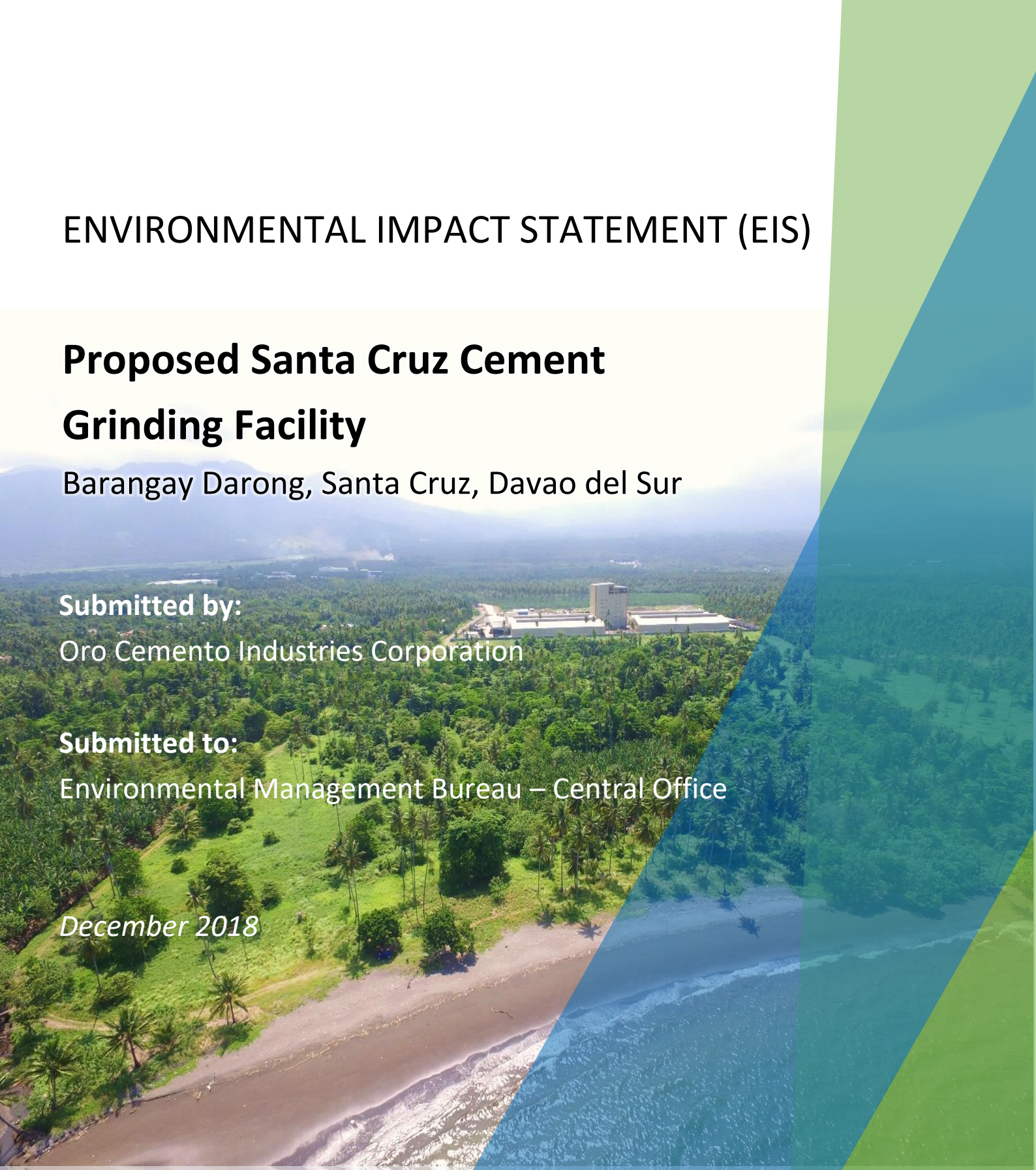
ENVIRONMENTAL IMPACT STATEMENT (EIS)

Proposed Santa Cruz Cement Grinding Facility

Barangay Darong, Santa Cruz, Davao del Sur



Submitted by:

Oro Cemento Industries Corporation

Submitted to:

Environmental Management Bureau – Central Office

December 2018

An Environmental Report By:

LCI ENVI CORPORATION
Unit 8L-M, Future Point Plaza 3
111 Panay Avenue, South Triangle
Quezon City, Metro Manila, The Philippines, 1103

Submitted To:

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

DOCUMENT TRACKING

Version No.	**Report Compiled By:**	**Checked By:**		**Approved By:**		
		Name	**Signature**	**Name**	**Signature**	**Date**
0	JB Leaño KG Bartolome	BM Magante		JM Lim		
1	JB Leaño KG Bartolome	JM Lim		JM Lim		

Distribution of Latest Version				
No. of Copies	**Submitted To:**	**Date Submitted**	**Received By:**	**Remarks:**
1	EMB-CO			
1	Proponent			
1	LCI			

ORO CEMENTO INDUSTRIES CORPORATION
40 San Miguel Avenue, Brgy. Wack-Wack, Mandaluyong City
Tel No. 632-3000

20 August 2018

DIR. METODIO U. TURBELLA
Director, Environmental Management Bureau – Central Office
Department of Environment and Natural Resources
EMB Building, DENR Compound, Visayas Avenue
Diliman, Quezon City

ATTENTION : **Atty. MICHAEL DRAKE MATIAS**
Chief, EIA Division

SUBJECT : **Environmental Compliance Certification (ECC) Application**
Oro Cemento Industries Corporation's
Proposed Santa Cruz Cement Grinding Facility
Barangay Darong, Santa Cruz, Davao del Sur

Dear **Dir. Turbella,**

We are submitting herewith the Environmental Impact Statement (EIS) for the Environmental Compliance Certificate (ECC) application of Oro Cemento Industries Corporation's **Proposed Santa Cruz Cement Grinding Facility** located in Barangay Darong, Santa Cruz, Davao del Sur.

We hope that this report and its attached documents meet the requirements of your good office. Should you have queries, please contact our EIA study team, Engr. Bryan Magante and Mr. Jerome B. Leaño of LCI Envi Corporation at (02) 442-2830 or 961-9226.

Very truly yours,

FERDINAND K. CONSTANTINO
President/Director
Oro Cemento Industries Corporation

Table of Contents

List of Figures

List of Tables

List of Acronyms

AERMIC	-	American Meteorological Society/EPA Regulatory Model Improvement Committee
BACT	-	Best and Available Control Technology
BFAR	-	Bureau of Fisheries and Aquatic Resources
BMB	-	Biodiversity Management Bureau
BLGU	-	Barangay Local Government Unit
CAA	-	Clean Air Act
CADC	-	Certificate of Ancestral Domain Claim
CADT	-	Certificate Ancestral Domain Title
CALC	-	Certificate of Ancestral Land Claim
CALT	-	Certificate of Ancestral Land Title
CARP	-	Comprehensive Agrarian Reform Program
CBFMA	-	Community-Based Forest Management Agreement
CENRO	-	Community Environment and Natural Resources Office
CMR	-	Compliance Monitoring Report
DENT	-	Department of Environment and Natural Resources
DIA	-	Direct Impact Area
DIV		Dutch Intervention Values
DOLE	-	Department of Labor and Employment
DPT	-	Digit Photo-Transect
ECC	-	Environmental Compliance Certificate
EGF	-	Environmental Guarantee Fund
EIA	-	Environmental Impact Assessment
EIS	-	Environmental Impact Statement

EMB	-	Environmental Management Bureau
EMP	-	Environmental Monitoring Fund
EMoP	-	Environmental Monitoring Plan
FVC	-	Fish Visual Census
GHG	-	Greenhouse Gas
GLC	-	Ground-Level Concentration
GPS	-	Global Positioning System
IEC	-	Information and Education and Communication
IFMA	-	Integrated Forest Management Agreement
IIA	-	Indirect Impact Area
IRR	-	Implementing Rules and Regulations
KBA	-	Key Biodiversity Area
kW	-	Kilowatts
kWh	-	Kilowatt hour
LCI	-	LCI Envi Corporation
MANP	-	Mt. Apo Natural Park
MASL	-	Meters above sea level
MENRO	-	Municipal Environment and Natural Resources Office
MGB	-	Mines and Geoscience Bureau
MHO	-	Municipal Health Officer
MLLW	-	Mean Low Low Water
MMTPY	-	Million Metric per Year
NAAQS	-	National Ambient Air Quality Standards
NAAQGV	-	National Ambient Air Quality Guideline Values
NESSAP	-	National Emission Standard for Source Specific Air Pollutants
NGOs	-	Non-Government Organizations
NIPAS	-	National Protected Areas System
nm	-	Nanometer
NOAH	-	Nationwide Operational Assessment of Hazards
NPCC	-	National Pollution Control Commission
NSCB	-	National Statistical Coordination Board
NWRB	-	National Water Resources Board
PAGASA	-	Philippine Atmospheric, Geophysical, and Astronomical Services Administration
PAR	-	Philippine Area of Responsibility
PBL	-	Planetary Boundary Layer
PCG		Philippine Coast Guard
PDR	-	Project Description Report
PEISS	-	Philippine Environmental Impact Statement System
PENRO	-	Provincial Environment and Natural Resources Office
PHILVOCS	-	Philippine Institute of Volcanology and Seismology
PM	-	Particle Matter
PNSDW	-	Philippine National Standards for Drinking Water
PPS	-	Personal Protective Equipment
PSA	-	Philippine Statistics Authority
PSR	-	Public Scoping Report
PQ	-	Pliocene-Quaternary
RHU	-	Rural Health Unit
SB	-	Sangguniang Bayan
SBCs	-	Sensitive Biological Communities
SDP	-	Social Development Program
SMFI	-	San Miguel Food Inc
SMR	-	Self-Monitoring Report
SRTM	-	Shuttle Radar Topography Mission
SWMP	-	Solid Waste Management Program
TINMR	-	Taklong Island National Marine Reserve
TSP	-	Total Suspended Particles
UN	-	United Nations

EXECUTIVE SUMMARY

Project Fact Sheet

<table>
<tr><td>Name of Project</td><td>Santa Cruz Cement Grinding Facility</td></tr>
<tr><td>Project Location</td><td>Province of Davao del Sur, Municipality of Sta. Cruz, Barangay Darong</td></tr>
<tr><td>Nature of Project</td><td>Cement (Clinker) Grinding Process</td></tr>
<tr><td>Project Size</td><td>2.0 Million Metric Tons per Year (MMTPY) Cement/50,000,000 Cement Bags</td></tr>
<tr><td>Summary of Major Project Components</td><td>
<table>
<tr><th>PROJECT COMPONENT</th><th>DESCRIPTION/SPECIFICATIONS</th></tr>
<tr><td>Raw Materials Storage</td><td>Longitudinal storage with 50,000 MT capacity and with mechanical reclaimer</td></tr>
<tr><td>Clinker Storage</td><td>6 x 10,000 tons capacity</td></tr>
<tr><td>Dosing Silos</td><td>6 x silos with various sizes, with weigh feeders</td></tr>
<tr><td>Cement Mill</td><td>1 x 250 TPH Vertical Roller Mill</td></tr>
<tr><td>Cement Storage</td><td>4 x 10,000 tons capacity</td></tr>
<tr><td>Cement Packing and Dispatch</td><td>3 x 90 TPH Rotary Packing machine</td></tr>
<tr><td>Water Source</td><td>Deepwell (110 cu.m./day)</td></tr>
<tr><td>Air Pollution Control</td><td>Bag Filters</td></tr>
<tr><td>Wastewater Pollution Control</td><td>Septic Tanks
Sewage Treatment Plant</td></tr>
<tr><td>Pier Facility</td><td>Raw Material/Clinker Unloading & Conveyor</td></tr>
<tr><td colspan="2">Support Facilities
Warehouses
Administration Building and Staff House
Parking and Truck Marshalling Area
Water and Wastewater Treatment Facilities
Clinic
Power Substation</td></tr>
</table>
</td></tr>
<tr><td>Project Cost</td><td>Php 2,000,000,000.00</td></tr>
<tr><td>Construction Period</td><td>2018 to 2019</td></tr>
<tr><td>Commercial Operation Date</td><td>2nd Quarter of 2020</td></tr>
<tr><td>Proponent Name</td><td>Oro Cemento Industries Corporation</td></tr>
<tr><td>Proponent Authorized Representative</td><td>Mr. Ferdinand K. Constantino
President/Director</td></tr>
<tr><td>Proponent Address and Contact Details</td><td>SMC Head Office Complex
San Miguel Avenue, Mandaluyong City
1603 Metro Manila, Philippines</td></tr>
<tr><td>EIA Preparer (Consultant)</td><td>LCI Envi Corporation</td></tr>
<tr><td>Preparer Contact Person</td><td>Engr. Jose Marie U. Lim, MSc.
EIA Team Leader</td></tr>
<tr><td>Preparer Address and Contact Details</td><td>Unit 8L-M Future Point Plaza 3
111 Panay Avenue, South Triangle
Quezon City, Metro Manila, Philippines
Tel. No.: (632) 442-2830
Fax No.: (632) 961-9226</td></tr>
</table>

Process Documentation

Terms of Reference for the EIA Study

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

2 **Oro Cemento Industries Corporation** intends to put up a cement grinding facility in Barangay Darong, Sta. Cruz, Davao del Sur. The facility will have cement grinding equipment, bulk storage, and other support facilities. It will have a production capacity of 2 million metric tons per year (MMTPY).

3 The Proponent is required to secure an Environmental Compliance Certificate (ECC) from the DENR-EMB prior to any development in the project site. Pre-requisite to the acquisition of an ECC for a project of this scale is the preparation of an Environmental Impact Statement (EIS), as stated in Annex A, Item No. 1.3.2 (Refineries-Category A) of the EMB Memorandum Circular 005-2014 (Revised Guidelines for Coverage Screening and Standardized Requirements under the Philippine EIS System). The Environmental Impact Assessment (EIA) Study used the EIS Scoping and Screening Form for Mining Projects as a guide in the impact analysis.

Scope of the EIA Study

4 This EIA Report documents the baseline environmental conditions in the proposed project area in relation to the various stages of development of the proposed project. This report also presents how **Oro Cemento Industries Corporation** plans to manage the environmental impacts associated with the proposed Cement Grinding Facility operations through a comprehensive environmental management and monitoring plan. This document shall be submitted to the Environmental Management Bureau (EMB) Central Office for review and evaluation.

EIA Team

5 LCI Envi Corporation (LCI) was commissioned by **Oro Cemento Industries Corporation** to conduct the EIA study for the proposed Cement Grinding Facility Project. LCI was tasked to prepare, document, and, on behalf of the Proponent, submit to the DENR-EMB all the necessary information related to the proposed Project. The following table presents the EIA Study Team composition.

CONSULTANT	EXPERTISE	REGISTRATION NO.
Engr. Jose Marie U. Lim, MSc.	Team Leader/Environmental Specialist	IPCO-029
Asuncion B. De Guzman, Ph.D.	Marine Ecology	-
Joseph P. Lalo, M.A.	Sociology/Social Development Specialist	IPCO-149
Engr. Bryan M. Magante	Environmental Specialist	IPCO-030
Kevin Paolo G. Bartolome	Environmental Specialist	IPCO-353
Jerome B. Leaño	Social Development Specialist	IPCO-059

EIA Study Schedule & Area

EIA Study Schedule

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

PROCESS	EIA STUDY MILESTONES	DATE
PRE-SCOPING	Information and Education Campaign (IEC) with Barangay Darong LGU	November 10, 2017
	Information and Education Campaign (IEC) with Sta. Cruz Sangguniang Bayan Council	March 22, 2018
SCOPING	Public Scoping	June 7, 2018
	Submission of Public Scoping Report (PSR) to EMB Central Office	June 13, 2018
	Technical Scoping at EMB Central Office	July 2, 2018
ENVIRONMENTAL IMPACT ASSESSMENT	Submission of EIA Report to EMB Central Office	August 2018
TECHNICAL REVIEW	Conduct of 1st Technical Review	September 28, 2018
PUBLIC HEARING	Conduct of Public Hearing at Barangay Darong Covered Court	November 16, 2018
	Submission of Public Hearing Report (PHR) to EMB Central Office	December 6, 2018

EIA Study Area

7 The proposed project site is situated in Brgy. Darong in the Municipality of Sta. Cruz, Davao del Sur, Region XI (Davao Region). Initially, the project impact area generally consisted of the 11.7-hectare project footprints as the direct impact area (DIA) and the areas in the immediate vicinity of the project site in the host barangay LGU Darong as the indirect impact area (IIA). In accordance with the guidelines provided in DAO 2017-15, after the completion of the EIA study, the delineation of the direct and indirect impact areas was updated as follows:

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

- For the Water component, the DIA refers to the location of the deep well within the project site that will be tapped to supply the water requirements of the project. Nearby groundwater sources were considered in the general characterization of the project area. Further, the alignment of the proposed pier facility that will potentially affect the water quality of the municipal water of Sta. Cruz (Davao Gulf) and surrounding marine ecosystem.

- For the Air component, the DIA covers the areas within the host barangay of Darong where the ground-level concentrations (GLC) of total suspended particles (TSP), the criteria pollutant of potential concern, were projected to exceed 40 µg/Ncm based on 1-hr averaging time. According to the dispersion modelling, the maximum GLC does not exceed the standards stated in DAO 2000-81.

- For the People component, the IIA encompasses the communities in the host Municipality of Sta. Cruz, particularly Brgy. Darong (host barangay), which are expected to benefit from the employment, business opportunities, taxes, and other potential socio-economic contributions of the project.

EIA Methodologies

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

EIA MODULE	METHODS	PURPOSE
LAND	• Review of land use plan in the host municipality of Sta. Cruz, Davao del Sur • Soil sampling and quality analysis • Review of relevant geologic maps covering the study area • Assessment of terrestrial ecology in the study area through desktop-based evaluation and tree inventory census	• To assess land use/zoning compatibility of the proposed project • To establish baseline information on soil quality in the proposed project site • To assess possible impacts of geologic hazards on the proposed development • To establish baseline information on terrestrial flora and fauna in the proposed project site
AIR	• Climatological data from the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) • Ambient air quality and noise level monitoring and analysis • Air dispersion modeling	• To assess possible impacts of meteorology on the proposed development • To establish baseline information on ambient air quality and noise levels in the project area with considerations on relevant national standards • To assess possible impacts of proposed project activities on air quality in the impact area
WATER	• Coastal, groundwater and surface water sampling and quality analysis to establish the baseline • Review of available water quality monitoring data covering the study area	• To establish baseline information on water quality along the project area with considerations on relevant national standards • To assess possible impacts of the project to groundwater and marine quality and ecosystem.
PEOPLE	• Socio-economic and perception survey in the project impact areas • Review of socio-economic profile of the communities in the impact area (Barangay Darong), Stakeholder consultations (focused group discussion, key informant interview with various stakeholders	• To establish baseline information on the socio-economic conditions in the impact areas and general perception on the proposed project • To involve stakeholders in the EIA process and address issues and concerns on the proposed project

Scoping and Public Participation

Information and Education Campaign

9 As stipulated in the DENR Administrative Order No. 2017-15 (Guidelines on Public Participation under the Philippine Environmental Impact Statement System), at the onset of the EIA process, early involvement of stakeholders must be initiated before the scoping through the conduct of information and education campaign (IEC) and focused group discussions (FGDs).

10 For the proposed Santa Cruz Cement Grinding Project, the invitation to conduct the IEC was coursed through the host community: the barangay local government unit (BLGU) of Darong in the Municipality of Sta. Cruz, Davao del Sur.

11 The IEC activity was conducted at the barangay council session hall of Darong on November 10, 2017 (Friday). The participants were composed of BLGU Darong officials, staff, and council

members (Sangguniang Barangay). The meeting was facilitated by LCI (EIA Consultant), together with the Proponent representatives.

12 Another IEC activity was conducted for the Sangguniang Bayan (SB) of Sta. Cruz last March 22, 2018.

13 The preliminary issues and concerns raised and addressed during the IEC activity for the proposed project covered a wide array of subject matter, including employment opportunities, request for construction of high school building near the project area, plant visit and parking spaces. The importance of constant open communication between the community and the project Proponent throughout the different phases of the project implementation was emphasized during the meeting. The complete documentation report of the IEC and the initial perception survey was submitted to the EMB Central Office on April 27, 2018 as part of the request for scoping.

Initial Perception Survey

14 To assess the preliminary knowledge and perception of the community representatives on the proposed cement grinding facility, an initial perception survey was conducted in conjunction with the IEC activity held in Barangay Darong, Sta. Cruz, Davao del Sur on November 10, 2017.

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

16 A total of 13 respondents participated in the initial perception survey, the results of which have been presented in the documentation report submitted to the EMB Central Office on April 27, 2018 as part of the request for scoping.

Public Scoping

17 As further stipulated in DAO 2017-15, scoping can then be performed to establish the scope of work and terms of reference for the EIA once the social preparation activities are completed. For the proposed Project, the request to conduct Public Scoping was submitted to the EMB Central Office on April 27, 2018.

18 On May 29, 2018 the Notice of Public Scoping (scheduled on June 7, 2018), along with an e-copy of the Project Description Report (PDR), was posted in the EMB Website for free public viewing. The invitation letters from DENR EMB were officially distributed to the following invitees identified based on the stakeholder groups indicated in Section 5 of DAO 2017-15.

19 The Public Scoping activity was conducted from 9:00AM to 12:00AM on June 7, 2018 (Thursday) at the Barangay Darong Covered Court. A total of 43 participated in the meeting, which was facilitated by DENR EMB Region XI Representatives, LCI Envi Corporation (EIA Consultant), together with the representatives from **Oro Cemento Industries Corporation**.

20 The issues and concerns raised during the Public Scoping were similar with those that were raised during the social preparation activities (IEC and FGDs). A wide array of subject matter, from health to the local economy to the environment were covered owing to the multi-sectoral composition of the audience. Again, the importance of constant open communication between the community and the project Proponent throughout the different phases of the project implementation was

highlighted. The complete documentation report of the Public Scoping was submitted to the EMB Central Office on June 13, 2018.

Socio-Economic and Perception Survey

21 As part of the baseline characterization and impact assessment on People, a socio-economic and perception survey was conducted on July 26 to 28, 2018. The survey covered the host community of Brgy. Darong (Sta. Cruz) of the project area.

22 The socio-economic and perception survey employed random sampling based on estimated 1,300 households in Brgy. Darong, with 95% confidence level and 5% margin of error. This resulted to a sampling size of 300 households for Brgy. Darong.

23 Through local enumerators, the respondents were asked to accomplish a two-page survey form, which was written in the local vernacular (Tagalog).

Technical Scoping

24 The technical scoping was held at the EMB Central Office on July 2, 2018 with the Project Proponent (**Oro Cemento Industries Corporation**) and its EIA Consultant (**LCI Envi Corporation**). The composition of the EIA Review Committee is presented below.

EIA REVIEW COMMITTEE MEMBER	AREAS/EXPERTISE	REGISTRATION NO.
Chester Cabalza, Ph.D.	Anthropology	RCO-053
Oskar Cruz	Geology and Hydrogeology	RCO-030
Engr. Jose Reynato Morente	Air Quality and ERA	RCO-002
Engr. Glenn Marcelo Noble	Minerals Processing	-
Engr. Pura Vita Pedrosa	Water Quality and EMP	RCO-037
Teresita Perez, Ph.D.	Terrestrial Ecology	RCO-010

25 The EIS Scoping and Screening Form for Mining Projects was used during the technical scoping to define the coverage of the EIA Study for the proposed Santa Cruz Cement Grinding Facility Project.

Public Hearing

26 On October 26, 2018 the Notice of Public Hearing (scheduled on November 16, 2018), along with an e-copy of the draft EIS and EIA Summary for the Public (ESP) written in Filipino and English, was posted in the EMB Website for free public viewing. The invitation letters from DENR EMB were officially distributed to the following invitees identified based on the stakeholder groups indicated in Section 5 of DAO 2017-15.

27 The Public Hearing activity was conducted from 9:00AM to 1:00PM on November 16, 2018 (Friday) at the Barangay Darong Covered Court. A total of 155 participated in the meeting, which was facilitated by DENR Central Office Representatives, LCI Envi Corporation (EIA Consultant), together with the representatives from **Oro Cemento Industries Corporation**.

28 The issues and concerns raised during the Public Hearing were similar with those that were raised during the public scoping. Topics raised during the open forum were: impacts of the project to the community, establishment of the multi-partite monitoring team (MMT), water consumption, biosecurity in relation to the greening program, site visitation, and the community's request for the Darong High School location. The complete documentation report of the Public Hearing was submitted to the EMB Central Office on December 6, 2018.

EIA Summary

Summary of Alternatives

29 In terms of siting, the project site in Brgy. Darong was selected since this was already owned by **Oro Cemento Industries Corporation**. The zoning of the project site is also suitable for industrial purposes; the project footprint will not be built on agricultural areas.

30 In terms of technology, **Oro Cemento Industries Corporation** choose to implement a cement grinding facility instead of the full cement plant. Its advantage is that no kiln will be installed and no heating process. Clinker is already the raw material and will blend with cement additives in the grinding facility before bagging. Minimal air emission will also be produced since there is no stack installed to produce the clinker. One of the disadvantages of using dry process as opposed to wet process is the air emissions. Dry process generally yields more dust, although this can easily be controlled by watering the area.

Key Findings of the Environmental Baseline Studies

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

MODULE	SUMMARY OF FINDINGS
LAND	
Land Use and Classification	• The proposed project site is situated in an area designated industrial use. • The proposed project site does not fall within any declared ECA and is not covered by any tenurial instrument. • There are no visually significant landforms, landscapes, or structures in the proposed project site that can potentially be affected by the project activities.
Geology/ Geomorphology	•
Pedology	• Based on the soil quality assessment, the detected levels of all parameters tested were way below the respective threshold limits/intervention values.
Terrestrial Ecology	• The location of the Mt. Apo Natural Park (MANP) is approximately 10 kms. away from the project area. There are no important species (flora and fauna) identified in the project area.
WATER	
Competition in Water Use	• The project will use 110 cu.m. of water per day for various purposes. This will be sourced from a deep well within the project site. • The cement grinding facility will use 10 cu.m./day for system cooling.
Oceanography	• Obstruction of flow of currents is not expected if the pier facility will be constructed on piles or pillars. • Bathymetry will not be changed. The docking area is located approximately 230m from the shore. The target depth is 15 m.
Water Quality	• Fecal coliform in the ground water (sampling station GW2) exceeds DAO 2016-08 Class A and PNSDW 2017 standards. • Fecal coliform in the surface water exceeds DAO 2016-08 Class C standards • Fecal coliform in the coastal water (sampling station CW4) exceeds DAO 2016-08 Class SC standards.
Marine Ecology	• Coral reefs in the area are not well developed, fragmented, and widely scattered. Moreover, the reefs have sustained significant damage, presumably caused by dynamite fishing in the past. • Seagrass resources are sparse

MODULE	SUMMARY OF FINDINGS
	• There are mangroves located approximately 1 km south of the proposed pier; these mangroves will not be affected by the proposed project. • Due to the condition of the habitat, the population of reef fish is poor.
AIR	
Meteorology	• The proposed project area mainly belongs to Type IV climate under the modified Coronas classification with rainfall being more or less distributed through the year. • Temperature is highest in April and May and lowest in January and February. • Precipitation is highest in June and lowest in February. • The surface wind in the area northward from November to April and southward May to October • An average of 1 cyclone passes by the Davao area every 12 years.
Ambient Air Quality and Noise	• Out of the 6 sampling stations, only the station near the perimeter fence of the adjacent feed mill exceeded TSP standards because of the ongoing construction activities. • Noise levels near roads and highways are above the NPCC standards. The station near the perimeter fence of the feed mill also exceeded NPCC standards mainly due to its ongoing construction.
PEOPLE	
	• Water supply sources in Sta. Cruz include piped connection, deep wells, shallow wells and spring sources. As of 2014, more than 90% of households in Darong have access to electricity through Davao del Sur Electric Cooperative, Inc. • The consistent leading cause of morbidity in Sta. Cruz from 2010 to 2012 was diarrhea. • Based on the perception survey, (~70%) of the 300 respondents have prior knowledge about the proposed project. A good portion (33%) of the respondents believed that the proposed project would be beneficial, while (33%) believed otherwise; majority (33%) were undecided. The most cited potential positive impact of the project is employment generation (52%), followed by tax revenues (26%), business opportunities (12%). Conversely, the most cited potential negative impact of the project is air pollution (28%), followed by noise pollution and impacts to the sea (Davao Gulf) (16% respectively), and water pollution (14%).

Integrated Summary of Impacts and Residual Effects After Mitigation

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

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
LAND			
LAND USE AND CLASSIFICATION			
Impact in terms of compatibility with existing land use	Pre-Construction	The proposed project site is situated in an area designated as an Industrial Zone in Sta. Cruz, Davao del Sur	A zoning certification for the proposed project has been secured from Sta. Cruz LGU
Devaluation of land value as a result of improper solid waste management and other related impacts	Construction, Operation, Abandonment	Solid waste is expected to be produced	Implementation of a solid waste management plan
PEDOLOGY			
Soil erosion/Loss of topsoil	Construction	There may be some soil erosion due to the earth	Limitation of earth movement to areas where

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
		movement during the site development	site development is necessary
Change in soil quality/fertility	Construction, Operation, Abandonment	There is a risk of soil contamination due to the maintenance of heavy equipment	Use sawdust, rice hulls, or coir dusts to absorb the oil spills
WATER			
HYDROLOGY/HYDROGEOLOGY			
Change/ disruption in water circulation	Construction/ Operation	Pier construction may affect water circulation in the coastal area	Construction of pier on piles/pillars to allow unobstructed flow of currents
WATER QUALITY			
Degradation of ground water quality	Construction	Accidental oil spills from heavy equipment	Use sawdust, rice hulls, or coir dusts to absorb the oil spills Maintain canal in the maintenance and repair area of vehicles and equipment
	Operation	Accidental oil spill from delivery trucks	
Degradation of ground water / coastal water quality	Construction/ Operation	Ground and coastal water contamination from improper disposal of wastes, percolated wastewater, sludge and fecal matter	Provision of sanitation facilities for workers (e.g. toilets, showers, etc.)
Degradation of coastal water quality	Construction	Possible siltation and surface runoff Increase in turbidity of coastal water due to spillage of building materials for pier facility and debris	Establishment of sediment traps and erosion barriers Regular removal of silt and sediments.
	Operation	Runoff from plant and pier operations Possible spillage of raw materials from pier Accidental oil spill from ship	Installation and maintenance of drainage system within the plant and the pier Coastal water monitoring Oil spill contingency plan
MARINE ECOLOGY			
Threat to existence and/or loss of important local species and habitat	Construction	Possible siltation that may disturb nearby reefs	Installation of silt curtain.
AIR			
AMBIENT AIR QUALITY AND NOISE			
Impact on Air Quality	Construction	NO_x, SO_2, and CO emissions from heavy equipment that will be used during construction	Proper maintenance on heavy equipment

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
	Operation	TSP and PM_{10} emissions from the cement grinding facility is of primary concern.	Installation of bag filters that will control at least 90% of the emissions from the cement grinding facility Road watering within the plant site to control dust
Increase in Ambient Noise Level	Construction/ Operation	Noise will be generated by heavy equipment during construction The cement grinding facility will generate some noise	Maintenance of engines and other mechanical parts of the equipment Installation of exhaust mufflers Constructing enclosures surrounding the project site Maintenance of vegetation surrounding the area to serve as natural noise barriers.
PEOPLE			
Threat to Public Health and Safety	Construction Operation	Dust may cause negative health effects (i.e., respiratory) to the community and workers if not properly mitigated Crime incidence may also increase in the local community	Conduct of medical missions and regular check-ups to workers and host barangay Coordination with Municipal Health Officer (MHO) and barangay health units to address health-related needs of the community Coordination with barangay officials to ensure peace and order among workers and community members
Generation of Local Benefits from the Project	Operation	Generation of additional source of income and livelihood Additional revenue for the local government Increased basic social services Addition and improvement of local residential dwelling	Implementation of social development programs that are responsive to local needs in the impact area
Traffic Congestion	Construction Operation	Increase in traffic generation in the area due to delivery trucks coming in and out of the Plant	Coordination with LGU on scheduling and handling the flow of traffic near the project area

Risks and Uncertainties

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

MODULE	RISKS AND UNCERTAINTIES	IMPLICATION ON DECISION MAKING
Water	Possible oil spills	Installation of silt curtain during construction of the pier
		Development of oil spill management plan
Air	TSP and PM_{10} emissions from the cement grinding facility is of primary concern.	Installation of bag filters that will control at least 90% of the emissions from the cement grinding facility. Road watering within the plant site to control dust.

SECTION 1

PROJECT DESCRIPTION

34 **Oro Cemento Industries Corporation** intends to put up a cement grinding facility in Barangay Darong, Sta. Cruz, Davao del Sur. The facility will have cement grinding equipment, bulk storage, and other support facilities. It will have a production capacity of 2 million metric tons per year (MMTPY). **Table 1-1** shows the details of the project, the Proponent, and the EIA Preparer.

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

Name of Project	**Santa Cruz Cement Grinding Facility**
Project Location	Province of Davao del Sur, Municipality of Sta. Cruz, Barangay Darong
Nature of Project	Cement (Clinker) Grinding Process
Project Size	2.0 Million Metric Tons per Year (MMTPY) Cement/50,000,000 Cement Bags
Proponent Name	**Oro Cemento Industries Corporation**
Proponent Authorized Representative	**Mr. Ferdinand K. Constantino** President/Director
Proponent Address and Contact Details	SMC Head Office Complex San Miguel Avenue, Mandaluyong City 1603 Metro Manila, Philippines
EIA Preparer (Consultant)	**LCI Envi Corporation**
Preparer Contact Person	**Engr. Jose Marie U. Lim, MSc.** EIA Team Leader
Preparer Address and Contact Details	Unit 8L-M Future Point Plaza 3 111 Panay Avenue, South Triangle Quezon City, Metro Manila, Philippines Tel. No.: (632) 442-2830 Fax No.: (632) 961-9226

1.1 Project Location and Area

1.1.1 Project Location

35 The proposed cement grinding facility will be constructed inside an industrial area in Barangay Darong, Santa Cruz, Davao del Sur. The general location map of the proposed project is shown in **Figure 1-1**. The geographic coordinates defining the boundary of the proposed project site are provided in the table below.

Table 1-2: Coordinates of the Proposed Project Site

POINT	LATITUDE (N)	LONGITUDE (E)
1	6.9373186638 N	125.4847068498 E
2	6.9369851785 N	125.4847059891 E
3	6.9363642793 N	125.4849999914 E
4	6.9363133746 N	125.4839625645 E
5	6.9352201662 N	125.4840144376 E
6	6.9349197040 N	125.4839313943 E
7	6.9347395445 N	125.4847670417 E
8	6.9342444697 N	125.4846673677 E
9	6.9341354541 N	125.4851220328 E
10	6.9337664054 N	125.4859419274 E`
11	6.9351928088 N	125.4864287456 E

POINT	LATITUDE (N)	LONGITUDE (E)
12	6.9348490945 N	125.4878922638 E
13	6.9365119884 N	125.4878833563 E
14	6.9373186638 N	125.4878833563 E

1.1.2 Project Area

36 The cement grinding facility will be installed in a portion of a 111,765-square meters (11.7 Has.) property located in Barangay Darong, Sta. Cruz, Davao del Sur.

37 The nearest plants near the cement grinding facility are listed in the table below.

Table 1-3: Proximity of Other Plants with the Project Area

DIRECTIONAL REFERENCE (FROM THE PROJECT AREA)	TYPE OF PLANT	BRIEF DESCRIPTION
North	Coal-Fired Power Plant	▪ Therma South Inc. is wholly-owned subsidiary of Aboitiz Power Corporation operates a 300-MW circulating-fluidized bed coal-fired power plant in Davao City and Sta. Cruz, Davao del Sur. It is approximately 3 km away from the proposed site.
West	Feed Mill Facility	▪ A feed mill facility owned by San Miguel Foods, Inc. located in Brgy. Darong. It is approximately 150 m away from the proposed site. The facility is still being constructed.
	Brewery	▪ A brewery owned by San Miguel Brewery Inc. (Davao Brewery) located in Brgy. Darong. It is approximately 1 km away from the proposed site.
	Coconut-Processing Plant	▪ A coconut desiccating plant owned by Franklin Baker located in Brgy. Darong. It is approximately 1.5 km away from the project site.

1.1.3 Project Impact Areas

38 Initially, the project impact area generally consisted of the 11.7-hectare project footprint as the direct impact area (DIA) and the areas in the immediate vicinity of the project site in the host barangay LGU Darong as the indirect impact area (IIA). In accordance with the guidelines provided in DAO 2017-15, after the completion of the EIA study, the delineation of the direct and indirect impact areas was updated as follows:

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

- For the Water component, the DIA refers to the location of the deep well within the project site that will be tapped to supply the water requirements of the project. Nearby groundwater sources were considered in the general characterization of the project area. Further, the construction of the proposed pier facility and delivery of raw materials via Panamax vessels during operations, that will potentially affect the water quality of the municipal water of Sta. Cruz (Davao Gulf) and surrounding marine ecosystem (IIA).

- For the Air component, the DIA covers the areas within the host barangay of Darong where the ground-level concentrations (GLC) of total suspended particles (TSP), the criteria pollutant of potential concern, were projected to exceed 40 µg/Ncm based on 1-hr averaging time. According to the dispersion modelling, the maximum GLC does not exceed the standards stated in DAO 2000-81.

- For the People component, the IIA encompasses the communities in the host Municipality of Sta. Cruz, particularly Brgy. Darong (host barangay), which are expected to benefit from the employment, business opportunities, taxes, and other potential socio-economic contributions of the project.

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

1.1.4 Accessibility of the Project Site

40 The proposed project site is approximately 35 kilometers away (or about 1-hour drive) from the Francisco Bangoy (Davao) International Airport. It is located near the San Miguel Brewery Davao Plant and can be easily accessed by any type of land vehicle via the Pan-Philippine (Maharlika) Highway.

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

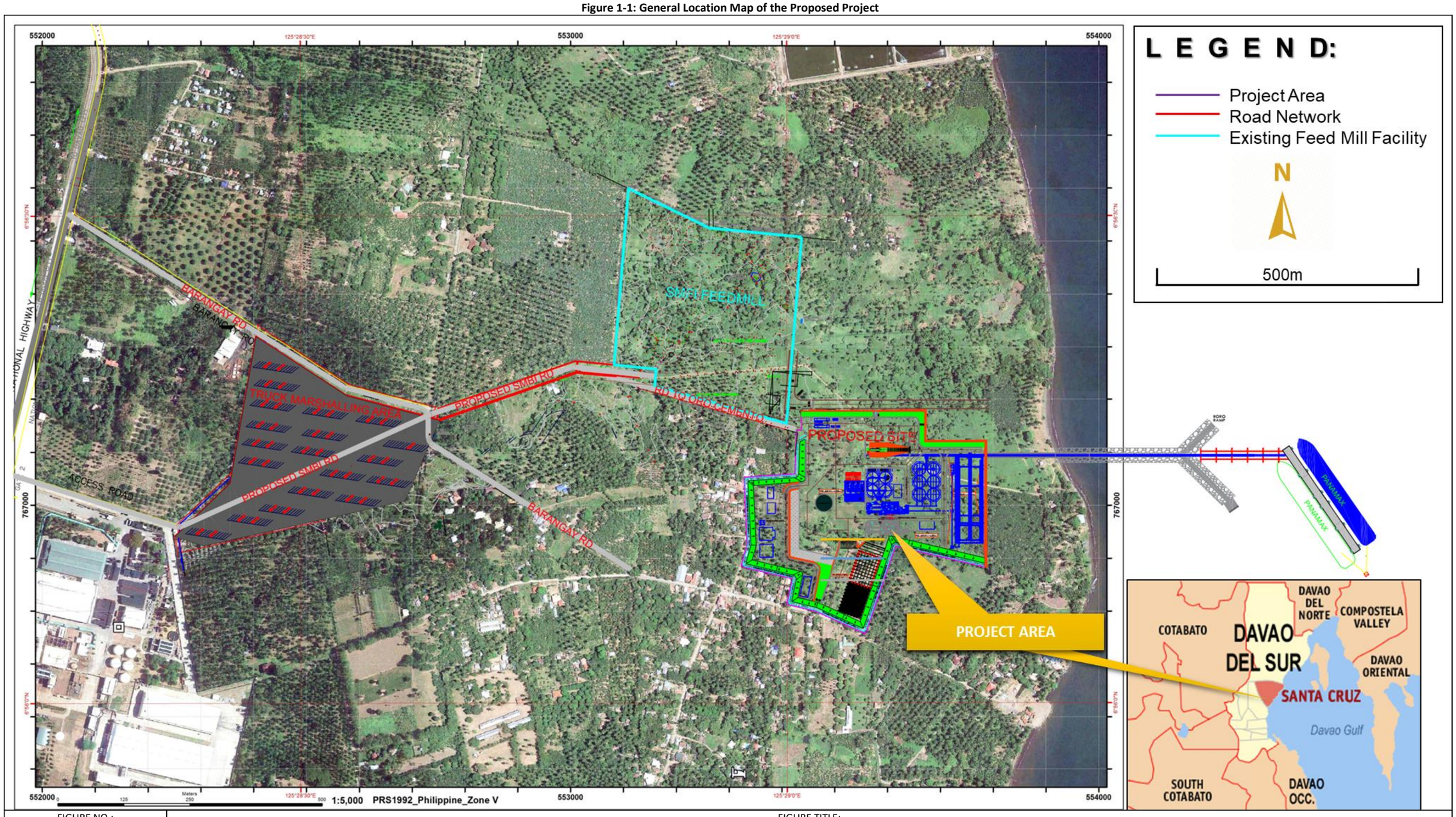


FIGURE NO.:	FIGURE TITLE:
1-1	**GENERAL LOCATION MAP OF THE PROPOSED PROJECT**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 1-2: Primary and Secondary Impact Areas

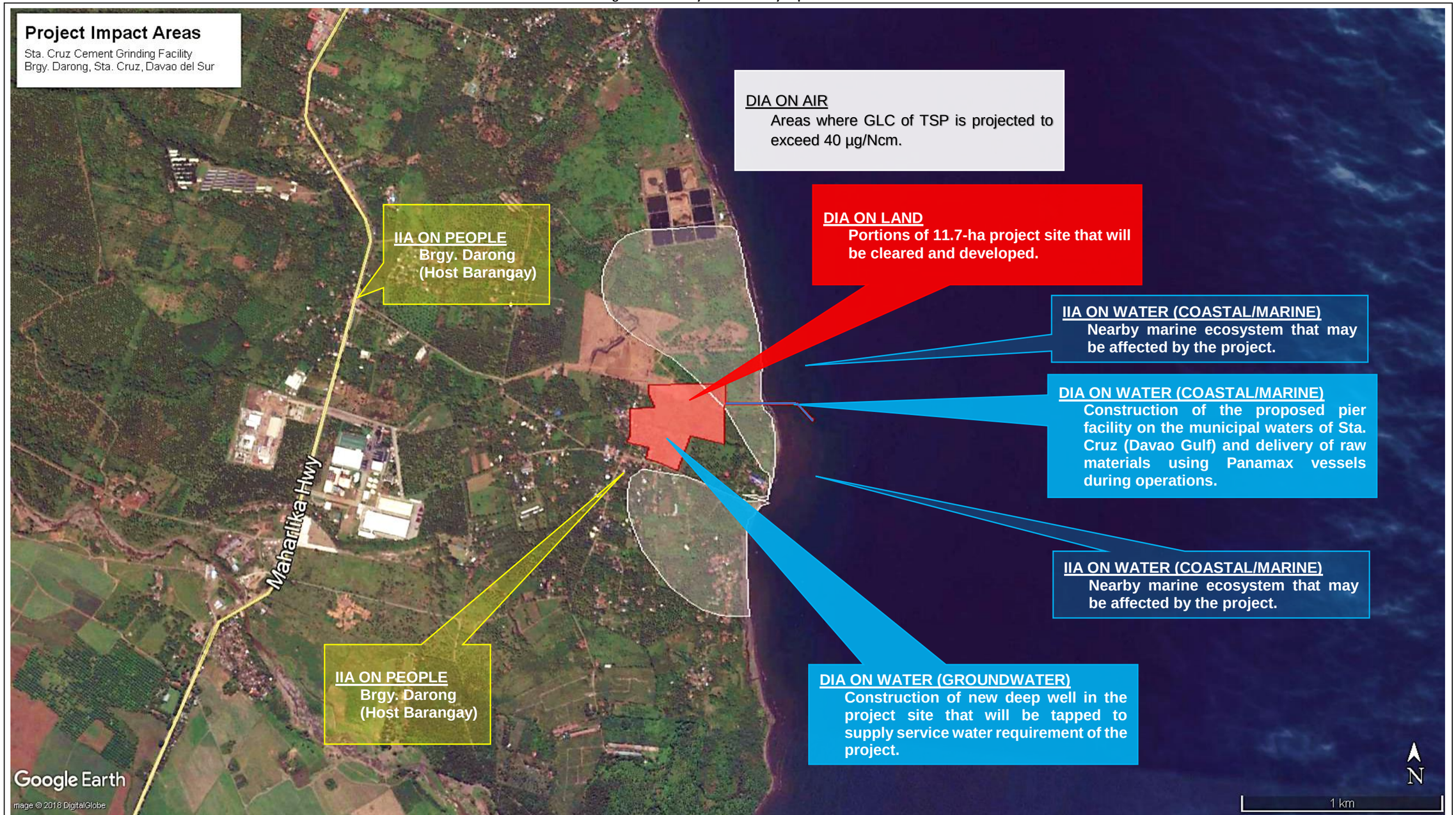


FIGURE NO.:	FIGURE TITLE:
1-2	**PRIMARY AND SECONDARY IMPACT AREAS**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 1-2a: Impact on Land

FIGURE NO.:	FIGURE TITLE:	
1-2a	**IMPACT AREA ON LAND**	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 1-2b: Impact on Water

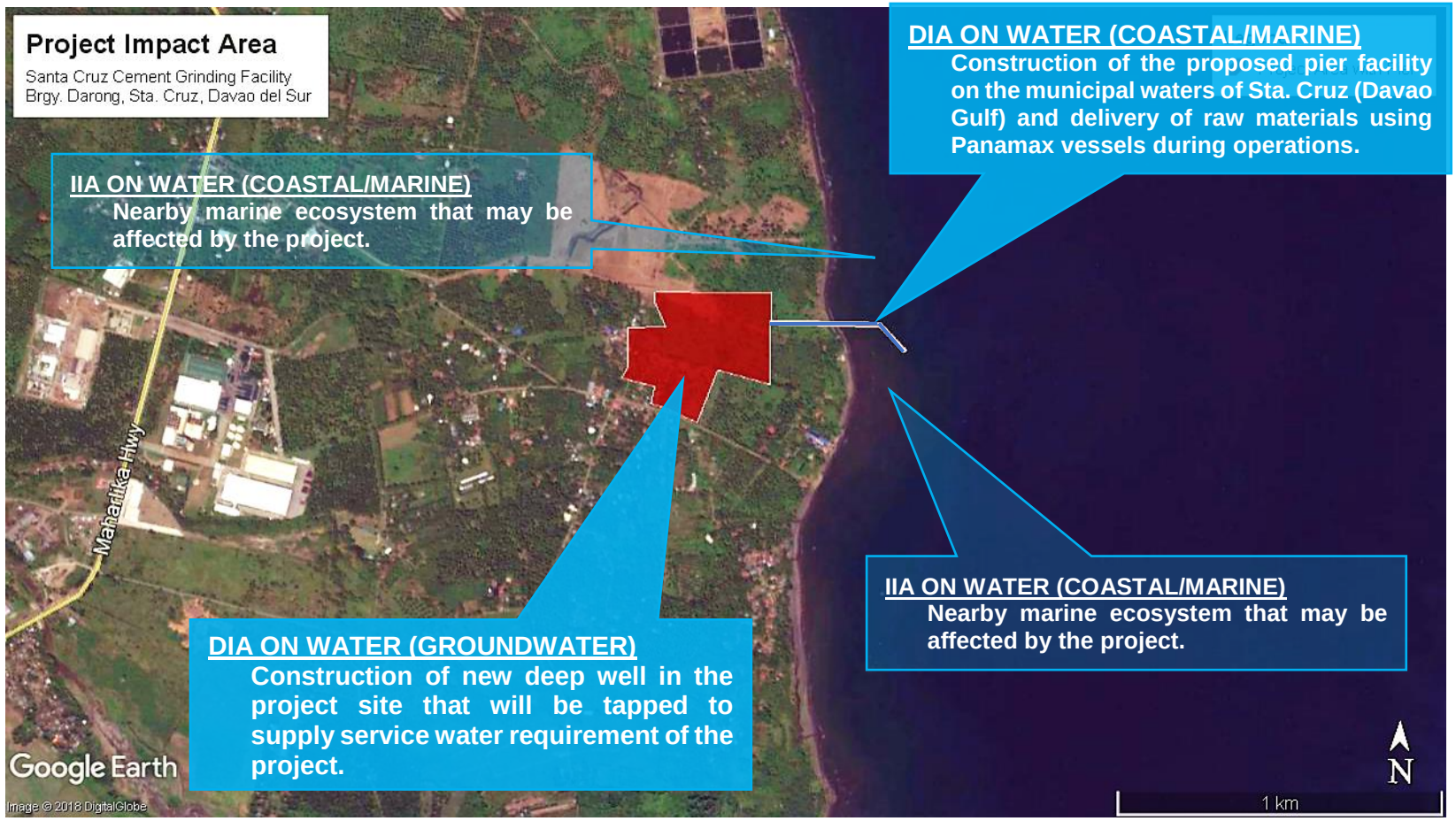


FIGURE NO.:	FIGURE TITLE:
1-2b	**IMPACT AREA ON WATER**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 1-2c: Impact on Air

FIGURE NO.:	FIGURE TITLE:
1-2c	**IMPACT AREA ON AIR**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 1-2d: Impact on People

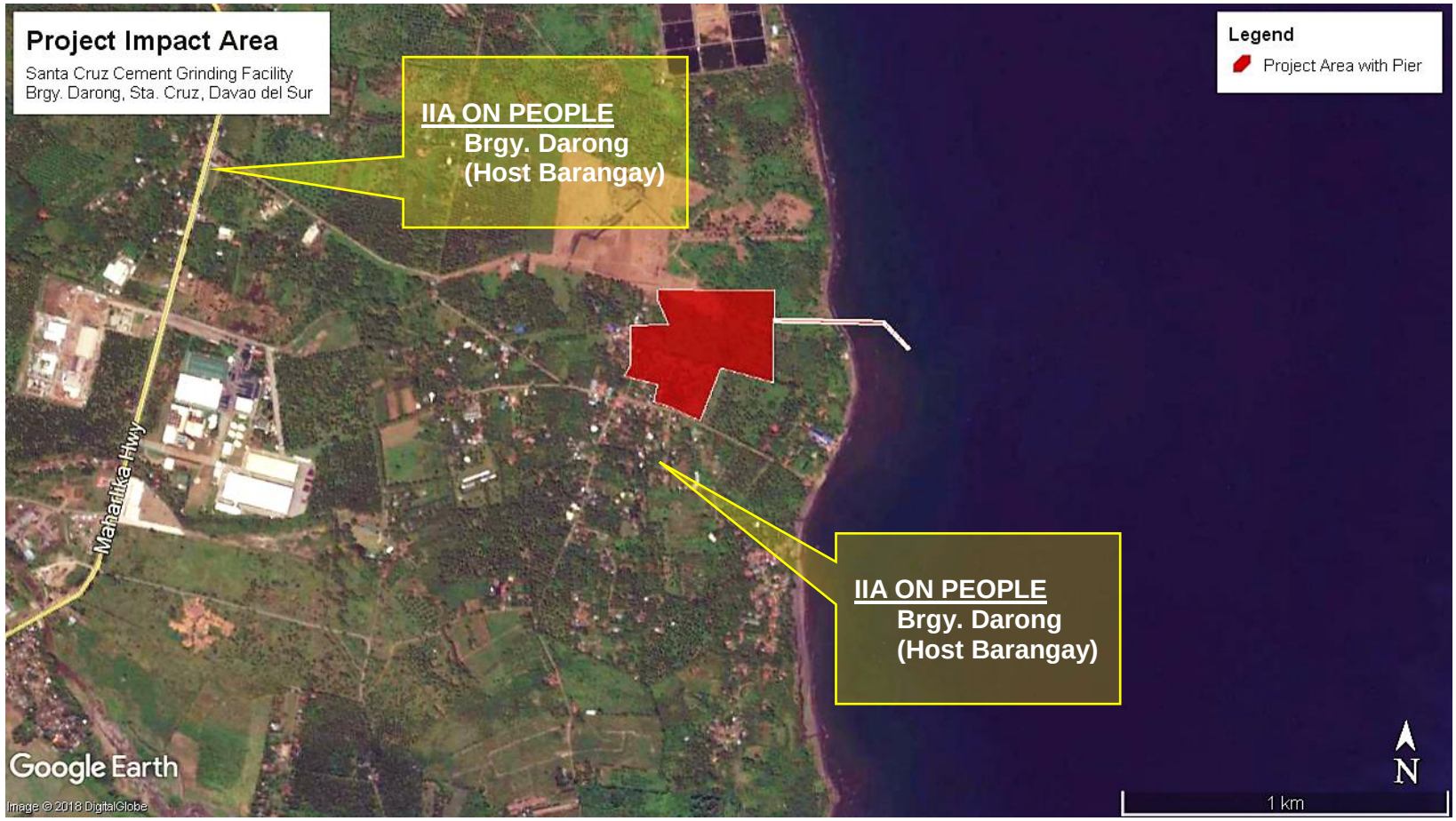


FIGURE NO.:	FIGURE TITLE:
1-2d	**IMPACT AREA ON PEOPLE**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

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

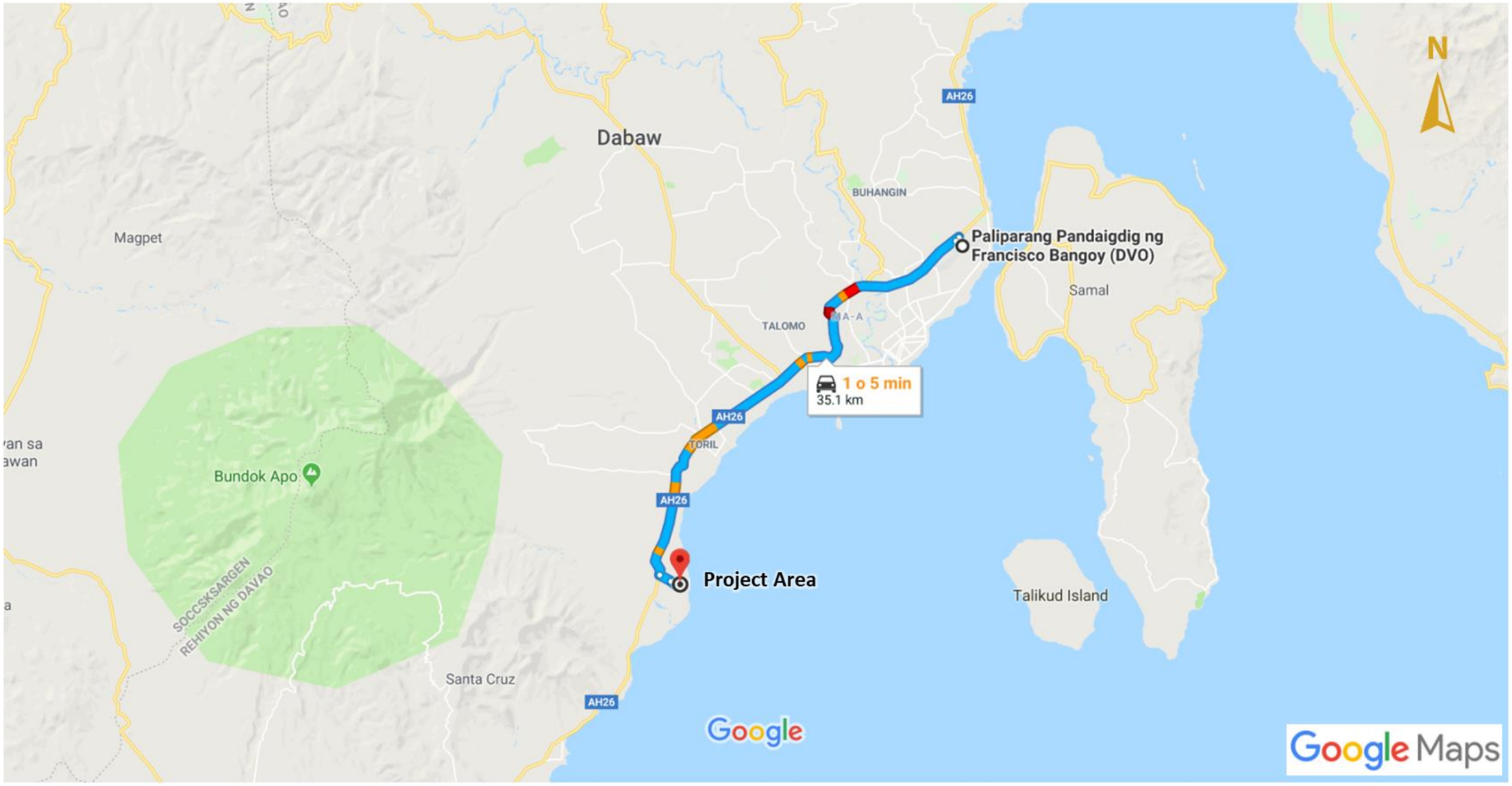


FIGURE NO.:	FIGURE TITLE:
1-3	**ACCESSIBILITY MAP OF THE PROPOSED PROJECT SITE**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 1-4: Aerial Photo of the Project Area

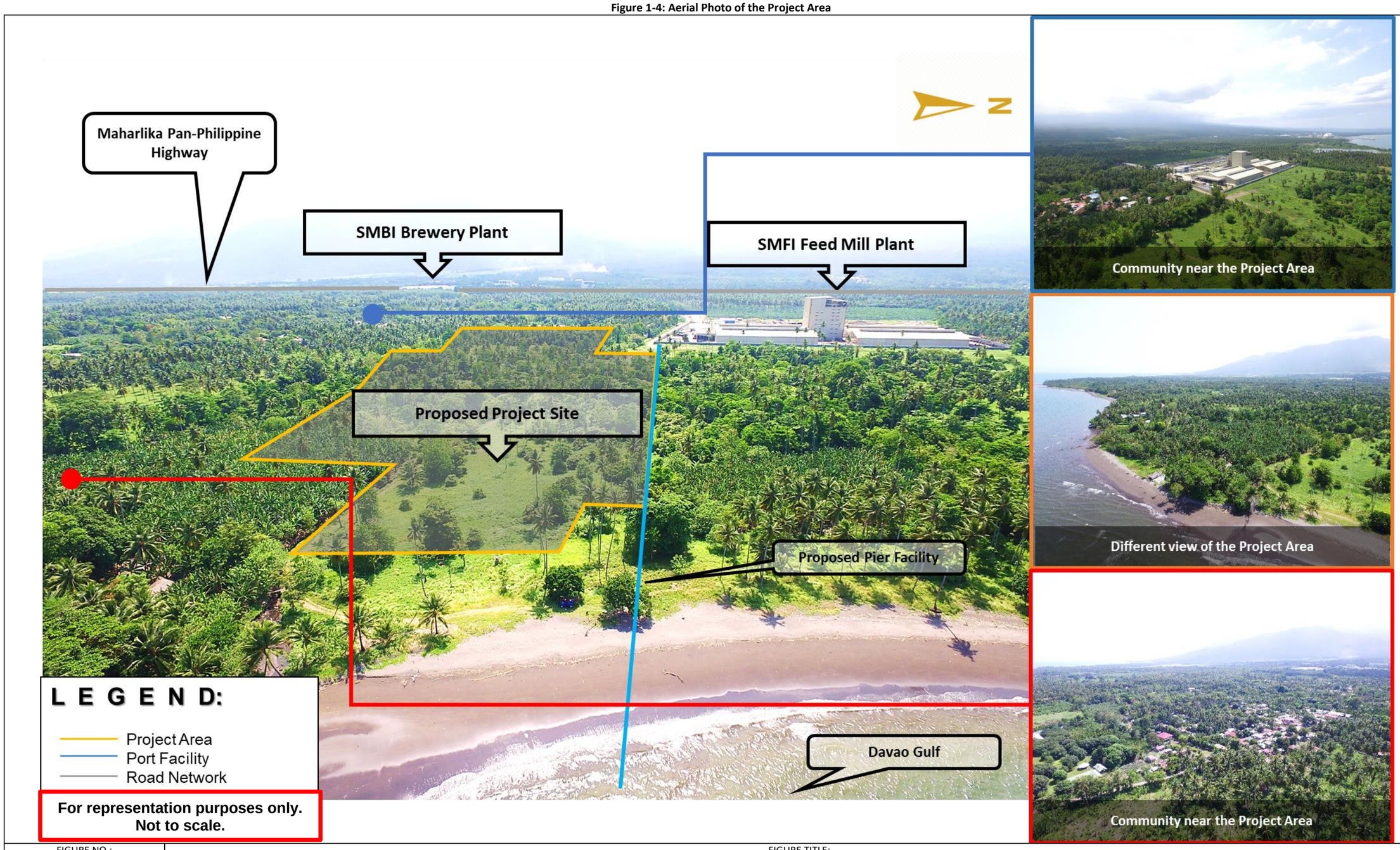


FIGURE NO.:	FIGURE TITLE:
1-4	**AERIAL PHOTOS OF THE PROJECT AREA**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

1.2 Project Rationale

41 With the increased investments in the residential, non-residential, and infrastructure sector, the construction market in Philippines is expected to grow significantly. Cement is an essential material for the construction industry and national development. A substantial demand for cement is expected to be experienced in the country over the next few years due to major planned construction projects, among other factors.

