explosives. The explosion will take place in a brief moment. The exposed overburden and mineral will be hauled into the main production facility (1.5 MMTPY of Limestone), while the remaining 5.6 MMTPY of limestone as well as the excavated shale and pozzolan will go directly to Eagle Cement Corporation.

The Plant will utilize 90% ANFO (ammonium nitrate fuel oil) and 10% water gel with a powder factor of 0.25 kg/ton.



#### Figure 1-5: Plant Layout of the Proposed Project



Environmental Performance Report and Management Plan SOLID NORTH SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant Brgy. Akle, San Ildefonso, Bulacan

Figure 1-6: Schematic Diagram of the Project





#### Figure 1-7: Material Balance of the Project





#### 1.5.2 Limestone Processing

#### 1.5.2.1 Limestone Crushing and Conveying

A Limestone Crusher will be utilized to process the raw materials before grinding. The limestone from the nearby quarry area will be dumped into a receiving hopper. An apron feeder will then convey the raw limestone into the crusher. A Jaw Crusher will be the primary crushing mechanism. The materials will be crushed further using an Impact Hammer. The crushed limestone will be conveyed to the limestone storage.

Bag filters will be used to collect the dust produced during crushing to ensure that the emission will not exceed 30 mg/Nm<sup>3</sup>.

**Figure 1-8** and **Figure 1-9** show the existing Limestone Crushing and Conveying Systems, respectively.



#### Figure 1-8: Existing Limestone Crusher


#### Figure 1-9: Existing Conveying System



#### 1.5.2.2 *Limestone Storage*

The existing limestone storage with a capacity of 9,953 MT will be utilized. From the storage, the crushed limestone will be extracted by a Payloader and will be fed to the hopper. The limestone will then be transported to the vibrating feeder via belt conveyor.

Figure 1-10 shows the Material Transport and Limestone Storage.

 SOURCE: SNMC

 FIGURE TITLE:

 TOJECT PROPONENT:

 SOIRC PROJECT PROPONENT:

 SOIRC PROJECT PROPONENT:

 SOIRC PROJECT PROPONENT:

 SOIRC PROJECT PROPONENT:

 SOIRC Organization & 1.5 MMTCPY Limestone Pulverizing Plant

 Corporation

 SIMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant

 Brgy: Akle, San Ildefonso, Bulacan

Figure 1-10: Material Transport and Limestone Storage



## 1.5.2.3 Limestone Grinding Mill

The grinding mill that will be used is the MTW215 European Type Trapezium Mill composed of four units with a rated capacity of 40 TPH each. This state-of-the-art equipment has numerous patented features and is advanced in international standards. It is able to process non-flammable and non-explosive materials with moisture levels of less than 6% and hardness levels less than 9 according to Moh's scale of hardness. Examples of materials the machine can process are calcite, limestone, talcum, and magnetite, among numerous others.

The crushed materials are elevated into a hopper and will be fed into the grinding chamber by a vibrating feeder for even and continuous powder processing. The product of the mill blown into the cyclone collector and discharged to the dragchain is then conveyed by a bucket elevator to feed into the coarse powder separator to ensure product quality.

### Figure 1-11 shows the MTW215 Grinding Mill.



Figure 1-11: MTW215 Grinding Mill

### 1.5.2.4 Pulverized Limestone Storage & Bulk Loading

The pulverized limestone will be stored in 3 of the 4 existing cement silos with rated capacities of 900 tons each, while the other silo will be used to store the materials that did not pass the quality assessment.

Materials that passed the quality assessment will be transported into the silo by means of bucket elevator and airslide. The silos are equipped with an internal cone and fluidization system at the bottom for material extraction. The fluidization system is equipped with relative roots blower. Each cement silo will be equipped with its own de-dusting system at the top, and its top roof will be equipped with a control pressure valve.



Figure 1-12 and Figure 1-13 present the existing cement silo and raw meal silo, respectively.

#### Figure 1-12: Existing Cement Silo



Figure 1-13: Existing Raw Meal Silo

SQURCE: SNM			
FIGURE NO.:	GURE NO.: FIGURE TITLE:		
1-13	13 Existing Raw Meal Silo		
PROJEC	T PROPONENT:	PROJECT NAME & LOCATION:	
Solid N	orth Mineral	SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant	
Corporation		Brgy. Akle, San Ildefonso, Bulacan	

### 1.5.3 Pollution Control Devices

#### 1.5.3.1 *Air Pollution Control*

Control of fugitive dust from the limestone pulverizing facility is the main priority. To manage fugitive dust produced during crushing of limestone, bag filters are installed to keep emissions below 30mg/Nm<sup>3</sup>. Regular road watering is being done by **SNMC** to control dust on in the quarry area and limestone pulverizing facility.

#### 1.5.3.2 Water Pollution

Since dry process is employed, wastewater is limited to domestic wastewater and water from the surface run-off. Siltation ponds within the limestone pulverizing facility and shale quarry area are already constructed to manage surface runoff.

Two siltation ponds are constructed to serve the limestone pulverizing facility, while three siltation ponds are installed for the shale quarry area. Furthermore, the existing drainage is shown in **Figure 1-5**.

A septic tank is where the wastewater flows through and solids will be separated from the liquid or effluent. It has three (3) chambers, and could be made up of concrete, brick work, pre-fabricated concrete rings, PVC or fiberglass. In the first chamber, the heavy solid particles will settle to the bottom as sludge while lighter particles rise to the top and form a scum layer. It must be two-thirds (2/3) of the total length of the tank.

A baffle or the separation between the two chambers prevents the scum and solids to escape the effluent. The second chamber serves as another filter for the wastewater. The liquid or effluent will next go to the drain field after it goes through the first and second chamber.

It will remove 30 to 50% of BOD (Biological Oxygen Demand), 40 to 60% of TSS (Total Suspended Solids) and result in an abatement of 1 log units E. coli although efficiencies vary greatly depending on the influent concentrations and climatic conditions. The retention time should be 48 hours to achieve moderate treatment.

Over time, the sludge that settles at the bottom of the tank is degraded anaerobically. The sludge and scum will be dug out of the chamber for the efficiency of the septic tank. Septic tanks will also be checked from time to time to ensure that they are watertight. Coarse materials, grease and other floating debris will be removed to ensure there are no blockages to the inlet or outlet of the septic tank.

#### Figure 1-14: Existing Siltation Ponds within Limestone Pulverizing Facility



#### Figure 1-15: Existing Siltation Ponds in Shale/Pozzolan Quarry Area



 
 PROJECT PROPONENT:
 PROJECT NAME & LOCATION:

 Solid North Mineral Corporation
 SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant

 Brgy. Akle, San Ildefonso, Bulacan



# 1.6 Project Size

**SNMC** will utilize its existing plant site which covers approximately 14.89 hectares. The rated capacity of the limestone pulverizing facility is 1.5 million metric tons per year (MMTPY). The product will be supplied to Petron Corporation (PETRON) Circulating Fluidized Bed (CFB) Power Plant and to Eagle Cement Corporation.

The quarrying activities will be done within parcels 1 & 2 of the 757-hectare MPSA 161-2000-III. **SNMC** will extract 7.1 MMTPY of limestone (an increase of 5.9 MMTPY from the existing ECC), 0.81 MMTPY of shale (an increase of 0.61 MMTPY from the existing ECC), and 0.75 MMTPY of pozzolan. The extracted materials will be supplied to Eagle Cement Corporation.

The inferred resources of **MPSA 161-2000-III** were estimated using the Surpac surveying software **(Table 1-5)**. Considering the inferred resources and the proposed extraction rate, the estimated mine life of the (a) limestone quarry: 30 years; (b) shale quarry: 325 years; (c) pozzolan: 350 years.

Currently, the preparation for the Final Exploration Report (FER) of a competent person is being conducted and will be completed by August 15, 2018.

Parcel	Mineral	Inferred Resource (MMT)
1	Limestone	212.5
2	Shale	263.3
	Pozzolan	262.6

#### Table 1-5: Inferred Resource of MPSA 161-2000-III

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

The development will be within the **SNMC** property and existing MPSA area. After considering the full construction and proposed changes, the operation of the proposed project is scheduled within the year 2017 to 2018.

#### 1.7.1 Pre-Construction

This phase of the proposed project would involve the acquisition of the necessary documents before actual quarry development, such as the ECC (amendment).

#### 1.7.2 Construction

During this phase, the equipment to be used would be purchased and assembled on site. Proper occupational safety and health procedures would be implemented to ensure the welfare of the workers.

#### 1.7.3 Operation

The quarry operation and limestone pulverizing are the main activities of SNMC. Additional skilled workers will be employed to manage the pulverizing facility and the expanded quarry operations. The same strict observation of occupational health and safety during construction will be followed.



#### 1.7.4 Decommissioning/Abandonment/Rehabilitation

The **SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant** is not expected to be abandoned within the next 10 to 25 years of its planned operations. According to past and present geological surveys, the site have mine reserves that could last to 150 years based on normal production capacities. However, abandonment of the Plant may be necessary, due to the following potential scenarios:

- Unsustainable business operations due to economic downturns
- Changes in zoning and other related ordinances of the municipalities of San Ildefonso and DRT;
- Transfer of operations to other sites;
- Accidents and emergencies, either natural or man-made, that resulted to severe facility damage and loss of human life; and
- Closure order from Government agencies.

As such, if the abovementioned scenarios happened which could result to the partial or total closure of the Plant, an Abandonment Plan will be initiated by the **SNMC**.

An abandonment plan shall be drafted prior to construction which shall be made consistent with the Final Mine Rehabilitation/Decommissioning Plan (FMRDP).

The new FMRDP will be submitted to MGB after the release of the ECC as required by MGB. Any hazardous material and chemicals would be dismantled, handled and disposed of through DENR-accredited contractors and treaters to avoid any contamination with the immediate environment. **SNMC** shall undergo the updating process of its approved FMRDP, EPEP and SDMP as required under the Philippine Mining Act (Republic Act No. 7942). The updating will be done as soon as the ECC is released, pursuant to the guidelines of MGB.

**Table 1-6** lists the components of the limestone pulverizing plant and quarry area with corresponding closure criteria and performance standards. The details of the abandonment plan and proposed final land use are presented in **Table 7-1**.

Process/Component	Closure Criteria	Performance Standard
Limestone, Shale and Pozzolan Quar	rry	
<ul> <li>Active/Un-rehabilitated Benches</li> </ul>	Stable and re-vegetated	80% survival rate and self-
before closure	area.	thriving plants
<ul> <li>Active/Un-rehabilitated Pit</li> </ul>	Stable and re-vegetated	80% survival rate and self-
Bottom before closure	area.	thriving plants
<ul> <li>Siltation traps/ponds and drainage system</li> </ul>	<ul> <li>Stable and re-vegetated area.</li> <li>Drainage system retrofitted to conform to proposed final land use.</li> </ul>	<ul> <li>80% survival rate and self- thriving plants for rehabilitated silt traps/ponds.</li> <li>Effective drainage system.</li> </ul>
<ul> <li>Rehabilitated/Reforested area and Road Networks</li> </ul>	<ul> <li>Retained and Maintained area.</li> </ul>	<ul> <li>80% survival rate and self- thriving plants. Operational road networks.</li> </ul>
Limestone Pulverizing Plant		
Limestone Pulverizing Plant and	Stable and re-vegetated	80% survival rate and self-
Facilities	area.	thriving plants.

Table 1-6: Quarry and Limestone Pulverizing Plant Closure Criteria and Performance Standard



Process/Component	Closure Criteria	Performance Standard
	Empty and clean storage	Reusable material storage
	area.	area.
<ul> <li>Office and accommodation buildings (canteen, warehouse, administration building, staff house, guest house, contractors camp, motor pool, assay laboratory, roads, nursery, etc.).</li> </ul>	<ul> <li>Unoccupied buildings, motor pool and laboratory.</li> </ul>	<ul> <li>Reusable buildings, motor pool and laboratory that conforms to the government standards.</li> </ul>
<ul> <li>Silt traps/ponds, water reservoir and drainage system which includes the silt traps surrounding the plant.</li> </ul>	<ul> <li>Silt traps/ponds backfilled and re-vegetated.</li> <li>Water reservoir retained as recreation/picnic area.</li> <li>Drainage system retrofitted to conform to proposed final land use.</li> </ul>	<ul> <li>80% survival rate and self- thriving plants for rehabilitated silt traps/ponds.</li> <li>Effective drainage system.</li> </ul>

#### 1.7.5 **Indicative Timeline**

Table 1-7 shows the indicative timeline of the project. The pre-feasibility study and ECC application is expected to be done by the end of the 1<sup>st</sup> quarter of 2018. Rehabilitation works and installation of equipment will be done until the 1st quarter of 2018. The startup and commissioning is projected to be on the 2<sup>nd</sup> quarter of 2018. Finally, the commercial operation will start by 2019.

Table 1-7:	Proposed	Project	Schedule

Activity/Milestone		2017		2018			2019		
	1	2	3	4	1	2	3	4	1
1. Pre-feasibility and ECC									
Application									
2. Geologic Survey (FER)									
2. Detailed Engineering									
3. Rehabilitation (Covered by									
previous ECC)									
4. Installation of equipment									
including pollution control									
devices (Covered by previous									
ECC)									
5. Startup and									
Commissioning of limestone									
pulverizing facility and									
quarry expansion									
6. Commercial Operation									

#### 1.8 Manpower Requirements

The estimated manpower needed for the project would be approximately 1,200 personnel. SNMC currently employs men from the community as laborers and women as cooks and canteen staff. People from the community are hired in cooperation with the barangay LGU.



Project Phase	Estimated	Tasks to Perform	Skill Requirement/s
	Manpower Requirements		on nequirementy o
Construction	1,000	<ul> <li>Civil works, architectural, and electro-mechanical works.</li> </ul>	Engineers, project managers, skilled and non-skilled laborers
Operation	60-180	<ul> <li>Oversee the entire operations of the proposed Project, including emergency situations; Ensuring the safety and welfare of its personnel</li> <li>Maintain conformity of the proposed Project to relevant government regulations, including tax payments, ECC compliance, etc.</li> <li>Promote and uphold a harmonious relationship with the host community</li> </ul>	Management and administration skills; over- all knowledge on the operation including key environmental, labor, and local ordinances
Abandonment	35-50	<ul> <li>Implement the abandonment plan</li> </ul>	As required

#### Table 1-8: Manpower Requirement for the Proposed Expansion and Plant Operation

Based on the latest data on manpower for 2017 (see: **Table 1-9**), there are a total of 142 employees from both **SNMC** and its contractors. From the 21 **SNMC** employees, only 2 are from Bulacan. From the contractors, 72 of the 121 (59.5%) hires are from Bulacan. In addition to this, 28 or (38.88%) of these hires are sourced from Barangay Akle. Services from the contractor's end include: construction, plants operations, housekeeping and security.

Manpower	Ge	nder	Bulacan				Outside	Total		
	Distr	ibution			San Ildef	onso		Other	Bulacan	
			Akle	Alagao	Gabihan	Umpucan	Other	Parts of		
Company Name	Male	Female					Barangays	Bulacan		
Proponent										
Solid North	17	4	-	-	-	-	1	1	19	21
Mineral Corporation										
Contractors										
Buildnet	5	1	2	1	-	-	-	-	3	6
ANTA	6	1	1	1	-	1	1	1	2	7
Eagle Global	24	-	1	2	2	-	1	-	18	24
TOPSERVE	16	1	4	2	1	2	4	4	-	17
N. Valencia	23	2	7	1	-	1	2	7	7	25
CPG	7	1	2	1	-	-	-	-	5	8
Agilex	12	2	2	1	-	1	-	2	8	14
ISS	5	2	7	-	-	-	-	-	-	7
Ampani	12	1	2	1	-	1	-	3	6	13
TOTAL	127	15	28	10	3	6	9	18	68	142

Table 1-9. Breakdown of Man	nower Based on Gender	& Residency (SNM	AC Employees and	Contractors)
Table 1 5. Dicakaowii ol wian	power based on denaer		ic Linployees and	contractors

#### 1.9 Project Cost

The indicative cost for the project is estimated to be **Three Hundred Million Pesos** (**Php 300,000,000.00** or **US \$6,000,000.00**).



## SECTION 2

# **ASSESSMENT OF ENVIRONMENTAL IMPACTS**

#### 2.1 Land

#### 2.1.1 Land Use and Classification

#### 2.1.1.1 Impacts terms of compatibility with existing land use

Bulacan is located in Region III and is bounded by Nueva Ecija in the north, Aurora and Quezon in the east, Pampanga on the west, Rizal on the south, and Metro Manila in the southwest. According to the Land Management Bureau, Bulacan has a total land area of 297,610 hectares as of 2007. The municipality of San Ildefonso has divided its land area, thru its land use plan, into several types: (a) residential, (b) agricultural, (c) commercial, (d) industrial, (e) mineral, and (f) institutional. Table 2-1 presents the breakdown of the municipality's land use.

It could be noted that the project site is within the production and mining area. Quarrying component of the project would be confined in the specified MPSA so as not to disturb nearby agricultural and forest areas. (See: Figure 2-1)

Type of Land Use	Area (in sq. m.)	Percentage
Residential	4,958,771.50	3.05
Agricultural	152,072,987.50	93.56
Commercial	162,302.00	0.10
Industrial	2,603,946.00	1.60
Mineral	505,131.00	0.31
Religious	33,655.00	0.02
Education	1,785,513.00	1.10
Government	422,776.00	0.26
TOTAL	162,545,082.00	100

#### Table 2-1: Land Use Profile of San Ildefonso

Source: Municipal Profile of San Ildefonso, 2007

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

Based on the list of environmentally critical areas in the DENR Administrative Order No. 96-37, the project footprint is not classified as environmentally critical areas.

#### 2.1.1.3 Impacts in existing land tenure issue/s

The project area is not under CARP. Furthermore, the area does not have CAFC, CADT, CALC, or CALT. It is also without IFMA/CBFMA, and not within COC. However, the areas for quarry expansion are within Parcels 1 and 2 of MPSA 161-2000-III, which is owned by Solid North **Mineral Corporation.** 

#### 2.1.1.4 Impairment of visual aesthetics

Sitio Narra, which is within Brgy. Akle, is home to a grotto, which holds aesthetic value to the sitio. A 200-meter buffer zone from this grotto is being observed; there are no impacts on the grotto since quarrying and limestone pulverizing are located away from the grotto.

Aside from this, there are no other visually significant landforms/landscapes/structures in the area. Furthermore, the modification of slopes of the mountains and hills, through the removal of soils, creates an unaesthetic view of the natural surroundings.

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

SNMC strictly implements its Solid Waste Management Plan. The Solid Waste Management Procedure implemented by SNMC is compliant with RA 9003. In addition to establishing and implementing Solid Waste Management Plan, SNMC plans to construct its own Materials Recovery Facility. To ensure that its solid waste is properly disposed, SNMC delivers solid waste to Clark Sanitary Landfill. With these measures firmly in place, impact of improper solid waste management the area is effectively mitigated. Proper implementation of this procedure is even more significant during the construction phase of the project, when the volume of solid waste is augmented due to construction debris.

The Waste Management Procedure is discussed in Section 3: Environmental Management Plan.



#### Figure 2-1: 2007 Land Use Map of Bulacan





#### Geology/Geomorphology 2.1.2

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

The main facility and quarry site of **SNMC** are underlain entirely by the Angat and Madlum Formations. Geologic structures in the vicinity of the site are unremarkable with the buff-light colored limestone, and showing no unusual features. The limestone unit occurs as an irregular north-south trending strip which lies sub-parallel to the main trend of the Sierra Madre mountain range.

The underlying limestone are undisturbed by faulting or other evidence of local slips and unusual earth movements, except for some moderate erosion stage that is characteristic of karst topography. The topographic map of the site is shown in Figure 2-2.

The slope map of Bulacan (Figure 2-3) shows that the project area is generally level to very gently sloping (0-3%). However, the area surrounding the project site classified as rolling to hilly (18-30%).

The quarry site will be within the existing MPSA for the mineral extraction. The project creates a direct impact on the land, specifically the gross modification and alteration of natural slope. The company maintains the bench slopes at 75 degrees while quarry slopes to 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.



#### Figure 2-2: Topographic Map of the Project Area





### 2.1.2.2 Change in Sub-surface geology/underground conditions

The municipalities of San Ildefonso and DRT, where the project site is located, are in the northern part of eastern Bulacan, in the vicinity of the western foothills of Southern Sierra Madre Range and the edge of the north trending Central Luzon Basin (**Figure 2-4**). The basement of the Southern Sierra Madre mountain range consists principally of Late Cretaceous ophiolitic rocks. Dioritic intrusions that commenced in Middle Eocene time formed batholithic masses from Isabela in the north to Aurora province in the south. Magmatic activity that persisted up to Late Oligocene gave rise to stocks of quartz diorite, diorite and alkali rocks. Magmatism is associated with the subduction of the West Philippine Basin along the ancient East Luzon Trough during the Paleogene period that was driven by seafloor spreading from the Central Basin Spreading Center (Peña and others, 2009). Subduction ceased at the close of the Paleogene with the accretion of Benham Rise (rafted towards eastern Philippines by the seafloor spreading) to the eastern margin of northern Luzon. Since the accretion of Benham Rise, no subduction-related magmatism has taken place in the eastern strip of Northern Luzon.

Sedimentation took place in the areas covered by the Southern Sierra Madre with the onset of the Cenozoic era. The Paleogene period was a time of deposition of limestones, clastic sedimentary rocks, volcaniclastic rocks, volcanic flows and pyroclastic rocks. During the Neogene period, after the cessation of subduction beneath the eastern section of northern Luzon, sedimentation gave rise to limestones and clastic sedimentary rocks.

Bulacan province partly occupies the edge of the eastern part of the Central Luzon Basin. The sedimentary sequences that constitutes the eastern part of the basin came from the uplifted portions of what is now the southern Sierra Madre range. The sedimentary rocks comprising the western flank of the basin is derived from the rocks underlying the Zambales Range on the western part of Luzon.





#### Figure 2-3: Slope Map of Bulacan











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

The ground rupture map of Bulacan shows that the active fault nearest the project site is part of the West Valley Fault System (Figure 2-5). According to PHIVOLCS, no surface fissures are visible or observed. Furthermore, the zones along these active faults are prone to ground rupture in the event of an earthquake.

According to the Bulacan Provincial Development and Physical Framework Plan (2010-2030), Bulacan had experienced seven earthquakes in the past 400 years that caused significant damage. Earthquakes recorded in 1645 and 1990 are the strongest recorded, at magnitude 7.9 and 7.8 respectively. Bulacan is susceptible to Intensity VII earthquakes, which is classified as very destructive. The earthquakes shown on the historical map are those that happened in the last 400 years that caused significant damage to Bulacan (Figure 2-6).

