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ENVIRONMENTAL PERFORMANCE REPORT AND MANAGEMENT PLAN

Barangay Bahay Pare, Meycauayan City

STEEL ASIA MANUFACTURING CORPORATION | 2017

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EXECUTIVE SUMMARY

Project Information			
Name of Project	Proposed Increase in Production Capacity of the Steel Rolling Mill Project		
Location	Ciudad Industria Bahay Pare, Meycauayan Bulacan		
Background and Nature of Project	The proposed expansion Project consists of:		
	 A. Increase in production capacity of Rolling Mill 1 from 50mt/hr to 80mt/hr or 600,000 mty 		
	 Rolling Mill 1, with ECC no. 9504-004-102Cwill have the following developments: 1. New Pusher Type furnace will replace the current walking hearth furnace 2. New smoke stack with height of 50 meters 3. Additional 2 roughing mill stands 		
	B. Operation of Rolling Mill 2 Rolling Mill 2, formerly owned by Peninsula Steel Manufacturing was issued with ECC No. 8902-003- 107A. It was not operational since its acquisition by SteelAsia. To keep up with market demand, SteelAsia plans to operate it with production capacity of 20mt/hr or 100,000 mt/year		
Size and Scale	This project will involve increase in rebar production capacity for Rolling Mill 1 from 50 mt/hr allowed in its existing ECC to 80 mt/hr or 600,000 mt/year and 100,000 mt/year for Rolling Mill 2.		
Proponent Profile			
Name of Proponent	SteelAsia Manufacturing Corporation (SAMC)		
Address	Corporate Office: 2/F B5 Bonifacio High Street, Fort Bonifacio Global City, Taguig Plant : 90 Ciudad IndustriaBahay Pare, Meycauayan, Bulacan		
Contact Person and Details of Proponent's Authorized Rep.	Mr. Benjamin O. Yao +632 8566888		
Preparer Profile			
Name of Preparer	Rosalie R. Lorenzo / SteelAsiaMfg Corporation		
Address	dress 90 Ciudad IndustriaBahay Pare, Meycauayan, Bulacan		
Contact Person and Details of Preparer's Authorized Rep.	HES Head / 09178946198		



Component		Existing	Expansion	
Rolling Mill 1	Capacity	50 mt/hr or approx 400,000 mt/yr	600,000 mt/yr	
	Furnace	Walking Hearth (50mt/hr)	Pusher Type (80 mt/hr)	
	Smoke Stack	45m high	50m high	
	Mill Train	18 stands	20 stands	
	Capacity	not operational	100,000 mt/yr	
Rolling Mill 2	Furnace	Pusher Type (20 mt/hr)	same	
	Smoke Stack	36m high	same	
	Mill Train	11 stands	same	

Table ES-1. Project Components

Table ES-2. Project Size

	Existing	Proposed
Rolling Mill 1 Capacity (in metric tons per year)	400,000	600,000
Rolling Mill 2 Capacity (in metric tons per year)	Not operational	100,000
Project Size (in hectares)	18	18

ES 1 PROCESS DOCUMENTATION OF THE CONDUCT OF ENVIRONMENTAL IMPACT ASSESSMENT

ES 1.1 EIA Study Team

The EIA Study Team members are presented in **Table ES-3** and their Sworn Statement of Accountability is provided in **Annex A**.

Table ES-5. ETA Study Team				
Name Role / Module				
Reynaldo Tejada	Air Quality / Air Dispersion Modelling			
Jess Addawe	EIA Process			
Ernesto Flores	EIA Process			
Henry James Botengan	Socio-economics			
Rosalie Lorenzo	SAMC-HES Head / Report Integration			

Table	ES-3.	EIA	Study	Team
Table	20 01		Juay	- Cuili

ES 1.2 EIA Study Schedule

The schedule of activities performed as part of the preparation of the EIS is detailed in the table below:

Table	ES-4.	EIA	Schedule
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Activity	Date
Site visit	October 19, 2016
Public scoping	November 8, 2016
Submission of Project Description for Scoping (PDS) to EMB	January 12, 2017
Technical scoping	February 13, 2017
Conduct of field sampling and surveys	March 13, 2017 onwards
Conduct of perception survey, key informant interviews and	May 17, 2017
focus group discussions	
Public Hearing	ТВА

ES 1.3 EIA Study Area

The EIA study was conducted within the vicinity of the proposed project footprint and its potential impact areas, particularly in the Meycauayan City, Bulacan. The coverage of the EIA study is based on the agreed scope of the EIA Review Committee (EIARC) during the technical scoping activity conducted on February 13, 2017. The primary and secondary impact zones of the project are delineated and discussed in **Chapter 1.2.2**.

ES 1.4 EIA Methodology

The approach and methodology adopted to complete this EIS is in accordance with the prescribed methods of EMB and the procedural manual for DAO 2003-30. The table below provides the methodology used for each module.

Module	Methodology		
Land			
Land use and classification	Review of secondary data		
	 Spatial analysis of reference maps 		
Geology and geomorphology	Review of secondary data		
	 Spatial analysis of reference maps through GIS 		
	 Analysis of historic occurrences of geologic hazards 		
Pedology	Review of secondary data		
Water			
Hydrology	Review of secondary data		
Water quality	Characterization of water quality by water sample collection and		
	analysis		
Air			
Climate and meteorology	Review of secondary data		
Air quality and noise	Characterization of ambient air quality and noise levels by		
	sampling		
	Air and Noise Modeling		
People	Review of secondary data		
	Perception survey		
	 Characterization of socio-economic condition 		

Table ES-5. EIA Methodology

ES 1.5 Public participation

Stakeholder participation for the project was ensured to determine the current situation of the affected residents, including the issues and concerns they are experiencing in their community. The issues and concerns based on the results of the perception survey and public scoping are summarized below:

ES 1.6 Public participation

Stakeholder participation for the project was ensured to determine the current situation of the affected residents, including the issues and concerns they are experiencing in their community. The issues and concerns based on the results of the perception survey and public scoping are summarized below:

- 1. Due to the expansion of warehouse of Steel Asia, it will also increase the use of trucks / haulers and the new warehouse located near residence area. The first concern is to improve the paging system that may affect residence nearby area, and second, improvement of parking area inside the plant to prevent parking along roadways that causes congestions and traffic.
- 2. What is the water volume capacity that the water catchment basin can absorb? Based on experience, flood in our area can be up to waist deep.
- 3. Requesting to enlarge the receiving canals from baranggay going to SteelAsia's planned catchment to help in preventing floods during heavy rains



4. Verification if there are data attachments in the presentation regarding ambient testing results, water testing results. What are impacts in increase of production to the community? Does the home owners and the whole Barangay can rely to SAMC project in relieving the flood. How sure that the quality of the water coming from barangay is acceptable.

Perceived Positive and Negative Impacts of the Project based on the Perception Survey Conducted

The respondents' perceive benefits from the proposed expansion project are:

- 1. Possible employment opportunities
- 2. Increase in land tax
- 3. Improvement of government services (through community projects)
- 4. Progress in the community
- 5. Electrification or cheaper electricity fees
- 6. River and flood control

On the other hand, the perceived negative effects of the project to the community are:

- 1. Negative effect on air quality
- Occurrence of flooding should SteelAsia stop allowing rainwater from baranggay to pass through the plant's drainage system, hazards, and other risks
- 3. Damage/Destruction of the surrounding environment

ES 2 EIA SUMMARY

ES 2.1 Summary of baseline characterization, key environmental impacts and mitigation plan

The summary of baseline characterization and its corresponding environmental impacts and mitigation plan is presented below. Chapter 2 of this EIS provides a more detailed discussion of the baseline conditions, environmental impacts and mitigation measures.

EXECUTIVE	Environmental Performance Report and Management Plan
SUMMARY	Proposed Increase in Production Capacity of the Steel Rolling Mill Project

Table ES-6. Summar	y of	baseline	characterization
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Module	Baseline characterization
Land use and classification	 The project is located within industrial land use area City of Meycauayan is declared as Alienable and Disposable land
Geology	 The topography of Meycauayan is generally flat The site is underlain by the Quaternary Alluvium detrital deposits No geologic structures were observed in the project site Seismic-related hazards relevant to the project site are ground rupture, ground shaking and liquefaction Upper parts of the city, where the project is located, is classified as 'less likely tobe flooded' based on Mines and Geosciences Bureau (DENR-MGB) Flood Hazard Map
Pedology	• Four distinct types of soil classification comprise the soil structure of Meycauayan, namely:Prenza clay loam, Prenza silty loam, Obando fine sandy loam and the Bulacanhyrosol
Terrestrial ecology	There are no rare or threatenedspecies of flora and fauna that will be affected by the project.
Hydrology	 The project area is underlain by local and less productive aquifers. It was alsonoted that the project area is very near the watershed divide of the Marilao andMeycauayan Rivers.
Water quality	The water quality of Steel Asia Manufacturing Corporation and are all within the DENR standards based on March 2012 to June 2016 monitoring results
Freshwater ecology	Freshwater study is not applicable for this project.
Meteorology	 Climate at Meycauyan generally falls under Type I with two pronounced seasons: dry from November to April and wet during the rest of the year The total annual rainfall is 2532.30 mm
Air quality	• The proposed TSP, CO, SO ₂ , NO ₂ , and heavy metal emissions will not have significant environmental impact to the ambient air quality
Noise	Result shows that noise level impacts at full operation will emit below the Light and Heavy Industrial Allowable noise level standards
Socio-Economic	 Historical data on Barangay Pare population show that significant increase in population happened from 2004-2010. The municipality of Meycauayan has a high percentage of literacy by the 95.78 percentliteracy rate based on 1995 Census of population The crime statistics in the province of Bulacan based on the historical data from 1996 to2008 has shown a decreasing trend. The literacy rate in the province exhibited a decreasing trend from 1990 to 2000 surveys. Diseases of the heart is the number one cause of death in Meycauayan in 2013.
Perception Survey	 The respondents' perceive benefits from the proposed expansion project are: Possible employment opportunities Increase in land tax Improvement of government services (through community projects) Progress in the community Electrification or cheaper electricity fees River and flood control On the other hand, the perceived negative effects of the project to the community are: Negative effect on air quality Occurrence of flooding should SteelAsia stop allowing rainwater from baranggay to pass through the plant's drainage system, hazards, and other risks Damage/Destruction of the surrounding environment

ES 2.2 Environmental management and monitoring plan

Chapters 3 and 6 of this EIS present the Environmental Management and Monitoring Plan (EMP) for the proposed Project. The proposed EMP includes the proposed mitigating measures, information on environmental parameters to be monitored (i.e. EQPL values), frequency and procedure of monitoring, and its estimated costs.