42 **Oro Cemento Industries Corporation** intends to construct a cement grinding facility with a rated capacity of 2,000,000 tons per year (2.0 MMTPY), equivalent to 50 million bags of cement annually. The clinker and other raw materials shall be delivered to this facility for grinding and bagging. The proposed project shall be undertaken to sustain the increasing demand of cement in the country. Development of the new facility will ensure that this demand can be met and will therefore contribute significantly to the sustainability of the construction industry.

1.3 Project Alternatives

Table 1-4: Comparison of Anticipated Environmental Impacts of Project Alternatives

ALTERNATIVES	ANTICIPATED ENVIRONMENTAL IMPACTS
Full Cement Plant	• **Land:** Site preparation and earthworks for a wider tract of land may entail considerable changes in the surface landform/terrain/slope and threat to terrestrial ecology due to vegetation removal and loss of habitat. Solid waste generation may be higher due to use of more resources and employment of more personnel. • **Water:** Construction and operation of larger facilities may have higher water supply requirement that may, in turn, result to competition in water use and higher wastewater generation. • **Air:** Dust emissions from the cement processing may also adversely affect ambient air quality in the project area if not properly mitigated. • **People:** Local benefits from the large-scale project (i.e., increased employment, social and economic activities, tax revenues, and basic social services) may be greater. However, dust generated from the cement plant may cause adverse health effects to the community and workers if not properly mitigated.
Cement Grinding Facility	• **Land:** Minimal site preparation and earthworks may cause minor changes in the surface landform/terrain/slope and threat to terrestrial ecology. Solid waste generation may be low due to lower resource use and manpower requirement. • **Water:** Water supply requirement is limited and may pose little competition in water use. Wastewater generation is expected to be low. • **Air:** Dust emissions may also adversely affect ambient air quality in the project area if not properly mitigated. • **People:** Local benefits from the project include increased employment, social and economic activities, tax revenues, and basic social services. However, dust generated from the grinding plant may also cause adverse health effects to the community and workers if not properly mitigated.
No-Project Scenario	• **Land:** The land use in the area will still be allotted for industrial use, according to the present Comprehensive Land Use Plan of Sta. Cruz. • **Air:** Current ambient condition will remain to be affected by the soon-to-be operated feed mill facility. Low levels of air pollutants such as SO2, NOx, CO, and TSP will still be experienced; changes in the micro-climate will be minimal in the absence of the proposed project. • **Water:** High levels of fecal coliform will still be observed in Davao Gulf, while elevated levels of fecal coliform will remain in the groundwater. • **People:** The no-project scenario entails loss of local employment and service opportunities. If the project is not pursued, the supply of cement will be affected,

ALTERNATIVES	ANTICIPATED ENVIRONMENTAL IMPACTS
	especially with the Duterte Administration's push for infrastructure development under the "Build, Build, Build" program.

1.3.1 Site Selection

43 San Miguel Corporation (SMC) has acquired parcels of land to establish the proposed cement grinding facility which is within the area categorized as industrial land. Before the proposed location was chosen, two alternative sites were determined.

44 The alternative proposed site is located further from the proposed port site, which now became the proposed truck marshalling of SMC, intended for the operations of San Miguel Foods Inc. (SMFI) and **Oro Cemento Industries Corporation** (**Figure 1-5**). The site selection criteria for the current proposed site are given below:

a) The proposed project site is located in the industrial area, which is aimed to cater as a most suitable industrial location. Also having all basic facilities like availability of water (groundwater) and electricity.

b) Moreover, an available area for a port facility is very near which could facilitate procurement of raw materials from Luzon, Visayas and Mindanao by waterways. It will result in overall savings of fossil fuels by road transport, reduced hazardous material movement.

c) There is a huge demand of cement in the Philippines, particularly in the Davao area because of industrial development and hence the proposed project will have great potential to cater the cement demand of the market. This will eventually reduce the cost of transporting cement from a long distance and associated environmental risk.

d) Plant site is only approx. 30 km away from Davao City, which is having transportation facilities like linkage with other Regions in Mindanao, that can be accessed through the National Highways.

Figure 1-5: Site Alternative for the Cement Grinding Facility

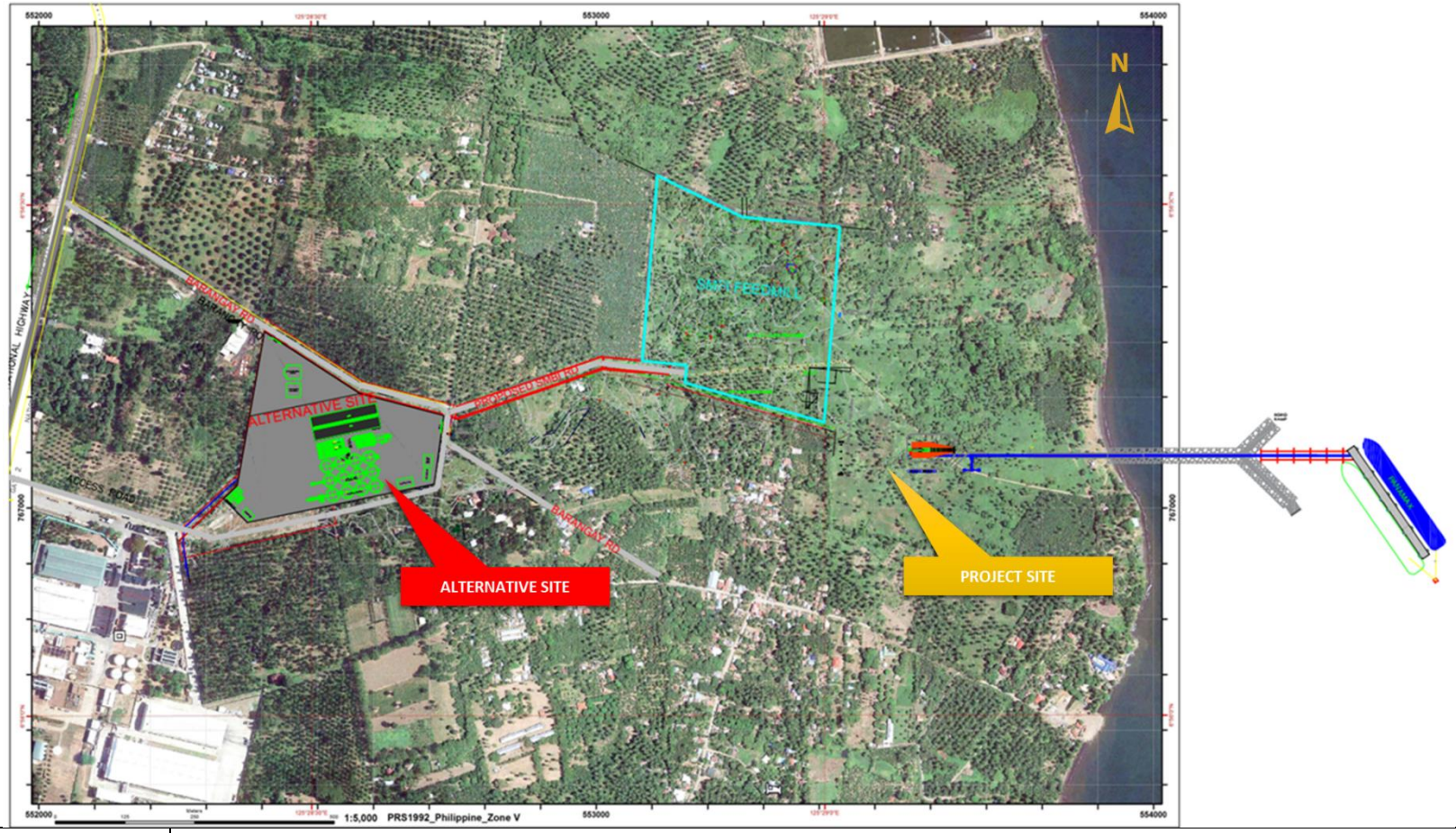


FIGURE NO.:	FIGURE TITLE:
1-5	**SITE ALTERNATIVE FOR THE CEMENT GRINDING FACILITY**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

1.3.2 Technology Selection

45 There has recently been a global trend for *"stand-alone"* cement-grinding plants instead of installing grinding units within integrated cement lines.

46 The main reasons are: a.) deposits of limestone (major raw material for cement) only occur in certain parts of the country, whereas cement demand is widely distributed throughout the Philippines, b.) since clinker is easier to transport than cement, then moving clinker closer to the market and producing cement in a stand-alone grinding unit becomes advantageous.

47 **Oro Cemento Industries Corporation** choose to implement a cement grinding facility instead of the full cement plant. Its advantage is that no kiln will be installed and no heating process. Clinker is already the raw material and will blend with cement additives in the grinding facility before bagging. Minimal air emission will also be produced since there is no stack installed to produce the clinker. One of the disadvantages of using dry process as opposed to wet process is the air emissions. Dry process generally yields more dust, although this can easily be controlled by watering the area.

Figure 1-6: Process Comparison Between Full Cement Manufacturing and Cement Grinding

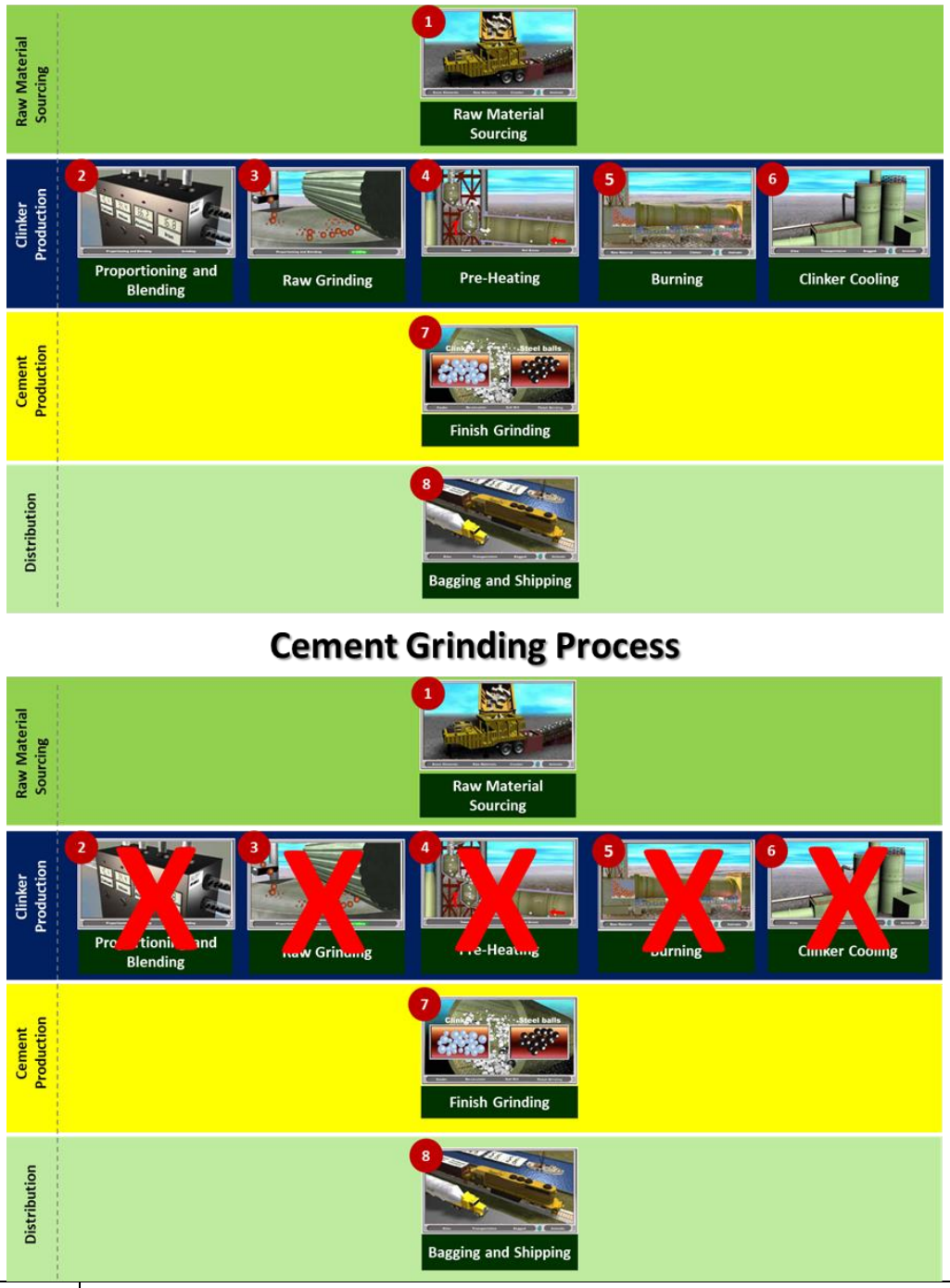


FIGURE NO.:	FIGURE TITLE:
1-6	**PROCESS COMPARISON BETWEEN FULL CEMENT MANUFACTURING AND CEMENT GRINDING**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

1.3.3 Resources

Water Resource

48 **Oro Cemento Industries Corporation** will construct deepwell pumps for its 110 cu.m./day water requirement. In addition, a water reservoir will be constructed to serve as back-up source.

Raw Materials

49 Clinker and cement additives will be sourced from local as well as foreign sources.

1.4 Project Components

50 The project components for the cement grinding facility are summarized in **Table 1-5**. These include the components for cement grinding and support facilities. The proposed facility layout is presented in **Figure 1-9**.

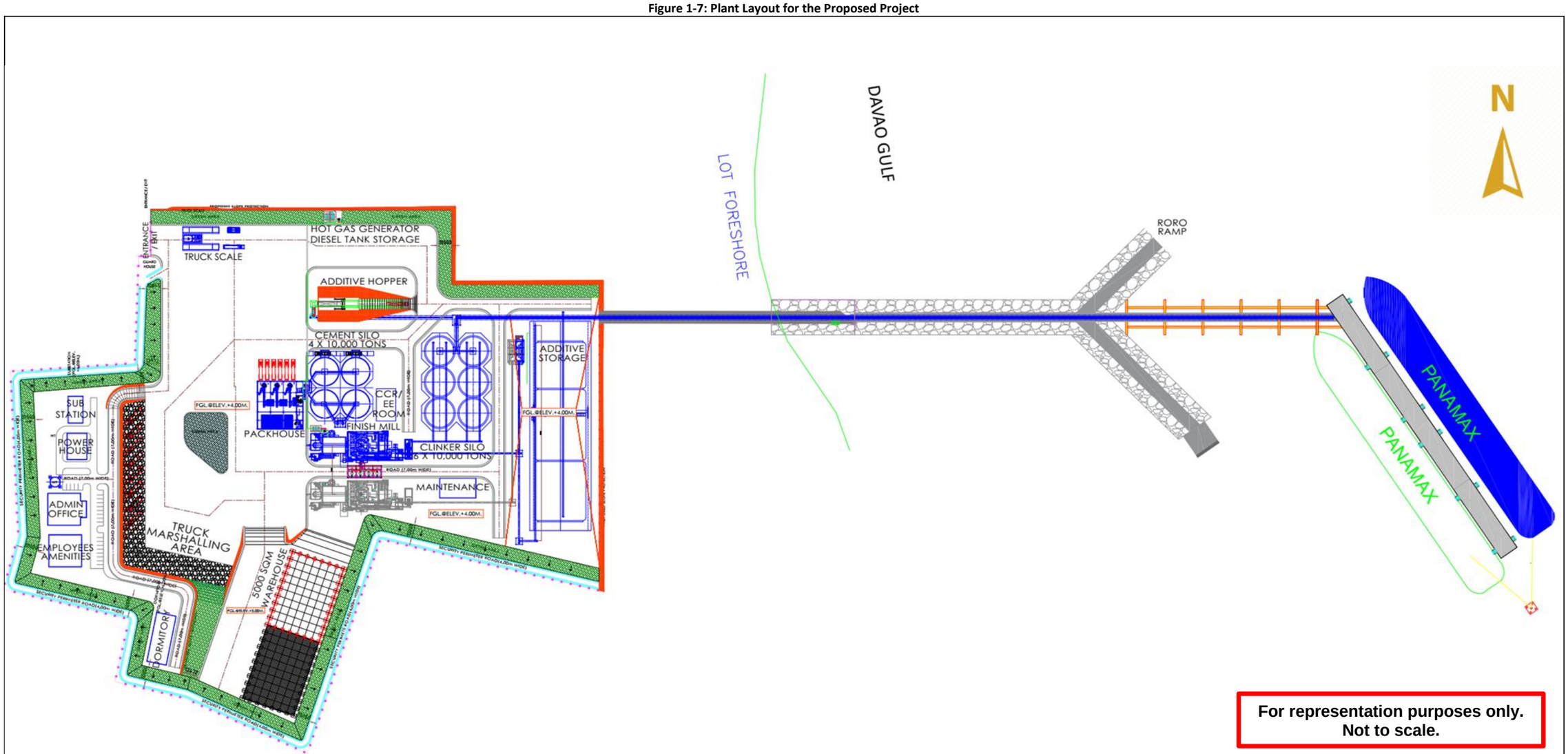
Table 1-5: Project Components of the Proposed Cement Grinding Facility

PROJECT COMPONENT	DESCRIPTION/SPECIFICATIONS
Raw Materials Storage	Longitudinal storage with 50,000 MT capacity and with mechanical reclaimer
Clinker Storage	6 x 10,000 tons capacity
Dosing Silos	6 x silos with various sizes, with weigh feeders
Cement Mill	1 x 250 TPH Vertical Roller Mill
Cement Storage	4 x 10,000 tons capacity
Cement Packing and Dispatch	3 x 90 TPH Rotary Packing machine
Water Source	2 Deepwell Pumps (capacity: 110 cu.m./day)
Air Pollution Control	Bag Filters
Wastewater Pollution Control	Septic Tanks Sewage Treatment Plant
Pier Facility	Raw Material/Clinker Unloading & Conveyor
Support Facilities • Warehouses • Administration Building and Staff House • Parking and Truck Marshalling Area • Water and Wastewater Treatment Facilities • Clinic • Power Substation	

Temporary Facilities (During Construction)

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

Figure 1-7: Plant Layout for the Proposed Project



For representation purposes only. Not to scale.

FIGURE NO.:	FIGURE TITLE:
1-7	**PLANT LAYOUT FOR THE PROPOSED PROJECT**

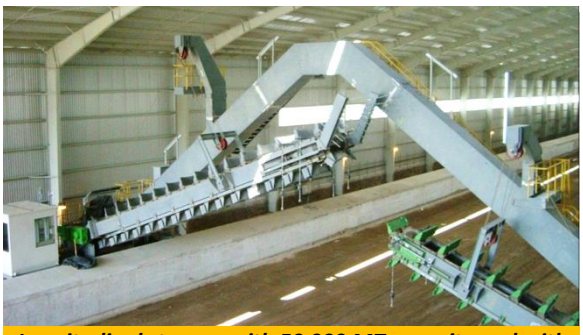
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

1.5 Process/Technology

1.5.1 Major Components

1.5.1.1 Raw Materials Receiving and Storage

52 Clinker will be delivered by at least 2 maritime vessels of Panamax Class, in addition, about 2 to 3 smaller vessels will transport gypsum. The port stay of these maritime vessels will be 20 days per month. These will then be conveyed to silos for storage. The other raw materials will be delivered by trucks and stored in the longitudinal storage. An overhead stacking conveyor with travelling tripper will distribute the materials along the length of the storage hall.



Longitudinal storage with 50,000 MT capacity and with mechanical reclaimer
(Photo source: supplier brochure)

53 Fly ash will be delivered by truck bulk carriers and transferred and then pneumatically conveyed to storage silo.

1.5.1.2 Material Feeding into the Mill

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

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

Typical cement weigh feeder
(Photo source: supplier brochure)

1.5.1.3 Cement Grinding

56 The materials will be ground in a vertical roller mill. They will be pulverized as they are crushed in between the four rollers pressing on a rotating table. Hot air is injected from underneath the nozzle ring outside the periphery of the rotating table. This jet of hot air dries the materials and the fine particles are entrained by the gases exiting thru a rotating classifier at the upper portion of the mill body. There is internal recirculation of the particles that could not pass thru the internal classifier. The coarse particles are rejected out of the mill and are re-circulated into the mill for re-grinding. The finer particles pass thru the classifier and are carried by the exit gases that will pass thru a bag filter where the finished cement will be separated

250 TPH Vertical Roller Mill
(Photo source: supplier brochure)

by the bags and collected at the bottom of the bag filter and subsequently conveyed into the cement silos. There is internal recirculation of the particles that could not pass thru the internal classifier.

1.5.1.4 Cement Storage and Dispatch

90 TPH Roto packers
(Photo source: supplier brochure)

57 Cement in the four cement silos are extracted at the bottom by sets of air slides and is conveyed to the bins of the rotary packing machines. Each of the three roto-packers has eight spouts which fill the bags as the machine rotates. The filled bags containing 40 kilograms of cement are conveyed to trucks on where they will be loaded manually.

58 Cement may also be dispatched in bulk to bulk carriers from a separate bulk cement bin thru expandable bellows. Cement may also be dispatched in jumbo bags with 1,000 kilograms net content. The jumbo bag loading facility will be located under the cement silo. Loading of cement into bulk carriers is controlled by the weight of cement already loaded into the bulk carrier.

Figure 1-8: Process Diagram of Cement Grinding Production

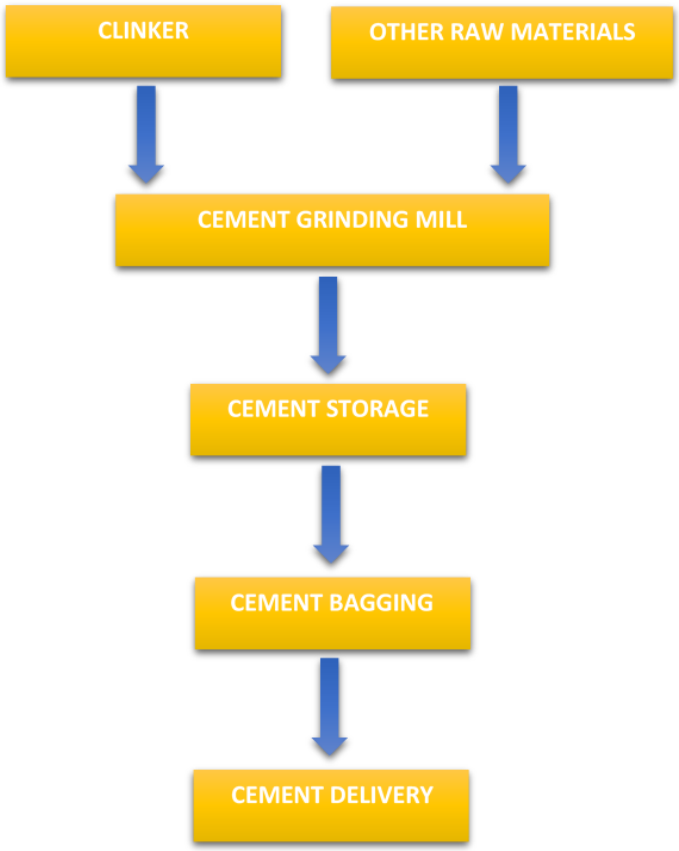


FIGURE NO.:	FIGURE TITLE:	
1-8	**PROCESS DIAGRAM OF CEMENT GRINDING PRODUCTION**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

1.5.2 Support Facilities

59 To receive clinker from sources far from the plant site, a pier will be constructed to accommodate ships of up to 80,000 Mt DWT (Panamax Class vessels). At least 2 Panamax vessels will be docked in a month with port stay of 20 days. With regards to the height of the port facility, it will be 5.2 mean low low water (MLLW). Clinker will be imported from countries like Indonesia and Vietnam.

60 San Miguel Foods, Inc. (SMFI) will also be utilizing the pier facility, with at least 2 to 3 maritime vessels per month with 10 to 12 days port stay.

61 Unloading will be done using the cranes of the ships. There will be hoppers on the pier head to receive the materials and underneath the hoppers will be a conveyor that will transport the clinker to the silos inside the cement plant premises.

62 There will also be a ramp to accommodate RORO vessels (LCTs or barges) handling gypsum and pozzolan. At least 2 to 3 RORO vessels will be docked twice a month with port stay of 3 days.

63 Modular dust collectors will be installed at the hoppers area and at conveyor transfer points, up to the top of the clinker silos.

64 In addition, warehouses, administration building, staff house, utility building, and parking and truck marshalling area will be constructed to support the operation of the proposed project.

Figure 1-9: Pier Facility Perspective

FIGURE NO.:	FIGURE TITLE:
1-9	**PIER FACILITY PERSPECTIVE**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

1.5.2.1 Water Supply and Demand

65 Water will be sourced from 2 deep wells to be installed within the project area. A water reservoir (elevated tank) will be constructed for water storage with a capacity of 150 cu. m. Everyday, 110 cu. m. will be consumed by the project based on the following uses: (a) 30 cu. m./day for industrial use, (b) 50 cu. m./day for gardening of green area, and (c) 30 cu. m./day for domestic use.

66 There will be a separate storage tank for fire protection.

67 For industrial use, the cement mill cooling system will use 8 cu. m./day and will be stored in a siltation pond for re-use. Evaporation rate is estimated at 2 cu. m./day. Dust suppression (including road watering) will utilize 20 cu. m./day.

68 For domestic use, approx. 30 cu. m./day of water will be utilized. 5 cu. m./day will be consumed, while 25 cu. m./day will be domestic waste water. The waste water will be treated in the sewage treatment plant and will eventually be discharged in the storm drainage (25 cu. m./day).

Table 1-6: Water Use for the Proposed Project

WATER USE	WATER CONSUMPTION (m^3/day)	WASTEWATER GENERATION (m^3/day)
Domestic Use	30	25
Green Area Gardening (13,600 m2)*	50	-
Cement Mill Cooling	10	-
Dust Suppression	20	-
Total	**110**	**25**

Note: * - using gardening requirement of 0.623 gal/sq.m.-week

Figure 1-10: Water Balance for the Project

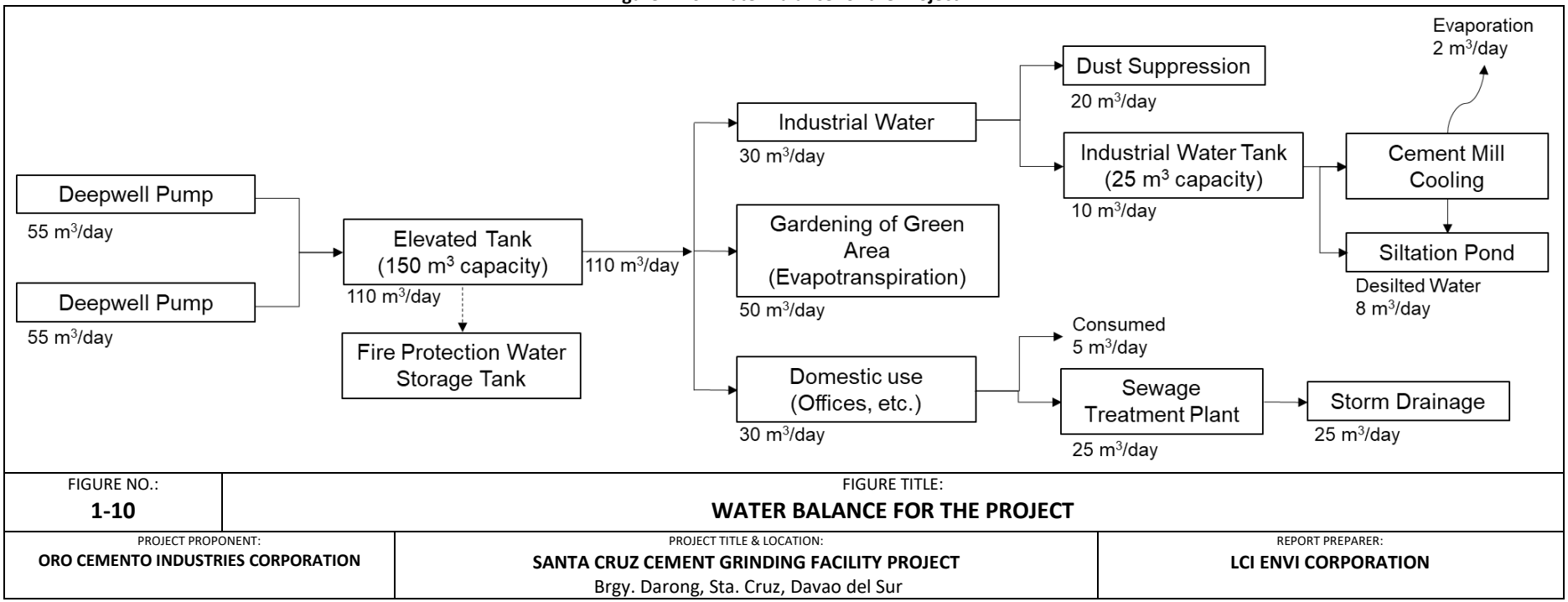


FIGURE NO.:	FIGURE TITLE:
1-10	**WATER BALANCE FOR THE PROJECT**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

1.5.2.2 Power Supply and Demand

69 During operation, the facility is expected to consume about 12 Megawatt (MW) of electricity to be supplied by the National Grid Corporation of the Philippines (NGCP) and/or Davao del Sur Electric Cooperative, Inc. (DASURECO).

1.5.3 Material Balance

70 The materials that will be processed by the cement grinding facility include clinker, pozzolan, gypsum, and fly-ash. The material balance is presented on **Figure 1-11**. The cement grinding facility will process about 1,700,000 TPY of clinker, 100,000 TPY of pozzolan, 100,000 TPY of gypsum, and 100,000 TPY of fly-ash.

71 Since the project employs a closed-process system with baghouse filters, material losses will be very minimal and negligible compared to the total product. The baghouse filters to be used are 99.99% efficient. Thus, there will only be an expected loss of 0.01%, or 200 tons per year.

Figure 1-11: Material Balance of the Cement Grinding Facility

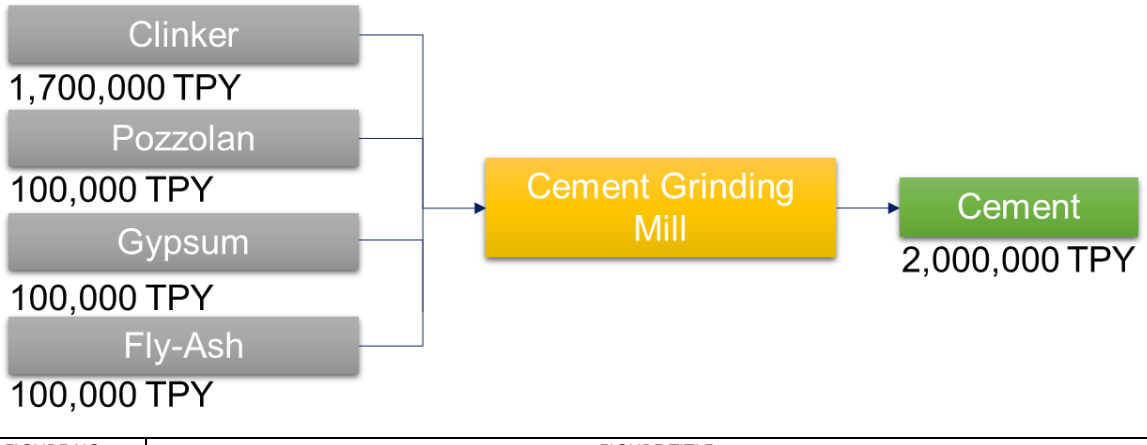


FIGURE NO.:	FIGURE TITLE:
1-11	**MATERIAL BALANCE OF THE CEMENT GRINDING FACILITY**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

1.5.4 Pollution Control Devices

1.5.4.1 Air Pollution Control

72 The priority is to minimize the increase in ambient particulate levels by reducing the mass load emitted from fugitive emissions and from other sources. Collection and recycling of dust is required to improve the efficiency of the operation and to reduce atmospheric emissions. For control of fugitive particulate emissions, ventilation systems shall be used in conjunction with hoods and enclosures covering transfer points and conveyors. Drop distances shall be minimized using adjustable conveyors. The operations of the air pollution control system are described in the following sections:

- Bag filters are installed at various points in the plant to collect the solid particulates escaping from the system. The bag filters have guaranteed efficiency of 99.99% in eliminating the dust. The bag filters are provided with a fan, driven by an electric motor, to regulate volumetric flow, gas temperature, and static pressure.

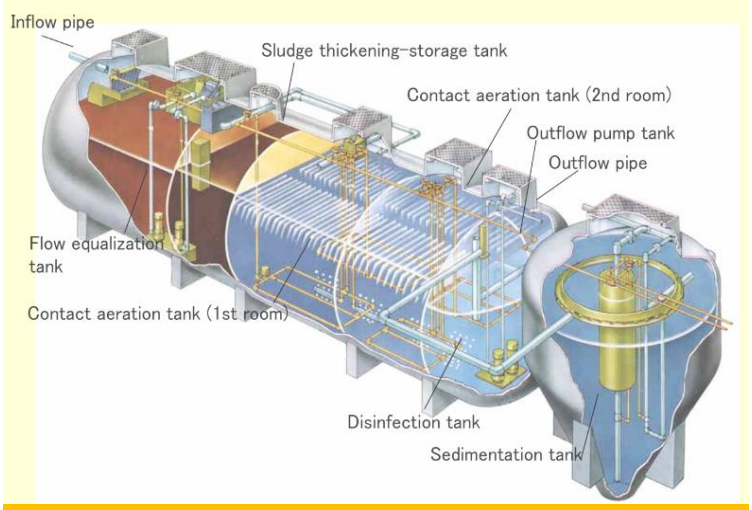
- Operating areas which could be dusty, such as the pack house and the additives storage hall will be fully enclosed and provided with dust collectors. Fugitive dusts on the roads will be suppressed with water sprays.
- A green area about 10 meters wide will be constructed along the sides of the plant premises where residential houses are located nearby. The green area will be planted with trees of various heights and "thicknesses" to act as dust barrier or dust curtain.

Table 1-7: Air Pollution Source and Corresponding Air Pollution Control Facility

AIR POLLUTION SOURCE	AIR POLLUTION CONTROL FACILITY
Belt Conveyor (Raw Material/Clinker Unloading)	• Bag Filters
Clinker Silo	• Bag Filters
Clinker Silo discharge	• Bag Filters
Transport conveyor	• Bag Filters
Cement Mill feed transport	• Bag Filters
Top of clinker bin	• Bag Filters
Air slide transport to Cement Silo	• Bag Filters
Cement Mill Fly Ash Bin	• Bag Filters
Cement Silo	• Bag Filters
Pack House (Bag filter at Roto Packer)	• Bag Filters
Transport Bag Filter	• Bag Filters

1.5.5 Water Pollution Control

73 With regards to the sewage generation coming from domestic sources will be drained in the Sewage Treatment Plant (STP). For the capacity of STP, the project will generate domestic waste water at around 25 m^3/day. Compact-type STP technology, such as *"Johkasou"* technology from Japan, will be employed for the project.



Middle-scale Johkasou Diagram
(Photo source: supplier brochure)

1.5.6 Solid Waste Control

74 Solid wastes from the office, dormitory/kitchen and other facilities will be segregated as to non-/bio-degradable will be disposed of accordingly with the help of the municipal government.

1.6 Project Size

75 The proposed cement grinding facility will have a rated capacity of 2,000,000 tons of cement per year or 50 million cement bags per year. This translates to 6,000 tons per day of cement based 22-hours operating time and 335 days per year of operation.

76 The proposed facility will cover a total of 11.7 Has., through a certification from San Miguel Corporation and Paul William Uy, situated inside the industrial area in Barangay Darong, Sta. Cruz, Davao del Sur.

1.7 Development Plan, Description of Project Phases and Corresponding Timeframes

1.7.1 Pre-Construction

77 Site preparation and clearing will be done prior to the construction phase. Initial development of the area includes the enhancement of road networks for increased accessibility and easier transport of materials and supplies. This phase of the proposed project will also involve the acquisition of the necessary documents before actual construction, such as Environmental Compliance Certificate (ECC), Building Permits, and Permit-to-Operate (PTO) Application.

78 The project site has already secured an ECC for site development and warehouse last March 2018. Site clearing and development activities will take 6 months and is expected to be completed by October 2018.

1.7.2 Construction

79 Immediately thereafter, the development of the area shall follow. This involves construction/installation of the cement grinding and support facilities. The equipment to be used will be purchased and assembled on site. Proper occupational safety and health procedures will be implemented to ensure the welfare of the workers.

80 The construction of the warehouse facility will begin by September 2018 and is expected to be completed in 5 months.

81 In addition, the construction of the cement grinding facility and pier is targeted on November 2018. The expected duration of the construction is 10 months (until August 2019).

1.7.3 Operations

82 Major activity of the plant entails the 24/7 operation of the cement production. The same strict observation of occupational health and safety during construction will be followed.

83 Once the installation of equipment is done (13 months), commissioning activities will take place on January to February 2020. Operations will take place starting March 2020.

1.7.4 Abandonment

84 The proposed project is not expected to be abandoned within the next 30 years of its planned operations. However, the abandonment of the facility may be necessary due to the following potential scenarios:

- Unsustainable business operations due to economic downturns;
- Changes in zoning and other related ordinances of Sta. Cruz;
- 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.

Table 1-8: Indicative Timeline of Activities

ACTIVITIES	2018											2019												2020		
	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Secure ECC for Site Dev't. and Warehouse																									
Site Clearing and development inc. access road																									
Construct warehouse																									
Secure ECC for Cement Grinding Plant																									
Construction of Pier, Foundations & Plant Buildings																									
Delivery of Equipment Components																									
Installation of Equipment																									
Commissioning/ Start-up																									
Design/Construct other facilities																									

LEGEND
Permit Ready
Engineering Design
Bidding/Award
Document Preparation
Construction
Equipment Delivery
Installation
Commissioning
Commercial Operation

1.8 Manpower

85 **Table 1-9** summarizes the manpower requirements throughout the development phases of the proposed project. As shown, around 200 workers will be employed for the construction of all necessary project components and facilities, and an estimate of 50 personnel, inclusive of engineers and skilled workers, will be hired to run the cement grinding facility on a 24/7 operation.

Table 1-9: Manpower Requirement

PROJECT PHASE	ESTIMATED MANPOWER REQUIREMENTS	TASKS TO BE PERFORMED	SKILLS REQUIREMENTS
Construction	~200	• Civil works, architectural, and electro-mechanical works	• Engineers, project managers, skilled and non-skilled laborers
Operation	~50	• Oversee the entire operations of the proposed project, including emergency situations; Ensuring the safety and welfare of its personnel • Maintain conformity of the proposed project to relevant government regulations, including tax payments, ECC compliance, etc. • Promote and uphold a harmonious relationship with the host community	• Management and administration skills; over-all knowledge on the operation including key environmental, labor, and local ordinances
Abandonment	~10	• Implement the abandonment plan	• As required

86 **Oro Cemento Industries Corporation** will prioritize hiring of locals whose skills and experience match the specific needs of the project. The proponent will also provide the necessary training of locals for possible hiring as the need arises.

1.9 Project Cost

87 Indicative cost for the proposed project is estimated to be **Php 2,000,000,000.00 (2 Billion Pesos)**. These will include the following:

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

SECTION 2

ASSESSMENT OF ENVIRONMENTAL IMPACTS

2.1 The Land

88 For the Land component of the EIA study, coverage includes the proposed site for development as the direct impact area. The relevant baseline characterization and impact assessment are presented in the succeeding sub-sections: land use and classification; geology/geomorphology; pedology; and terrestrial ecology.

2.1.1 Land Use and Classification

89 As indicated in **Section 1.1**, the proposed project site lies within the political jurisdiction of Brgy. Darong and the Municipal Government of Sta. Cruz in the Province of Davao del Sur in Region XI (Davao Region). The Municipality of Sta. Cruz is politically subdivided into nine urban barangays, as shown in **Figure 2-1**. The respective land area of region, province, municipality, and barangay that cover the proposed project site are presented in **Table 2-1**.

Table 2-1: Land Area of Region XI, Province of Davao del Sur, Sta. Cruz, and Brgy. Darong

JURISDICTION	LAND AREA (HAS.)
Region XI (Davao Region)	**2,043,338**
Province of Davao del Sur	**516,400**
Municipality of Sta. Cruz	**28,759**
Barangay Darong	**1,483**
Sources: Philippine Statistics Authority National Economic and Development Agency Region XI	

90 Sta. Cruz is one of the 15 municipalities in Davao del Sur. It has a total land area of 28, 759.79 Has. excluding the contested area in Barangay Kapatagan (33,474 has if included). It is geographically situated between two urban growth centers. It bounded by Davao City, the Regional Center, from the north, Davao Gulf from the east and Digos City, the Provincial Center, from the south and Mt. Apo from the west. It is approximately between the geographical coordinates 125˚ 16'10" and 125˚ 29' 25" E longitude and 6˚ 26'26" and 6˚59'22" N latitude. Around 58% of the municipality occupies the eastern slope of Mt. Apo.

91 The municipality is composed of 18 barangays characterized as follows: seven upland, nine upland-lowland-coastal and two lowland coastal. Barangay Darong, the location of the proposed site, is bordered by Barangay Inawayan from the north, Davao Gulf from the east, Barangay Sibulan from the west and Barangay Astorga from the south.

2.1.1.1 Impact in terms of compatibility with existing land use

92 The current land use of Brgy. Darong is composed of 10 uses including residential, commercial, industrial, agro-industrial, agricultural, institutional, forest (mangrove), cemetery, river & creek and road networks. In which, 1,395.41 Has. (94%) is classified as agricultural. The project area, leased under TCT-10896 and TCT-25159, are classified for industrial use. **Table 2-2** presents the current land use of Brgy. Darong.

Table 2-2: Current Land Use of Barangay Darong

BARANGAY	BASE ZONE											TOTAL (HAS.)
	Residential	Commercial	Industrial	Agro-Industrial	Agricultural	Institutional	FOREST		Cemetery	River & Creek	Road Network	
							MANP	Mangrove				
Darong	11.09	0.82	38.97	7.26	1395.41	2.94	-	4.73	0.10	4.51	17.49	1483.32

Source: Comprehensive Land Use Plan of Sta. Cruz

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

93 The proposed project site does not fall within any declared environmentally critical area (ECA), defined in the DENR Administrative Order No. (DAO) 2017-15 as *"an area that is environmentally sensitive and is so listed under Presidential Proclamation No. 2146, Series of 1981, as well as other areas which the President of the Philippines may proclaim as environmentally critical in accordance with Section 4 of Presidential Decree No. 1586."*

2.1.1.3 Impact in existing land tenure issue/s

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

Figure 2-1: Administrative Map of the Municipality of Sta. Cruz

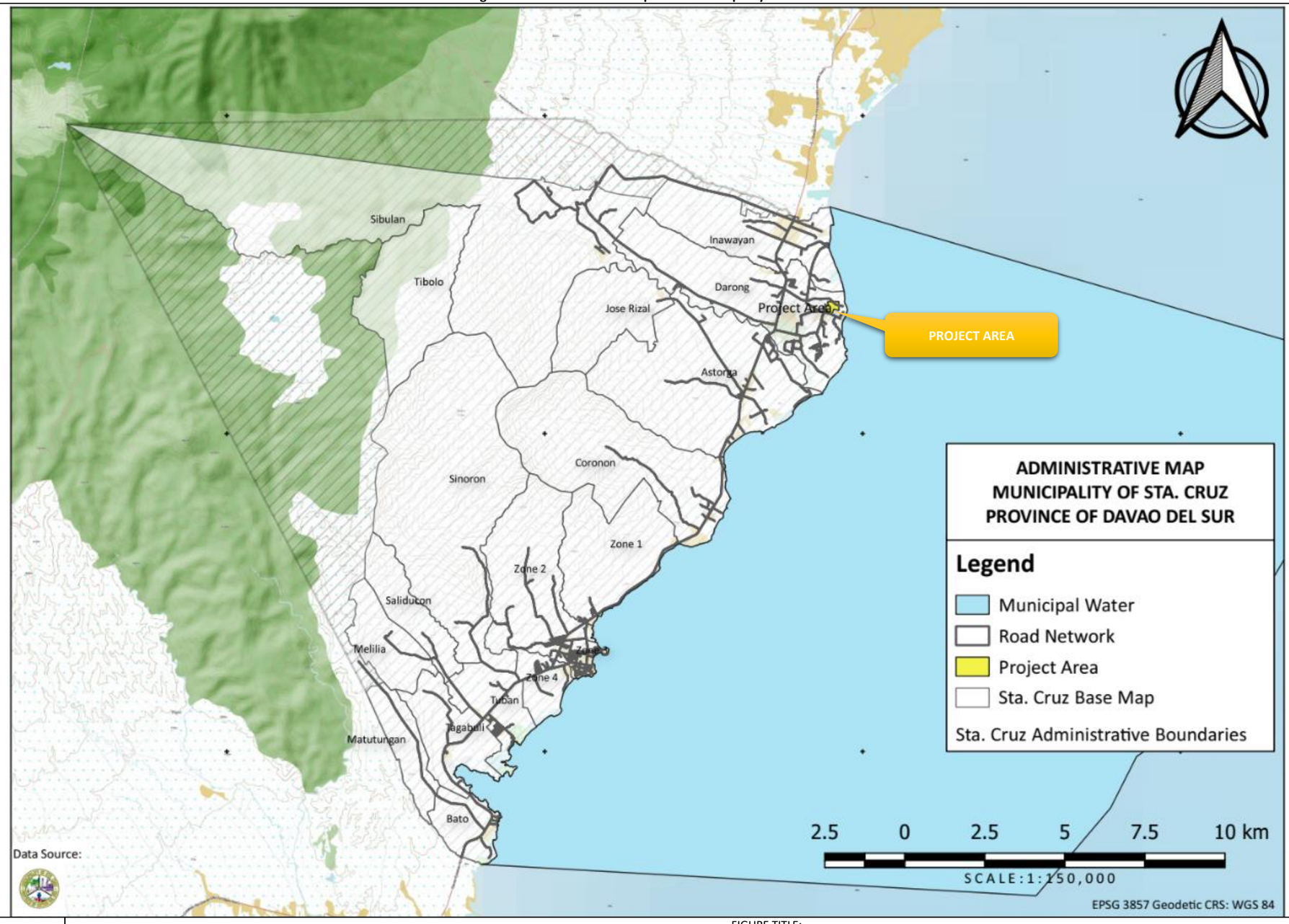


FIGURE NO.:	FIGURE TITLE:
2-1	**ADMINISTRATIVE MAP OF THE MUNICIPALITY OF STA. CRUZ**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-2: Existing Land Use Map of the Municipality of Sta. Cruz

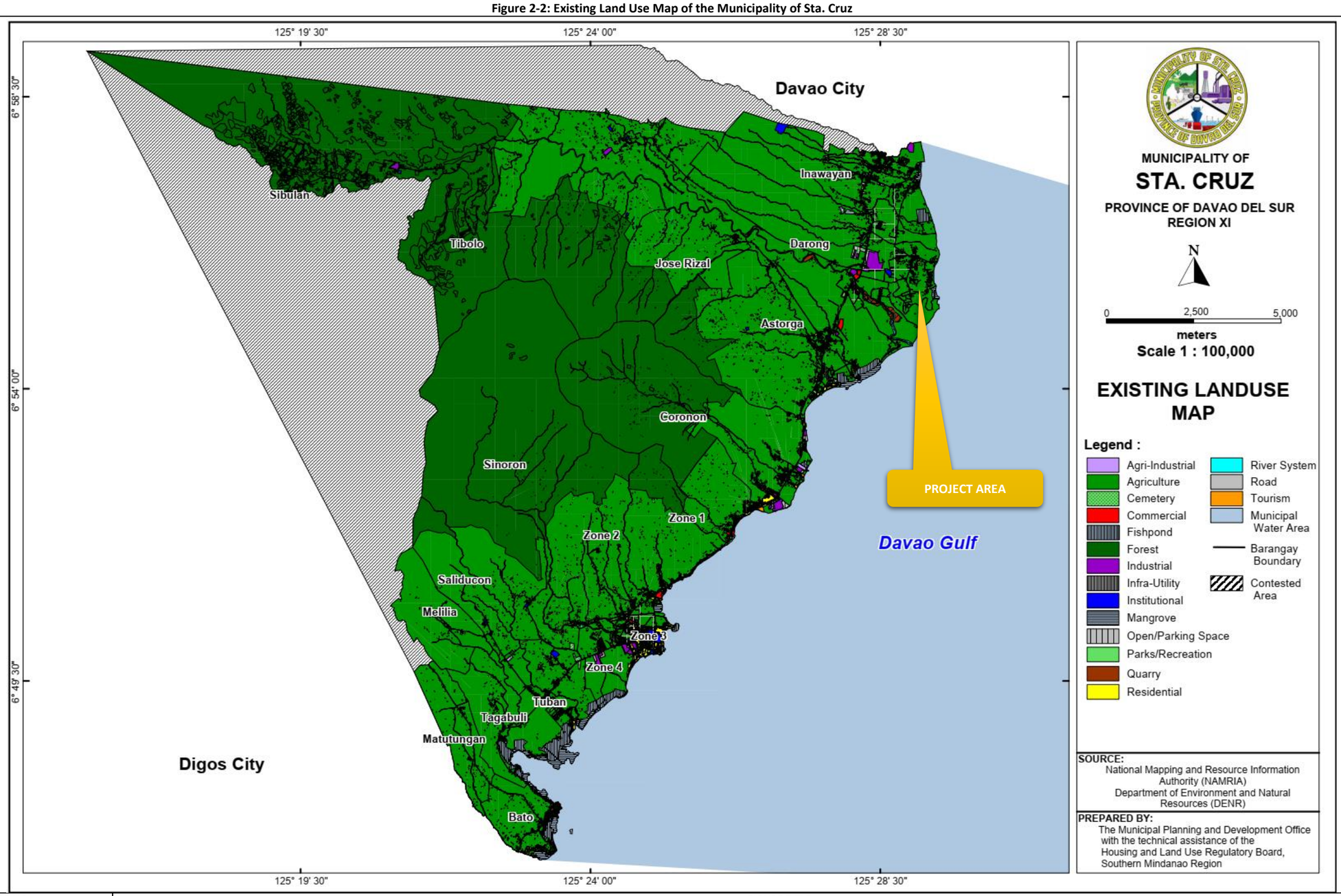


FIGURE NO.:	FIGURE TITLE:
2-2	**EXISTING LAND USE MAP OF THE MUNICIPALITY OF STA. CRUZ**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

2.1.1.4 Impairment of visual aesthetics

95 There are no visually significant landforms, landscapes, or structures in the proposed project site that can potentially be affected by the project activities. Considerations are made in the proposed project design to preserve and enhance the visual aesthetics in the project area. For instance, vegetation in the perimeter of the project site will be maintained to serve as natural buffers and to also contribute in the mitigation of other perceived project impacts (i.e., air and noise).

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

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

2.1.2 Geology/Geomorphology

97 Sta. Cruz is traversed by mountain ranges and high relief thus rendering the topography of the municipality as extreme. Included among the high peaks of the municipality is the Mt. Apo, Philippines highest mountain peak. The municipal elevation ranges from 10 to 2,939 m (33 to 9,642 ft) above sea level. The rugged topography of the central area gradually undulates toward the coastal plains of the northeastern, eastern and southeastern parts.

98 Only 13% of Sta. Cruz's area is classified as level to nearly level (0-3% slope). These can be found on the coastal part of the municipality. About 3% is gently sloping (3-5%) while 4% is gently undulating and rolling (5-8%). Some 11% is moderately undulating and rolling (8-15%). Approximately, 58% are steeply undulating and rolling land (15-18% slope) and the remaining 11% are very steep sloping land i.e. 18 % and above.

99 Settlements sprawl contiguously along the coast of Davao Gulf under the vast monotony of coconut plantations. On the western frontier, a plateau stretches toward Barangay Kapatagan of Digos City. In Barangay Darong, 1,186.65 hectares has level to nearly level land while 296.66 hectares with 8-15% rolling land as summarized in **Table 2-4** and as shown in **Figure 2-3**. Based from this slope map, the proposed project site is situated a gently sloping area.