Figure 2-7 shows the Mines and Geosciences Bureau (MGB) geohazard susceptibility map of Bulacan's Sibul Spring Quadrangle. According to the map, SNMC plant site is away from areas susceptible to back flooding and flash floods.

Based on geological surveys, SNMC plant site lies in an area that has apparently, no indication of unusual or urgent geological conditions that present or pose significant and largemagnitude hazards. The limestone ridges appear to be stable, and there no naturally-exposed cliffs or outcrops that might signify susceptibility of the area to landslides

However, 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 quarrying procedures to minimize the occurrence of erosions near the quarry area.





#### Figure 2-5: Ground Rupture Map of Bulacan





Figure 2-6: Historical Map of Earthquakes near Bulacan





#### Figure 2-7: Geohazard Map of Sibul Spring Quadrangle







#### 2.1.3. Pedology

#### 2.1.2.4 Soil Erosion/Loss of topsoil/overburden

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 guarry 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 lowlying communities. However, these threats can be greatly minimized by strictly following SNMC's guidelines on proper excavation, and putting up erosion barriers, silt traps, etc.

Quarrying activities will expose bedrock that is unsuitable for agricultural or forestry development. SNMC, as part of their Environmental Protection and Enhancement Program (EPEP), implements progressive rehabilitation which entails backfilling and planting in mined-out areas.

#### 2.1.2.5 *Change in soil quality/fertility*

A one-time soil sampling was conducted to investigate the elements, particularly heavy metals, which are present in the soil matrix within the project site. Heavy metals are a special concern since these substances are hazardous, even in small amounts. Moreover, heavy metals have a potential to contaminate the surrounding environment since the Plant involves soil excavation. Although the present DENR-EMB guideline does not have a definitive acceptable standard or limits on the presence of heavy metals on soils. SNMC conducted the sampling to establish a baseline on soil quality. The area is not being used for agricultural activities. The operation may contaminate the soil through release of heavy metals because of the quarrying activities.

Heavy metals such as mercury, arsenic, barium, cadmium, chromium, and lead were tested. Results of soil sampling were compared with Dutch Target and Intervention Values (2013), which was established to determine whether soil require urgent remediation due to unmitigated contamination primarily during construction activities. The results are presented in Table 2-2.

The soil sampling point (Figure 2-8) is the riparian area of Akle River, a major body of water in Brgy. Akle. This area was studied because runoff from the soil of the riparian area may affect the water quality of the river.

The results show that all parameters tested are within the Dutch Target and Intervention Values which proves that the operation has minimal effect on pedology in terms of heavy metal contamination.

Type of Heavy Metals Analyzed	Dutch 2013 Target Values (mg/kg)	Soil Sampling Point: Akle River Riparian Area (mg/kg)	Remarks
Total Mercury	40	0.029	Passed
Total Arsenic	76	0.44	Passed
Total Barium	*	<2.0	Passed
Total Cadmium	13	<0.03	Passed
Total Chromium	258	55	Passed
Total Lead	530	0.029	Passed

#### Table 2-2: Results of the Soil Sampling Activity, 2017

Figure 2-8: Soil Sampling Map



Soil fertility of the area will be affected by the quarrying activities due to loss of topsoil. As a mitigating measure, SNMC shall set aside the topsoil for future greening purposes. Progressive rehabilitation, which requires land preparation through application of soil on mined-out areas, shall also be part of the Environmental Protection and Enhancement Program (EPEP).

#### 2.1.4. Terrestrial Ecology

An assessment of the vegetation and associated faunal component SNMC project site was conducted last April 21-23, 2016.

The terrestrial flora and fauna survey started from the primary impact areas (project site) moving outward in all directions within the 5.0-kilometer radius to include the secondary impact areas (for access road construction) by tracing transect lines.

#### 2.1.4.1. Vegetation removal and loss of habitat

#### **Terrestrial Flora**

In order to determine plant dominance quantitatively in a mixed grass-tree-shrub plantation ecosystem, the parameter that was measured was the percent (%) frequency of occurrence of the various plant species along transects lines. Five 100-meter long transect lines were randomly laid out in the designated sampling stations (Figure 2-9) within and around the proposed project site.

Transect walk/site observation maps was prepared to show the vegetation and faunal profile, ecosystems encountered, topography, land use, opportunities and problems observed in the project site (Table 2-3).

The various plant ecosystems encountered in both the primary and secondary impact areas were noted and assessed.

The following points/locations employing GPS readings were established as the sampling stations to cover the project primary and secondary impact areas. (Table 2-3)





	Environmental Performance Report and Management Plan
	SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant
8	Brgy. Akle, San Ildefonso, Bulacan

Table 2-3: Location and Description of Sampling Stations (Terrestrial Ecology)			
Station	Location (Geographic Coordinates)	Description	
STN 1	Sitio Narra	Vegetation composed of mixture of grasses,	
	15.05967 N	herbs, shrubs and many small and large trees.	
	121.06368 E	The area is flat and a highly disturbed mixed tree	
		plantation/garden. This station is located	
		parallel the road adjacent to the cement plant.	
STN 2	Junction – Sinambalan	Vegetation composed of mixture of grasses,	
	15.063657 N	herbs, shrubs and few small trees. The area is	
	121.067332 E	flat and highly disturbed mixed tree	
		plantation/garden. This station is located	
		parallel the road perpendicular to Sitio Narra.	
STN 3	Grotto	Vegetation composed of mixture of grasses,	
	15.05870 N	herbs, shrubs and few small trees. The area is	
	121.07189 E	flat to hilly and a highly disturbed mixed tree	
		plantation.	
STN 4	Talbak, DRT	Vegetation composed of mixture of grasses,	
	15.0704361 N	herbs, shrubs and trees. The area is flat to hilly	
	121.0683305 E	and a highly disturbed mixed tree	
		plantation/garden. This station is parallel to the	
		road leading to the Poblacion.	
STN 5	Boundary between Eagle and Solid	Vegetation composed of mixture of grasses,	
	North	herbs, shrubs and very few small trees. The area	
	15.05720 N	is flat parallel to the road connecting the two	
	121.06918 E	plants. It is a highly disturbed mixed wasteland	
		and small tree plantation. This station is parallel	
		to a narrow dirt road at the back of the old Solid	
		North Cement Plant.	
STN 6	Shale Quarry Site	Vegetation composed of mixture of grasses,	
	15.05281N	herbs, shrubs and very few small trees. The area	
	121.05806 E	is slightly sloping parallel to the road. It is a	
		highly disturbed area planted to cassava and	
		chili pepper.	



Assessment of Environmental Impacts

Figure 2-9: Locations of Sampling Stations





#### Figure 2-10: Photographs at the Terrestrial Ecology Sampling Stations, April 2016

Station 1 at Along Sitio Narra adjac to Solid North Cement Plant	ent Station 2 near Junction Sinambalan. The old quarry site at the background	Station 3 showing mixed Tree Plantation next to the Grotto Shrine	Station 4 showing mixed Tree Plantation in Talbak, DRT	
Station 5 between Eagle Cement P and Solid North Cement Plant	ant Station 6 in the vicinity area where the shale quarry is located (Side A)	Station 6 in the vicinity area where the shale quarry is located (Side B)		
SOURCE: Terrestrial Survey				
<b>2-10</b>	FIGURE TITLE:			
	LO	cations of Sampling Stations		
PROJECT PROPONENT:	CNINAC OW	PROJECT NAME & LOCATION:	Pulvorizing Plant	
Solid North Wineral Corporation		Sivivic Quarry Expansion & 1.5 Wivi Pr Limestone Puivenzing Plant		
		Digy. Akie, San nueronso, Bulacan		



The historic pre-development pattern of land use in the SNMC site and surrounding environment can be analyzed to have the following characteristics:

- The area composed of a predominantly a mixture of existing tree plantation/agroecosystem with scattered patches of shrubs and trees;
- The presence of secondary growth forest on higher elevations suggests that the ecosystems were most likely characterized by 'relatively low to moderate species diversity' and 'impaired rates of ecological functioning';
- The Plant Site and its surrounding ecosystems represent a 'region of low to medium • ecological significance'; and
- No rare or endangered plant and tree species are believed to have inhabited the Plant Site and its vicinity in the recent past.

The historic pre-development pattern of land use in the project site was predominantly a mixed of existing tree plantation/agro-ecosystem with scattered patches of shrubs and trees, and secondary growth forest on higher elevations which suggests that the ecosystems in this area were most likely, characterized by relatively low to moderate species diversity and impaired rates of ecological functioning. The project site and its surrounding areas represent a region of low to medium ecological significance.

No rare or endangered species are believed to have inhabited the area in the recent past.

Based from the assessment done, species composition, distribution and density is moderately high since the site is a less disturbed mixed of secondary growth and plantation forest area mostly dominated by fruit and lumberwood trees that include: Ipil-ipil (Leucaena leucocephala), yemane (Gmelina arborea), mahogany (Swietenia macrophylla), bagras (Eucalyptus deglupta), tuba-tuba (Jatropha curcas), alibangbang (Bauhinia malabarica), banana (Musa sapientum), atis (Annona squamosa), mango (Mangifera indica), kakawati (Gliricidia sepium), guava (Psidium guajava), alagao (Broussonetia luzonicum), malunggay (Moringa oliefera), narra (Pterocarpus indicus), akasya (Samanea saman), caimito (Chryssophyllum caimito) langka (Artocarpus herophylla), kawayang-tinik (Bambusa blumeana), mikania (Mikania cordata), hagonoy (Chromolaena odorata) and talahib (Saccharum indicum) being the most dominant species encountered along with some common grass and weed species.

Most of grasses, shrubs and herbs species that were found at some portions of the project site were common and have no significant ecological or commercial value.

Considered as indicator plant species, the observed occurrence of lush growth of pure stands of Chromolaena odorata, Mikania cordata and Synedrella nodiflora are indicative of the ecological status of a given area, that of a highly-disturbed ecosystem, most especially by rampant and uncontrolled man's activities.

Some flowering plants were also observed to be grown by some local residents in the area. The flowering species include roses (Rosa sp), gumamela (Hibiscus rosa-sinensis), santan (Ixora chinensis), bougainvilleas (Bougainvilla spectabilis) and sampaguita (Jasminum sambac) among others. Most of these flowering plants are introduced species and not indigenous to the area. A number of ornamental plants, likewise, were observed to be grown by the residents, such as Fortune plants (Sansiviera sp), San Francisco (Codeaum variegatum) plants and Chinese bamboo.

#### **Vegetation in Shale Quarry Site**

The area is slightly sloping parallel to the road. Vegetation composed of mixture of grasses, herbs, shrubs and very few small trees. It is a highly-disturbed area planted with cassava, banana and chili pepper.

Weeds species abound growing with cassava include hagonoy (*Chromolaena odorata*), pukinggan-baging (*Clitorea ternatea*), talahib (*Saccharum spontaneum*) and cogon (*Imperata cylindrica*).

Few trees present include aratiles (Muntingia calabura), alibangbang-parang (Bauhinia malabarica), duhat (Syzygium cumini), yemane (Gmelina arborea), tuba-tuba (Jatropha curcas), mango. (Mangifera indica), ipil-ipil (Leucaena leucocephala) and alagasi (Leucosyke capitellata).

#### Vegetation in Limestone Quarry Site

The Limestone Quarry is a sunken complex approximately 14 hectares in size that is parallel to a dirt road. Vegetation composed of mixture various kinds of weeds belonging to grasses, vines, herbs, shrubs and very few small trees.

Weeds species also abound growing mostly in the ridges include wild sunflower (*Tridax* procumbens), fingergrass (*Chloris polydactyla*), barbgrass (*Cenchrus echinatus*), hagonoy (*Chromolaena odorata*), pukinggan-baging (*Clitorea ternatea*), talahib (*Saccharum spontaneum*) and cogon (*Imperata cylindrica*). Few trees present include aratiles (*Muntingia calabura*).

The only tree species observed were aratiles and ipil-ipil.

A summary of tree, shrub, herbs, vine and grass species found in the area classified according to their family, scientific name and common/local names is shown in **Table 2-4** and **Table 2-5** while the frequency values of all the species encountered in all the sampling stations are presented in **Table 2-10**.



Table 2-4: Tree Species Surveyed Within and Around the Project Site				
Common/Local Name	Scientific Name	Distribution	Uses	
1. Talisay	Terminalia catappa	Common	Shade	
2. Akasya	Samanea saman	Common	Wood	
3. African Tulip	Spathodea campanulata	Common	Wood	
4. Afu	Anisoptera brumea	Common	Wood	
5. Agoho	Casuarina equisitolia	Common	Wood	
6. Agoho del Monte	Casuarina rumphiana	Common	Wood	
7. Akle	Serialbizia acle	Common	Wood	
8. Akleng Parang	Albizzia procera	Common	Wood	
9. Alibangbang	Bauhinia malabarica	Common	Wood	
10. Almaciga	Agathis philippinensis	Common	Wood	
11. Alupag	Euphoria didyma	Common	Wood	
12. Alupag amo	Litchi philippinensis	Common	Wood	
13. Amugis	Koorsidendron pinnatum	Common	Wood	
14. Anabiong	Trema orientalis	Common	Wood	
15. Anang	Diospyros pyrrhocarpa	Common	Wood	
16. Antipolo	Artocarpus blancoi	Common	Wood	
17. Anubing	Artocarpus ovata	Common	Wood	
18. Apitong	Dipterocarpus	Common	Wood	
	grandifloras			
19. Aranga	Homolium foetidum	Common	Wood	
20. Ata-ata	Diospyros mindanensis	Common	Wood	
21. Bagras	Eucalyptus deglupta	Common	Wood	
22. Bagtikan	Parashorea plicata	Common	Wood	
23. Bagtikan	Dracontamelon dao	Common	Wood	
24. Balikbilan	Drypotas bordami	Common	Wood	
25. Balinghasai	Buchanonis arborscons	Common	Wood	
26. Balite	Ficus balite	Common	Wood	
27. Balu	Cordia subcordata	Common	Wood	
28. Banaba	Lagerstroemia speciosa	Common	Wood	
29. Bangkal	Nuclea orientalis	Common	Wood	
30. Bansalangin	Mimosops parviflora	Common	Wood	
31. Banuyo	Wallacedendron	Common	Wood	
	colobicum			
32. Batato	Kingiodendrum	Common	Wood	
	alternifolium			
33. Batikuling	Litsea leytensis	Common	Wood	
34. Batino	Alstonia macrphylla	Common	Wood	
35. Batintinan	Lagerstroemia	Common	Wood	
	paciformes			
36. Bayanti		Common	Wood	
37. Bayok	Pterospornum	Common	Wood	
	diversifolium			
38. Betis	Madhuca betis	Common	Wood	
39. Binggas	Terminalia centrina	Common	Wood	
40. Binunga	Macaranga tanarius	Common	Wood	
41. Bitangnol	Calophyllum blancol	Common	VVOOD	
42. Bitaog	Ciopnyllum inophyllum	Common	Wood	
43. Bogo	Garuga floribunda	Common	Wood	
44. Bolacat		Common	VVOOd	
45. BOION	Aipnonsea arborera	Common	vvood	
40. BOIOIIg-eta	Naphalium philipping	Common	Wood	
1 4/. Duidid	I NUDHUHUH DHHDDHENSIS		vvuuu	



<b>o (b 1 b c c c c c c c c c c</b>				
Common/Local Name	Scientific Name	Distribution	Uses	
48. Busain	Brugiera gymnorrhiza	Common	Wood	
49. Caña fistula	Cassia fistula	Common	Wood	
50. Dagang	Hopea aurea	Common	Wood	
51. Dalinai	Terminalia pallucida	Common	Wood	
52. Dalingdingan	Hopea foxworthyi	Common	Wood	
53. Dangula/teak	Tectona philippinensis	Common	Wood	
54. Dao	Dracontamelon dao	Common	Wood	
55. Dita	Alstonia scholaris	Common	Wood	
56. Duhat	Syzygium cumini	Common	Wood	
57. Macabuhay	Macaranga grandiflora	Common	Medicinal	
58. Duklitan	Puotaria duklitan	Common	Wood	
59. Dulit	Canarium hirsulum	Common	Wood	
60. Dungon Late	Haritiera littoralis	Common	Wood	
61. Mayapis	Vatica mangchapoi	Common	Wood	
62. Ebony	Diospyros ferrea	Common	Wood	
63. Fire Tree	Delonix regia	Common	Wood	
64. Gisihan	Shorea contorta	Common	Wood	
65. Guiio	Shorea auiso	Common	Wood	
66. Guisok-guisok	Hopeg philippinensis	Common	Wood	
67. Hagakhak	Dipterocarpus warbuaii	Common	Wood	
68 Hawili	Ficus sentica	Common	Wood	
69 Inil	Intsia hiiyaa	Common	Wood	
70 Inil-inil	Leucaena leococenhala	Common	Fuelwood	
70. Ipil Ipil 71. Kakawate	Gliricidia senium	Common	Fence	
72 Kalamansanai	Neonuclea calvcina	Common	Wood	
72. Kalantas	Toong kalantas	Common	Wood	
74 Kalingag	Cipnamomum mercadoi	Common	Wood	
74. Kalingag	Storculia footida	Common	Wood	
75. Kalumpit	Terminalia microcarna	Common	Wood	
76. Kanunpit	Diosphyros philippinonsis	Common	Wood	
77. Kalliagolig		Common	Wood	
78. Kamalog	donsiflorum	Common	wood	
70 Kamuning	Murava papiculata	Common	Wood	
79. Kamanai		Common	Wood	
80. Kanapol	Ficus mananijona	Common	Wood	
81. Katmon	Dillined philippinensis	Common	Wood	
82. Katmon Kalabaw	Dillenia reijjora	Common	W000	
83. Katural	Sesbania granalifiora	Common	FOOD	
84. Kuling Manok	Aglaia philippinensis	Common	Wood	
85. Kupang	Parkia javanica	Common	Wood	
86. Lamio	Dracontomelon edule	Common	Wood	
87. Lamog	Planchonia spectabilis	Common	Wood	
88. Lamog	Planchonia spectabilis	Common	Wood	
89. Lanete	Wrightia laniti	Common	Wood	
90. Langarai	Brugiera parviflora	Common	Wood	
91. Lanipau	Terminalia copelandii	Common	Wood	
92. Lanutan	Hitrophora lanotan	Common	Wood	
93. Lauan	Shorea negronensis	Common	Wood	
94. Mahogany	Swietenia macrophylla	Common	Wood	
95. Makaasim	Syzygium nitidum	Common	Wood	
96. Malaanonang	Shorea polita	Common	Wood	
97. Malakatmon	Ailanthus triphyssa	Common	Wood	
98. Malaruhat	Cloistacalyx operculatus	Common	Wood	
99. Malasantol	Sandoricum vidalii	Common	Wood	



Common/Local Name	Scientific Name	Distribution	Uses
100. Malugai	Moringa oliefera	Common	Wood
101. Manggachapui	Hopea acuminata	Common	Wood
102. Mangium	Acacia mangium	Common	Wood
103. Mayapis	Shorea squamata	Common	Wood
104. Molave	Vitex parviflora	Common	Wood
105. Nangka	Artocarpus heterophylla	Common	Wood
106. Nareg	Hopea cagayanensis	Common	Wood
107. Narra	Pterocarpus indicus	Common	Wood
108. Pagsahingin	Canarium asperum	Common	Wood
109. Paguringon	Cratoxylon celebicum	Common	Wood
110. Pahutan	Mangifera altissima	Common	Food
111. Palis	Caricarpa erioclana	Common	Wood
112. Palosanto	Triplaris cumingiana	Common	Wood
113. Palosapis	Shorea thurifera	Common	Wood
114. Puso-puso	Neolitse vidalii	Common	Wood
115. Rain tree	Samanea saman	Common	Wood
116. Sakat	Terminalia vitens	Common	Wood
117. Salisis	Ficus beniamina	Common	Wood
118. Santol	Sandoricum koetiape	Common	Wood
119. Tagpo	Ardisia sauamulosa	Common	Wood
120. Takin asin	Macaranaa arandiflora	Common	Wood
100 Tamayuan	Strombosia nhilinninensis	Common	Wood
101 Tambalu	Knema alomerada	Common	Wood
102 Tangisang Bayawak	Fius varieaata	Common	Wood
103 Tanglin	Adenanthera intermeia	Common	Wood
104 Tanguile	Shorea polysperma	Common	Wood
105 Teak	Tectona arandis	Common	Wood
106 Tibig	Ficus nota	Common	Wood
107 Tindalo	Afzelia rhomboidea	Common	Wood
	Rischofia javanica	Common	Wood
109 White Jauan	Shorea contorta	Common	Wood
110 Vakal	Shoreg gisok	Common	Wood
111 Vomano	Cmaling groot	Common	Construction
	Manaifora indica	Common	Each
112. Makana	Suzuaium camaraonso	Common	Food
114 Cocoput	Syzygium sumurgense	Common	Food
		Common	FUOU
115. Guava	Auntingia adabura	Common	FUOU
110. Aratiles	Carica nangua	Common	FOOD
		Common	Food
118.Atis	Annona squamosa	Common	FOOD
119. Camachile	Arta a susses altilia	Common	FOOD
120. Kamansi	Artocarpus altilis	Common	FOOD
121. Akapulko	Cassia alata	Common	Medicinal
122. Kapok	Ceiba pentandra	Common	Mattress
123. Kaimito	Chrysophyllum cainito	Common	Food
124. Kalamansi	Citrus mitis	Common	Food
125. Achuete	Bixa orellana	Common	Spice
126. Avocado	Persea americana	Common	Food
127. Himbabao	Bruossonetia luzonica	Common	Wood
128. Sampalok	Tamarindus indicus	Common	Food
129. Katuray	Sesbania grandiflora	Common	Food
130. Kaimito	Chrysophyllum cainito	Common	Food