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Construction Pr	lase					
Site Preparation / Construction Activities	Land - Geology	 Modification of existing topography Minimal increase in soil erosion 	 Proper planning and close supervision during preconstruction activities Adopt erosion control measures(i.e. coconet) 	Proponent's Environmental Unit	Php3M – implementation ofsite preparation adhering to bestengineering practices andmaintenance	Project Development Budget Contractor's contract
	Water Quality	Sedimentation/ Siltation	 Implementation of proper engineering control designs and measures for potential erosion and siltation 	Project development team, PCO, Contractor	Php3M – implementation ofsite preparation adhering to bestengineering practices andmaintenance	Project Development Budget Contractor's contract
		Generation of wastes	 Implementation of the documented Waste Management Program (SA-IMS- CP-216) Materials Recovery Facility (recover recyclable wastes) Hazardous Waste Containment Facility 	Project development team, PCO, Contractor	Php50,000 / Year –provision for propersolid waste disposal	Project Development Budget Contractor's contract
	Air and Noise Quality	Generation of dust	 Sprinkling of water along exposed areas especially during dry season; Road dust cleaning using the existing vacuum type mechanical street sweeper Vehicle speed limit at 10pkh inside plant compound 	Project development team,PCO, Contractor	Php50,000/ year – operational expenses	Project Development Budget Contractor's contract
		Increase in noise level	 Maintain equipment deployment schedule which, if possible, limits the construction activity only during daytime Regular maintenance of vehicles and construction equipment 	Project development team, PCO, Contractor	Php2,000,000 / year -cost ofmaintenance of heavy equipment	Project Development Budget Contractor's contract

Table ES-7. Impact Management Plan

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements	
						Compliance to RA 8749 and its IRR	
	People	Generation of solid and hazardous waste	 Implementation of the documented Waste Management Program (SA-IMS- CP-216) Materials Recovery Facility (recover recyclable wastes) Hazardous Waste Containment Facility 	Proponent's Environmental Unit/ PCO	Php50,000 / Year – provision for propersolid waste disposal	Project Development Budget Compliance to RA 9003 and its IRR Contractor's contract	
			 Increase of job and business opportunities 	 Continuous implementation of local hiring policy. Comply with local ordinances on providing local community employment opportunities Coordinate with LGU 	Proponent / Contractor		Part of the Project Cost; Compliance to Local and National Laws
		Occupational safety and health	 General EHS Guidelines for Contractors Conduct of EHS risk assessment for contractors scope of work and their potential impact both to contractors' workers & SAMC workers Implementation of the Work Permit system Requirement of Safety Officers employed by contractors to be on duty on site 	Proponent	Php100,000/ year –Safety and healthprogram will coverthis activities	MOA with contractors ECC	
		 Additional Revenue for the LGU 	Pay the taxes required by law	Proponent		ECC	
		Other Livelihood Opportunities	Conduct of livelihood trainings for the affected community	Proponent	Php500,000/ year – SDP budget will beutilized for the	ECC, SDP	

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
		Increase in traffic	Implementation of traffic scheme	Proponent	implementation ofactivities such as,livelihood programs,educationassistance, medical assistance, IEC,among others. Php100,000/ year –Safety and	ECC
		volume			activities	
Operation Phase	9					
	Water Quality	Generation of wastes	 Implementation of the documented Waste Management Program (SA-IMS- CP-216) Materials Recovery Facility (recover recyclable wastes) Hazardous Waste Containment Facility 	PCO, Admin	P500,000 annually for waste handling and disposal	Annual Admin & HES Budget
	Air Quality	Source Emission (Mill 1 and Mill 2 Furnace)	 Periodic maintenance of Furnace and Cleaning of Stacks. Periodic maintenance of Recuperator Use of Low Sulfur Fuel Oil (LSFO) or Special Fuel Oil 60 (SFO -60) with Sulfur content < 1% PLC automatic air-fuel ratio valve Standard Furnace Temperature Settings (Running & Idle States) Provision of Green Buffer Zone to serve as Air Pollution and GHG sink (currently has 163 trees inside plant compound) To consider the use of pollution control such as scrubber or other pollution control device to mitigate SO₂ stack emission (should actual test results 	PCO, Maintenance Department, PDN	P3M annually	Annual Production and Maintenance Budget

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			exceed standards). This is to note that the predicted ambient ground level SO ₂ concentration complies the National Ambient Air Quality Standards for Source Specific Air Pollutant (NAAQSSSAP).			
	Air Quality	Vehicular Emission (Delivery Trucks and Hauling Trucks)	 Check PETC certificates of vehicles. Check Vehicles to emission control such as Catalytic converter and muffler for cars, trucks etc (Hauler accreditation procedure) Semi-annual Physical Truck Inspection Checklist (Contracted Haulers) Periodic Maintenance of in-house vehicles 	Logistics (Contracted Haulers) Motorpool	P300k/yr	Annual Production and Maintenance Budget
	Noise Quality	Noise generation	 Planting of trees along perimeter Enclosed mill building To reconstruct current perimeter wall of 2.5 meter high to 3.5 meters Regular maintenance of vehicles Implement noise protection measures such as PPEs and enclosures Provision of Effective Enclosure such as Noise Barriers Maintain equipment deployment schedule. 	Admin PCO, Maintenance Dept.	Included in the operation cost	Annual Maintenance Budget
	People	Generation of solid and hazardous waste	 Implementation of the documented Waste Management Program (SA-IMS- CP-216) Materials Recovery Facility (recover recyclable wastes) Hazardous Waste Containment Facility 	PCO, Admin	MRF : P250k for relocation Handling & Disposal : P500k annually	Admin Annual Budget

Project Phase Environmental / component Environmental likely to be Aspect affected	I Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	Increase of job and business opportunities	 Continuous implementation of Local hiring policy. Coordinate with LGU 	Proponent / Contractor	N/A	Part of the Project Cost; Compliance to Local and National Laws
	Occupational safety and health (potential injuries due to accidents)	 Implementation of an Occupational Health & Safety Management System complying to OHSAS 18001 Semi-annual review and updating of documented hazard-risk assessment to address significant risks Analysis of annual WEM(Work Environment Measurement) results which provides current conditions about noise, ventilation, heat stress, illumination, dust. Establishment of action plans on failed results Strict implementation of wearing Personal Protective Equipment (PPE) as per the established PPE Matrix Ensure operators of heavy equipment and critical machines are all competent & authorized Work Permit system for dangerous works like hotworks, work at heights, confined space, working at high voltage areas Annual safe work load test for cranes and DOLE Permit to Operate for mechanical equipment Monthly inspection of fire alarms and fire fighting equipment, Regular safety & housekeeping 	Proponent	PPE: P1.3M annually Signages: P100,000 annually Building & grounds maintenance: P2.4M annually Annual Physical Examination: P500,000 annually	MOA with contractors ECC

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
		 Additional Revenue for the LGU Other Livelihood 	 inspection by Core team lead by the Safety Officers Regular inspection of machine guards Annual Physical Examination for all employees 3 fulltime Safety Officers 3 health officers (Occupational nurses) on duty 24-7 Occupational doctor on duty 12 hrs a week Deployment of Emergency Response Team in cases of emergencies; conduct of regular emergency drills Pay the taxes required by law Conduct of livelihood trainings for the 	Proponent Proponent	Additional of P5M annually P150,000 for the 1styr (Bokashi	ECC ECC, SDP
		Opportunities	affected community		Balls making)	
Plant closure	People	 Loss of livelihood of local work force 	Provide and develop sustainable livelihood programs and alternative livelihood training programs	Proponent	Php1M / year – SDP budget will be utilized for the implementation of activities such as, livelihood programs, education assistance, medical assistance, IEC, among others.	ECC, Rehabilitation / Abandonment Plan / SDP

ECC/EMP Condition/Requirement Categorization	NO.	ECC CONDITION	STATUS OF COMPLIANCE (if complying)	REMARKS
Project Coverage	1	This certificate shall cover the construction and operation of a Rolling Mill Plant using one (1) unit Walking hearth Furnace with a production capacity fifty (50) tons per hour of steel products	Yes	The total production from January to June year 2016 is 221,383.694 metric ton
Institutional arrangements necessary for implementation of environmental management measures	2	A properly designed perimeter wall of sufficient height shall be constructed and trees should be planted along the wall to augment its buffet capacity.	Yes	Trees are planted besides perimeter wall of the plant.
Institutional arrangements necessary for implementation of environmental management measures	3	Adequate mitigating measures should be provided to prevent noise/air and water pollution.	Yes	Air, Noise and water pollution is within DENR target standards.
Institutional arrangements necessary for implementation of environmental management measures	4	Proper maintenance of pollution control equipment and facilities shall be carried out at all times to attain maximum efficiency.	Yes	Continuous monitoring and maintenance of pollution control equipment. See picture of pollution control device during replacement (recuperator).
Institutional arrangements necessary for implementation of environmental management measures	5	An adequate settling pond shall provided for the process cooling water and no effluent from the same shall be discharged into any receiving water body without prior treatment and if it has not met DENR standards.	Yes	Settling pond is provided inside the plant for the process cooling water and no effluent from the same shall be discharged into any receiving water body.
Institutional arrangements necessary for implementation of environmental management measures	6	Proper collection and disposal of solid wastes particularly sludges from the settling pond and mill scales shall be effected.	Yes	Continuous collection of solid waste materials and transfer to waste management area with appropriate and proper documents.
Institutional arrangements necessary for implementation of environmental management measures	7	The proponent shall monitor regularly the noise levels, stack emissions and effluents, ambient air and water quality following the submitted/accepted monitoring program and using monitoring equipment duly authorized by DENR.	Yes	Continues monitoring Air, Noise, water quality, stack emission pollution is within DENR target standards. 3 rd party testing (DENR accredited)
Institutional arrangements necessary for implementation of environmental management measures	8	Noise levels, emissions and effluents generated shall conform to DENR set standards.	Yes	Air, Noise and water pollution is within DENR target standards.
Institutional arrangements necessary	9	An Environmental Unit (EU) shall created by the management to	Yes	The company has designated a PCO who