Table 2-3: Topography and Slope Classification in Sta. Cruz

SLOPE CATEGORY	DESCRIPTION	LAND AREA (HAS.)	%
A. 0-3%	Level to nearly Level Land	3,738.7721	13
B. 3-5%	Gently Sloping Area	862.7936	3
C. 5-8%	Gently Undulating & Rolling	1,150.3914	4
D. 8-15%	Moderately Undulating & Rolling	3,163.5764	11
E. 15-18%	Steeply Undulating & Rolling Land	16,680.6756	58
F. 18% & Over	Very Steeply Sloping Land	3,163.5764	11
Total		**28,759.7855**	**100**

Source: Bureau of Coast and Geodetic Survey (BCGS), 1956

Table 2-4: Topography and Slope Classification in Darong

SLOPE CATEGORY	DESCRIPTION	LOCATION	LAND AREA (HAS.)
0-3%	Level to nearly level land	Purok Guava, Lacatan, Mangga, Papaya, Lanzones, Rambutan, part of Caimito and Durian	1,186.6549
8-15%	Rolling Land	Purok Cardava, portion of Purok Caimito and Durian	296.6638

Source: Bureau of Coast and Geodetic Survey (BCGS), 1956

Figure 2-3: Slope Map of Sta. Cruz

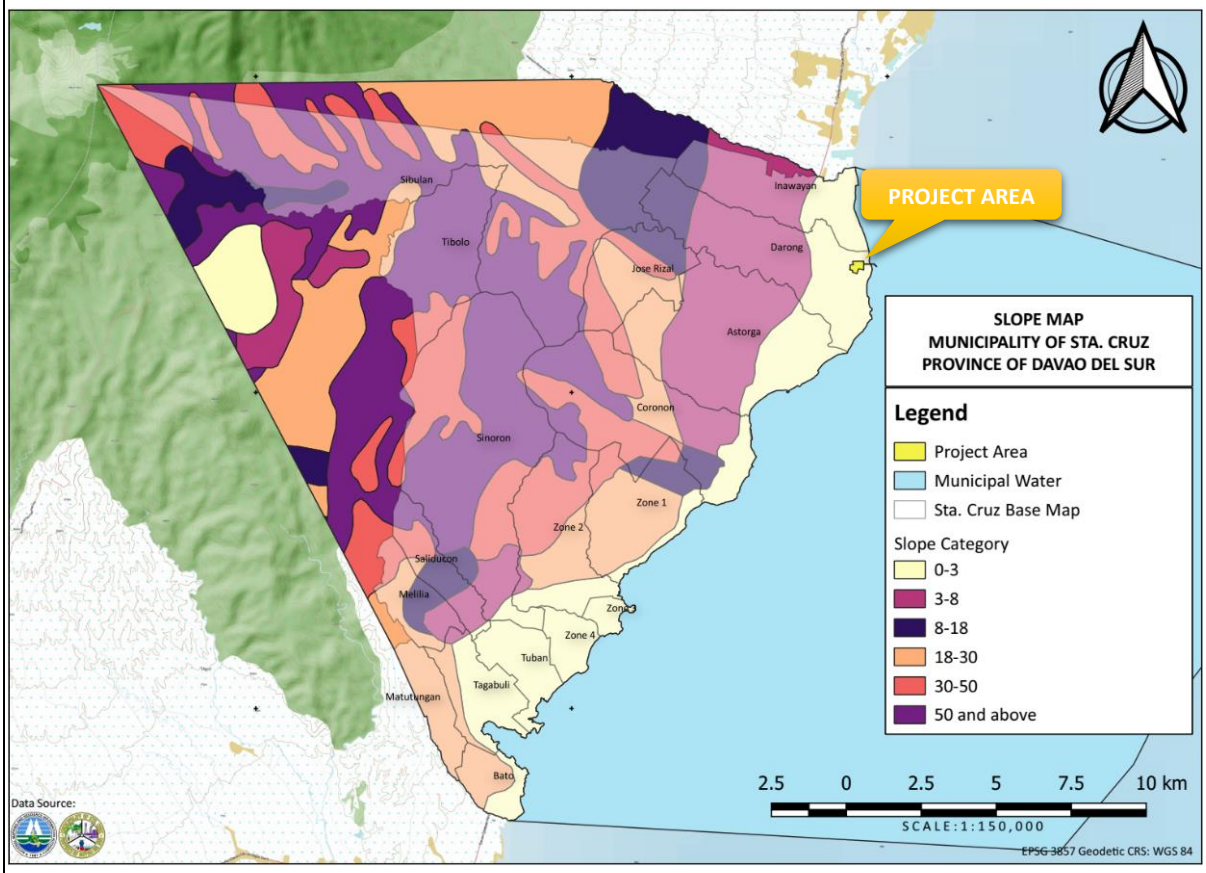


FIGURE NO.:	FIGURE TITLE:
2-3	**SLOPE MAP OF STA. CRUZ**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

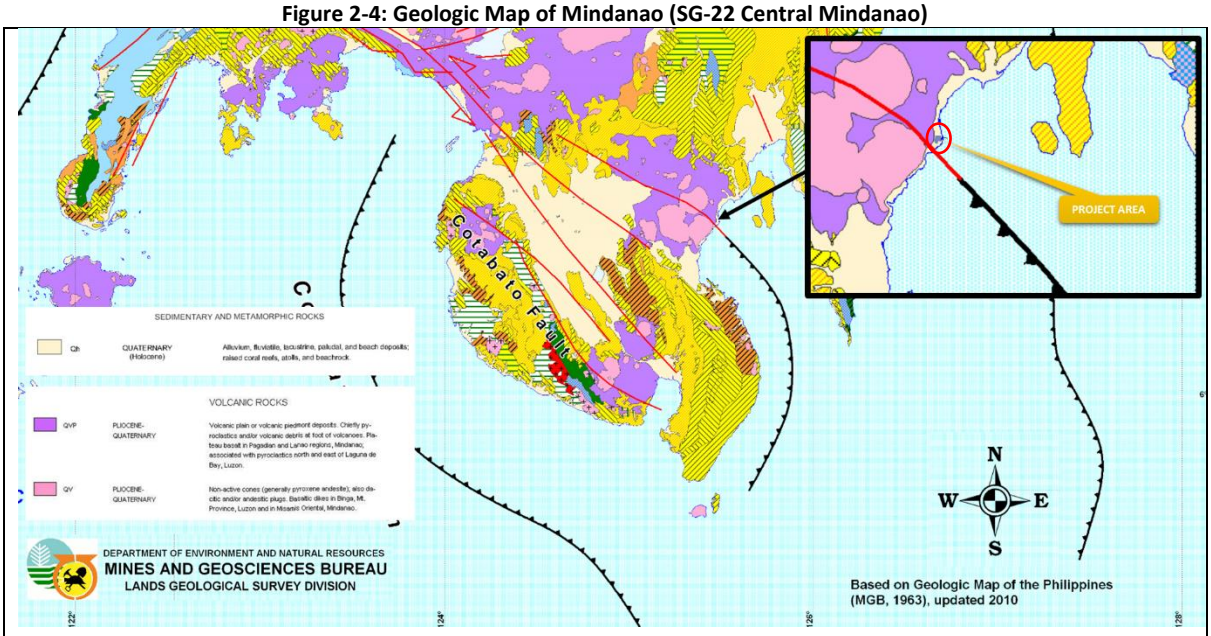
100 Based from the Geology of the Philippines (2nd Ed.) of the Mines and Geosciences Bureau (MGB), Central Mindanao belongs to Stratigraphic Grouping 22 (SG-22), which represents an ancient arc that covers Misamis-Oriental-Bukidnon-Lanao and the Mindanao Central Cordillera by superimposed Quaternary volcanic complex defined by a north-northwest belt from Camiguin Island in the north down to Mt. Parker in the south. The stratigraphy of Central Mindanao is subdivided into Misamis Oriental-Bukidnon-Lanao, Mindanao Central Cordillera and Central Mindanao Volcanic Complex, representing volcanic deposits from eruptions of Quaternary volcanic centers.

101 Sta. Cruz is located within Apo Volcanic Complex, based on lithology is composed of basalt, andesite and pyroclastic rocks under the Pleistocene Epoch.

102 According to the Geology of the Philippines, the Apo Volcanic Complex is described as volcanic flows and pyroclastic rocks, chiefly agglomerates and tuffs, underlie the broad slopes of Apo, Boribing, Talomo and Sibulan mountains. Mt. Apo consists of basaltic flows cut and overlain by more recent andesites in the northeastern portion. The agglomerates consist chiefly of fragments of basaltic andesite and pyroxene andesite cemented by a tuffaceous matrix. Beds of ash tuff are horizontal to moderately dipping. Flows of andesite porphyry are found at the Sta. Cruz, Davao del Sur and at Barrio Sirawan in Davao City.

103 The geologic map of Mindanao focusing on SG-22, covering the Municipality of Sta. Cruz, is presented in **Figure 2-4**.

Figure 2-4: Geologic Map of Mindanao (SG-22 Central Mindanao)



Source: Mines and Geosciences Bureau, Geology of the Philippines (2nd Ed.), 2010

FIGURE NO.:	FIGURE TITLE:
2-4	**GEOLOGIC MAP OF MINDANAO (SG-22 CENTRAL MINDANAO)**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

104 The Philippine archipelago is located within the Philippine Mobile Belt found between the tectonic boundary of the Philippine Sea Plate and the Eurasian Plate. The movement of these plates and displacements along the Philippine Fault Zone and other faults are responsible for the seismicity in the Philippine Archipelago. On an average the country experiences numerous unnoticeable and notable seismic events. Seismic hazards such as ground shaking, liquefaction and ground rupture can lead to the destruction of infrastructures and facilities that could hinder access to basic needs.

Earthquakes

105 As seen in **Figure 2-5**, based from Active Faults and Liquefaction Susceptibility Map of Region XI, the project area is not near any identified fault or trench. Further, based on the Earthquake-Triggered Landslide Susceptibility Map of Region XI, the project area is not susceptible to earthquakes (**Figure 2-6**). Over the past 400 years the general area of Davao City and Sta. Cruz has experienced several earthquakes with shallow depths and has magnitudes of 6 and below.

Liquefaction

106 The typical soil that is susceptible to liquefaction is loose sand located near the surface and with shallow groundwater table. During an earthquake, ground shaking causes loosely-consolidated sand deposits to contract resulting to increase in pore water pressure and reduced grain to grain effective stress (Seed, 1970). This causes loss of soil bearing capacity and makes the soil behave like fluid. In the process, there is an upward flow of water to the ground surface where it emerges in the form of mud spouts or sand boils. Liquefaction is usually accompanied by differential settlement and lateral spreading because of withdrawal of materials beneath the ground surface. Areas where liquefaction is likely to occur include river beds, old or abandoned river beds and meanders, swamps and back swamps. Alluvial plains, pyroclastic plains and coastal plains with shallow groundwater and with silty to sandy soils are also possible sites for liquefaction.

107 Based on the Active Faults and Liquefaction Susceptibility Map of Region XI shown in **Figure 2-5**, Sta. Cruz and Brgy. Darong is not susceptible to liquefaction.

Landslide

108 Landslide is the general term for readily perceptible mass movements, slow or rapid. It includes, rock slide, rock fall, mudflow, slump, debris avalanche and many others.

109 Areas with high risk to landslide are those with steep slopes, high precipitation, highly fractured rocks (sheared zone), scarce vegetation and location close to active faults. Due to the presence of steep slopes, as 60% of the total municipal area is under the foot of Mt. Apo, it poses natural disaster like landslides and erosion. As presented in the Landslide Map of the Mines and Geosciences Bureau (MGB) in **Figure 2-7,** the municipality of Sta. Cruz is susceptible to landslides. However, the proposed site is not susceptible to landslides.

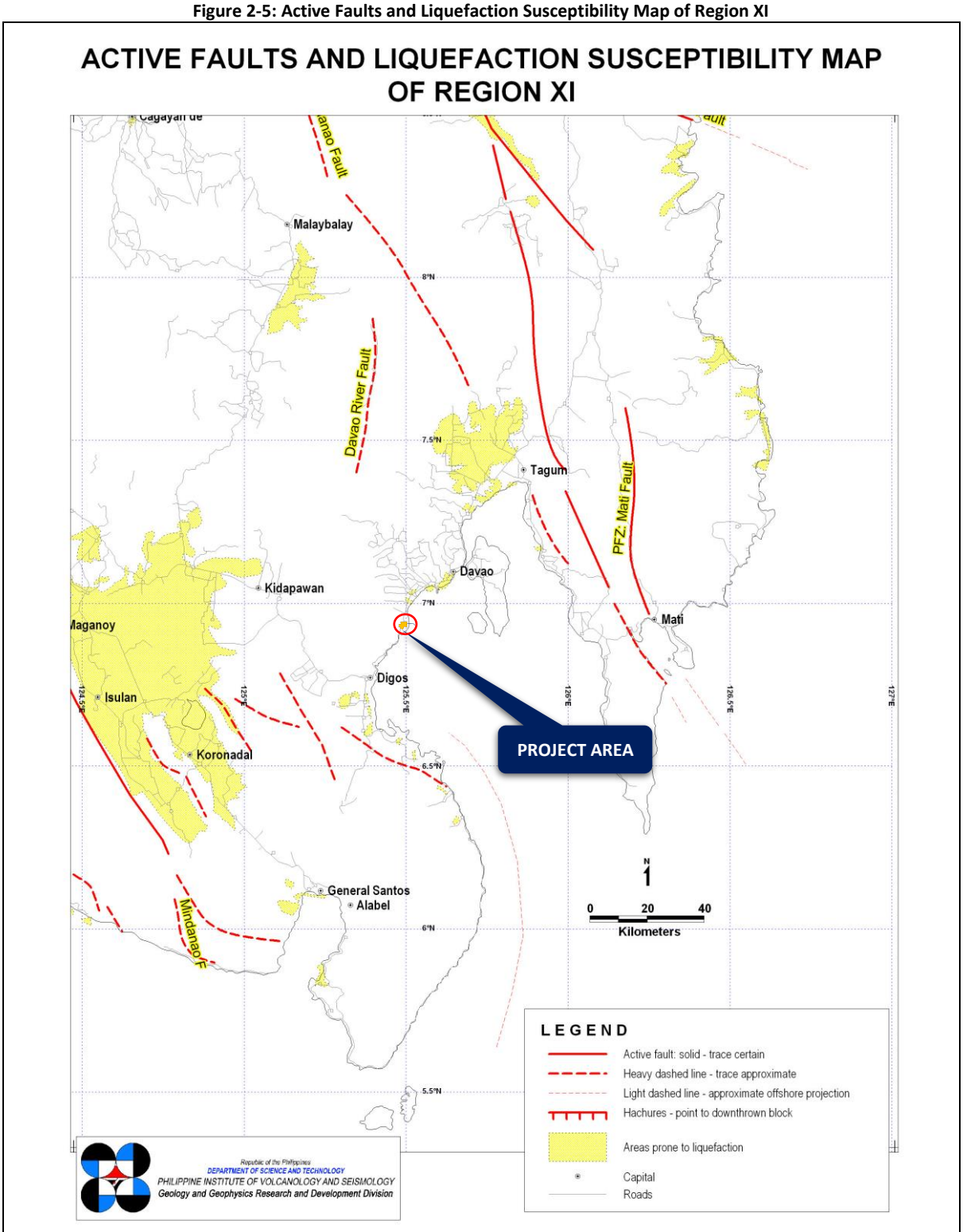
Volcanic Events

110 Active volcanoes are defined by PHIVOLCS as volcanoes having erupted within historical times (last 600 years), accounts of these eruptions were documented. The Philippines, based on the latest PHIVOLCS data, has 23 active volcanoes. The most active volcanoes considered by PHIVOLCS are: Mayon, Taal, Bulusan, Canlaon and Hibok-Hibok. However, the nearest active volcanoes in Sta. Cruz are Leonard Kniaseff (~133 kms. away) in Compostela Valley and Matumtum (~113 kms. away) in South Cotabato.

111 Volcanic hazards from volcanic activity and eruption include lava flow, debris flow, pyroclastic flow, debris avalanche, lahar, bombs and ballistics projectiles, ash fall, volcanic gases emission, flooding and volcanic quakes. This may cause health problems since ash fall may contaminate water sources and also cause respiratory illnesses.

112 As presented in **Figure 2-8**, Sta. Cruz is within proximity to the non-active volcano Mt. Apo. This, however, has no known eruptions to this date. Despite this, should any volcano erupt ash fall may affect the Sta. Cruz since the extent of ash fall depends on wind directions and height of eruption column.

Figure 2-5: Active Faults and Liquefaction Susceptibility Map of Region XI

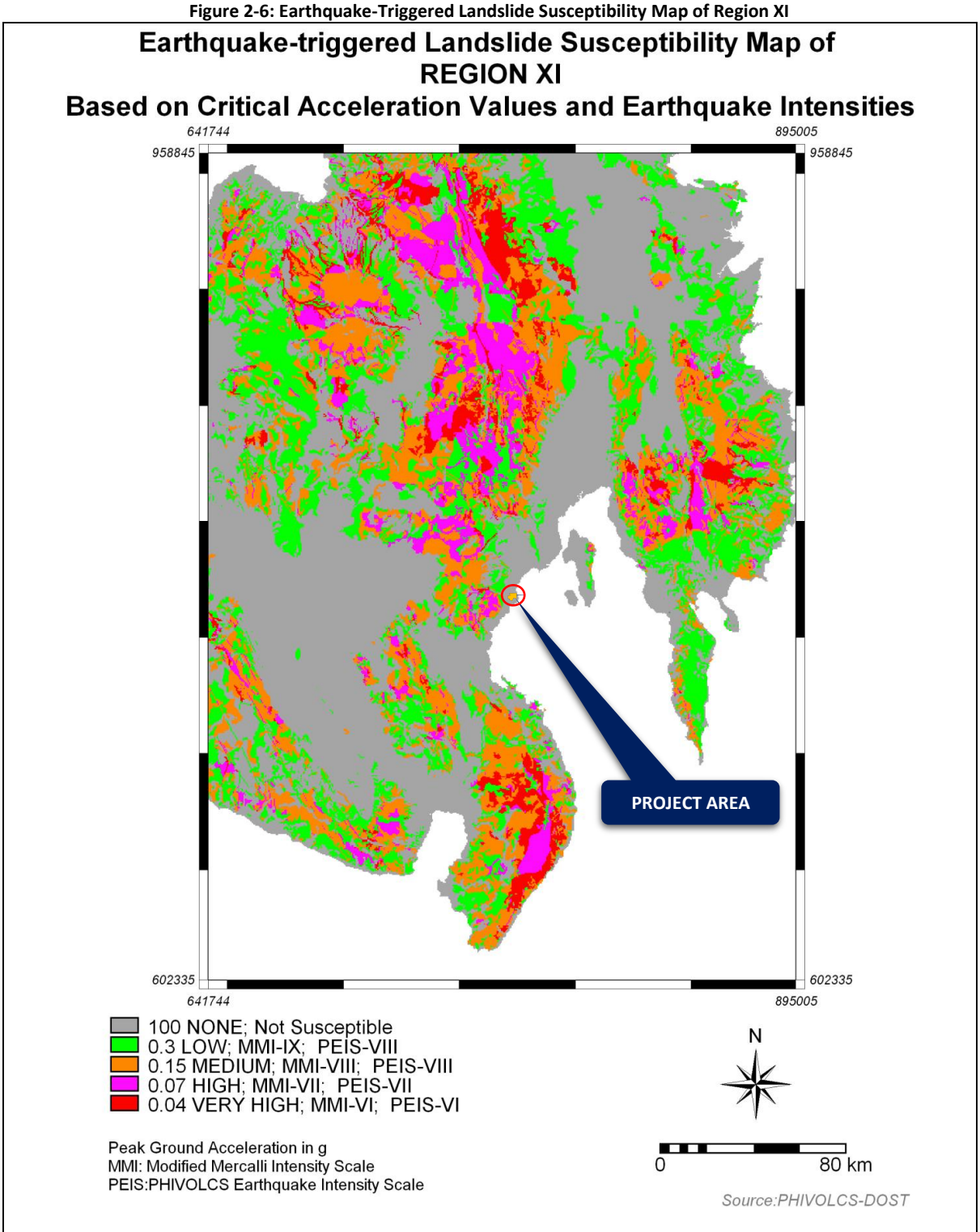


Source: Philippine Institute of Volcanology and Seismology

FIGURE NO.:	FIGURE TITLE:
2-5	**ACTIVE FAULTS AND LIQUEFACTION SUSCEPTIBILITY MAP OF REGION XI**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-6: Earthquake-Triggered Landslide Susceptibility Map of Region XI

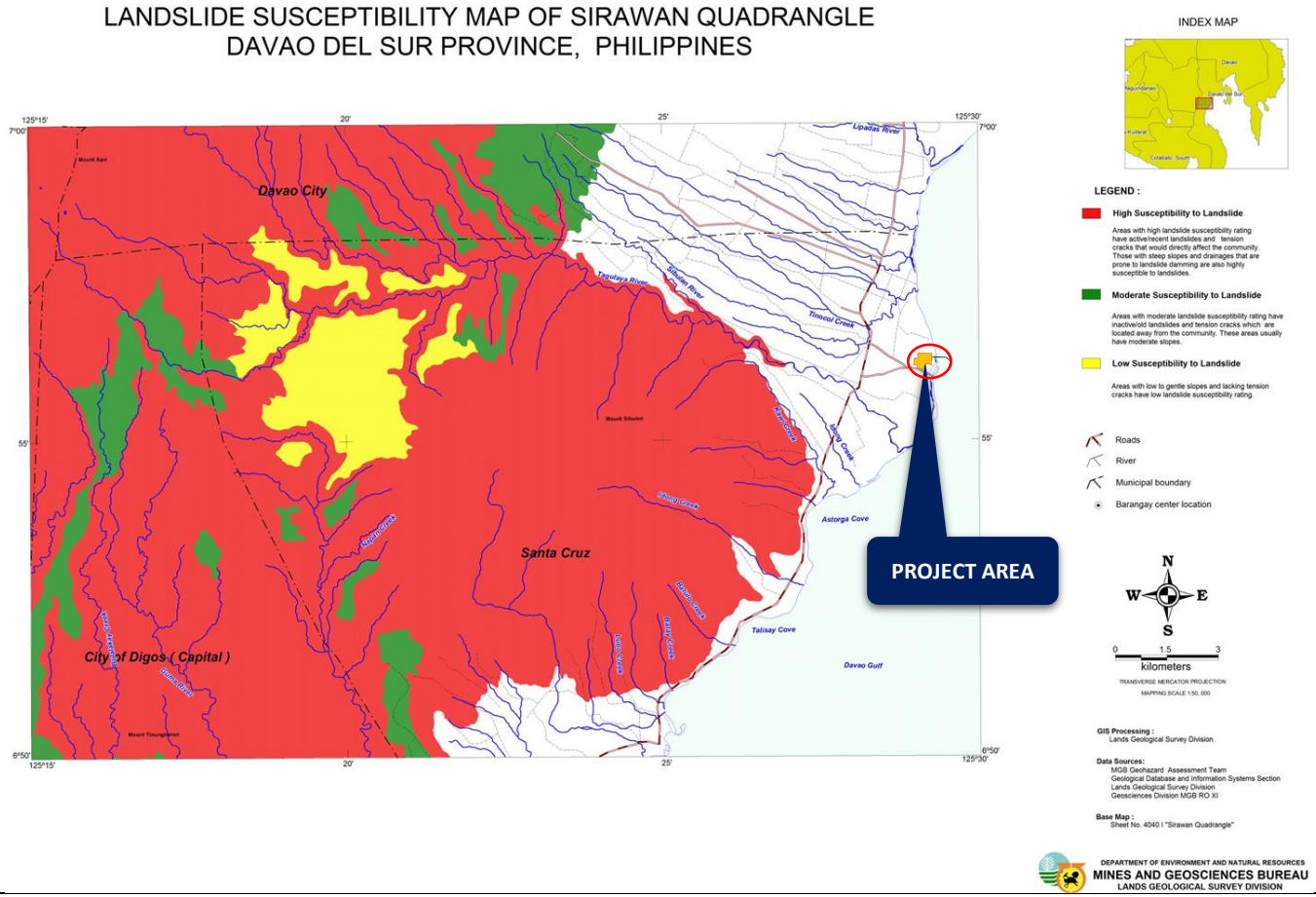


Source: Philippine Institute of Volcanology and Seismology

FIGURE NO.:	FIGURE TITLE:
2-6	**EARTHQUAKE-TRIGGERED LANDSLIDE SUSCEPTIBILITY MAP OF REGION XI**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-7: Landslide Susceptibility Map of Sirawan Quadrangle

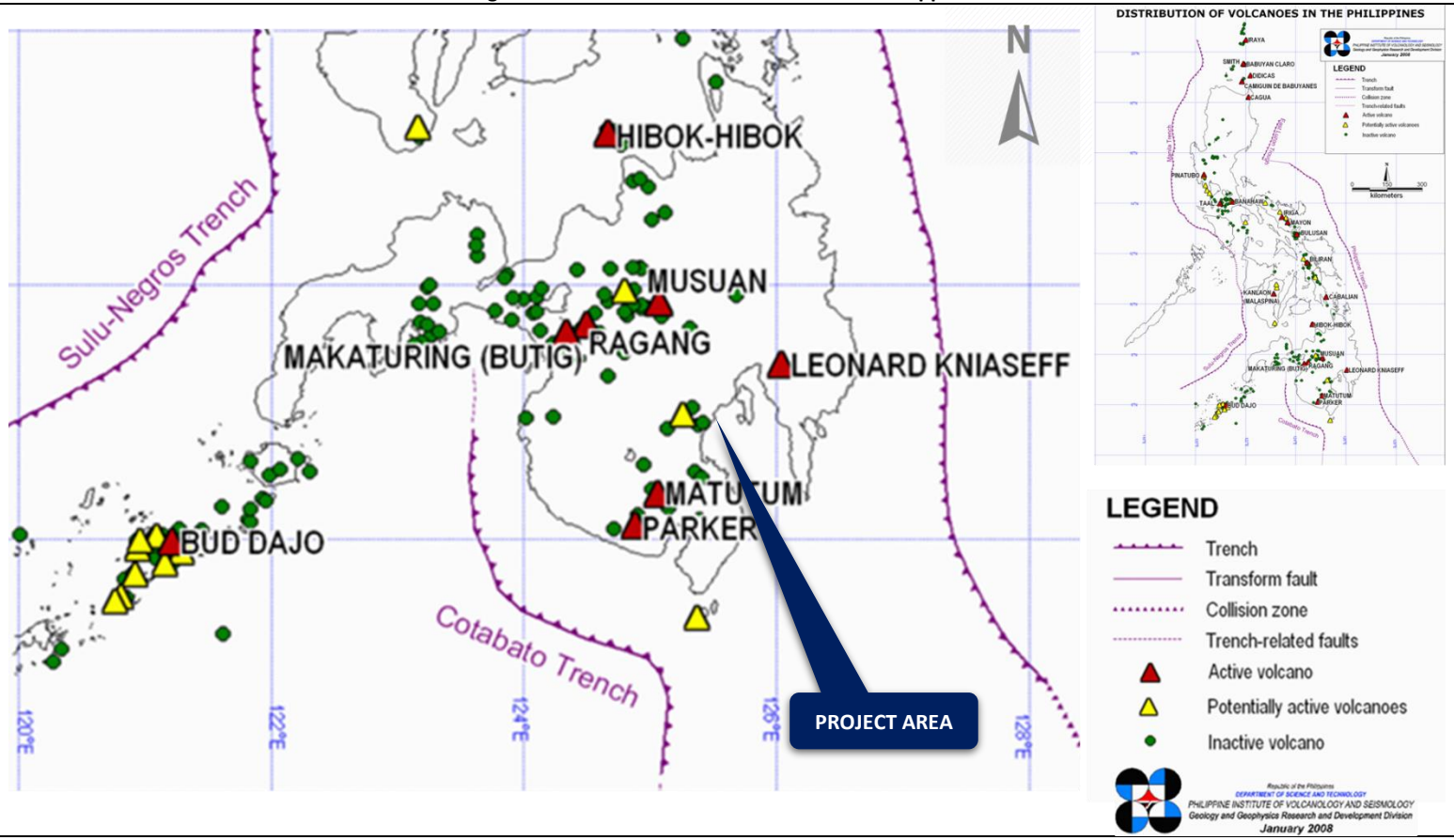


Source: Mines and Geosciences Bureau

FIGURE NO.:	FIGURE TITLE:
2-7	**LANDSLIDE SUSCEPTIBILITY MAP OF SIRAWAN QUADRANGLE**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-8: Distribution of Volcanoes in the Philippines



Source: Philippine Institute of Volcanology and Seismology

FIGURE NO.:	FIGURE TITLE:
2-8	**DISTRIBUTION OF VOLCANOES IN THE PHILIPPINES**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Tsunami

113 Tsunamis occur when a large volume of water is displaced due to a seismic activity, volcanic eruption or other large water explosion or collision. This materializes as a series of tidal waves, which may occur for extended periods of time, with longer wavelengths. Based from the tsunami map of the Philippines of PHIVOLCS presented in **Figure 2-9**, the coastal areas of Sta. Cruz are prone to trench related local and distant tsunamis.

Flooding

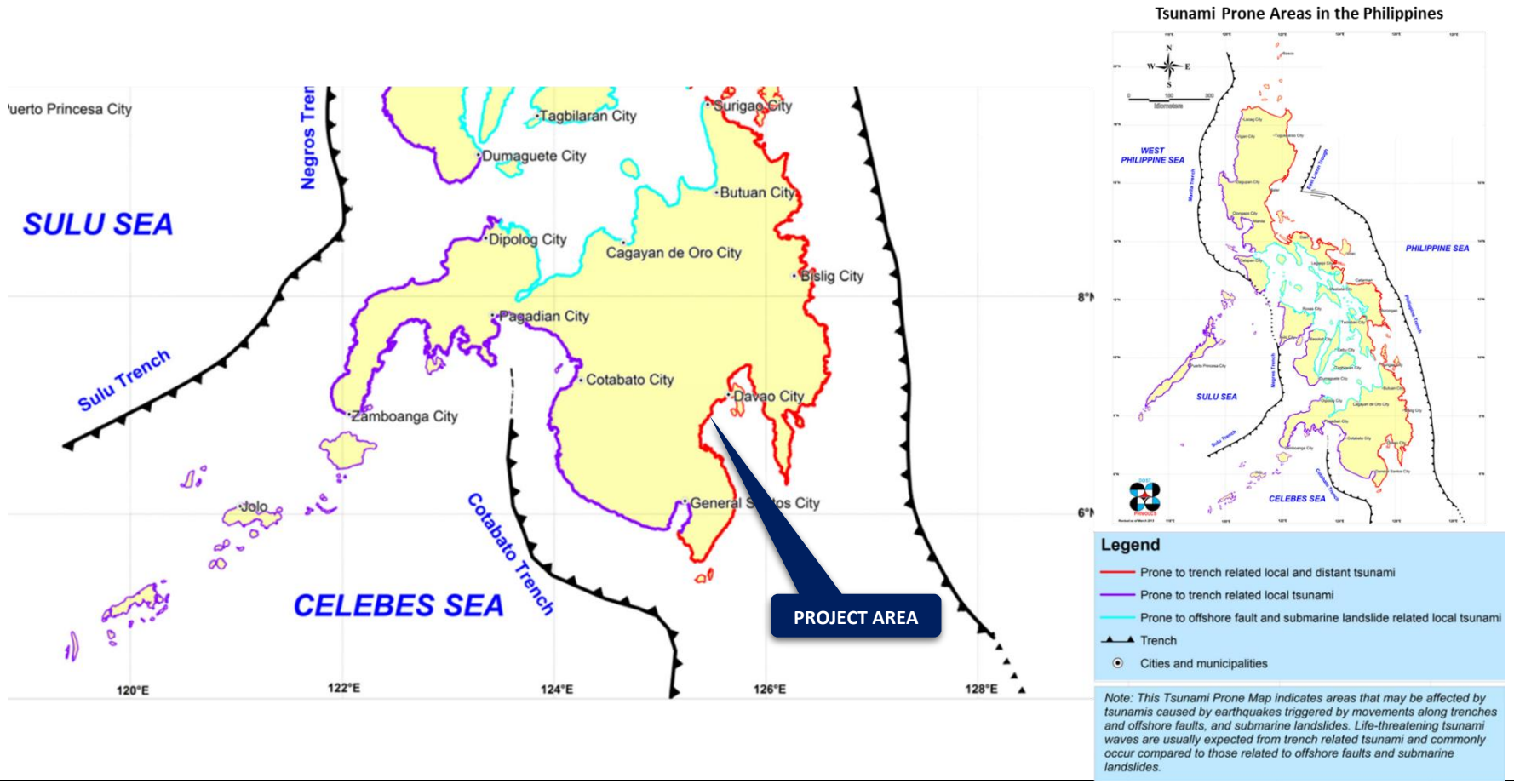
114 Flooding in the country is often caused by prolonged rain. As such, majority of the flood occurrences are then associated with tropical cyclones or monsoon rains. In addition to this, anthropogenic activities such as accumulation of improperly disposed solid wastes, poor flood dynamics in public facilities and infrastructures, illegal or extreme logging without reforestation and inadequate preparedness for natural calamities may also cause or even worsen flooding events. Based from a Flooding Map of Sta. Cruz presented in **Figure 2-10**, portions of Sta. Cruz which includes Brgy. Darong and the proposed project site is highly to moderately susceptible to flooding.

Storm Surge

115 Storm surge is the abnormal rise in seawater level during a storm as defined by the National Oceanic and Atmospheric Administration (NOAA). It is measured as the height of the water above the normal predicted astronomical tide. It is primarily caused by a storm's winds pushing water onshore.

116 According to the model of the Nationwide Operational Assessment of Hazards (NOAH) for storm surge, part of the project area will be categorized as high (>1.5 m) on storm surge advisory 4 (SSA 4), wherein the predicted storm surge height is at 5 meters.

Figure 2-9: Tsunami Prone Areas in the Philippines

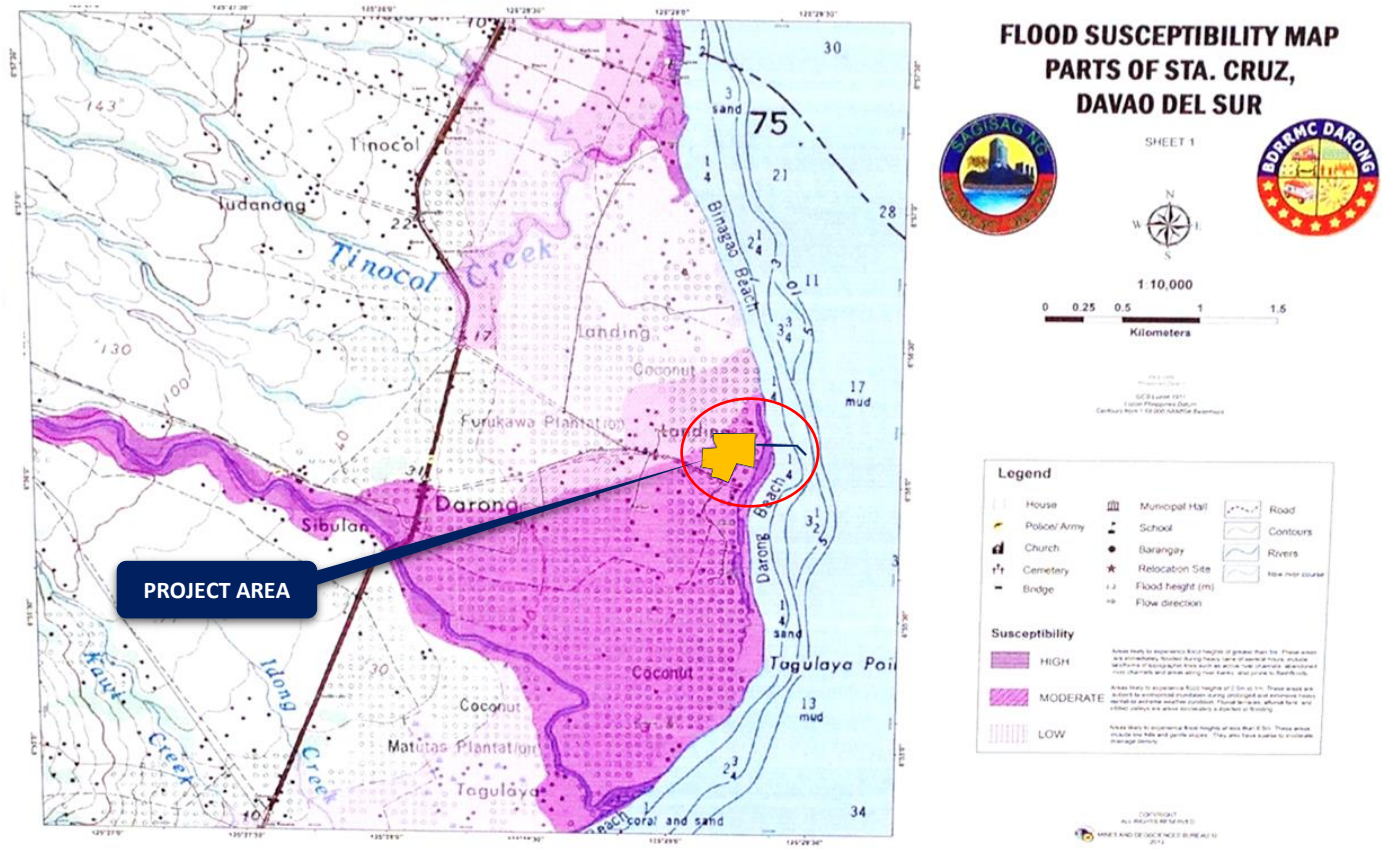


Source: Philippine Institute of Volcanology and Seismology

FIGURE NO.:	FIGURE TITLE:
2-9	**TSUNAMI PRONE AREAS IN THE PHILIPPINES**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-10: Flood Susceptibility Map of Barangay Darong

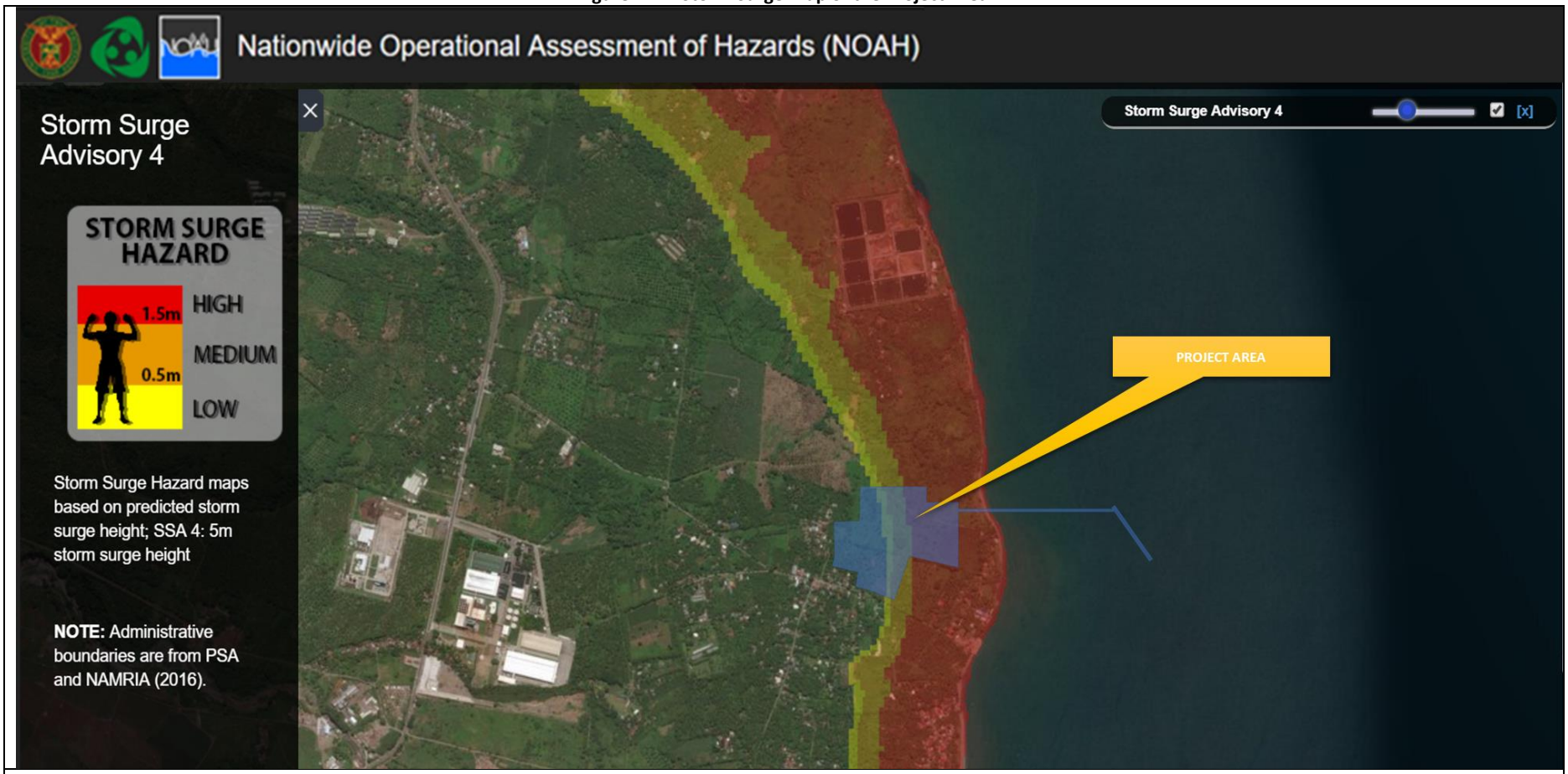


Source: Mines and Geosciences Bureau Region XI and Barangay Darong BDRRMC

FIGURE NO.:	FIGURE TITLE:
2-10	**FLOOD SUSCEPTIBILITY MAP OF BARANGAY DARONG**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-11: Storm Surge Map of the Project Area



Source: Nationwide Operational Assessment of Hazards (NOAH)

FIGURE NO.:	FIGURE TITLE:
2-11	**STORM SURGE MAP OF THE PROJECT AREA**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

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

117 Significant changes on the surface landform, geomorphology, topography, terrain, and slope of the proposed project site are not expected given the proposed project design.

2.1.2.2 Change in sub-surface geology/underground conditions

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

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

119 The proposed project is not expected to induce or cause subsidence, liquefaction, mud/debris flow, landslide, and any other geological hazard.

2.1.3 Pedology

120 Sta. Cruz has 4 basic soil types: San Manuel Silty Clay Loam (14%), Tugbok Clay Loam (26%), Mandunga Clay Loam (17%) and Undifferentiated Mountain Soil (43%). The summary of the land area covered with this basic soil types are listed in **Table 2-5** and shown in **Figure 2-12.** Barangay Darong is covered by San Manuel Silty Clay Loam and Tugbok Clay.

Table 2-5: Basic Soil Type, Area and Location in Sta. Cruz

BASIC SOIL TYPE	LAND AREA	PERCENTAGE (%)
San Manuel Silty Clay Loam	4,026.3700	14
Tugbok Clay Loam	7,477.5442	26
Mandunga Clay Loam	4,889.1635	17
Undifferentiated Mountain Soil	12,366.7078	43
Total	**28,759.7855**	**100**

Source: Bureau of Soils, Region XI

Figure 2-12: Soil Map of Sta. Cruz

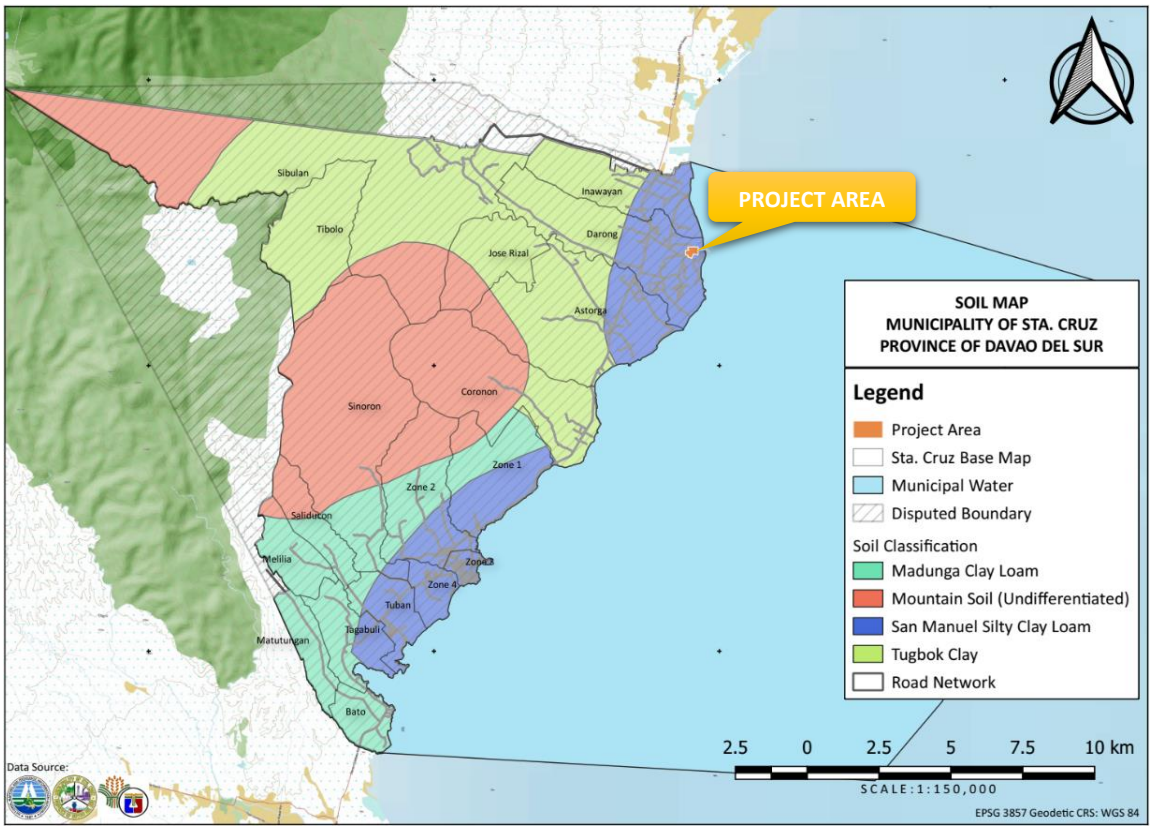


FIGURE NO.:	FIGURE TITLE:	
2-12	**SOIL MAP OF STA. CRUZ**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

2.1.3.1 Soil erosion/loss of topsoil/overburden

121 Soil erosion is expected during the site development since this activity entails earth movement. The expected removal of some trees and soil-binders can increase this problem. During heavy rains or strong winds, erosion can be triggered. However, erosion can be greatly minimized constructing erosion barriers, silt traps, etc. The exact location of the silt traps will depend on the strategy of the contractor on land clearing and the existing drainage. If the existing drainage will be used, a silt trap or siltation pond will be installed before discharge to lake.

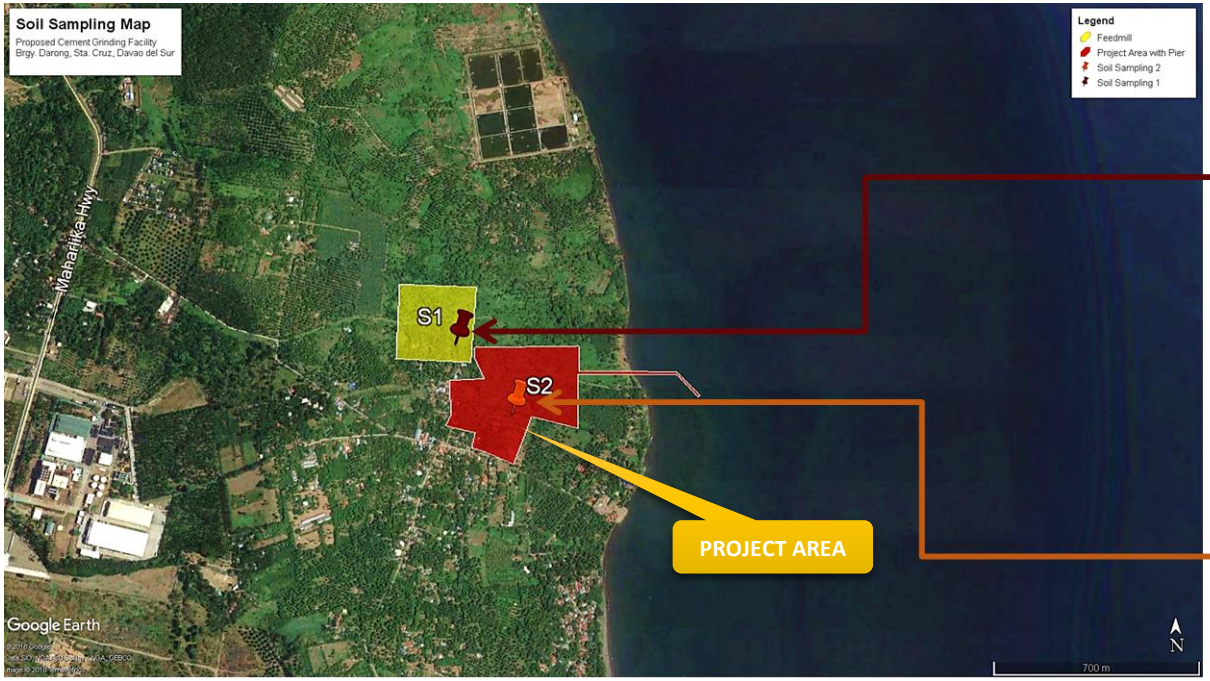
2.1.3.2 Change in soil quality/fertility

122 A subsurface soil sample was collected and incorporated in the EIS for San Miguel Foods, Inc.'s (SMFI) Feed Mill Facility located near the project area. The depth of the soil sample was approximately 30 cm deep and was obtained through the use of a trowel and stored in clean plastic bags last September 8, 2014 as shown in **Figure 2-46**. The soil sample was obtained from the land where the proposed project was situated to determine heavy metal content in the area prior to any project phase. Atomic Absorption Spectrophotometric Method was employed in the analysis for cadmium, chromium and lead. Cold Vapor Atomic Absorption Spectrometry was used for analysis of mercury. The laboratory analysis was coursed through the DENR Accredited Laboratory, F.A.S.T. Laboratories, located in Cagayan de Oro City. The result of the soil analysis summarized in **Table 2-6**.

123 Further, additional sampling was made last October 19, 2018 for Arsenic (As) and organic compounds including: total phosphorus, total organic matter, potassium (K), pH and total nitrogen (N). This is to determine organic properties of the soil within the project area. The laboratory analysis was coursed through the DENR Accredited Laboratory, CRL Environmental Corporation, located in Clark Freeport Zone, Pampanga.

124 In the absence of Philippine soil standards, results were then compared with the Dutch Intervention Values (DIV). As compared to these values, the soil sample in the proposed location has heavy metals including: cadmium, chromium, lead and mercury but are within Dutch Standard Values. Having passed the said standards and having low level of such parameters, there is no need for intervention or remediation action.

Figure 2-13: Soil Sampling Map (SP 1: September 8, 2014 & SP 2: October 19, 2018)



SAMPLING POINT	LATITUDE (N)	LONGITUDE(E)
1	6°56'14.55"	125°29'2.88"
2	6°56'7.00"	125°29'9.17"

Note: Location map generated using Google Earth
Source: S2SMFI Feed Mill Facility EIS

FIGURE NO.:	FIGURE TITLE:
2-13	**SOIL SAMPLING MAP**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Table 2-6: Result of Soil Quality Analysis

PARAMETER	UNIT	DETECTED LEVEL AT THE SAMPLING POINTS BASED ON LABORATORY ANALYSIS (values in RED exceed the reference standard/s)	DUTCH INTERVENTION VALUE	REMARKS
		SP1 & SP2	*(Dutch Soil Remediation Circular 2013)*	
A. METALS				
Arsenic	mg/Kg	0.7	76	**Acceptable**
Cadmium	mg/Kg	0.09	13	**Acceptable**
Chromium	mg/Kg	2.14	380	**Acceptable**
Lead	mg/Kg	5.56	530	**Acceptable**
Mercury	mg/Kg	<0.025*	10	**Acceptable**
B. ORGANIC PARAMETERS				
Total Phosphorus	mg/Kg	533	-	**N/A**
Total Organic Matter	% w/w	3.55	-	**N/A**
Potassium	mg/Kg	817	-	**N/A**
pH	-	5.8	-	**N/A**
Total Nitrogen	mg/Kg	1,290	-	**N/A**

Notes: SP = Sampling Point | ND = Not Detected | mg/kg = milligrams per kilogram | (*) Method detection limit
References: Varian Analytical Methods of Spectrophotometry, 1976; Standard Methods of Analysis for Soil, Plant Tissue, Water and Fertilizer, 1980; Dutch Soil Remediation Circular, 2013, Annex 1, Table 1

SP1
SP2

2.1.4 Terrestrial Ecology

Terrestrial Flora

125 Certain parts of the municipality of Sta. Cruz is within the Mt. Apo Natural Park (MANP), declared Protected Area and component of the National Protected Areas System (NIPAS) under Republic Act No. 9237 series of 2013, which covers approximately 64,000 Has. Further, it is included in the United Nations (UN) list of National Parks and Equivalent Reserves and included in ASEAN Heritage Site. It is located in South-Central Mindanao spanning the provinces of North Cotabato, Davao del Sur and Davao Region. The altitude of Mt. Apo is 2,954 meters above sea level (masl.) – making it the highest mountain in the Philippines.

126 Based from the Biodiversity Management Bureau (BMB), there is an estimated 800 vascular and non-vascular plant species. Among the endemics, collected between 300 masl. and 1000 masl., of Mt. Apo are members of the genera *Pipturus*, *Sauravia* and *Poikilospermum*. Banago *(Humalanthus populneus),* dilang-aso *(Elephantopus spicatus)*, ikmo *(Piper apoanum)* and waling-waling *(Vanda sanderiana).*

Waling-waling *(Vanda sanderiana)*
Photo source: davaotourism.com

127 Endemics at the mid-altitudes include almasiga *(Agathis philippensis)* and endangered species

like ulayan tindog (*Lithocarpus submonticolus)* and *(Peperomia elmeri)*. Upper montane endemics are *(Cypholopus microphyllus)* and *(Nepenthus copelandi)*.

128 Based from the actual resource inventory of BMB, collected data on five representative habitats indicated a total of 126 floral species recorded (50 are considered endemic to Mt. Apo or the Mindanao Faunal Region).

129 The endemics include almaciga, almon, waling-waling, igem, kalantas, mindanao kalingag, apo bubonan *(Aglaia apoena)* and other species; 18 species are considered to be at risk; including waling-waling, kalantas including a rattan species *(Plectocomia elmerii)*, pahutan *(Mangifera altissima)*, *Shorea sp*. (e.g. almon, mayapis, malaanonang, narig and guijo)

130 It was also found out that 37 of these species have economic, cultural and medicinal significance. Most species are used for construction like *Shorea sp.* (e.g. lauaan, guijo, apitong) and *Bambusa sp.* (e.g. buho and bagakay); as fibers like wild abaka (*Musa sp.*), for baskets and containers, food for wildlife like balite (*Ficus sp.*), kalingag (*Cinnamommum mercadoii* and *mindanensis*), ulayan (*Lithocarpus sp*.) etc; and other medicinal plants like wild betel nut *(Areco caliso)*, saging bundok *(Musa balbasiana)*, kalingag, hagimit (*Ficus sp.*) and hamindang *(Macaranga bicolor)*.

131 It can be noted that the project area is located approximately 10 km. away from the MANP and is located in an industrial area.

132 **Oro Cemento Industries Corporation** applied for permit to cut trees (TCP) to both the City Environment and Natural Resources Office (CENRO) and Philippine Coconut Authority (PCA) both located in Digos City.

133 As part of the application, CENRO foresters and PCA officers conducted site inspection, tree tagging and tree inventory census for the properties of San Miguel Corporation and Paul William Uy. This was conducted on April 6, 2018 and presented in **Figure 2-14**.

Figure 2-14: Tree Inventory Census of CENRO and PCA Digos City

Note: Photos taken from the site last April 6, 2018.

FIGURE NO.:	FIGURE TITLE:
2-14	**TREE INVENTORY CENSUS OF CENRO AND PCA DIGOS CITY**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

134 Based from the tree inventory census conducted, it was determined that coconut tree (*Cocos nucifera)* was the dominant species in the area. The census also revealed that there is a total of 450 coconut trees within the applied properties were the project area is to be situated. Based from the findings of PCA, the coconut trees in the area were no longer productive. Further, the coconuts found in the area are not sold commercially.

135 For the tree census conducted by CENRO Digos City, there are a total of 46 trees, of 7 species namely; (a) Gmelina (*Gmelina arborea)*, (b) Santol (*Sandoricum koetjape*), (c) Raintree (*Samanea saman* (Jacq.) Merr.), (d) Talisay (*Terminalia catappa*), (e) Breadfruit (*Artocarpus altilis)*, Mango (f) *Mangifera indica, and (g)* Kapok *(Ceiba pentandra)*.

136 It was also noted that there are several banana plants (*Musa sapientum*) in the area but are not on a plantation scale.

137 **Table 2-7** presents the summary of TCPs issued for the properties covering the project area.

Table 2-7: Summary of TCPs Issued for the Properties Covering the Project Area

PERMIT TO CUT TREES	ISSUED BY	DATE ISSUED	COMMON NAME	SCIENTIFIC NAME	ENDIMICITY	TOTAL NO. OF TREES
Permit No. 18-8104	DENR Region XI	June 27, 2018	Gmelina	*Gmelina arborea*	Introduced	10
			Santol	*Sandoricum koetjape*	Cultivated	1
			Raintree	*Samanea saman* (Jacq.) Merr.	Introduced	8
			Talisay	*Terminalia catappa*	Introduced	18
			Breadfruit	*Artocarpus altilis*	Native	3

PERMIT TO CUT TREES	ISSUED BY	DATE ISSUED	COMMON NAME	SCIENTIFIC NAME	ENDIMICITY	TOTAL NO. OF TREES
			Mango	*Mangifera indica*	Native	5
			Kapok	*Ceiba pentandra*	Native	1
					Sub-total	**46**
Permit No. 48546	Philippine Coconut Authority (Digos City)	April 25, 2018	Coconut	*Cocos nucifera L.*	Cultivated	450
					Sub-total	**450**
					Total	**496**

Terrestrial Fauna

138 Based from BMB, MANP is Key Biodiversity Area (KBA) home to 272 species of birds were 111 species are endemic to Mt. Apo. Of all species recorded, 2 are in the critical list: including the Philippine Eagle *(Pthecophaga jefferyi)* and abukay *(Cacatua heamatopygia)*; 10 of which are considered endangered species; Mindanao scoops owl *(Otus mirus)*, lesser eagle owl *(Bobu philippensis)*, Mindanao lorikeet *(Tricoglosus johnstoniae)*, writhed hornbill *(Aceros leucocephalus)*; further, 20 vulnerable and 20 are near-threatened. 96 species were identified to have both cultural and economic importance to nearby communities or communities within MANP.

Philippine Eagle *(Pthecophaga jefferyi)*
Photo source: flickr.com/wandering_angel/

139 Mammalian diversity has a total of 53 species, 49% are endemic: tudaya giant rat *(Bollimus bagobos)*, wild pig *(Sus phillippinensis)*, tarsier *(Tarsius syricta)*, *(Acerodon jubatus)*; 3 are listed as threatened: tree shrew *(Urogale Everetti)*, *(Acerodon jubatus)*, and Philippine brown deer *(Cervus marianus)*.

140 At least 26 species were found to have economic and cultural values. Most are utilized for food, extracts from hoofs and toes are believed to be remedy for stomach ache, omens observed during rituals and farming practices and the seed dispersals.

141 There are 53 recorded species of Herpetofauna. This includes 17 species of amphibians and 36 species of reptiles; (36%) are restricted to the Mindanao faunal region: bak-bac *(Rana magna)*, lokwak-manobo *(Ansonia mcgregorii)*, tok-tok manobo *(Kalaula picta)*, and cobra *(Naja samarensis).* Further, 3 species are on the critical list: ibid *(Hydrosaurus pustulatus)*, halo and turtle *(Cuora ambionensis)* turtle.

142 A total of 24 species are known to be with local and cultural importance. Most are for food, respiratory remedies, and serves as indicator for bad omen.

143 As mentioned previously, the project area is located approximately 10 km away from the MANP and is located in an industrial area.