Common/Local Name	Scientific Name	Distribution	Uses
131. Balimbing	Averrhoa carambola	Common	Food
132. Kamias	Averrhoa bilimbi	Common	Food
133. Kalachuchi	Plumeria alba	Common	Ornamental



labi	e 2-5: Undergrowth	Shrubs, Herbs, and Grasses Su	irveyed Within and Ar	ound the Project	Site
	Family	Scientific Name	Common/Local Name	Distribution	Uses
1.	Graminae	Saccharum. spontaneum	Talahib	Very Common	Weed
2.	Graminae	Chrysopogon aciculatus	Amorseko	Very Common	Weed
3.	Graminae	Chloris polydactyla	Fingergrass	Very Common	Weed
4.	Graminae	Paspalum conjugatum	Sourgrass	Very Common	Weed
5.	Graminae	Rhynchelytrum repens	Natalgrass	Common	Weed
6.	Graminae	Pennisetum purpureum	Napier grass	Very Common	Weed
7.	Graminae	Panicum maximum	Guinea grass	Very Common	Fodder
8.	Graminae	Axonopus compressus	Carabao grass	Very Common	Weed
9.	Graminae	Eleusine indica	Yardgrass	Common	Weed
10.	Graminae	Dactyloctoctenium aegyptium	Crowfoot grass	Very Common	Weed
11.	Graminae	Cynodon dactylon	Bermuda grass	Very Common	Weed
12.	Graminae	Digitaria sanguinalis	Crabgrass	Common	Weed
13.	Graminae	Imperata cylindrica	Cogon	Very Common	Weed
14.	Graminae	Bambusa blumeana	Kawayang-tinik	Very Common	Fence
15.	Cyperaceae	Cyperus rotundus	Mutha	Common	Weed
16.	Labiatae	Hyptis suaveolens	Suab-kabayo	Common	Medicinal
17.	Leguminosae	Mimosa invisa	Makahiyang-lalake	Common	Weed
18.	Leguminosae	Mimosa pudica	Makahiya	Common	Weed
19.	Leguminosae	Desmodium procumbens	Desmodium	Common	Weed
20.	Convulvulaceae	Ipomoea triloba	Morninglory	Very Common	Weed
21.	Leguminosae	Cassia tora	Sicklepod	Common	Medicinal
22.	Leguminosae	Crotolaria striata	Mani-mani	Common	Weed
23.	Compositae	Mikania cordata	Mikania	Very Common	Weed
24.	Portulacaceae	Portulaca oleracea	Purslane	Common	Weed
25.	Musaceae	Musa sapientum	Banana	Very Common	Food
26.	Commelinaceae	Commelina benghalensis	Alikbangon	Common	Weed
27.	Compositae	Chromolaena odorata	Hagonoy	Very Common	Weed
28.	Compositae	Sphaeranthus africanus	Boto-botonisan	Common	Weed
29.	Compositae	Eclipta prostata	Tinta-tintahan	Common	Weed
30.	Boraginaceae	Heliotropium indicum	Trompang elepante	Very Common	Weed
31.	Acanthaceae	Blechum pyramidatum	Wild hops	Common	Weed
32.	Verbenaceae	Lantana camara	Sapinit	Common	Weed
33.	Nyctaginaceae	Boerhavia diffusa	Paanbalibis	Common	Weed
34.	Compositae	Ageratum conyzoides	Blue Sprangletop	Very Common	Weed
35.	Compositae	Bidens pilosa	Beggartick	Common	Weed
36.	Compositae	Emilia sonchifolia	Tasselflower	Common	Weed
37.	Compositae	Synedrella nodiflora	Nodeweed	Common	Weed
38.	Compositae	Tridax procumbens	Wild sunflower	Common	Weed
39.	Euphorbiaceae	Euphorbia hirta	Milkweed	Very Common	Weed
40.	Euphorniaceae	Phyllanthus niruri	Gripeweed	Very Common	Weed
41.	Euphorbiaceae	Ricinus communis	Castorbean	Common	Medicinal
42.	Malvaceae	Sida acuta	Broomweed	Very Common	Weed
43.	Rubiaceae	Borreria laevis	Buttonweed	Very Common	Weed
44.	Solanaceae	Physalis angulata	Hogweed	Common	Weed
45.	Verbenaceae	Stachytarpheta jamaicensis	Verbena	Very Common	Weed
46.	Compositae	Elephatopus scaber	Paang elepante	Common	Weed
47.	Polypodiaceae	Drynaria quercifolia	Pakapak lawin	Common	Ornamental
48.	Polypodiaceae	Pteridium aquilinum	Pteridium	Common	Ornamental
49.	Polypodiaceae	Pteris vittata	Pteris	Common	Ornamental
50.	Polypodiaceae	Asplenium nidus	Fern	Common	Ornamental

Family	Scientific Name	Common/Local	Distribution	Uses
		Name		
51. Polypodiaceae	Ceratopteris thalictroides	Fern	Common	Ornamental
52. Polypodiaceae	Nephrolepis hirsutula	Fern	Common	Ornamental
53. Araceae	Philodendron sp.	Philodenron	Common	Ornamental
54. Cyperaceae	Cyperus rotundus	Purple nutsedge	Very Common	Weed
55. Pandanaceae	Pandanus sp.	Pandan	Common	Food
				flavoring
56. Graminae	Cenchrus echinatus	Barbgrass	Common	Weed
57. Graminae	Scleria sp.	Scleria	Common	Weed
58. Zingeberaceae	Zingiber officinale	Ginger	Common	Spice
59. Graminae	Setaria genticulata	Setaria	Common	Weed
60. Convulvolaceae	Ipomea batatas	Camote	Common	Food
61. Euphorbiaceae	Manihot esculenta	Cassava	Common	Food
62. Graminae	Leptochloa filiformis	Feathergrass	Common	Weed
63. Malvaceae	Hibiscus rosa-sinensis	Gumamela	Common	Ornamental
64. Nyctaginaceae	Bougainvilla spectabilis	Bouganvilla	Common	Ornamental
65. Rubiaceae	Ixora chinensis	Santan	Common	Ornamental
66. Oleaceae	Jasminum sambac	Sampaguita	Common	Ornamental
67. Rosaceae	Rosa sp.	Rose	Common	Ornamental
68. Amaryllidaceae	Sansiviera sp.	Fortune plant	Common	Ornamental
69. Urticaceae	Leucosyke capitellata	Alagasi	Common	Medicinal

#### Conclusion

The plant species encountered are common, ordinary and widespread or also growing in abundance in other comparable and related ecosystems all over the Philippines. Table 2-6 shows a list of identified species that are critically endangered and other wildlife species, as well as management/protection plans and conservation strategies.

DAO and IUCN listed	Ecological/Vulnerability	Management Plans/Protection and Conservation
native tree species	Status	Strategies
<ol> <li>Gisok-gisok</li> <li>Kamagong</li> <li>Narra</li> </ol>	Critically Endangered (a species or subspecies facing extremely high risk of extinction in the wild in the immediate future. This shall include varieties, forms or other	<ul> <li>DAO 2007-01 Section 7. Collection of Plants and/or By-products and Derivatives. The collection of plants listed under this Order and or their by-products and derivatives shall be allowed only for scientific or propagation purposes in accordance with Section 23 of RA 9147 and its Implementing Rules and Regulations Provided that only the accredited</li> </ul>
4. Katmon	infra-specific categories) Other wildlife species (non-threatened species of plants that have the tendency to become threatened due to destruction of habitat or other similar causes)	<ul> <li>individuals, business, research, educational or scientific entities shall be allowed to collect for scientific or propagation purposes only.</li> <li>DAO 2007-01 Section 8. Illegal Acts. It shall be unlawful for any person, group or entity to collect and or trade the species listed hereof, unless such acts are covered by a permit granted by the DENR pursuant to Section 17 of RA 9147 and its Implementing Rules and Regulations and Sections 4 and 5 of r DAO NO. 2004-55.</li> <li>The Proponent should request for permits from the regional office of the DENR/EMB before cutting any fruit bearing trees found in the area of the proposed Project. In addition, the</li> </ul>

Table 2-6: List of Identified Critically Endangered and Wildlife Species



DAO and IUCN listed	Ecological/Vulnerability	Management Plans/Protection and Conservation		
native tree species	Status	Strategies		
		Proponent should be responsible in providing an area for transplanting any balled-out trees and/or replacement of cut trees.		
		• The Proponent is urged to expand the measures on how to restore and conserve biodiversity not only by reforestation. One suggestion is to create reserve or protected areas to still produce and sustain biodiversity even with the implementation of the proposed Project.		
		<ul> <li>Re-vegetation and enhancement of buffer zones</li> <li>Areas identified as special habitat of flora and fauna will be avoided and its existence will be reported to concerned government agencies</li> </ul>		
		<ul> <li>Habitat Protection: Retaining and managing viable habitat units within and surrounding the project's development block areas</li> </ul>		
		<ul> <li>Species Protection: Low disturbance levels in habitat blocks</li> </ul>		
		<ul> <li>Species Protection: Presence of key habitat requirements</li> </ul>		
		Species Protection: Specific management policies		
		<ul> <li>Buffer Zone: Provision of protected area around sensitive sites</li> </ul>		
		Buffer Zone: Limiting spread of urban     development into the countryside		
		<ul> <li>Education: EHS Manager in coordination with CENRO. MENRO and PENRO should conduct trainings, seminars and field demonstrations on company personnel on how to identify, care, propagate these threatened native tree species</li> </ul>		

### **Terrestrial Fauna**

An assessment of the wildlife population at the project site was conducted. The animal species present in the project site were identified and classified. Frequency of occurrence and degree of endemicity was also determined.

A standard two-kilometer transect Strip-Census Method (SCM) was used for each sampling station in gathering the data required of this project. The four animal groups encountered within a 50meter radius along the transect lines were tallied. Those that needed identification were later measured in terms of their biometrics and referred to taxonomic literature.

Actual observations through the naked eye, binoculars, and those through vocalizations were used to identify the fauna encountered. Animal droppings were also used as indicators to the presence of such animals.

The determination of the existence of a potential Tree Corridor was also done to help explain avian biodiversity.


Another technique used was the **Participatory Rapid Biodiversity Survey** wherein key informants, secondary, and ethno-biological surveys were utilized to gather other information that otherwise would not be covered by the primary data gathering.

The most common faunal species encountered or sighted during the site investigation were mostly birds. According to interviews with local residents of the community, there were probably around 20 species of birds inhabiting the vicinity area of the plant site.

The number of identified bird species in the area is an indicator that more birds may still be found nearby. The presence of a moderately low number of bird species can be attributed to the presence to the following factors:

- Possible presence of highly disturbed ecosystems;
- The absence or insufficiency of appropriate and desirable floral components; and
- The availability of a wide variety of foods in the area in the form of seeds, flowers, fruits, and insects.

**Table 2-7** enumerates the terrestrial fauna spotted/observed by the ecologist and later confirmed by local residents in the area using KII. The number of identified bird species in the area is an indicator that more bird species may still be found in the area.

The presence of a moderately low number of bird species, can be attributed to the presence of highly disturbed ecosystems and to the **absence or insufficiency** of appropriate and desirable floral components which provide not only good sanctuary and nesting place owing to the adjoining/neighboring lush and highly diverse vegetation cover which include: the existing patches of secondary-growth vegetation adjacent to the project site (hilly areas), and also of the tree plantations; as well as the availability of a wide variety of foods in the area in the form of seeds, flowers, fruits and insects.

Birds present in the area can be classified as either residents or visitors. The resident birds are those, which live their entire life in the area. A large number of birds that are not native in the area (and in the country in general) are mostly regular winter migrants, that is, they come to the Philippines at the onset of the cold season in the northern parts of Asia and return in the summer months when they breed.

# **Other Animal Groups**

Other animal groups present in the areas include reptiles, mammals, and a few amphibians, a number of insects and the usual domesticated animals raised by local residents.

There are 8 reptilian species represented by python, common snake, turtle, bubuli, bayawak, monitor lizard and the common house lizard. Some of these reptiles are caught by local poachers and hunters and eaten as exotic foods.

The mammalian group is represented by 18 species which include bats and various kinds of rats.

There are only 3 species of amphibians encountered, namely the marine toad and the estuarine frog and a salamander species.

The domesticated animals raised by the local community include cattle, cats, dogs, chickens, goats, carabaos, horses and pigs.



Insect species commonly associated with the area like bees, ants, grasshoppers, butterflies, dragonflies, wasps, mosquitoes, spiders and the common housefly were also observed.

The incidence of insect infestation in the area was observed to be low. This may be attributed to the presence of a wide variety of insectivorous birds, amphibians, reptiles and other natural predators that inhabit and frequent the area.

Similarly, endemicity of wildlife fauna is moderately high with an approximate value of 70.68%.

Migrant fauna was predominantly belonging to the bird group.



#### Figure 2-11: Identified Tree Corridor









#### Figure 2-13: Key Informant Interviews



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#### Table 2-7: Terrestrial Fauna Found Within the Vicinity of the Project Site

Common/Local Name	Scientific Name	Distribution
Birds		
Wild Chicken/labuyo	Gallus gallus sp.	Very common
Rock Dove/Feral Pigeon	Columba livia	Very common
Crested Myna/Martinez	Acridotheres cristatellus	Common
Brown Shrike	Lanius cristatus	Very common
Philippine eagle owl	Bubo philippensis	Common
Uwak (Phil. Crow)	Corvus macrorhynchos	Very common
Alimokon	Phapitreron leucotis nigrorum	Very common
Maya (Chestnut Mannikin)	Lonchura mallaa jagori	Very common
Layang-layang	Collocalia troglodytes	Very common
Pugo	Turnix suscitator	Very common
Lawin (Hawk)	Haliastus indus intermedius	Less common
Pipit	Nectarinia sperata	Very common
Tikling	Rallus striatus	Very common
Palago, kulkul	Pycnonotus goiavier	Common
Punay	Treron pompadora axillaris	Common
Oriole	Oriolus chinensis	Common
Korokok/kokok	Centropus viridis	Common
Tarat san diego	Lanius schach nasutus	Very common
Kasay-kasay (white-collared	Halcyon chloris collaris	Common
kingfisher)		
Tagak kalabaw/Talabong	Bubulcus ibis coromandus	Very common
Reptiles		
Snake/Sawa	Phyton reticulatus	Common
Cobra	Naja	Common
Box turtle	Cuora amboinensis	Common
Common snakes	Lycodon aulicus	Very common
Bubuli	Mabuya multifasciata	Very common
Bayawak	Geckko	Very common
HouseLizard	Sphenomophus sp.	Very common
Monitor Lizard	Varanus salvator	Very common
Amphibians		T
Toad	Bufo marinus	Very common
Frog	Rana sp.	Very common
Salamander	Salamanara sp.	Common
Mammais	Dten e chime in serii	Manualan
	Ptenochirus jägörii	Very common
Daga	Ruttus norvegicus	Very common
Small Field Rat	Rattus avulans	Very common
	Aus masculus	Very common
Long tailed macaque/unggov	Macaca sp	Common
Wild Pig	Sus sn	Common
Philippine Deer	Cervus sp	Common
Civet Cat	Pradoxurus nhilininensis	Common
Philipping tree squirrel	Sundasciurus philippinensis	Common
Farm Animals		
Cattle (Domesticated)	Bovidae	Very common
Cat (Domesticated)	Eelis domestica	Very common
Dog (Domesticated)	Canis familiaris.	Very common
	cano jaminano.	



Common/Local Name	Scientific Name	Distribution
Chicken (Domesticated)	Gallus	Very common
Goat (Domesticated)	Capra hircus	Very common
Pig (Domesticated)	Sus spp.	Very common
Carabao (Domesticated)	Bubalus bubalis	Common
Horse (Domesticated)	Caballo sp.	Common
Insects		
Вее	Apis indica	Very common
Grasshopper	Gastrimargus marmoratus	Very common
Dragonfly	Labellia sp.	Very common
Wasp	Vespa sp.	Very common
Common housefly	Musca domestica	Very common
Mosquitoes	Culex sp.	Very common
Ants	Formica sanguinea	Very common
Spider	Theridion sp.	Very common
Butterfly	Papilio sp.	Very common

# Conclusion

There are no rare, threatened and endangered endemic species of wildlife in the area based on the inventory except for bayawak/monitor lizard recently declared by PAWB-DENR as endangered. All plants and animals recorded in the project site are either common throughout the Philippines and in the island of Luzon.

# 2.1.4.2. Threat to existence and/or loss of important species

# **Floral Endemicity**

The top three most dominant plant species were Ipil-ipil with the highest Relative Frequency (RF) value of 20.000, followed by Mahogany with RF value of 7.000 and by Talahib with 5.000 RF value.

The summary of plant endemicity is presented in Table 2-8. Of the total 223 species, there are 154 trees; 36 shrubs, herbs and vines; 20 monocots; and 13 lower vascular plants belonging mostly to the fern group. One hundred forty-three (143) species are considered native, 62 introduced and 18 cultivated.

Endemicity is still moderately high with a value of 64.13%.

#### **Table 2-8: Summary of Plant Endemicity**

Plant Groups	Native Species	Introduced Cultivated Species Species		Total
Trees	100	48	6	154
Dicots (Shrubs, herbs, vines)	23	8	5	36
Monocots	14	2	4	20
Lower Vascular Plants (Ferns & Mosses)	6	4	3	13
Total	143	62	18	223



#### Faunal Endemicity

Table 2-9 summarizes the wildlife endemicity. Of the 58 species surveyed, 20 species are birds, 18 mammals, 9 insects, 8 reptiles, and 3 are amphibians.

Wildlife Group	Endemic	Resident	Introduced	Migrant	Total
Amphibians	1	-	2	-	3
Reptiles	8	-	-	-	8
Birds	10	6	1	3	20
Mammals	13	-	5	-	18
Insects	9	-	-	-	9
Total	41	6	8	3	58

#### Table 2-9: Summary of Wildlife/Faunal Endemicity

# 2.1.4.3. Threat to abundance, frequency, and distribution of important species

The frequency and relative frequency values (Table 2-10) of the floral species were obtained based on the number of times a given plant species were intercepted by the transect line. These were then counted and computed. The following plants species were tabulated as the most dominant. A total of 28 plant species were recorded to have been intercepted by the transect lines.

Plant Species	Common Name	No. of times	Relative Frequency
Ficus variegata	Tangisang bayawak	1	1,000
Leucaena leucocenhala	Inil-inil	20	20.000
Gmeling arboreg	Vemane	20	4 000
Manaifera indica	Mango	2	2 000
Anong sayamosa	Δtis	2	2.000
Codequem variegatum	San Francisco	1	1 000
Sandoericum koetiane	Santol	1	1.000
Samanea saman	Δκοςγο	3	3.000
Gliricidia senium	Kakawate	3	3.000
Bougginvilla spectabilis	Boungainvilla	1	1 000
Psidium quaiqua	Guava	1	1.000
Hibiscus rosa-sinensis	Gumamela	1	1.000
Moringa oliefera	Malunggay	1	1.000
Chrysophylum caimito	Kaimita	1	1.000
Dtorocarpus indicus	Narra	1	1.000
Macaranaa arandifalia	Dinunga	1	1.000
Arteegnus beterenbulla	Billuliga	1	1.000
Anocapus neterophylia	Langka	1	1.000
	Banana	1	1.000
Cocos nucifera	Coconut	1	1.000
	Kamachile	1	1.000
Muntigia calabura	Aratiles	1	1.000
Saccharum spontaneum	Talahib	5	5.000
Chromolaena odorata	Hagonoy	2	2.000
Swietemia macrophylla	Mahogany	7	7.000
Eucalyptus deglupta	Bagras	1	1.000
Jatropha curcas	Tuba-tuba	2	2.000
Broussonetia luzonica	Himababao	1	1.000

Table 2-10: Frequency of Intercepted Plant Species at the Project Site and Their Corresponding Relative Frequencies



Plant Species	Common Name	No. of times	<b>Relative Frequency</b>
		intercepted	(%)
Bauhinia malabarica	Alibangbang	3	3.000
(Blank)		(29)	(29.000)
Total	28 Species	100	100.000

# 2.1.4.4. Hindrance to wildlife access

The survey map is presented in Figure 2-9. The quarry operation will pose a significant hindrance to wildlife access; wildlife will not be able to access the quarry areas due to the human activities in the area. The migration corridor will be lost.





#### Water 2.2

#### Hydrology/Hydrogeology 2.2.1

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

The SNMC Project is located in the vicinity of two rivers: Conlong River in the north with headwaters at about 250 meters in elevation, and Salapangan (or Salapungan) River in the south with headwaters at about 170 meters in elevation (Figure 2-14). Both rivers originate from the east and have a prevailing westerly directional flow. The rivers flow around Mount Lumot, which has a peak elevation of approximately 590 meters. Conlong and Salapungan Rivers are located more than 1km away from the limestone pulverizing plant, but part of Conlong River runs through MPSA 161-2000-III. Akle River is near the SNMC site but is beyond the confines of the plant, which is closed off by a wall.

The project will not affect the hydrological property of the adjacent rivers. According to the geohazard survey conducted by the MGB, the area is not susceptible to any flooding.

Figure 2-14: Location Map of Conlong River





### 2.2.1.2 Change in stream, lake water depth

No streams or lakes will be affected by the project.

#### 2.2.1.3 Depletion of water resources/competition in water use

Based from the National Water Resources Board (NWRB), only **Solid North Mineral Corporation** and Eagle Cement Corporation have been registered and permitted to legally utilize groundwater in the area.

Comparing the actual plant requirement and the production capacity of the two wells, less than 15% will be extracted. Hence, the competition for water use with the community will be minimized. The **SNMC** lagoon with a capacity of 30,000 m<sup>3</sup> will also serve as a water reservoir that will collect run-off and rainwater that can be tapped during extreme dry weather.

## 2.2.2 Oceanography

This section is not applicable to the project.

## 2.2.3 Water Quality

## 2.2.3.1 *Groundwater quality*

Water that will be used by **SNMC** is extracted from two deepwells. Water will be used primarily by the Limestone Pulverizing facility as coolant for the heavy machinery.

Groundwater quality assessment was conducted in May 2016. **Table 2-11** presents the results of the monitoring. All groundwater quality parameters were compared to Philippine National Standards for Drinking Water (PNSDW). TDS for SNMC staff house and total coliform yielded failed results for SNMC motorpool and staff house.

Groundwater quality may be affected by the discharges from domestic sources when not properly managed. To manage discharges from domestic sources, septic tanks are installed in the sanitation facilities of the plant. Contamination may also be brought by oil spills and leaks from vehicle maintenance and fuel storage. Secure storage areas for oil are established to mitigate this concern.

Parameters	PNSDW Standards	Units	Solid North BCI Motor Pool	Remarks	Solid North Staff house	Remarks
BOD <sub>5</sub>	-	mg/L	5	Passed	2	Passed
TSS	-	mg/L	6.0	Passed	13	Passed
Turbidity	5	NTU	0.75	Passed	0.10	Passed
TDS	500	mg/L	266	Passed	633	Failed
Chlorides	250	mg/L	7.0	Passed	21	Passed
Phosphates	-	mg/L	0.03	Passed	0.03	Passed
Nitrates	-	mg/L	0.1	Passed	0.8	Passed
рН	6.5-8.5	-	7.2	Passed	7.5	Passed
Total Hardness	300	mg/L	77	Passed	183	Passed
(as CaCO₃)						
<b>Total Coliform</b>	<1.1	MPN/100mL	6.9	Failed	23	Failed

Table 2-11: Groundwater Quality Assessment Results, May 2016



### 2.2.3.2 *Surface water quality*

Secondary water quality data of Akle River was reviewed to assess the water quality of the river. **Figure 2-15** presents the sampling points. Parameters included in the analysis are pH, Total Suspended Solids (TSS), and Total Dissolved Solids (TDS). Results of the monitoring are compared with DAO 2016-08 Class C standards.