Table ES-8. Summary status of ECC and EMP Compliance

ECC/EMP Condition/Requirement Categorization	NO.	ECC CONDITION	STATUS OF COMPLIANCE (if complying)	REMARKS
for implementation of environmental		handle the environment-related aspects of the project. The EU		shall perform and carry out the duties of EU.
management measures		DENR-EMPAS Region III on a quarterly basis.		
Other sectoral requirements		Qualified local residence shall be given priority in employment.		Company HR and Admin prioritize the hiring
mandated by other agencies to be	10		Yes	of personnel leaving near the plant or within
complied with				Bulacan area.
Other sectoral requirements		Safety gadgets shall be provided to all workers to prevent health		Plant personnel protective equipment PPE is
mandated by other agencies to be	11	and occupational hazards.	Ves	given to the plant employee at a given task.
complied with			165	And it can be seen in the pant PPE matrix for
				personnel guidance.
Institutional arrangements necessary		On the spot monitoring and inspection may be conducted by the		Ocular inspection and meeting conducted by
for implementation of environmental	12	EMB, DENR Region III anytime in coordination with the concerned	Yes	the DENR region 3 and DENR Central last
management measures		groups		January 8, 2016. See Attached document.
Standard DENR requirements on the		Transfer of ownership of this project carries the same conditions in		There is No transfer of ownership was been
transfer of ownership	13	this ECC for which written notification shall made within fifteen	Yes	made.
		(15) days from such transfer.		

		Sampling and Measurement Plan			Logd	Annual	EQPL Management Scheme									
Environmental	Potential	Parameter to				Lead	Estimated		EQPL Range			M	anagemer	nt Measu	e	
Aspect	Impact	be Monitored	Method	Frequency	Location	Person	Cost	Alert	Action	Limit	Ale	ert	Acti	on	Lin	nit
WATER																
	Effluent Water	рН	Grab	Quarterly	1 Station	PCO/	P70,000	SAMC do n	ot discharge	6.0 - 9.0	No	action	No	action	No	action
	(no water	Temperature	Sampling			MMT		water from p	rocess, thus	3 (max	needed	since	needed	since	needed	since
	discharge but	(° C)						EQPL was	not defined;	rise)	not	being	not	being	not	being
	water sample	TSS	DENR AO					water samp	le is being	150	discharg	ed	discharg	ed;	discharge	ed
	to be taken	Oil & Grease	2016-08					taken from th	e last tank of	10						
	from the last	BOD	Class C					the water	recycling	100						
	water tank of	Cd						system.		0.005						
	the cooling	Pb								0.30						
	water system);	Cr								0.10						
	monitoring	Phenolic								0.05						
	later to be	Substance														
	decided by	Cyanide								.1						
	MIMI IT TO DE	Surfactants								1.5						
	slopped based	Barium								3						
	on trend of	Iron								1.5						
	Tesuits	Lead								0.05						
		Manganese								0.2						
		Nickel								0.2						
		Mercury								0.02						
		Zinc								2						
		Fecal Coliforms								200						
		Ammonia								0.05						
		Chloride								350						
		Sulfate								275						
		Dissolved								5						
		Oxygen														
		Flouride								1						
		Nitrate								7						
1		Phospate								0.5						
AIR				-	-					-						

Table ES-9. Environmental Monitoring Plan

- · · · ·			Sampling	Sampling and Measurement Plan			Annual	EQPL Management Scheme					
Environmental	Potential	Parameter to	Mathad	Freewooner	Location	Lead	Estimated		EQPL Range	1	N	lanagement Measu	re
Aspect	Impact	be monitored	Method	Frequency	Location	Person	Cost	Alert	Action	Limit	Alert	Action	Limit
	Air Quality (Ambient)	SO₂ (µg/Ncm)	DENR AO 2000-81 Rule XXVI, Sec.1	Semi Annual	4 station (hourly)	PCO/ MMT	P50,000	289 (1hr)	306 (1hr)	340 (1hr)	Check weather condition during sampling and if location is downwind of	Check weather condition during sampling and if location is downwind of	Check weather condition during sampling and if location is downwind of
		NO₂ (µg/Ncm)	DENR AO 2000-81 Rule XXVI, Sec.1	Semi Annual	4 station (hourly)	PCO/ MMT		221 (1hr)	234 (1hr)	260 (1hr)	 the area. Check possible source of pollution including external factors. Check status of furnaces for any uppet of off 	the area. Conduct site visit at said sampling stations and hire a 3 rd party DENR	the area. Conduct site visit at said sampling stations and hire a 3 rd party DENR
		TSP (µg/Ncm)	DENR AO 2000-81 Rule XXVI, Sec.1	Semi Annual	4 station (hourly)	PCO/ MMT		255 (1-hr)	270 (1-hr)	300 (1-hr)	operating parameters and have it adjusted	sampling firm to confirm by checking	sampling firm to confirm by Checking
		PM ₁₀ (μg/Ncm)	DENR AO 2000-81 Rule XXVI,	Semi Annual	4 station (hourly)	PCO/ MMT		170 (1-hr)	180 (1-hr)	200 (1-hr)	needed.	emission of smoke stack . Conduct adjustment of the unit's operation per operating manual.	emission of smoke stack Conduct adjustment of the unit's operation per operating manual. Temporarily stop certain aspect of operation unless the problem has been resolved.
	Air Quality (Source Specific)	Furnace (Mill1 and 2) Stack + genset Emission: PM (mg/Ncm) Furnace (Mill1	DENR AO 2000-81 Rule XXV, Sec.1; NESSAP	Furnace Stack – see ECC condition Genset -1st	Mill 1 & 2 Stack and Genset Stack	PCO/ MMT	P60,000 /stack	128 (85%) 630 (80%)	135 (90%) 665 (95%)	700	Check status of furnaces for any upset of off- operating parameters and have it adjusted	Hire a 3 rd party stack testing firm as per DAO 2013-26 for stack emission testing.	Hire a 3 rd party Stack testing firm as per DAO 2013-26 for stack emission

			Sampling	and Measurem	nent Plan		Annual			EQPL	Management Scher	ne				
Environmental	Potential	Parameter to	Madhaad	F		Lead	Estimated		EQPL Range		M	anagement Measu	re			
Aspect	Impact	be Monitored	Method	Frequency	Location	Person	Cost	Alert	Action	Limit	Alert	Action	Limit			
		and 2) Stack + genset Emission: SO ₂ (mg/Ncm)		year and 2 years thereafter (MC 2007-							accordingly as needed. Coordinate with operations and	Conduct proper and regular maintenance of combustion	testing. Conduct proper and regular maintenance of			
		Furnace (Mill1 and 2) Stack + genset Emission: NO ₂ (mg/Ncm)		03)				850 (85%)	9000 (90%)	1,000	verify the status of engines or any upset of off- operating parameters and	furnace. Clean inside stack walls.	combustion furnace. Temporarily stop operation unless the			
		Fumace (Mill1 and 2) Stack + genset Emission: CO (mg/Ncm)						425 (85%)	420 (90%)	500	have it adjusted accordingly as needed.		problem has been resolve.			
		Noise (Decibels dBA)	Portable Noise sampler NPCC Class C for industrial area	Semi Annual	2 stations (hourly) 1 station (24 hours)	PCO	P10,000	Daytime - 60dB Night-time - 55dB	Daytime - 63 Night-time – 58	Daytime - 70 Night-time - 60	Conduct survey at sampling station to verify complaints as per Noise Level Monitoring and Measurement Procedure. Check the sound level using sound meter. Determine possible cause.	If source of noise is from Mill, inform the plant manager to provide noise mitigation measures. Conduct noise monitoring to verify if the level is already with the limits. If source of noise is not from plant, inform the MMT regarding the possible source of noise for the group's investigation and coordination	Conduct noise sampling in the presence of the DENR and 3rd party environmental firm. Inform the operation or the area owner to stop activity unless noise mitigation measure has been installed or the source of noise has been corrected. Upon installation of noise mitigation measures conduct noise monitoring to			

			Sampling and Measurement Plan				Annual	EQPL Management Scheme					
Environmental	Potential	Parameter to	Mathad	Frequency	Location	Borson	Estimated		EQPL Range	1	M	anagement Measu	re
Aspect	Impact	be Monitored	Method	Frequency	Location	cation Person		Alert	Action	Limit	Alert	Action	Limit
												with LGU.	verify if the
													noise level is
													already within
													limits.
PEOPLE													
	Exposure of	Safe person-	Incident	Annually	Project Site	MMT	Part of the	10%	10%	Major	Conduct re-	Inspect the area	Hire 3 rd party
	employees	hours, injury,	reporting,				monitoring	increase	increase in	accidents	training of the	wherein most	safety
	and the local	near miss and	survey,				fund of	in injury,	injury, near	such as	workers on	accident	practitioner to
	community to	other safety	include in the				MMT	near	misses	fires,	safety rules and	happens.	conduct safety
	heavy	performance	Health and					misses	and minor	explosion,	regulations.	Conduct	audit in the
	industrial	indices Health	Safety Plan					and minor	accidents.	etc.	Conduct	monitoring.	plant site.
	operation	statistic.	of the					accidents.			investigation.		
	activities		proponent.										
	Community	Health Statistics	Inputs from	Quarterly	Direct and	MMT	Part of the	Increase	Complaints	Multiple	Talk with the	Intensify IEC	Conduct public
			the LGU		Indirect		MMT	level of	lodged by	complaints	local	and community	hearing if
			health		Impact		Budget	sickness	the	lodged by	stakeholders to	relations.	necessary.
			workers who		Community			such as flu	community	the	check their		
			attends the					as result		community	stand on the		
			regular MMT					of the			issues to		
			meetings					health and			property		
								social			address it.		
								survey					



Environmental Monitoring Fund and Environmental Guarantee Fund

The Proponent will commit an Environmental Guarantee Fund of P500,000 intended to rehabilitate components of the environment and compensate damage/s to properties adversely affected by the project. The company will also allocate Environmental Monitoring Funding in the amount of P500,000 for activities to be done by the MMT and replenish the same when necessary. However, the stated amounts on the said funds are only indicative, the MMT will evaluate and recommend the final amount of EMF and EGF fund to be put up for the proposed plant.