2.1.4.1 Vegetation removal and loss of habitat

144 As discussed, the site was already cleared of vegetation based on the TCPs issued by DENR Region IX and PCA-Digos City. The conduct of tree inventory census (100%) were done by CENRO Digos City. Therefore, there will be no impact to vegetation and loss of habitat, should the construction of the cement grinding facility begin.

145 Vegetation clearing were limited to the area where the project facilities and equipment will be located. The surrounding vegetation were preserved to act as natural air and noise buffers.

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

146 Results of both the qualitative (site reconnaissance and FGD) and quantitative (tree inventory census of the City Environment and Natural Resources Office (CENRO)) vegetation analyses revealed that there were no important species identified in the proposed project site.

147 Species and total number of trees were based from the tree inventory census. (See: **Table 2-7**). There were no important local species found in the project site.

2.1.4.3 Threat to abundance, frequency and distribution of important species

148 As stated in the previous sections, there were no important species identified within the proposed project site. This is due to the fact that the site is highly disturbed due to construction and site development activities in the area.

2.1.4.4 Hindrance to wildlife access

149 The proposed project is not expected to be of hindrance to wildlife access as it is located in an industrial area with residential areas in the peripheries. There was no survey conducted for the wildlife access.

2.1.5 Summary of Baseline Findings, Impacts and Mitigation on Land

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

Table 2-8: Summary of Significant Baseline Findings and Potential Impacts and Mitigation on Land

SUMMARY OF BASELINE FINDINGS ON LAND

- **Land Use and Classification**
  - The proposed project site is situated in an area designated industrial use.
  - The proposed project site does not fall within any declared ECA and is not covered by any tenurial instrument.
  - There are no visually significant landforms, landscapes, or structures in the proposed project site that can potentially be affected by the project activities.
- **Geology/Geomorphology**
  - The coastal areas of Sta. Cruz are prone to trench related local and distant tsunamis.
  - Portions of Sta. Cruz which includes Brgy. Darong and the proposed project site is highly to moderately susceptible to flooding.
- **Pedology**
  - Based on the soil quality assessment, the detected levels of all parameters tested were way below the respective threshold limits/intervention values.

- **Terrestrial Ecology**
  - The location of the Mt. Apo Natural Park (MANP) is approximately 10 kms. away from the project area. There are no important species (flora and fauna) identified in the project area.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
LAND USE AND CLASSIFICATION			
Impact in terms of compatibility with existing land use	Pre-Construction	The proposed project site is situated in an area designated as an Industrial Zone in Sta. Cruz, Davao del Sur	A zoning certification for the proposed project has been secured from Sta. Cruz LGU
Devaluation of land value as a result of improper solid waste management and other related impacts	Construction, Operation, Abandonment	Solid waste is expected to be produced	Implementation of a solid waste management plan
PEDOLOGY			
Soil erosion/Loss of topsoil	Construction	There may be some soil erosion due to the earth movement during the site development	Limitation of earth movement to areas where site development is necessary
Change in soil quality/fertility	Construction, Operation, Abandonment	There is a risk of soil contamination due to the maintenance of heavy equipment	Use sawdust, rice hulls, or coir dusts to absorb the oil spills

2.2 The Water

151 The nearest water bodies to the proposed project site are the Davao Gulf and the Sibulan River. These two bodies of water are considered critical resource for the economic activities of the areas they cover.

152 The Davao Gulf is located in the southeastern part of the Philippines and lies approximately between 6°7' and 7°4.5' north latitude and 125°11.5' east latitude. It is bounded by Davao City and the four provinces of Davao del Sur, Davao del Norte, Compostela Valley and Davao Oriental. Within the gulf are the islands of Samal and Talikud.

153 The Sibulan River, on the other hand, spans across Barangays Darong and Sibulan in Sta Cruz. The river is approximately located at 7.4333° latitude and 122.9167° longitude which is around 2-hours away from Davao City. Due to its depth, the current and twist and turns of the river, it is an emerging tourist spot and adventure destination in the Davao Region for water rafting and water tubing.

2.2.1 Hydrology/Hydrogeology

Davao Gulf

154 The Davao Gulf spans over five coastal cities and 18 coastal municipalities. Classified as the 10th major fishing ground of the country, it also has one of the most diverse marine ecosystems in the world as it is the host to reef and mangrove species, cetaceans, invertebrates and even to endangered species such as the leatherback turtle and dugong (sea cow).

155 Based from the Davao Gulf Management Council, the typhoon-free climate and relative peace in the region have favored expansion and development in the agro-industrial, fishery, tourism and other service sectors. As a result, processing plants and industries, settlements and built-up areas, ports, beach resorts, and all facets of economic progress have spread across the coasts, affecting the bio-physical condition of the Gulf and leading to numerous management issues and concerns. Commonly encountered issues with these anthropogenic activities include: 1) bio-physical deterioration of mangrove, seagrass and coral habitats, 2) conversion of mangrove areas to other uses, 3) presence of domestic and agro-industrial wastes and 4) siltation

156 The Davao gulf has a total water area of 10,500 km² and a total catchment area of 5,132 km² which is derived from the various watersheds of Sarangani, Davao del Norte, Davao del Sur, Davao Oriental, Compostela Valley, and Davao City. The average depth of the Gulf is 17 meters and volume of approximately 112x109 m³. Its widest point is approximately 160 km while coastline is approximately 520 km., reckoned from Calian Point in Davao del Sur to Cape San Agustin in Davao Oriental. Within the Gulf are the islands of Samal and Talikud in Davao del Norte, Kopiat in Davao Oriental and Lunod in Compostela Valley.

157 Davao gulf is the final catchment for all runoffs, erosion and effluents coming from 33 major rivers and creeks. As defined by the River Basin Committee for the Davao Gulf Tributaries, these tributaries make up 12 major watersheds and 8 micro watersheds. The major watersheds that drain into the Gulf are summarized in **Table 2-9**. These watersheds from the region have headwaters coming from the mountain ranges of Sarangani Province in the west and south-west portion of the region, the mountain ranges of Mount Apo in the south portion, the mountain ranges of Davao del Norte in the north and north-west portion, and mountain ranges of Compostela Valley and Davao Oriental in the eastern side.

158 The water of the Gulf is generally oceanic in nature. The inner parts and the northern part of the Gulf, however, are estuarine in character due to the massive influx of freshwater from the flood plains especially during the rainy season. Water exchange is mainly tidal with relatively good surface mixing during strong monsoon winds. Water mass flows from the south to the southwest at about 0.26 to .42 m/sec during flood tides. In the northern portion, between Bassa Point and Gill Point, water mass flows northeast, then southward and swiftly veers east-northeast during the peak tide current. In addition to this, during flood events the saline oceanic waters move northward to the deeper sections of the Gulf while waves occurring ahead at the eastern section cause older water to move towards the area of low elevation at the western side. Eddies and standing oscillations are also present within the Gulf.

Table 2-9: Major Watersheds of the Davao Gulf

PROVINCE	WATERSHED	
Davao del Sur	• Balutakay Watershed • Digos Watershed • Lais Watershed	• Padada-Miral Watershed • Sibulan Watershed
Davao del Norte	• Tagum-Libuganon-Saug Watershed • Tuganay Watershed	
Davao City	• Davao River Watershed • Lipadas-Talomo Watershed	
Compostela Valley	• Hijo Watershed • Kingking Watershed	
Davao Oriental	• Sumlog Watershed	

Source: Davao Gulf Management Council Website. Accessed on 12 September 2014 <http://davaogulfmanagementcouncil.org/enr_1.html>

Sibulan River

159 Sibulan River is a small-sized river that is the merging point of two smaller tributaries: Baracatan and Tagulaya River. Based from the Environmental Management Bureau Adopt an Estero Program 2012 Progress Report for Sibulan River, the Baracatan River extends itself to the source which is the Talomo Mountain Range at the northwestern part of Davao del Sur. Tagulaya River extends westernly to Mt. Apo and branches southward to the Sibulan Mountain Range. Sibulan River meanders eastward along lower Sibulan and Darong area and empties itself into Tagulaya point at Davao Gulf. Sand, gravel and big boulders are abundant along the river channel.

Creek

160 Within the project site is a creek that bisects the area. Based from interviews of the site caretaker and residents nearby, this creek has no known name and is just referred to as “the creek”. The creek is intermittent with regular flow occurring only during the rainy season while it is almost dried up during the summer. This creek is an indirect tributary of the Sibulan River and directly discharges to the Davao Gulf. To unify the project areas, improve the flow of activities and to improve the flow of the creek, this will be redirected outside the feed mill periphery.

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

161 The project will not alter the drainage morphology in the area.

2.2.1.2 Change in stream, lake water depth

162 The project will not affect the stream of any surface water body in the area. There is no stream and lake near the project site/vicinity.

2.2.1.3 Depletion of water resources/competition in water use

163 According to the list of National Water Resources Board (NWRB), there is only 1 permit holder in Brgy. Darong for the extraction of groundwater (Ref. 15WU018107).

164 The project will only utilize 110 cu.m. of water per day for various purposes.

165 Based from discussions with Barangay Darong officials, water depletion has been observed at some communal water sources. Jetmatic water pumps in the area are significantly pumping less water. Water completion is not expected since the proposed cement grinding facility will employ a dry process. Water for domestic use will be sourced from a deep well located within the project site. Appropriate permits will be applied through NWRB.

2.2.2 Oceanography

166 The study area for the oceanography is limited to the Darong Beach, located approximately 200 m east of the project site. **Figure 2-15** shows the location of the study area. A total of 80 hectares were surveyed for the oceanography.

Tides

167 The nearest station that collects data on tidal statistics is Davao Port, which is approximately 28km northeast of the project site.

168 **Table 2-10** shows pertinent information on the tidal statistics in the area. The mean lower low water (MLLW) and the mean higher high water (MHHW) ranges from -0.75m to 0.78m.

Table 2-10: Tidal Statistics

STATION	TIDE ELEVATION				
	MHHW Mean Higher High Water	**MHW** Mean High Water	**MTL** Mean Tide Level	**MLW** Mean Low Water	**MLLW** Mean Lower Low Water
Davao Port	0.78	0.65	0	-0.66	-0.76

Waves

169 The offshore wave conditions are shown on **Table 2-11.** The prevailing wind directions in the area are south and north, with annual occurrence frequency of 33.21% and 28.5%, respectively. The estimated highest offshore waves are 0.66m high with periods of approximately 2.84s.

Table 2-11: Offshore Wave Conditions

DIRECTION	VELOCITY RANGE (MPS)	ANNUAL OCCURRENCE FREQUENCY (%)	REMARK ON WIND	SIGNIFICANT WAVE HEIGHT (M)	SIGNIFICANT WAVE PERIOD (SEC)	REMARK ON WAVE
N	1-4	28.5	2nd Prevailing Direction	0.18	1.58	
	5-8	0.10		0.50	2.40	2nd Highest Wave Height

DIRECTION	VELOCITY RANGE (MPS)	ANNUAL OCCURRENCE FREQUENCY (%)	REMARK ON WIND	SIGNIFICANT WAVE HEIGHT (M)	SIGNIFICANT WAVE PERIOD (SEC)	REMARK ON WAVE
NNE	1-4	7.90	5th Prevailing Direction	0.23	1.82	10th Highest Wave Height
	5-8	0.10		0.66	2.84	Highest Wave Height
SE	1-4	0.10		0.45	3.05	3rd Highest Wave Height
SSE	1-4	0.80	10th Prevailing Direction	0.45	3.04	5th Highest Wave Height
S	1-4	33.21	Prevailing Direction	0.45	3.04	4th Highest Wave Height

Consolidated Bathymetric Model

170 The depth within 300m from the shore is 11 m - but goes as deep as 58 m within 900 m from the shore. The target depth of 15 m for the pier construction is located from 230 m from the shore at the northern part of the study area to 375 m at the southern part of the study area. The bathymetric survey plan is shown in **Figure 2-16**.

2.2.2.1 Change/disruption in water circulation pattern, littoral current, and coastal erosion and deposition

171 Depending on the design of the pier, there will be disruption of water circulation pattern. It is suggested that the proponent opt for construction of pier facility on piles or pillars rather than breakwater type to allow unobstructed flow of currents.

2.2.2.2 Change in bathymetry

172 Construction of the pier will not alter the bathymetry of the area. The pier will be constructed on piles and there will be no reclamation. The docking area of the Panamax will be located in an area where the depth of the water is at least 15 m.

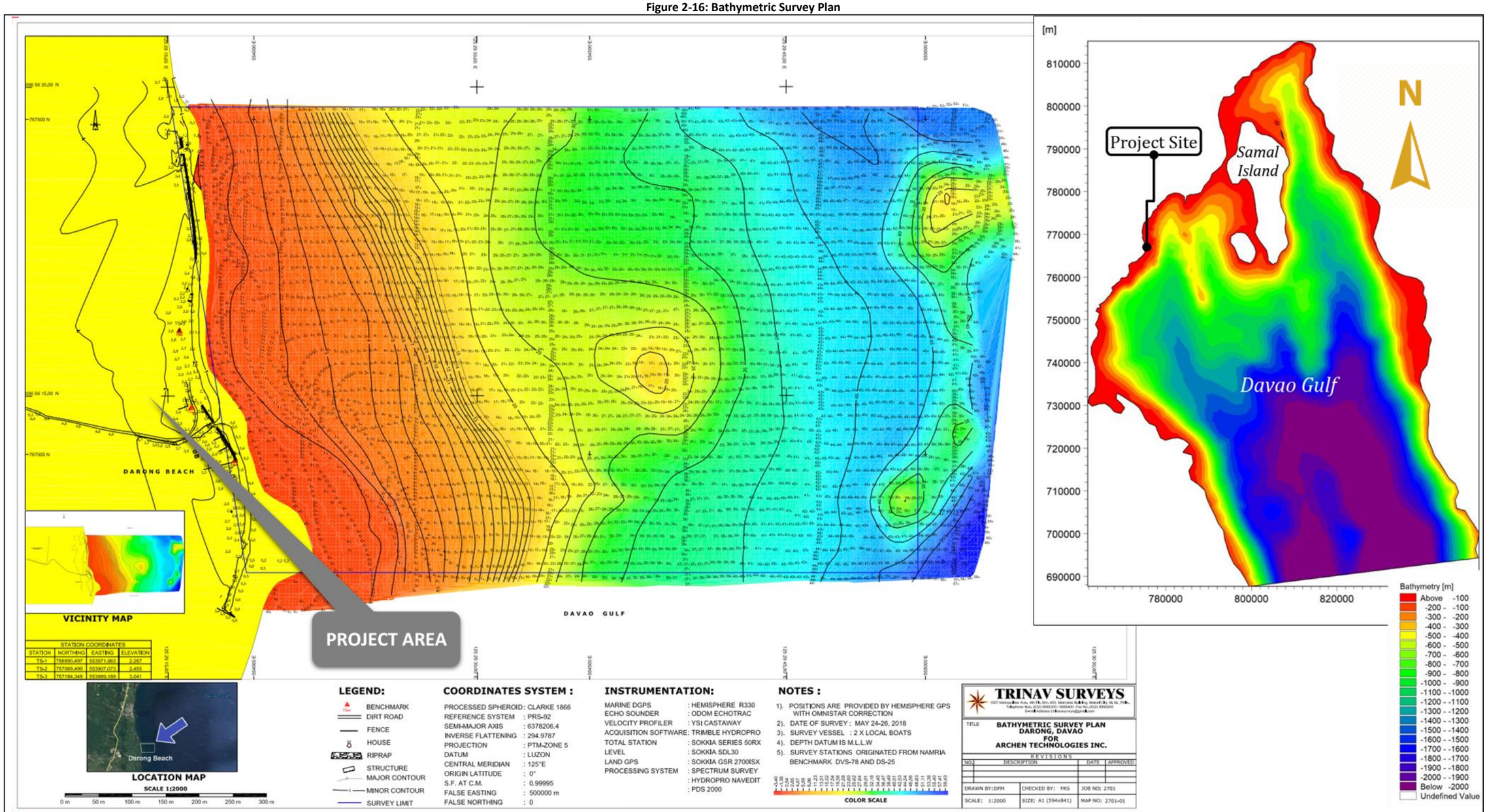
Figure 2-15: Hydrographic Survey Boundary

Source: ArchEn Technologies, Inc.

FIGURE NO.:	FIGURE TITLE:
2-15	**HYDROGRAPHIC SURVEY BOUNDARY**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-16: Bathymetric Survey Plan



Source: TRINAV SURVEYS

FIGURE NO.:	FIGURE TITLE:
2-16	**BATHYMETRIC SURVEY PLAN**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

2.2.3 Water Quality

2.2.3.1.1 Degradation of groundwater quality

173 Ground water sampling was conducted on April 5, 2018. Samples were obtained from two sampling points shown in **Figure 2-17** and were submitted to CRL Environmental Corporation for analysis.

174 The results were compared with the Philippine National Standards for Drinking Water (PNSDW) of 2017 (DOH Administrative Order No. 2017-0010) and the Water Quality Guidelines and General Effluent Standards of 2016 (DAO 2016-08) for Class A water bodies or Public Water Supply Class II intended as sources of water supply requiring conventional treatment to meet the latest PNSDW (**Table 2-12**)

175 As presented in **Table 2-12**, all water quality parameters except for fecal coliform are within the DAO 2016-08 Class A and PNSDW limits. The concentration of fecal coliform station GW2 (located on the road going to the feed mill) is 6.9 MPN/100mL, while DAO 2016-08 Class A and PNSDW standards are >1.1 MPN/100mL. The high concentrations of fecal coliform may be due to lack of appropriate sanitation facilities in inhabited areas within Brgy. Darong.

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

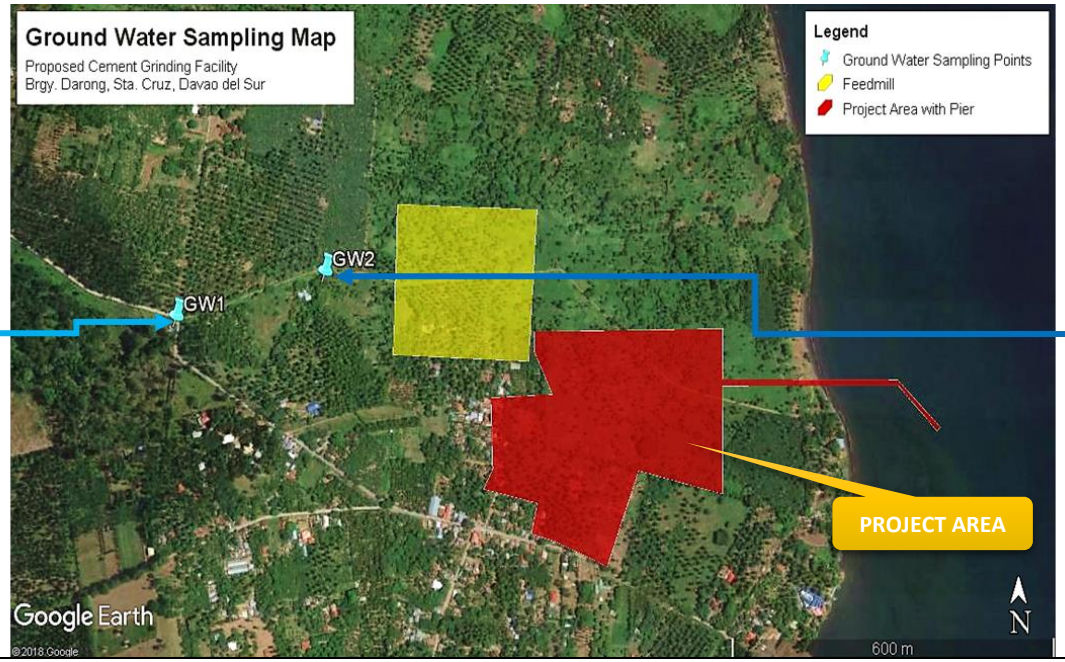
177 Accidental oil spills may also happen during the operation phase since there will be trucks the will deliver the products. The trucks shall not have access to areas that are not lined with cement. The proponent has a truck marshaling area within the project site.

178 Diesel oil will also be stored in the area. The estimated capacities of the Shift Tank and the Mother Tank are 25m^3 and 150m^3, respectively. Storage of fuel in the area increases the risk of accidental oil spills. Bund walls and secondary containment areas are part of the design of the fuel storage.

179 Another aspect that may affect ground water quality is the influx of workers in the area. Ground water quality may be affected by domestic wastewater. **Oro Cemento Industries Corporation** will install proper sanitation facilities to ensure that fecal coliform levels do not increase.

180 **Oro Cemento Industries Corporation** will monitor ground water quality from the deep well that will be installed within the plant site. The parameters to be monitored are pH, fecal coliform, and oil & grease.

Figure 2-17: Location Map of Ground Water Sampling Points



SAMPLING POINT	LATITUDE (N)	LONGITUDE(E)
1	6°56'14.39"	125°28'43.05"
2	6°56'16.74"	125°28'52.05"

Note: Location map generated using Google Earth

FIGURE NO.	FIGURE TITLE
2-17	**LOCATION MAP OF THE GROUND WATER SAMPLING POINTS**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Table 2-12: Results of Ground Water Quality Analysis (April 5, 2018)

PARAMETER	UNIT	DETECTED LEVEL AT THE SAMPLING POINTS BASED ON LABORATORY ANALYSIS (values in RED exceed the reference standard/s)		GUIDELINE VALUE FOR DRINKING WATER QUALITY	GUIDELINE VALUE FOR CLASS A WATER BODY
		GW 1 *(Near clinic)*	***GW 2*** *(Along road going to SMFI)*	*(DOH AO No. 2017-10)*	*(DENR AO No. 2016-08)*
A. WET CHEMISTRY					
Color	Apparent CU	3	40	*	50
Nitrate	mg/L	0.2	0.2		7
pH	pH	7.1	7.4	5	6.5 – 8.5
Phosphate	mg/L	0.06	0.2	*	0.5
Oil & Grease	mg/L	0.4	0.3	*	1
Chloride	mg/L	2	2	250	250
Turbidity	NTU	1	2.5	5	*
Total Suspended Solids	mg/L	4.3	6	600	1,000
B. MICROBIOLOGY					
Fecal Coliform	MPN/100mL	<1.1	6.9	<1.1	<1.1
Total Coliform	MPN/100mL	<1.1	6.9	<1.1	1,000
C. METALS					
Arsenic	mg/L	<0.008	<0.008	0.01	0.01
Cadmium	mg/L	<0.001	<0.001	0.003	0.003
Chromium	mg/L	<0.005	<0.005	0.05	0.01
Copper	mg/L	0.01	0.007	1.0	0.02
Lead	mg/L	<0.005	<0.005	0.01	0.01
Mercury	mg/L	<0.0002	<0.0002	0.001	0.001

Notes: GW = Ground Water| | mg/L = Milligrams per liter | MPN/100mL = Most probable number per 100 milliliters | NTU = Nephelometric Turbidity Unit
(*) No guideline value at present
[1] As per DOH AO No. 2017-0010, nitrate, pH, TDS, fecal coliform, As, Cd, and Pb are mandatory drinking-water quality parameters required to be tested for initial and periodic examinations.
[2] TDS and total coliform are not covered in DENR AO No. 2016-08. Guideline values are based on DENR AO No. 1990-34.
REFERENCES: DOH AO No. 2017-0010 (Philippine National Standards for Drinking Water of 2017); DENR AO No. 2016-08 (Water Quality Guidelines and General Effluent Standards of 2016)

2.2.3.2 Degradation of surface water quality

181 Surface water samples were also collected to assess the baseline condition of the Sibulan River. One sample was collected and submitted to CRL Environmental Corporation for analysis. **Figure 2-18** shows the surface water sampling point. There are commercial establishments and residences in the vicinity.

182 Results of the water quality analysis were compared with DAO 2016-08 Class C standards (**Table 2-13**). Class C water bodies are intended for the following beneficial uses:

i. Fishery Water for the propagation and growth of fish and other aquatic resources

ii. Recreational Water Class II – For boating, fishing, or similar activities

iii. For agriculture, irrigation, and livestock watering.

183 All parameters are within the standards, except for fecal coliform. The detected concentration of fecal coliform is 1,600 MPN/100mL, while the Class C standards only allow up to 200 MPN/100mL.

184 The high concentrations of fecal coliform may be due to lack of proper sanitation facilities in the commercial and residential areas in the vicinity.

185 The project will not pose any impacts on the water quality of the river, especially since the project site is approximately 2 km from the nearest river and will not discharge any wastewater into the river.

Figure 2-18: Location Map of Surface Water Sampling Point

Note: Location map generated using Google Earth

FIGURE NO.	FIGURE TITLE
2-18	**LOCATION MAP OF THE SURFACE WATER SAMPLING POINT**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Table 2-13: Results of Surface Water Quality Analysis (April 5, 2018)

PARAMETER	UNIT	DETECTED LEVEL AT THE SAMPLING POINTS BASED ON LABORATORY ANALYSIS (values in RED exceed the reference standard/s)	GUIDELINE VALUE FOR CLASS C WATER BODY
		SW 1 *(Sibulan River)*	*(DENR AO No. 2016-08)*
A. WET CHEMISTRY			
Color	TCU	8	**75**
Nitrate	mg/L	0.06	**7**
Oil and Grease	mg/L	0.3	**2**
pH		7.8	**6.5 – 9.0**
Phosphate	mg/L	0.05	**0.5**
Total Suspended Solids	mg/L	7	**80**
Biochemical Oxygen Demand	mg/L	2	**7**
B. MICROBIOLOGY			
Fecal Coliform	MPN/100mL	1,600	**200**
Total Coliform	MPN/100mL	2,400	**5,000**
C. METALS			
Arsenic	mg/L	<0.008	**0.02**
Cadmium	mg/L	<0.001	**0.005**
Chromium	mg/L	<0.005	**0.01**
Lead	mg/L	<0.005	**0.05**
Mercury	mg/L	<0.0002	**0.002**
Copper	mg/L	0.004	**0.02**
Zinc	mg/L	<0.008	**2**

Notes: SW = Surface Water| | mg/L = Milligrams per liter | MPN/100mL = Most probable number per 100 milliliters
[1] Total coliform is not covered in DENR AO No. 2016-08. Guideline values are based on DENR AO No. 1990-34.
REFERENCES: DOH AO No. 2017-0010 (Philippine National Standards for Drinking Water of 2017); DENR AO No. 2016-08 (Water Quality Guidelines and General Effluent Standards of 2016)

2.2.3.3 Degradation of coastal/marine water quality

186 Water samples from four stations in the coastal area were collected to assess the baseline conditions. Samples were submitted to CRL Environmental Corporation for analysis. The sampling stations, as shown in **Figure 2-19,** are approximately 100 m from the beach.

187 Results were compared to the water quality criteria for Class SC water bodies. This classification is for water bodies intended for the following uses:

iv. Fishery Water Class III – For the propagation and growth of fish and other aquatic resources and intended for commercial and sustenance fishing

v. Recreational Water Class II – for boating, fishing, or similar activities

vi. Marshy and/or mangrove areas declared as fish and wildlife sanctuaries

188 All parameters are within the aforementioned standards, except for the concentration of fecal coliform in station CW4. Fecal coliform concentrations in this sampling station is 1,700 MPN/100mL, while the DAO 2016-08 standard only allows 200 MPN/100mL. (**Table 2-14**)

189 The increased concentrations of fecal coliform may be attributed to lack of sanitation facilities. Furthermore, it must be noted that residents of Brgy. Darong use this water body for recreation, which may have contributed to the degradation of the water body.

190 The project may have impacts on the coastal water quality, particularly on the concentration of total suspended solids, during the construction and operation of the pier facility.

191 During construction, building materials and debris may accidentally spill into the water body. To mitigate this concern, sediment traps and erosion barriers shall be installed prior to any construction activities.

192 Since heavy equipment will be used, another concern during the construction is accidental oil spills. An oil spill management plan must be in place. Furthermore, the canal in the assigned repair area of vehicles must be maintained.

193 Influx of workers may entail higher organic load through wastes. Proper sanitation facilities must be installed given the projected influx of workers during the construction phase.

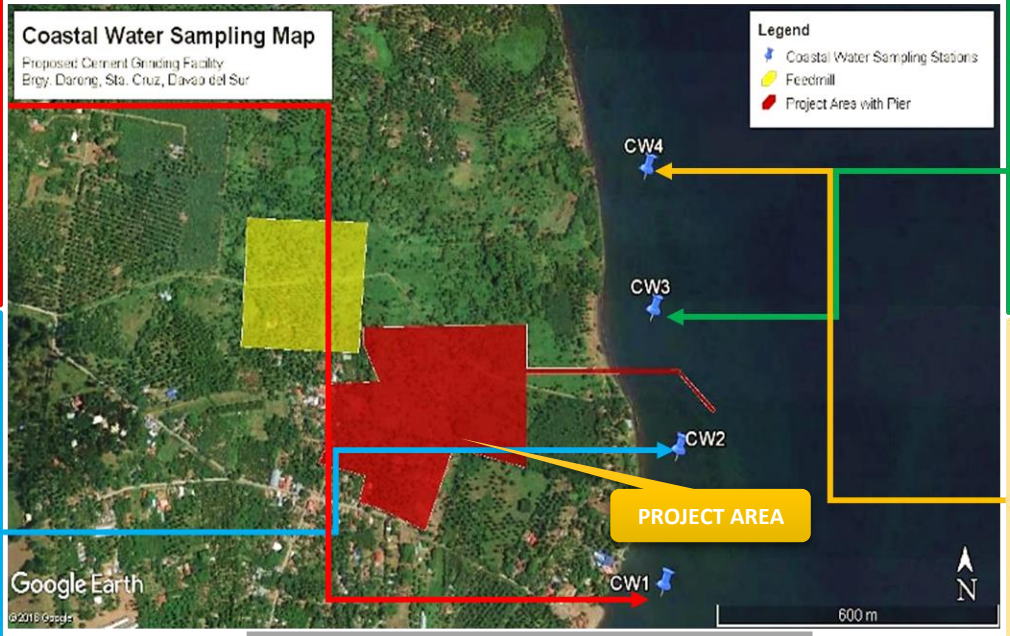
194 Operation of the pier facility entails delivery of raw materials that will be processed by the cement grinding facility; there might also be possible spillage of materials such as clinker, gypsum, and pozzolan that will be delivered to the facility. Surface runoff from the plant and the pier facility may also affect the TSS concentrations. The proponent shall install and maintain appropriate drainage system within plant and pier facility.

195 Panamax vessels will be used for delivery of materials. Because of this, another potential concern is accidental oil spills. An oil spill management plan will be prepared by the proponent and will be applied in case of oil spill in the coastal area.

196 The proponent commits to quarterly monitoring of coastal water. The main parameters that will be monitored are pH, TSS, oil & grease, and fecal coliform.

Figure 2-19: Location Map of Coastal Water Sampling Points

SAMPLING POINT	LATITUDE (N)	LONGITUDE(E)
1	6°55'57.42"	125°29'25.73"
2	6°56'5.77"	125°29'26.86"



SAMPLING POINT	LATITUDE (N)	LONGITUDE(E)
3	6°56'14.54"	125°29'25.20"
4	6°56'23.58"	125°29'24.82"

Note: Location map generated using Google Earth

FIGURE NO.	FIGURE TITLE
2-19	**LOCATION MAP OF THE COASTAL WATER SAMPLING POINTS**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Table 2-14: Results of Coastal Water Quality Analysis (April 5, 2018)

PARAMETER	UNIT	FDETECTED LEVEL AT THE SAMPLING POINTS BASED ON LABORATORY ANALYSIS (values in RED exceed the reference standard/s)				GUIDELINE VALUE FOR CLASS SC WATER BODY
		CW 1 *(Offshore project site)*	***CW 2*** *(Offshore project site)*	***CW 3*** *(Offshore project site)*	***CW 4*** *(Offshore project site)*	*(DENR AO No. 2016-08)*
A. WET CHEMISTRY						
Color	TCU	3	5	8	8	75
Nitrate	mg/L	0.1	0.1	0.3	0.09	10
Oil and Grease	mg/L	0.5	0.4	0.7	4.1	3
pH		8.1	8.1	8	8	6.5 – 8.5
Phosphate	mg/L	<0.006	0.006	<0.006	<0.006	0.5
Total Suspended Solids	mg/L	4.0	34	3.3	5	80
B. MICROBIOLOGY						
Fecal Coliform	MPN/100mL	7.8	13	130	1,700	200
Total Coliform	MPN/100mL	23	17	130	5,400	5,000
C. METALS						
Arsenic	mg/L	<0.008	<0.008	<0.008	<0.008	0.02
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	0.005
Chromium	mg/L	<0.005	<0.002	<0.005	<0.005	0.05
Lead	mg/L	<0.005	<0.005	<0.005	<0.00a5	0.05
Mercury	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	0.002
Copper	mg/L	0.005	0.006	<0.003	0.02	0.02
Zinc	mg/L	<0.005	<0.005	<0.005	0.03	0.8

Notes: CW = Coastal Water| (-) = Not monitored | (*) = No guideline value at present | mg/L = Milligrams per liter | MPN/100mL = Most probable number per 100 mL
[1] As per DENR AO No. 2016-08, color, nitrate, pH, TSS, and fecal coliform are primary water quality parameters required to be monitored for each water body; while [2] Oil & grease, arsenic, cadmium, chromium, lead, mercury, and selenium are secondary water quality parameters to be used in baseline assessment as part of the EIA and other water quality monitoring purposes as defined in the Ambient Water Quality Monitoring Manual issued through EMB MC 2008-008. Total coliform is not covered in DENR AO No. 2016-08. Guideline value is based on DENR AO No. 1990-34.
Reference: DENR AO No. 2016-08 (Water Quality Guidelines and General Effluent Standards of 2016)

2.2.4 Freshwater Ecology

197 Given that the project will not discharge its wastewater into any freshwater body and that proposed project site is approximately 2 km from the closest river, the project will not have any impacts on freshwater ecology.

2.2.5 Marine Ecology

198 The marine ecology survey was conducted along the coastal area of Brgy. Darong, Municipality of Sta. Cruz, Davao del Sur on July 25 to 28, 2018. Assessment of nearshore sensitive biological communities (SBCs) was carried out following multiple methods and tools in order to provide an updated ecological profile of the coastal environment and resources adjacent to the proposed project site.

2.2.5.1 Methodologies

2.2.5.1.1 Coastal Resource Mapping

199 Mapping of coastal habitats within the 2-kilometer stretch of the proposed project site was conducted to show the distribution of various ecosystems and to obtain estimates of area (in ha) that they cover. The extent of coral reefs, seagrass beds and mangrove forest will be mapped using global positioning system (GPS).

200 The depth of sampling for the coastal resource mapping are as follow:

a) Depth of sampling coral reef sites (between tides): Site 1 = 4 meters; Site 2 = 4 meters; Site 3 = 2 meters

b) Depth (during low tide) of subtidal seagrass bed in Site 1 = 2-3 meters; Site 2 = 2 meters; Site 3 = 0.5-1 meters

c) Distance from shore of coral reef sites: Site 1= 170 meters; Site 2 = 150 meters; Site 3= 100 meters

d) Distance from shore of seagrass sites: In all 3 sites we started sampling at the edge of shore, but the point/distance from shore where seagrass was found varied by site:
   - Site 1 = 90m;
   - Site 2 = no seagrass was found in Transects 1 & 2, estimated at left and right of the proposed pier where the bottom is purely fine, dark sand; seagrass appeared at 60 meters from shore in Transect 3 where a sandy-rocky reef flat is found.
   - Site 3 = seagrass appeared at 20-30 meters from shore across 4 transects.

2.2.5.1.2 Reconnaissance Survey

201 Manta tow reconnaissance survey (**Figure 2-20**) as described by English *et al*. (1997) was conducted along the 2-km stretch of coastal area along Brgy. Darong fronting of the proposed project site to determine the location of coral reefs, seagrass beds, and soft bottom areas, particularly around the area of the proposed 500-m pier (Figure 4). A total of 12 two-minute manta tows was carried out along this stretch (Figure 5); at each stop, the observer recorded observations on percent cover of live coral, dead coral, soft coral, substratum type and other noteworthy fauna or flora. Data on percent cover of coral and other benthos were translated into status categories (i.e., poor = 0-24.9%; fair = 25-49.9%; good = 50-74.9%; and excellent = 75-100%) used by Gomez et al. (1981) to describe the health or condition of the reef.

Figure 2-20: Manta Tow Reconnaissance Survey

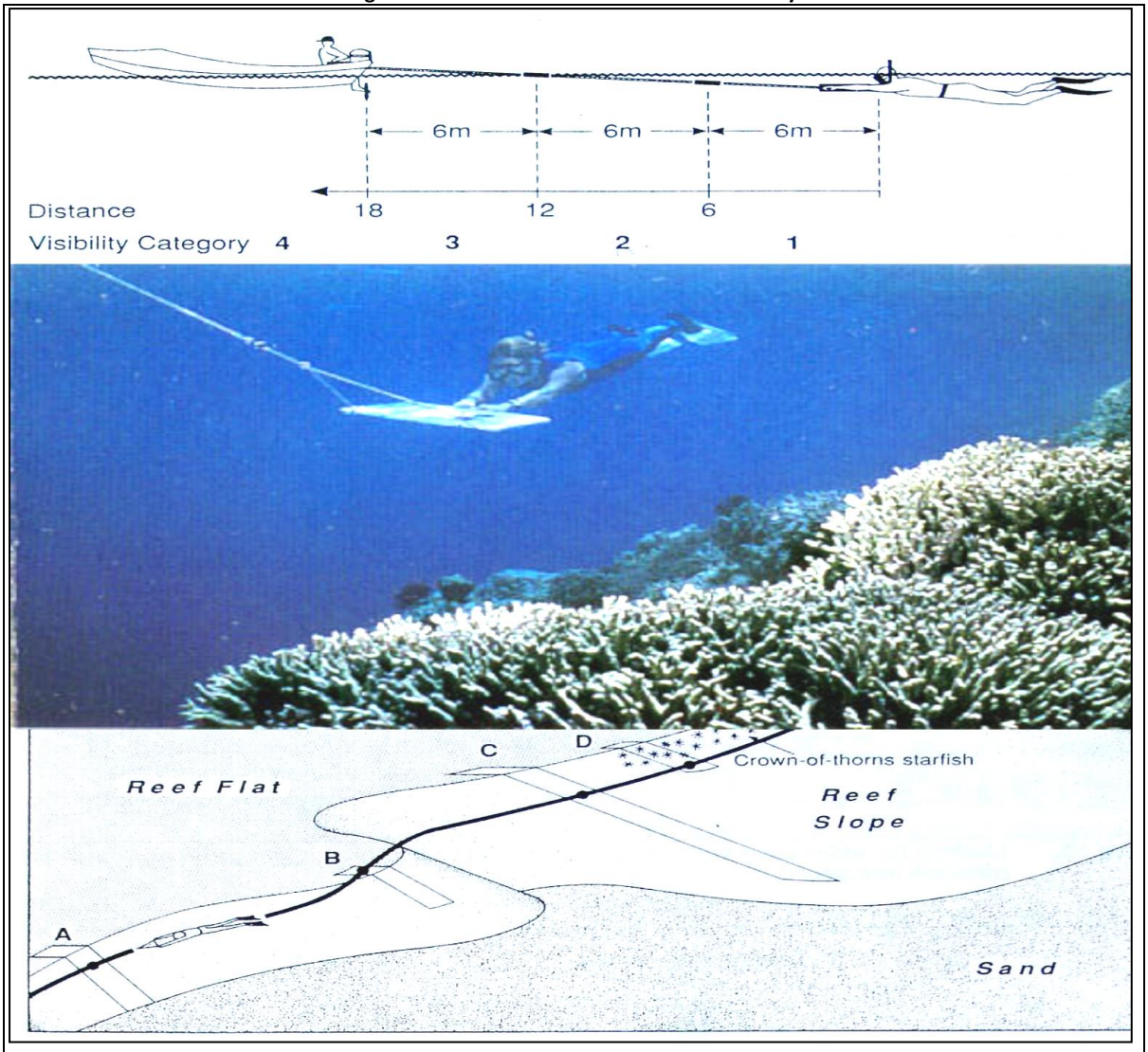


FIGURE NO.	FIGURE TITLE	
2-20	**MANTA TOW RECONNAISSANCE SURVEY**	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-21: Location of Manta Tow Stops and Selected Sites for Detailed Coral Reef Survey (Designated S1-S3) along the Coast of Brgy. Darong

FIGURE NO.	FIGURE TITLE	
2-21	**LOCATION OF MANTA TOW STOPS AND SELECTED SITES FOR DETAILED CORAL REEF SURVEY (DESIGNATED S1-S3) ALONG THE COAST OF BRGY. DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

2.2.5.1.3 Coral Reef Survey

Corals and Other Benthic Lifeforms

202 Based on the results of the manta tow survey, three sites along the coast of Brgy. Darong, Sta. Cruz were identified and surveyed to determine the status of coral communities and other benthic lifeforms. Site 1 is located to the north of the proposed pier site while Site 2 is located about 500 meters from Site 1 and very close to the end part of the proposed pier (point P3 based on coordinates provided to the assessment team). Site 3 is approximately 780 m to the right of Site 2 and immediately fronting the population center of Purok Guava.

203 Estimates of percent cover of live coral and other lifeforms were obtained using the digital photo-transect (DPT) method described in Vergara and Licuanan (2007). Scuba dive surveys were carried out to take photographs of the benthos using a digital camera inside a waterproof housing mounted on a distance bar or monopod along two 50-meter transects laid on the reef and parallel to the shore. Image processing was done later to obtain estimates of percent cover of corals and other benthic lifeforms. Data on percent cover of coral and other benthos were translated into status categories or criteria (i.e., poor = 0-24.9%; fair = 25-49.9%; good = 50-74.9%; and excellent = 75-100%) used by Gomez et al. (1981) to describe the health or condition of the reef.

Reef Fish Communities

204 Reef fish diversity (family and species composition) and abundance (fish population density per hectare) were assessed along the same sites as the coral/benthos survey using the daytime fish visual census (FVC) described by English et al. 1997. Estimates of fish biomass of target food species and indicator species of reef health were obtained from estimates of fish size and abundance. Species richness, population density, and fish biomass data obtained from the proposed project site are compared with known standards in coral reef fish communities (Aliño and Dantis 1999; Hilomen at al. 2000; Nañola et al. 2004).

2.2.5.1.4 Seagrass Beds and Seaweed Resources

205 Assessment of seagrass and seaweed resources within the impact zone of the proposed project site was carried out in three sites, as identified by the manta tow survey, using a uniform transect-quadrat method. Site 1 was located adjacent to the coral reef Site 1, to the left of the proposed pier, while Site 2 was alongside the proposed pier. Site 3 was the reef flat fronting Purok Guava. The seagrass meadow in Site 1 was quite deep and the survey needed scuba diving which was conducted on the last day. Due to limited amount of air left in the tanks the divers were able to survey only one transect. Three transects were surveyed in Site 2 while four transects were deployed in Site 3: two transects in the shallow reef flat and two transects in the subtidal area. The length of each transect varied according to the extent of the reef flat or the subtidal seagrass meadow. Seagrass diversity, percent cover and shoot density were determined in each 0.25m2 quadrat at fixed intervals of 10 meters along each transect.

206 In the case of seaweed resources only species composition and cover estimates were obtained as shoot density cannot be easily determined from their variable growth forms. Macrobenthic invertebrates associated with seagrass and seaweeds were identified and counted. Photographs of different seagrass, seaweed, and associated invertebrate species were obtained.

2.2.5.1.5 Mangrove Resources

207 The narrow strip of mangroves that occurs adjacent (about 100 meters to the right) to the densely populated Purok Guava was surveyed. Since the mangrove community was quite narrow and occurs as a single line along a narrow creek, a full census of trees, saplings and seedlings was made instead of the standard transect-plot method described by English et al. (1997) to obtain data on mangrove community structure. Using GPS, the area of the narrow strip of mangroves was estimated to be only 1.8 hectares. Species composition and counts of seedlings, saplings and mature mangrove trees found along both sides of the creek was recorded. Tree girth-at-breast height or circumference of all mangrove trees was obtained for use in estimation of basal area.

2.2.5.1.6 Nearshore Plankton and Soft-Bottom Communities

Field Collection of Samples

208 Replicate vertical tows of plankton using a plankton net were carried out in four sites, corresponding to the coral and seagrass sites within the impact zone, with an additional sample taken near the end of the proposed pier. Plankton samples were collected into properly labelled bottles and brought to the laboratory for analysis.

209 Sediment samples from soft bottom areas in each of the three sites and in the area where the proposed pier or wharf will be constructed were collected by divers by driving a modified sediment corer (fashioned from a 2 inch-diameter x 6 inches long PVC corer) into the sediment. Two replicate samples of sediments were collected from each site and placed in pre-labeled Ziploc bags, treated with 10% formalin solution and brought to the laboratory for analysis.

Laboratory Analysis

210 Analysis of plankton and meiofauna was conducted by a plankton and meiofauna specialist in a private laboratory in Naawan, Misamis Oriental. Parameters obtained for both sets of samples are species composition and population density (no. individuals/m3 for plankton and no. individuals/m2 for meiofauna). Substrate type of bottom samples is also described.

2.2.5.1.7 Coastal Fisheries

211 A profiling of the coastal or capture fisheries of Brgy. Darong was carried out using a short questionnaire survey administered to fishers in two coastal villages, namely, Purok Guava and Purok Lakatan on 26-27 July 2018.

2.2.5.2 Results and Discussions

2.2.5.2.1 Coastal Resource Map

212 Coral reefs in the proposed site are not well developed, fragmented, and widely scattered rather than occurring as a continuous fringing reef. The manta tow survey showed that live corals were spotted in only three sites corresponding to Tow # 1-3, 5-7 and 11-12 (**Figure 2-22**) but at very low cover (10-20%). Based on these tow results three coral reef sites were established namely; Site 1 (to the north of the proposed pier), Site 2 (adjacent to and south of the proposed pier), and Site 3 (fronting Purok Guava). Of the three reef sites, Site 2 has the biggest area of approximately 3.8 hectares while Site 1 (0.8 ha) and Site 3 (1.3 has.) are quite small.

213 Seagrass resources in Brgy. Darong are found along three sites adjacent to the coral reef sites but occur in very sparse cover near the shore or on the shallow reef flats. More extensive growth occurs in subtidal seagrass meadows found north of the proposed pier (adjacent to coral reef Site 1) and immediately in front of Purok Guava (Site 3). Only rough estimates of area coverage of seagrass beds in each site (i.e. Site 1 = 0.03 ha; Site 2 = 0.4 ha; Site 3 = 0.5 ha) are presented due to strong wave action and highly turbid waters at the time of the survey due to strong SW monsoon. The dark gray to black sandy bottom in all areas made it more difficult to detect the occurrence of seagrass beds under high turbulence and turbidity. It is possible that seagrass beds are more extensive than presented in this report.

214 Productivity can be determined from both primary and secondary production of the coastal ecosystems of Darong. Primary productivity is usually measured either by the abundance of phyto- (microscopic plant) plankton and zooplankton (microscopic animals) or by the amount of chlorophyll. In the case of this survey we used only plankton abundance as a proxy to primary production. Secondary production can be determined from the amount of fish caught or produced by the artisanal fishers of Darong. Diversity and abundance of soft-bottom meiofauna can also be used as indicator of productivity. All these three indicators were investigated in the marine survey of the proposed site.

215 Based on phytoplankton abundance (mean of 29,709 cells m-3) primary productivity in Darong can be considered low when compared to the rest of Davao Gulf where phytoplankton densities reached an average of 362,100 cells m-3 (MSU Naawan 1995). Zooplankton abundance in Darong is also very low (7,901 cells m-3) as compared to mean zooplankton abundance in Davao Gulf (397,960 cells m-3). The coastal plankton community is quite diverse although the population density is just moderate and much lower than reported for Davao Gulf. The most abundant pythoplankton in Darong are Trichodesmium and Chaetoceros, which were also reported as the most abundant pythoplankton in Davao Gulf in past decades. Copepods are the most abundant zooplankton in Darong waters which were also reported the dominant zooplankton in the rest of the Gulf.

216 Fish production in Darong is largely contributed by pelagic (offshore) fish rather than demersal (reef-associated) fish, which suggests that reef is not productive in terms of fish. This observation is supported by the results of reef fish visual census conducted in this survey showing that the reefs of Darong have very poor or low fish diversity, abundance and biomass. Catch per unit Effort (CPUE) is a common indicator of fisheries production, and in Darong, except for Handline and Troll Line which are used offshore to catch tuna and other pelagic fish, most other gears have very low CPUE (2-8 kg gear unit-1 trip-1).

217 The meiofaunal community, on the other hand, has low diversity and abundance when compared to that in other seagrass-associated sites, which suggests that the soft-bottom environment may be disturbed, probably as a result of prevailing high turbulence.

Figure 2-22: Coastal Resource Map of Brgy. Darong

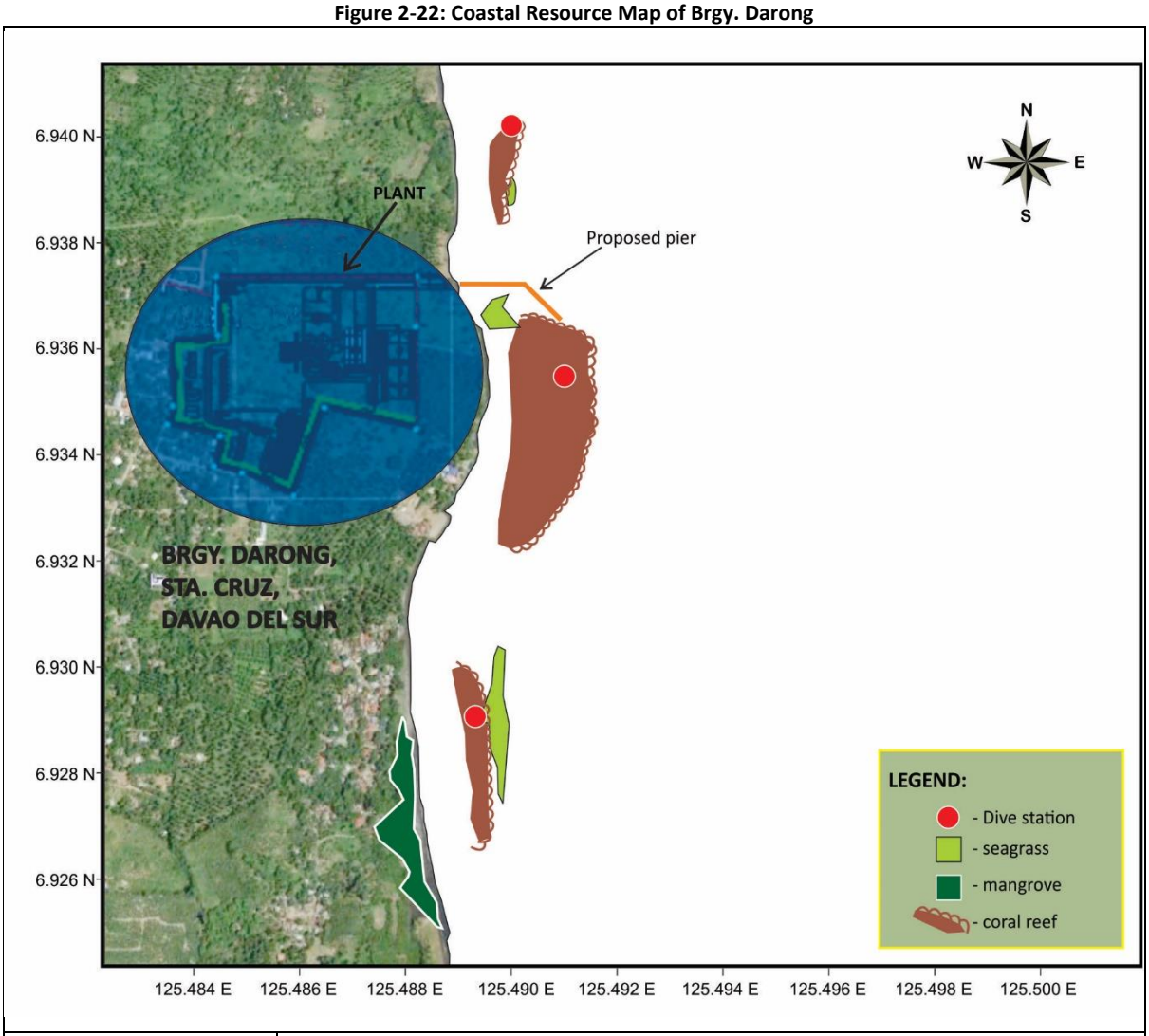


FIGURE NO.	FIGURE TITLE	
2-22	**COASTAL RESOURCE MAP OF BRGY. DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Figure 2-23: Relative Cover of Live Coral and Other Benthic Lifeforms

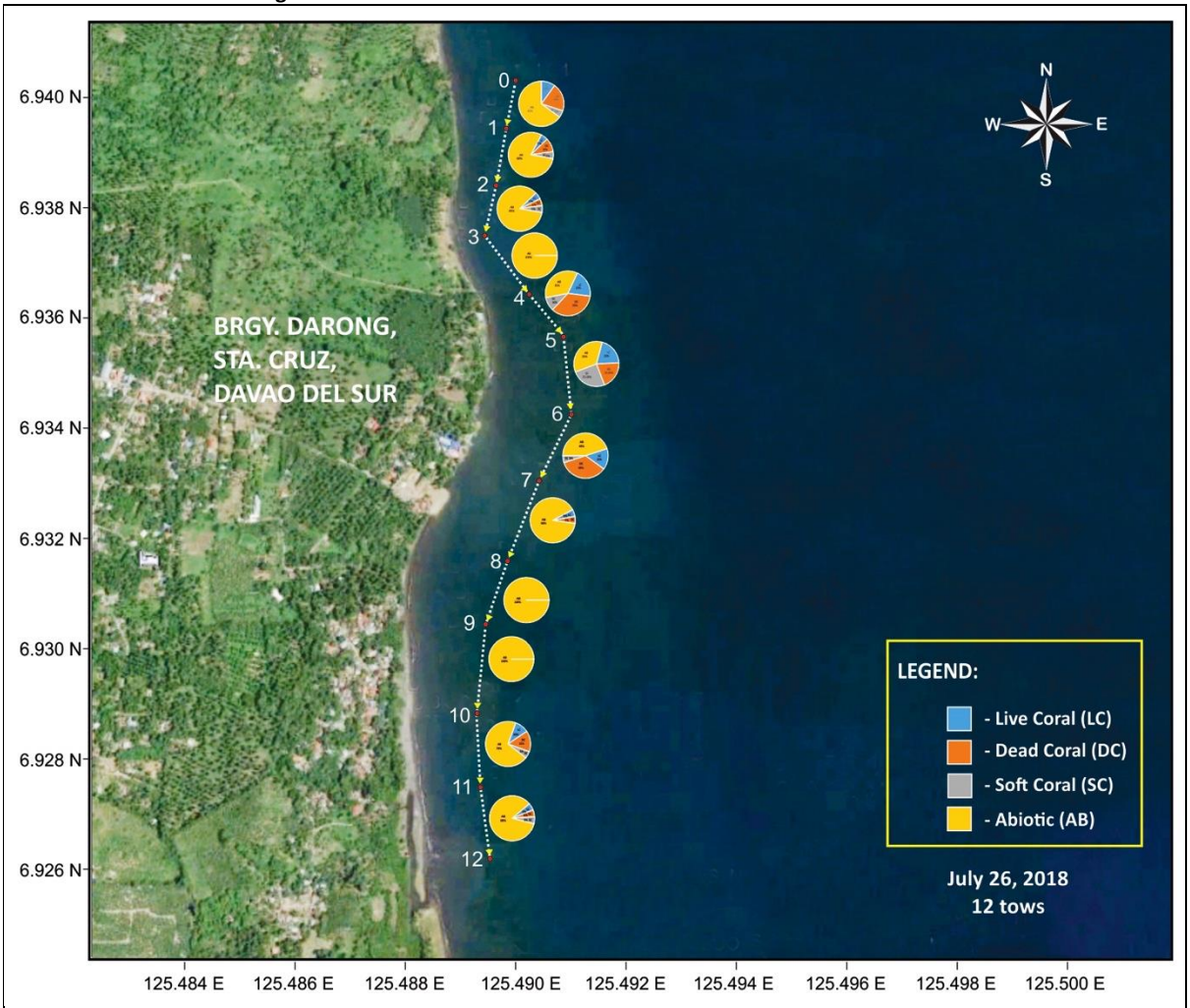


FIGURE NO.	FIGURE TITLE	
2-23	**RELATIVE COVER OF LIVE CORAL AND OTHER BENTHIC LIFEFORMS**	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

218 The mangrove resources of Brgy. Darong occupying about 1.8 Has. are restricted to the southern part of Purok Guava and dominated by nipa fronds *(Nypa fruticans)* that grow profusely in both water and dried portions of the creek (The other species of mangroves occur as a narrow strip of vegetation on both sides of the almost dried-up creek. Residents of Purok Guava narrated that the creek used to be larger than it is now and filled with water. Today, however, many parts of the creek have dried up and overgrown with nipa and fringed by sparse growth of mangroves and other associated vegetation.

Figure 2-24: Nipa *(Nypa fruticans*) Dominates the Mangrove Resources of Brgy. Darong

FIGURE NO.	FIGURE TITLE	
2-24	**NIPA *(NYPA FRUTICANS)* DOMINATES THE MANGROVE RESOURCES OF BRGY. DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

2.2.5.3 General State of Sensitive Biological Communities

2.2.5.3.1 Corals and Other Macrobenthos

219 Results of the assessment of coral communities and other benthic lifeforms show that the coral reefs of Darong had sustained widespread damage, presumably from dynamite fishing that fishers said were common in the past, and from other activities that altered the coral reef environment. In all three sites divers found poor coral cover (<25% live coral cover or LCC) while higher proportions of dead coral and abiotic (i.e. rock, sand, silt) were found on the reef sites (**Table 2-15**). Of the three areas, Site 1 (north of the proposed pier) had the lowest mean LCC (5.69%) while Site 2 (right to the pier site) and Site 3 (fronting Purok Guava) had higher LCC of 20.59% and 12.35%, respectively (**Figure 2-25**).