Results for pH analysis in Akle River from 2012 to 2016 show that the water quality is within the prescribed standards in DAO 2016-08. Although this is the case, it can be noted that there is a sudden drop of pH from pH 8 (3<sup>rd</sup> quarter, 2015) to pH 7 (4<sup>th</sup> quarter, 2015). This drop cannot be attributed to the limestone quarry operation since limestone is basic, with pH higher than 7. In fact, limestone can be used to partially neutralize strong acids. A valid reason why a drop in pH was recorded during this period is equipment failure; the pH meter that was used may not be calibrated properly. It is imperative that equipment is calibrated before use. To supplement analysis using pH meter, pH paper can also be used to verify the result.

It can also be observed that there is a sudden decline in TSS from 2014 to 2015. This may be attributed to slower current of the river, which may cause particles to settle. Sudden change in TSS can also be caused by inconsistent sampling techniques. Although this is the case, concentrations of TSS is below the DENR standards.

Monitoring of Oil & Grease shows values that exceed DENR Standards for Class C water bodies. This can be attributed to activities car maintenance activities within the community. There are also a number of public and private vehicles that go through Brgy. Akle.

**SNMC** started its own water quality monitoring in the 4<sup>th</sup> quarter of 2017. The parameters are based on DAO 2016-08 PSIC Code 239. The sampling stations are presented on **Figure 2-15**. The results show that water quality in the sampling stations are within DENR Class C Standards.

PARAMETERS	DENR DAO 2016-08	4TH QUARTER (October 26, 2017)				
	STANDARDS	WS1	WS2	WS3	WS4	WS5
	CLASS C-					
рН	6.0-9.0	7.6	8.1	7.2	7.9	7.5
Temperature	25-31	27.8	29.3	29.6	28.2	27.6
COD mg/L	100	37	27	18	34	8
Cadmium (Cd) mg/L	0.005	<0.003	<0.003	<0.003	<0.003	<0.003
Chromium (Cr) mg/L	0.02mg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc (Zn)mg/L	2mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Copper(Cu) mg/L	0.02mg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Lead (Pb)mg/L	0.05mg/L	<0.03	<0.03	<0.03	<0.03	<0.03

#### Table 2-12: SNMC Water Quality Monitoring

Increased human activities in the vicinity can be assumed due to the scaled-up operations of **SNMC**, thus, pollution loads associated with domestic sewage may increase oxygen demand of the receiving bodies of water. **SNMC** already has sanitation facilities and septic tanks that can accommodate its workers. This should mitigate any concerns regarding the sewage management.

Surface runoff within the limestone pulverizing plant and quarry areas may also have an effect on the surface water quality. To mitigate this concern, multiple siltation ponds are installed within



the quarry areas and the limestone pulverizing plant. **SNMC** regularly maintains the siltation ponds by removing silt and sediments.

Possible oil spills may also contaminate the surface water. It is imperative that storage areas are secured to mitigate concerns or oil spills; bund or containment walls are already constructed to help with securing storage areas for oil to prevent spills. Strict application of safety and sanitation protocols is already in place. Vehicle maintenance are done in concrete-lined motorpools to prevent oil spills. Within the motorpools are constructed canals to channel oil leaks during vehicle maintenance. The use of rice hull, sawdust, or coir dust to absorb oil spills is already being done.

## Figure 2-15: Monitoring Stations for Water Quality with Siltation Ponds



Assessment of Environmental Impacts

SOLID NORTH SINCE CORPORATION SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant Brgy. Akle, San Ildefonso, Bulacan





Assessment of Environmental Impacts

**Environmental Performance Report and Management Plan** SOLID NORTH SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant Brgy. Akle, San Ildefonso, Bulacan











#### 2.2.3.3 Water Quality of Siltation Pond

**SNMC** monitors water quality of its siltation ponds. Water quality monitoring of shale quarry siltation pond is presented on **Table 2-13.** Results are compared with DAO 2016-08 General Effluent Standards.

All parameters passed the DENR standards, which means that the installed siltation pond within the shale quarry area is effective in treating the effluent.

Parameters	Shale Quarry Siltation Pond 2	Units	DAO 2016-08 General Effluent Standards	Remarks
рН	8.3	-	6.5-9.5	Passed
Temperature	34.4	°C	3°C change	Passed
Color	20@pH7.9	NTU	150	Passed
COD	2	mg/L	100	Passed
Cadmium	<0.005	mg/L	0.01	Passed
Chromium	<0.02	Mg/L	-	-
Zinc	<0.01	mg/L	4	Passed
Copper	<0.002	mg/L	0.04	Passed
Lead	<0.03	mg/L	0.1	Passed

Table 2-13: Water Quality Monitoring of Shale Quarry Siltation Pond 2 (May 6, 2017)

#### **Freshwater Ecology** 2.2.4

Survey of freshwater organisms in six sampling sites was previously done in 2006 to determine the species composition of fish and invertebrates found in the vicinity of the plant (Table 2-14). The list is also being used by the MMT for its current monitoring.

Sampling Stations	Barangay	Municipality
1. Akle (upstream)	Camachin	San Ildefonso
2. Akle (lower stream)	Akle	San Ildefonso
3. Akle	Alagao	San Ildefonso
4. Tangkey stream	Sitio Nara, Akle	San Ildefonso
5. Garlang	Busikit	San Ildefonso
6. Garlang River	Bubulung Munti	San Ildefonso

#### Table 2-14: Sampling Stations for Aquatic Fauna

Identification of fishes and invertebrates were based on actual identification and interviews of people around the river. Fish species found in the different sampling stations are shown in **Table** 2-15.

A total of 17 species of fish and invertebrates (crabs, shrimp and shells) were found in six (6) sampling sites. Station 6 recorded the highest number of species (17), followed by Station 5 (15).

Seven species of fish (C. batrachus, O. striatus, Awaous ocellaris, Anguila australlis, Anguila bicolor, T. nilotica and Ambasis nalua) and S. bangkokensis, V.viviparus and shrimp were the common crabs, shell and shrimp found in the area.

Species	Sampling Stations					
	1	2	3	4	5	6
Vertebrates						
Clarias batrachus (hito)	Х	Х	Х	Х	Х	Х
Ophicephalus striatus (dalag)	Х	Х	Х	Х	Х	Х
Awaous ocellaris (bia)	Х	Х	Х	Х	Х	Х
Anguila australlis (palos)	Х	Х	Х	Х	Х	Х
Anguila bicolor (igat)	Х	Х	Х	Х	Х	Х
Tilapia nilotica (tilapia)	Х	Х	Х	Х	Х	Х
Trichogater pectoralis (gourami)					Х	Х
Anabas testudineus (liwalo)						Х
Tilapia mozambica (native tilapia)						Х
Ambasis nalua (talandi)	Х	Х	Х	Х	Х	Х
Invertebrates						
Sayamia bangkokensis (talangka)	Х	Х	Х	Х	Х	Х
Viviparus (suso)	Х	Х	Х	Х	Х	Х
Srygothelphusa bidiensis (crab)					Х	Х
Pomacea canaliculata (golden snail)				Х	Х	Х
Palaemon concinnus (kuhol)					Х	Х
Shrimp (hipon)	Х	Х	Х	Х	Х	Х
Corbicula flumea (tulya)					Х	Х

Table 2-15: U	pdated Fish S	Species Found	in the 6 Sam	pling Stations

The principal threats to the river are siltation and organic pollution. Siltation, coming from the mountains and river banks activities, contributes to the eutrophication of the river system, even before the plant started operation. Quarry activities may augment siltation, increasing possible eutrophication of the water bodies. Installed siltation ponds shall mitigate these concerns.



Domestic waste from the SNMC facility may also contribute to the eutrophication of the receiving bodies of water. Sanitation facilities and septic tanks are already installed to mitigate this concern.

#### 2.2.5 Marine Ecology

The plant and quarry site are far from any marine or coastal areas. This section is not applicable to the project.

2.3 Air

#### Meteorology/Climatology 2.3.1

### 2.3.1.1 *Change in the local micro-climate e.g. local temperature*

Data for the climatological or meteorological parameters of the project area are not available since there is no PAGASA synoptic weather station in the area. The nearest weather station, however, is the Science Garden Synoptic Station located in Quezon City. The data from this station is considered representative of the meteorological conditions in the project site and, therefore, is used in this section.

The municipality of San Ildefonso and Doña Remedios Trinidad are located in a Type I climate of the Corona System, according to the Philippine climate classification, as shown in Figure 2-19. This type of climate has two (2) pronounced seasons, being generally dry from December to May, to generally wet from June to November.

The prevailing winds in the area are affected by the following wind flows: northeast monsoon (Hanging Amihan) from November to February, southwest monsoon (Hanging Habagat) from June to September, and trade winds in between monsoon seasons. The northeast monsoon brings cooler air while the southwest monsoon brings heavy rains. The annual prevailing wind direction in the area is northeast, with annual speed rated at 2 meters per second. An extreme wind speed was recorded on May 1992 in the area at 50 meters per second. Figure 2-20 shows the annual wind rose from 1971-2000 at Science Garden, Quezon City.

Like the rest of Bulacan province, the area is prone to typhoons, with an average of 1 to 2 major storms hitting the area per year. These typhoons, if it hits landfall and directly crossing Bulacan province, could potentially bring extensive wind and rain hazards (i.e. landslides, flooding) in the local area.

The average temperature of 27.4°C, with highs registering 32.1°C and lows of 22.7°C. The warmest temperature recorded in the area was 38.5°C on 14 May 1987, while the coolest was 15.1°C on 13 December 1986.

Rainfall data (1990-2012) from Science Garden in Quezon City was considered as Bulacan data, as suggested by PAG-ASA. The highest amount of rainfall can be experienced during March. Furthermore, highest amount of rainfall was recorded in 2012, which is the most recent data available.

The Relative Humidity (RH) in the area averages 77% annually, and 65% to 85% monthly. The high humidity in the area is affected by the presence of Akle River.

The details of the climatological parameters are found in the nearest synoptic station in the area as listed in Table 2-16.

Higher temperatures caused by loss of vegetation due to quarry operations is the main impact of the project on the micro-climate of the area. This can be mitigated by employing progressive rehabilitation and greening programs.







Figure 2-20: Annual Wind Rose at Science Garden Monitoring Station (1971-2000)





# SOLID NORTH SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant

Brgy. Akle, San Ildefonso, Bulacan

#### Table 2-16: Climatological Normals and Extremes, 1971-2000

STATION NAME: SCIENCE GARDEN, QUEZON CITY						Latitude : 14°38'41" N			Elevation : 43.0 m					
PERIOD	: 1971	: 1971 – 2000					Longitude : 121°02'31" E							
Month		Temperature Var				Vapor	Rel. Hum.	MSLP	Wi	nd	Cloud	N	o. Days w/	
	Max	Min	Mean	Dry	Wet	Dew	Pressure	%	(MBS)	DIR (16	SPD	Amount	TSTM	LTNG
	(°C)	(°C)	(°C)	(°C)	(°C)	Pt. (°C)	(mos)			pt)	(mps)	(OKLA)		
JAN	30.4	20.4	25.4	25.1	22.0	20.7	24.3	76	1012.2	NE	1	5	0	0
FEB	31.6	20.6	26.1	25.9	22.0	20.4	23.8	71	1012.0	NE	1	4	0	0
MAR	33.3	21.6	27.4	27.4	22.7	20.8	24.3	67	1011.5	SE	2	4	1	1
APR	34.9	23.3	29.1	29.1	23.9	21.9	26.1	65	1009.9	SE	2	4	4	4
MAY	34.6	24.4	29.5	29.3	25.1	23.6	29.0	71	1008.5	SE	2	5	14	13
JUN	32.9	24.3	28.6	28.2	25.3	24.3	30.2	79	1007.9	SW	2	6	17	13
JUL	31.6	23.9	27.8	27.3	25.0	24.2	30.1	83	1007.3	SW	2	6	19	13
AUG	31.1	23.9	27.5	27.1	25.0	24.3	30.2	84	1007.2	SW	2	7	17	9
SEP	31.5	23.7	27.6	27.1	24.9	24.1	30.0	84	1008.2	SW	1	6	18	12
ОСТ	31.3	23.2	27.3	26.8	24.6	23.8	29.4	83	1008.6	Ν	1	6	11	9
NOV	31.1	22.4	26.7	26.3	23.8	22.9	27.7	81	1010.0	Ν	1	5	5	2
DEC	30.3	21.3	25.8	25.4	22.7	21.6	25.7	79	1011.6	Ν	1	5	1	0
ANNUAL	32.1	22.7	27.4	27.1	23.9	22.7	27.6	77	1009.6	SW	2	5	107	76

Source: PAGASA Station No. 430 Science Garden, Quezon City



Figure 2-21: Monthly Rainfall Data (Science Garden, QC, 1990-2012)



# 2.3.1.2 Contribution in terms of greenhouse gas emissions (or GHG mitigation potential)

The IPCC Guidelines, under Chapter 2 on Mineral Industry Emissions, cover only cement manufacturing and not limestone pulverizing. Therefore, estimating GHG emissions using the IPCC Guidelines is not necessary. Although there are no cement operations, some potential sources of GHG emissions are the use of vehicles and generator sets, which both burn fossil fuels for power.

# 2.3.2 Air Quality and Noise

2.3.2.1 Impact on air quality

# **Ambient Air Quality**

Ambient air quality was assessed by reviewing available air quality monitoring data in the vicinity. Aside from the shale quarry area of **SNMC**, monitoring data from the limestone quarry area of Eagle Cement Corporation was also considered to account for the cumulative impacts caused by all activities in the vicinity. Parameters that were monitored include TSP NO<sub>2</sub>, SO<sub>2</sub>, and PM<sub>10</sub>. The Air sampling map is presented on **Figure 2-22**.

Results of the ambient air monitoring (Figures 2-23 to 26) showed that TSP and PM10 exceed the DENR standards. As stated by the monitoring team, the high TSP result observed was due to the dust caused by passing vehicles and heavy equipment.

Air pollution in the area is largely due to passing vehicles. Fugitive emissions from the pulverizing plant may also cause impacts on ambient air quality, specifically on TSP and PM10. To mitigate these concerns, constant watering of areas that may generate dust is being done by the proponent. Bag filters shall also be installed as part of the limestone pulverizing facility to minimize fugitive emissions coming from the plant. Unnecessary earth movement within the shale and pozzolan quarry areas is being avoided; same measures shall also be applied in limestone quarry.

















2-24	NO <sub>2</sub> Monitoring Results (2015-2017)				
PROJECT PROPONENT:		PROJECT NAME & LOCATION:			
Solid North Mineral Corporation		SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant			
		Brgy. Akle, San Ildefonso, Bulacan			

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> Figure 2-25: SO<sub>2</sub> Monitoring Results (2015-2017) SO2 (2015-2017) 400 350 300 SO2 (µg/Ncm) 250 200 150 100 50 0 2015 3rd Qtr 2015 4th Qtr 2016 1st Qtr 2016 2nd 2016 3rd Qtr 2016 4th Qtr 2017 1st Qtr 2017 2nd Qtr Qtr Sampling Date Downwind Brgy. Alagao Shale Quarry Area Upwind Station Brgy. Narra Shale Quarry Area DENR STANDARD Limestone Quarry Area Upwind Station Limestone Quarry Area Downwind Station SOURCE: SNMC FIGURE TITLE: FIGURE NO .: 2-25 SO<sub>2</sub> Monitoring Results (2015-2017) PROJECT PROPONENT: PROJECT NAME & LOCATION: **Solid North Mineral Corporation** SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant Brgy. Akle, San Ildefonso, Bulacan

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Figure 2-26: PM10 Monitoring Results (2015-2017)



# 2.3.2.2 Increase in ambient noise level

Sampling points for ambient noise level are the same as sampling points for ambient air quality monitoring (Figure 2-22). SNMC also complies with noise standards set by the DENR for heavy industrial areas (Class D).

Expansion of the quarry operations require more heavy equipment, which will add to the existing ambient noise in the vicinity. To minimize noise, heavy equipment is appropriately muffled. To ensure safety of workers, PPEs are issued to operators of heavy equipment. Furthermore, noisy activities such as blasting shall be done only during daytime. Noise barriers and sound proofing are already installed in areas that generate loud noises.

Measures that are being applied to minimize noise have proven to be effective, as shown by the ambient noise monitoring **(Figure 2-27)**. The same measures shall be applied upon the operation of the limestone pulverizing facility and the expanded quarry area.







# 2.3.3 Air Dispersion Model

A steady state Gaussian plume dispersion model was applied to evaluate the air pollution impact on the local air quality from the proposed Eagle Cement Corporation (EAGLE) and **Solid North Mining Corporation (SNMC)** Expansion Project at San Ildefonso, Bulacan which is within the Metro Manila air shed area. The modeling domain that contains the study area is 10 km by 10 km grid centered on the possible stack locations (15°3'14.50"N, 121°4'10.34") of the cement line production as shown in **Figure 2-28**. The primary air pollutant to the air quality of the study area will be particulates emitted from the cement line production and the quarrying site from both EAGLE and SNMC.

# Figure 2-28: Model Domain of the Study Area



To develop an accurate air dispersion model that depicts the conditions in the area, other industries in the vicinity were considered. Aside from the limestone pulverizing and quarrying operations of **SNMC**, other activities in the area that were considered are the quarrying and cement production (Line 1, Line 2, and Line 3) of Eagle Cement Corporation, and the fly-ash processing facility of Armstrong Fly-Ash and Logistics Company, Inc. Eagle Cement Corporation is currently applying for an ECC for the construction and operation of Line 3, while Armstrong Fly-Ash and Logistics Company, Inc. was granted its own ECC for fly-ash processing. The aforementioned activities are enumerated on **Table 2-17**.



Companies	Operations	Type of Emissions			
Eagle Cement Corporation	Quarrying	Area emission			
	Cement Line 1, Line 2, and Line 3	Area emission			
	(Crushing)				
Armstrong Fly-Ash and Logistics	Fly-Ash Processing Facility	Area emission due to			
Company, Inc.		transfer of fly-ash; no			
		source emissions			
Solid North Mineral	Quarrying	Area emission			
Corporation	Limestone Pulverizing	Area emission (no stacks)			

# Table 2 17: Operations Considered in the Air Disp

Figure 2-29 shows the estimated location of the point, volume, or area source of particulates from the crushing operations and quarrying area.





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.

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

# Emission rate (g/s) = Max Limit (mg/Nm<sup>3</sup>) x Stack volumetric flowrate (Nm<sup>3</sup>/s) x $10^{-3}$

For particulates, the maximum concentration is set to 150 mg/Nm3 to stacks of the cement line production of Eagle Cement Corporation but with the exception of the stack of coal mill which is based on the design of bag filters provided by the proponent, i.e., to 50 mg/Nm3. It is also assumed that sixty five percent of the Total Suspended Particulates (TSP) will be PM10 for the worst-case scenario. Another potential source of particulates as fugitive dust is from the crushing plant and quarrying site which is assumed to have an emission rate of 0.2 g/s and 1.0 x 10-5 g/s-m2, respectively. The fugitive dust emissions from crushing plant and quarry site are modeled as a 100m-length volume source and a 100m-radius circular area source, respectively. 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 2-18**. The estimate emission rates in g/s are shown in **Table 2-19**. All of these parameters are either based on the data provided by the proponent or typical values assumed as regard to the design of the facility.

Point source	Stack height (m)	Stack Diameter (m)	Exit Stack Gas Temp (K)	Exit gas vol. flow (Nm³/hr)	Number of stacks
Raw mill-Kiln	60	3.5	423	600000	1 /line
Coal mill	30	1.5	393	180000	1 /line
Clinker cooler	30	3.5	473	600000	1 /line

Table 2-18: Description of the Stacks from the Proposed Project

Point source	TSP	PM10			
Raw mill-Kiln	25.0	16.25			
Coal mill	2.5	1.62			
Clinker cooler	25.0	16.25			
Total	52.5	34.12			

Table 2-19: Emission Rate (g/s) from the Stacks of Each Line with a Capacity of 2.0 MMTY

The proposed facility is located in an area where regional meteorological condition and terrain would have a significant effect on the predicted GLCs of its air emissions. The meteorological data used for the model was derived from a mesoscale regional meteorological model (MM5) for the said area. The summarized wind frequency data as shown in the wind rose diagram (**Figure 2-30**) indicates that the prevailing wind direction in the area is in northeasterly and southwesterly sectors with a wind speed range between three to six meters per second. As for the terrain elevation data, it was obtained from high resolution database of Earth's topography collected during the Shuttle Radar Topography Mission (SRTM). The elevation data was then processed (see **Figure 2-31**) 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 x 10 km grid with a 200m resolution of the uniform cartesian grid receptor.








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Table 2-20 summarizes the modeling results describing the predicted incremental maximum ground level concentration (GLC) of particulates at different averaging time

The predicted concentration from the scenario exceeded the National Ambient Air Quality Guideline Values (NAAQGV) for suspended particulates as summarized in Table 2-18. Assuming the uncontrolled scenario, indications suggest the uncontrolled fugitive dust emissions in the quarry site have significant impact on the air quality of the study area, particularly the suspended particulates. Figure 2-32 suggests the major impact of the plume is in southwesterly and northwesterly direction as influenced by the predominant wind condition in the area. The long-term predicted maximum GLCs of particulates were also observed at the quarry site of both Eagle Cement Corporation and SNMC. Thus, the proponent must install and operate "Best and Available Control Technology" (BACT) to reduce the emission rate of particulates and ensure that the impact of the integrated operations of Eagle Cement Corporation, Armstrong Fly-Ash and Logistics Company, Inc., and SNMC will not be detrimental to air quality of the area. SNMC, as well as other industrial operations in the area are using bag filters to control emissions in the area.

Moreover, the isopleth for the long-term annual incremental GLC of the said criteria pollutant is shown in Figure 2-32. It should be noted that these concentrations present the uncontrolled scenario, which are the predicted maximum increase in the existing ambient air levels without implementing air emission control facilities such as bag filters.



Use of air pollution control devices, specifically bag filters for the limestone pulverizing facility. Assuming that the installed facilities are 90% efficient, TSP and PM10 emissions from the limestone pulverizing facility shall be below NAAQSGV standards.