CHAPTER 1 PROJECT DESCRIPTION

1.1 PROJECT BACKGROUND

The Meycauayan Works of SteelAsia houses two rolling mill lines which the company calls M1 and M2.

M1 is a Philippine steel industry pioneer and is the heart of the Meycauayan Works. commissioned in 1996, it was the country's first modern rolling mill.It featured many pioneering technologies such as 12-meter billet capability, walking-hearth furnace, inline rolling train configuration, independent drives, Level-2 automation, quick size change and more new advances that allowed the Philippine steel industry to leapfrog into the modern era of efficiency, productivity, conservation and operational health and safety.The mill was given tax incentives by the Philippine Board of Investments as a Pioneer investment, due to these new technologies. The mill has been a multiple and Hall of Fame Awardee of the Department of Energy for energy conservation.

M1 is also the first rebar rolling mill in the Philippines to have the following certifications; ISO 9001 (Quality Management System), ISO 14001 (Environmental Management System), OHSAS 18001 (Occupational Health and Safety Management) and UK CARES (British Standard).

The most significant fact about M1 is that it changed the Philippine steel industry. The capabilities of the mill raised the benchmarks of reliable service, quality and low cost. The mill put the consumer first and emphasized customer satisfaction and added value. The mill allowed the business of rebar to become de-commoditized and more of a service differentiated industry. M2 is a 100,000 tpy cross-country rolling mill commissioned in 1989¹.

Rolling Mill 1 has an Environmental Compliance Certificate(ECC No. 9504-004-102C)which involves 50 mt/hr rebar production capacity with 400,000 metric tons per year production while Rolling Mill 2 is not yet operational. SAMC plans to increase in rebar production capacity for Rolling Mill 1 from 50 mt/hr allowed in its existing ECC to 80 mt/hr or 600,000 mt/year. On the other hand, the existing Rolling Mill 2, formerly owned by Peninsula Steel Manufacturing was issued with ECC No. 8902-003-107A. It was not operational since its acquisition by SteelAsia in May 1999. To keep up with market demand, SteelAsia plans to operate said existing Mill 2 with production capacity of 20mt/hr or100,000 mt/year.

1.2 PROJECT LOCATION AND AREA

The project is located within the 18 hectares property of SAMC in Ciudad Industria Bahay Pare, Meycauayan, Bulacan.**Figure 1-2** and **Figure 1-2** shows the location of the

¹Meycauayan Works (2017). Retrieved June 29, 2017 from http://www.steelasia.com/company/plant-facilities/meycauayan-works



project relative to the Province of Bulacan and City of Meycauayan respectively.**Figure 1-3**shows the location on the NAMRIA topographic map.

Corners	Latitude	Longitude
1	14.762659	121.007677
2	14.763243	121.008837
3	14.766376	121.007013
4	14.76733	121.00729
5	14.767076	121.00902
6	14.765989	121.009052
7	14.766031	121.00902
8	14.765375	121.011603
9	14.763869	121.010575
10	14.762821	121.011919
11	14.762297	121.010688
12	14.763243	121.008837
13	14.762078	121.007964

	•	-	•	•		
Table 1-1. Geographic	co :	ord	linates	of the	Project Area	

1.2.1 Accessibility of the Project Site

The site can be reached from Manila through NLEX and then Malhacan Road or through Congressional Extension Road and Manufacturers Avenue. There are land transportations available in the area with several terminals such as one at El Camino Public Market and EMA Town Center.Iba Road is the main road artery to the project site. The access road to the site is within Ciudad Industria.Green lines in the **Figure 1-4** map below shows the access road going to the site.



CHAPTER 1

Environmental Performance Report and Management Plan



Figure 1-2. Location Map of the Project



Figure 1-3. Topographic Map of the Project Area



Figure 1-4. Project Accessibility Map





1.2.2 Delineation of Impact Areas

The direct impact areas ("DIA") are zones where all project facilities are proposed to be located and where operations of the project are to be undertaken. To be specific, the direct impact area of the project will be the project area lot in Barangay Bahay Pare, Meycauayan, Bulacan where the existing and proposed expansion project will be built. DIAs also include areas where emissions of the project may have significant environmental impacts based on the impact assessment conducted. Results of air dispersion modeling reveal that highest ground level concentration (GLC) of all modeled parameters falls within the residential areas of Brgy. Bahay Pare.

The indirect impact areas are areas outside the project boundaries that may be affected by the project. In terms of the physical and biological environment, indirect impact areas include the downstream portions of Meycauayan River. In terms of indirect socioeconomic impacts, the municipality of Meycauayan is also identified.



Figure 1-5. Project Impact Areas


1.3 PROJECT RATIONALE

The steel industry in the Philippines is one of the most significant growth industries. Steel constitutes a basic industry prerequisite in a country's pursuit of development and industrialization. The central role of the industry stems from its linkages with numerous sectors, where its products serve as an essential input to countless uses, such as building and construction, automotive, shipbuilding and repair, electronics, packaging, etc. and it is equally important contributions to employment generation, growth, and promotion of industrial activity, etc. Therefore, ensuring a strong domestic steel and steel-based industry is vital in developing the competitive edge of a country in meeting the challenges of globalization.

With the boost in infrastructure industry in the country together with the rehabilitation activities in some parts of the country, there will be a bigger demand for reinforcing steel bars. The proponent is investing in the expansion of SAMC Plant to improve its production capacity and operations process to cater to the aforementioned increase in demand.

1.4 PROJECT ALTERNATIVES

1.4.1 Siting

Based on the ten-year market projections from 2015 to 2025, the rebar market would grow from 3 million tons to 7 million tons. Half of the rebar demand will be in Metro Manila, Central Luzon & Northern Luzon. To address this market demand, SAMC plans to operate said existing Mill 2 with production capacity of 20mt/hr or100,000 mt/year.

The existing rolling mills are located near the developing cities and municipalities in Luzon.

SAMC has already considered putting up new steel mills in other areas like Compostela in Cebu, Candelaria in Quezon and another one in Calaca Batangas. ECC applications for these new plants are still in process. It would take at least 3 years more before any of these new plants can be functional. Considering time, cost and opportunity of using new technology, the management decided to pursue the expansion for Meycauayan site by revamping Mill 1 old furnace and rehabilitating and operating Mill 2. One of the significant factor that lead to the expansion is the increasing maintenance cost of Mill 1 furnace plus it's decreasing fuel efficiency. Since the Mill 1 old furnace will be replaced with a more fuel efficient one, there arise an opportunity of adding 2 more roughing mill stands to enable the mill to use bigger billets thus increasing productivity. Also, the Mill 2 facility, upon evaluation, only needs rehabilitation and can still produce 100kmty. In only about 6 months, these developments can be completed and can already help augment the supply to the increasing market demand for rebars.

1.4.2 Technology Selection

The technology and the processes to be used in the proposed expansion is the same with the project's existing technologies. The only difference between process of Mill1 and Mill 2 is that Mill2 has no quenching process.

1.4.3 Resources

In terms of water source, the Project will collect water from deepwells and rainwater reservoir. In terms of power supply, the requirement is not as much as steel mill with a melting facility. Meralco will provide the power requirement of the mill, they will also provide the tapping point and the distribution line going to the mill Electrical Substation.

1.5 PROJECT COMPONENTS

1.5.1 Major Project Component

Table 1-2 shows the comparison of the existing and proposed project components of the project while presents the Project Site Development Plan.

Component		Existing	Expansion
	Capacity	50 mt/hr or approx 400,000 mt/yr	600,000 mt/yr
Rolling	Furnace	Walking Hearth (50mt/hr)	Pusher Type (80 mt/hr)
Mill 1	Smoke Stack	45m high	50m high
	Mill Train	18 stands	20 stands
	Capacity	not operational	100,000 mt/yr
Rolling	Furnace	Pusher Type (20 mt/hr)	same
Mill 2	Smoke Stack	36m high	same
	Mill Train	11 stands	same

Table 1-2. Existing and Proposed Project Components

Other facilities to be constructed as a result of the proposed expansion:

- Additional Finished Goods Warehouse with area of6,510 sq.m and capacity of25,000 mt of finished goods
- Bigger Truck Marshalling Area (6,578 sq.m, 72 trucks capacity)
- Rainwater Catchment / Reservoir (approx. 10,000 cu.m.)

1.5.1.1 Rolling Mill

Billets shall be fed & heated in a reheating furnace then undergo size reduction in a series of rolling mill stands. Then, the rolled steel bars shall pass through a quenching system where it is rapidly cooled. The cooled bars shall then be cut into the desired length, then sorted, bundled and stockpiled prior to delivery. The production capacity of the proposed rolling mill will be 600,000 Metric Tons annually. Illustration of the process is shown below. Technical details on the subcomponents of the rolling mill are provided as caption for the succeeding illustrations.