Table 2-15: Comparative Cover (%) of Coral and Other Benthic Lifeforms in 3 Reef Sites in Brgy. Darong

BENTHIC LIFEFORM	STATIONS					
	S1T1	**S1T2**	**S2T1**	**S2T2**	**S3T1**	**S3T2**
Live Coral	10.59	0.78	23.92	17.25	15.69	9.02
Dead Coral	6.67	0.00	43.92	43.92	40.78	27.84
Other Fauna	3.14	58.43	10.59	10.98	25.88	54.51
Algae	0.39	1.18	2.35	1.18	5.49	3.92
Abiotic	79.22	39.61	19.22	26.67	12.16	4.71
TOTAL	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Figure 2-25: Comparative Cover of Live Coral and Other Lifeforms Across the 3 Reef Sites in Brgy. Darong

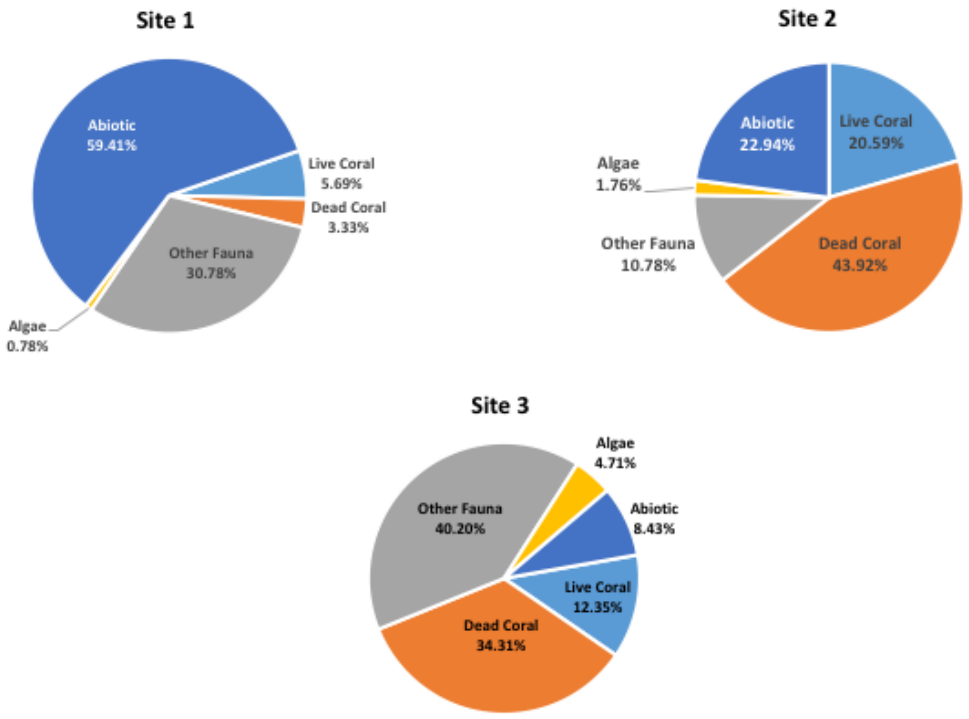


FIGURE NO.	FIGURE TITLE	
2-25	**COMPARATIVE COVER OF LIVE CORAL AND OTHER LIFEFORMS ACROSS THE 3 REEF SITES IN BRGY. DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

220 Very high proportion (91%) of abiotic and other lifeforms (e.g. algae, seagrass, sponges) was found in Site 1, while dead coral (usually DCA or overgrown with algae) cover was very high in Site 2 (44%) and Site 3 (35%). Newly dead coral is often white (bleached) and may become substratum for new recruits. On the other hand, high DCA cover suggests that the corals were not damaged recently but sometime ago, and algal growth can prevent recruitment or resettlement of coral larvae on these substrates. Silt was not observed on the coral reefs of Darong, probably due to strong current and wave action that keeps fine sand resuspended or carried away.

Figure 2-26: Comparison of Relative Cover of Live Corals and Other Benthic Lifeforms on the Reefs of Brgy. Darong Within the Vicinity of The Proposed Project

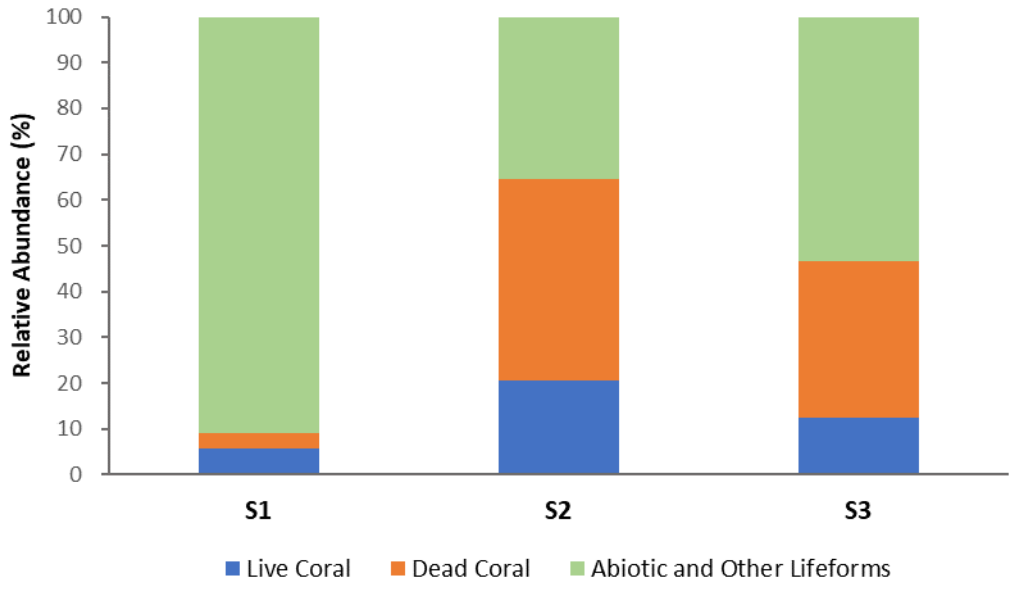
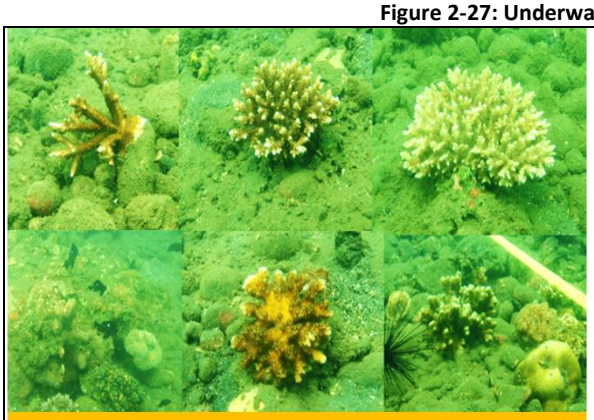


FIGURE NO.	FIGURE TITLE	
2-26	**COMPARISON OF RELATIVE COVER OF LIVE CORALS AND OTHER BENTHIC LIFEFORMS ON THE REEFS OF BRGY. DARONG WITHIN THE VICINITY OF THE PROPOSED PROJECT**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

221 There are, however, clear signs that the damaged reefs are on the process of recovery. In several parts of the coral reef area in Site 1 (north of the proposed pier site) several young coral recruits measuring between 5-15 cm in diameter were found growing on dead corals and bedrock (**Figure 2-27a**). The reefs in Site 2 (**Figure 2-27b**) and Site 3 (**Figure 2-27c**) are relatively narrow, old systems composed of large-sized coral heads most of which are dead. However, scattered across these coral reef sites are relatively young and healthy corals.

222 The coral reef areas of Brgy. Darong are relatively shallow, ranging only from 3-4 meters deep during high tide when the surveys were made. Dive surveys around the proposed pier found that beyond the 500 m point (P3) the area is quite shallow, not exceeding 3m deep and relatively flat or gently sloping. The bottom is largely made up of fine, black sand with sparse seagrass cover. The shallow location of the coral reefs of Darong increases their vulnerability to strong wave action and storm surges that can cause damage on fragile branching coral. The dominance of massive (e.g. *Porites, Lobophyllia, Favites*), rather than branching, corals in Site 2 and Site 3 is most probably influenced by high turbulence in the area, particularly during the southwest (SW) monsoon or habagat. Branching *Acropora* is also very common in the three sites, but often occurs as small, young colonies. **Figure 2-27** shows the most frequently occurring coral genera in Darong reefs.

Figure 2-27: Underwater Photos of Site 1 to 3



A.) Underwater photos of young coral recruits growing on damaged reef in Site 1, indicating that parts of the reef may be recovering.

B.) Underwater photos of the coral reef in Site 2 showing an older, more developed reef but with poor to fair coral cover.

C.) Underwater photos of the coral reef in Site 3, fronting Purok Guava, Brgy. Darong, showing associated fish and contiguous seagrass meadow.

Note: Taken by LCI Marine Team

FIGURE NO.	FIGURE TITLE	
2-27	**UNDERWATER PHOTOS OF SITE 1 TO 3**	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-28: Most Common Genera of Live Hard Coral Found on the Reefs of Brgy. Darong

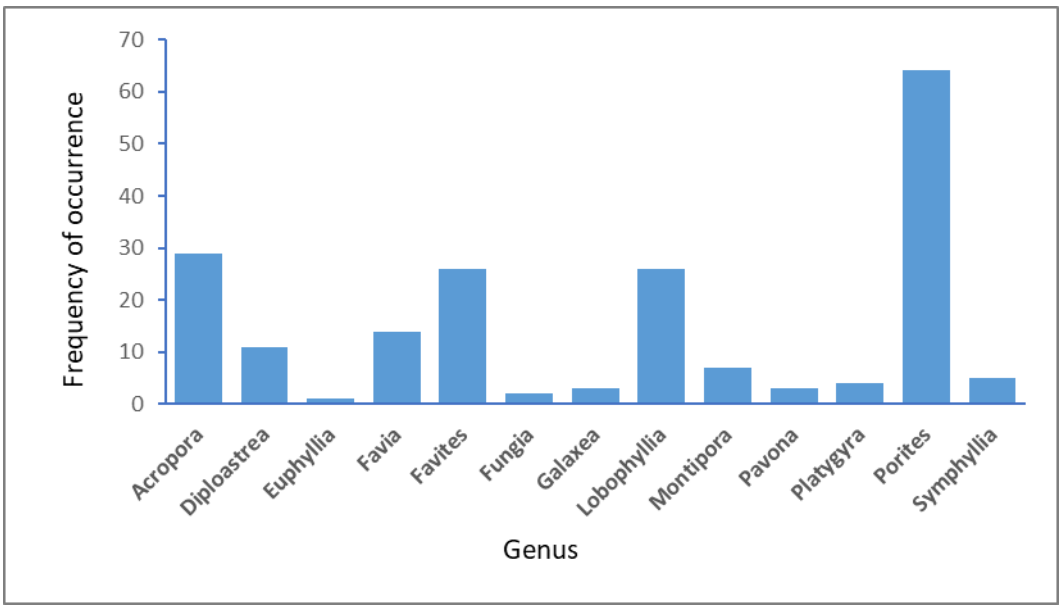


FIGURE NO.	FIGURE TITLE	
2-28	**MOST COMMON GENERA OF LIVE HARD CORAL FOUND ON THE REEFS OF BRGY. DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

2.2.5.3.2 Reef Fish Communities

223 Compared to many coral reef sites in the Davao Gulf region and other parts of Mindanao (MSU Naawan, 1996; De Guzman et al. 2012; Recamara and De Guzman, 2015) the fish community in the Darong reefs (**Table 2-16**) is considered in very poor condition, based on the established criteria by Aliño et al. (1991) and Hilomen et al. (2000) on species richness, abundance, and biomass. Species richness of reef fish in all three sites is as low as 12-14 species per 1000 m2 and classified as very poor (<26 species/1000 m2). Abundance or population density ranges from 64-96 in Site 1 & 3 (very poor) to 223 fish/1000 m2 (low), and average biomass range from 0.38-1.1 kg/1000 m2 is described as very low.

Table 2-16: Diversity and Abundance Profile of Fish Communities in the Coral Reefs of Brgy. Darong

FISH GROUP/CATEGORY	FAMILY	NO. OF SPECIES	POP. DENSITY *(NO.FISH/1000M2)*	MEAN BIOMASS *(KG/1000M2)*
Target Food Fish	Nemipteridae	1	1	0.041
	Siganidae	1	1	0.028
Indicator Species	Labridae	1	1	0.007
Major Demersals	Apogonidae	2	5	0.009
	Fistulariidae	1	1	0.025
	Labridae	10	11	0.144
	Pinguipedidae	2	2	0.051
	Pomacentridae	12	112	0.393
	Tetraodontidae	1	1	0.005
Total	**9 families**	**31**	**135**	**0.704**

224 From **Table 2-16**, it is obvious that very few fish were found on the reefs at the time of the survey, and because of the poor condition of the coral reef habitat (i.e. poor coral condition) it is not surprising to see the same condition of the reef fish community. Similar to other reefs the species composition of reef fish in Darong (**Figure 2-29**) is dominated by small damselfishes (Pomacentridae) and wrasses (Labridae), however, in the case of Darong the fish are much smaller and fewer, thus convert to vary small biomass (**Figure 2-30**).

225 Reef fish are important sources of food and livelihood of coastal or artisanal (i.e. small-scale) fishers. A common classification of reef fishes to determine their economic and ecological values is to group them into Target Food Fish, Indicator Species, and Major Demersal or miscellaneous species. Target food fish includes families and species of commercially important species that fishers target for their economic value. Indicator species are those whose abundance on the reef suggests healthy reefs and have high ecological value. Despite their often-small size, major demersal fish (often exhibit high diversity and abundance and contributes to ecosystem resilience. Small demersal fish make up 90% of the reef fish community (**Figure 2-29**); the remainder made up of food fish (7%) and indicator species (3%). The existing community structure of reef fish in Darong, therefore, indicates a highly degraded fish community that cannot support sustainable fisheries.

Figure 2-29: Relative Abundance of Fish Families and Groups on the Coral Reefs of Brgy. Darong, Sta. Cruz Within the Vicinity of The Proposed Project

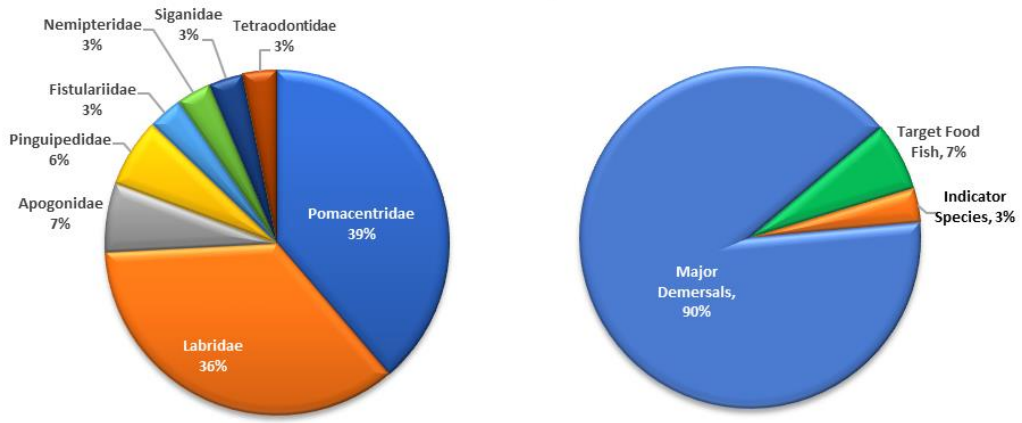


FIGURE NO.	FIGURE TITLE	
2-29	**RELATIVE ABUNDANCE OF FISH FAMILIES AND GROUPS ON THE CORAL REEFS OF BRGY. DARONG, STA. CRUZ WITHIN THE VICINITY OF THE PROPOSED PROJECT**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Figure 2-30: Overall Fish Species Richness and Comparison of Abundance and Biomass Estimates Across Three Reef Sites in Brgy. Darong Fronting the Proposed Project Site

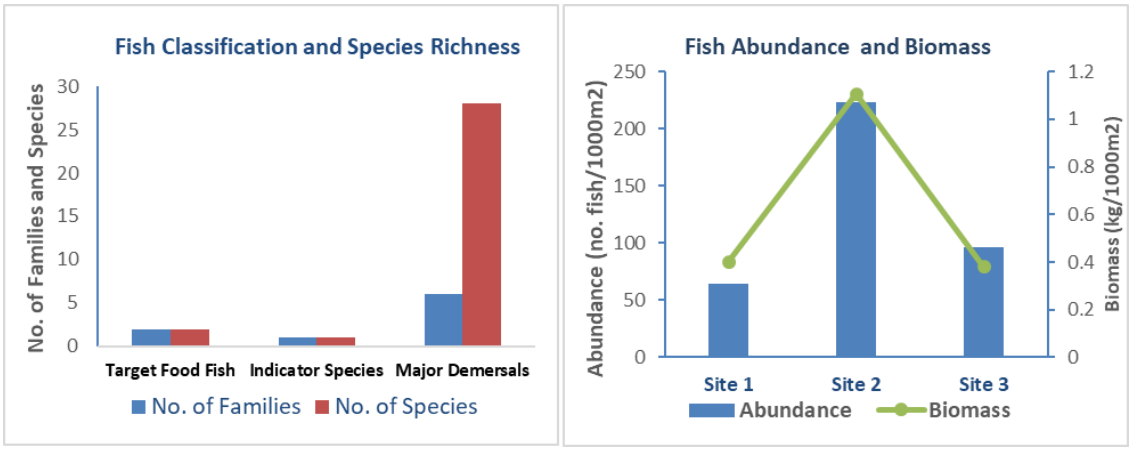


FIGURE NO.	FIGURE TITLE	
2-30	**OVERALL FISH SPECIES RICHNESS AND COMPARISON OF ABUNDANCE AND BIOMASS ESTIMATES ACROSS THREE REEF SITES IN BRGY. DARONG FRONTING THE PROPOSED PROJECT SITE**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

2.2.5.3.3 Seagrass and Seaweed Resources

226 The seagrass ecosystem in Brgy. Darong starts from the sandy-rocky portions of the reef flat some 25-30 meters from the shore. The areas closest to shore are characterized by fine, dark sand devoid of vegetation. Residents say that beach seine or baling is constantly operated in shallow, soft bottoms at certain times of the year coinciding with the goby and anchovy fry season, which may explain why virtually no seagrass grows on these parts. Seagrass grows quite abundantly, however, in deeper (or subtidal) parts not often exposed during low tides. Except for the coralline algae *Amphiroa fragilissima*, no seaweed was encountered in the reef flat survey.

227 Four species of seagrass were commonly found in the three sites, namely, the round-tipped seagrass *Cymodocea rotundata*, the trident-tipped needlegrass *Halodule uninervis*, the syringe grass *Syringodium isoetifolium*, and the turtle grass *Thalassia hemprichii*. The spoon grass Halophila sp. was also found but no estimates of cover were made as it was difficult to detect in highly turbid and turbulent water. Highest aggregate seagrass cover (71.7%) was recorded in Site 1 (north of the proposed pier and close to coral Site 1). Site 3 (fronting Purok Guava) had moderate seagrass cover at 54.6% while Site 2 (along the proposed site for the pier) had the lowest at only 5.2% (**Table 2-17**).

228 Among the four species, *C. rotundata* had the highest average cover (33%) across sites (**Figure 2-31**), *T. hemprichii* had 25% cover followed closely by *H. uninervis* (23%) and *S. isoetifolium* (19%). Highest average shoot density (number of upright shoots/m2) was obtained from *C. rotundata* followed by *H. uninervis* which are characterized by long, slender blades. Although having a high percent cover, *T. hemprichii* had lower shoot density due to its thicker root and leaf sheath and wider, curved leaves and thus, occupy more space than the other three slender seagrass species.

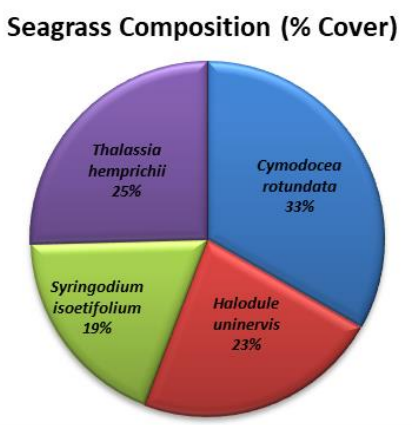
229 Seagrass cover was highest in the deeper end of the meadow than on shallower parts of the reef flat where the plants are either absent or have sparse cover. The slender *H. uninervis* occurred abundantly in Site 1 especially on the deeper side but not found in Site 2 (**Figure 2-32**). On the other hand, *C. rotundata* and *T. hemprichii* are ubiquitous or found in all sites but at higher coverage in Site 1. The syringe grass *S. isoetifolium* occurred in all sites but at higher abundance in Site 3.

Table 2-17: Estimates of Abundance of Seagrass Resources in Brgy. Darong

SEAGRASS SPECIES	MEAN SG COVER			MEAN SHOOT DENSITY		
	Site 1	Site 2	Site 3	Site 1	Site 2	Site 3
Cymodocea rotundata	15.8	4.4	17.9	384	102	365
Halodule uninervis	26.7	0.0	10.7	567	0	261
Syringodium isoetifolium	5.8	0.8	11.9	69	5	235
Thalassia hemprichii	23.3	0.0	14.1	222	0	142
Total	**71.7**	**5.2**	**54.6**	**1242**	**107**	**1003**

230 Overall, Site 2 where the proposed pier would be constructed had the lowest seagrass cover but higher abundance in the deeper subtidal end of the transect (**Figure 2-33**). This portion could be avoided during the construction of the pier perhaps by a slight repositioning of the structure. **Figure 2-34** shows some photos of the seagrass meadow in the subtidal area, the sampling conducted on the reef flat, and of the common species of seagrass found in the area. Very few invertebrates were encountered in the seagrass survey, but the two bivalves (pen shell *Atrina sp.* and white clam *Tellina sp.*) shown in the photo are common in the area according to residents.

Figure 2-31: Species Composition and Comparative Shoot Abundance of the Seagrass Community in Brgy. Darong Fronting the Proposed project Site



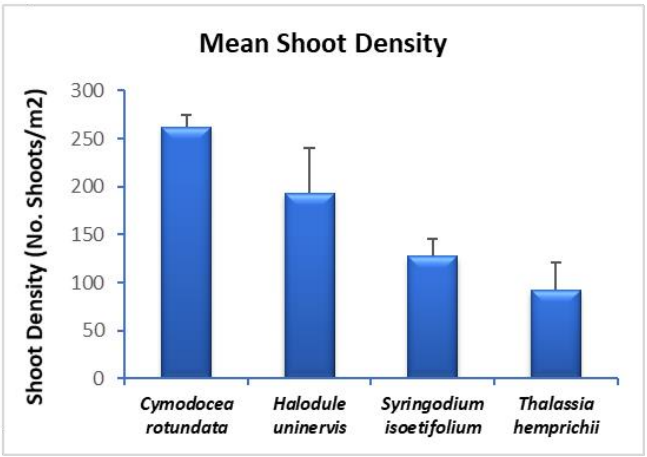


FIGURE NO.	FIGURE TITLE	
2-31	**SPECIES COMPOSITION AND COMPARATIVE SHOOT ABUNDANCE OF THE SEAGRASS COMMUNITY IN BRGY. DARONG FRONTING THE PROPOSED PROJECT SITE**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Figure 2-32: Comparison of Seagrass Cover and Shoot Density of Different Seagrass Species Found on Both Shallow and Subtidal Portions of the Reef Flats in Brgy. Darong

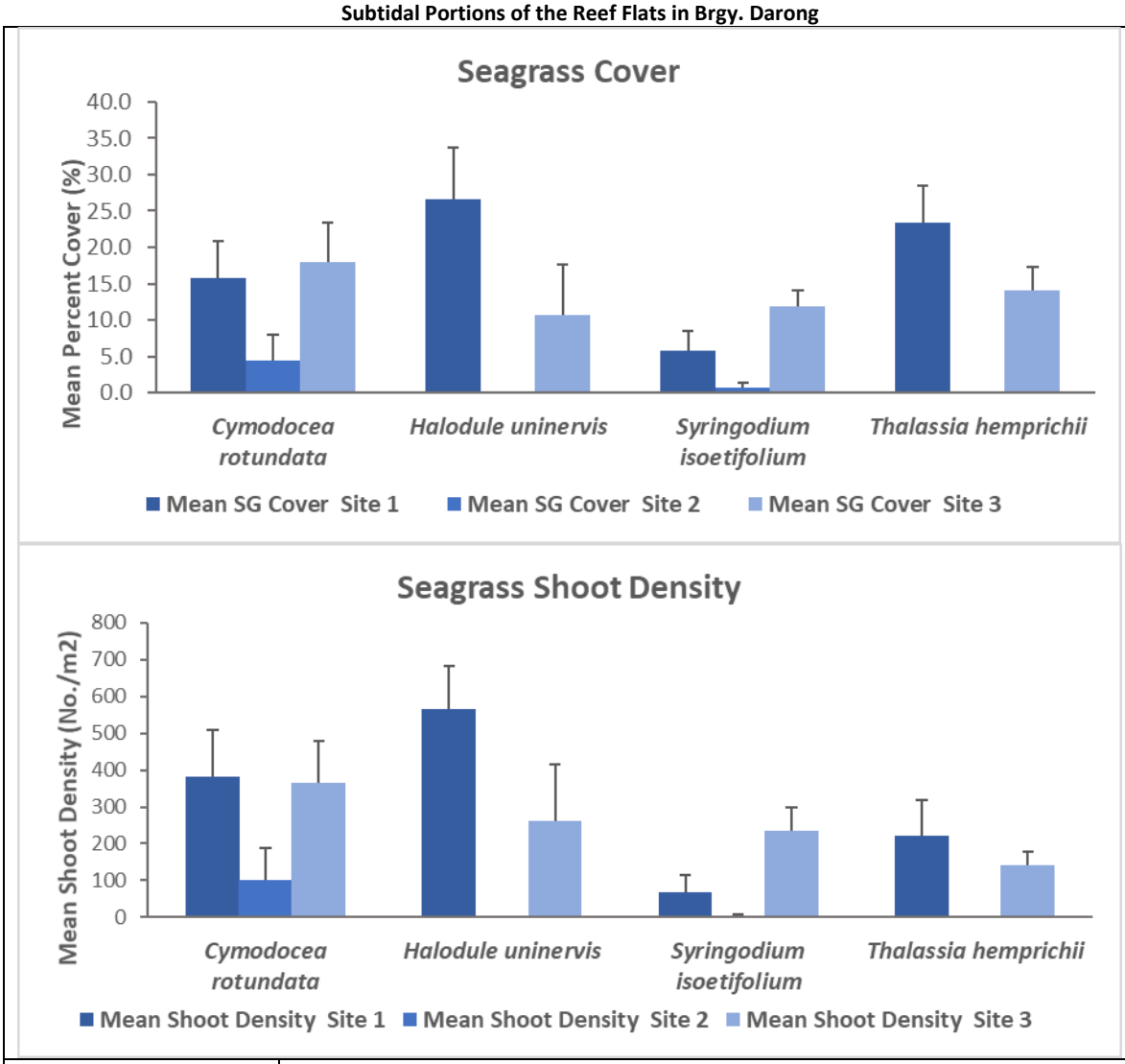


FIGURE NO.	FIGURE TITLE	
2-32	**COMPARISON OF SEAGRASS COVER AND SHOOT DENSITY OF DIFFERENT SEAGRASS SPECIES FOUND ON BOTH SHALLOW AND SUBTIDAL PORTIONS OF THE REEF FLATS IN BRGY. DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Figure 2-33: Comparison of Aggregate Seagrass Cover and Average Shoot Density Across 3 Sites in Brgy. Darong in The Vicinity of the Proposed Project Site

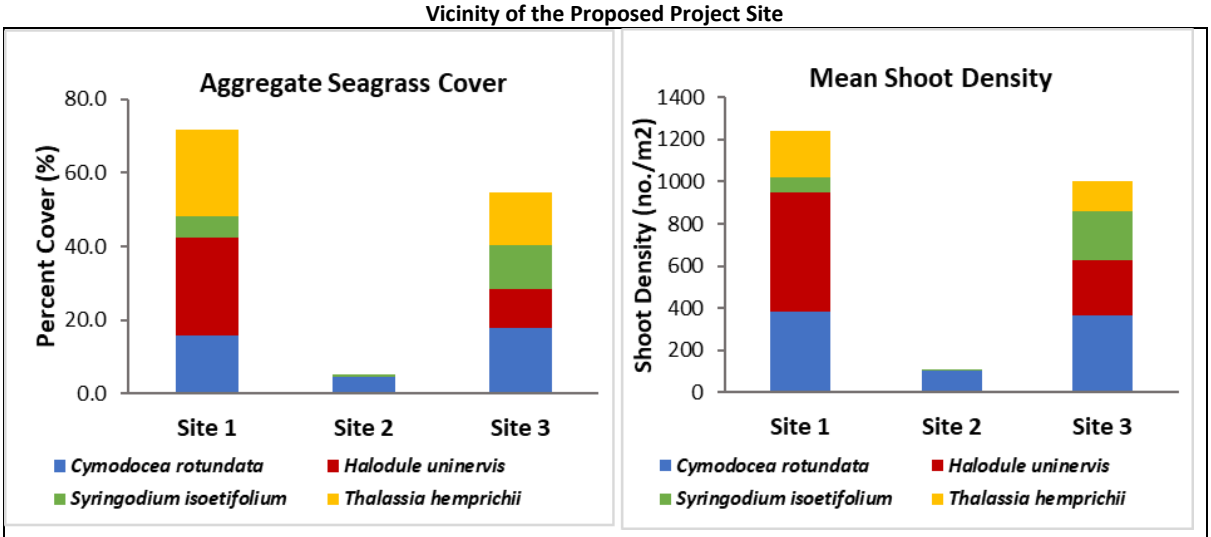


FIGURE NO.	FIGURE TITLE	
2-33	**COMPARISON OF AGGREGATE SEAGRASS COVER AND AVERAGE SHOOT DENSITY ACROSS 3 SITES IN BRGY. DARONG IN THE VICINITY OF THE PROPOSED PROJECT SITE**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Figure 2-34: Photos of Seagrasses and Seaweed Resources in Brgy. Darong

Note: Taken by LCI Marine Team

FIGURE NO.	FIGURE TITLE	
2-34	**PHOTOS OF SEAGRASSES AND SEAWEED RESOURCES IN BRGY. DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

2.2.5.3.4 Mangrove Resources

231 The mangroves of Darong occur as a narrow strip of vegetation on both sides of the almost dried-up creek found to the south of Purok Guava. Six species of mangroves were identified, and counts of mature trees, saplings, and seedlings of each species are presented in **Table 2-18**. Aside from

the six mangroves, the palm nipa *(Nypa fruticans)* was found to be the dominant vegetation in the mangrove stand. No counts were made, however, due to the densely packed growth and the difficulty of penetrating the thick nipa fronds. *Rhizophora apiculata* (known as "bakhaw lalaki") had the greatest number of trees while *Rhizophora mucronata* had the most number of saplings and seedlings. Most of the mangroves along the beach front (close to the water line) are tall, old trees of *Avicennia rhumphiana* and *R. apiculata* (**Figure 2-35**).

Table 2-18: Mangrove Community Structure Adjacent to Purok Guava in Brgy. Darong

MANGROVE SPECIES	LOCAL NAME	TREE COUNT	AVERAGE GBH (CM)	SAPLING COUNT	SEEDLING COUNT
Avicennia rhumphiana	Piapi, Api-api	8	79.38	0	0
Rhizophora apiculata	Bakhaw Lalaki	45	46.21	0	10
Rhizophora mucronata	Bakhaw Babae	13	39.00	28	69
Sonneratia alba	Pagatpat	5	83.40	0	0
Sonneratia caseolaris	Perara	2	129.50	0	0
Xylocarpus sp.	Tabigui/Piagao	2	46.50	0	0
Total/Mean		**75**	**53.21**	**28**	**79**

232 Large trees of *Sonneratia caseolaris* with mean girth-at-breast height (GBH) of about 130 cm were growing along the creek. Tall fruiting trees of *Sonneratia alba* were also found with a mean GBH of 83.4 cm (**Figure 2-36**). Old trees of *R. apiculata* and *R. mucronata* were found numerous along the creek. A passing resident volunteered that their association planted these *bakhaw* way back in the 1990s but the mangrove rehabilitation project was later abandoned when the creek dried up and many of the mature trees had been cut by residents.

Figure 2-35: Photos of Mangroves in Brgy. Darong

Note: Taken by LCI Marine Team

FIGURE NO.	FIGURE TITLE	
2-35	**PHOTOS OF MANGROVES IN BRGY. DARONG**	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-36: Comparative Tree Sizes of Mangrove Species Found in Brgy. Darong Based on Girth or Trunk Circumference

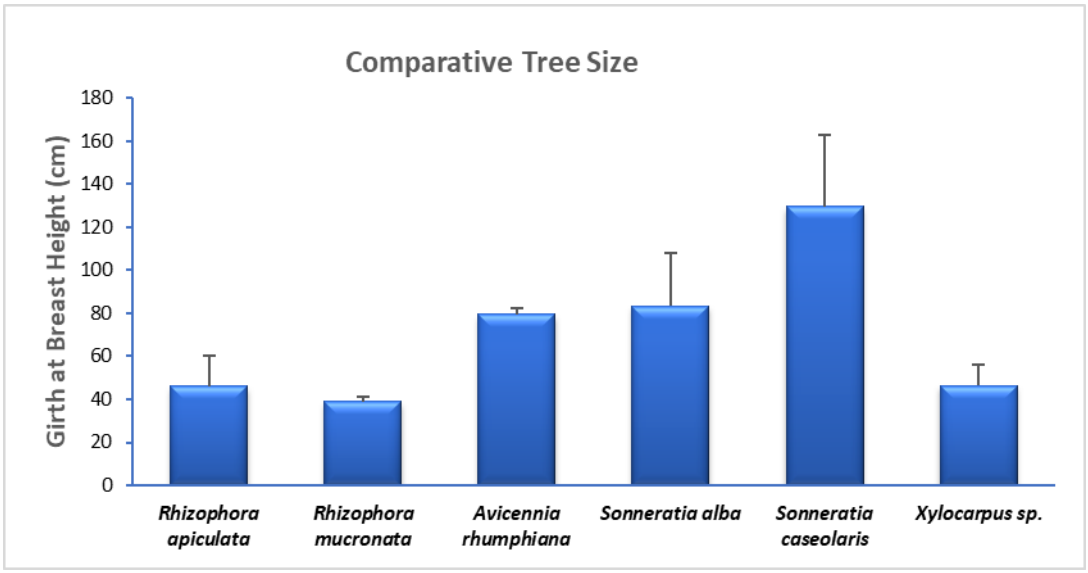


FIGURE NO.	FIGURE TITLE	
2-36	**COMPARATIVE TREE SIZES OF MANGROVE SPECIES FOUND IN BRGY. DARONG BASED ON GIRTH OR TRUNK CIRCUMFERENCE**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Figure 2-37: Relative Proportion of Mangrove trees, Saplings and Seedlings (left) and 6 Mangrove Species Found Along the Creek in Purok Guava, Brgy. Darong (right).

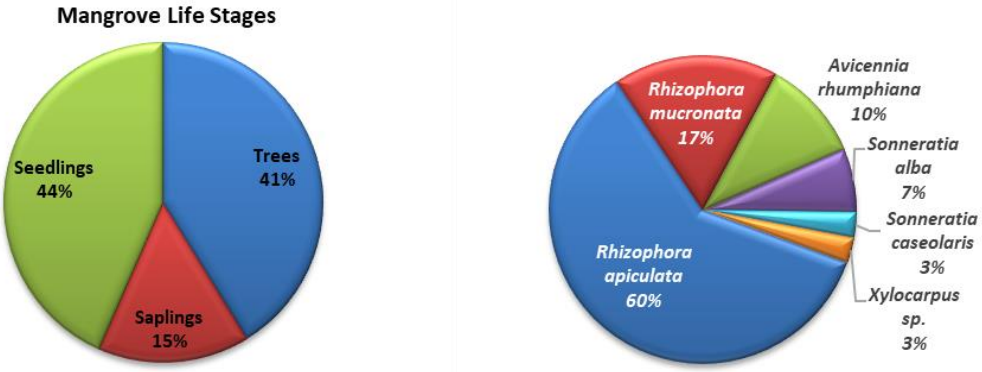


FIGURE NO.	FIGURE TITLE	
2-37	**RELATIVE PROPORTION OF MANGROVE TREES, SAPLINGS AND SEEDLINGS (LEFT) AND 6 MANGROVE SPECIES FOUND ALONG THE CREEK IN PUROK GUAVA, BRGY. DARONG (RIGHT).**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

2.2.5.3.5 Plankton Communities

233 The plankton community in the coastal waters of Darong is fairly diverse with 19 genera of phytoplankton and 7 groups of zooplankton. Overall density of phytoplankton is 20,357 cells/cm^3 while that of zooplankton is much lower at 4,805 cells/cm^3. Samples taken from the proposed pier had the highest mean population density for phytoplankton while the highest zooplankton density was found in samples from ST1 (**Table 2-19** & **Figure 2-39**).

Table 2-19: Comparative Density Estimates of Phytoplankton and Zooplankton in 4 Sites in the Coastal Waters of Brgy. Darong

PLANKTON GROUP	DARONG ST1	DARONG ST2	DARONG ST3	PROPOSED PIER	GRAND MEAN
Phytoplankton					
Amphora	0	0	0	146.71	36.68
Biddulphia	0	0	0	146.71	36.68
Ceratium	1907.28	2200.70	0	1467.14	1393.78
Chained Chaetoceros	3374.41	7335.68	3521.13	0	3557.81
Cladophora	0	0	0	586.85	146.71
Climacodium	0	0	1760.56	0	440.14
Coscinodiscus	2347.42	1173.71	2640.85	1613.85	1943.96
Diatoma	586.85	0	0	586.85	293.43
Dynophysis	293.43	0	0	0	73.36
Fragillaria	293.43	0	0	2934.27	806.92
Gonyaulax	0	146.71	0	0	36.68
Guinardia	0	0	440.14	0	110.04
Noctiluca	0	293.43	0	0	73.36
Peridinium	0	0	0	146.71	36.68
Pleurosigma	0	0	146.71	586.85	183.39
Rhizosolenia	0	733.57	146.71	440.14	330.11
Spicules	0	0	1613.85	0	403.46
Synedra	0	0	0	880.28	220.07
Thalassionema	0	0	4988.26	880.28	1467.14
Trichodesmium	3961.27	6455.40	9536.38	15111.50	8766.14
Sub-total	**12764.08**	**18339.20**	**24794.60**	**25528.17**	**20356.51**
Zooplankton					
Codonellopsis	0	0	146.71	0	36.68
Copepod (adult)	6748.83	0	2053.99	4841.55	3411.09
Copepod (nauplius)	1613.85	0	1760.56	733.57	1027.00
Fish egg	0	0	146.71	440.14	146.71
Foraminifera	0	0	0	146.71	36.68
Oikopleura	0	440.14	0	0	110.04
Sagitta	0	146.71	0	0	36.68
Sub-total	**8362.68**	**586.85**	**4107.98**	**6161.97**	**4804.87**
Grand Total	**21126.76**	**18926.06**	**28902.58**	**31690.14**	**25161.38**

234 The most abundant phytoplankton in all sites (**Figure 2-39**) is *Trichodesmium,* a widespread genus of filamentous cyanobacteria (or blue-green algae) that is found in tropical and subtropical ocean waters with low nutrient levels (https://www.aims.gov.au/doc;). These phytoplankton can form large colonies or clumps of several filaments that appear as reddish slicks often called “sea sawdust” or “blooms” (Capone et al. 1997). These cyanobacteria are important in nitrogen fixation and thus, are important in sustaining marine life through supplying nutrients (Bergman et al. 2013). Another important phytoplankton is the chain-forming *Chaetoceros* considered the most diverse genus of marine diatoms. Most of the abundant phytoplankton found in Darong waters

are marine diatoms but some armored or thick-plated dinoflagellates also occur, such as *Gonyaulax, Ceratium,* and *Peridinium. Gonyaulax* is one of the dinoflagellates that cause "red tide" blooms in many tropical oceans, however, its current population level is too low to cause any imminent threat.

Figure 2-38: Comparison of Plankton Density in Tow Samples from 4 Sites in Brgy. Darong

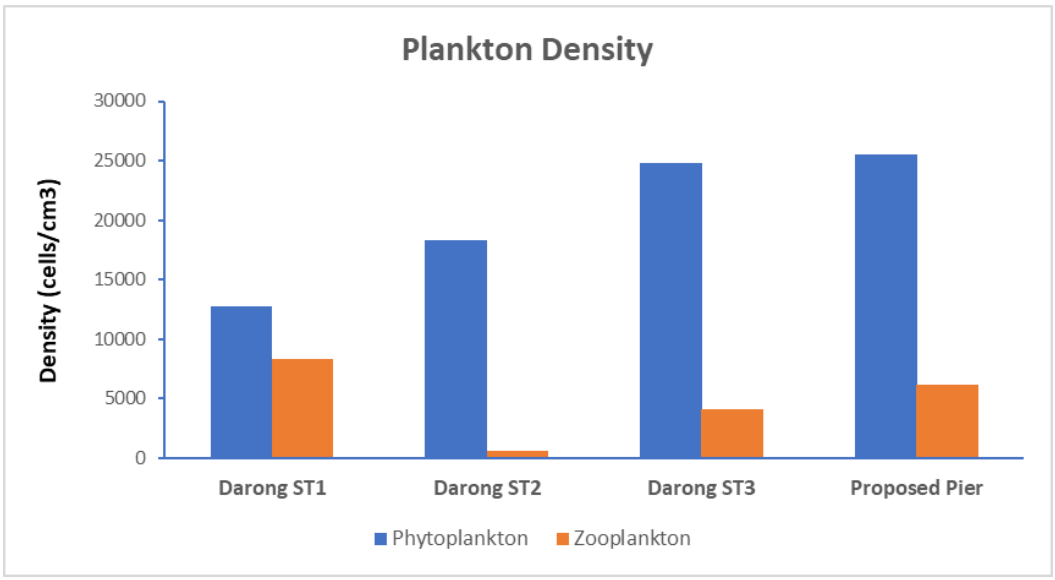


FIGURE NO.	FIGURE TITLE	
2-38	**COMPARISON OF PLANKTON DENSITY IN TOW SAMPLES FROM 4 SITES IN BRGY. DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Figure 2-39: Relative Abundance of Phytoplankton and Zooplankton in the Coastal Waters Fronting the Proposed Project Site in Brgy. Darong

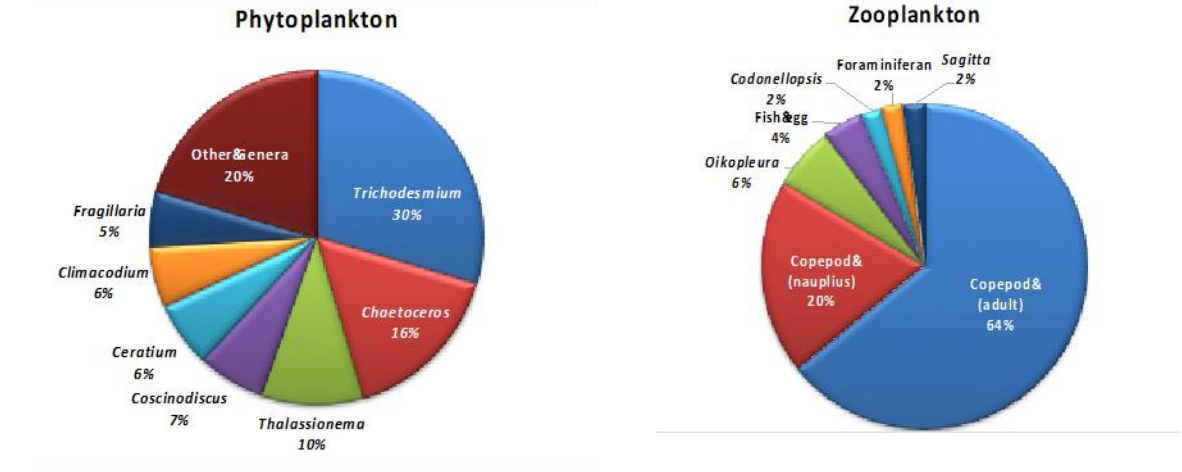


FIGURE NO.	FIGURE TITLE	
2-39	**RELATIVE ABUNDANCE OF PHYTOPLANKTON AND ZOOPLANKTON IN THE COASTAL WATERS FRONTING THE PROPOSED PROJECT SITE IN BRGY. DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

235 The most abundant zooplankton in the tow samples are adult (64%) and larval (20%) copepods. Copepods are among the most important food items of small pelagic fish juveniles, such as anchovy, sardine and roundscads. These results show that the coastal waters of Darong still have high primary production and food available to support fisheries production particularly of pelagic fish.

2.2.5.3.6 Meiofaunal Communities

236 The meiofaunal (or interstitial fauna) community in the shallow (3-4 meters), soft-bottom areas of Darong is not as diverse as its plankton community. Only six groups or taxa of meiofauna were found in four sites (**Table 2-20**). These groups, however, includes several genera or species, however, this level of classification was difficult to do given the available facility and taxonomic expertise for this study. Studies on meiofauna diversity in other sites show much higher variety, such as in the Taklong Island National Marine Reserve (TINMR) in Guimaras Island (Burgos et al. 2013) which identified 42 taxa.

237 Nematodes or round worms dominate the meiofaunal samples (75%) at a mean density of 202 indiv/m2. Nematodes are common inhabitants of marine soft-bottom environments particularly fine (125-250 μ) to medium (250-500μ) sand similar to the areas in the four sites of Darong where sediment samples were obtained. Crustacean meiofauna (copepods, ostracods and isopods) are also common interstitial fauna but in this study they had very low densities. The overall population density of 220 indiv/m2 is way lower than meiofaunal density in other places in the Philippines. For example, meiofaunal density in the seagrass areas of Guimaras in Western Visayas reaches from 156,000-388,000 indiv/m2 and even higher in other areas of Visayas Sea (Burgos et al. 2013).

Table 2-20: Meiofaunal Organisms Found in the Soft-Bottom Environment of Brgy. Darong

SITE	ORGANISM	REPLICATE 1	REPLICATE 2	TOTAL	AVERAGE	RELATIVE ABUNDANCE (%)	POP'N DENSITY INDIV/M²
Darong ST1	Copepod	0	1	1	0.5	5.00	2.5
	Isopod	0	1	1	0.5	5.00	2.5
	Nematode	1	14	15	7.5	75.00	37.5
	Ostracod	1	0	1	0.5	5.00	2.5
	Polychaete	1	0	1	0.5	5.00	2.5
	Turbellaria	0	1	1	0.5	5.00	2.5
				20	10	**100.00**	**50.00**
Darong ST2	Nematode	35	7	42	21	97.67	105.0
	Copepod	1	0	1	0.5	2.33	2.5
				43	21.5	**100.00**	**107.50**
Darong ST3	Nematode	2	9	11	5.5	91.67	27.5
	Polychaete	0	1	1	0.5	8.33	2.5
				12	6	**100.00**	**30.00**
Darong Pier	Nematode	11	2	13	6.5	100.00	32.5
				13	6.5	**100.00**	**32.5**

Figure 2-40: Comparison of Diversity and Abundance of Meiofauna on the Soft Bottom Environment Fronting the Proposed Project Site

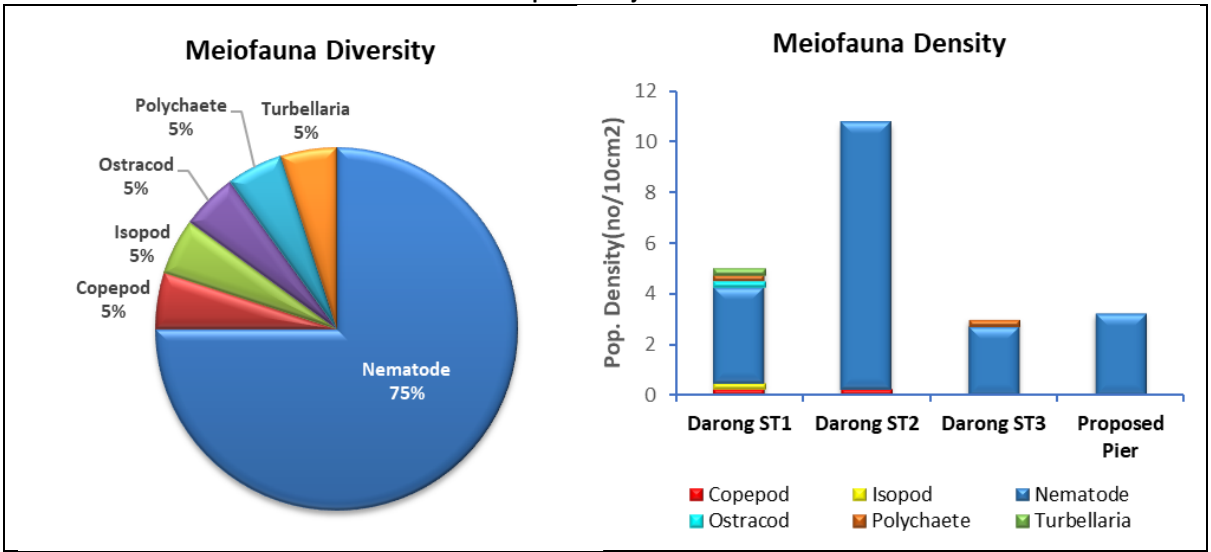


FIGURE NO.	FIGURE TITLE	
2-40	**COMPARISON OF DIVERSITY AND ABUNDANCE OF MEIOFAUNA ON THE SOFT BOTTOM ENVIRONMENT FRONTING THE PROPOSED PROJECT SITE**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

238 Results of meiofaunal analysis suggest that the soft-bottom habitats of Darong are degraded or disturbed, probably due to strong turbulence prevalent in the area at the time of the survey. The sediment samples from Darong were collected from shallow, unvegetated areas characterized by fine to coarse sand. Research work on meiofauna showed that higher densities are observed in sediments associated with seagrass beds than in unvegetated sediments (Liao and Muk 2015; Burgos et al. 2013).

2.2.5.3.7 Coastal Fisheries

239 Fishing is an important livelihood among residents of the small coastal village of Brgy. Darong,. The capture fishery of this village is largely artisanal or small-scale involving a variety of traditional fishing gears and small fishing boats. No commercial fishing occurs in the area (**Figure 2-41**).

240 Based on data from the barangay office, the estimated number of fishers in Darong engaged actively in capture fisheries exceeds 150, but only around 30 of these are listed as registered fishers with the office of the Barangay secretary. Most of these fishers are residents of Purok Guava which is the population center of Darong.

241 A short questionnaire survey of 26 fishers was conducted in two coastal villages of Darong, namely, Purok Guava (17 fishers) and Purok Lakatan (9 fishers) was carried out on July 27 to 28, 2018. Majority of the respondents in both villages belong to the Kalagan (or Kagan) tribe and all are believers of Islam. Except for one respondent, all surveyed fishers have been resident of Darong since birth. Majority of the fishers (56%) are between 31-45 years old but a small fraction (8%) of older fishers are still active.

Figure 2-41: Photos Depict the Artisanal Nature of Capture Fisheries in Darong

Note: Taken by LCI Marine Team

FIGURE NO.	FIGURE TITLE	
2-41	**PHOTOS DEPICT THE ARTISANAL NATURE OF CAPTURE FISHERIES IN DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Gear Technology and Fishing Areas

242 Darong fishers operate nine kinds of artisanal fishing gear using both motorized and non-motorized boats. Motorized boats are powered by engines ranging from 6-16 hp, while non-motorized bancas are often dug-out canoes with a wooden paddle to propel the fishers at sea. Most fishers employ more than one gear to increase catch and income. Some fishers bring along 3-4 kinds of fishing gear in a single fishing trip.

243 The type of boat and gear determines the location and distance of their fishing ground. Handline fishing (troll lie, MHL, single handline) using motorboats usually bring fishers as far as Talikud Island and Digos (**Figure 2-42**) while those on paddle boats fish loser to shore in Darong such as squid jigging and operating beach seine and bottomset gillnet.

Figure 2-42: Location of the Fishing Areas of Artisanal Fishers in Darong

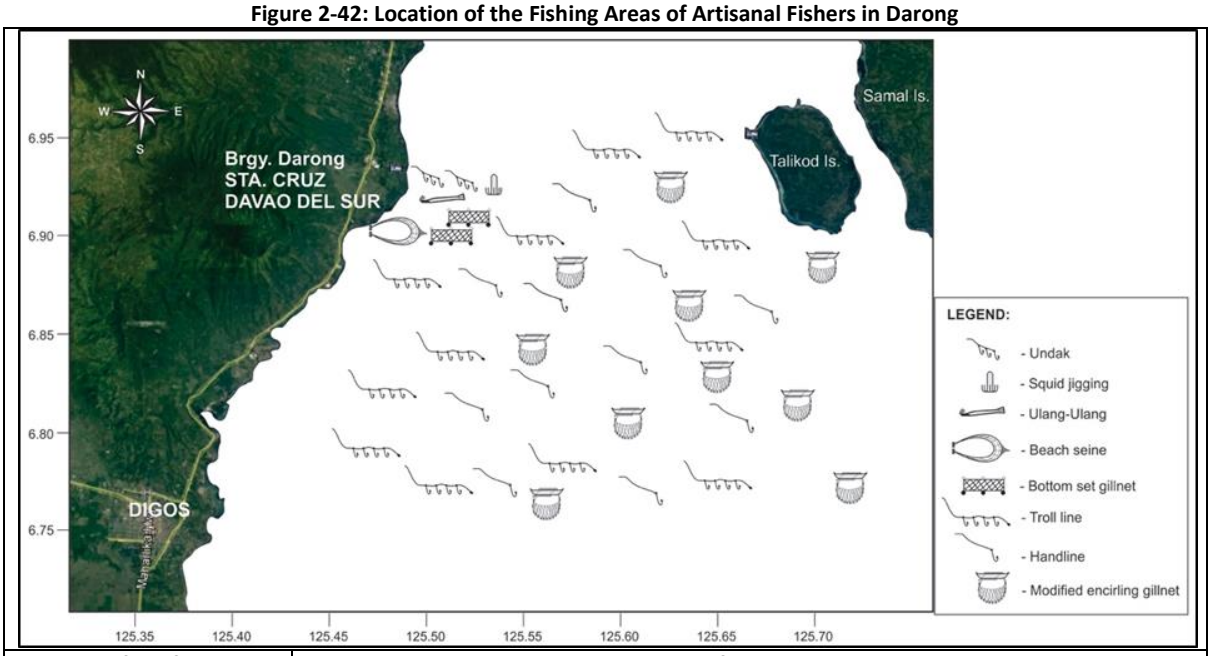


FIGURE NO.	FIGURE TITLE	
2-42	**LOCATION OF THE FISHING AREAS OF ARTISANAL FISHERS IN DARONG**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

2.2.5.4 Threat to existence and/or loss of important local species and habitat

244 Results of the marine ecology survey show that Brgy. Darong is moderately endowed in terms of coastal resources. All three natural marine ecosystems, often considered sensitive biological communities (SBC), are found in the coastal waters of the barangay. Unlike many areas in Mindanao, however, these biological systems are not extraordinary endowments, largely a consequence of past destructive fishing activities or other forms of environmental degradation.

245 The coral reefs of Darong have poor coral cover and much of the reef is dead, however, there are numerous healthy coral recruits scattered all over the reef that indicate the reef might be recovering. Seagrass beds are patchy rather than wide underwater meadows, except in Site 1, however, where they grow they look healthy and would serve as habitat for fish and invertebrates. The mangrove area is a small remnant mangrove forest dominated by nipa fronds rather than by mangrove trees.

246 The design and location of the pier will be based on the marine assessment. According to the study, a coral reef is near the initial location of the pier. It is recommended that the angle of the pier is geared northward to ensure that the habitat will not be disturbed.

247 Another impact of pier construction is generation of silt. It is recommended that a silt curtain be installed during construction of the pier.

248 The construction and operation of the pier will not threaten the existence of mangroves and seagrasses that were found in the area since the pier is far from these habitats.

2.2.5.5 Threat to abundance, frequency and distribution

249 Reef fish communities in all sites are depauperate: very low diversity, abundance and biomass were recorded from the dive surveys.

250 The capture fisheries of Darong is largely artisanal, however, there is very high dependence on fishing as the main source of livelihood particularly of residents in Purok Guava and Lakatan. Most fishing activities are done in offshore waters, except for those using squid jig and bottomset gillnet who fish nearshore.

251 Since the pier will avoid any habitat in the area, there are no threats on the abundance, frequency, and distribution of the species found in the area.

2.2.6 Summary of Baseline Findings Impacts and Mitigation on Water

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

Table 2-21: Summary of Significant Baseline Findings and Potential Impacts and Mitigation on Water

Summary of Baseline Findings on Water:

- **Competition in Water Use**
  - The project will use 110 cu.m. of water per day for various purposes. This will be sourced from a deep well within the project site.
  - The cement grinding facility will use 10 cu.m./day for system cooling.
- **Oceanography**
  - Obstruction of flow of currents is not expected if the pier facility will be constructed on piles or pillars.
  - Bathymetry will not be changed. The docking area is located approximately 230 m from the shore. The target depth is 15 m.
- **Water Quality**
  - Fecal coliform in the ground water (sampling station GW2) exceeds DAO 2016-08 Class A and PNSDW 2017 standards.
  - Fecal coliform in the surface water exceeds DAO 2016-08 Class C standards
  - Fecal coliform in the coastal water (sampling station CW4) exceeds DAO 2016-08 Class SC standards.
- **Marine Ecology**
  - Coral reefs in the area are not well developed, fragmented, and widely scattered. Moreover, the reefs have sustained significant damage, presumably caused by dynamite fishing in the past.
  - Seagrass resources are sparse
  - There are mangroves located approximately 1km south of the proposed pier; these mangroves will not be affected by the proposed project.
  - Due to the condition of the habitat, the population of reef fish is poor.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
HYDROLOGY/HYDROGEOLOGY			
Change/ disruption in water circulation	Construction/ Operation	Pier construction may affect water circulation in the coastal area	Construction of pier on piles/pillars to allow unobstructed flow of currents
WATER QUALITY			
Degradation of ground water quality	Construction	Accidental oil spills from heavy equipment	Use sawdust, rice hulls, or coir dusts to absorb the oil spills

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
			Maintain canal in the maintenance and repair area of vehicles and equipment
	Operation	Accidental oil spill from delivery trucks	
Degradation of ground water / coastal water quality	Construction/ Operation	Ground and coastal water contamination from improper disposal of wastes, percolated wastewater, sludge and fecal matter	Provision of sanitation facilities for workers (e.g. toilets, showers, etc.)
Degradation of coastal water quality	Construction	Possible siltation and surface runoff Increase in turbidity of coastal water due to spillage of building materials for pier facility and debris	Establishment of sediment traps and erosion barriers Regular removal of silt and sediments
	Operation	Runoff from plant and pier operations Possible spillage of raw materials from pier Accidental oil spill from ship	Installation and maintenance of drainage system within the plant and the pier Coastal water monitoring Oil spill contingency plan
MARINE ECOLOGY			
Threat to existence and/or loss of important local species and habitat	Construction	Possible siltation that may disturb nearby reefs	Installation of silt curtain

2.3 The Air

253 The coverage of the EIA study on Air Module includes the host barangay of Darong, particularly the residential areas in the vicinity. Industrial operations such as a brewery located approximately 1-km from the project site was also considered in the study. Another important part of the study area is the ongoing construction of the adjacent feed mill located northwest of the project site.