Scenario	Averaging time	Uncontrolled Scenario		Controlled Scenario (90% efficiency)		NAAQSGV		UTM East (m)	UTM North (m)
		TSP Maximu	PM <sub>10</sub> Maximu	TSP Maximu	PM <sub>10</sub> Maximu	TSP (μg/m³)	ΡΜ10 (μg/m³)		(,
		m GLCª	m GLCª	m GLCª	m GLCª				
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)				
Eagle Cement	1-hr	1632	1061	163.2	106.1	300	200	292679	1666410
Corporation,	24-hr	768	499	76.8	49.9	230	150	292679	1666410
Armstrong Fly-	Annual	244	159	24.4	15.9	90	60	292679	1666410
Asii, aliu									
Solid North									
Mineral									
Corporation									

#### Table 2-20: Predicted Incremental Maximum GLC of Particulates in the Study Area at Different Scenarios

Note: a 98th percentile value







#### People 2.4

#### Bulacan

Based on the 2010 Census of Population and Housing, Bulacan has a population of 2,924,433, with 659,168 households. From the previous baseline data from the National Statistics Office (NSO) Quickstat, 2007 the population of Bulacan back then was 2,826,926. The average household size is 4.4, which is lower than what was recorded in 2000 (4.8 people per household).

The recorded median age in 2010 was 24.8 years, which is older than the median age of 22.5 years recorded in 2000.

Furthermore, there were more males in the age groups 0 to 24 years and 30-49 years, while females were more dominant in the age group 25-29 years and 50 years and beyond. Children, on the other hand, composed the largest age group. Age groups 5-9 years and 10-14 years composed 10.5% of the population, followed by the age group 0-4 years at 10.9%.

Gender distribution in Bulacan is balanced, with males accounting for 50.1% and females accounting for 49.9% of the population.

64.5% of the population was of working-age (15-64), with dependents accounting for the remaining 35.5%. For every 100 working-age people, there are an estimated 55 dependents. This ratio is lower compared to the 2000 data, where there were 64 dependents per 100 working age people.

#### San Ildefonso

The Municipality of San Ildefonso is a 1<sup>st</sup> class municipality which is politically subdivided into 36 barangays. From which, there are 6 urban and 30 rural barangays. It also has diverse geographical characteristics that include mountains, hills, valleys and plains. The municipalities of San Miguel in the north, San Rafael in the south, Quezon province in the East and Pampanga in the West bound the municipality.

Based from the 2010 census from the Philippine Statistics Authority (PSA), the municipality has a total population of 95,000 with an annual growth rate (AGR) of (+0.61%). The population was increased by 1,562 people from the 2007 census of 93,438 with an AGR of (+2.17%).

San Ildefonso has a total land area of 16,407 hectares. The primary impact area is Brgy. Akle, which has a population of 3,320 as of May 1, 2010, according to the Socio-Economic Profile of San Ildefonso published in 2015. Based from the 2007 census on population there are only 2,993 residents in Brgy. Akle.

Name	Urban/Rural	Population (as of August 2007)	Population (as of May 1, 2010)*
Akle	Urban	2,993	3,320

#### Table 2-21: Barangays in San Ildefonso

Source: Socio-Economic Profile of San Ildefonso





#### 2.4.1 Displacement of settler/s

#### **Housing and Ownership**

According to available secondary data in 2015, 85% own their houses while 7.3% were renters while 6.4% were sharer or rent-free occupants.

38% of the structures were made mostly of concrete materials, while 25% were made of local materials such as nipa, sawali, and bamboo. There are still some structures made of light materials such as scrap materials and wood (15%).

Since construction and operation of limestone pulverizing plant and quarry expansion will be within **SNMC** property, there will be neither be displacement nor disturbance of properties or settlers. In relation to this, there will be no change or conflict in land ownership and change or conflict in right of way.

#### 2.4.2 In-migration

Culture of immigrants may be different from those of the local community. Through interaction, cultural adjustments may naturally follow, although this is not always the case. Adjustments may take time and is sometimes fraught with this disenchantment, a condition that breeds animosity and eventually violence. This is normally observed during drinking sessions. SNMC, in its years of operation, has no recorded incident involving peace and order among the workers and the community members. Furthermore, in-migration is limited through local hiring.

Based on the latest data on manpower for 2017 there are a total of 142 employees from both SNMC and its contractors. From the 21 SNMC employees, only 2 are from Bulacan. From the contractors, 72 of the 121 (59.5%) hires are from Bulacan. In addition to this, 28 or (38.88%) of these hires are sourced from Brgy. Akle. SNMC shall continue making sure that its contractors maintain the trend of hiring from within Brgy. Akle to mitigate the negative effects of in-migration.

In the event that migrant workers are hired, the barangay, through coordination with SNMC, issue certificates to new employees which contains pertinent information about employees such as name, and address.

Most of the in-house employees of **SNMC** are not from the host barangay. To ensure the safety of these employees, they are housed within **SNMC** compound.

#### 2.4.3 Cultural/lifestyle change (especially on Indigenous Peoples, if any)

There are no known indigenous peoples (IPs) or indigenous cultural communities (ICCs) residing near or within the project area.

In terms of lifestyle change, the increase in the income from working for the project have a tendency to introduce and expose workers and the community with vices that tend to undermine the morality of the people. Hostelry areas like videoke bars, nightclubs, gambling places, and prostitution among others may rise if construction and operations workers will be attracted to such "tempting" places. These vices may increase social problems like the destruction of family and values, and committing of crimes if not properly handled.

SNMC commits to work closely with the LGU and PNP to regulate law to avoid vice-related problems in the community. In addition, SNMC strictly implements a drug and alcohol-free work SOLID NORTH SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant Brgy. Akle, San Ildefonso, Bulacan

environment. Commitment to install closed circuit televisions (CCTVs) in strategic places in the plant and the community will be prioritized. Trainings in peace-keeping will also be provided.

## 2.4.4 Impacts on physical cultural resources

Sitio Narra, located about 1 km away from **SNMC** plant site, is home to an old grotto which holds a religious significance in the community. Aside from this, there are no literature or inter/national publications found in the project area that have archaeologic, paleontologic, historical, aesthetic, or cultural, both tangible and intangible, significance, or immovable objects, below ground or underwater, sites, structures, groups of structures, and natural features.

There will be no impacts on the grotto since the project activities are located far from the grotto. **SNMC** observes a 200m buffer zone from its site to ensure that this grotto remains pristine.

## 2.4.5 Threat to delivery of basic services/resource competition

**SNMC**, through its contractors, usually brings in skilled personnel if skills are not available in the locality. Under the Social Development Program (SDP) developed by **SNMC**, a program to provide relevant skills training to residents, to minimize hiring outside of the locality, is being planned. A substantial number is required and these people are what this document refers to as transients. Although their residency is temporary, the workers nevertheless have needs similar to the permanent residents in the area. They will therefore compete for food, shelter, power, water and other resources that are available to the local community. Such additional needs will therefore exert pressure to the resources of the community. **SNMC** provides shelter for its workers; some contractors also provide shelter for its workers. Food, power, and water are available in the housing facilities.

### Water Supply

According to the 2015 Socio-Economic Profile of San Ildefonso, all households in Brgy, Akle have access to safe water. There is an existing local water utility in San Ildefonso however the scope is limited only to a few barangays. The service is concentrated mainly on the Poblacion and its vicinity barangays.

In Akle, 60% of the household derived their water from deepwell, while the remaining 30% from the piped spring water coming from the mountain some 10% get their water from the river. In Alagao, 90% obtain their water from the deepwell and the remaining 10% from the springs and river.

### **Power Supply**

Manila Electric Company (MERALCO) powers the Municipality of San Ildefonso. 93% of the residents in Brgy. Akle have power, while 89% in Brgy. Alagao has power.

### **Communications/Transportation**

In terms of telecommunications, PLDT, Smart, Globe, Sun Cellular are the service providers which have been operating in the area.

In terms of transportation, jeepneys and tricycles are the preferred mode of transportation in the area. Some of the residents have their own motorcycles and private vehicles.



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> Threat to public health and safety 2.4.6

### Health

Health of workers is regularly monitored by an in-house physician. Furthermore, SNMC conducts medical missions as well as providing medicines in local health clinics in the area.

Based on latest available data from Field Health Service Information System (FHSIS) morbidity and mortality reports from the San Ildefonso Rural Health Unit-II (RHU-II), the top leading causes for morbidity and mortality are presented in Tables 2-22 and 2-23, respectively.

Diarrhea is the leading cause of morbidity with 831 recorded cases followed by hypertension with 270 cases. Respiratory illnesses such as pneumonia, bronchitis/bronchiolitis, influenza consist a total of 481 cases. In addition, vector-borne diseases such as dengue, chikungunya and leptospirosis are among the cases reported to the RHU-II. In total, there are 1,595 residents affected by the said diseases, in which 795 are males and 800 are females.

100			
1	Diarrhea	6	Dengue
2	Hypertension	7	Meningococcemia
3	Pneumonia	8	Chikungunya
4	Influenza	9	Leptospirosis
5	Bronchitis/Bronchiolitis		

### Table 2-22: Top 9 Causes of Morbidity, 2013

In 2015, all forms of cancer were the leading cause of mortality with 40 cases, followed by stroke with 18 cases. Cardiovascular-related diseases comprise of at least 36 recorded cases. For Barangay Akle, there are 9 recorded deaths for 2015. The causes of deaths vary to include; myocardial infection, non-Hodgkin's lymphoma, septicemia, pulmonary tuberculosis, cancer, epilepsy, hypertension, and cerebrovascular accident.

### Table 2-23: Top 10 Causes of Mortality, 2015

1	Cancer (all forms)	6	Hypertension (HPN)
2	Stroke (Cerebrovascular Accident)	7	Chronic Obstructive Pulmonary Disease
			(COPD)
3	Heart Attack (Myocardial Infraction)	8	Pneumonia
4	Cardiac Arrest (CRA)	9	Bronchial asthma
5	End-Stage Renal Disease (ESRD)	10	Cardio Pulmonary Arrest (CPA)

### Peace and Order/Crime

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.

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. SNMC, regularly coordinates with the barangay officials to ensure peace and order among the workers and the community members. In addition to this, there is also minimal interaction among the workers and the community members, as most of the times, the workers are in the plant premises.



#### **Sanitation**

Majority of the houses (75.3%) had toilets that were not water-sealed, while 7.1% use communal toilets. Only 4.1% of the homes had water-sealed toilets. According to baseline data before **SNMC** operations, only 50% of the residences had toilets.

Disposal of garbage usually utilizes burning (83%). There are residents who bury their trash (11%) while only 1% of the residents depend on garbage collection.

### 2.4.7 Generation of local benefits from the project

#### Livelihood, Industry and Commerce

The major industries in San Ildefonso includes cement, pyrotechnics, feed mills, food processing, garments, wood crafts, farming, marble processing, and metalcraft.

Commercial establishment in the municipality varies from small to medium scale levels. This is primarily because San Ildefonso is relatively close to major commercial centers in the province and Metro Manila. Commercial centers in town ranges to sari-sari stores, general merchandise stores, restaurants, bakeries, lumber and hardware stores, gasoline service stations, beauty shops, dress and cloth shop and other wholesale and retail shops.

Charcoal making and firewood gathering are from Ipil-ipil tree that the residents plants because of its fast-growing characteristics. A group of small mining operators exist in the areas, 10 in Alagao and 7 in Akle. These operators employ around 10 to 20 workers most of whom are from Bicol Region. Many residents of Akle and Alagao work in the farm during the planting and harvest season of palay.

#### **Housing and Ownership**

In terms of housing and infrastructure, 93% of the residents of Akle own their houses while the remaining 5% do not own the houses but are living for free with the consent of the landowner. The rest of the 2% are renting. Similarly, 98% of Alagao owned their houses and the rest are living on their house for free with the consent of the landlord.

Majority of the houses in both the Barangays have GI roofing with wood or cement as walls. However, there are still houses that are made of Nipa roof with wood or bamboo as walls. Housing conditions are relatively better than other rural-agricultural areas. Most of the houses are of bungalow type, single level unit.

The residents from within or from the surrounding barangays will have the opportunity to enjoy temporary employment. It may not be a lifetime opportunity but it will significantly help the families of those who will benefit from it. Hence, this is a positive impact. Local employment during the development and operations of the mine can create an improved economic condition were money circulation is loose and business opportunities are available.

One of the offshoots of the cement and quarrying operation is downstream commerce. The project creates various opportunities for retailing, services, buy and sell, planting, and others. The basic needs of the community will now 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 actual needs of the workers and their dependents so that they can prepare what appropriate investment response will they adopt to earn some income.



## **Generation of Local Taxes and Income**

**SNMC**'s operation is subject to excise tax wherein a portion of the gross income is allotted to the Local Government Units (LGUs) and divided into percentages for the Provincial Government, the municipal government, and the barangay government. The community is also entitled to additional benefits that are covered by 1% of the mining or quarrying cost.

#### 2.4.8 Traffic congestion

Traffic may also increase in the area, due to the influx of workers, and delivery trucks coming in and out of the Plant. At present, traffic condition is relatively fast moving to moderate as there are only limited number of vehicles plying the route in and out of the plant site.



# SECTION 3

# ENVIRONMENTAL MANAGEMENT PLAN

## 3.1 Construction Phase

3.1.1 Physical Environment

3.1.1.1 Land

#### Soil displacement

Construction of new components (e.g.) and auxiliary structures (e.g., communal toilets and septic tanks) may necessitate significant amount of soil to be displaced.

To minimize the alteration of the topography, grading and leveling may be restricted to exact locations where earth moving is necessary. Furthermore, to prevent erosion hazard at the onset of rain, it is advised to pile the bulk of excavated soil on low-lying areas and to construct barriers, such as batter boards, that avert soil movement.

Excavated topsoil may be set aside for future greening purposes. Hedgerow growing of indigenous grasses, crops, and other appropriate plant species that can abate soil erosion is also advised.

#### 3.1.1.2 *Water*

#### Surface water pollution

During construction, surface water quality may be affected by sediments and dusts from earth moving activities. Slopes must be stabilized prior to construction activities through the construction of embankment. Constant watering of soil piles or provision of covering, such as tarpaulin, can mitigate this impact.

### **Groundwater contamination**

Wastewater, if untreated prior to disposal, can percolate in the ground and contaminate nearby groundwater sources. 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

Potential sources of air pollution are hauling activities and equipment operation within the construction sites.

#### <u>Dust</u>

The absence of a concrete road system will promote suspension of particulate matter (primarily dust) and its re-suspension up to 200 meters away, depending on the velocity of the prevailing wind, the type and moisture content of the soil, and the capacity of the surrounding terrain and vegetation to absorb re-suspended particulates. Periodic watering and sprinkling of soil piles and of dirt roads being passed by delivery trucks and equipment must be done to lessen re-suspension of dust particles. If water is scarce, alternative soil covering, such as tarpaulin, may be utilized. Furthermore, excavated soil materials must be promptly transferred to and compacted in the designated area.

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#### **Gaseous emissions**

Aside from dust, gaseous emissions from heavy equipment and generators used in the construction site will produce short-term impacts on the ambient air quality. An increased concentration of carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), and nitrogen dioxide (NO<sub>2</sub>) 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<sub>2</sub> and nitrogen oxides (NO<sub>x</sub>) due to the hydrocarbon and sulfur content. If possible, all heavy equipment shall be fitted with exhaust mufflers.

## 3.1.1.4 Noise and Vibration

Noise may also be generated by blasting operations and equipment. Although blasting operations are expected to occur regularly, the impacts may be considered temporary, since noise will only occur for a split second during blasting and a few seconds after blasting, from falling rock fragments.

Another possible impact of quarrying is vibration. Optimum blasting design through optimum blast holes pattern and optimum explosives loading will minimize over blasting thus, avoiding vibration



#### 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	А	В	С	D				
Day Time	50	55	65	70	75				
(9am-6pm)									
Morning/Evening	45	50	60	65	70				
(5am-9am) & (6pm-10pm)									
Night Time	40	45	55	60	65				
(10pm-5am)									

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

Note:

Mitigating measures that can be employed are: 1) proper maintenance of motor engines and other mechanical parts of heavy equipment; 2) installation of exhaust mufflers to the equipment; and 3) putting up of enclosures at the construction site. As much as possible, construction activities shall be concentrated during normal working hours, particularly at sites near built-up areas.

The impact of vibration is less serious than, but related to, that of noise. Although only few structures may be affected by vibration, it is the people's interest that is of concern. To minimize vibrations, machines should be mounted on shock-absorbing mountings, such as cork or reinforced concrete foundation or a floating isolated foundation set on piles, depending on the machinery. Reduction of working hours and/or introduction of short breaks during working days may also lessen the consequences of vibrations.

#### 3.1.2 Biological Environment

Anthropogenic movements, noise, and vibrations may drive wildlife away from the ecosystem, causing either temporary or permanent migration. However, since the area is mineralized and vegetation cover is not extensive, loss of habitat, feeding ground, migration corridor, and/or nesting ground leading to disturbance of wildlife are not deemed significant for this undertaking. Still, ecosystem conservation and rehabilitation are recommended prior to and after construction and operation. Assistance from specialists must be secured in identification of wildlife.

#### 3.1.3 Socio-Economy

## 3.1.3.1 Accessibility and Circulation Concerns

Traffic is not a problem 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.

# 3.1.3.2 Local Economy

The project is expected to have a positive impact on the local economy of the host community with an increase in business opportunities, such as food retail, housing rental, and other services to the construction workers. This is in addition to the employment opportunities that will be available to the local workforce.

## 3.1.3.3 *Population*

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 Akle 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.

## 3.1.3.4 Peace and Order

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

#### 3.1.4 Health and Safety

Excavations 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.

Potential health and safety risks may also arise from dust, pollutants, noise and vibration to be generated from construction activities. Workers, particularly those operating heavy equipment, must be provided with personal protective equipment (PPE), such as earmuffs, gloves, boots, and helmets. The Contractor is also required to have an infirmary.

#### 3.1.5 Solid Waste

Accumulation of solid waste, especially of construction debris, is also a concern during project construction but can be addressed with the implementation of an effective solid waste management program formulated prior to the construction phase. Solid wastes must be disposed in a duly designated disposal site. An information, education, and communication (IEC) campaign on proper solid waste management shall also be conducted for the personnel.



### 3.2 Operational Phase

## 3.2.1 Physical Environment

### 3.2.1.1 Water

#### **Increased sediment yields**

Soil erosion will likely continue to occur in the quarry site during blasting operations. Earth moving and ground clearing resulting to soil erosion may increase sediment yields of the receiving body of water. The rainwater drainage systems in both plant and quarry site must be maintained regularly to prevent surface runoff. Upkeep of existing sedimentation ponds is also advised in order to allow sediments to settle without reaching the drainage system.

#### Surface and groundwater contamination due to oil spills

Oil spills from vehicle and equipment repair and maintenance may also impact both surface and groundwater quality 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 spills can also be contained by absorption using sawdust, rice hulls, or coir dust.

#### Ground subsidence

The quantity of water supply may also be affected during the operational phase of the project. Since the water supply is mainly from a deep well, ground subsidence may occur from excessive pumping, especially during dry seasons where lowering of groundwater table is normally experienced. In order to facilitate recharge of groundwater, it is advised to provide an area where no quarrying activities will be done.

## 3.2.1.2 Air

#### <u>Dust</u>

Utilizing high-efficiency equipment with cyclone separators and baghouse filters can minimize and contain the fugitive dusts to be generated in the operational phase. During bagging of cement, dust generation can be diminished through the use of baghouse filters. Regular sprinkling of the dirt roads and tree planting also curtail dispersal of particulates.

#### **Gaseous emissions**

Heavy equipment to be used during quarrying should be maintained properly to minimize the pollutants such as TSP,  $SO_2$  and  $NO_x$  that are emitted in combustion of diesel fuel.

### 3.2.1.3 Noise and Vibration

Noise may also be generated by blasting operations and equipment. Although blasting operations are expected to occur regularly, the impacts may be considered temporary, since noise will only occur for a split second during blasting and a few seconds after blasting, from falling rock fragments.

On the other hand, the noise and vibration generated by the machines and equipment can be reduced to tolerable levels through the use of suppressers or mufflers.

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#### **Biological Environment** 3.2.2

### 3.2.2.1 Vegetation

Areas that have been cleared of its natural vegetation may either regenerate original or similar species from residual plant parts. Some land use change shall be from agro-forestry lands to industrial area. Access roads leading to plant and guarry sites will pave way to further encroachment of people in search of possible livelihood and other activities. Vegetation succession about the project site shall sporadically grow with or without anthropogenic assistance.

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.

### 3.2.2.2 Wildlife

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

#### 3.2.3.1 Local Economy

Old business establishments may expand resulting to increased employment opportunities. From agricultural- and forest-based income generation, local residents may now find employment in the limestone pulverizing mill and its expansion project as a source of income. The limestone pulverizing mill will also 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.

### 3.2.3.2 *Population*

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.

### 3.2.3.3 Peace and Order

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.

#### 3.2.4 Unavoidable and Residual Impacts

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.



#### Summary Matrix of Environmental Impact and level of Significance 3.3

Table 3-3 presents the summary of the identified environmental impacts and the corresponding mitigating measures per activity phase.

**SNMC** applied environmental management procedures to mitigate environmental impacts of its existing quarry operations. Environmental management procedures shall also be applied during the operation of the limestone pulverizing facility.

A waste management procedure is already in place, which includes waste prevention, reduction, and reuse. Waste is disposed to Metro Clark Sanitary Landfill. SNMC will construct its own Materials Recovery Facility to further reduce their waste. There have been no formal complaints regarding solid waste from SNMC, which proves that the current waste management procedure is effective.

Siltation ponds have been installed in the quarry and plant site to control water pollution. Three siltation ponds are in the quarry site, while two are in the plant site. Quality of the effluent is within DENR standards according to the monitoring data. Furthermore, septic tanks and sanitation facilities are already present to prevent groundwater pollution due to percolation of domestic wastewater.

Air pollution, particularly fugitive dust, is of main concern in the area. This concern is mitigated through installation of bag filters as part of the limestone pulverizing facility and regular watering of roads. There are some exceedances in the 2017 1<sup>st</sup> quarter ambient air monitoring in the shale/pozzolan quarry area. As noted on the monitoring report, the exceedances are due to passing vehicles. To address this concern, SNMC commits to conduct daily watering of the quarry areas and access roads. Air quality will continuously be monitored by SNMC.

Possible impacts of blasting in the area is ground shaking and presence of fly-rocks. Optimum blasting design through optimum blast holes pattern and optimum explosives loading will minimize over blasting thus, avoiding fly rocks. The focus of blast energy will minimize if not, eliminate unnecessary ground shaking within the blasting vicinity. Application of this measure will eliminate the possible impacts of blasting on the facilities.

Health and safety procedures are already being implemented and is further discussed in Section 3.6. There was only one recorded no lost time accident in 2016.