FURNACE, to achieve rollable temperature of 1020°C to 1080°C, and measured through billet temperature profiler.









TEMPCORE is applied to assist rolling mill to achieve rebar target grade considering a flexible billet or off chemistry billet.







The rolled billet is pre-cut in **DIVIDING SHEAR** due to cooling bed limited length capacity of 80 meters.



BRAKING PINCH ROLL is used to decelerate and to control the bar landing in cooling bed.











1.5.1.2 Process Wastewater Treatment Plant (WTP)

The water treatment system is designed to handle both the direct and indirect cooling water from the rolling mill operations. Direct cooling water is the water which is in direct contact with the product, specifically the water used to cool the rolls in the bar mill line. Indirect cooling water on the other hand is the water that does not touch the products and stays inside the pipes and ducts. The WTP is designed to cool and recycle 2,720 m³/hr of direct cooling water and 1,020 m³/hr of indirect cooling water. The recycled water allows the mill to significantly reduce the amount of fresh water required. The equipment used in this WTP are five cooling towers, sedimentation basins, several filters and pumps.



Figure 1-6. Cooling Water Recirculating Process

1.5.1.3 Electrical Substation

A 115 KV substation which will consist of a 20 MVA power transformer will be installed as a requirement for the power supply of Rolling Mill and plant auxiliaries.Harmonic filters will also be installed for the rolling mill to be compliant with the Philippine grid code on the system power quality such voltage and frequency variations, flicker severity and harmonic distortions. Meralco will provide the power requirement of the mill, they will also provide the tapping point and the distribution line going to the mill Electrical Substation.



Other Ancillary Components:

- Water Catchment Pond to mitigate use of water
- Materials Recovery Facility for waste segregation and recovery of materials for recycling
- Fuel Tank for storing Low Sulfur Fuel Oil (LSFO) for air pollution control
- **Recuperator System** to reduce emission of greenhouse gasses
- Flue Stack with increased height

Proposed Increase in Production Capacity of the Steel Rolling Mill Project



Figure 1-7. Project Site Development Plan



1.5.2 Pollution Control Devices

The furnace is equipped with state of the art combustion automation for effective and efficient control of gas emission. The smoke stack is 50m high reducing impact on the immediate surroundings. The furnace also has a recuperator which is a special purpose counter-flow energy recovery heat exchanger positioned in the exhaust gas to recover the waste heat. Air/Fuel ratio and recuperator is controlled by Programmable Logic Control (PLC) through Human Interface Interface (HMI).

The plant has a closed loop water system. The water used in cooling the equipment and in the quenching process flows back to the cooling system, into the water tanks for settling particulates and recirculated back to the process. Domestic wastewater goes to the septic tanks which are regularly maintained/ siphoned by DENR recognized service providers. Thus, there's no water effluent from the plant. The drainage system is for rainwater.

1.5.3 Waste Management System

Scale

Scale is formed on the outer surfaces of plates, sheets or profiles when they are being produced by rolling red hot iron or steel billets in rolling mills. Mill scale is composed of iron oxides mostly ferric and is bluish black in color. It is usually less than 1 mm thick and initially adheres to the steel surface and protects it from atmospheric corrosion. Scales will be collected in containers and will be for sale abroad for recycling in sinter plants.

Used oil

Used oil will be collected and put inside sealed drums, stored in a company designated Material Recovery Facility (MRF) inside the plant. It will be transported and treated by a DENR accredited TSD facility.

Solid wastes

Solid Wastes will be properly segregated and to be disposed in the Material Recovery Facility of Meycauayan.Moreover, Busted Fluorescent Bulbs will be put in a container, stored inside the plant MRF in accumulation until there are sufficient inventory for proper disposal through a DENR accredited TSD facility.

For the contaminated rags and gloves, the wastes will also be put in bags, stored inside the plant MRF in accumulation until there is sufficient inventory for proper disposal through a DENR accredited TSD facility.

Used automotive batteries will be traded-in to designated suppliers.

Waste Items	Disposal Plan	Frequency	Responsible
1. Steel Scrap	Sorted and transferred to Meltshop (Calaca)	Every 20 MT / type availability	Scrap disposal
2. Mill scales	Stored/accumulated in storage	Every 2 months	Scrap disposal

Table 1-3. Waste Management System of SAMC



Waste Items	Disposal Plan	Frequency	Responsible
	yard. Sell to regular exporters.		•
3. Used oil	Sell/donate to DENR certified recyclers.	Weekly / depends on accumulated quantity.	Scrap disposal
4. Used grease	Sell/donate to DENR certified recyclers	Weekly / depends on accumulated quantity.	Scrap disposal
5. Domestic garbage	Collected by Municipal / Barangay garbage collectors or private haulers	Every 2 months	Plant Admin
6. Electricalwaste	Sell to accredited waste recyclers	Depends on accumulation	Scrap disposal
7. Scrap computers	Sell to accredited waste recyclers.	Depends on accumulation	Scrap disposal
8. Used car/truck batteries	Sell to accredited waste recyclers.	Depends on accumulation	Scrap disposal
9.Used rubber tires	Sell to accredited buyers.	Depends on accumulation	Scrap disposal
10. wood/crate materials	Sell to interested employees / donate	As available	Plant Admin
11. Empty paint tin cans	Sell/donate to DENR certified recyclers.	Depends on accumulation	Scrap disposal
12. Accumulated paint droplets	Sell/donate to DENR certified recyclers.	Depends on accumulation	Scrap disposal
13. Used gloves and rags	Sell/donate to DENR certified recyclers	Depends on accumulation	Scrap disposal
14. High valued scrap(copper, bronze)	Sorted and disposed through bidding	Depends on accumulation	Scrap disposal

SAMC manages wastes as per established procedure SA-IMS-CP-216 Waste Management Program.Proper waste segregation is observed using color coded containers.

- 1. Green- decomposing wastes, i.e. paper, carton boxes
- 2. Blue- non-decomposing wastes i.e. plastics, Styrofoam, rubber
- 3. Gray– used gloves, oily rugs
- 4. Yellow metal based wastes, i.e. metal cuttings, replaced parts, bolts, nuts,Slings, tie wires
- 5. Red- electrical wastes, i.e. electrical wires, carbon brush, bustedlamps, contactors (located at Electrical Shop)

Appropriate storage areas are identified:

Table 1-4. Storage for waste items						
Waste Items	Designated Storage	EHS Control				
1. Steel Scrap	Scrap yard:Column AB 22-24 and	Use of steel buckets/ sorting				
	Adjacent billet yard.					
2. Mill scales	Mill scale dumping area	Containment with oil trap.				
3. Used oil	Used oil /grease storage area	Covered storagewith containment				
4. Used grease	Used oil/grease storage area	Covered storagewith containment				
5. Domesticgarbage	Waste segregation facility	Contained in color coded and				
		labeled trash drums/bins.				
6. Electrical waste	Temporary storage only in Electrical	Red colored drums and Segregated				
	shop. Note: Busted fluorescent / high	from other wastes				
	bay lighting bulbs are segregated and					
	stored at waste hazard facility.					
7. Scrap computers	Stored in a container van at Mill 2 area	Segregated from other wastes.				

Waste Items	Designated Storage	EHS Control
8. Used	Hazard waste facility	Segregated from other wastes.
car/truckbatteries		
9.Used rubber tires	Waste segregation facility	Segregated from other wastes.
10.Wood / crate	Temporary storage only in respective	Offer to sell to interested
materials	areas.	employees.
11. Empty paint tin can	Waste segregation facility	Segregated from other wastes.
12. Accumulated paint	Hazard waste facility	Segregated from other wastes.
droplets		
13. Used gloves and	Hazard waste facility	Surrender to stores prior to
rags		issuance
14. High valued	Waste segregation facility	Segregated in sealed drum
<pre>scrap(copper, bronze)</pre>		

Work instructions on Waste Management

In addition to the above procedure on waste management, there are other established specific work instructions which specify operational controls to address significant environmental aspects which were identified in the regular aspect-impact assessment conducted by each department. Some of which are:

SA-WI-IMS-001 Proper Collection, Labeling & Storage of Waste Oil & Grease

SA-IMS-REF-006 General Health, Environment, & Safety Contractor's Guidelines

SA-WI-MM-101-17 Water Tank & Scalepit Descaling

SA-WI-EMAINT-108-01 Proper Handling & Storage of Refrigerant (for ACUs)

SA-WI-MM-101-45 Grease Trap Maintenance Procedure

Monitoring checklists are also being used to ensure controls are in place. Some of which are Safety & Housekeeping Inspection Checklists (includes checking of condition of secondary containment) & Process & equipment inspection Checklists of each maintenance group to ensure defined parameters are within set standards to prevent processes going out of control to avoid unnecessary loss of resources like power, water & fuel and that generated wastes are handled properly.

1.6 PROCESS/TECHNOLOGY

Process involve in the rolling mill are as follows:

Process	Process Description	Equipment	Input	By-Product		
Receiving of Billet	Imported or local billets are unloaded and piled up at the billet yard and handled using semi-gantry cranes; received and inspected as per set standards	Semi-Gantry Crane	Power			
Cold Charging/Re- heating of Billets	Billets are loaded by the semi- gantry crane to the charging table,transferred by rollers to the furnace, & reheated to achieve the required rolling temperature.	Semi-gantry crane, Charging table, rollers, Reheating	Fuel, Power	Scales- Complex iron oxide formed on the billet surface during reheating process.		