2.3.1 Meteorology/Climatology

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

254 Climate pertains to the average long-term weather of an area and is typically determined over a period of at least 30 years. It is an essential environmental factor as it affects general growth and development. In the Philippines, climate is classified into 4 types based on the rainfall distribution and pattern.

255 As presented in the climatological map of the Philippines in **Figure 2-43**, the proposed project area mainly belongs to Type IV climate under the modified Coronas classification with rainfall being more or less distributed throughout the year.

Temperature

256 April and May are the hottest months of the year, with a recorded mean temperature of 28.6 degrees Celsius (°C), while January is the coldest month, with an average temperature of 27.1°C (**Table 2-22**).

257 According to the climatological extremes (**Table 2-23**), the highest temperature recorded in the area is 37.3°C on May 5, 1905, while the lowest recorded temperature is 16.5°C on February 3, 1962.

Rainfall

258 According to the Climatological Normals in Davao City, the area may experience about 1,759.1mm of rainfall annually, with 174 rainy days. The highest amount of rainfall is experienced in June (186.7mm), while the lowest amount of rainfall is experienced in March (108.4mm).

259 The climatological extremes is presented in **Table 2-23**. According to the data, the greatest daily rainfall experienced in the area was on August 2, 1902 at 242.6 millimeters.

Surface Wind

260 Wind directions in Davao are northward from November to April and southward May to October.

Tropical Cyclones

261 Tropical cyclones or typhoons are the most influential factors that bring considerable rainfall in the Philippines. Typhoons usually occur in the country from June to December, with highest frequencies during the months of July and August. The mean annual number of typhoons that pass through the Philippine Area of Responsibility (PAR) is about 20. As shown in **Figure 2-44**, an average of one cyclone passes by Davao every 12 years.

PAGASA Climate Projection

262 In November 2011, Department of Environment and Natural Resources - Environmental Management Bureau (DENR-EMB) released a memorandum circular numbered 005 (MC 2011-005), which mandates the inclusion of DRR and CCA in the Philippine EIS System, to "ensure that the project is resilient and that their environmental impact do not exacerbate natural hazards or climate change's effects on human or natural systems" (DENR-EMB, 2011). The circular aims to provide information on changes that may happen to the area based on projections made by the Philippine Atmospheric, Geophysical, and Astronomical services Administration (PAGASA). The projections include temperature increases, rainfall change, and frequency of extreme events in 2020 and 2050 under medium range emission scenario. The PAGASA projections are shown in **Figure 2-45**.

263 According to the PAGASA 2020 and 2050 projections, Region XI will experience higher temperatures throughout the year. Higher temperatures will be experienced during the months of June, July, and August, according to the 2020 and 2050 projections. For comparison, the observed baseline (1971-2000) shows that higher temperatures are experienced during the month of March, April, and May.

264 PAGASA also projects the amount of rainfall change in 2020 and 2050. The data shows that Davao del Sur will experience greater rainfall during the months of December, January, and February, while less rainfall will be experienced in the remaining months.

265 Frequency of extreme events under medium-range emission scenario will increase in 2020 and 2050. The number of days with temperatures above 35°C will increase from 109 days (1971-2000) to 2,981 days (2020 projections), and 5,373 days (2050 projections). Although there will be a rise in temperature, the number of dry days is anticipated to decrease from 7,930 days (1971-2000), to 4,789 (2020 projections), and 5,368 (2050 projections). Days with rainfall greater than 150mm is expected to increase from 2 days (1971-2000), to 3 days (2020 projections), and 4 days (2050 projections).

266 Considering these figures, water shortages may be the main impact of less rainfall and higher temperature. Appropriate measures such as tree planting and water conservation shall be employed during the construction and operation phases of the project to avoid any complications in the long-run.

Table 2-22: Mean Historical Monthly Temperature and Rainfall Data (1981-2010)

STATION: DAVAO CITY, DAVAO DEL SUR												**LATITUDE:** 07°07'40.41''N				
PERIOD: 1981 - 2010												LONGITUDE: **125°39'17.43''E**				
												ELEVATION: **17.29m**				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16a)	(16b)
MONTH	RAINFALL		TEMPERATURE						VAPOR PRESS. (mbs)	RH (%)	MSLP (mbs)	WIND		CLOUD AMT. (okta)	NO. OF DAYS W/	
	AMOUNT (mm)	NO. OF RD	MAX (°C)	MIN (°C)	MEAN (°C)	DRY BULB (°C)	WET BULB (°C)	DEW POINT (°C)				DIR (16pt)	SPD (mps)		TSTM	LTNG
JAN	140.3	14	30.8	23.3	27.1	26.5	24.1	23.2	28.4	82	1010	N	2	6	3	4
FEB	109.4	12	31.2	23.3	27.3	26.7	24.1	23.1	28.2	81	1010	N	2	6	2	3
MAR	108.4	11	32.2	23.6	27.9	27.4	24.4	23.3	28.5	78	1010	N	2	5	5	5
APR	124.7	11	33	24.2	28.6	28.2	25	23.9	29.5	77	1009	N	2	5	8	10
MAY	158.7	10	32.6	24.6	28.6	28.2	25.5	24.6	30.8	80	1009	S	2	6	16	19
JUN	186.7	18	31.8	24.2	28	27.7	25.3	24.5	30.6	82	1009	S	1	6	14	16
JUL	165	16	31.5	23.9	27.7	27.4	25.1	24.3	30.3	83	1009	S	1	6	13	16
AUG	170	15	31.7	24	27.9	27.6	25.1	24.2	30.1	82	1009	S	2	6	14	16
SEP	170.4	15	31.9	23.9	27.9	27.6	25.1	24.2	30.1	82	1009	S	1	6	15	17
OCT	174.8	16	32.3	23.9	28.1	27.7	25.1	24.2	30.1	81	1009	S	1	6	17	19
NOV	138.1	16	32.1	23.9	28	27.5	25	24.1	29.9	82	1009	N	2	6	12	15
DEC	112.6	14	31.4	23.7	27.5	27.1	24.6	23.7	29.2	81	1009	N	2	6	6	8
ANNUAL	**1759.1**	**174**	**31.9**	**23.9**	**27.9**	**27.5**	**24.9**	**23.9**	**29.6**	**81**	**1009**	**N**	**2**	**6**	**125**	**148**

Definition of Terms:

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

Table 2-23: Climatological Extremes Davao City, Davao del Sur (2000-2017)

STATION: DAVAO CITY, DAVAO DEL SUR										**LATITUDE:** 07°07'40.41''N			
YEAR: AS OF 2017										LONGITUDE: **125°39'17.43''E**			
										ELEVATION: **17.29m**			
MONTH	**TEMPERATURE (°C)**				**GREATEST DAILY RAINFALL (mm)**		**STRONGEST WINDS (mps)**			**SEA LEVEL PRESSURES (mbs)**			
	HIGH	**DATE**	**LOW**	**DATE**	**AMOUNT**	**DATE**	**SPD**	**DIR**	**DATE**	**HIGH**	**DATE**	**LOW**	**DATE**
JAN	35.0	01-15-1973	17.0	01-10-1912	122.4	01-28-2000	22	N	01-25-1962	1018.6	01-17-1959	1000.1	01-22-1989
	35.0	01-22-2016											
FEB	36.7	02-25-1915	16.1	02-03-1962	124.3	02-20-1970	20	NNE	02-08-2004	1018.4	02-27-1969	1001.9	02-13-2001
MAR	36.7	03-25-1915	17.4	03-16-1912	132.2	03-27-1988	15	N	03-03-1976	1018.5	03-30-1958	1000.1	03-19-2004
APR	37.0	04-30-1977	19.1	04-13-1912	193.0	04-02-1993	18	N	04-23-1974	1016.6	04-07-1965	1001.8	04-12-1985
MAY	37.3	05-05-1905	20.2	05-01-1914	174.3	05-08-1966	31	NNW	05-15-1976	1016.5	05-09-1957	1002.3	05-30-1970
JUNE	35.2	06-02-1905	20.3	06-10-1961	176.4	06-06-2008	21	NW	06-18-1962	1016.6	06-06-1966	1001.2	06-30-1970
JULY	35.6	07-16-1973	20.0	07-03-1917	179.6	07-02-1902	19	NE	07-06-2001	1016.0	07-02-1965	999.6	07-03-2001
AUG	36.0	08-02-1905	18.5	08-07-1918	242.6	08-02-1902	15	N	08-14-1998	1015.7	08-03-1965	1001.2	08-17-1990
SEP	35.1	09-17-1977	20.0	09-03-1916	123.7	09-21-1911	20	S	09-21-1983	1018.2	09-22-1950	1001.3	09-24-1970
OCT	35.9	10-08-2016	19.2	10-19-1918	153.7	10-08-2013	16	NW	10-22-1995	1016.1	10-07-1959	998.6	10-18-1970
NOV	36.2	11-17-1908	19.1	11-14-1911	114.4	11-24-2002	15	N	11-08-1974	1016.8	11-17-1965	999.8	11-06-1996
DEC	35.0	12-08-1987	16.2	12-24-1918	153.6	12-02-1910	15	N	12-15-1962	1016.7	12-12-2002	1001.2	12-05-2001
	35.0	12-05-2017											
ANNUAL	**37.3**	**05-05-1905**	**16.1**	**02-03-1962**	**242.6**	**08-02-1902**	**31**	**NNW**	**05-15-1976**	**1018.6**	**01-17-1959**	**998.6**	**10-18-1970**
Period of Record	**1903 - 2017**				**1902 - 2017**		**1950 - 2017**			**1949 - 2017**			

Source: PAGASA

Figure 2-43: Climatological Map of the Philippines

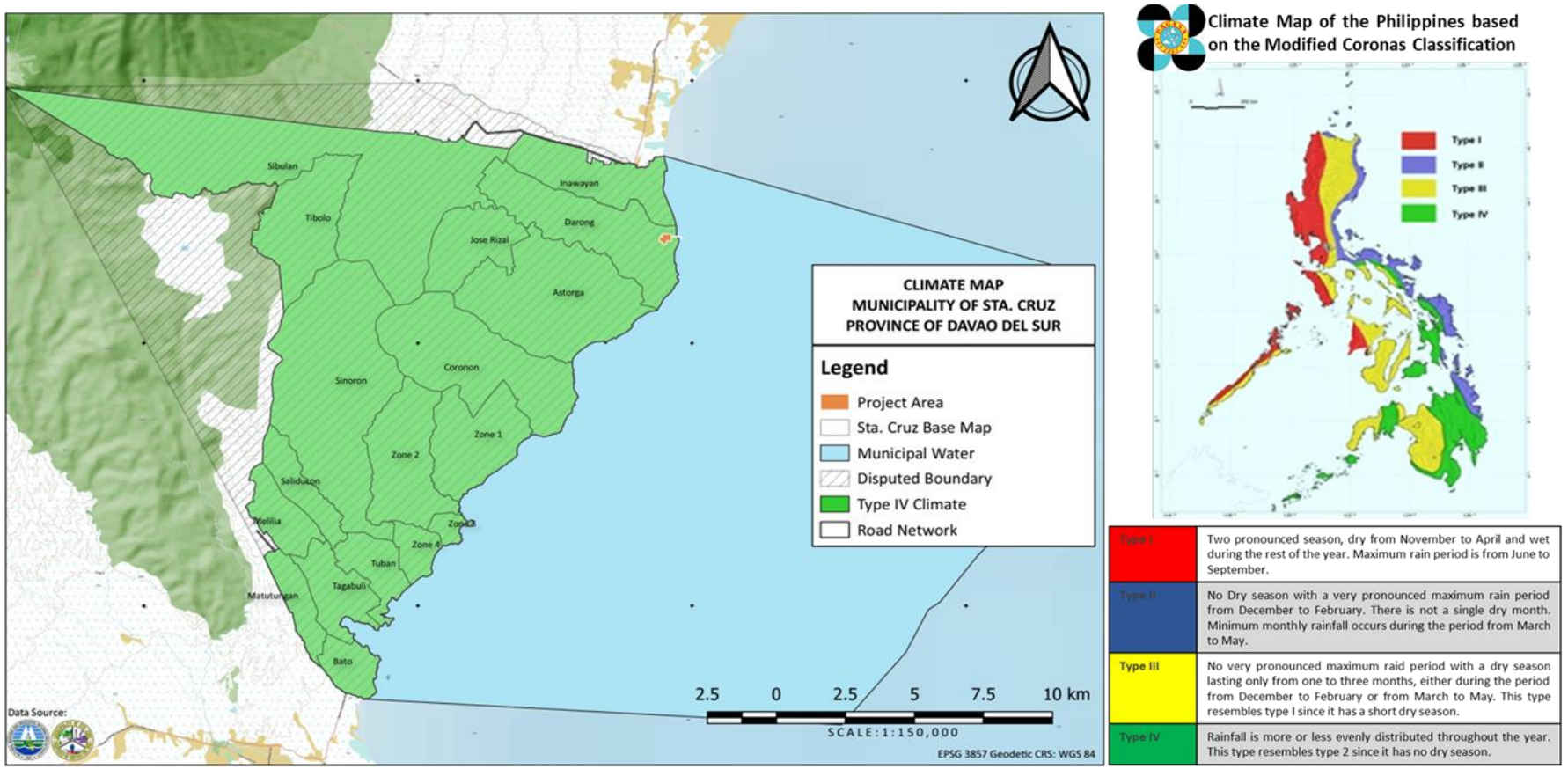


FIGURE NO.	FIGURE TITLE	
2-43	**CLIMATOLOGICAL MAP OF THE PHILIPPINES**	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-44: Frequencies of Tropical Cyclones in the Philippines

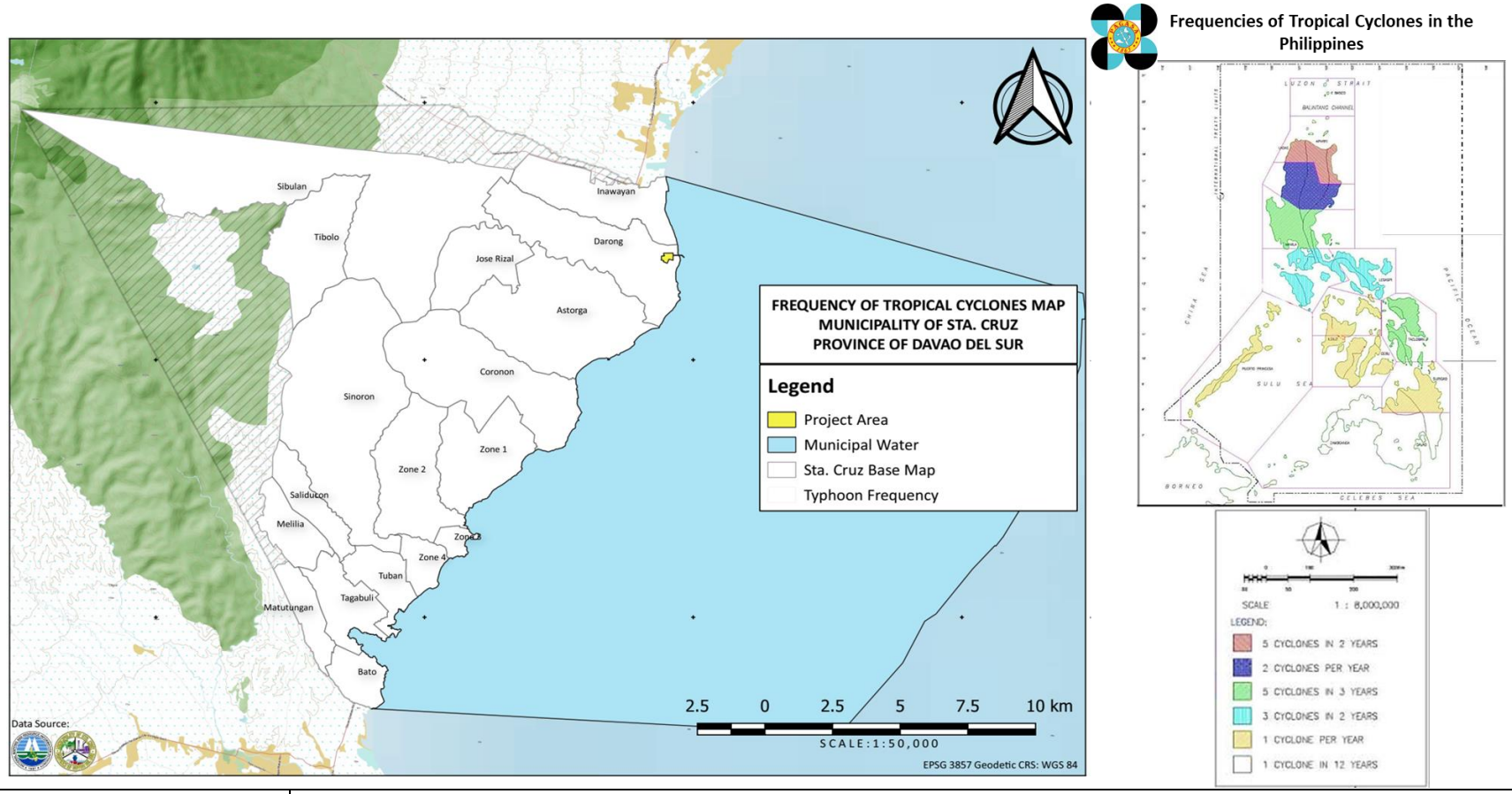


FIGURE NO.	FIGURE TITLE	
2-44	**FREQUENCIES OF TROPICAL CYCLONES IN THE PHILIPPINES**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Figure 2-45: PAGASA Climate Projection for 2020 and 2050 covering Davao Region

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 11

PROVINCES	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 11												
COMPOSTELA VALLEY	26.7	27.8	27.6	27.6	0.9	1.1	1.2	1.1	1.9	2.3	2.4	2.1
DAVAO DEL NORTE	26.7	27.8	27.4	27.4	0.9	1.1	1.2	1.1	1.9	2.3	2.5	2.1
DAVAO DEL SUR	26.9	27.8	26.9	27.1	0.9	1.1	1.1	1.0	1.9	2.2	2.3	2.0
DAVAO ORIENTAL	26.8	27.8	27.5	27.6	0.9	1.0	1.1	1.0	1.8	2.0	2.4	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 11

PROVINCES	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 11												
COMPOSTELA VALLEY	748.1	559.0	546.7	586.6	10.2	-11.3	-2.7	0.3	6.6	-21.9	-6.5	0.0
DAVAO DEL NORTE	637.0	496.5	535.6	556.2	9.2	-12.5	-3.6	-1.5	1.1	-22.2	-7.9	-2.2
DAVAO DEL SUR	288.1	347.1	494.1	442.3	18.1	-9.8	-7.8	-2.4	15.2	-12.0	-12.6	-4.5
DAVAO ORIENTAL	827.3	611.8	540.4	599.2	12.3	-5.7	-4.7	1.2	15.9	-16.1	-9.9	4.9

Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 11

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >150mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
DAVAO DEL SUR	Davao	109	2981	5373	7930	4789	5368	2	3	4

Note:
- For Davao del Norte, Davao Oriental and Compostela valley, use values of Davao City.

SOURCE: PAGASA

FIGURE NO.:	FIGURE TITLE:	
2-45	**PAGASA CLIMATE PROJECTION FOR 2020 AND 2050 COVERING DAVAO REGION**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

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

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

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

- **Scope 1 Emission Sources:** Hot Gas Generator
- **Scope 2 Emission Sources:** 12,000kW power requirement (to be purchased)
- **Scope 3 Emission Sources:** Panamax Vessels, Delivery Trucks

269 The Tier 1 equation was used to compute for the potential Scope 1 CO_2 emissions, particularly the hot gas generator. **Table 2-24** shows the input data, as well as the potential CO_2 emissions per year. The hot gas generator consumes 2,000 L/day of diesel fuel, which converts to 0.077 TJ/day. The emission factor of 74,100 kg CO_2/TJ was taken from Chapter 2, Volume 2 of the IPCC Guidelines. An estimated 2,082,580 kg of CO_2 will be emitted by the hot gas generator per year.

Tier 1 Equation for Greenhouse Gas Emissions from Stationary Combustion

$$Emissions_{CO_2\ Diesel\ Oil} = Fuel\ Consumption_{Diesel\ Oil}\ x\ Emission\ Factor_{CO_2\ Diesel\ Oil}$$

Table 2-24: Scope 1 Potential Emission Data

INPUT DATA		POTENTIAL EMISSIONS PER YEAR (kg CO_2)
Fuel Consumption[1] (TJ/day)	**Emission Factor[2] (kg CO_2/TJ)**	
0.077	74,100	2,082,580

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

270 The emission factor from the World Bank Greenhouse Gas Emissions Inventory Management Plan for Internal Business Operations (2010) was used to compute for the Scope 2 Emission Sources. The given country-based emission factor for the Philippines is 989.34 lb CO_2/MWh, which is equal to 0.45 kg CO_2/kWh. The power requirement of the cement grinding facility is 12,000 kW. Assuming that the facility will operate 24/7, the project consumes about 105,120,000 kWh. Given these data, the Scope 2 CO_2 emissions from the cement grinding facility is 47,304,000 kg CO_2 per year **(Table 2-25)**.

Equation for Estimating Potential Scope 2 Emissions

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

Table 2-25: Scope 2 Potential Emission Data

Input Data		Potential Emissions per year (kg CO_2)
Power Consumption[1] (kWh)	**Emission Factor[2] (kg CO_2/kWh)**	
105,120,000	0.45	47,304,000

[1] – Power consumption data provided by Oro Cemento
[2] – Emission Factor taken from World Bank Greenhouse Gas Emissions Inventory Management Plan for Internal Business Operations (2010)

271 Volume 2, Chapter 3 of the IPCC Guidelines was used to estimate Scope 3 emissions. Tier 1 equation for water-borne navigation and road transportation were used to estimate emissions from the Panamax vessels and the delivery trucks, respectively. The fuel consumption of one Panamax vessel is assumed to be 0.14 TJ/day, while the estimated fuel consumption of 100 delivery trucks was 0.19 TJ/day. The data shows that the project may potentially emit an estimated 9,226,123 kg of CO_2 per year.

Equation for Estimating CO_2 Emissions from Road Transport

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

Table 2-26: Scope 3 Potential Emission Data

POTENTIAL EMISSION SOURCE	INPUT DATA		POTENTIAL EMISSIONS PER YEAR (kg CO_2)
	Fuel Consumed[1] (TJ/day)	**Emission Factor[2] (kg CO_2/TJ)**	
1 Panamax Vessel	0.14	77,400	3,995,330

POTENTIAL EMISSION SOURCE	INPUT DATA		POTENTIAL EMISSIONS PER YEAR (kg CO_2)
	Fuel Consumed[1] (TJ/day)	**Emission Factor[2] (kg CO_2/TJ)**	
100 Delivery Trucks	0.19	74,100	5,230,793
		Total	**9,226,123**

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

272 Results of potential CO_2 emissions was compared to the Second National Communication on Climate Change (Philippines). As shown in **Table 2-27**, the projected emissions from the operations of **Oro Cemento Industries Corporation** is 567 Gg CO_2/year, compared to the projected 100,402 Gg CO_2/year emitted in the Philippines in the year 2020. Emissions from Oro Cemento is only 0.56% of the annual CO_2 emission of the Philippines in 2020.

Table 2-27: CO_2 Emissions from Oro Cemento

YEARLY EMISSIONS	Gg CO_2/yr.
Second National Communication on Climate Change (Philippines)	
2000	69.667
2020	100,402
Oro Cemento Industries Corporation	
Projected emissions per year	567

2.3.2 Air Quality (& Noise)

273 To assess the potential impact on air quality, ambient air sampling was conducted to establish the baseline air quality in the area. Also, air dispersion modelling was done to predict the potential impact of the project on the overall air quality in the area.

274 According to the baseline air quality data, the TSP near the project site exceeds the NAAQS, primarily due to the construction of an adjacent feed mill. TSP levels are expected to be lower after the construction.

275 The project is not expected to emit gases such as CO, NO2, and SO2 due to its nature. However, TSP and PM10 are expected because of the cement grinding facility. According to the results of the modelling, TSP and PM10 levels should be lower than the NAAQS, even without mitigating measures such as bag filters.

276 Baseline noise data was also collected. Stations situated in busy areas (e.g. national highway, brgy. road) exceed the maximum allowable noise level. Noise in this area is not expected to be affected by the operations of the proposed cement grinding facility.

2.3.2.1 Degradation of air quality

277 Ambient air sampling was done on July 5 and 6, 2018 to assess the baseline ambient air quality in the vicinity. The location map is shown in **Figure 2-46**.

278 One-hour monitoring was done for each station. Field sampling and laboratory analysis were performed by CRL Calabarquez Corporation, a DENR-recognized laboratory based in Laguna.

279 Ambient air quality monitoring results are compared with the National Ambient Air Quality Standards (NAAQS) as per the Implementing Rules and Regulations (IRR) of the Philippine Clean Air Act of 1999 or Republic Act 8749 (DAO 2000-81). The observed 1-hour ambient air concentrations at the monitoring stations are summarized in **Table 2-28**.

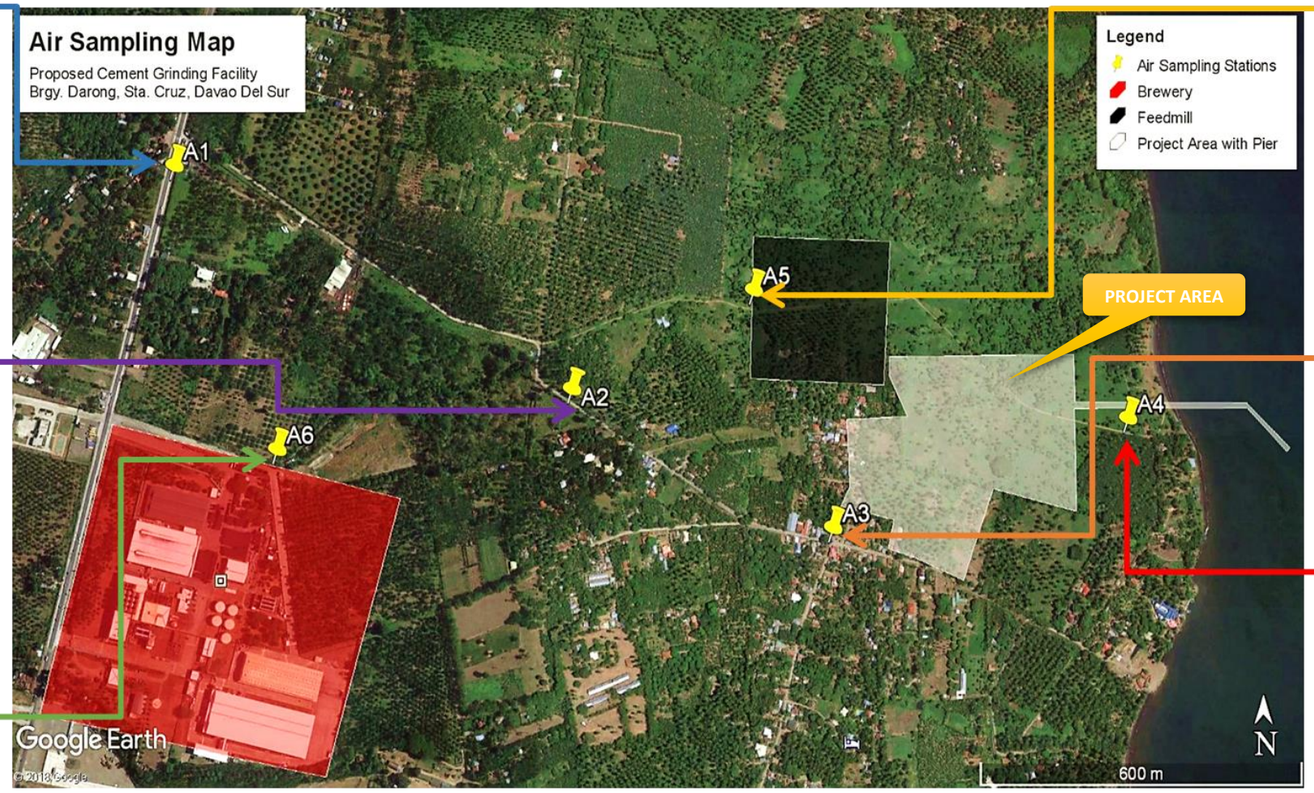
280 As presented on **Table 2-28**, results showed acceptable ambient air conditions, with most values below the specified NAAQS limits except for TSP in Station A5 with 480.9 µg/Ncm. This could be attributed to the ongoing construction of the adjacent feed mill. The high TSP concentration is expected to subside after construction activities.

281 It is anticipated that the project will have impacts on air quality in the area. Heavy equipment that will be used during the construction phase will emit the usual pollutants from mobile sources, which are NOx, SO2, and CO. This can be mitigated with proper maintenance on the equipment to ensure its efficiency in burning fuel.

282 Given the nature of the project, the primary air quality parameters of concern during the operation phase are TSP and PM10. According to the US EPA AP-42: Compilation of Air Emissions Factors, finish grinding mills or cement grinding mills is a source of particulate matter emissions. The proponent will install bag filters to control TSP and PM10 emissions. Road watering around the vicinity shall also be an effective measure to control dust.

Figure 2-46: Location Map of the Ambient Air and Noise Level Monitoring Stations

SAMPLING POINT	LATITUDE (N)	LONGITUDE(E)	SAMPLING POINT	LATITUDE (N)	LONGITUDE(E)
1	6°56'24.32"	125°28'20.45"	4	6°56'9.86"	125°29'19.43"
2	6°56'11.51"	125°28'45.16"	5	6°56'17.17"	125°28'56.38"
3	6°56'3.65"	125°29'1.16"	6	6°56'8.07"	125°28'27.22"



Note: Location map generated using Google Earth

FIGURE NO.	FIGURE TITLE
2-46	**LOCATION MAP OF THE AMBIENT AIR AND NOISE LEVEL MONITORING STATIONS**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Table 2-28: Results of Ambient Air Quality Analysis (5 & 6 July 2018)

STATION	LOCATION	OBSERVED 1-HOUR AMBIENT AIR CONCENTRATIONS, µg/Ncm			
		TSP	*PM_{10}*	*NO_2*	*SO_2*
A1	Along National Highway (Before Darong Brgy. Hall)	148.2	121.7	ND	287.6
A2	Inside Brgy. Road (After Clinic)	122.3	49.8	ND	ND
A3	Brgy. Road (Near Brgy. covered court)	50.3	28.9	ND	ND
A4	Inside Project Site	41.1	9.4	ND	ND
A5	Near Perimeter Fence of Feed Mill	480.9	59.5	ND	ND
A6	East Road Near Perimeter of Brewery	38.8	23.1	ND	227.3
NAAQS (1-hour sampling)		300	200	260	340

Notes:
ND = Not detected / below detection limit (NO_2 = 0.26µg; SO_2 = 0.75µg);
(*) = Evaluation of this standard is carried out for 30-minute averaging time.
REFERENCE: DAO 2000-81 (IRR of Republic Act 8749)
Red Marks: Exceeds Standards

Air Dispersion Model

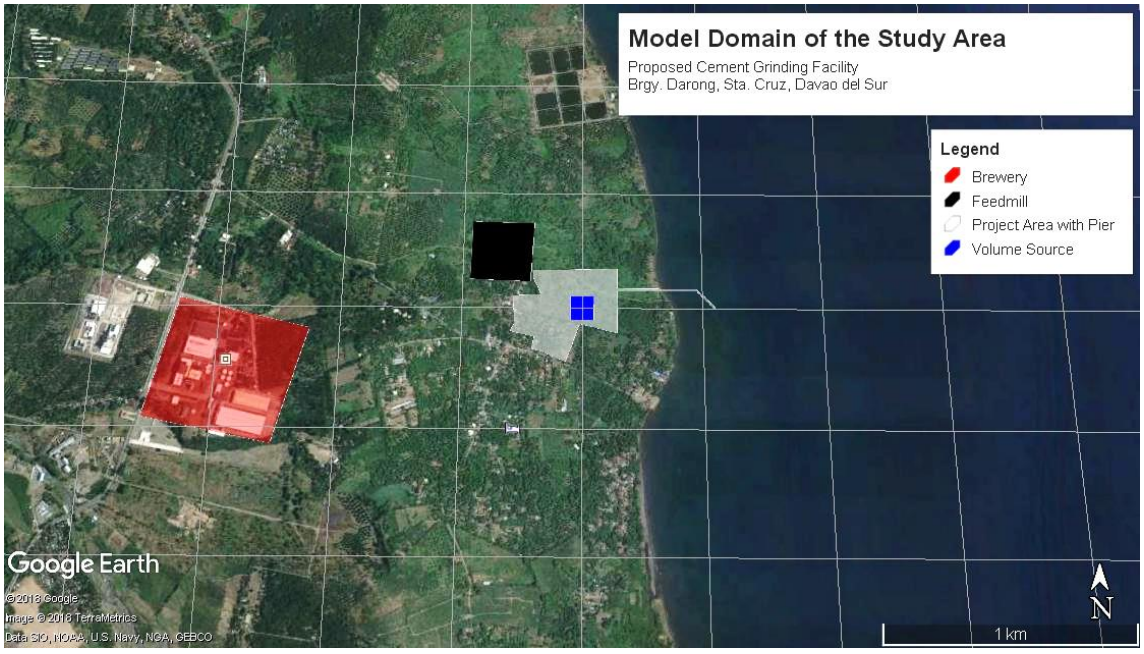
283 A steady state Gaussian plume dispersion model was applied to evaluate the air pollution impact on the local air quality from the proposed cement grinding facility in Brgy. Darong, Sta. Cruz, Davao del Sur. The modeling domain covering the study area is a 10-km by 10-km grid centered on the possible location of the cement grinding mill as shown in **Figure 2-47**.

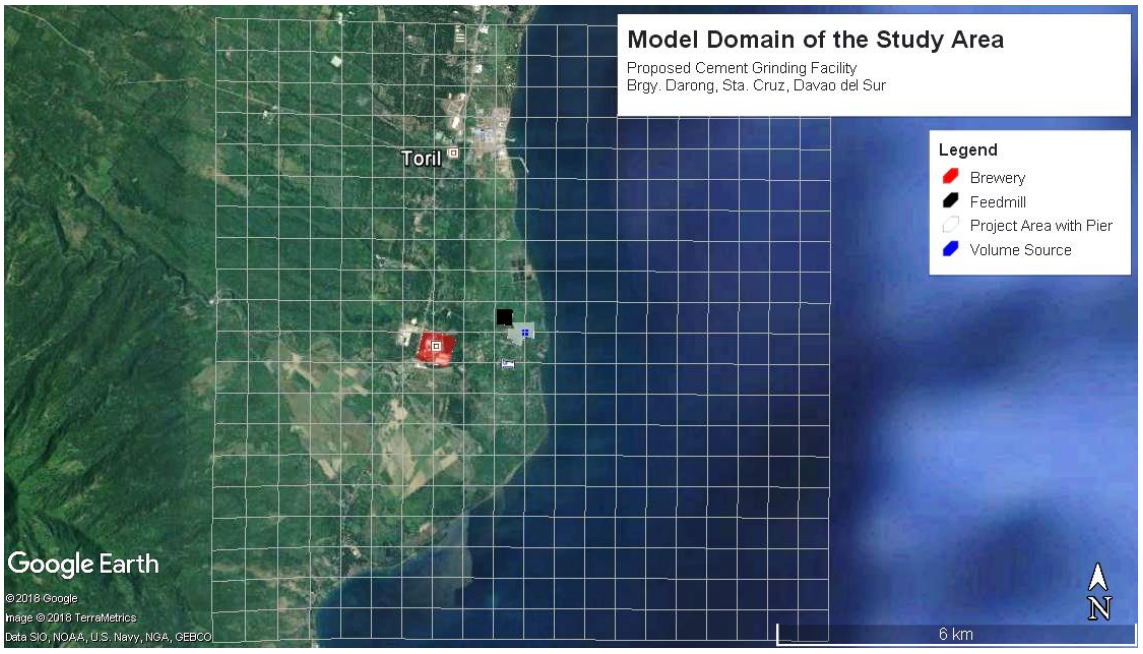
284 The primary air pollutant to the air quality of the study area will be particulates (TSP and PM10) that will be emitted from the cement grinding mill.

285 The proposed facility is in an area where regional meteorological condition and terrain would have a significant effect on the predicted ground-level concentration (GLC) of its air emissions. The meteorological data used for the model was derived from a 3-year mesoscale regional meteorological model (MM5) for the said area. The summarized wind frequency data for the three-year MM5 data as shown in the wind rose diagram (**Figure 2-48**) indicates that the prevailing wind direction in the area is in northeasterly, southwesterly, and southeasterly sectors with a wind speed range between two to eleven meters per second. The MM5 data was processed by AERMET, the meteorology data processor for AERMOD. The terrain elevation data was obtained from high resolution database of Earth's topography collected during the Shuttle Radar Topography Mission (SRTM). The elevation data was then processed (**Figure 2-49**) by AERMAP, the terrain preprocessor for AERMOD air dispersion study, to calculate the hill height scale and elevations for receptors within the model domain of 10 km x 10 km grid with a 500 m resolution of the uniform Cartesian grid receptor.

286 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.

Figure 2-47: Model Domain of the Study Area

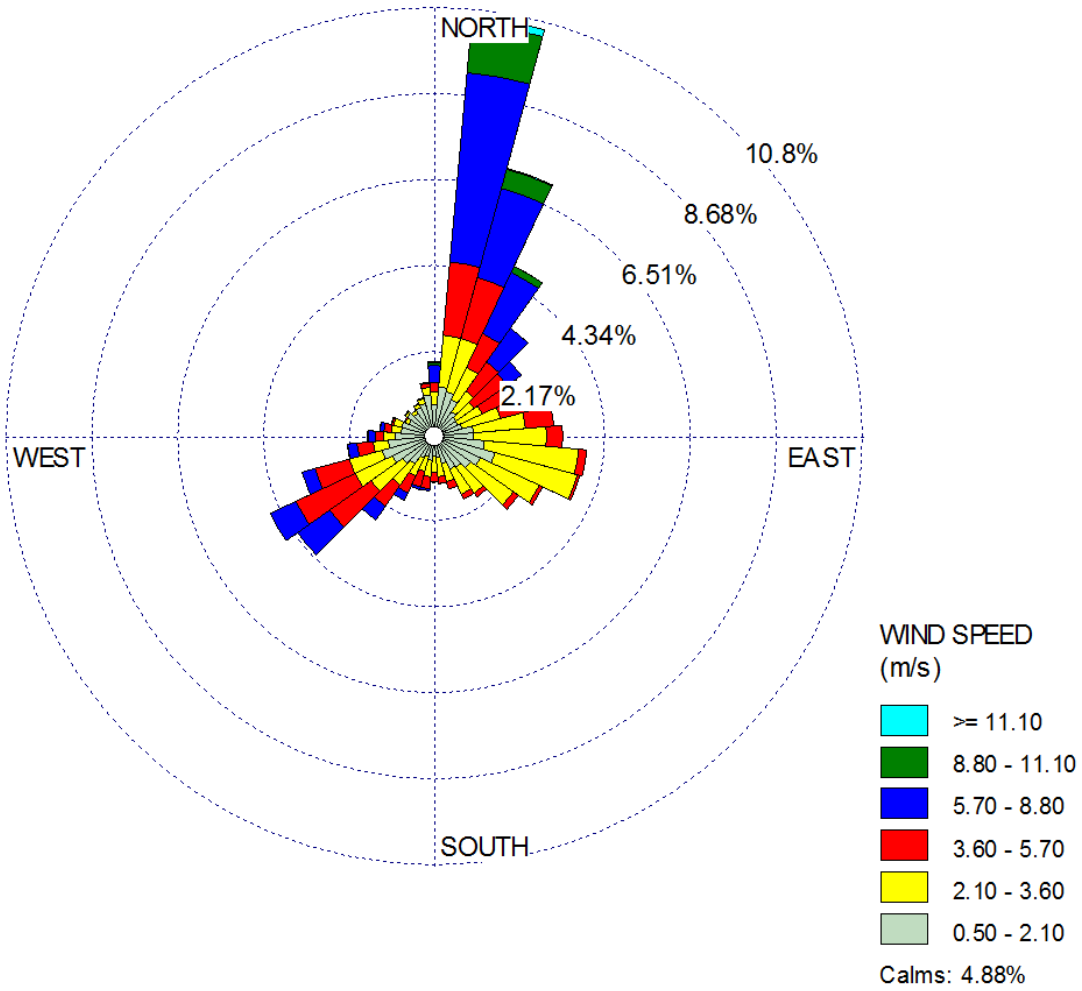




Source: LCI Envi Corporation

FIGURE NO.	FIGURE TITLE	
2-47	**MODEL DOMAIN OF THE STUDY AREA**	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

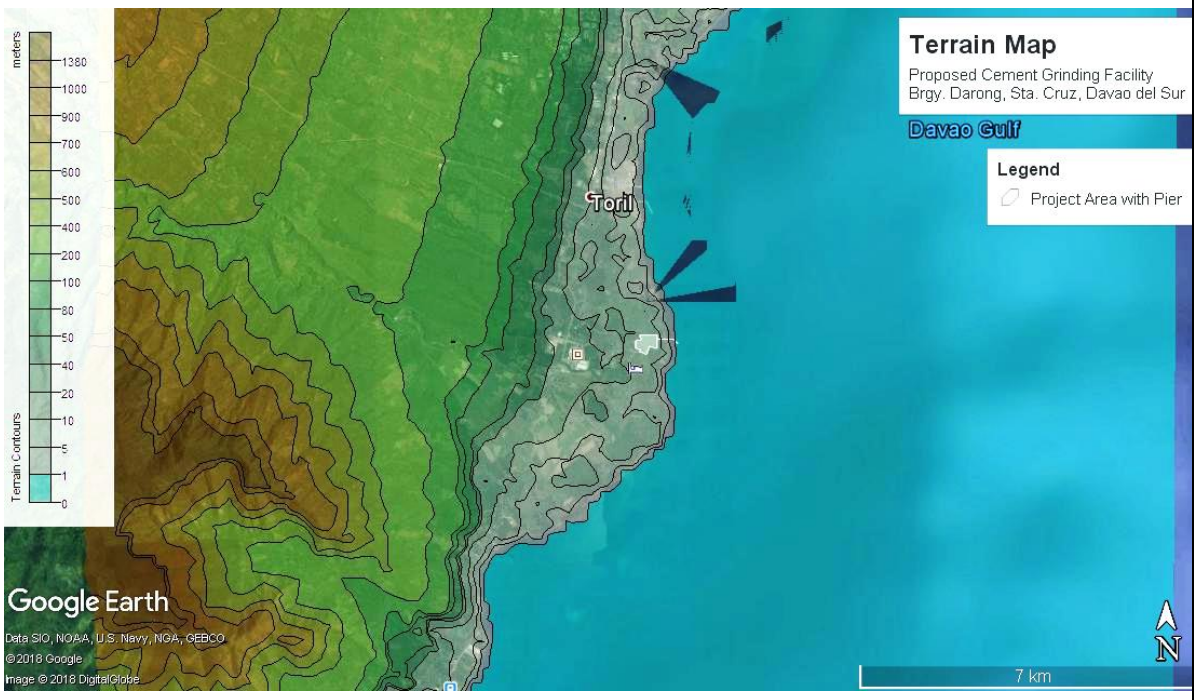
Figure 2-48: Wind Rose Diagram based from the Mesoscale Regional Meteorological Data of Three Years



Source: LCI Envi Corporation

FIGURE NO.	FIGURE TITLE	
2-48	**WIND ROSE DIAGRAM BASED FROM THE MESOSCALE REGIONAL METEOROLOGICAL DATA OF THREE YEARS**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Figure 2-49: Digitized Terrain Map of the Study Area



Source: LCI Envi Corporation

FIGURE NO.	FIGURE TITLE	
2-49	**DIGITIZED TERRAIN MAP OF THE STUDY AREA**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

287 Aside from the activities related to the operations of **Oro Cemento Industries Corporation**, the boiler of the adjacent SMFI Feed Mill was also considered in the air dispersion model. The following are the details regarding the considered sources:

Table 2-29: Operations Considered in Air Dispersion Model

COMPANIES	SOURCES OF EMISSIONS	TYPES OF SOURCES	NO. OF DAYS/YEAR
Oro Cemento Industries Corporation	Cement Grinding Mill	Volume Source	365
San Miguel Foods, Inc.	Boiler	Point Source	365

288 Emission factor was multiplied with activity rate to obtain the emission rates of TSP and PM10 from the cement grinding mill (volume source). For the emission factor, US EPA AP-42 emission factors of finish grinding mills of Portland Cement manufacturing facilities was used. The activity rate of the operation was also obtained. Table 2-12 shows the variables that were used in the following equation was used:

$$\text{Emission Rate (g/s)} = \text{Emission Factor (kg/ton)} \times \text{Activity Rate (ton/h)} \times 10^3 \text{ (g/kg)} \times 1/3600 \text{ (h/s)}$$

Table 2-30: Values Used for Emission Rates of Volume Source

VARIABLE	VALUE	UNIT	REFERENCE
Emission Factor	0.0042	kg/ton	US EPA AP-42 emission factors for Portland Cement Manufacturing
Activity Rate	250	Tons/hour	ORO CEMENTO INDUSTRIES

289 To compute for the emission rates of TSP and PM10 from the boiler (point source) of San Miguel Foods, Inc., variables in **Table 2-31** were applied to the following equation:

Emission Rate (g/s) = Max Limit (mg/Nm3) x Stack volumetric flow rate (Nm3/s) x 10-3 (g/mg)

Table 2-31: Values Used for Emission Rates of Point Source

VARIABLE		VALUE	UNIT	REFERENCE
Max Limit	TSP	150	(mg/Nm^3)	DAO 2000-81
	PM_{10}	97.5*		
Stack volumetric flow rate		4.67	(Nm^3/s)	San Miguel Foods, Inc.
* Assumes that PM_{10} is 65% of TSP				

290 The following are the emission rates of each pollutant:

Table 2-32: Emission Rates of Point Source

POLLUTANTS	ORO CEMENTO INDUSTRIES CORPORATION EMISSION RATES, G/S	SAN MIGUEL FOODS, INCORPORATED EMISSION RATES, G/S
TSP	0.29	0.70
PM_{10}	0.19*	0.46
Note: * Assumes that PM_{10} is 65% of TSP due to lack of reference emission factors from US EPA **Assumes that PM_{10} is 65% of TSP due to lack NESSAP Standards		

291 **Table 2-33** summarizes the modelling results describing the predicted incremental maximum ground- level concentration (GLC) of criteria air pollutants at different averaging times. Moreover, the isopleths for the long 24-hr incremental GLC of the said pollutants are also shown **Figure 2-50 and Figure 2-51**. It should be noted that these concentrations are the predicted maximum increase in the existing ambient air levels in the study area based on a reasonable worst-case scenario.

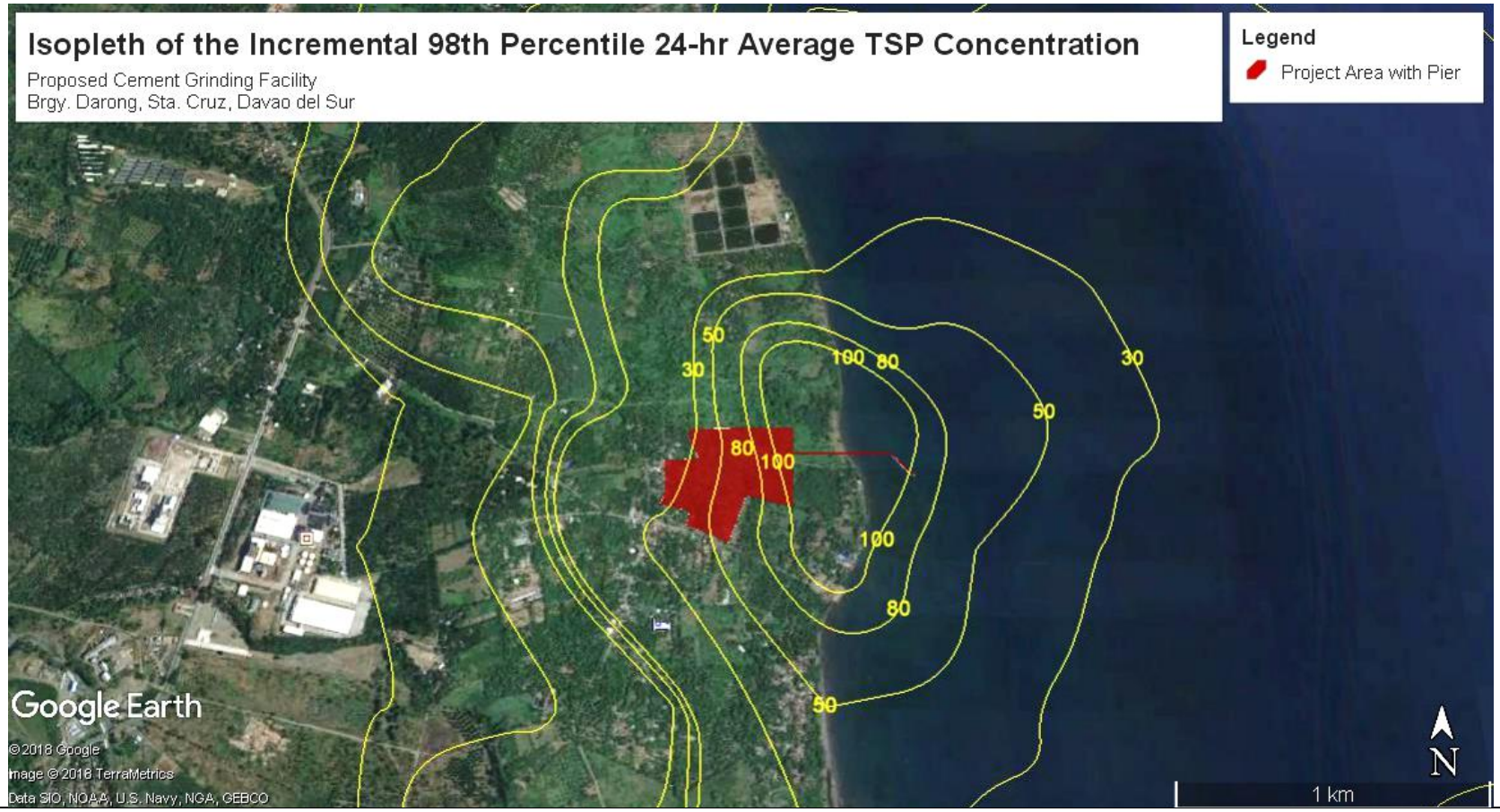
292 Results indicate the predicted incremental GLC of TSP and PM_{10} are below the prescribed limit stipulated in DAO 2000-81, the Implementing Rules and Regulation (IRR) of RA 8749, the Philippine Clean Air Act (CAA) of 1999, considering only the operations of **Oro Cemento Industries Corporation**. However, considering the cement grinding mill operations of **Oro Cemento Industries** Corporation and the boiler of San Miguel Foods, Inc., the maximum GLC of TSP and PM_{10} for 1-hour averaging time are beyond NAAQS. If the proponent will consider "Best Practices" and install and operate "Best and Available Control Technology" (BACT) to lower the emission rate of the pollutants, the impact of the project on air quality will be minimized.

Table 2-33: Predicted Incremental Maximum Ground-Level Concentration (GLC) of Criteria Air Pollutants

POLLUTANT	AVERAGING TIME	CEMENT GRINDING MAXIMUM GLC[C], µg/m³	CUMULATIVE MAXIMUM GLC[C], µg/m³	UTM EAST, m	UTM NORTH, m	CAA STANDARDS, µG/m³	REMARKS
TSP	1-hr	97.01	371.96	775265.77	767373.00	300[A]	**CUMULATIVE MAXIMUM GLC IS BEYOND NAAQS**
	24-hr	89.27	165.06	775265.77	767373.00	230[B]	**Passed**
	Annual	14.30	29.56	775265.77	767373.00	90[B]	**Passed**
PM_{10}	1-hr	63.55	243.70	775265.77	767873.00	200[A]	**CUMULATIVE MAXIMUM GLC IS BEYOND NAAQS**
	24-hr	58.49	108.15	775265.77	767873.00	150[B]	**Passed**
	Annual	9.37	19.37	775265.77	767873.00	60[B]	**Passed**

Notes:
[A] Section 1, Rule XXVI Source Specific Ambient Air Quality Standards (DAO 2000-81)
[B] Section 1, Rule VII National Air Quality (DAO 2000-81)

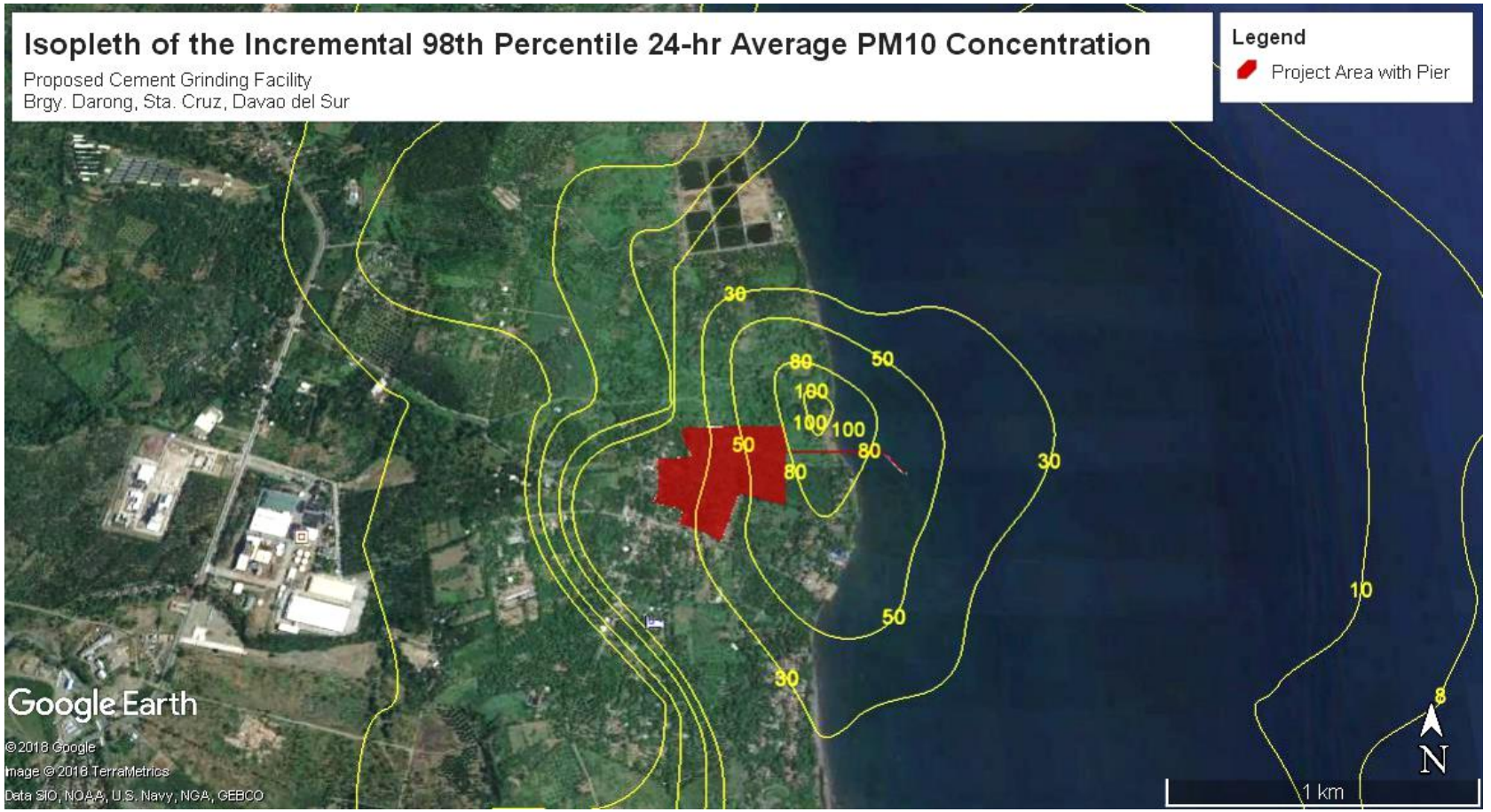
Figure 2-50: Isopleth of the Incremental 98th Percentile 24-hr Average TSP Concentration



Source: LCI Envi Corporation

FIGURE NO.	FIGURE TITLE	
2-50	**ISOPLETH OF THE INCREMENTAL 98TH PERCENTILE 24-HR AVERAGE TSP CONCENTRATION (µG/M³)**	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

Figure 2-51: Isopleth of the Incremental 98th Percentile 24-hr Average PM10 Concentration



Source: LCI Envi Corporation

FIGURE NO.	FIGURE TITLE	
2-51	**ISOPLETH OF THE INCREMENTAL 98TH PERCENTILE 24-HR AVERAGE PM10 CONCENTRATION (µG/M3)**	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

2.3.2.2 Increase in ambient noise level

293 Along with ambient air monitoring, noise monitoring was also conducted; the stations for air quality monitoring and noise monitoring are the same.