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Table 5-5. Summary Matrix of Environmental impacts and Mitigating Measures	Table 3-3: Summary	y Matrix of Environmental I	mpacts and Mitigating Measures
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Envt'l Aspect	Envť I Component	Impact	Mitigating and Enhancement Measure	Validation on the Effectiveness of Mitigating Measure	Schedule of Implementation	Estimated cost	Responsible Party	Guarantees
				(EQPL as reference)				
Quarry Developm	ent & Operation	on Phase	1					
Rainwater runoff in limestone pulverizing plant and quarry site	The Water	Soil erosion	Operate and maintain sedimentation ponds to prevent particulates to be washed out by rainwater Maintain rainwater drainage systems.	Sedimentation ponds are in place. <b>SNMC</b> maintains sedimentation ponds. Results of effluent monitoring are within DENR 2016-08 Class C General Effluent Standards	Operational stage	P200,000	SNMC	Environmental Monitoring Report
			Constant and periodic monitoring of ground and surface water	Results of effluent monitoring are within DENR 2016-08 Class C General Effluent Standards				
Oil spills and leaks from equipment		Surface and ground water contamination	Oil spill response program is in place	<b>SNMC</b> implements spill management procedures. No recorded oil spills to date	Operational stage		SNMC	Environmental Monitoring Report
			Use sawdust, rice hulls, or coir dusts to absorb the oil spills					



Envt'l Aspect	Envt'l Component	Impact	Mitigating and Enhancement Measure	Validation on the Effectiveness of Mitigating Measure (EQPL as reference)	Schedule of Implementation	Estimated cost	Responsible Party	Guarantees
			Maintain canal in the maintenance and repair area of vehicles and equipment			P10,000		
Operation of limestone pulverizing plant	The Air	Dust generation during limestone processing	Operate and maintain filter bags in the equipment Watering of dusty areas to avoid fugitive emissions from area sources	No operation yet. Ambient air monitoring will be conducted to validate effectiveness of mitigating measures	Operational stage	~P300,000	SNMC	Environmental Monitoring Report
		Increased levels of SO <sub>2</sub> , NO <sub>x</sub> brought about by vehicle and equipment emissions	Proper maintenance should be done for the vehicles and equipment	No operation yet. Ambient air monitoring will be conducted to validate effectiveness of mitigating measures	Operational stage	P50,000	SNMC	Environmental Monitoring Report
Quarrying	The Air	Increased levels of PM <sub>10</sub> and TSP due to quarry operations. Increased levels of SO <sub>2</sub> , NO <sub>x</sub> brought about by vehicle and	Daily road watering Proper maintenance should be done for the vehicles and equipment	Some monitoring reports state some exceedances in PM10 and TSP despite regular road watering. <b>SNMC</b> commits to water the quarry areas daily to avoid any more exceedances.	Operational stage	P50,000	SNMC	Environmental Monitoring Report



Envt'l Aspect	Envt'l Component	Impact	Mitigating and Enhancement Measure	Validation on the Effectiveness of Mitigating Measure (EQPL as reference)	Schedule of Implementation	Estimated cost	Responsible Party	Guarantees
		equipment emissions						
	The People	Increased occupational health and safety risks because of explosives use	Proper storage of magazines Extensive training for selected personnel in handling and operating explosives Issuance of alarms and warning devices prior to and during blasting operations	No recorded accidents involving explosives to date	Prior to and during blasting operations	Covered by contract amount of contractor	<b>SNMC</b> in cooperation with Contractor	Handling and Blasting Procedure
		Possible impacts of blasting in the area is ground shaking (vibrations) and presence of fly- rocks, which may cause property damage	Optimum blasting design through optimum blast holes pattern and optimum explosives loading will eliminate vibrations and fly rocks.	No recorded complaints due to blasting in the shale/pozzolan quarry area.				



Envt'l Aspect	Envt'l Component	Impact	Mitigating and Enhancement Measure	Validation on the Effectiveness of Mitigating Measure (EQPL as reference)	Schedule of Implementation	Estimated cost	Responsible Party	Guarantees
	The Land	Disturbance and removal of trees and vegetation	Monitoring and evaluation of species survival within identified habitat.	EPEP and FMRDP is still under review by MGB. A new EPEP and FMRDP will be developed after issuance of ECC	Operational stage	P10,000	SNMC	Environmental Monitoring Report/AEPEP
		Change in land forms and elevation	Maintain bench slopes at 75 degrees while quarry slopes at 45 degrees. Monitor slopes for potential failures.	There have been no slope failures in the shale/pozzolan areas. <b>SNMC</b> continuously monitors the angles of slopes and applies proper quarrying practices.				
	The Water	Surface runoff from the quarry area	Install siltation ponds in quarry areas Regular removal of silt and sediments in siltation pond, especially during rainy season.	SNMC maintains three siltation ponds in the operating shale/pozzolan quarry area. SNMC also monitors water quality of one siltation pond within this area.	Operational stage	P10,000	SNMC	Environmental Monitoring Report
Effect of operations on economy	The People	Old business establishments may expand resulting to increased	Provide seminars on financial literacy and entrepreneurship.	Small business development is quite evident in the area as small stores and restaurant are	Operational stage	Php50,000	SNMC in cooperation with Barangay Council	SDP



Envt'l Aspect	Envt'l Component	Impact	Mitigating and Enhancement Measure	Validation on the Effectiveness of Mitigating Measure (EQPL as reference)	Schedule of Implementation	Estimated cost	Responsible Party	Guarantees
		employment opportunity		ubiquitous, especially near the plant site.				
		Increased tax revenue	Proper registration, tax contribution, land registration and other laws/ordinances shall be followed	SNMC pays proper taxes	Operational stage		SNMC in cooperation with Barangay Council, LGU	Tax collection certificate
		Increased employment opportunities	Priority in hiring of personnel shall be given to the directly affected residents.	SNMC contractors hire most of their workers from Brgy. Akle. Workers from San Ildefonso and Bulacan are also hired.	Operational stage		SNMC in coordination with LGU, Barangay Council	Municipal / Barangay Development Plan / MOA
		Traffic congestion in Barangay Akle	Ensure that delivery trucks are parked in the parking space provided by <b>SNMC</b> Follow traffic management implemented by LGU.	SNMC has a motorpool within its facility where vehicles are parked and maintained SNMC coordinates with local barangay regarding implementation of traffic rules	Operational stage		SNMC, in coordination with LGU, Barangay Council, DPWH	Municipal / Barangay Development Plan
In-migration	The People	Transient settlers may opt to stay permanently thus increase in	Improvement of infrastructures and support services for local constituents and		Operational stage	c/o LGU	SNMC in cooperation with LGU, Barangay Council, DPWH	Municipal / Barangay Development Plan



Envt'l Aspect	Envt'l Component	Impact	Mitigating and Enhancement Measure	Validation on the Effectiveness of Mitigating Measure (EQPL as reference)	Schedule of Implementation	Estimated cost	Responsible Party	Guarantees
		population may be realized	in coming visitors shall be continuously undertaken Increasing housing units or transient motels				and the business sector	
		Partiality between local residents and new comers/migrant workers	Policing of the barangay to monitor, orient and advice constituents and new comers as deemed necessary	Based on FGD, barangay does not have complaints regarding peace and order	Operation Stage	c/o LGU	SNMC in cooperation with Barangay Tanods	Barangay Report
	Local Governance	Coalition of leaderships, people's organizations, private sectors, etc.	Alliance and networking activities	SNMC conducts regular SDMP planning sessions with barangay technical working group	Operational stage		SNMC in cooperation with Barangay	Municipal/ Barangay Development Plan
	Peace and Order	Influx of migrants and or visitors shall bring about indifferences affecting peace and order	Coordinate with barangay, specifically barangay police/tanods, the imposition of laws and apprehension of erring individuals/groups of people	Based on FGD, barangay does not have complaints regarding peace and order	Operational stage		SNMC in cooperation with Barangay	Barangay Report



#### **Construction Environmental Program** 3.4

During the construction phase of the project, the designated contractor for the proposed expansion project shall implement and be responsible for its environmental program, under the supervision of **SNMC**. The designated contractor will be required to implement the EMP, in accordance to the ECC conditions.

The implementation of the Construction Environmental Program shall be part for the scope of work of SNMC in accordance with the conditions stipulated in the ECC. It shall include specific actions and measures such as:

- Provision of temporeary lodging and sanitation amenities for workers, and liquid and solid waste handling/disposal facilities;
- Silt and sedimentation controls (i.e. siltation ponds);
- Avoidance of unnecessary earth-movement and vegetation losses;
- Worker and project site safety programs, including emergency response plans;
- Proper storage and disposal of hazardous wastes (i.e., used oils, etc.);
- Reduction/elimination of pollution sources; and
- Proper demobilization procedures (i.e., clean-up of construction sites, replacement/re-planting of removed trees).

#### 3.5 Solid Waste Management

Solid waste will inevitably be generated during the Construction and Operations phases of the project. **SNMC** is currently implementing a solid waste management program (SWMP), which aims to reduce the solid waste generation during the different phases of project development. Their program aims to decrease the amount of operational costs as a result of handling, storage, and disposal of solid wastes. To realize these targets, **SNMC** incorporated the following in SWMP:

- Issuance of a 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;
- Operation of a Materials Recovery Facility;
- Residual waste is transported to Clark Sanitary Landfill to ensure proper disposal.

#### 3.6 Occupational Health and Safety

SNMC implements its occupational health and safety policy. Proper implementation of this policy is crucial to reduce the likelihood of injuries/fatalities that may affect its personnel and protect valuable equipment and properties. Table 3-4 summarizes the various elements of the SNMC occupational health and safety policy, as well as the specific programs for each element.

Element	Specific Programs							
Safety Meetings	Monthly meeting of Safety and Health Committee							
	Weekly meetings of department heads and contractors							
	Toolbox meetings with employees before deployment to respective							
	orkplaces							
Management and	Health, Environment, Safety, and Security (HESS) Orientation conducted for							
Employees	newly hired employees and visitors							
Trainings	Confined space rescue training							
	Rigging, lifting, and supporting load training							
	Fire safety training							

#### Table 3-4: SNMC Safety and Health Program



**Environmental Performance Report and Management Plan** SOLID NORTH SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant Brgy. Akle, San Ildefonso, Bulacan

Element	Specific Programs
	Emergency preparedness training
	First-Aid/BLS CPR training
	Hand and power tools training
	Working at heights training
	Awareness training on PPE
	Awareness training on risk assessment
Planned	Limestone pulverizing facility
inspections	Quarry operations
Accident/incident	Investigation and analysis of incidents and accidents
investigation	
Health Control and	Medical check-ups are conducted for every new contractor and employee
Services	prior to deployment. Yearly medical check-ups are also done.
	Provision of medical supplies and equipment.
Good	Daily housekeeping in plant and quarry areas are conducted.
housekeeping	
Emergency	Fire Drill
Response and	Workplace Emergency Medical
Preparedness	Rescue Drill
Program	Earthquake Drill
	Quarry cave-in drill
	Maintenance of Emergency Equipment
Provision of PPE	Continuous purchase and issue of PPE to new employees

#### 3.7 Air Emissions Management

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, SNMC employs some strategies which include:

- Installation of dust collectors and bag filters 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.

Air emissions are expected during the construction phase as well. SNMC will employ its existing air emissions management program to mitigate concerns on air emissions during construction of the limestone pulverizing plant.

#### 3.8 Vehicular Traffic Management

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, SNMC may implement the following measures:

- Coordination with the San Ildefonso 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.

# SECTION 4

# **ENVIRONMENTAL RISK ASSESSMENT**

## 4.1 Methodology

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

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 Scree	ning Matrix								
	<b>Activities Requirin</b>	ng Risk Screening Exe	ercise <sup>1</sup>	ERA Applicability to					
				the Project					
1) Facilities for the	production or proc	essing of organic/inc	rganic chemicals using:	Not Applicable					
Alkylation	Esterification	Polymerization	Distillation						
Amination	Halogenation	Sulphonation	Extraction						
Carbonylation	Hydrogenation	Desulphurization	Solvation						
Condenstation	Hydrolysis	Nitration	Pesticides &						
Dehydrogenation	Oxidation	Phosphorus	pharmaceutical						
		prod.	prod.						
2) Installations for c	2) Installations for distillation, refining, and other processing of petroleum products Not Applicable								
3) Installations for t	otal or partial dispo	osal of solid or liquid	substances by	Not Applicable					
incineration or cher	nical decompositio	n							
4) Installations for t	he production or p	rocessing of energy	gases (e.g., LPG, LNG,	Not Applicable					
SNG.)									
5) Installations for t	he dry distillation o	of coal or lignite		Not Applicable					
6) Installations for t	he production of m	netals and non-meta	ls by wet process or	Not Applicable					
electrical energy									
7) Installations for t	he loading and unl	oading of hazardous	materials as defined by	Applicable					
RA 6969 (or DAO 29	))								
CONCLUSION				Risk screening level					
				exercise is					
				applicable					

Note:

<sup>1</sup>Based on Annex 2-7e of DAO 30-2003 Revised Procedural Manual

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## 4.3 Risk Identification and Analysis

The Project is susceptible to risks caused by natural, anthropogenic, or combination of both hazards. Earthquakes, geological instability (e.g. sink holes, landslides), and typhoons are considered as natural risks while anthropogenic risks are caused by accidents such as fires, structural/equipment failure, chemical spillages, and human error. Moreover, anthropogenic risks can be aggravated as a direct consequence of natural risks.

# 4.3.1 Operational Risks

# 4.3.1.1 Physical Failure of Equipment

The operational risks at the Project identified as equipment failure and equipment explosion. The equipment here includes the process equipment and the Air Pollution Sources and Control Facilities (APSCF's). For purposes of this ERA, we give more attention to APSCF's.

Equipment failure, as the name implies refers to the inability of the equipment to function the way it is intended. Failure of equipment will be detrimental to both the community and the plant operation. Foremost among such facilities, whose failure poses more risks, are the Air Pollution Control Facilities (APCF); the Filter Baghouses (FBs), and the cyclones. Failure of any of the APCF's will lead to excessive dust emission. In addition to failure any equipment in ECC may also explode if not properly operated or because of wear and tear.

# 4.3.1.2 Fires/Explosions

Fires and explosions could also come from hydrocarbon fuels, which are utilized at the plant site. Gasoline is used in passenger cars, which is served at service stations outside the site. Diesel fuel, which is placed in storage tanks, will be utilized for the refueling of mobile and stationary heavy equipment. This facility will be situated beside the road of convenience. Accidents near and around the fuel storage areas involving vehicles, equipment and people can be a source of fire.

# 4.3.1.3 Occupational Safety Hazards

The effects of occupational hazards are on the workers' physical and mental well-being and soundness. Work-related hazards were identified and evaluated based on: (1) careful examination of the workers' working environment while on-the job (in the plant, offices and in the field); (2) data gathered from similar conditions and projects; and (3) the project EIA. A list of possible occupational of work-related hazards was compiled and each item was assessed considering the proposed facilities and activities of the plant. The assessment resulted in the identification of hazards relating to occupational health and safety, which are discussed in the succeeding sub-section.

## <u>Noise</u>

Workers at the plant are exposed to high noise levels above the 85 dBA. This hazard comes from heavy equipment at the plant. Continuous exposure to high noise intensity can cause hearing impairment which is irreversible.

## Dust

Workers and residents in the surrounding communities may be exposed to dust coming from the pulverizing plant facilities.

Road dust, particularly abundant during dry months, can cause common colds to asthmatic symptoms among workers. Rock dust is released into the air from cement plant operations such as loading, haulage, shoveling and etc. Dirt roads get dusty when frequently used by heavy equipment.

#### Falling Objects

Workers are exposed to materials falling from elevated places or conveyors at the plant and ancillary facilities. Such accidents may result in cut/contusion injuries. Workers not using hard hats are susceptible to this hazard. Defective equipment can also cause parts to fall on other moving equipment.

#### Fall from Elevated Positions

The design of the cement plant and cement transport system require people and equipment to operate at different levels separated only by walkways and machinery. Rock fragments, parts of equipment, and even people can fall from one level to the next. Workers, as well as equipment are exposed to this hazard. Lack of railings, guards, or other protective structures within the cement plant facility can cause workers to fall from high elevations. Equipment, which is not properly supported when undergoing repairs, can fall on equipment beneath.

#### **Heat Stress**

Workers can be exposed to this heat stress hazard when conditions exceed deep body temperature of 38oC. Exposure may result in heat exhaustion, heat cramps, and disorders including electrolyte imbalance, dehydration, skin rashes, heat edema, and loss of physical and mental capacity.

#### **Electric Shock**

Workers can be exposed to live conductors when working on electrical equipment that have been inadvertently exposed or energized.

#### **Accidental Maiming**

While working on or repairing equipment, workers' hands/fingers/body parts or items of clothing can be caught in moving parts of equipment. Workers could suffer serious injuries resulting from grinds, squeezing or crushing.

#### **Overexertion**

Workers handling heavy materials are exposed to overexertion when they unload or move these for delivery. Musculoskeletal disorders (MSDS) could result from manual lifting and load-onshoulder movements. Physical stress, beyond the body's capabilities may be damaging to the workers' health.

### 4.3.2 Natural Hazards

#### 4.3.2.1 *Earthquakes*

Based on geological surveys, the **SNMC Plant** lies in an area that has apparently, no indication of unusual or urgent geological conditions that present or pose significant and large-magnitude hazards. The limestone ridges appear to be stable, and there no naturally-exposed cliffs or outcrops that might signify susceptibility of the area to landslides.

#### 4.3.2.2 Typhoons

Like the rest of Bulacan, the Project area is prone to typhoons, with an average of 1 to 2 major storms hitting the area per year. These typhoons, if it hits landfall and directly crossing Bulacan province, could potentially bring extensive wind and rain hazards (i.e. landslides, flooding) in the local area.

#### 4.3.2.3 Flooding

The **SNMC Plant** lies in an elevated area, thus flooding is not a significant risk. However, if the quarry spoils are left unchecked, it may cause siltation in the nearby river. This has the potential to create flooding problems in the downstream communities.

### 4.3.3 Safety Statistics

Safety statics are records which contain the number of casualties, injuries, near misses, fatalities, etc. about a company or organization. **Tables 4-2** and **4-3** present the safety statistics of **SNMC** for year 2016 to 2017. Last 2016, only 1 non-lost time accident happened on July for a total of 379,115 of man-hours worked. In addition to this, an increase in the number of non-lost time accidents (3 recorded) happened last April, June & July of 2017 for a total of 410,239 man-hours worked.



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Table 4-2: Safety Statistics f	or 2016												
Performance Parameters	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Manpower	64	61	61	66	176	166	170	179	169	178	230	216	
Man-hours Worked	12,441	12,885	12,883	21,285	33,434	39,197	40,328	38,854	39,921	39,176	46,070	42,691	379,115
Non-Lost Time Accidents	0	0	0	0	0	0	1	0	0	0	0	0	1
Lost Time Accidents	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Fatal													
Fatalities	0	0	0	0	0	0	0	0	0	0	0	0	0
Days Lost	0	0	0	0	0	0	0	0	0	0	0	0	0
Near Miss Incidents	0	0	0	0	0	0	0	0	0	0	0	0	0
Frequency Rate per	0	0	0	0	0	0	0	0	0	0	0	0	0
Million Man-hours													
Severity Rate per Million	0	0	0	0	0	0	0	0	0	0	0	0	0
Man-hours													
Combined Frequency-	0	0	0	0	0	0	0	0	0	0	0	0	0
Severity Rate													

Note: (a) Frequency Rate per Million Man-hours (Philippines Surface Mines Standard = 0.99)

(b) Severity Rate per Million Man-hours (Philippines Surface Mines Standard = 1,388 days)

(c) Combined Frequency-Severity Rate (Philippines Surface Mine Standard = 587 days)

#### Table 4-3: Safety Statistics for 2017

Performance Parameters	Jan	Feb	Mar	April	May	Jun	Jul	Aug	To Date
Manpower	218	253	307	248	240	197	205	175	
Man-hours Worked	43,719	45,242	69,237	59,127	52,773	45,544	51,574	43,023	410,239
Non-Lost Time Accidents	0	0	0	1	0	1	1	0	3
Lost Time Accidents Non-Fatal	0	0	0	0	0	0	0	0	0
Fatalities	0	0	0	0	0	0	0	0	0
Days Lost	0	0	0	0	0	0	0	0	0
Near Miss Incidents	0	0	0	0	0	0	0	0	0
Frequency Rate per Million Man-hours	0	0	0	0	0	0	0	0	0
Severity Rate per Million Man-hours	0	0	0	0	0	0	0	0	0
Combined Frequency-Severity Rate	0	0	0	0	0	0	0	0	0

Note: (a) Frequency Rate per Million Man-hours (Philippines Surface Mines Standard = 0.99)

(b) Severity Rate per Million Man-hours (Philippines Surface Mines Standard = 1,388 days)

(c) Combined Frequency-Severity Rate (Philippines Surface Mine Standard = 587 days)



#### Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) 4.4

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 data for 2020 and 2050. The PAGASA projections are shown on Figure 4-1.

According to the projection, the whole of Region 3 would experience higher temperatures during summer seasons by year 2020 and 2050. The amount of rainfall, however, would be slightly lower than the current quarterly climatic averages, with some fluctuations. Higher temperatures will result in water shortages. Taking these figures in consideration, appropriate precautionary measures may be employed during the construction and operation phases of the project to avoid any complications in the long-run. Environmental measures, such as recycling, may also be done to have a more environment-friendly facility.

As part of its Annual Environmental Protection and Enhancement Program, SNMC employs greening programs to help mitigate concerns on climate change, which include re-vegetation of barren surfaces. The budget allocated for the re-vegetation of barren surfaces is Php100,000 for planting of a total of 2,076 species of mahogany at the shale quarry area with a spacing of 2m x 3m. Construction of a nursery for seedlings is being proposed with a budget of Php100,000. The nursery will be constructed as soon as the project is approved.

Another major concern due to climate change is water shortage. To mitigate this concern, **SNMC** may opt to establish a water sustainability program to reduce water consumption. To accomplish this program, the proponent must identify processes that consume water and try to develop measures to lessen water consumption. SNMC may also establish a water reuse program as part of the water sustainability program.