Table 1-5. Process in the rolling mill



Proposed Increase in Production Capacity of the Steel Rolling Mill Project

Process	Process Description	Equipment	Input	By-Product
		Furnace		
Rolling	Billet passes through rollers to reduce the cross section that results to elongation of the billet.	Rolling Stands	Power, Water, Lubrication, Compressed Air	Crop Ends- irregularly shaped head and tailsteel bars which are cut off to avoid cobbles
Water Quenching(for Rolling Mill1 only)	Steel bars passes through a quenching system where it is rapidly cooled by pressurized water to alter its strength grade.	Water Quenching System	Water	Scales- Complex iron oxide formed on the steel surface.
Cooling	Steel bars are air-cooled and transported to the discharge end by the cooling bed.	Cooling Bed	Power, Compressed Air	NA
Product Testing	A sample bar per batch will be cut from the cooling bed and will be submitted to QA Laboratory for physical, mechanical and chemical testing.	Cutting Torch, UTM, Spectrometer, Caliper, Weighing Scale	Power, Oxy acetylene	NA
Cutting	Steel bars are cut into commercial lengths.	Cold Shear	Power, compressed air	Short Bars- steel bars with length less than the commercial length.
Counting	Cut re-bars are conveyed to the assembly bed and separated by the mechanical chains to be ready for counting; An automatic screw counter will count the re- bars.	Rolling Mill 1: Automatic Screw Counter Rolling Mill 2: Manual Counting	Power	NA
Bundling	As one standard bundle is completed, the buffered re-bars will be conveyed to the automatic bundling machines (2 or 3 tie per bundle).	Bundling Machine	Bundling Wire, Power, Oil, Air	NA
Tagging & Color Coding	A tag indicating the actual grade, size, length will be attached to the bundled re-bars. The ends of the bundled re-bars are painted with colors depending on its grade.	Printer, paint spray	Wire, Tag, paint,	NA
Storage	Finished goods will then be transferred to the warehouse by the overhead cranes and will be ready for delivery to customers.	Overhead cranes	Power	NA

Figure 1-8 shows the Process Flow Chart and **Figure 1-9** show the photos. The only difference between process of Mill1 and Mill 2 is that Mill2 has no quenching process.

Proposed Increase in Production Capacity of the Steel Rolling Mill Project



BY-PRODUCT

Crop Ends/Bar Ends

Short Bars

Environmental Performance Report and Management Plan Proposed Increase in Production Capacity of the Steel Rolling Mill Project



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Figure 1-10 shows the Material Balance Diagram and Figure 1-11 to Figure 1-13 shows the Water Balance Diagrams.



Figure 1-10. Material Balance Diagram

Environmental Performance Report and Management Plan

Proposed Increase in Production Capacity of the Steel Rolling Mill Project



Figure 1-11. Current Water Balance Diagram of Mill 1

CHAPTER 1 Environmental Performance Report and Management Plan Proposed Increase in Production Capacity of the Steel Rolling Mill Project



Environmental Performance Report and Management Plan Proposed Increase in Production Capacity of the Steel Rolling Mill Project







Maintenance of Facilities

SAMC's maintenance departments are responsible for the equipment control and maintenance:

- Building & Grounds Maintenance Group is in charge of the general upkeep and cleanliness of buildings and grounds of the plant.A Facilities Engineer heads the group of technicians and facilities maintenance personnel.
- Mechanical Maintenance Department is responsible for the maintenance of mechanical equipment such as the water cooling system, spindles, drives, inhouse vehicles and heavy equipment, etc.
- Electrical Maintenance Department is responsible for the maintenance of electrical equipment and facilities like motors, PLCs, lightings, wirings, etc.

Each group has established Preventive Maintenance Programs for equipment and facilities under their management.

1.7 PROJECT SIZE

The production capacity will increase to 600,000 metric tons per year for Rolling Mill 1 (from 400,000 metric tons per year) and 100,000 metric tons per year for Rolling Mill2 (from not operational).The total annual production in metric tons per annum for the proposed project is 700,000.

Total project area is 18 hectares.

	Existing	Proposed
Rolling Mill 1 Capacity (in metric tons per year)	400,000	600,000
Rolling Mill 2 Capacity (in metric tons per year)	Not operational	100,000
Project Size (in hectares)	18	18

Table 1-6. Size of existing and proposed project

1.8 DEVELOPMENT PLAN, DESCRIPTION OF PROJECT PHASES AND CORRESPONDING TIMEFRAMES

1.8.1 **PRE-CONSTRUCTION**

There will be no additional land to be acquired.Permit applications necessary for land developments and construction are to be considered in the contracts with contractors.Around 30 trees will be cut inside the SAMC property and necessary tree cutting permit will be secured.

1.8.2 CONSTRUCTION

Development phase is comprised mostly of civil works construction. It is estimated that the construction of all the necessary structures will be finish in approximately nine (9) months. The major activities are as follows:



Proposed Increase in Production Capacity of the Steel Rolling Mill Project

- Mobilization of personnel and equipment
- Clearing and grubbing
- Earthworks/ Excavation
- Structural/ Civil Works
- Utilities
- Sanitary
- Plumbing
- Electrical
- Mechanical
- Finishing
- Equipment Installation
- Landscaping of Open Spaces/Open Space Development
- Demobilization

Environmental Performance Report and Management Plan

Proposed Increase in Production Capacity of the Steel Rolling Mill Project

The schedule of activities for each project component is presented in **Figure 1-14** and **Figure 1-15**.

8

2 3 4 5 6 7

1

NEW FURNACE BUILDING

- 1 Site Inspection
- 2 Clearing Activities
- 3 Structural Reworks
- 4 Furnace Foundation Works
- **5** Structural Erection

Wall



WEEKS

9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

1 Clearing Activities

2 Grading Activities

3 Civil works

Figure 1-14. Project Schedule for Mill 1

Environmental Performance Report and Management Plan

Proposed Increase in Production Capacity of the Steel Rolling Mill Project

For Rolling Mill2, following facilities and equipment will either be replaced or repaired on the following timelines:

Mill 2 Activities	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Roof Replacement with sidings for M2						
Replacement of Furnace Skid rail						
Smokestack rehabilitation (1 lot)						
Electric Wire Rope Hoist 10Ton Capacity (1unit)						
Abus Hoist Motor 2.3 / 14.8Kw (1unit)						
Garbarino Pump (2units)						
Oil Pump Viking (4units)						
Gridmember for Roughing Mill						
Universal Cross Joint for Finishing Mill						
Gear Tandem Intermediate Mill						
1-set Winflex coupling 95T						
Gear Motor 1:30 10Hp 440V (2 units)						
Repair 1500Hp AC motor						
3-Units Frequency Converter 22Kw						
4-Units Frequency Converter 5KW						
1 unit 2500 kVA transformer						
Testing of all equipment						

Figure 1-15. Project Schedule for Mill 2

The rainwater reservoir is still at evaluation and design stage.



1.8.3 OPERATION

Permit to Operate for the Furnaces of both Mills will be secured from the Regional Office of EMB-Region III.Commissioning will last for about 1 month to establish the new parameters for the efficient operation of the furnace and of the mill. Standard configurations will then be established like Furnace Temperature Control, Rolling Mill Setup, and Delay Strategies.

1.8.4 DECOMMISSIONING/ABANDONMENT/REHABILITATION

Should there be case wherein the project will be abandoned, activities to be performed shall include Environmental Site Assessment to determine contaminants left by the operation and also dismantling and clean-up of the areas of operation.

1.9 MANPOWER

1.9.1 Manpower Requirements

Currently, SAMC has 415 plant employees. With the expansion, below additional manpower is required. **Table 1-7** shows that 175 workers will be hired for construction stage and 148 workers for the operation stage. A total of 323 manpower will be required for the construction and operation of the proposed expansion project.

Table 1-7. Hanpower requirements for proposed expansion project							
Component	Existing		Proposed Expansion				
component	Manpower	Direct	Indirect	Position	Qualification		
Construction		5		Project Engineers	Engineering graduate		
 New Furnace 			30	Skilled Workers (Welders,	Technical graduate		
for Mill 1				fabricators, steelman, mason)			
			20	Laborers	Elementary level		
- New			50	Skilled Workers (Welders,	Technical graduate		
Warehouse				fabricators, steelman, mason)	_		
			50	Laborers	Elementary level		
- Truck			10	Skilled Workers	Technical graduate		
Marshalling				(Fabricators, steelman, mason)			
Area			10	Laborers	Elementary level		
Sub-total			175				
Operation	415	27		Distribution Assistant	College Level		
		27		Riggers	Highschool graduate		
		5		Technicians	Technical Course / Vocational		
					Graduate		
		9		Mill Crews	Technical Course / Vocational		
					Graduate		
			20	Bundlers	Elementary level		
			30	Truck Drivers	Elementary level		
			30	Tuck Helpers	Elementary level		
Sub-total	415		148				
TOTAL	415		323				
Grand total							
(existing +							
proposed project		738					
manpower							
requirements)							

Table 1-7	. Manpower	requirements	for proposed	expansion project	t
					-



1.9.2 Scheme for sourcing locally from host and neighboring LGUs

The proponent shall give priority hiring to locals of the impact barangay whose skills and experience match theproject's specific needs. A local hiring scheme will be established in close coordination withthe concerned barangay Local Government Units (LGUs). In general, the proponent willprovide a list of anticipated job requirements with corresponding qualifications to the concerned barangay LGUs. These potential opportunities will be promoted by the barangayLGUs in their respective jurisdictions and potential applicants will be forwarded to the proponent, for further review and evaluation by the Human Resources office.

Consultations shall be made with the LGUs and host communities to finalize a scheme forhiring residents from host communities. Qualified local residents will be given priority inhiring. For technical positions not available in the host communities, the proponent reservesthe option to source its manpower requirements elsewhere. Compensation terms and theprocess of hiring will comply and adhere with existing labor laws, rules, and regulations.

Of the current 415 employees, 275 or 66% are from Meycauayan, Bulacan. A hundred (100) from this (or 24%)are from Bahay Pare, Meycauayan.

There is no indigenous group/people present in the project area.

1.10 PROJECT COST

The estimated project investment cost is 780.4 million.