294 Noise level monitoring results are compared with the appropriate guideline values stipulated under the National Pollution Control Commission (NPCC) Memorandum Circular No. 002, Series of 1980.

295 The observed noise level propagations at the monitoring stations (daytime and evening) are summarized in **Table 2-34** It can be observed that noise levels near or in roads (Stations A1, A2, and A3) exceed the appropriate maximum allowable noise levels. The noise is mainly due to passing vehicles on the roads. It can also be observed that noise in Station A5 exceeds NPCC standards due to the ongoing construction of a feed mill. These trends were also observed during evening, except for A3 – which was within the maximum allowable noise level. This can be attributed to lack of people/activities in the covered court.

296 Noise is expected to be generated by heavy equipment during construction.

297 **Table** 2-35 presents the expected noise levels of construction equipment, which is expected to attenuate with distance.

298 Although the project site is classified as an industrial area, there are residents in the vicinity who may be affected by the noise during the construction. The proponent has to implement mitigating measures to control noise. Some measures that the proponent will apply are proper maintenance of engines and other mechanical parts of the heavy equipment, installation of exhaust mufflers, and installing enclosures surrounding the project site. The proponent will maintain and enhance the existing vegetation surrounding the site which will act as natural noise barriers. The proponent will also limit activities during normal working hours.

299 Noise will be generated by the cement grinding mill once it is operational. The equipment will be housed to control the noise. Vegetation, which will serve as natural noise barriers, will be maintained around the perimeter of the site.

Table 2-34: Results of Noise Level Monitoring

STATION	LOCATION	OBSERVED 1-HOUR NOISE LEVEL PROPAGATION, dB(A)	MAXIMUM ALLOWABLE NOISE LEVEL, dB(A)
A. Daytime			
A1	**Along National Highway (Before Darong Brgy. Hall)**	64.36	55**
A2	**Inside Brgy. Road (After Clinic)**	63.68	50*
A3	**Brgy. Road (Near Brgy. covered court)**	68.02	55**
A4	**Inside Project Site**	67.69	70***
A5	**Near Perimeter Fence of Feed Mill**	71.53	70***
A6	**East Road Near Perimeter of Brewery**	60.20	70***
B. Evening			
A1	**Along National Highway (Before Darong Brgy. Hall)**	62.53	50**
A2	**Inside Brgy. Road (After Clinic)**	53.87	45*

STATION	LOCATION	OBSERVED 1-HOUR NOISE LEVEL PROPAGATION, dB(A)	MAXIMUM ALLOWABLE NOISE LEVEL, dB(A)
A3	**Brgy. Road (Near Brgy. covered court)**	47.06	50**
A4	**Inside Project Site**	59.45	65***
A5	**Near Perimeter Fence of Feed Mill**	69.07	65***
A6	**East Road Near Perimeter of Brewery**	57.23	65***

Notes:
(*) Class AA = A section or contiguous area which required quietness, such as areas within 100 meters from school sites, nursery schools, hospitals, and special homes for the aged (daytime/evening)
(**) Class A = Areas primarily used for residential purposes (daytime/evening)
(***) Class C = Light industrial area (daytime/evening)
REFERENCE: NPCC Memorandum Circular No. 1980-002
Red Marks: Exceeds Standards

Table 2-35: 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

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

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

Table 2-36: Summary of Significant Baseline Findings and Potential Impacts and Mitigation on Air and Noise

Summary of Baseline Findings on Air:

- **Meteorology**
  - The proposed project area mainly belongs to Type IV climate under the modified Coronas classification with rainfall being more or less distributed through the year.
  - Temperature is highest in April and May and lowest in January and February.
  - Precipitation is highest in June and lowest in February.
  - The surface wind in the area northward from November to April and southward May to October
  - An average of 1 cyclone passes by the Davao area every 12 years.
- **Ambient Air Quality and Noise**
  - Out of the 6 sampling stations, only the station near the perimeter fence of the adjacent feed mill exceeded TSP standards because of the ongoing construction activities.
  - Noise levels near roads and highways are above the NPCC standards. The station near the perimeter fence of the feed mill also exceeded NPCC standards mainly due to its ongoing construction.

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURES
AMBIENT AIR QUALITY AND NOISE			
Impact on Air Quality	Construction	NO_x, SO_2, and CO emissions from heavy equipment that will be used during construction	Proper maintenance on heavy equipment.
	Operation	TSP and PM_{10} emissions from the cement grinding facility is of primary concern	Installation of bag filters that will control at least 90% of the emissions from the cement grinding facility Road watering within the plant site to control dust
Increase in Ambient Noise Level	Construction/ Operation	Noise will be generated by heavy equipment during construction The cement grinding facility will generate some noise	Maintenance of engines and other mechanical parts of the equipment Installation of exhaust mufflers Constructing enclosures surrounding the project site Maintenance of vegetation surrounding the area to serve as natural noise barriers

2.4 The People

Land Area

301 Sta Cruz is a 1st class municipality in the Philippines and has a land area of 28,759 has, which is 7.31% of the total land area of Davao del Sur. As discussed in the section regarding land classification, the municipality is predominantly forested and agricultural lands with increasing reclassification of some areas due to the influx of investors and rising economic activities.

Demography

302 Sta. Cruz has a total population of 81,093 people with a total number of households of 17,954 at an average household size of 4-5 as of 2010 census by the National Statistical Coordination Board (NSCB). Based from the 2015 census of the Philippine Statistics Authority (PSA), the total population of Sta. Cruz is 90,987. Noting an increase of 9,894 persons in a span of 5 years. For the sake of completeness, 2010 demographic data will be utilized in the discussion.

303 As summarized in **Table 2-37**, the municipality is comprised of 9 urban and 9 rural barangays based on considering their population, presence of establishments and facilities within. The data presented shows that urban population greatly outnumbers the population of rural barangays.

304 Astorga has the highest population with 11,372 residents while Saliducon has the lowest population of only 821. Barangay Darong, has a total population of 4,279 with 1,018 households.

Table 2-37: Population of Sta Cruz per Barangay, 2010

BARANGAY	POPULATION	NUMBER OF HOUSEHOLD	AVERAGE HOUSEHOLD SIZE
A. Urban			
1. Zone 1	7,301	1,521	4.8
2. Zone II	4,456	969	4.6
3. Zone III	10,127	2,250	4.5
4. Zone IV	5,486	1,167	4.7
5. Astorga	11,372	2,584	4.4
6. Bato	5,651	1,177	4.8
7. Coronon	7,630	1,695	4.5
8. Darong	4,279	1,018	4.2
9. Inawayan	5,518	1,200	4.6
Sub-total	**61,820**	**13,851**	**4.5**
B. Rural			
1. Jose Rizal	1,337	304	4.4
2. Matutungan	884	210	4.2
3. Melilia	853	258	3.3
4. Saliducon	821	222	3.7
5. Sibulan	5,132	1,069	4.8
6. Sinoron	1,174	294	4.0
7. Tagabuli	2,091	465	4.5
8. Tibolo	1,197	266	4.5
9. Tuban	5,784	1,285	4.5
Sub-total	**19,273**	**4,373**	**4.2**
Total	**81,093**	**17,954**	**4.4**

Source: 2010 NSO Survey on Population and Housing

305 From the 2014 household survey conducted by barangay Darong, the population of the barangay increased to 4,984 residents with 1,139 households. From the data presented in **Table 2-38,** males and females are generally well distributed in the barangay. Purok Lanzones has the highest population with 1,069 residents while Cardava has the least with only 125 residents.

Table 2-38: Population of Barangay Darong per Purok, 2010

PUROK	TOTAL POPULATION	MALE	FEMALE	NO. OF HH
Barangay Darong	4,984	2,572	2,412	1,139
Purok				
Lacatan	261	128	133	59
Guava	612	286	326	133
Papaya	1,031	526	505	226
Mangga	552	286	266	145
Lanzones	621	315	306	144
Rambutan	288	139	149	62
Lanzones	1,069	591	478	240
Durian	425	228	197	103
Cardava	125	73	53	26

Population Density

306 Given the total land area and 2010 population of the municipality, every square kilometer is inhabited by more or less 660 people (250/km^2).

Population Growth Rate

307 The total population of the municipality has significantly increased with 34,762 in 1970 to 81,093 by 2010. Sta. Cruz experienced a +46.63 population growth in urban barangays and -20.57 decrease in rural barangays as summarized in **Table 2-39**. This can be attributed to the re-classification of some barangays from rural to urban due to the continuous economic growth of the municipality. In fact, from 2007 to 2010, level of urbanization increased from 33% to 76%.

Table 2-39: Population Growth, 1970 to 2010

	MUNICIPAL POPULATION			AVERAGED YEARLY POPULATION GROWTH RATE (%)		LEVEL OF URBANIZATION (%)
Year	**Urban**	**Rural**	**Total**	**Urban**	**Rural**	**Municipal**
1970	10,081	24,681	34,762	-	-	29.0
1975	13,608	28,226	41,834	+7.00	+2.87	32.5
1980	16,417	31,859	48,276	+4.13	+2.57	34.0
1990	19,566	36,449	56,015	+1.92	+1.44	34.9
1995	20,116	39,023	59,139	+0.56	+1.41	34.0
2000	22,191	45,126	67,317	+2.06	+3.13	33.0
2007	25,770	50,343	76,113	+2.30	+1.65	33.9
2010	61,820	19,273	81,093	+46.63	-20.57	76.2

Source: Comprehensive Land Use Plan of Sta. Cruz

Main Sources of Income and Employment

308 Sta. Cruz has five main sources of income and employment: 1) Agriculture, 2) Forestry, 3) Industries, 4) Commerce and Trade and 5) Tourism.

309 As of 2012, agricultural lands account for about 15,716.37 hectares. These are cultivated into various crops and the top ten major crops are summarized in **Table 2-40**. Coconut (44.76%) and

banana (30.66%) plantations, the two leading crops planted in the municipality, are spread throughout the municipality and are present in all barangays.

Table 2-40: Ten Major Crops in Sta. Cruz, 2012

MAJOR CROPS	BARANGAY	AREA	
		Hectares	%Total
Coconut	18 barangays	7,560.00	44.76
Banana	18 barangays	5,178.85	30.66
Lanzones	Melilia, Sinoron, Jose Rizal	1,100.00	6.51
Abaca	Sibulan, Tibolo, Jose Rizal, Astorga, Coronon, Melilia	446	2.64
Durian	Saliducon, Jose Rizal	422.10	2.50
Coffee	Sinoron, Melilia, Zone II, Jose Rizal, Sibulan, Tibolo	400.00	2.36
Sugarcane	Astorga, Zone IV, Tagabuli	248.50	1.47
Mango		181.92	1.07
Rubber	Zone II, Sinoron, Jose Rizal	120.00	0.71
Cacao	Matutungan, Darong, Jose Rizal, Tuban, Sinoron	59.00	0.35

Source: Municipal Agricultural Office

310 In the same year, in terms of forestry, 8,737 hectares are dedicated for natural timber-production, timber-production in plantations, agro-forests, pasture/grazing land, mineral areas, watershed areas, community-based forest management areas and for other special uses such as tourism, fish, farms, ponds etc.

311 Historical data in terms of industries in Sta. Cruz, showed that in the year 2008, there were no investors in the municipality due to a worldwide economic breakdown. Succeeding years, however, resulted to investors pouring in. In fact, in the year 2011 alone, over 21 hectares had to be converted into agro-industrial and industrial areas to accommodate these. This economic boom is also observed in Barangay Darong which hosts the biggest brewing company in Asia, the San Miguel Brewery, Inc., the CJ Toyota Philippines for xylose production out of the moisture content from coco shell, the HEDCOR which generates 42.5 megawatts of hydro-electric power from Plants A & B; the IPI Steel which fabricates industrial steel pipes.

Table 2-41: Historical Data on Industrial Areas in Sta. Cruz

LOCATION	INDUSTRIAL AREAS (IN HA.)				
	2008	2009	2010	2011	2012
Darong	-	3	5	5	5
Astorga	-	-	-	8	-
Coronon	-	5	-	8	3
Zone 4	-	5	-	-	-
Total	**-**	**13**	**5**	**21**	**8**

Source: LGU-LEEM

312 Commerce and trade in the municipality are conducted in, but not limited to, the Old Public Market, Commercial Complex which has the New Public Market and the Integrated Transport Terminal and in other Commercial Strips.

313 For tourism, Sta. Cruz experienced an increase in tourist arrivals over the past five years. Arrivals brought about the hosting of international event and effective image-building initiatives with the aid of the Department of Tourism. Tourism-related establishments such as hotels, inns and other forms lodging were also erected to support tourism activities in the municipality. The main sites

that are often visited are the eco-cultural and adventure tourism sites: Mt. Apo and the huge coastline of the Davao Gulf.

Gender, Age Composition and Labor Force

314 Based from the computed NSO Records for 2010 presented in **Table 2-42**, of the total population of Sta. Cruz males (51%) outnumbered the females (49%) that resided in the municipality that year.

315 Majority of the residents belong to the productive or working-age population (15-64 years). The young dependents (0 to 14 years) comprised are around 27,699 while the old dependents (65 years and over) accounted for only 3,235. From this data, 53,325 of the total population belonged to the allowable labor force (15 years old and over). Additionally, there were more males (52%) than females (48%) within this group.

316 In Darong, of their total population 35.85% are employed while 47.63% are unemployed as summarized in **Table 2-43**. The remaining percentage are those not in the labor force.

Table 2-42: Sta. Cruz Total Population by Age Group and Sex, 2010

AGE GROUP	BOTH SEXES	MALE		FEMALE		SEX RATIO
		Number	%	Number	%	
School going population	33,452	17,239	52%	16,213	48%	1.06
Pre-school (3-6)	7,209	3,666	51%	3,543	49%	1.03
Elementary (7-12)	11,026	5,647	51%	5,379	49%	1.05
Secondary (13-16)	7,110	3,590	50%	3,520	50%	1.02
Tertiary (17-21)	8,107	4,336	53%	3,771	47%	1.15
Working age (15-64)	50,090	26,334	53%	23,756	47%	1.11
Labor Force (15 and over)	53,325	27,837	52%	25,488	48%	1.09
Dependent population	30,934	15,746	51%	15,188	49%	1.04
Young (0-14)	27,699	14,243	51%	13,456	49%	1.06
Old (65-over)	3,235	1,503	46%	1,732	54%	0.87

Source: Comprehensive Land Use Plan of Sta. Cruz
Note: Computed based on the 2007 NSO data on household population by age group

Table 2-43: Barangay Darong Sex and Employment Status, 2010-2014

SEX	HOUSEHOLD POPULATION	IN LABOR FORCE (ECONOMICALLY ACTIVE)				NOT IN LABOR FORCE	%
		Employed	%	Unemployed	%		
Male	1,326	658	49.62	469	35.36	199	15.00
Female	1,382	313	22.64	821	59.40	248	17.94
Both Sexes	2,708	971	35.85	1,290	47.63	447	16.50

Source: BHW Household Survey 2008, Darong Sta. Cruz, Davao del Sur from the Comprehensive Barangay Development Plan 2010-2014

Literacy and Highest Educational Attainment

317 In terms of literacy and highest educational attainment in Sta. Cruz in the year 2010, 94.03% are considered literate while only 5.97 are illiterate. As shown in **Table 2-44,** there were more males who attended school than females. In Darong, the total population of ages 5 years old and above by highest educational attainment reached 3,702 as presented in **Table 2-45.** Out of these, 49% have elementary education, 34% got secondary education, 6% are college undergraduates and 1% are academic degree holders.

Table 2-44: Sta. Cruz Highest Educational Attainment and Sex, 2010

	MALE		FEMALE		BOTH SEXES	
	No.	%	No.	%	No.	%
Population 5 years old over	34,758	51.87	32,246	48.13	67,004	100.00
Literate	32,701	48.81	30,302	45.22	63,003	94.03
Illiterate	2,057	3.07	1,944	2.90	4,001	5.97

Source: Comprehensive Land Use Plan of Sta. Cruz
Note: Computed based on the 2007 NSO data on Highest Educational Attainment and Sex

Table 2-45: Barangay Darong Highest Grade Completed, 2010-2014

GRADE COMPLETED	MALE	FEMALE	TOTAL
No Grade Completed	14	20	34
Pre-school	153	124	277
Elementary Level	567	423	990
Elementary Graduate	423	409	832
High School Level	323	345	668
High School Graduate	206	398	604
College Undergraduate	100	123	223
Academic Degree Holder	20	34	54
Post-Baccalaureate	2	0	2
Not Reported	10	8	18
Total	**1,818**	**1,884**	**3,702**

Source: BHW Household Survey 2008, Darong Sta. Cruz, Davao del Sur from the Comprehensive Barangay Development Plan 2010-2014

Housing

318 Most of the households in Barangay Darong stay in houses and lots that they own as shown in **Table 2-46.** It comprises 66.55% of the total households in the barangay. Additionally, 18.98% of the households were determined to live in houses they own in rent-free lots but with the consent of the owner. These houses are commonly made with concrete or half concrete and half wood as the main outer wall material as summarized in **Table 2-47.**

Table 2-46: Type of Building/House and Tenure Status of Lot, 2010-2014

STATUS	TOTAL HH	PERCENTAGE
Owner, Owner-like Possession of House and Lot	589	66.55
Rent House/Room Including Lot	44	4.98
Own House/ Rent Lot	8	0.90
Own House, rent-free lot with consent of owner	168	18.98
Own House, rent free lot without consent of owner	0	0
Rent free house and lot with consent of owner	76	8.59
Rent free house and lot without consent of owner	0	0
Total	**885**	**100**

Source: BHW Household Survey 2008, Darong Sta. Cruz, Davao del Sur from the Comprehensive Barangay Development Plan 2010-2014

Table 2-47: Type of Building/House By Outer wall Construction Materials, 2010-2014

STATUS	TOTAL HH	PERCENTAGE
Owner, Owner-like Possession of House and Lot	589	66.55
Rent House/Room Including Lot	44	4.98
Own House/ Rent Lot	8	0.90
Own House, rent-free lot with consent of owner	168	18.98
Own House, rent free lot without consent of owner	0	0
Rent free house and lot with consent of owner	76	8.59
Rent free house and lot without consent of owner	0	0
Total	**885**	**100**

Source: BHW Household Survey 2008, Darong Sta. Cruz, Davao del Sur from the Comprehensive Barangay Development Plan 2010-2014

Health Services

319 In terms of health service, Barangay Darong has one main health center located at Purok Caimito and one sub health center located at Purok Papaya. The services offered are health education, control of locally endemic diseases, immunization, maternal/child health and family planning, nutrition (operation timbang, breast feeding, etc.), treatment of common diseases and supply of essential drugs. Doctors and dentists and other health personnel from the municipal or provincial sector regularly visit the barangay. Distance from the purok to these health facilities are summarized in **Table 2-48**. In Sta. Cruz, the leading cause for morbidity is diarrhea while the leading cause for mortality is cardiac respiratory arrest.

320 Darong is the recipient of the United Nation Multi Donor Program and one of the projects provided by the program is the medical facilities at the health station. Barangay health workers and hilots underwent training as part of their capability building. The health station has 1 assigned midwife. The midwife regularly provides services in the community and is assisted by Barangay Health Workers. The total health personnel in the area is sixteen: 1 Midwife, 9 BHWs, 1 Barangay Nutrition Scholar and 5 Hilot (Healers).

Table 2-48: Distance of Puroks to Health Facilities

FROM BARANGAY PUROKS	TO (IN KM.)			
	Brgy. Health Center	Municipal Health Center	Provincial Hospital	Davao Medical Center
Cardava	7.0	16.0	31.0	31.0
Durian	0.6	9.6	24.6	24.6
Caimito	0	9.0	24.0	24.0
Papaya	1.5	10.5	25.5	25.5
Mangga	2.0	11.0	26.0	26.0
Lanzones	1.0	10.0	25.0	25.0
Rambutan	2.0	11.0	26.0	26.0
Guava	2.0	11.0	26.0	26.0
Lacatan	2.5	11.5	26.5	26.5

Source: BHW Household Survey 2008, Darong Sta. Cruz, Davao del Sur from the Comprehensive Barangay Development Plan 2010-2014

Table 2-49: Ten Leading Causes of Morbidity in Sta. Cruz, 2010-2012

CAUSES	NO. OF CASES			
	2010	2011	2012	Total
1. Diarrhea	357	181	349	**887**
2. Acute Respiratory Infection	0	254	244	**498**
3. Skin Disease	401	18	17	**436**
4. Dengue	33	36	196	**265**
5. Pneumonia	0	137	116	**253**
6. Hypertension	118	47	58	**223**
7. Cervical	160	0	0	**160**
8. Pulmonary Tuberculosis	0	47	48	**95**
9. Influenza	69	0	18	**87**
10. Asthma	0	31	38	**69**

Table 2-50: Ten Leading Causes of Mortality in Sta. Cruz, 2010-2012

CAUSES	NO. OF DEATHS			
	2010	2011	2012	TOTAL
1. Cardio Respiratory Arrest	114	88	91	**293**
2. Cardiopulmonary	78	60	115	**253**
3. Hypertension	38	42	40	**120**
4. Cancer all forms	15	31	26	**72**

CAUSES	NO. OF DEATHS			
	2010	2011	2012	TOTAL
5. ACC all causes	16	0	20	**36**
6. Pulmonary Tuberculosis	7	14	10	**31**
7. Heart Disease	9	0	18	**27**
8. Kidney Disease	13	0	12	**25**
9. Pneumonia	0	9	14	**23**
10. Diabetes	6	0	15	**21**

Power Supply

321 Davao del Sur Electric Cooperative, Inc. is the main power supply provider in the municipality. It caters to around 13,000 households in the municipality including most of the households in Barangay Darong. Darong is considered as an energized barangay. As presented in **Table 2-51,** in Barangay Darong, majority of the household use electricity or 91.86% of the total households and only 8.13% use kerosene as their means for lighting.

Table 2-51: Barangay Darong Type of Lighting Used, 2010-2014

BARANGAY	NO. OF HH	ELECTRICITY		KEROSENE		SOLAR ENERGY	BATTERY CHARGING
		No	No. of HH	No	No. of HH	HH Served	No. of HH
Darong	885	813	91.86	72	8.13	-	-

Source: BHW Household Survey 2008, Darong Sta. Cruz, Davao del Sur from the Comprehensive Barangay Development Plan 2010-2014

Water Supply

322 The Municipal Waterworks system was rehabilitated/reconstructed by the LGU of Sta. Cruz under a loan with Development Bank of the Philippines thru the Local Urban Water System & Sanitation Project of the DILG & World Bank. It started the construction stage during the early parts of 2006. As of 2012, however, only 7 out of 10 barangays are connected to level III municipal waterworks system. Barangay Darong is not among the barangays served.

323 During the time of the survey for the Barangay Development Plan for 2010-2014, Barangay Darong had a total of 885 households (HH). Water supply are classified into 3 levels and doubtful sources. Based from the data presented in **Table 2-52**, there are 34 water systems (level I) serving 303 households, 14 water systems (level II) serving 532 households and the remaining 50 households obtain water from doubtful sources such as springs, rivers and open wells.

Table 2-52: Barangay Darong Water Source, 2010-2014

BARANGAY	NO. OF HH	LEVEL I (JETMATIC, PITCHER, ELECTRIC PUMPS)		LEVEL II (COMMUNAL FAUCET)		LEVEL III (WATER SYSTEM)	DOUBTFUL SOURCE
		No	HH Served	No	HH Served	HH Served	HH Served
Darong	885	34	303	14	532	0	50

Source: BHW Household Survey 2008, Darong Sta. Cruz, Davao del Sur from the Comprehensive Barangay Development Plan 2010-2014

2.4.1 Displacement of settler/s

324 Displacement of settlers is not expected to result from the project, since the properties where the cement grinding facility is proposed to be constructed and operated is fenced has undergone site development.

2.4.1.1 Displacement/disturbance of properties

325 The project will not displace nor cause disturbance to nearby properties, as the project area will only occupy approx. 11.7 Has. of the total 19.5 Has. of the properties where the project will be situated. The project is also located in an industrial zone.

2.4.1.2 Change/conflict in land ownership

326 **Oro Cemento Industries Corporation** has obtained certification to use and develop the 11.7 Has., from San Miguel Corporation and Paul William Uy. The project will not result to any change or conflict in land ownership.

2.4.1.3 Change/conflict on Right-of-Way

327 A private road will be developed, leading to and from the National Highway, by **Oro Cemento Industries Corporation** and San Miguel Foods, Inc. (SMFI). Hence, the project will not cause any change or conflict on right-of-way (ROW).

2.4.1.4 Impact of Public Access

328 In terms of impact to public access, the project will not utilize the existing barangay road near the project area.

2.4.2 In-migration

329 A total of 200 manpower will be required during the project construction and 50 during operation. **Oro Cemento Industries Corporation** commits to prioritize employment of qualified workers from Brgy. Darong and the Municipality of Sta. Cruz to mitigate the negative effects of in-migration.

330 If migrant workers are hired, **Oro Cemento Industries Corporation** will coordinate with the host LGU for the issuance of certificates containing pertinent information about the new employees. Furthermore, employees who are not from the host barangay or municipality will be housed within the cement grinding facility compound to ensure their safety.

2.4.2.1 Proliferation of informal setters

331 Proliferation of informal settlers is not expected to result from the project as **Oro Cemento Industries Corporation** intends to prioritize employment of qualified workers living within Brgy. Darong and the Municipality of Sta. Cruz.

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

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

333 In terms of lifestyle change, increased local income from the project may introduce and expose workers and the community to vices that tend to undermine the morality of the people. Hostelry areas, such as videoke bars, nightclubs, gambling places, and prostitution, among others may proliferate with demand. If not properly handled, addiction to such vices may contribute in social problems, such as destruction of family and values and increase in crime rate.

334 **Oro Cemento Industries Corporation** commits to work closely with the both the municipal and barangay LGUs and PNP to regulate law to avoid vice-related problems in the community. In addition, **Oro Cemento Industries Corporation**. will strictly implement a drug- and alcohol-free work environment. Commitment to install closed circuit televisions (CCTVs) in strategic places in the plant and the community will be prioritized.

2.4.4 Impacts on Physical Cultural Resources

335 There are no literature or national/international 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.

2.4.5 Threat to Delivery of Basic Services/Resource Competition

336 If skills are not available in the locality, **Oro Cemento Industries Corporation**, or its contractors, may bring in skilled personnel from outside of the host municipality. Although their residency is temporary, transient workers will have needs that are similar to the permanent residents in the area. Hence, competition for food, shelter, power, water, and other local resources may be expected.

2.4.6 Threat to Public Health and Safety

337 Given the nature of the project, dust may cause negative health effects, especially in the respiratory system, to the community members and workers if not properly mitigated. **Oro Cemento Industries Corporation** will conduct medical missions and regular check-ups to its workers and the host barangay. In addition, there will be constant coordination with the Municipal Health Officer (MHO) and barangay health units to address health-related needs of the community.

338 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.

339 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. **Oro Cemento Industries Corporation** will regularly coordinate with the barangay officials to ensure peace and order among the workers and the community members. In addition to this, there will be minimal interaction among the workers and the community members, as most of the times, the workers are in the plant premises.

2.4.7 Generation of Local Benefits from the Project

340 In terms of generation of local benefits, the proposed project will generate positive impacts. The project will not adversely affect the employment, livelihood, and income of the residents; on the contrary, it may even provide income opportunities. The positive impacts of the project are the following: 1) generation of additional source of income and livelihood; 2) additional revenue for the local government; 3) increased basic social services; and 4) addition and improvement of local

residential dwellings. These benefits may be further enhanced through the implementation of social development programs responsive to local needs in the impact area.

2.4.8 Traffic Congestion

341 Public transportation options in the area include jeepneys and tricycles that travel to neighboring barangays. Residents also have private vehicles ranging from cars, tricycles and motorcycles.

342 An estimated 100 trucks per day come in and out of the plant site. The barangay roads from the main highway leading to the plant site cannot accommodate the volume of traffic. To mitigate this concern, **San Miguel Brewery, Inc.** (SMBI) will construct another road from the main highway to the plant site. Furthermore, SMBI will provide additional parking area to complement truck marshalling area within **Oro Cemento Industries Corporation**.

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

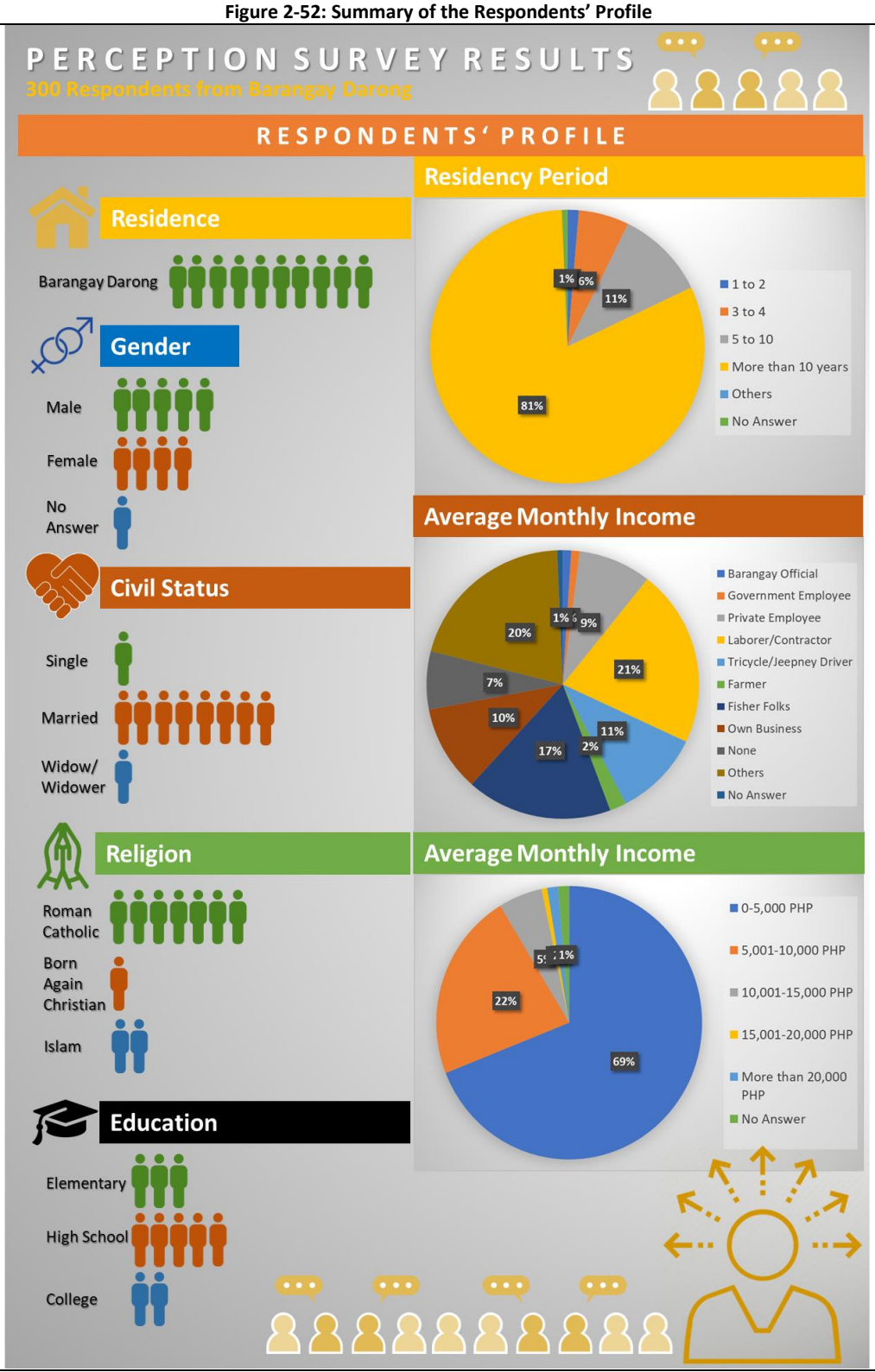
344 To mitigate the said impact, **Oro Cemento Industries Corporation** commits to develop a traffic management plan with the LGU of Sta. Cruz. The following measures shall be included in the plan:

- Coordination with LGU of Sta. Cruz;
- Lane designation and speed limit;
- Regulation of truck deployment;
- Provision of safety barriers, warning signs and lights, traffic marshals within the vicinity of project sites, and adequate parking spaces;
- All deliveries of construction materials and heavy equipment, either inbound or outbound of the facility may be done during off-peak hours and at designated delivery hubs located near the Project area to prevent blockage of traffic flow along public roads; and
- Assistance of security personnel in directing traffic of vehicles coming in and out of the facility.

2.4.9 Social Acceptability and Perception

345 **Figure 2-52 and Figure 2-53** summarize the social acceptability and perception of the 300 respondents from Brgy. Darong regarding the proposed project.

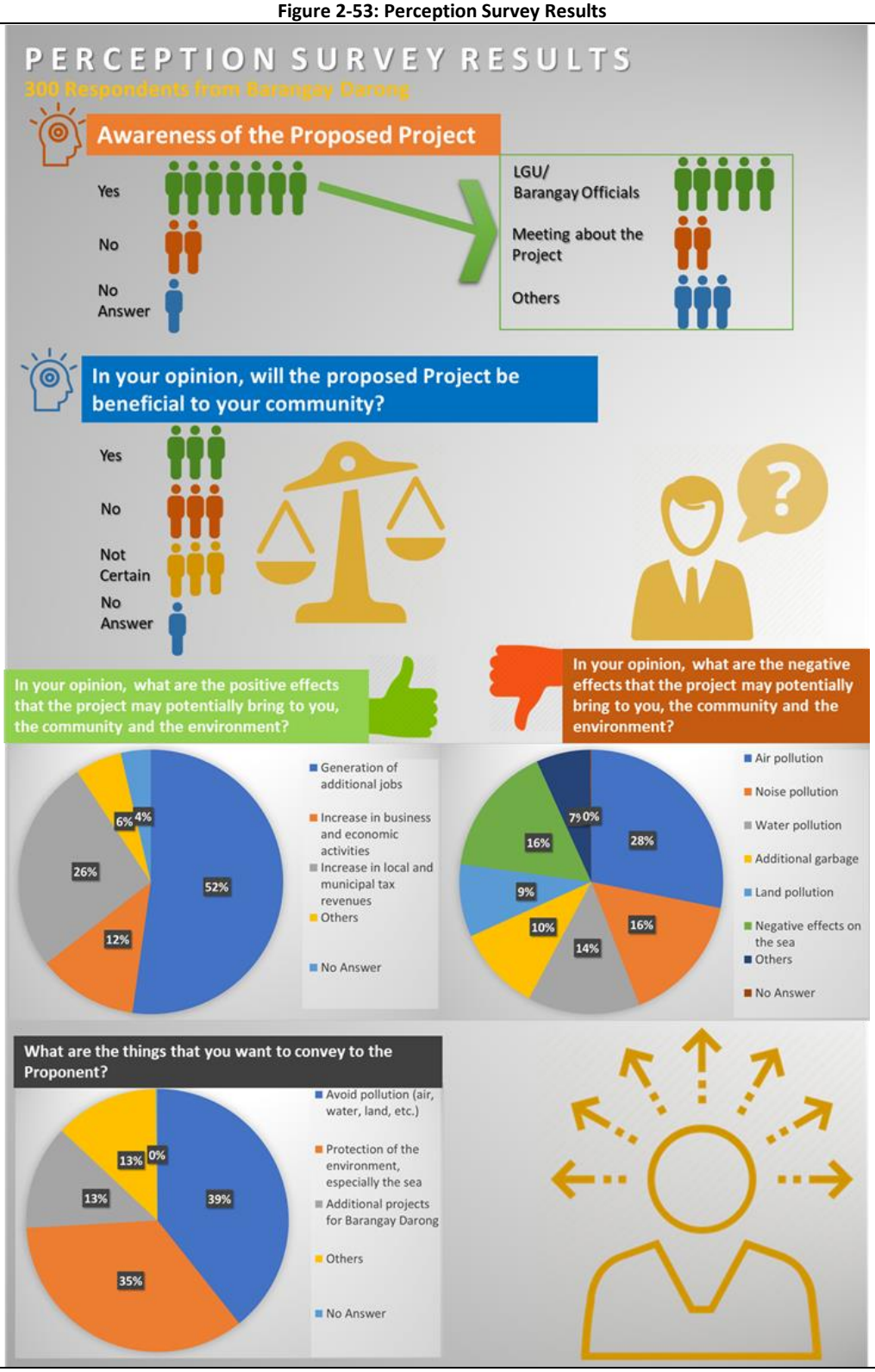
Figure 2-52: Summary of the Respondents' Profile



Source: LCI Envi Corporation Perception Survey for Brgy. Darong regarding the proposed project.

FIGURE NO.	FIGURE TITLE	
2-52	**SUMMARY OF THE RESPONDENTS' PROFILE**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Figure 2-53: Perception Survey Results



Source: LCI Envi Corporation Perception Survey for Brgy. Darong regarding the proposed project.

FIGURE NO.	FIGURE TITLE	
2-53	**PERCEPTION SURVEY RESULTS**	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

2.4.10 Summary of Baseline Findings, Impacts and Mitigation on People

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

Table 2-53 Summary of Significant Baseline Findings and Potential Impacts and Mitigation on People

Summary of Baseline Findings on People:

- Water supply sources in Sta. Cruz include piped connection, deep wells, shallow wells and spring sources. As of 2014, more than 90% of households in Darong have access to electricity through Davao del Sur Electric Cooperative, Inc.
- The consistent leading cause of morbidity in Sta. Cruz from 2010 to 2012 was diarrhea.
- Based on the perception survey, (~70%) of the 300 respondents have prior knowledge about the proposed project. A good portion (33%) of the respondents believed that the proposed project would be beneficial, while (33%) believed otherwise; majority (33%) were undecided. The most cited potential positive impact of the project is employment generation (52%), followed by tax revenues (26%), business opportunities (12%). Conversely, the most cited potential negative impact of the project is air pollution (28%), followed by noise pollution and impacts to the sea (Davao Gulf) (16% respectively), and water pollution (14%).

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURE
In-migration	N/A	The project only requires 200 manpower for construction and 50 manpower in operation	Prioritization of hiring qualified local workers
Cultural/Lifestyle Change	Operation	No known IPs residing near or within the project area, hence no perceived cultural and lifestyle changes (for IPs) expected to result from the project Increase in income can introduce and expose workers and community to vices that tend to undermine morality	Coordination with barangay LGUs and PNP to enforce law to avoid vice-related problems in the community Strict implementation of a drug and alcohol-free work environment Installation of CCTVs in strategic places
Threat to Delivery of Basic Services/ Resource Competition	Construction Operation	The project will have minimal effect in terms of resource competition with nearby households. Project's water requirement is for maintenance and domestic use. There will be a construction of a new deep well for the project. The project will be served by Davao Light and Power Company to power the offices and utilities to be constructed within the project area	N/A
Threat to Public Health and Safety	Construction Operation	Dust may cause negative health effects (i.e., respiratory) to the community and workers if not properly mitigated Crime incidence may also increase in the local community	Conduct of medical missions and regular check-ups to workers and host barangay Coordination with Municipal Health Officer (MHO) and barangay health units to address

POTENTIAL IMPACTS	PROJECT PHASES	DESCRIPTION	MITIGATING MEASURE
			health-related needs of the community Coordination with barangay officials to ensure peace and order among workers and community members
Generation of Local Benefits from the Project	Operation	Generation of additional source of income and livelihood Additional revenue for the local government Increased basic social services Addition and improvement of local residential dwellings	Implementation of social development programs that are responsive to local needs in the impact area
Traffic Congestion	Construction Operation	Increase in traffic generation in the area due to delivery trucks coming in and out of the Plant	Coordination with LGU on scheduling and handling the flow of traffic near the project area

SECTION 3

ENVIRONMENTAL MANAGEMENT PLAN

3.1 Construction Phase

3.1.1 Physical Environment

3.1.1.1 Land

Soil displacement

347 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.

348 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.

349 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

350 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

351 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

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

Dust

353 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.

Gaseous emissions

354 Aside from dust, gaseous emissions from heavy equipment and generators used in the construction site will produce short-term impacts on the ambient air quality. An increased concentration of carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2) may be realized in the ambient air. This impact may not be a primary concern, since the construction phase will only take several months until project completion. Nevertheless, heavy equipment must be kept in prime condition at standard air and fuel ratio in order to limit gaseous emissions, particularly total suspended particulates (TSP). Diesel fuel products emit TSP, SO_2 and nitrogen oxides (NO_x) due to the hydrocarbon and sulfur content. If possible, all heavy equipment shall be fitted with exhaust mufflers.

3.1.1.4 Noise and Vibration

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

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

EQUIPMENT	DISTANCE (M)				
	15	**30**	**60**	**120**	**240**
Front Loader	75	69	63	57	51
Backhoes	85	79	73	67	61
Graders	88	82	76	70	64
Trucks	91	85	79	73	67
Concrete Mixers	82	79	73	67	61
Cranes	83	77	71	65	59
Generators	78	72	66	60	54
Compressors	81	75	69	63	57
Pumps	76	70	64	58	52
Pile Drivers	101	95	89	83	77
Jackhammers	88	82	76	70	64

Source: Larry W. Canter, Environmental Impact Assessment, New York, 1977

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

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

TIME	CATEGORY AREA				
	AA	A	B	C	D
Source: UP NCTS Environmental Text Series					

356 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.

357 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

358 Anthropogenic movements, noise, and vibrations may drive wildlife away from the ecosystem, causing either temporary or permanent migration. However, since the area is already industrialized, the 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

359 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

360 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

361 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 Darong 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

362 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

363 Construction may pose danger to vehicles, equipment, and even people. Accidents can be prevented through the installation of enclosures, early warning devices, and other protective means within and around the working area. The Contractor will be required to submit an Occupational Safety and Health Plan (OSHP), based on the Department of Labor and Employment (DOLE) DO No. 13 Series of 1998, that covers the safety of the workers and the community.

364 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

365 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

Surface and groundwater contamination due to oil spills

366 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

367 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.

3.2.1.2 Air

Dust

368 Utilizing high-efficiency equipment with 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

369 Heavy equipment to be used during construction 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

370 The noise and vibration generated by the machines and equipment can be reduced to tolerable levels through the use of suppressers or mufflers.

3.2.2 Biological Environment

3.2.2.1 Vegetation

371 Areas that have been cleared of its natural vegetation may either regenerate original or similar species from residual plant parts. Access roads leading to grinding facility 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.

372 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

373 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

374 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 cement grinding facility as a source of income. The cement grinding facility 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

375 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

376 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

377 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.

3.3 Summary Matrix of Environmental Impact and level of Significance

378 **Table 3-3** details the matrix summary of the mitigating and enhancement measures with the corresponding environmental aspects and impacts for the different phases of its development. This matrix summary also includes the responsible parties, estimated costs, and guarantees involved.

Table 3-3: Summary Matrix of Environmental Impacts and Mitigating Measures

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
PRE-CONSTRUCTION PHASE							
Acquisition of applicable permits and licenses	The People	Disclosure of project components and activities	• Submission of complete requirements for processing of all permits	Prior to construction	Minimal	Oro Cemento Industries Corporation	Pre-construction expenses
Local sourcing of labor	The People	Employment opportunities	• Priority hiring within Brgy. Darong • Local labor requirement to be announced and posted in barangay hall and public areas.	Prior to construction	Minimal	Oro Cemento Industries Corporation	Pre-construction expenses
CONSTRUCTION PHASE							
Construction and installation, including site facilities and pier	The Land	Accumulation of construction debris and other solid waste	• Implementation of the solid waste management program by the contractor • Regular transport of construction debris and other solid waste in the approved designated area by the DENR.	During construction	Covered by contract amount of Contractor PHP 40,000	Oro Cemento Industries Corporation	Contractor's EMP, Site Inspection Report
	The Water	Possible siltation and surface runoff Increase in turbidity of coastal water due to spillage of building materials for pier facility and debris	• Establishment of sediment traps, erosion barriers, and silt curtains • Regular removal of silt and sediments	During construction	PHP 50,000	Oro Cemento Industries Corporation	Contractor's EMP, Site Inspection Report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
		Possible siltation due to pile driving (pier construction)					
	The Air	Generation of dust	• Regular watering of construction site • Apply canvas cover on construction materials to avoid long exposure to strong winds	During construction	PHP 30,000	Oro Cemento Industries Corporation	Contractor's EMP, Site Inspection Report
Use of heavy equipment, during construction works	The Land	Ground vibration	• Apply non-vibration techniques during construction, if possible • Notify nearby residents about use of heavy equipment • For hauling trucks, comply with road weight limit standards to avoid ground vibration	During construction	Minimal	Oro Cemento Industries Corporation	Contractor's EMP, Site Inspection Report
	The Land/The Water	Coastal and groundwater contamination due to accidental oil spills/leaks	• Use sawdust, rice hulls, or coir dusts to absorb the oil spills • Maintain canal in the maintenance and repair area of vehicles and equipment	During construction	Minimal	Oro Cemento Industries Corporation	Contractor's EMP, Site Inspection Report
	The Air	Generation of Air Emissions and Noise	• Regular maintenance of heavy equipment • Perform noisy activities during daytime • Establish and maintain green zone to serve as natural noise barrier.	During construction	Covered by contract amount of Contractor	Oro Cemento Industries Corporation	Contractor's EMP, Site Inspection Report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
	The People	Traffic congestion	• Provide early warning devices/road signs • Provide parking spaces within project site	During construction	Covered by contract amount of Contractor	Oro Cemento Industries Corporation	Contractor's EMP, Site Inspection Report
Influx of workers	The Land	Generation of solid waste	• Implement solid waste management plan • Hauling of discarded items by accredited haulers	During construction	Minimal	Oro Cemento Industries Corporation	Contractor's EMP, Site Inspection Report
	The Water	Ground and coastal water contamination from improper disposal of wastes, percolated wastewater, sludge and fecal matter.	• Provision of sanitation facilities for workers (e.g. toilets, showers, etc.)	During construction	PHP 30,000	Oro Cemento Industries Corporation	Contractor's EMP, Site Inspection Report
	The People	Occupational Health and Safety	• Proper training on construction safety • Provision of PPE • Proper supervision by trained professionals during construction activities	During construction	PHP 100,000	Oro Cemento Industries Corporation	Contractor's EMP
	The People	Employment opportunities	• Priority in hiring should be given to residents of host communities	Construction stage	-----	Oro Cemento Industries Corporation	SDP
OPERATION PHASE							
Operation of cement grinding mill and pier facility	The Air	Increased levels of TSP Increased noise levels	• Regular ambient air monitoring • Operate and maintain bag filters	Operational stage	Php50,000	Oro Cemento Industries Corporation	Environmental Monitoring Report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
			• Daily road watering to avoid fugitive emissions from area sources • Maintain green zone to serve as natural noise barrier.				
	The Water	Runoff from plant and pier operations Possible spillage of raw materials from pier Accidental oil spill from ship	• Installation and maintenance of drainage system within the plant and the pier • Coastal water monitoring • Oil spill contingency plan	Operational stage	Php100,000	Oro Cemento Industries Corporation	Environmental Monitoring Report
	The Land	Accumulation of hazardous waste	• Develop and implement a hazardous waste management plan that complies with RA 6969.	Operational stage	-----	Oro Cemento Industries Corporation	Environmental Monitoring Report
	The Land	Accidental oil spill from delivery trucks	• Use sawdust, rice hulls, or coir dusts to absorb the oil spills • Maintain canal in the maintenance and repair area of vehicles and equipment	Operational stage	-----	Oro Cemento Industries Corporation	Environmental Monitoring Report
	The Water	Ground and coastal water contamination from improper disposal of wastes, percolated wastewater, sludge and fecal matter.	• Provision of sanitation facilities for workers (e.g. toilets, showers, etc.)	Operational stage	PHP 30,000	Oro Cemento Industries Corporation	Environmental Monitoring Report

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
	The People	Occupational Health and Safety	• Proper training on safety • Provision of PPE	Operational stage	PHP 100,000	Oro Cemento Industries Corporation	Environmental Monitoring Report
Effect of operations on local economy	The People	Increased tax revenue	• Proper registration, tax contribution, land registration and other laws/ordinances shall be followed	Operational stage	------	Oro Cemento Industries Corporation	Tax collection certificate
		Increased employment opportunities	• Priority in hiring of personnel shall be given to residents in the impact areas (host LGUs)	Operational stage	------	Oro Cemento Industries Corporation	Municipal / Brgy. Development Plan / MOA
Influx of delivery trucks in the area	The Air	GHG emissions from delivery trucks	• Implement carbon sink programs such as tree planting to mitigate GHG emissions	Operational stage		Oro Cemento Industries Corporation	Environmental Monitoring Report
	The People	Traffic congestion	• Develop a traffic management plan together with the Municipality of Sta. Cruz • Provide truck marshalling area within plant site • Provide early warning devices/road signs	Operational stage	------	Oro Cemento Industries Corporation	Environmental Monitoring Report
DECOMMISSIONING/ABANDONMENT PHASE							
Pull-out of equipment	The Air	Generation of air emissions and nose	• Regular maintenance of heavy equipment • Perform decommissioning during daytime	Decommissioning/ Abandonment	Covered by contract amount of Contractor	Oro Cemento Industries Corporation	EMP
Abandonment of offices and other facilities	The People	Abandonment of facilities	• Possible donation to LGU	Decommissioning/ Abandonment	Minimal	Oro Cemento Industries Corporation	EMP

ENVT'L ASPECT	ENVT'L COMPONENT LIKELY TO BE AFFECTED	POTENTIAL IMPACT	OPTIONS FOR PREVENTION OR MITIGATION OR ENHANCEMENT	SCHEDULE OF IMPLEMENTATION	ESTIMATED COST	RESPONSIBLE ENTITY	GUARANTEES
Termination of employment	The People	Loss of employment	• Provide 6 months' notice of impending termination of employment • Provide compensation to affected personnel • Provide training of personnel in preparation for other jobs	Prior to decommissioning/ abandonment	To be determined	Oro Cemento Industries Corporation	EMP

3.4 Construction Environmental Program

379 During the construction phase of the Project, the designated contractor for the Project shall implement and be responsible for its environmental program, under the supervision **Oro Cemento Industries Corporation**. The designated contractor will be required to implement the EMP, in accordance to the ECC conditions.

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

- Provision of temporary lodging and sanitation amenities for workers, and liquid and solid waste handling/disposal facilities;
- Avoidance of unnecessary earth-movement;
- Worker and project site safety programs, including emergency response plans;
- Proper storage and disposal of hazardous wastes (i.e., used oils, 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

381 Solid wastes will inevitably be generated during the Construction and Operations phases of the project. To address this concern, **Oro Cemento Industries Corporation** will adopt a solid waste management program (SWMP), which will target to reduce the solid waste generation during the different phases of its development. This program shall aim to decrease the amount of operational costs as a result of handling, storage, and disposal of solid wastes. To realize these targets, the proposed project will incorporate the following details to enhance its SWMP:

- Implementation of waste segregation (biodegradable and non-biodegradable) policy for all construction and operations personnel;
- Provision of solid waste handling and storage facilities, such as dumpsters, trash cans in common areas and strategic locations in the facility;
- The biodegradable wastes, such as discarded kitchen wastes and yard trimmings shall be composted;
- Implement a paper usage reduction program in the administration office by re-using paper for other similar purposes;
- The recyclable wastes, such as paper, plastics, and metals, shall be sorted accordingly and sold to waste service providers; and
- The residual and other general solid wastes shall be disposed in their appropriate bins and in accordance with the local solid waste collection schedule.

3.6 Occupational Health and Safety

382 **Oro Cemento Industries Corporation** shall have an occupational health and safety policy that will be implemented in all the project phases. This policy will undergo continuous improvement to adapt to the existing conditions. Occupational health and safety policy is necessary since it will not just reduce the likelihood of injuries/fatalities that may affect its personnel, but also protect valuable equipment and properties against damages.

383 The following details are basic guidelines that **Oro Cemento Industries Corporation** will be applying for the Project:

- All management, technical, and non-technical personnel shall undergo specialized training courses to familiarize themselves to the operations and maintenance of the Project's various facilities;
- Emergency response plan shall be updated regularly, and emergency drills shall be performed regularly to improve personnel's response technique and time;
- Audits shall be conducted by the management and personnel, with possible assistance from various safety consultants;
- Personnel shall undergo scheduled annual health check-ups;
- Safety signage, adequate illumination, anti-skid steps and guard rails, fire extinguishers, first-aid kits, and other safety features shall be established throughout the Project's facilities; and
- Personal protective equipment (PPE), which includes safety boots, hard hats, gloves, safety goggles (in some instances) shall be mandatory for construction workers (during Constructions phase) and personnel (during Operations phase) working on the Project.

3.7 Air Emissions Management

384 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, **Oro Cemento Industries Corporation** 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.

385 Air emissions are expected during the construction phase as well. **Oro Cemento Industries Corporation** will employ its existing air emissions management program to mitigate concerns on air emissions during construction of the cement grinding facility.

3.8 Vehicular Traffic Management

386 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 **Oro Cemento Industries Corporation** may implement the following measures:

- Coordination with the Santa Cruz LGU;
- Provision of safety barriers, warning signs and lights, traffic marshals within the vicinity of project sites, and adequate parking spaces;
- All deliveries of construction materials and heavy equipment, either inbound or outbound of the facility may be done during off-peak hours and at designated delivery hubs located near the Project area to prevent blockage of traffic flow along public roads; and
- Assistance of security personnel in directing traffic of vehicles coming in and out of the facility.

3.9 Oil Spill Contingency Plan

387 The project includes operation of a pier facility for the delivery of clinker, gypsum, and pozzolan via RORO and Panamax vessel. Accidental oil spill from the Panamax is of primary concern. **Oro Cemento Industries Corporation** shall prepare an oil spill contingency plan that shall consider the following:

1) **Risk Area:** the risk area is limited to the docking station of the barge. This is an off-shore area.
2) **Activities and Risks:** oil spill risk may occur if an accident causes hull breach during docking. The priority area for protection is coastal area in the vicinity of the pier.
3) **Off-shore spill response strategy:**

Limiting and Adverse Conditions:

- Visibility during night time
- Turbulent waters
- Continuous rainfall
- Shipping traffic
- Availability of manpower and equipment

Containment and Recovery of Spilled Oil:

- Control sea traffic at waterfront
- Secure the area
- Deploy spill booms to contain oil
- Use skimmers to recover contained oil
- Apply dispersant with the permission of PCG
- Shore clean-up
- Disposal of recovered oil into tanks

SECTION 4

ENVIRONMENTAL RISK ASSESSMENT & EMERGENCY RESPONSE POLICY AND GUIDELINES

4.1 Methodology

388 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

389 A risk screening level exercise refers to specific facilities or the use of certain processes that has the potential to pose significant risks to people and its surrounding environment. The Plant is covered by the risk screening level exercise, as indicated in **Table 4-1**.

Table 4-1: Risk Screening Matrix

ACTIVITIES REQUIRING RISK SCREENING EXERCISE*	ERA APPLICABILITY TO THE PROJECT
1) Facilities for the production or processing of organic/inorganic chemicals using: Alkylation, Amination, Carbonylation, Condenstation, Dehydrogenation, Esterification, Halogenation, Hydrogenation, Hydrolysis, Oxidation, Polymerization, Sulphonation, Desulphurization, Nitration, Phosphorus prod., Distillation, Extraction, Solvation, Pesticides & pharmaceutical prod.	Not Applicable
2) Installations for distillation, refining, and other processing of petroleum products	Not Applicable
3) Installations for total or partial disposal of solid or liquid substances by incineration or chemical decomposition	Not Applicable
4) Installations for the production or processing of energy gases (e.g., LPG, LNG, SNG.)	Not Applicable
5) Installations for the dry distillation of coal or lignite	Not Applicable
6) Installations for the production of metals and non-metals by wet process or electrical energy	Not Applicable
7) Installations for the loading and unloading of hazardous materials as defined by RA 6969 (or DAO 1992-29)	Applicable
CONCLUSION	**Risk screening level exercise is applicable.**
Note: *- Based on Annex 2-7e of DAO 2003-30 Revised Procedural Manual	

4.3 Risk Identification and Analysis

390 The proposed Project entails risks that are natural, man-made, or a combination of both. Natural risks are hazards caused by phenomena such as earthquakes, geological instability (e.g., sink holes, landslides), and typhoons. Meanwhile, man-made risks are caused by accidents such as fires, structural/equipment failure, spillages, and human error. Man-made risks could also be aggravated as a direct consequence of natural risks.

4.3.1 Natural Hazards

4.3.1.1 Seismicity

391 Intense or strong seismic activities may cause damage to the cement grinding facility infrastructures. The construction and operational phase of the proposed project should then factor the potential for earthquake induced risks.

4.3.1.2 Typhoons

392 The mean annual number of typhoons that pass through the Philippine Area of Responsibility (PAR) is about 20, of which around 9.2 cross the country. If a typhoon directly hits the plant facilities, it could possibly bring extensive wind and rain hazards (i.e. strong wave currents and flooding). Regular weather monitoring should be done so that cement grinding facility safety protocols can be done.

4.3.1.3 Flooding

393 The proposed project area is not prone to flooding. However, heavy rains may occur in times of extreme precipitation volume and intensity. During heavy rains, flooding may occur which may affect the cement grinding facility operations. Emergency responses must be considered for possible occurrences.

4.3.2 Man-Made Hazards

4.3.2.1 Occupational Accidents

394 The project involves a variety of equipment and facilities which may possibly injure personnel and/or damage property if handled/operated improperly. These risks can be greatly reduced with scheduled maintenance checks. Also, personnel handling such equipment and operating the facilities will be properly trained and supervised and re-trained periodically.

4.3.2.2 Accidental Spills (e.g. fuel, engine lubrication oil, coolant)

395 Oil spillage that may come from engine maintenance or storage failure may be caused by several reasons such as faulty operational procedures, pipe deterioration, sabotage, and force majeure. It may result to anaerobic conditions since large spills may form a film on water surfaces impairing oxygen transfer. This scenario may be harmful to aquatic organisms. The fuel may be decomposed by micro-organisms, but degradation is selective and can result in sediment becoming enriched with aromatic hydrocarbons. Proper oil spill protocols should then be observed should this happen.