### Figure 4-1: PAGASA Climate Projection for 2020 and 2050

Table a: Seasonal tem	Table a: Seasonal temperature increases (in *C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 3											
	OBSER	VED BASEL	INE (1971	L-2000)	CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 3												
AURORA	24.5	27.1	27.9	26.7	0.9	0.9	1.0	1.0	1.9	2.0	2.0	2.0
BATAAN	26.4	28.7	27.6	27.3	1.0	1.1	0.8	1.0	2.0	2.1	1.7	1.9
BULACAN	25.6	27.9	27.1	26.7	0.9	1.1	0.9	1.0	1.9	2.1	1.7	1.9
NUEVA ECIJA	25.3	27.7	27.5	26.8	0.9	1.1	0.9	1.0	2.0	2.1	1.8	2.0
PAMPANGA	26.0	28.3	27.5	27.1	1.0	1.1	0.9	1.0	2.1	2.2	1.8	2.0
TARLAC	26.1	28.3	27.8	27.3	1.1	1.1	1.0	1.1	2.2	2.2	1.9	2.1
ZAMBALES	26.3	28.3	27.4	27.2	1.0	1.1	0.9	1.0	2.1	2.1	1.7	1.9

Table b: Seasonal ra	(able b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 3												
	OBSERV	ED BASEL	INE (1971-2	2000) mm	CHANGE in 2020 (2006-2035)				CHAN	CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	
Region 3													
AURORA	615.7	546.4	768.7	1151.1	-0.3	-17.1	6.7	5.8	8.7	-29.2	7.4	-5.7	
BATAAN	71.7	368.7	1326.2	872.6	2.7	-5.2	9.4	-0.4	-8.2	-8.1	29.1	1.5	
BULACAN	212.4	288.9	1041.4	842.1	4.2	-23.0	12.8	-2.9	-13.2	-36.4	23.6	-3.3	
NUEVA ECIJA	155.2	316.5	995.0	745.0	7.5	-13.8	10.1	1.6	-7.4	-25.7	22.7	-2.4	
PAMPANGA	120.8	320.6	1030.4	785.2	16.3	-18.8	4.4	-5.1	-15.4	-26.4	13.9	-7.2	
TARLAC	43.4	265.4	1193.5	644.3	26.0	-13.7	-1.6	-9.6	-6.7	-18.2	8.8	-5.5	
ZAMBALES	40.9	368.0	1793.9	872.0	34.2	-4.5	13.3	-1.6	-2.2	-21.6	31.4	5.6	

#### Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 3

		No. of Da	iys w/ Tmax	>35 °C	No.	of Dry D	)ays	No. of Days	w/ Rainfall	>200mm
Provinces	Stations	OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
AURORA	Baler	397	819	2008	1295	6176	6161	12	43	43
NUEVA ECIJA	Cabanatuan	1293	3271	4796	8113	6117	6202	9	13	17
PAMPANGA	Clark	355	1855	3108	889	5701	5754	8	12	12
ZAMBALES	Iba	259	573	1573	8034	6500	6325	4	12	13

Note:

For Tarlac, use values of Clark.

For Bulacan, use values of Science Garden (page 35).

#### Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in NCR

		No. of Days w/ Tmax >35 °C			No.	of Dry D	ays	No. of Days w/ Rainfall >200mm			
Provinces	Stations	OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050	
METRO	Port Area	299	1176	2118	7380	6445	6382	12	12	13	
MANILA	Science Garden	1095	1984	3126	7476	6302	6220	9	13	17	

SOURCE: PAG-ASA										
FIGURE NO.:		FIGURE TITLE:								
4-1		PAGASA Climate Projection for 2020 and 2050								
PROJECT PROPONENT:		PROJECT NAME & LOCATION:								
Solid North Mineral		SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant								
Corporation		Brgy. Akle, San Ildefonso, Bulacan								

# **SECTION 5**

# SOCIAL DEVELOPMENT FRAMEWORK

## 5.1 Social Development Plan

5.1.1 The Plan

A community-based Social Development Plan/Framework (SDP/F), as presented in Table 5-1, was developed by Solid North Mineral Corporation (SNMC) through a series of consultations with various sectors of the project-affected barangays, barangay and municipal councils, and the National Government Agencies (NGAs), NGOs, POs and the Community Relations Offices (ComRel) of SNMC. As SNMC recognizes its commitment in addressing the needs of the host communities.

The objectives of the SDP included the following:

- 1. Identify the basic needs and welfare of the community as basis for the framework of social development programs of the project-affected barangay within the site of the Project;
- 2. Prepare an indicative sustainable plan based on the Barangay Development Plans and the mandated support of SNMC; and
- 3. Establish a working relation with SNMC and the various community stakeholders with the goal of improving the quality of life of the project-affected community by enabling them to becoming self-reliant.

The community-based consultation and focus group discussions (FGDs) held for the development of the SDP also provided an opportunity that identified the following:

- To address of key issues and concerns by the various stakeholders, including those that were raised during the Information, Education and Communication activities (IEC), Public Scoping and FGD's;
- To identify and establish recommend measures in response to the issues and concerns that were raised;
- To identify existing sustainable livelihood programs as well as handicraft projects to serve common stakeholders;
- To identify the lead agency or organization responsible in implementing the measures; and
- To set the timelines in implementing these measures consistent with the plans and programs of the lead agencies.

The information collected from the community perception survey and scoping will also form part of the SDP that mainly addressed the following issues:

- Perceived fears of environmental "destruction" or negative impact due to pollution of land, air, water and resources, and health risks;
- Possibility of affecting their homes and farmlands; and
- Possibility of affecting their source of livelihood.

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### 5.1.2 Strategies

The SDP will consist of 7 major components namely: environmental protection; livelihood and enterprise development; community strengthening and organizational development; education and cultural strengthening; health and safety works; financing strategy; and monitoring and evaluation. The components stated above were identified based on the actual situation of the area and the result of social impact assessment, series of consultations with the different sectors in the affected area where their issues and concerns were raised and discussed.

## **Environmental Protection**

One of the primary concerns of the residents in the area is the pollution on land, water and air the project may cause. Due to the existence of other industrial projects in the area, past experiences have made the residents cautious of these resources fearing that the impacts on these resources will be further aggravated. It is then important to ensure that the environmental management and monitoring plan for the project is properly implemented to protect these resources. Since the plant has not been in operation since 2007, there have been minimal effects on land and on the terrestrial ecosystem. Despite this, Solid North plans to conduct reforestation, nursery development and planting of indigenous tree species activities to mitigate environmental damage.

## Livelihood and Enterprise Development

The existing project aimed to provide substantial employment in the area especially to residents of the directly affected area who will be prioritized during the hiring process. Qualified and competent representatives from each household will be hired and livelihood programs and skills training will be conducted to provide livelihood assistance and employment opportunities for those affected.

The enterprise development design will be based on a series of workshop and participatory meetings to identify relevant and appropriate micro-businesses. The project also aimed to enhance small cottage industries such as agri-business and its downstream market.

## **Community Strengthening and Organizational Development**

There are various organizations in the area formed mostly by farmers. The capacity of officers and members of these organizations will be enhanced through trainings and seminars on financial management, marketing, bookkeeping, and etc. which will be sustained in the years to come.

## **Education and Cultural Strengthening**

Like livelihood, improving educational quality was always a major discussion in any consultation and meeting. The assistance of the company to improve educational quality and facilities in the area is imperative. It will be materialized with the sustained help of DepEd and the LGU of the Municipality of San Ildefonso, through the Local School Board. By proposing to provide scholarship programs and the establishment of classrooms, the community's educational quality will be elevated.

Cultural strengthening will include awareness, cultural heritage consciousness and participation with Bulacan's historical and cultural milieu. Solid North actively participated in the promotion of local culture respecting all aspects within.

## Health and Safety Works

Because of unpredictable results of natural disasters and the various environmental impacts brought about by existing project in the area, improving health services is another main concern of the residents. Solid North plans to provide additional health services in the affected areas and in adjacent barangays to particularly address the leading causes of diseases and illnesses. SOLID NORTH NUMERAL CORPORATION Environmental Performance Report and Management Plan SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant Brgy. Akle, San Ildefonso, Bulacan

A series of planning and project meetings will be facilitated to discuss the impacts and effects the project and related natural disasters that affects the health condition of the residents and employees. Mitigating measures will be discussed carefully and put in place at the onset of the project operation.

Due to the concerns of the safety of workers, the company will be formulating occupational health and safety measures including emergency response. The improvement of health services have seen a need in additional manpower and finances to procure important first aid materials and medicines. The LGU and local health office will be continuously coordinated to provide trainings and other form of assistance.

## **Financing Strategy**

The revenue coming from SNMC will support the implementation of the SDP. The funds will be expended according to the approved expenditures or activities stipulated in the SDMP. The barangay council will play a major role in monitoring the release and auditing of funds.

## **Monitoring and Evaluation**

A multi-partite monitoring team (MMT) will be formed to examine the effects of the operations to the environment and people. The monitoring team will be composed of different stakeholders who have the capacity to implement the team's tasks. Regular monitoring and evaluation activities will be carried out by the team and along regular reporting of their findings to the residents, local organization, academe, LGU and proponent. The team will also be tasked with informing the proponent in case a new problem is found. The team and the proponent will work together to take actions in resolving or preventing the problem.



Concern	Program/Project/Activity	Responsible Community Member/ Beneficiary	Government Agency/Non- Government Agency and Services	Proponent	Indicative Timeline	Source of Fund
Livelihood and Employment	<ul> <li>On-the-Job Training (OJT) Program</li> </ul>	<ul> <li>Barangay Kagawad for Education</li> <li>Bonafide students of academic institutions in San Ildefonso and Bulacan taking:         <ul> <li>Engineering, Science courses, institutions and office administrations, and among others</li> </ul> </li> </ul>	CHEd Region III San Ildefonso LGU Barangay Akle LGU	ComRel of Solid North Mineral Corporation (SNMC)	Operation	SNMC
Livelihood and Employment	<ul> <li>Women handicraft skills training (cross-stitch, rug making, beauty care and hair dressing, cooking, etc.)</li> <li>Food processing training</li> <li>Skills training (welding, machinery and auto- mechanics, etc.)</li> <li>Provision of relevant crops and trainings for farmers</li> </ul>	<ul> <li>Barangay Kagawad for Education</li> <li>Unemployed members of the host community</li> <li>Women</li> <li>Farmers Organization/Cooperative</li> <li>Out-of-school youth</li> </ul>	TESDA Region III San Ildefonso LGU Barangay Akle LGU MAO	ComRel of SNMC	Operation	SNMC
Infrastructure	<ul> <li>Provision of cement to various Barangays Akle LGU projects</li> </ul>	<ul> <li>Barangay Kagawad for Infrastructure</li> <li>Host community</li> </ul>	Barangay Akle LGU	ComRel of SNMC	<ul><li>Construction</li><li>Operation</li></ul>	SNMC
Infrastructure	<ul> <li>Support in the development of water supply system for Barangay Akle</li> </ul>	<ul> <li>Barangay Kagawad for Infrastructure</li> <li>Host community</li> </ul>	San Ildefonso Water District (SIWAD) San Ildefonso LGU Barangay Akle LGU	ComRel of SNMC	Operation	SNMC
Infrastructure	<ul> <li>Support in maintenance and construction of road networks for Barangay Akle</li> </ul>	<ul> <li>Barangay Kagawad for Infrastructure</li> <li>Host community</li> </ul>	DPWH Region III San Ildefonso LGU Barangay Akle LGU	ComRel of SNMC	Construction	SNMC


**Environmental Performance Report and Management Plan** 

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Concern	Program/Project/Activity	Responsible Community Member/ Beneficiary	Government Agency/Non- Government Agency and Services	Proponent	Indicative Timeline	Source of Fund
Health and Nutrition	<ul> <li>Provision of medicines/medical and dental services</li> </ul>	<ul> <li>Barangay Kagawad for Health and Education</li> <li>Host community</li> </ul>	DOH Region III MHO San Ildefonso LGU Barangay Akle LGU	ComRel of SNMC	<ul><li>Construction</li><li>Operation</li></ul>	SNMC
Education	<ul> <li>Provision of scholarships and financial assistance to students (both formal and informal education)</li> </ul>	<ul> <li>Qualified students of the host barangay</li> </ul>	CHEd Region III DepEd Region III TESDA Region III Barangay Akle LGU	ComRel of SNMC	<ul><li>Construction</li><li>Operation</li></ul>	SNMC
Peace and Order	<ul> <li>Capacity building trainings and strengthening for Barangay Tanods in peace keeping</li> </ul>	<ul> <li>Barangay Kagawad for Peace and order</li> <li>Barangay Tanods</li> </ul>	PNP Barangay Akle LGU	Chief Security Officer of SNMC	Operation	SNMC
Peace and Order	<ul> <li>Financial support on closed circuit television (CCTV) installation in strategic areas in Barangay Akle</li> </ul>	<ul> <li>Barangay Kagawad for Peace and order</li> <li>Host community</li> </ul>	Barangay Akle LGU	Chief Security Officer of SNMC	Operation	SNMC
Environment	Climate Change Adaptation and Disaster Risk Reduction Management training	<ul> <li>Host community and nearby barangays</li> </ul>	MDRRC San Ildefonso LGU Barangay Akle LGU Nearby barangay LGUs	Safety and Environmen tal Officer of SNMC	Operation	SNMC
Safety	<ul> <li>Provision of traffic signages and early warning devices in strategic areas in Barangay Akle</li> </ul>	<ul> <li>Host community</li> <li>Host community and nearby barangays</li> </ul>	Barangay Akle LGU	Safety Officer of SNMC	<ul><li>Construction</li><li>Operation</li></ul>	SNMC
Safety	First Aid Training for the     Barangay Rescue Team of     Barangay Akle	Host community	Barangay Akle LGU	Safety Officer of SNMC	Operation	SNMC
Cultural Heritage	<ul> <li>Financial support to sports, recreation and town fiesta and cultural activities</li> </ul>	<ul> <li>Residents of San Ildefonso</li> <li>Host community and nearby barangays</li> </ul>	San Ildefonso LGU Barangay Akle LGU	ComRel of SNMC	Operation	SNMC

### Environmental Performance Report and Management Plan

Social Development Framework

# SOLID NORTH SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant

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Concern	Program/Project/Activity	Responsible Community Member/	Government	Proponent	Indicative	Source
		Beneficiary	Agency/Non-		Timeline	of Fund
			Government Agency			
			and Services			
			Nearby barangay			
			LGUs			
Spiritual	<ul> <li>Financial support to religious institutions maintenance and construction works</li> </ul>	<ul> <li>Religious sector</li> <li>Ecumenical (pastors, priests, ministers, etc.)</li> </ul>	Barangay Akle LGU Nearby barangay LGUs	ComRel of SNMC	Operation	SNMC

Note: Based on the Revised Procedural Manual for DENR Administrative Order 2003-30 (DAO 2003-30)





### 5.1.3 SDMP Accomplishment

DAO 2010-21 states that a minimum of 1.5% of the total operating costs of a mining company shall be allotted for social development, environmental enhancement, and IEC programs. In accordance with the policy, **SNMC** has implemented the following programs:

SD Projects/Programs	Status of Implementation	Category	No. of Beneficiaries
2014			
Medical mission with free medical consultation and medicines	Completed	Basic Health	274 residents of Brgys. Akle & Alagao
2016		•	•
Educational Assistance	Completed	Education	12 (youths/students)
Monetary assistance to the 12 scholars	Completed	Education	12 (youths/students)
Provision of medicines and medical equipment to Botika ng Barangay	Completed	Basic Health	Brgys. Akle & Alagao LGUs
Flu vaccination for senior citizens	Completed	Basic Health	70 (senior citizens)
Provision of cement	Completed	Infrastructure	Brgys. Akle & Alagao LGUs

#### Table 5-2: SNMC SDMP P/P/As for 2014 & 2016

For the year 2014, medical mission was conducted with Alpha Delta Mu Sorority and Zeta Beta Mu Fraternity of the University of Santo Tomas (UST). The contingent was composed of 3 doctors, 37 nurses, and 2 barangay health workers (BHW).

In 2016, the programs, projects and activities (P/P/As) that were implemented included (a) educational assistance to 12 college students from Barangays Alagao and Akle; (b) the Botika ng Barangay donation of various medicines and medical equipment, (c) flu vaccinations for the senior citizens, and (d) provision of cement to support infrastructure projects of Barangays Alagao and Akle.

## 5.2 Information, Education, and Communications Framework

The Information, Education and Communication (IEC) campaign for the proposed expansion project will be conducted in all phases of its development, which also allows for a regular feedback mechanism of issues and concerns. The contents of IEC were based on the action or operation plans of **SNMC** and will be monitored by a multipartite group for evaluation.

The main purpose of IEC activities is to raise awareness of **SNMC's** activities within the community. The IEC shall promote the benefits of the project to the host community, as well as the measures taken by the company to avoid environmental degradation. It is also imperative the SNMC properly differentiates the operation of the neighboring **Eagle Cement Corporation** from its own operations to keep the community well-informed.

A feedback mechanism is a very important tool to educate people regarding the project's development whether it has negative or positive effects or perception. It will strengthen the knowledge of the people with regards to the positive impact of the project, as well as the effort of the monitoring team together with **SNMC** in resolving unfavorable events. To date, there have been no reports on accidents or major complaints.



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> Integral to the IEC is the regular reporting of SNMC on the progress of its operations. SNMC shall update the LGU in general regarding the fulfilment of the agreements and if changes were needed to be made. It is also in their responsibility to inform the people if they have seen possible problems that might occur and advice the LGU on appropriate preparations that are necessary in order to avoid or mitigate negative results. SNMC shall conduct regular IEC activities to establish transparency, and develop a partnership with the host communities.

> SNMC, in compliance with appropriate laws and regulations, also formulates socio-economic programs to serve as the mechanism for engaging the host communities in implementing the various social development and livelihood assistance programs. Moreover, SNMC will employ a Community Relations Officer that will manage these programs and will serve as the liaison officer for the various stakeholders of the project.

> IEC activities envisioned for the project will be numerous interactions between SNMC, the host communities, and local government officials. Table 5-3 presents the indicative IEC plan, which will be regularly improved and revised after consultations and developments during the course of the Project. Throughout the project, SNMC will continuously inform the stakeholders about the status of the SDMP in order to prevent any speculations, anxiety, and miscommunication.



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Table 5-3: Matrix of the Proj	ect's IEC Plan				
Target Sector Identified	Major Topic/s of Concern in	IEC Scheme / Strategy	Information Medium	Indicative Timelines	Indicative Cost
as Needing Project IEC	Relation to Project	/ Methods		and Frequency	(Php)
Residents of San	Personnel requirements and	<ul> <li>Group Consultation</li> </ul>	<ul> <li>Invitation letter</li> </ul>	At least, two months	P 50,000.00
Ildefonso, Bulacan	announcement of job opening	<ul> <li>Multi-media</li> </ul>	<ul> <li>Multi-sectoral cluster</li> </ul>	prior to start of	
	for potential		meetings	construction	
	workers/employees/contractors		<ul> <li>Newspaper publication</li> </ul>		
			<ul> <li>Radio broadcast</li> </ul>		
			<ul> <li>Posters</li> </ul>		
Municipality of San	Presentation of construction	<ul> <li>Group Consultation</li> </ul>	Invitation letters	At least 1 month prior	P50,000.00
Ildefonso	works/activities	<ul> <li>Multi-media</li> </ul>	Focus Group Discussion	to start of construction	
Residents of Barangay	Potential impacts and proposed		<ul> <li>Multi-sectoral cluster</li> </ul>	and quarterly during the	
Akle, Farmers, NGOs	mitigation measures during		meetings	entire construction	
	construction works		Hand outs	phase	
			<ul> <li>Audio-visual</li> </ul>		
			presentations on EIA		
			Posters and flyers		
Municipality of San	Report on project's compliance	<ul> <li>Group Consultation</li> </ul>	Invitation Letters	1 month prior to	P 25,000.00
Ildefonso	to ECC and EMP during		Hand outs	completion of	
Barangay Akle	construction period		<ul> <li>Multi-sector cluster</li> </ul>	construction works	
NGOs			meeting		
Municipality of San	Presentation of completion of	<ul> <li>Group Consultation</li> </ul>	Invitation Letters	1 month prior to	P 25,000.00
Ildefonso	construction works and		<ul> <li>Multi-sectoral meeting</li> </ul>	completion of	
Barangay Akle	preparation for operation			construction phase	
Municipality of San	Project operation phase	<ul> <li>Group Consultation</li> </ul>	<ul> <li>Invitation letter</li> </ul>	Priority to operation	P 40,000.00
Ildefonso	Highlight of the project's		Hand outs	phase and yearly	
Barangay Akle	environmental control		<ul> <li>Posters</li> </ul>	thereafter	
NGOs	measures				
	<ul> <li>Compliance to ECC</li> </ul>				
	conditionality's and the EMP				
	Actual impacts during				
	construction and control				
	measures implemented				



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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)
Schools	Plant tour and highlight of	<ul> <li>Group Consultation</li> </ul>	<ul> <li>Educational tour to</li> </ul>	Throughout the	P 50,000.00
NGOs	project's environmental control		project site	operation phase	
LGUs	measures, SDP, and				
	environmental projects				
Solid North Mineral	Awareness and Safety	<ul> <li>Group Consultation</li> </ul>	<ul> <li>Climate change</li> </ul>	Once a year	P 50,000.00
Corporation employees	Disaster Risk Reduction and	<ul> <li>Multi-media</li> </ul>	adaptation and		
	Management		disaster risk		
	Climate Change awareness and		reduction and		
	adaptation		management		
			seminar		
			<ul> <li>Hazard</li> </ul>		
			identification and risk		
			assessment		
			training		
			<ul> <li>First aid training</li> </ul>		
Barangay Akle	Climate Change awareness and	<ul> <li>Group Consultation</li> </ul>	<ul> <li>Climate change</li> </ul>	Once a year	P 50,000.00
Schools	adaptation	<ul> <li>Multi-media</li> </ul>	adaptation and disaster		
	Disaster Risk Reduction and		risk reduction and		
	Management		management seminar		

Table 5-4 presents the status of IEC implementation of SNMC for 2014 and 2016.

#### Table 5-4: Status of IEC Implementation

IEC Projects/Programs	Medium/Material Used	Status of Implementation
2014		
Consultative meetings for the formulation of the 2015 SDMP	Multi-sectoral Cluster Meeting	Completed
2016		
2017 SDMP Planning	Workshop/Multi-sectoral Cluster	Completed
	Meeting	



# **SECTION 6**

# **ENVIRONMENTAL COMPLIANCE MONITORING**

#### Environmental Performance 6.1

Table 6-1 presents SNMC's actions taken to comply with ECC conditions.