CHAPTER 2 KEY ENVIRONMENTAL IMPACTS AND MANAGEMENT/ MONITORING PLAN

2.1 LAND

2.1.1 LAND USE AND CLASSIFICATION

2.1.1.1 EXISTING LAND USE

The Municipality of Meycauayan is bordered by the towns of Sta. Maria, San Jose del Monte, Marilao, and Obando in the province of Bulacan and City of Valenzuela. It is approximately 19 kilometers north of the City of Manila and 22 kilometers south of Malolos, the provincial capital. It is bounded on the east by Kalookan City, on the west by Obando, on the north by Marilao, and on the south by Valenzuela City.

It encompasses an aggregate area of 3,210 hectares, representing 1.17 percent of the total land area of the province of Bulacan.

Linking the municipality to major commercial centers of Luzon are two major transportation arteries, namely, North Luzon Expressway and MacArthur Highway. The municipality is easily accessible to all types of vehicle.

Meycauayan is presently composed of twenty-six (26) barangays, namely: Poblacion, Hulo, Banga, Tugatog, Bancal, Longos, Bayugo, Ubihan, Liputan, Zamora, Calvario, Saluysoy, St. Francis, Malhacan, Pandayan, Iba, Camalig, Lawa, Caingin, Langka, Libtong, Perez, Bahay-Pare, Bagbaguin, Pantok, and Pajo. Poblacion is the town's central business district.

The existing general land use of Meycauayan consists of the following (Table 2-1).

Residential

An area of 1,253.6785 hectares or 39.06 percent account for residential uses in all barangays situated mostly along the transport line or roadway. Other residents, however, built individually apart from the settlement cluster and are interspersed with other land uses.

The following barangays are classified as:

- R 1 Ubihan, Liputan, Camalig, Pajo and Bagbaguin
- R 2 Pantok, Iba, Perez, Bahay-Pare, Libtong, Langka and portion of Pandayan
- R 3 Saluysoy, Zamora, Calvario, Longos, Poblacion, Bayugo, Tugatog, Caingin, Lawa, Malhacan, Bancal, portion of Pandayan, Hulo, Banga, and St. Francis (Gasak)

Commercial

Commercial areas occupy 216.6985 hectares or 6.75 percent of the total land area of the municipality. Commercial activities are centered in the Poblacion and its nearby barangays.

The ensuing list of barangays are categorized as:

- GC Portion of Malhacan, Iba, Pantok, Camalig, Saluysoy and Bancal
- C1 Poblacion, Calvario, Hulo, Banga, portion of Saluysoy, Malhacan and St. Francis (Gasak)
- C2 Bancal, Bañga, Saluysoy

Institutional

The present institutional area of 20.76950 hectares or 0.65 percent include all schools, churches, chapels and other government and non-government buildings/offices located within the different barangays in the municipality.

Industrial

Big industrial establishments dispersed in different barangays covering an area of 766.2065 hectares or 23.87 percent of the municipality's total land area. Identified sites for this purpose are portions of Barangay Iba, Bancal, Camalig, Tugatog, Libtong, Pantok, Bahay-Pare, Perez and Bagbaguin.

Parks and Recreational Zone

Parks and recreational zone, which consists of memorial parks, recreational areas and other open spaces, constitutes 25.882 hectares or 0.81 percent.

Agricultural/Fish Ponds

Recent developments such as the establishment of new residential subdivisions and industries are significantly decreasing the agricultural areas in the municipality. Areas devoted to agricultural use account for 371.3 hectares or 11.57 percent for crop production while 517.465 hectares or 16.12 percent are for fishponds.

Land Use	Area (Hectares)	Percent
Residential	1,253.6785	39.06
Agricultural	371.3000	11.56
Commercial	216.6985	6.75
Industrial	766.2065	23.87
Institutional	20.7695	0.65
Fish Ponds	517.4650	16.12
Open Space	38.0000	1.18
Parks and Recreation	25.8820	0.81
Total	3,210.0000	100

Table 2-1. Existing Land Use in Meycuayan, Bulacan (2001)

Source: 2015-2016 Meycuayan Socio Economic Profile

2.1.1.2 LAND CLASSIFICATION

Land Classification of Bulacan in **Figure 2-1** shows that the whole City of Meycauayan is declared as Alienable and Disposable land. Alienable and disposable lands are those lands exempt from forest use and can be issued with a title.

Proposed Increase in Production Capacity of the Steel Rolling Mill Project



Figure 2-1. Land Classification Map of Bulacan



2.1.1.3 POTENTIAL IMPACTS AND OPTIONS FOR PREVENTION, MITIGATION AND ENHANCEMENT

2.1.1.3.1 IMPACTS IN TERMS OF COMPATIBILITY WITH EXISTING LAND USE

The project is located within an Industrial Zone based on the existing land use of Meycauayan City.

2.1.1.3.2 IMPACT ON COMPATIBILITY WITH CLASSIFICATION AS AN ENVIRONMENTALLY CRITICAL AREA (ECA)

The proposed project site is inside an Industrial Zone and classified as Alienable and Disposable land. Also, it is not located in any of the 12 ECA Categories identified in the Revised Procedural Manual of DAO 2003-30.

2.1.1.3.3 IMPACT IN EXISTING LAND TENURE ISSUES

There are no possible land issues since the area of the project site is a property the proponent.

2.1.1.3.4 IMPAIRMENT OF VISUAL AESTHETICS

There are no visually significant landforms/structures near the project area nor will result to damage to visual aesthetics of its vicinity. However, establishment of vegetation buffers are recommended.

2.1.1.3.5 DEVALUATION OF LAND VALUE AS A RESULT OF IMPROPER SOLID WASTE MANAGEMENT AND OTHER RELATED IMPACTS

Fifty tons of garbage are being collected daily in Meycauayan City as of 2014 (Socio-Economic Profile of Meycauayan City, 2015). The proponent implements its own waste management program as discussed in **Chapter 1.6.2**.

2.1.2 GEOLOGY/GEOMORPHOLOGY

2.1.2.1 SURFACE LANDFORM / GEOMORPHOLOGY

Topography

The general topography of the land is relatively flat with an almost gently rolling hills. Comfortably above sea level, this terrain is an interweaving of greenery and concrete road network. The slope of the land dips towards a west to north westerly direction. River and drainage waterways envelope and criss-cross the sea.

Based on **Figure 2-2**, the project area is located on a gently sloping to undulating (3-8%) slope.

Proposed Increase in Production Capacity of the Steel Rolling Mill Project



Figure 2-2. Slope map of Bulacan

2.1.2.2 SUB-SURFACE GEOLOGY

Regional Stratigraphy

Meycauayan City generally grouped under the Stratigraphic Grouping of Central Luzon Basin and Southern Sierra Madre-Mainland. The stratigraphic column of both groupings is extracted from the revised edition of the Geology and Mineral Resources of the Philippines shown in the figure.

					CENTRAL L	SIERRA MADRE MAINLAND	
PERIOD	EPOCH HOLOCENE	AGE	Ma	WEST SIDE			EAST SIDE
							Manila Formation
	PLEISTOCENE	3 Late 2 Middle 1 Early	0.0115	Demortia Formation	Bamban Formation	Guadalupe Formation	Antipolo Basalt
	PLIOCENE	3 Late 2 Middle 1 Early	2.59	Cataguintingan Formation Amleng	Tarlac		
	MIOCENE	3 Late	7.25 11.61 13.65	Mainta Formation Monones Formation		Tartaro Formation	
		2 Middle-				Madium Formation	Madlum Formation
		1 Early	20.43			Angat Formation	Angat Formation
PALEOGENE	OLIGOCENE	2 Late 1 Early	23.03	Aksitero Formation		Daughos Ecomotion	Sta. Ines Diorite
	EOCENE	4 Late 3 Middle - 2 1 Early	Late 37.2 Middle - 40.4 Early 48.6			Dayabas Pormailon	Maybangain Formation
	PALEOCENE	3 Late 2 Middle 1 Early	55.8 58.7 61.7				
CRETACEOUS	Upper	Late	00.0			Baronas - Baito Formation	Montalban Ophiolitic Comple
	Lower	Early					7 7 7
URASSIC	Upper	3 Late	145.5				
	Middle	2 Middle	175.6				
	Lower	1 Early	109.6				

GMRP, Volume 1: Geology

Edited by: Aurelio and Peña

Figure 2-3. Stratigraphic Column showing the Stratigraphic Groupings of Central Luzon Basin and Southern Sierra Madre (MGB, 2004)

Meycauayan City is underlain by two distinct lithologic units, the central portion is underlain by older rock sequence (Pleistocene) consisting of well-bedded tuffaceous clastics and welded tuff belonging to the Guadalupe Formation. This formation has an approximate thickness of 1,500 to 2,200 meters and it is composed of two members: Alat Conglomerate and the Diliman Tuff. The east and west of this elevated area, thick layers of very young (late Pleistocene to Recent), poorly-consolidated alluvial sands and clays are deposited which is now called as Manila Formation. This formation has an approximate thickness of 800 meters that overlies the Diliman Tuff in general. It is a sequence of unconsolidated fluvial, deltaic and marine deposits consists of clay, silt, gravelly sand and tuffaceous silt. Both formations are cut by the Valley Fault System.

Exposed along upstream of Malolos River and Meycauayan River where outcops of members of the Pleistocene Guadalupe formation. The Guadalupe formation has a lower Alat Conglomerate member and upper Diliman Tuff member, named after Diliman, Quezon City where typical examples are exposed.

The Alat Conglomerate are exposed as low, rolling hills from eastern and northern Montalban through the northern portion of Novaliches to San Jose del Monte. The conglomerate constituents are made up of poorly sorted to unsorted rounded boulders, pebbles and cobbles well cemented by finer calcareous materials. It contains interbeds of sandstone, mudstone and shale. Overall color is gray. The shale is buff to brown, silty, tuffaceous, soft, porous, homogenous and highly fractured. Its base with the underlying volcanics is composed of thickly set pebbles, cobbles and boulders ranging from two to eight inches in diameter consisting of basement complex rock types and also upper Tertiary volcanic cobbles and boulders. Beds are from flat to about 100 to the west.