4.3.3 Air Pollutants Hazards

396 Considering the nature of the project, exposure to pollutants associated with cement grinding facility may lead to potential health effects and other hazards. Regular maintenance of equipment and other air mitigating measures should be strictly done to avoid these risks. Potential air pollutants associated with cement grinding facilities TSP and PM_{10}.

4.3.3.1 Particulate Matter

397 Particle matter (PM) is the term for a mixture of solid particles and liquid droplets found in the air. Airborne particulate matter varies in size and may be in different chemical constituents. Airborne particles can range in size from a few nanometers (nm) to around 100 micrometers (µm) in diameter. PM_{10} is the concentration of particles that are less than or equal to 10 µm in diameter; similarly, $PM_{2.5}$ describes the concentration of particles that are less than or equal to 2.5 µm in diameter.

398 Particulate matter comes from a variety of sources and contains primary components, which are emitted directly into the atmosphere, and secondary components, which are formed within the atmosphere because of chemical reactions. Primary sources include combustion sources (road vehicles and power stations), mechanical processes (e.g. quarrying and agricultural harvesting), and natural processes (e.g. entrainment of soil by the wind and generation of marine aerosol particles). Secondary particles form in the atmosphere because of chemical reactions that lead to the formation of substances of low volatility, which consequently condense into the solid or liquid phase, thereby becoming particles. The formation of secondary particulate matter takes hours or days and the air containing the pollution can travel long distances.

399 The “coarse particles” (such as those found near roadways and dusty industries) with diameters between 2.5 and 10 micrometers and “fine particles” (such as those found in smoke and haze) that are 2.5 micrometers in diameter or less are of concern due to their effect on human health. Both short and long-term exposure to these can cause increased respiratory symptoms (e.g., irritation of the airways, coughing, or difficulty breathing); decreased lung function; aggravated asthma; development of chronic bronchitis; irregular heartbeat; nonfatal heart attacks; and premature death in people with heart or lung disease.

400 The most serious health problems occur among susceptible groups with pre-existing lung or heart disease and the elderly and children. However, even healthy individuals may experience temporary symptoms from exposure to elevated levels of particle pollution.

4.4 Identification of Potential Emergencies

401 Emergencies are unforeseen events or episodes that are caused by natural forces and circumstances that may result to negative effects to people, property, and the surrounding environment. As a preliminary step in developing an effective emergency response policy, it is important to identify the potential emergency scenarios that would most likely occur. **Table 4-4** lists the most probable emergencies that could happen in future operation of the Project.

402 Emergency situations may also require different levels of classification and response procedures, depending on the degree of situations. These levels will be referred to as: 1) Incident; 2) Emergency; and 3) Crisis.

403 Incident situations present minor events that may require partial or total mobilization of the proposed Project's resources to effectively deal with an accident. An episode may present very minimal injuries and/or partial damages to property.

404 Emergency situations require the utilization of all resources, with the assistance of local emergency responders, and additional resources from **Oro Cemento Industries Corporation's** main office. This episode may present serious injuries and some fatalities and could result to severe or total damage to the property.

405 Crisis situations are the worst conditions, which require the utilization of full resources, and possibly, assistance from the national government to address the event. An episode may present multiple fatalities, destruction of facilities, and severe/total damage to the surrounding community.

Table 4-2: Emergency Scenarios for the Project

TYPE OF EMERGENCY SITUATION	POSSIBLE CAUSES	POTENTIAL EFFECTS
Fire	• Electrical short-circuits, overloading of equipment • Accidental ignition of combustible materials	• Partial or total loss of equipment and property • Injuries and fatalities to personnel
Earthquakes	• Movement/rupture of nearby fault lines • Volcanic eruption	• Failure of concrete structures (i.e. collapse, dam breach, etc.) • Injuries and fatalities to personnel and downstream communities
Release of toxic substances	• Equipment malfunction • Accidental spillage • Man-made errors	• Health hazards to the employees, workers and nearby communities • Degradation of affected parameter (i.e. contamination of soil and water)
Occupational safety accidents	• Improper training and supervision of personnel • Equipment and facility failure • Lack of full understanding regarding the surrounding environment	• Injuries and fatalities to personnel • Partial and total loss of equipment

4.5 Emergency Plan

406 The Emergency Plan is a management structure that is intended as a guide for the personnel during emergency situations. This structure may or may not be similar to the existing organizational/management hierarchy of the Project, although comparison on roles and responsibilities can be used as reference.

407 The implementation of the Emergency Plan is a standard practice that is currently being integrated as part of company policies. Its objective is to establish an orderly and systematic approach in addressing an emergency, and in turn, decrease further injuries/fatalities and loss of property.

408 Forming the Emergency Plan requires the Proponent to select among the different skills and knowledge of its personnel at the Project. The selection process will involve background checks, training and skills learning, and voluntary application of selected personnel. The proposed project will follow the schematic diagram and procedures presented in **Figure 4-1** and **Table 4-5**. The roles and responsibilities of each personnel involved in the Emergency Plan are listed in **Table 4-6**.

409 The designation of the personnel and their corresponding responsibilities may be changed during different types of emergency scenarios that were previously identified in this section. Therefore, if such case will exist, **Oro Cemento Industries Corporation** will train and designate personnel appropriately to deal with each type of emergency.

Figure 4-1: Emergency Response Plan

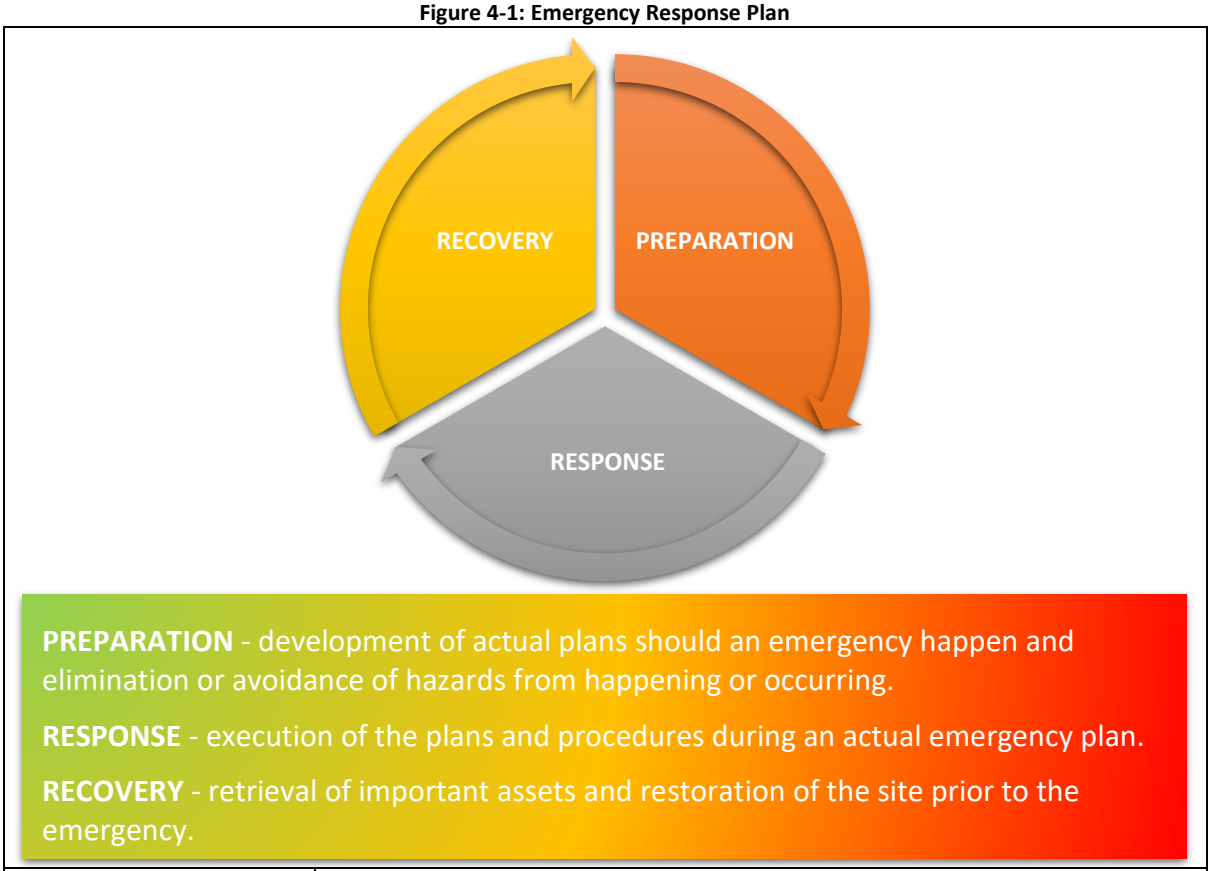


FIGURE NO.:	FIGURE TITLE:	
4-1	**EMERGENCY RESPONSE PLAN**	
PROJECT PROPONENT: **ORO CEMENTO INDUSTRIES CORPORATION**	PROJECT TITLE & LOCATION: **SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	REPORT PREPARER: **LCI ENVI CORPORATION**

Table 4-3: Emergency Response Procedures for Different Scenarios

PREPARATION	RESPONSE	RECOVERY
A. Fire		
• Orientation and training of personnel on fire safety	• Notice for personnel to keep calm and alert to prevent	• Prohibition of returning to the fire scene, as long as

PREPARATION	RESPONSE	RECOVERY
• Conduct of regular fire drills • Installation and regular testing of firefighting devices (i.e. fire hoses, fire extinguishers, smoke detectors, sprinkler system) • Regular inspection of electrical equipment and lines for any defect or malfunction, and replacement, as necessary • Securing of all flammable items in proper containers and storage facilities • Strict implementation of "No Smoking" policy in plant facilities • Placement of emergency numbers and communication equipment in conspicuous areas for easier notification • Designation of emergency exits (free from obstruction) and evacuation procedures • Regular maintenance of plant equipment	further injuries; to follow emergency evacuation procedures; and to report immediately any presence of smoke, spark, or open flame to authorized personnel • Immediate use of fire extinguishers, only if the fire can still be contained • Disconnection of electrical or fuel connections and shutdown of all affected equipment • Removal of all flammable materials from the fire scene to avoid further contact, if possible • Wearing of proper fire protection attire (i.e. fire suit, boots, breathing apparatus) by responders • Prohibition of using or pouring of water over fuel or alcohol fires, and electrical fires	necessary, unless declared for safe entry • Checking for personnel that may be trapped, injured, or needs further assistance • Reporting of any important incident that require immediate attention • Securing of important items and equipment from unauthorized access from outsiders, after the building is declared safe for re-entry • If fire damage is minimal, or if facility is recoverable, implementation of necessary corrective measures to prevent the accident from re-occurring
B. Earthquakes		
• Conduct of necessary preparations, including equipment and facility checks, to prevent injuries in an event of an earthquake • Securing of all loose items to prevent falling • Placement of heavy materials near the ground • Storage of flammable items in designated safe areas • Orientation of personnel on safe locations, emergency response equipment, and evacuation routes	• Notice for personnel to keep calm and alert to prevent further injuries; to protect themselves by getting under sturdy structures and stay away from sharp, flammable, or heavy items; and to prepare for immediate evacuation of the facility, if necessary • Shutdown of all gas and electric equipment	• If there are no threats of aftershocks, checking for personnel that may be trapped, injured, or needs further assistance • Prohibition of returning to the facility if it is deemed structurally unstable, or declared unsafe • Thorough inspection of the facility premises for any unusual crack/gap in the ground or walls • Checking for possible fires and advise authorities for appropriate response • Securing of important items and equipment from unauthorized access from outsiders, after the building is declared safe for re-entry • Inspection of the facility for any major structural defect, crack, unstable item, and other potential hazards

PREPARATION	RESPONSE	RECOVERY
		• If earthquake damage is minimal or facility is recoverable, implementation of corrective measures to prevent the further hazards from affecting personnel and property
C. Release of Toxic Substances (e.g. fuel)		
• Regular visual inspection for potential leaks and corrosion • Inspection of facilities, containers, and equipment for any sign of leaks or spills	• Notice for personnel to report the occurrence immediately to supervisor; to follow strictly instructions of supervisor in charge of cleaning operations • Ceasing of operations in the area affected by spillage and stop appropriate source • Stop vehicles' engines in the affected area • Ceasing of operations or any movement until clearance is given	• Immediate clean-up of all spills using proper conditions, including stoppage and containment of spill or leak • Implementation of measures to prevent re-occurrence of the incident
D. Occupational Hazards		
• Provision of basic PPEs. • Formation of an emergency response team for each department • Provision of first-aid kits and emergency equipment on critical workstations • Training of personnel on proper equipment handling and other safety practices • Posting of safety reminders on workstations • Provision of safety features, such as adequate lighting, guide rails, and safety signage	• Immediate reporting of any accident, especially those considered life-threatening • Immediate application of first-aid • Removal of affected personnel from the accident site • Bringing of affected personnel to the nearest first aid station or hospital if necessary	• Performing of corrective measures on equipment and procedures • Provision of additional safety procedures, equipment, and training
E. Flooding		
• Securing of all loose items (i.e. lamp post, roofs, loose planks, and other light materials) by adding extra guy wires or reinforcing materials • Removal of obstructions to the drainage system • In case of storm warning from PAGASA, monitoring of important weather forecast/ parameters, such as path and intensity of the storm	• Notice for personnel to avoid staying outdoors; to stay away from items that may be blown away by strong winds and from electrical mains • Continuous monitoring of the weather conditions • Shutdown of all gas and electric equipment	• Inspection of facility for any major structural defect, crack, unstable item, and other potential hazards • Repair of broken power lines, fuel lines, and other utilities, if necessary • Securing of important items and equipment from unauthorized access from outsiders, after the building is declared safe for re-entry

Table 4-4: Roles and Responsibilities in the Emergency Plan

EMERGENCY RESPONSE PERSONNEL	ROLES AND RESPONSIBILITIES
Incident Commander	• Overall in-charge of operations during an event of an emergency • Gives direction and orders to the response teams in managing the emergency
Safety Officer	• Supervises the daily safety performance of operations and maintenance procedures, including emergency response procedures
Liaison Officer	• Secures the necessary permits and training certification for the personnel
Public Information Officer	• Performs communication duties in behalf of **Oro Cemento Industries Corporation** to the media, government officials, and the local population • Issues relevant warnings and advisories to concerned authorities
Operations Team	• Performs the actual response, rescue, and retrieval of personnel and equipment during an event of an emergency
Planning/Intelligence Team	• Devices programs and policies for proper response procedures • Informs the operations team regarding the nature and type of response procedure for the Operations Team • Identifies potential hazards and performs recommendations to authorities
Logistics Team	• Provides the necessary supplies and equipment for the Operations Team • Provides additional support/assistance to the Operations Team
Finance and Administration Team	• Provides the assessment of expenses and allocates the necessary financial resources for the other Teams • Performs the disbursement of claims and compensation for affected personnel, property and the community

4.6 Safety and Health Program

410 **Oro Cemento Industries Corporation** gives priority on the safety of its employees and their working environment. It developed this program for accident and injury prevention through the implementation of plant rules and guidelines that shall involve management, supervisors, and employees in identifying and eliminating hazards that may develop during work process.

4.6.1 Leadership and Administration

411 The management will spearhead in the formation of a safety committee, develop a system for identifying/correcting hazards, prepare for foreseeable emergencies, provide appropriate trainings, and establish a disciplinary policy to ensure strict compliance.

4.6.1.1 Company Safety Policy

412 It is basic policy that no task is so important that an employee must take a risk of injury/illness or violate a safety rule. Active involvement in safety practices is then encouraged to make the area a safe place to work.

413 It is the daily duty of every employee to be cautious of unsafe conditions. In addition to this, supervisors or accountable managers are responsible in overseeing the actions of employees and to take prompt action in eliminating unsafe practices and hazards in the workplace.

4.6.2 Accident/Incident Investigation Reporting

414 It is very advantageous for every employee to be prepared for any emergency to prevent further injury, property damage, and loss of limb or even life. An emergency preparedness plan must then be prepared and strictly implemented.

4.6.2.1 Accident/Incident Investigation Reporting

415 Prevention of accidents by eliminating potential threats/hazards and anticipating other probable causes is an effective way of creating a safe and healthy environment.

Emergency Response Program

416 The emergency response program shall be implemented by an emergency response team composed of equipped and trained personnel who will be tasked to handle and manage the program, assist other employees to safety, and to prevent any damage or injury. Proper training and orientation of concerned team members will be accorded to prepare them in responding appropriately in any emergency they may encounter.

Personal Protective Equipment

417 The personal protective equipment (PPE) is a set of safety gear worn by personnel that is designed to provide sufficient safeguard against occupational-related illnesses and to prevent life-threatening injuries.

418 PPE, such as safety hats, safety shoes, gloves, dust mask, and ear plugs, will be provided as necessary. This is to ensure safe and protected personnel working in safe working environment. **Oro Cemento Industries Corporation** will make the usage of PPE a mandatory policy for personnel working inside the Project premises. Guests and visitors will also be required to wear PPE as necessary.

4.6.2.2 Incident Response Procedure

419 Any accident, injury, or work-related illness should be reported and investigated on immediately so as to determine the appropriate action to be conducted.

Recording and Review

420 It is mandatory that employees are to report any injury or work-related illness to their immediate supervisor regardless of how serious. Minor injuries, such as cuts and scrapes, can be entered on the first-aid only log. More serious injuries are to be reported and recorded properly for future review.

Incident Investigation

421 It is imperative that an incident scene should not be disturbed except to aid in rescue or make the scene from further incidence. In case of an incident resulting in death or serious injuries, a preliminary investigation will be conducted by the immediate supervisor of the injured person(s), a person designated by management, an employee representative of the safety committee, and any other person whose expertise would help the investigation.

422 The investigating team will obtain written statements from witness, photograph the incident scene and machines/equipment involved. The said team will also document, as soon as possible after the incident, the condition of equipment and anything that may be relevant in the work area. A written "Incident Investigation Report" is necessary. The report should include a sequence of events leading up to the incident, conclusions derived from the incident and any recommendation to prevent a similar incident in the future.

Damage Control

423 Damage cost because of accident, in reality, is unquantifiable, especially when damage to life and limb is involved. Cost of properties, structure, and equipment including its effect on existing productivity is quantifiable.

424 Any employee may be subject to on-the-spot termination when a safety violation places the employee or co-workers at risk of permanent disability or death.

SECTION 5

SOCIAL DEVELOPMENT PLAN/FRAMEWORK AND IEC FRAMEWORK

425 The following project stakeholders have been identified based on the stakeholder groups indicated in Section 5 of DENR Administrative Order No. 2017-15:

- **LGUs in areas where all project facilities are proposed to be constructed/situated and where all operations are proposed to be undertaken (a)**
  - Municipal LGU of Sta. Cruz, Davao del Sur (host municipality)
  - Brgy. Darong, Sta. Cruz (host barangay)

- **Government agencies with related mandate on the type of project and its impacts (b)**
  - DENR Region XI (Davao Region)
  - DENR EMB Region XI (Davao Region)
  - Provincial Environment and Natural Resources Office (PENRO Davao del Sur)
  - Community Environment and Natural Resources Office (CENRO Digos City)
  - Bureau of Fisheries and Aquatic Resources (BFAR)
  - Philippine Coast Guard (PCG)

- **Interest groups, preferably those with mission/s specifically related to the type and impacts of the proposed undertaking (c)**
  - IPMR Darong
  - BFARMC Darong
  - Darong Senior Citizens Association
  - KABABAIHAN

- **Local institutions (f)**
  - Darong High School

426 No "households, business activities, industries that will be displaced" (d) and "people whose socio-economic welfare and cultural heritage are projected to be affected by the project especially vulnerable sectors and indigenous populations" (e) have been identified for the project.

427 Other stakeholders for the proposed project include the local peace-and-order groups (i.e., PNP, Brgy. Police) and concerned non-government organizations (NGOs).

5.1 Social Development Program (SDP)

428 An indicative community-based Social Development Plan (SDP), as presented in **Table 5-1**, will be developed by **Oro Cemento Industries Corporation** through a series of consultation with various stakeholder representatives in the project impact area.

429 The objectives of the SDP include the following:

- Identify the basic needs and welfare of the host community as basis for the framework of social development program of the Project;

- Prepare an indicative sustainable plan based on the Barangay Development Plans and the mandated support of **Oro Cemento Industries Corporation**; and
- Establish a working relation with **Oro Cemento Industries Corporation** and the various community stakeholders with the goal of improving the quality of life of the project-affected communities by instilling self-reliance.

430 The community-based consultation and survey during the development of the SDP also provides an opportunity for identifying the following:

- Addressing key issues and concerns by the various stakeholders;
- Identifying and designing the recommend measures in response to the issues and concerns that were raised;
- Identifying the lead agency or organization responsible in implementing the measures; and
- Setting of timelines in implementing these measures consistent with the plans and programs of the lead agencies.

Table 5-1: Matrix of Social Development Plan

CONCERN	PROGRAM/PROJECT/ACTIVITY	RESPONSIBLE COMMUNITY MEMBER/ BENEFICIARY	GOVERNMENT AGENCY/NON-GOVERNMENT AGENCY AND SERVICES	PROPONENT	INDICATIVE TIMELINE	SOURCE OF FUND
Livelihood and Employment	On-the-Job Training (OJT) Program	Brgy. Kagawad for Education Bonafide students of academic institutions in Darong and nearby barangays	CHEd Region XI Sta. Cruz LGU Brgy. Darong LGU Nearby barangay LGUs	Oro Cemento Industries Corporation	Oro Cemento Industries Corporation	Oro Cemento Industries Corporation
	Handicraft skills training (cross-stitch, rug making, beauty care and hair dressing, cooking, etc.) Food processing training Skills training (welding, machinery and auto-mechanics, etc.) Provision of relevant tools and trainings for fisherfolks	Brgy. Kagawad for Education Unemployed members of the host community Women Fisherfolks organization/cooperative Out-of-school youth	TESDA Region XI Sta. Cruz LGU Brgy. Darong LGU Nearby barangay LGUs MAO	Oro Cemento Industries Corporation	Operation	Oro Cemento Industries Corporation
Infrastructure	Support in the development of water supply system for Brgy. Darong	Brgy. Kagawad for Infrastructure Host community	Sta. Cruz LGU Brgy. Darong LGU	Oro Cemento Industries Corporation	Operation	Oro Cemento Industries Corporation
Health and Nutrition	Provision of various medicines/medical and dental services	Brgy. Kagawad for Health and Education Host community	DOH Region XI MHO Sta. Cruz LGU Brgy. Darong LGU	Oro Cemento Industries Corporation	Construction Operation	Oro Cemento Industries Corporation
Education	Provision of scholarships and financial assistance to students (both formal and informal education)	Qualified students of the host barangay	CHEd Region XI DepEd Region XI TESDA Region XI Brgy. Darong LGU	Oro Cemento Industries Corporation	Construction Operation	Oro Cemento Industries Corporation

CONCERN	PROGRAM/PROJECT/ACTIVITY	RESPONSIBLE COMMUNITY MEMBER/ BENEFICIARY	GOVERNMENT AGENCY/NON-GOVERNMENT AGENCY AND SERVICES	PROPONENT	INDICATIVE TIMELINE	SOURCE OF FUND
	Provision of Darong High School site	Host community	DepEd Region XI Sta. Cruz LGU Brgy. Darong LGU	Oro Cemento Industries Corporation	Construction	Oro Cemento Industries Corporation
Peace and Order	Financial support on closed circuit television (CCTV) installation in strategic areas in Brgy. Darong	Brgy. Kagawad for Peace and Order Host community	Brgy. Darong LGU	Oro Cemento Industries Corporation	Operation	Oro Cemento Industries Corporation
Environment	Climate Change Adaptation and Disaster Risk Reduction Management training	Host community and nearby barangays	MDRRC Sta. Cruz LGU Brgy. Darong LGU Nearby barangay LGUs	Oro Cemento Industries Corporation	Operation	Oro Cemento Industries Corporation
	Coastal Resource Management Plan training/workshop	Fisherfolks organization/cooperative	Sta. Cruz LGU Brgy. Darong LGU	Oro Cemento Industries Corporation	Operation	Oro Cemento Industries Corporation
Safety	Provision of traffic signage and early warning device in strategic areas in Brgy. Darong	Host community and nearby barangays	Brgy. Darong LGU	Oro Cemento Industries Corporation	Construction Operation	Oro Cemento Industries Corporation
Cultural Heritage	Financial support to sports, recreation, town fiesta, and cultural activities	Residents of Sta. Cruz Host community and nearby barangays	Sta. Cruz LGU Brgy. Darong LGU Nearby barangay LGUs	Oro Cemento Industries Corporation	Operation	Oro Cemento Industries Corporation
Spiritual	Financial support to religious institutions maintenance and construction works	Religious sector Ecumenical (pastors, priests, ministers, etc.)	Brgy. Darong LGU Nearby barangay LGUs	Oro Cemento Industries Corporation	Operation	Oro Cemento Industries Corporation
Note: Based on the Revised Procedural Manual for DAO 2003-30						

5.2 Information and Education Campaign (IEC)

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

432 A feedback/grievance mechanism is a very important tool to educate people regarding the project's development and to check whether the project has negative or positive effects or perception. It will strengthen the knowledge of the people with regards to the positive impacts of the project, as well as the effort of the monitoring team together with the Proponent in resolving unfavorable events, if any.

433 Integral to the IEC is the regular reporting of **Oro Cemento Industries Corporation** on the progress of the proposed Project's operations. In general, the Proponent shall update the host LGUs if the agreements are followed or if there are minor or major changes to be made, and if there are problems that might occur and advice the LGU on appropriate preparations that are necessary to avoid or mitigate negative results. The Proponent will conduct IEC activities to establish transparency and to develop a partnership with the host communities.

434 IEC activities envisioned for the Project are numerous interactions between the Proponent, the host communities, and the local government officials. **Table 5-2** presents the indicative IEC plan, which can be further improved after the series of consultations and future developments of the Project. Throughout the different phases of the proposed project, the Proponent will continue to inform the stakeholders about the status of the social development plan (SDP) to prevent any speculations, anxiety, and miscommunication.

Table 5-2: Matrix of the Project's IEC Plan

TARGET SECTOR IDENTIFIED AS NEEDING PROJECT IEC	MAJOR TOPIC/S OF CONCERN IN RELATION TO PROJECT	IEC SCHEME / STRATEGY / METHODS	INFORMATION MEDIUM	INDICATIVE TIMELINES AND FREQUENCY	INDICATIVE COST (PHP)
Residents of Darong, Sta. Cruz	▪ Personnel requirements and announcement of job opening for potential workers/employees/contractors	▪ Group Consultation ▪ Multi-media	▪ Invitation letter ▪ Multi-sectoral cluster meetings ▪ Newspaper publication ▪ Radio broadcast ▪ Posters	At least, two months prior to start of construction	PHP 50,000.00
Municipality of Sta. Cruz Residents of Brgy. Darong, Fisherfolks, NGOs	▪ Presentation of construction works/activities ▪ Potential impacts and proposed mitigation measures during construction works	▪ Group Consultation ▪ Multi-media	▪ Invitation letters ▪ Focus Group Discussion ▪ Multi-sectoral cluster meetings ▪ Handouts ▪ Audio-visual presentations on EIA ▪ Posters and flyers	At least 1 month prior to start of construction and quarterly during the entire construction phase	PHP 50,000.00
Municipality of Sta. Cruz Brgy. Darong NGOs	▪ Report on project's compliance to ECC and EMP during construction period	▪ Group Consultation ▪ Grievance mechanism	▪ Invitation Letters ▪ Handouts ▪ Multi-sector cluster meeting ▪ Grievance box (comments, suggestions) at the municipal and barangay halls	1 month prior to completion of construction works	PHP 25,000.00
Municipality of Sta. Cruz Brgy. Darong	▪ Presentation of completion of construction works and preparation for operation	▪ Group Consultation	▪ Invitation Letters ▪ Multi-sectoral meeting	1 month prior to completion of construction phase	PHP 25,000.00
Municipality of Sta. Cruz Brgy. Darong NGOs	▪ Project operation phase ▪ Highlight of the project's environmental control measures ▪ Compliance to ECC conditionality's and the EMP ▪ Actual impacts during construction and control measures implemented	▪ Group Consultation ▪ Grievance mechanism	▪ Invitation letter ▪ Handouts ▪ Posters ▪ Grievance box (comments, suggestions) at the municipal and barangay halls	Priority to operation phase and yearly thereafter	PHP 40,000.00

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 **NGOs** **LGUs**	▪ Plant tour and highlight of project's environmental control measures, SDP, and environmental projects	▪ Group Consultation	▪ Educational tour to project site	Throughout the operation phase	PHP 50,000.00
Oro Cemento Industries Corporation employees	▪ Awareness and Safety ▪ Disaster Risk Reduction and Management ▪ Climate Change awareness and adaptation	▪ Group Consultation ▪ Multi-media	▪ Climate change adaptation and disaster risk reduction and management seminar ▪ Hazard identification and risk assessment training ▪ First aid training	Once a year	PHP 50,000.00
Brgy. Darong Schools	▪ Climate Change awareness and adaptation ▪ Disaster Risk Reduction and Management	▪ Group Consultation ▪ Multi-media	▪ Climate change adaptation and disaster risk reduction and management seminar	Once a year	PHP 50,000.00

SECTION 6

ENVIRONMENTAL COMPLIANCE MONITORING

6.1 Self-Monitoring Plan

435 The Environmental Monitoring Plan (EMoP) presents a set of critical environmental parameters that will allow **Oro Cemento Industries Corporation** to ensure environmental compliance and sustainability of the cement grinding facility operations. The EMoP allows monitoring, verification, and performance of the necessary corrective measures towards the mitigation of the identified environmental impacts. Information obtained during the EMoP implementation can be used in examining the short and long-term effects of the proposed Project's various environmental aspects, from which future strategies on environmental enhancement measures can be formulated.

436 **Table 6-1** presents the proposed EMoP that will be implemented by the Proponent during the different phases of the proposed Project's development. Shown in the matrix are the concerns, parameters to be monitored, as well as the corresponding sampling and measurement plan (method, frequency, location), lead person, annual estimated cost, and environmental quality performance level (EQPL) range (i.e., Alert, Action, Limit).

437 Air and water quality will be monitored as part of the EMoP. Proper methods for sampling and analysis of each media must be employed.

438 For sampling and analysis of air quality, the proponent must refer to DAO 2000-81: "Implementing Rules and Regulations of the Philippine Clean Air Act". Results of the ambient air quality sampling must be compared with the National Ambient Air Quality Guideline Values (NAAQGV) and National Emission Standards for Source Specific Air Pollutants (NESSAP), respectively. NAAQGV and NESSAP standards are disclosed in DAO 2000-81.

439 There are two references that must be followed regarding the sampling and analysis methods and water quality standards. Proper methods for water sampling and analysis are in EMB MC 2016-012 "EMB Approved Methods of Analysis for Water and Wastewater". Results of the water sampling and analysis must be compared with the standards stated in DAO 2016-08: "Water Quality Guidelines and General Effluent Standards of 2016."

440 The prescribed air and water monitoring stations are on **Figure 6-1**.

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

Table 6-1: Environmental Monitoring Plan (EMoP)

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
			Method	*Frequency*	*Location*			*EQPL Range*			*Management Measures*		
								Alert	*Action*	*Limit*	*Alert*	*Action*	*Limit*
PRE-CONSTRUCTION/CONTRUCTION PHASES													
Local Sourcing of Labor	People: Employment Opportunities	No. of employees from Barangay Darong	Record no. of employees from Barangay Darong	During pre-construction	Administration Office of the Project	Oro Cemento Industries, Corporation	Minimal	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Construction and installation of plant and pier facilities	Solid Waste Generation	Weight of waste generated	Weighing/ log-book recording	Daily/weekly	Waste storage facility	Oro Cemento Industries, Corporation	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	Maximum storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.
	People: Occupational health and safety	No. of work-related illnesses/ injuries, No. of safety man-hours	Log-book/ database registration	Daily	Administration office of the project site	Oro Cemento Industries, Corporation	Minimal	1 Non-Lost Time Accident	Multiple Non-Lost Time Accident	1 Lost Time Accident	Investigate, Do necessary actions. Re-training of staff regarding health and safety guidelines	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.
	Water Quality: Impact on Coastal water quality	pH	Refer to EMB MC 2016-12	Quarterly	Refer to Figure 6-1	Oro Cemento Industries, Corporation	PHP 10,000 per parameter	6.5-8.0	8.0-8.5	6.5-9.0	Investigate, identify non-point sources	Investigate, identify non-point sources	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
		TSS						60 mg/L	65 mg/L	80 mg/L			
		Fecal Coliform						1,800 MPN/100mL	1,900 MPN/100mL	2,000 MPN/100mL			
		Oil & Grease						4.5 mg/L	5.0 mg/L	6.0 mg/L			
	Water Quality: Impact on ground water quality	pH	Refer to EMB MC 2016-12	Quarterly	Refer to Figure 6-1	Oro Cemento Industries, Corporation	PHP 10,000 per parameter	6.5-8.0	8.0-8.5	6.5-9.0	Investigate, identify non-point sources	Investigate, identify non-point sources	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
		Fecal Coliform						8.0 MPN/100mL	9.0 MPN/100mL	10.0 MPN/100mL			
		Oil & Grease						0.5 mg/L	0.75 mg/L	1.0 mg/L			
Use of Heavy Equipment	Air Quality: Impact on Ambient Air Quality and Noise	NO_2	DAO 2000-81 Analysis Methods	Quarterly	Refer to Figure 6-1	Oro Cemento Industries, Corporation	PHP 20,000 per station per event	105 µg/NCM	135 µg/NCM	150 µg/NCM	Continuous maintenance of heavy equipment	Continuous maintenance of heavy equipment; Investigate, identify non-point sources	Investigate condition of equipment; Repair damages/ defects, repeat analysis
		SO_2						125 µg/NCM	160 µg/NCM	180 µg/NCM			
		TSP						180µg/ NCM	200µg/ NCM	230µg/ NCM			
		PM_{10}						500 mg/NCM	550 µg/NCM	600 µg/NCM			

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
			Method	*Frequency*	*Location*			*EQPL Range*			*Management Measures*		
								Alert	*Action*	*Limit*	*Alert*	*Action*	*Limit*
Use of Heavy Equipment	Hazardous Waste Generation (used oil)	Volume of wastes generated	Number of drums/log-book recording; Weighing/ log-book recording	Weekly	Waste storage facility (Refer to DAO 1992-29)	Oro Cemento Industries, Corporation	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	Maximum storage capacity	Ensure proper storage of hazardous waste, as stipulated in HW ID. Prepare hazardous waste for treatment/ disposal by third party (Refer to DAO 1992-29)	Ensure proper storage of hazardous waste, as stipulated in HW ID. Contact third party for hazardous waste for treatment/ disposal (Refer to DAO 1992-29)	Treatment/disposal of hazardous waste by third party. (Refer to DAO 1992-29)
OPERATION PHASE													
Operation of cement grinding mill	Air Quality: Impact on Ambient Air Quality and noise	NO_2	DAO 2000-81 Analysis Methods	Quarterly	Refer to **Figure 6-1.**	Oro Cemento Industries, Corporation	PHP 20,000 per station per event	80 µg/NCM	120 µg/NCM	150 µg/NCM	Continuous maintenance of engines	Continuous maintenance of engines; Investigate, identify non-point sources	Investigate condition of engines; Repair damages/ defects, repeat analysis
		CO						25 mg/NCM	30 mg/NCM	35 mg/NCM			
		SO_2,						120 µg/NCM	150 µg/NCM	180 µg/NCM			
		TSP						180µg/ NCM	200µg/ NCM	230µg/ NCM			
		PM_{10}						120 mg/NCM	150 µg/NCM	200 µg/NCM			
		Noise						65 dB	70 dB	75 dB			
Operation of cement grinding mill and pier	Water Quality: Impact on Coastal water quality	pH	Refer to EMB MC 2016-12	Quarterly	Refer to Figure 6-1	Oro Cemento Industries, Corporation	PHP 10,000 per parameter	6.5-8.0	8.0-8.5	6.5-9.0	Investigate, identify non-point sources	Investigate, identify non-point sources	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
		TSS						60 mg/L	65 mg/L	80 mg/L			
		Fecal Coliform						1,800 MPN/100mL	1,900 MPN/100mL	2,000 MPN/100mL			
		Oil & Grease						4.5 mg/L	5.0 mg/L	6.0 mg/L			
Operation of cement grinding mill and pier	Water Quality: Impact on Groundwater quality	pH	Refer to EMB MC 2016-12	Quarterly	Refer to Figure 6-1	Oro Cemento Industries, Corporation	PHP 10,000 per parameter	6.5-8.0	8.0-8.5	6.5-9.0	Investigate, identify non-point sources	Investigate, identify non-point sources	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
		Fecal Coliform						8.0 MPN/100mL	9.0 MPN/100mL	10.0 MPN/100mL			
		Oil & Grease						0.5 mg/L	0.75 mg/L	1.0 mg/L			
Operation of cement grinding mill and pier	Water: Impact on coastal resources	Coral cover mangroves, corals, and seagrasses	Coral reef survey,	Yearly	Refer to coastal resource map (Figure 2-21)	Oro Cemento Industries, Corporation	PHP 100,000 per assessment	Within 5% decrease of coral cover from baseline	Within 10% decrease of coral cover from baseline	Within 15% decrease of coral cover from baseline	Conduct annual marine survey; check if coastal water quality and effluent quality are within appropriate standards	Conduct semi-annual marine survey; check if coastal water quality and effluent quality are within appropriate standards	Conduct quarterly marine survey; check if coastal water quality and effluent quality are within appropriate standards
		No. of mangrove trees, saplings, and seedlings	Tree inventory					Within 5% decrease of no. of mangrove trees, saplings, and seedlings from baseline	Within 10% decrease of no. of mangrove trees, saplings, and seedlings from baseline	Within 15% decrease of no. of mangrove trees, saplings, and seedlings from baseline			
		Seagrass Cover	Transect-quadrat method					Within 5% decrease of seagrass cover from baseline	Within 10% decrease of seagrass cover from baseline	Within 15% decrease of seagrass cover from baseline			

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
			Method	*Frequency*	*Location*			*EQPL Range*			*Management Measures*		
								Alert	*Action*	*Limit*	*Alert*	*Action*	*Limit*
Operation of cement grinding mill and pier	People: Occupational health and safety	No. of work-related illnesses/ injuries, No. of safety man-hours	Log-book/ database registration	Daily	Administration office of the project site	Oro Cemento Industries, Corporation	Minimal	1 Non-Lost Time Accident	Multiple Non-Lost Time Accident	1 Lost Time Accident	Investigate, Do necessary actions. Re-training of staff regarding health and safety guidelines	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.	Investigate, Do necessary actions. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.
Operation of cement grinding mill and pier	People: Potential negative Public Perception	No. of valid complaints	Consultation with local officials and residents	Upon official request /summon of the local barangay office	Barangay Darong	Oro Cemento Industries, Corporation	Minimal	1 minor complaint, such as nuisance complaints (e.g. noise caused by operation)	Multiple minor complaints such as nuisance complaints (e.g. noise caused by operation)	1 major complaint (incidents causing loss of life, damage to private property, adverse effects to health an economics)	Investigate, address issue accordingly	Investigate, address issue accordingly. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.	Investigate, address issue accordingly. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines. Increase community IEC regarding measures taken to solve major complaints. Get feedback from community regarding acceptability or adequacy of actions taken to mitigate major concerns.
Operation of cement grinding mill and pier	Solid Waste Generation	Weight of waste generated	Weighing/ log-book recording	Daily/ weekly	Waste storage facility	Oro Cemento Industries, Corporation	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	Maximum storage capacity	Prepare waste for disposal by third party	Contact third party for waste for disposal	Disposal of waste by third party.
Operation of cement grinding mill and pier	Hazardous Waste Generation (used oil, oil-contaminated materials, BFLs)	Volume of wastes generated	Number of drums/log-book recording Weighing/ log-book recording	Weekly	Waste storage facility (Refer to DAO 1992-29)	Oro Cemento Industries, Corporation	Part of operation costs	50% of maximum storage capacity	80% of maximum storage capacity	Maximum storage capacity	Ensure proper storage of hazardous waste, as stipulated in HW ID. Prepare hazardous waste for treatment/ disposal by third party	Ensure proper storage of hazardous waste, as stipulated in HW ID. Contact third party for hazardous waste for treatment/ disposal	Treatment/disposal of hazardous waste by third party. (Refer to DAO 1992-29)

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
			Method	*Frequency*	*Location*			*EQPL Range*			*Management Measures*		
								Alert	*Action*	*Limit*	*Alert*	*Action*	*Limit*
											(Refer to DAO 1992-29)	(Refer to DAO 1992-29)	
Effluent from plant site	Water Quality: Degradation of water quality due to effluent discharge	Temp. change pH TSS	Refer to EMB MC 2016-12	Quarterly	Refer to Figure 6-1	Oro Cemento Industries, Corporation	PHP 10,000 per parameter	2°C (change) 6.0-9.5 90 mg/L	2.5°C (change) 6.0-9.5 95 mg/L	3°C (change) 6.0-9.5 100 mg/L	Continuous maintenance of treatment system. Continuous monitoring.	Investigate, identify non-point sources	Investigate, identify non-point sources, repair damages/ defects, repeat analysis
ABANDONMENT PHASE													
Pull-out of equipment, decommissioning of fuel storage, abandonment of offices	Generation of Demolition spoils and solid wastes	Weight (kg); no. of items	Weighing/ log-book recording	Daily/ weekly	Project Site	Oro Cemento Industries, Corporation	To be deter-mined	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Potential negative public perception	No. of valid complaints	Consultation with local officials and residents	Variable	Municipality of Sta. Cruz	Oro Cemento Industries, Corporation	PHP 40,000 per consultation	1 minor complaint, such as nuisance complaints (e.g. noise caused by decommissioning, inconvenience and traffic caused by trucks)	Multiple minor complaints such as nuisance complaints (e.g. noise caused by decommissioning, inconvenience and traffic caused by trucks)	1 major complaint (incidents causing loss of life, damage to private property, adverse effects to health an economics)	Investigate, address issue accordingly	Investigate, address issue accordingly. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines.	Investigate, address issue accordingly. Review and reinforce safety guidelines. Re-training of staff regarding health and safety guidelines. Increase community IEC regarding measures taken to solve major complaints. Get feedback from community regarding acceptability or adequacy of actions taken to mitigate major concerns.

Notes: EQPL = Environmental Quality Performance Level

- Alert or Red Flag: early warning
- Action Level: point where management measures must be employed so as not to reach the regulated threshold or limit level, or to reduce deterioration of affected environmental component to pre-impact or optimum environmental quality
- Limit Level: regulated threshold of pollutant (standard that must not be exceeded); point where emergency response measures must be employed to reduce pollutants to lower than standard limit.

Figure 6-1: Prescribed Monitoring Locations

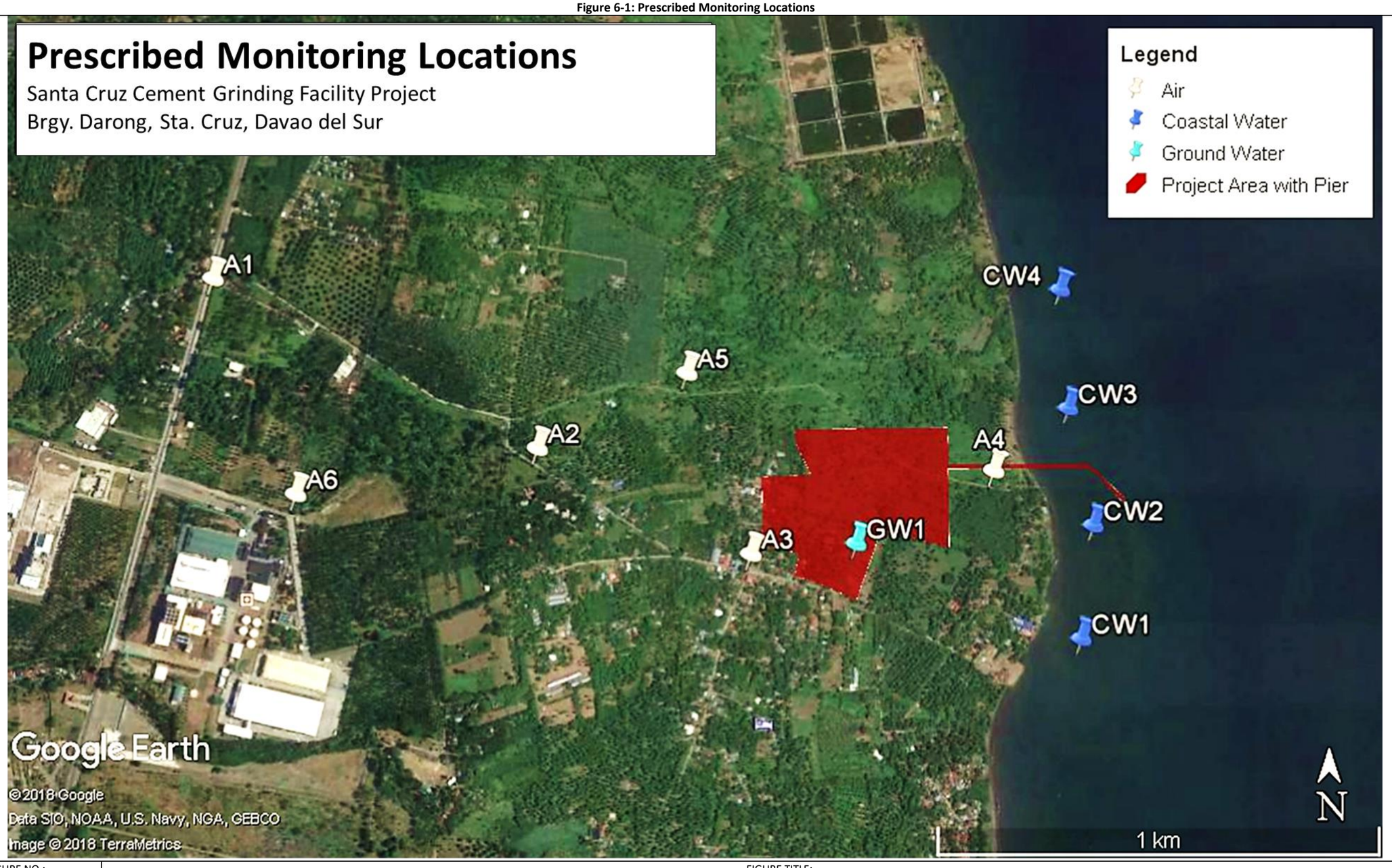


FIGURE NO.:	FIGURE TITLE:
6-1	**PRESCRIBED MONITORING LOCATIONS**

PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	**SANTA CRUZ CEMENT GRINDING FACILITY PROJECT** Brgy. Darong, Sta. Cruz, Davao del Sur	**LCI ENVI CORPORATION**

6.2 Multi-Sectoral Monitoring Framework

442 The Monitoring Framework, as stated in Annexes 3-2 and 3-4 of the RPM for DENR Administrative Order No. 2017-15, presents a proposed program wherein the proposed Project's environmental compliance will be verified and reported to concerned stakeholders.

443 The MMT will be composed of government regulators (LGU representatives) and recognized non-governmental organizations that have valid issues and concerns on the proposed project. The proponent shall provide appropriate funding for the MMT activities based on the Annual Work and Financial Plan approved by EMB. DENR-EMB must provide guidance to the MMT and shall conduct performance audits of the MMT.

444 The MMT's objective is to provide a venue to discuss the important concerns of stakeholders regarding the Project. These concerns may involve the following items:

- Verify the compliance of **Oro Cemento Industries Corporation** in its ECC and EMP;
- Validate the proposed Project's conformance to government standards, and **Oro Cemento Industries Corporation's** submission of necessary post-ECC documentation requirements;
- Identify the legitimate concerns of the host community, in relation to the implementation of the Project;
- Determine the extent and scale of the environmental impacts generated by the Project;
- Provide additional information, education, and communication (IEC); and
- Integration/documentation of complaints, suggestions, and compromise agreements.

445 The MMT members and their corresponding roles and responsibilities are presented in **Table 6-2**.

Table 6-2: Proposed Composition of the MMT for the Project

COMPOSITION	MEMBER	ROLE/RESPONSIBILITY
LGU representatives	(1) representative from the Municipal Environment and Natural Resources Office (MENRO) of Sta. Cruz	▪ Serve as the MMT chair ▪ Oversee Proponent's compliance to environmental regulations ▪ Issue/revoke the ECC of the Project as mandated
	(1) Rural Health Unit (RHU) Chief or Municipal Health Officer (MHO) of Sta. Cruz	▪ Exercise local authority and knowledge on environmental, health and social conditions in the project impact areas
	Concerned Barangay Captain (Darong)	
One representative from an LGU-accredited local NGOs with mission/s specifically related to environmental management	(1) To be determined	▪ Represent the mission/s of the NGO
Maximum of 2 representatives from locally recognized community leaders	(1) BFARMC (2) Darong Senior Citizens Association	▪ Represent vulnerable sectors in the project impact area
Maximum of 3 representatives from government agencies	(1) Philippine Coast Guard (PCG) (2) Bureau of Fisheries and Aquatic Resources (BFAR)	▪ Carry out mandate considering the project type and its expected impacts
Reference: DENR Administrative Order No. 2017-15		

446 The DENR heads the MMT and oversees compliance to environmental regulations. Furthermore, it has the power to revoke the ECC if deemed necessary. As the proponent, **Oro Cemento Industries Corporation** must comply with environmental regulations by providing mitigation and enhancement measures. Lastly, representatives from the host municipal and barangay LGUs provide the consensus of the local community and has jurisdiction over the project site.

447 **Oro Cemento Industries Corporation** will continue to regularly conduct consultations/meetings with the MMT members. These meetings shall be conducted quarterly and annually. Special meetings may also be held if necessary, most especially during emergency situations or other important occasions that require immediate resolution.

6.3 Environmental Guarantee and Monitoring Fund Commitments

448 The Environmental Guarantee Fund (EGF) pertains to the fund to be set up by a project proponent which shall be readily accessible and disbursable for the immediate clean-up or rehabilitation of areas affected by damages in the environment and the resulting deterioration of environmental quality as a direct consequence of a project's construction, operation or abandonment. It shall likewise be used to compensate parties and communities affected by the negative impacts of the project, and to fund community-based environment related projects including, but not limited to, information and education and emergency preparedness programs.

449 The indicative allocation for the EGF for the proposed project is PHP 1,000,000.00 (One Million Pesos). The said amount will be subject to review and approval of the MMT. The fund shall be replenished if the amount falls below 50%.

450 The EGF shall be established and used for the following risk-management related purposes:

- the immediate rehabilitation of areas affected by damage to the environment and the resulting deterioration of environmental quality as a direct consequence of project construction, operation, and abandonment;
- the conduct of scientific or research studies that will aid in the prevention or rehabilitation of accidents and/or risk-related environmental damages; or
- for contingency clean-up activities, environmental enhancement measures, damage prevention program including the necessary IEC and capability building activities to significantly minimize or buffer environmental risk- related impacts.

1 The EGF can be used for, but not limited to, the following project-specific purposes:

- Environmental enhancement measures such as greening programs in the area,
- Support development and implementation of coastal resource management in area,
- Support development and implementation of water conservation plan, and
- Oil spill clean-up

451 On the other hand, the Environmental Monitoring Fund (EMF) refers to the fund that a proponent shall set up after an ECC is issued for its project or undertaking, to be used to support the activities of the multi-partite monitoring team. It shall be immediately accessible and easily disbursable.

452 The indicative allocation for the EMF of the proposed project is PHP 500,000.00 (Five-Hundred Thousand Pesos), which will also be subject to review and approval of the MMT.

SECTION 7

DECOMMISSIONING/ABANDONMENT/REHABILITATION POLICY

453 **Oro Cemento Industries Corporation** will allocate sufficient time and available resources if the decommissioning, abandonment, and/or rehabilitation of the Project will be necessary.

454 Depending on the nature and reasons for abandonment, some facilities, such as the containers used as offices, may not be necessarily demolished or removed from the site, since some of these can be useful for other applications. Otherwise, proper dismantling, removal, and transportation of the structures, equipment, and machineries from the existing site will be conducted to minimize possible or further threats to the surrounding environment.

455 The operator will ensure that there will be no residual contamination in the project site and that proper disposal will be applied after decommissioning through following:

- After the fuel storage tanks are removed, soil and groundwater sampling should be conducted for subsurface contamination testing.
- If contamination exists, additional investigations, which may include risk assessment, should be done to determine the need for remediation.
- Since tanks used to store hydrocarbons and chemicals are classified as special wastes, disposal procedure must adhere to relevant provisions of DAO 1992-29.
- Also, since the tanks used to contain flammable materials, the operator must ensure that the waste disposal contractor will follow the appropriate health and safety guidelines in handling such materials.

456 In generator decommissioning, there will be certain reminders for successful output which are listed below:

- All on-site equipment, such as generators, transfer switches, transformers, fuel storage tanks, and conduit and electrical wiring, will be documented for inventory accuracy.
- A thorough examination and inspection of the current electrical system will be performed for safe decommissioning.

457 Other activities that will be done during this Phase are:

- Proper advice and compensation to all affected personnel;
- Securing of necessary government clearances related to the abandonment of the existing Project (including request for the relief of ECC conditions and commitment);
- Removal of solid, liquid, and hazardous wastes within the site through DENR-certified waste transporter/treater; and
- Clean-up and possible remediation of the site, if future evaluations and testing suggest that such activity is applicable.

SECTION 8

INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

458 The institutional organization of **Oro Cemento Industries Corporation** for the proposed Cement Grinding Facility Project is shown in **Figure 8-1**. The organization is formed to achieve the following:

- Economical and safety operations and maintenance of the proposed cement grinding facility components;
- Implementation of the company policies;
- Environmental compliance and sustainability; and
- Promotion and enhancement of the social acceptability of the proposed project.

459 The institutional organization will involve **Oro Cemento Industries Corporation's** top-level management, who is responsible for providing the corporate direction and policies of the company. The policies shall then be disseminated to the cement grinding department heads and managers for implementation of the company personnel, including those who will be working on the operations of the proposed project.

460 **Oro Cemento Industries Corporation** will also establish a partnership with relevant government agencies, various stakeholders, and local host communities in relation to the project. This partnership is necessary to maintain a transparent and positive relationship for the proposed project and its stakeholders, as well as to ensure that the environmental protection and enhancement measures are complied with.

461 The key stakeholders of the proposed project will be identified as the following:

- Municipality of Sta. Cruz, Davao del Sur;
- Brgy. Darong;
- Residents and community organizations that will be affected by the proposed project;
- Various industry organizations;
- Local peace-and-order councils (i.e., PNP, Barangay Police); and
- Other concerned non-government organizations.

462 **Oro Cemento Industries Corporation** commits to:

- Comply with the conditions that will be stipulated in the ECC and other related environmental laws;
- Foster mutually beneficial partnership and cooperation with the host community;
- Promote sustainable use and responsible development of resources by adopting appropriate technologies;
- Develop livelihood programs and upgrade skills of host community to contribute and enhance the quality of life; and
- Develop training programs for its employees to ensure that they will be continually prepared for the tasks assigned to them.

Figure 8-1: Organizational Chart for the Institutional Plan

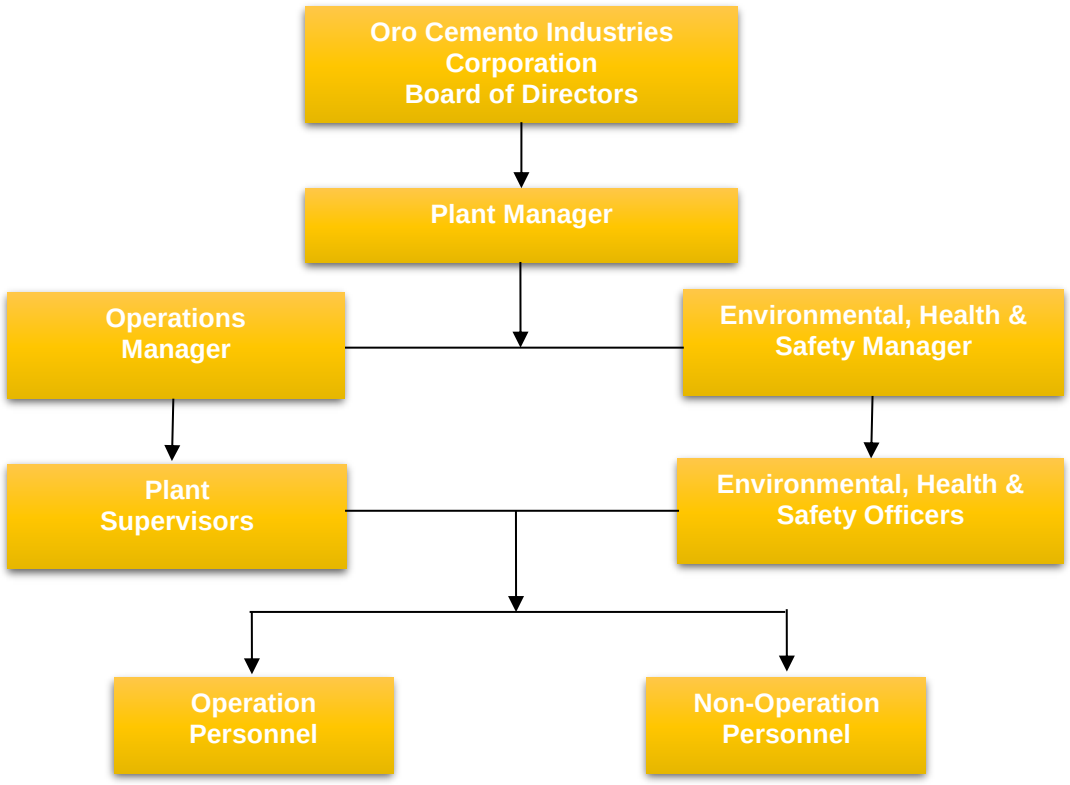


FIGURE NO.:	FIGURE TITLE:	
8-1	ORGANIZATIONAL CHART FOR THE INSTITUTIONAL PLAN	
PROJECT PROPONENT:	PROJECT TITLE & LOCATION:	REPORT PREPARER:
ORO CEMENTO INDUSTRIES CORPORATION	SANTA CRUZ CEMENT GRINDING FACILITY PROJECT Brgy. Darong, Sta. Cruz, Davao del Sur	LCI ENVI CORPORATION