Table 6-1: ECC	<b>Conditions and</b>	<b>Actions Taken</b>	for Compliance

ECC Conditions	Actions Taken for Compliance
Provide and maintain buffer zones along the	SNMC maintains a strict buffer zone around its
entire periphery of the project site, as well as	quarry areas. This buffer zone is the target area
between the nearest water bodies, subject to	for its revegetation programs.
existing/appropriate local government	
regulations. This shall be kept with dense	
vegetative cover and planted with additional	
endemic species to enhance their conditions	
and serve as dust buffers and noise barriers	
Undertake a continuing Information, Education	IEC program is ongoing. SNMC has scaled up its
and Communication (IEC) Program to inform	IEC programs to define the difference of SNMC
and explain to all stakeholders, especially its	and Eagle Cement operations. Aside from
local residents, about the project's mitigating	disclosing its activities to the affected
measures embodied in its EIS, the conditions	community, SNMC is also raising awareness on
stipulated in this Certificate and, the	the mitigation and enhancement measures that
environmental and human safety measures in	were established by the company to maintain
cement manufacturing for greater awareness,	and enhance the environment.
understanding, and sustained acceptance of the	
project	
The cement processing operations shall	No cement processing.
conform with the provisions of R.A. No. 6969	
(Toxic Substances and Hazardous and Nuclear	
Wastes Control Act of 1990). R.A. No. 9003	
(Ecological Waste Management Act of 2000),	
R.A. No. 9275 (Philippine Clean Water Act of	
2004), and R.A. No. 8749 (Philippine Clean Air	
Act of 1999)	
Air, water and noise quality monitoring devices	No cement processing.
including Continuous Emission Monitoring	
System (CEMS) shall be installed at strategic	
locations in the plant and its periphery	
The proponent shall comply with the	The Mines and Geosciences Bureau is currently
environmental management and protection	reviewing the EPEP and FMRDP submitted by
requirements of the pertinent provisions of the	<b>SNMC.</b> Although this is the case, <b>SNMC</b> already
Philippine Mining Act of 1995 (R.A. No. 7942)	has an MMT, MRFC, CLRF, and ETF. The MEPEO
and its implementing rules and regulations	is already functional and is performing
(D.A.O. No. 96-40, as amended), as well as the	environmental protection and monitoring
Memorandum of Agreement (MOA) between	activities. The community is already benefitting
EMB and MGB executed on April 16, 1998.	from the SDMP of <b>SNMC.</b>

ECC Conditions	Actions Taken for Compliance
These include, among others, the submission of	
the following within sixty (60) days upon receipt	
of this Certificate:	
- Submission of an Environmental	
Protection and Enhancement Program	
(EPEP) and Final Mine	
Rehabilitation/Decommissioning Plan	
(FMR/DP) to the MGB, for approval. EPEP	
shall also include Risk Management	
Plan/Program to address environmental	
risks and, in case of accidents, equipment	
malfunctions, machine failures and other	
emergencies;	
- Setting up of a Multipartite Monitoring	
Team (MMT), Mine Rehabilitation Fund	
Committee (MRFC), Contingent Liability	
and Rehabilitation Fund (CLRF) and	
Environmental Trust Fund (ETF). The MMT	
shall specifically include a representative	
from the local DOH;	
- Organization of Mine Environmental	
Protection and Enhancement Office	
(MEPEO), which shall completely handle	
the environment-related aspect of the	
project. In addition to the monitoring	
requirements as specified in the EWP, the	
meneous imposts vis a vis the predicted	
impacts and management measures in the	
FIS and submit compliance monitoring	
report in accordance of the prescribed	
guidelines for P D 1586.	
- Implementation of a Social Development	
and Management Program (SDMP) which	
shall be approved by MGB RO III, with the	
conv of which shall be submitted to FMB	
within thirty (30) days from its approval:	
Designation of a Community Relations Officer	Mr. Mark Malaza is the current CRO of <b>SNMC</b>
(CRO);	
Ensure that its contractors and subcontractors	<b>SNMC</b> monitors the compliance of its
properly comply with the relevant conditions of	contractors to the ECC conditions.
this Certificate;	
Controlled Blasting for quarrying will be	Controlled blasting is strictly being observed by
undertaken during day time only; and	SNMC to minimize the impacts of blasting that
	may negatively affect the community and the
	infrastructure in the area. Blasting is done only
	during daytime to avoid disturbing the
	community.

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ECC Conditions	Actions Taken for Compliance
In case transfer ownership of this project, these	There is no transfer of ownership.
same conditions and restrictions shall apply and	
the transferee shall be required to notify the	
EMB within fifteen (15) days regards to the	
transfer of ownership and secure the approval	
of EMB.	

# 6.2 Self-Monitoring Plan

The Environmental Monitoring Plan (EMOP) presents a set of critical environmental parameters that allows **Solid North Mineral Corporation** to ensure environmental compliance and sustainability of operations. The EMOP allows **SNMC** to monitor, verify, and perform the necessary corrective measures towards the mitigation of the identified environmental impacts. The information obtained during the EMOP implementation provide significant information on 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.

**Table 6-2** presents the matrix of the EMoP that will be implemented by **SNMC** during the different phases of the proposed Project's development.

**SNMC** will monitor its compliance through the regular submission of Self-Monitoring Report (SMR) and Compliance Monitoring Report (CMR) to DENR-EMB.

## 6.3 Multi-Sectoral Monitoring Framework

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. However, DAO 2017-15 (Guidelines on Public Participation under the Philippine Environmental Impact Statement System) modified the composition of the MMT. The proponent and DENR-EMB shall no longer be part of the MMT. Instead, the MMT will be composed of government regulators (LGU representatives) and recognized non-governmental organizations (NGOs) 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. Although DENR-EMB is no longer part of the MMT, the office must provide oversight guidance to the MMT and shall conduct performance audits of the MMT.

## 6.3.1 Multi-Partite Monitoring Team

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 SNMC in its ECC and EMP;
- Validate the proposed Project's conformance to government standards, and SNMC'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.

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Table 6-2: Matrix of Environmental Monitoring Plan Parameter to be Key Concern Sampling & Measurement Plan Lead Annual **EQPL** Range Environmental Monitored Method Frequency Location Person Estimated Alert Action Limit Ale Aspects per Cost **Project Phase** A. Quarry Development and Operations Phase SNMC N// Limestone Solid waste Weight or Weighing/log-Daily/ Project Site Minimal N/A N/A N/A book recording Pulverizing and generation volume of weekly Quarry wastes Operations generated Equipment Hazardous Weight or Number of Weekly Waste storage SNMC Part of 50% of maximum 80% of maximum Maximum Ensure p drums/log-book facility maintenance volume of operation storage capacity storage capacity waste storage storag generation wastes recording capacity as hazardous (used oil, Weighing/logstipulated in as stipula generated busted bulbs book recording the HW ID HW ID. F etc.) hazardou for treat disposal par Fresh surface pH, Temp, Total Grab sampling Quarterly Akle River SNMC P10,000 per pH = 6.5 8.5 9.0 Soil erosion, Investi and laboratory Temp = 25° C 30° C 31° C run-off due to water quality Suspended quarter per identify limestone Solids, Oil and analysis station TSS = 60mg/L 65mg/L 80mg/L point so pulverizing and Grease, Oil and Grease = 2.0mg/L 2.0mg/L quarry Cadmium, and 1.5 mg/L operations Iron Cadmium = 0.005 0.01 mg/L 0.01 mg/L mg/L Iron = 1.0 mg/L1.5 mg/L 1.5 mg/L Effluent Quality Effluent SNMC P10,000 per pH, Temp, Total Grab sampling Quarterly pH = 6.5 8.5 9.0 Contin Discharge Suspended and laboratory quarter per maintena 30° C 31° C Temp = 25° C Solids, oil and analysis from all station treatn siltation grease syste ponds (plant Contin 2.0mg/L Oil and Grease = 2.0mg/L and quarry) monito 1.5 mg/L TSS = 60mg/L 65mg/L 80mg/L Soil Quality Riverbank of SNMC P1,000 pH = less than 6.5 6.5 – 9.0 Contin pН, Sampling, Yearly Greater laboratory Akle River than 9.0 monito analysis Ground Water Chloride, Color, SNMC P10,000 per Chloride = 200 225 mg/L 250 mg/L Contin Limestone Grab sampling Quarterly Ground-water Pulverizing and Quality Fecal Coliform, Monitoring month mg/L maintena Quarry Nitrate, pH, Wells Color = 60 TCU 55 TCU 50 TCU treatn Operations Phosphate, Fecal Coliform = 150 MPN/100mL 100 syste Temperature, 175 MPN/100mL MPN/100mL

	Management Measur	e*
rt	Action	Limit
A	N/A	N/A
oroper	Ensure proper	Treatment/disposal
ge of	storage of	of hazardous waste
s waste,	hazardous waste,	by third party.
ated in	as stipulated in	
Prepare	HW ID. Contact	
is waste	third party for	
ment/	hazardous waste	
by third	for treatment/	
ty	disposal	Invostigato
y non-	identify non-noint	identify non-point
ources	sources	sources, repair
		damages/ defects.
		repeat analysis
uous	Investigate,	Investigate,
ance of	identify non-point	identify non-point
nent	sources for	sources for
em.	possible causes of	possible causes of
nring	increase	increase renair
, in B.	Continuous	damages/ defects.
	maintenance of	repeat analysis
	treatment system.	. ,
	Continuous	
	monitoring.	
uous	Investigate,	Investigate,
oring.	identify non-point	identify non-point
	sources for	sources for
	narameter	narameter
	increase.	increase, repair
	Continuous	damages/ defects.
	monitoring	repeat analysis
	-	
	Investigate	Investigate
ance of	identify non-noint	identify non-noint
nent	sources	sources. repair
em.		damages/ defects.
		repeat analysis



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Кеу	Concern	Parameter to be	Sampling	g & Measureme	ent Plan	Lead	Annual		EQPL Range			Management Measur	·e*
Environmental		Monitored	Method	Frequency	Location	Person	Estimated	Alert	Action	Limit	Alert	Action	Limit
Aspects per Project Phase							Cost						
,,		Total Suspended						Nitrate = 7 mg/L	7 mg/L	7 mg/L	Continuous		
		Solids						pH = 6.5-8.5	6.5-8.5	6.5-8.5	monitoring.		
								Phosphate = 0.5	0.5 mg/L	0.5 mg/L			
								mg/L					
								Temperature = 26-30 °C	26-30 °C	26-30 °C			
								Total Suspended	70 mg/L	65 mg/L			
								Solids = 75 mg/L					
	Impact on flora and fauna	Habitat loss	Monitoring and evaluation of species survival within identified habitat.	Yearly	Selected habitat according to quarry plan	SNMC	P50,000 per year	100% survival	80% survival	60% survival	Continuous monitoring.	Identify reasons for low survival. Resolve problems.	Identify reasons for low survival. Resolve problems.
	Rehabilitation	Progress of	Review of	Yearly	Buffer zone	SNMC	No cost	100% of AEPEP	80% of AEPEP	70% of	Implementation	Identify reasons	Identify reasons
	and	rehabilitation	AEPEP targets					targets met	targets met	AEPEP	of reforestation	why targets are	why targets are not
	revegetation		and actual							targets met	projects.	not met. Resolve	met. Resolve
Limestane	program	Desibel levels on	accomplishment	\\/han	Drojact Sita	CNIMC	D2 000 per	codp	CEAD	7040	Continuous	problems.	problems.
Linestone Bulvorizing and	Noise	solocted	lovel motor	nocossan	and host	SINIVIC	P2,000 per	OUUB	OSUB	7008	continuous maintonanco of	identify non-point	identify non-point
		oquinmont	levermeter	necessary	municipality		Station						
Operations		equipment			municipanty						Continuous	sources	damages/defects
operations											monitoring.		repeat analysis
	Soil Quality	Mercury.	Sampling.	Yearly	Within plant	SNMC	P30.000 per	Mercury = less	Greater than 10	40 mg/kg	Continuous	Investigate.	Investigate.
		arsenic,	laboratory		site, in		vear per	than 10 mg/kg	mg/kg		maintenance of	identify non-point	identify non-point
		cadmium,	analysis		motorpool		station	Arsenic = less	Greater than 10	76 mg/kg	equipment.	sources	sources, repair
		chromium, lead,			and near plant			than 10 mg/kg	mg/kg	0, 0	Continuous		damages/ defects,
		oil and grease			facilities			Cadmium = less	Greater than 1.0	13 mg/kg	monitoring.		repeat analysis
								than 1.0 mg/kg	mg/kg				
					Within quarry			Chromium = less	Greater than 100	258 mg/kg			
					site with			than 100 mg/kg	mg/kg				
					recent			Lead = less than	Greater than 100	530 mg/kg			
					excavation			100 mg/kg	mg/kg				
								Oil and Grease =	2.0mg/L	2.0mg/L			
								1.5 mg/L					

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Кеу	Concern	Parameter to be	Sampling & Measurement Plan		Lead	Annual	EQPL Range			Management Measure*			
Environmental		Monitored	Method	Frequency	Location	Person	Estimated	Alert	Action	Limit	Alert	Action	Limit
Aspects per							Cost						
Project Phase													
	Public	No. of valid	Consultation	Variable	Host	SNMC	Php40,000	1 minor	Multiple minor	1 major	Investigate,	Investigate,	Investigate,
	perception/	complaints	with local		Municipality		per	complaint, such	complaints such	complaint	address issue	address issue	address issue
	acceptability		officials and				consultation	as nuisance	as nuisance	(incidents	accordingly	accordingly.	accordingly.
			residents					complaints (e.g.	complaints (e.g.	causing loss		Review and	Review and
								noise caused by	noise caused by	of life,		reinforce safety	reinforce safety
								operation,	operation,	damage to		guidelines. Re-	guidelines. Re-
								inconvenience	inconvenience	private		training of staff	training of staff
								and traffic caused	and traffic caused	property,		regarding health	regarding health
								by trucks)	by trucks)	adverse		and safety	and safety
										effects to		guidelines.	guidelines.
										health an			Increase
										economics)			community IEC
													regarding
													measures taken to
													solve major
													complaints. Get
													feedback from
													community
													regarding
													acceptability or
													adequacy of
													actions taken to
													mitigate major
													concerns.
	Social	Progress of	Review of SDMP	Yearly	Community	SNMC	No cost	100% of ASDMP	80% of ASDMP	70% of	Implementation	Identify reasons	Identify reasons
	Development	SDMP	targets and					targets met	targets met	ASDMP	of SDMP	why targets are	why targets are not
	and		actual							targets met		not met. Resolve	met. Resolve
	Management		accomplishment									problems.	problems.
	Program												
B. Abandonment	Phase					1	1	I	I I	1	I I	I	
Abandonment	Demolition	Weight (kg); no.	Weighing/	Daily/weekly	Project Site	SNMC	To be	N/A	N/A	N/A	N/A	N/A	N/A
of facility	spoils and solid	of items	log-book				determined						
	wastes		recording										



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Кеу	Concern	Parameter to be	Sampling & Measurement Plan		Lead	Annual	EQPL Range			Management Measure*			
Environmental Aspects per Project Phase		Monitored	Method	Frequency	Location	Person	Estimated Cost	Alert	Action	Limit	Alert	Action	Limit
	Public perception/ acceptability	No. of valid complaints	Consultation with local officials and residents	Variable	Host Municipality	SNMC	Php40,000 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



Table 6-2 lists the members involved in the MMT, and their respective roles.

MMT Member	Role/Responsibility					
1 representative from the	<ul> <li>Presides as the head of the MMT</li> </ul>					
Municipal Environment and	<ul> <li>Oversees SNMC's compliance to environmental regulations</li> </ul>					
Natural Resources Office (MENRO)	<ul> <li>Mandated to issue/revoke the ECC of the proposed Project</li> </ul>					
Rural Health Unit Chief	<ul> <li>Has the local authority and knowledge about the environmental</li> </ul>					
Concerned Barangay Captain	conditions of the affected areas					
Maximum of 2 locally recognized	<ul> <li>Represent the local community and its vulnerable sectors</li> </ul>					
community leaders	(women, senior citizens)					
1 representative from an LGU-	<ul> <li>Represent the mission/s of the NGO which should be related to</li> </ul>					
accredited Non-Government	environmental management or quarrying					
Organization (NGO)						
Maximum of 3 representatives	<ul> <li>Carry out their mandate on the type of project and its impacts</li> </ul>					
from government agencies	(MGB)					

### Table 6-3: List of Members and Respective Roles of the MMT

#### **Environmental Guarantee and Monitoring Fund Commitments** 6.4

SNMC has trust funds with the Development Bank of the Philippines with the following funds and corresponding amounts:

- Rehabilitation Cash Fund: Php 5,000,000.00
- Mining Trust Fund: Php 150,000.00
- Final Mine and Rehabilitation Fund (initial): Php 1,000,000.00
- Environmental Trust Fund in lieu of Environmental Guarantee Fund: Php 100,000.00



# SECTION 7

# ABANDONMENT/DECOMMISSIONING/REHABILITATION POLICY

**SNMC** will perform a gradual closure of the facility if abandonment, decommissioning, and/or rehabilitation are necessary. This principle allows SNMC sufficient time and resources to mobilize its personnel, and create appropriate demobilization procedures (i.e. site clean-up, remediation, etc.) to ensure the proper closure of all facilities. Depending on the reasons for abandonment, facilities such as buildings and other equipment may not necessarily be demolished since it is possible to re-purpose these facilities. Otherwise, proper dismantling and removal or transportation of structures, equipment, and machineries from the site will be conducted to minimize possible or further threats to the surrounding environment.

Table 7-1 lists the general abandonment/demobilization procedures that SNMC is willing to undertake to enhance the surrounding environment after its mining operations.

In addition, the proposed final land use is also presented (Table 7-1) to include; (a) plant facilities, such as office, storage and accommodation buildings, can be repurposed by the community; (b) siltation ponds will be backfilled and re-vegetated and (c) the limestone & shale quarry will be stabilized and re-vegetated.

SNMC commits to prepare and submit an amended version of the FMRDP 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.

Quarry Area	Limestone Pulverizing Facility	Personnel and the Community					
<ul> <li>Mined-out areas that have steep or sharp slopes will be modified to represent a gentle slope</li> <li>Anti-erosion devices (i.e. coirs, rip-rap barriers) will be established in areas with high probability of erosion and landslides</li> <li>Re-planting of trees and re- introduction of endemic faunal species</li> <li>Possible establishment of eco- parks (i.e. camp sites, picnic zones, bird sanctuaries, etc.) to further improve the area</li> </ul>	<ul> <li>All major manufacturing equipment shall be checked and cleaned properly prior to final shut-down or dismantling</li> <li>Any solid, liquid, or hazardous wastes shall be segregated, and hauled/treated by duly-licensed contractors</li> <li>Any remaining explosives shall be disposed in coordination with the PNP-FED</li> <li>If necessary, SNMC will perform remediation on the Plant and quarry sites to determine possible contamination</li> </ul>	<ul> <li>All personnel that will be affected by the Plant's closure will be given at least 6 months' notice about the impeding termination of their respective positions</li> <li>All personnel will be given appropriate separation packages, including re-training</li> <li>The host communities and LGUs will be notified by SNMC about the planned closure of the Plant through public forums.</li> <li>SNMC will coordinate to local authorities about any possible valid concerns regarding the project</li> </ul>					
Process/Component	Proposed Final Land Use						
Limestone Pulverizing Plant							
Limestone Pulverizing Plant and	<ul> <li>Stable and re-vegetated area.</li> </ul>						
Facilities	<ul> <li>Removal of structures and possib sold.</li> </ul>	ly transferred to other projects or					

#### Table 7-1: Abandonment Plan of SNMC



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Process/Component	Proposed Final Land Use				
	Retained storages for other useful purpose.				
<ul> <li>Office and accommodation</li> </ul>	Retained facilities for other useful purpose.				
buildings (canteen, warehouse,	Laboratory and motor pool equipment and other items will be				
administration building, staff	removed and transferred to other projects or sold.				
house, guest house, contractors					
camp, motor pool, assay					
laboratory, roads, nursery, etc.).					
Silt traps/ponds, water reservoir	<ul> <li>Silt traps/ponds backfilled and re-vegetated.</li> </ul>				
and drainage system which	<ul> <li>Water reservoir retained as recreation/picnic area.</li> </ul>				
includes the silt traps	Drainage system retrofitted to conform to proposed final land use.				
surrounding the plant.					
Limestone and Shale Quarry					
Active/Un-rehabilitated Benches	Stable and re-vegetated area.				
before closure					
Active/Un-rehabilitated Pit	<ul> <li>Stable and re-vegetated area.</li> </ul>				
Bottom before closure					
Siltation traps/ponds and	<ul> <li>Stable and re-vegetated area.</li> </ul>				
drainage system	<ul> <li>Drainage system retrofitted to conform to proposed final land use.</li> </ul>				
Rehabilitated/Reforested area	Retained and Maintained area.				
and Road Networks					

#### 7.1 Existing Rehabilitation/Reforestation Program

Last November 25, 2017, SNMC has implemented reforestation program in the shale/pozzolan quarry area. A total of 720 seedlings were planted, 270 of which were coffee and 450 of which were mahogany, within 4,300 m<sup>2</sup> (Figure 7-1). SNMC commits to more reforestation/re-vegetation efforts in the coming years.







# **SECTION 8** INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

The institutional organization of the quarry expansion and 1.5 MMTPY limestone pulverizing plant as shown in Figure 8-1 contains people with their assigned responsibilities that require interaction among SNMC'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.

The institutional organization will involve Solid North Mineral Corporation'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.

**SNMC** will establish an institutional partnership with relevant government agencies, various stakeholders, and the local host community in relation to the SNMC Quarry Expansion & 1.5 MMTPY Limestone Pulverizing Plant. This partnership is necessary to maintain a transparent and positive relationship for the Project and its stakeholders.

The stakeholders of the Plant are identified as the following institutions/ organizations:

- LGU of San Ildefonso and Barangay Akle, and DRT and Barangay Alagao;
- DENR-EMB;
- Resident and community associations living nearby the Plant;
- . Workers union employed in the Plant;
- Chamber of commerce and cement manufacturers association;
- Local church groups;
- Local police and peace-and-order organizations; and
- Other concerned non-government organizations (NGOs).

**SNMC** 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.



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Figure 8-1: Organizational Chart for the Institutional Plan



The current organizational set-up for environmental concerns of SNMC is shown in Figure 8-2. The group is led by the resident manager. The Mine Environmental Protection & Enhancement Officer (MEPEO), Pollution Control Officer (PCO), Safety and Health Officer, and Community Relations Officer (ComRel) composes the team.

In terms of each offices' roles and responsibilities, The MEPEO will be in-charge of quarry-related issues/concerns and will primarily be interfacing with MGB Region III. The PCO, under MEPEO, will handle environment-related issues/concerns and will be interfacing with the multi-partite monitoring team (MMT), the Municipal Environment and Natural Resources Office (MENRO) and DENR EMB Region III. The Safety and Health Officer will be responsible for occupational health and safety issues/concerns and will be interfacing with the Department of



Labor and Employment (DOLE), worker's organizations, the Municipal Health Office (MHO) of San Ildefonso, and local police and peace-and-order organizations. The ComRel will be responsible in dealing with community issues/concerns and will be interfacing with the municipal and barangay local government units (M/BLGU) and different civic-organizations/groups in the locality.