Diliman Tuff is a thick series of well stratified andesitic tuff and tuffaceous sandstone, siltstone, shale, mudstone and conglomerate. Generally they are gray, buff, and brown. Some of the layers vary from a few centimeters to 4 meters or more and are of coarser material, which at times are gravely and full of pumiceous fragments of 3 to 5 cm. sizes. On the whole, both the thick and thin beds tend to lense out although an area of exposed impermeable tuff extends from Novaliches, Quezon City to southern Bulacan.

The "pyroclastics" is the lithologic unit mentioned in the Geologic Map of Bulacan from the the PDPFP 2011-2030 and its formation name is Guadalupe Formation as shown in the Stratigraphic Column where the lithologic members are the Diliman Tuff and the Alat Conglomerates.

The Alluvium would be the Quaternary period or Recent residual soil that may cover the rock formations and thickness would vary and may be verified by the geotechnical boreholes or from excavations done on site.

Proposed Increase in Production Capacity of the Steel Rolling Mill Project



Figure 2-4. Geologic Map of Bulacan (PDPFP, 2010-2030)

Structural Features

No geologic structures were observed in the project site. Based on the Valley Fault System map produced by the PHIVOLCS, the project site is quite far from the West Valley Fault (**Figure 2-5**). Although no surface structures were seen in the surface, subsurface structures may be present.



Figure 2-5 Tectonic Map of the Philippines (Source: PHILVOLCS)
2.1.2.3 GEOLOGIC HAZARDS

The geologic hazards that were identified to have potential impacts on the project are those related to seismicity and differential settlement.

2.1.2.3.1 Regional seismicity and Structures

The Philippine Islands' location along a major plate boundary almost guarantees that the levels of seismicity are high and earthquakes are large (moment magnitude [M] > 7). Based on the historical record, more than 50 earthquakes of Ms 7.5 and larger have struck the Philippines, most notable of these events have been the 1968 surface wave magnitude (Ms) 7.7 Casigman, 1976 Ms 7.9 Mindanao, and the 1990 Ms 7.7 Luzon earthquake. The figure shows the seismic distribution of some historical and recent earthquakes (Wong, et al, 2006).

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Figure 2-6. Historical Seismicity (1600-2006) and active faults in the Philippines (Wong, et al., 2007)

2.1.2.3.2 Fault related/seismic hazards

The high level of seismicity within the archipelago, averaging about five detectable earthquakes per day, is attributing to movements caused by the interaction of major tectonic plate boundaries along subduction zones and those generated from active faults. There are three major fault systems that may affect Meycauayan City, Bulacan Province and nearby Cities or Municipalities, namely: the Lubang (Verde Passage-Sibuyan Sea) Fault, the Valley Fault System and the Philippine Fault (Infanta Fault) that are all potentially active. Also, there are also subduction zone sources in the region that are potentially capable of generating earthquakes with greater than 8 magnitudes. The most significant is the Manila Trench subduction zone and the rest with a lesser amount occurs along the East Luzon Trough and the Philippine Trench (Wong, et.al, 2007) (Daligdig and Besana, 1993).

Lubang (Verde Passage-Sibuyan Sea) Fault. The Lubang Fault is an active strike-slip fault located about 138 km southwest of Meycauayan City, had also been the site of large earthquakes in the past, notably that of 1852 and 1972. However, the periodic stress release along this structure as indicated by the present high level of seismicity, lessens the potential for a major earthquake to come from this earthquake generator in the near future.

Philippine (Infanta Fault) Fault Zone (PFZ). About one-third of the destructive earthquakes that have impacted Bulacan were generated from the Philippine Fault Zone, a 1,300 km long strike-slip fault transecting the Philippine Archipelago. Although a majority of the most devastating earthquakes in Philippine history, including the 16 July 1990 event with a magnitude of 7.8 was produced by the PFZ, other segments along this geologic structure have not moved for a long time, thus constituting what are referred to as seismic gaps. These seismic gaps are potential sources of big earthquakes in the future, one such gap is located 81 km east of Meycauayan City, Bulacan.

Manila Trench. As mentioned earlier, the most significant subduction zone that may affect the metropolis is the Manila Trench. It is a 1,000 km-long zone between Taiwan and Mindoro Island in the Philippines. It is characterized by an east-dipping Wadati-Benioff zone that extends to ~200 km depth (Hamburger et al., 1983). Kinematic and geodetic studies indicate that Eurasia-Philippine Sea Plate convergence is accommodated primarily along the Manila Trench, and a lesser amount occurs along the East Luzon Trough and Philippine Trench (Galgana et al., 2007). Seismicity also indicates that the Wadati-Benioff zone varies from moderately dipping along the central part of the subduction zone to near vertical at both ends of the Manila Trench (Hamburger et al., 1983). Historically, the Manila Trench has had few large magnitude earthquakes. Only two Ms > 7 earthquakes have occurred west of Luzon during the past 100 years, in 1934 and 1948, and both are poorly located with respect to the subduction zone (Hamburger et al., 1983). Rowlett and Kelleher (1976) suggest that the 1948 earthquake was seaward of the trench, possibly related to intraplate faulting. Although the location of the 1934 Ms 7.6 earthquake is poorly constrained, it is close to where the Manila Trench changes trend from being more northsouth, south of 18° N, to northwest north of this latitude. It is approximately 194km from the project site.

Valley Fault System (VFS). The left lateral Valley Fault System forms a prominent escarpment for about 32 kilometers along the eastern margin of the Quezon City plateau. The Fault as it strikes nearly north-south extending from the eastern end of Tagaytay Ridge to as far north as the boundary of Rizal and Bulacan provinces. The fault skirts along the western shore of Laguna Lake and cuts through the Pasig-Marikina River Junction with local vertical displacement of at least 70 meters. Studies conducted by PHIVOLCS and USGS published in the Bulletin of the Seismological Society of America, reports that there were evidences of movements over the past 1300 to 1700 years thus Valley Fault System or "Marikina Valley Fault" is active. No recent seismic activity can yet be directly related to this fault but its proximity to the center of Metropolitan Manila (only 5 km) makes it a very significant tectonic feature (MGB, 2004). There is a range of 200 to 400 years is estimated as the recurrence interval of the studied part and a 6 to 7 magnitude earthquake is expected based on the predicted rupture length (Philippine Daily Inquirer, 2010). The VFS is about 15km from the project site.



Active Faults and Liquefaction Susceptibility Map of Region III

Figure 2-7. Active Faults and Liquefaction Susceptibility Map of Region III

The main hazard associated with earthquakes is intense ground shaking, with ground rupture/fissuring, liquefaction and landslides as collateral hazards. In general, intensity of ground shaking is magnitude-dependent, gradually decreasing with distance from the source. Difference in ground conditions, however, may cause deviations from this expected norm, particularly in areas underlain by recent alluvium or reclaimed areas.

Estimates of recurrence interval for earthquakes of a given range of magnitude (Ms) can be calculated from the annual rates of earthquake activity values derived by Thenhaus and others (1994). The estimated horizontal and vertical peak accelerations during an earthquake likely to occur in an area are useful information for designing buildings and other structures to withstand seismic shaking.

For zone inclusive of the project area, results are summarized in the table below.

within the regi	within the region (adapted from Themads and others, 1994).											
MAGNITUDE	ANNUAL RATE	INTERVAL										
(Ms)	(Frequency/year)	(years)										
5.2 to <5.8	0.32081	3										
5.8 to <6.4	0.12024	8										
6.4 to <7.0	0.04505	22										
7.0 to <7.3	0.01689	59										
73 to < 82	0.00633	157										

Table 2-2. Estimated recurrence interval for earthquakes of a given magnitude range within the region (adapted from Thenhaus and others, 1994).

Using the classification scheme of Fukushima and Tanaka (1990), ground condition at the project site can be classified as approximating that of medium soil. It can be noted that peak ground acceleration (PGA) for soft soil in the vicinity of the project site is \sim 0.39 to 0.40g, where g is the value of acceleration due of gravity (i.e. 9.8 m/s2). Projected magnitude and recurrence intervals have a 10 percent chance of being exceeded in 50 years.

This is based on the thickness of Pleistocene deposit above bedrock is more than 10 m and as shown in this map the project site is expected to experience above average levels of ground shaking.

2.1.2.3.3 Ground rupture

Ground surface rupture is the actual displacement and cracking of the ground surface along a fault trace. Displacement beneath a building that exceeds 1 or 2 inches can have a catastrophic effect. Surface rupture is confined to a narrow zone along an active fault. Rupture may happen rapidly during an earthquake and associated greater amount of displacement increases the longer the fault trace. Also the buffer zone against surface rupturing as recommended by PHIVOLCS is at least 5 meters on both sides as reckoned from the location of the fault line. Based on field investigation and analysis of topographic and geologic maps shows that the site is very far from the known active faults in the region and no known active fault structure directly passes the land property.

2.1.2.3.4 Liquefaction/differential settlements

Liquefaction is a process where particles of loosely-consolidated and water-saturated deposits of sand are rearranged into a more compact state. This results in the squeezing of water and sediments towards the surface in the form of "sand fountain" and creating a condition resembling "quicksand". In this phenomenon, the strength of the soil is reduced to a point where it is unable to support structures (Kramer, 1996).

This usually occurs in areas that are water-saturated, low-lying areas and situated in loose foundation such as sandy or silty deposits which are common in river banks, abandoned rivers, flood plains, coastlines and swamps.

There are engineering interventions that could in another way mitigate earthquake related hazards like liquefaction, which are by improving the strength, density and/or drainage characteristics of soil. This can be done through various ground improvement techniques. **Table 2-3** summarizes the liquefaction hazard mitigation techniques. (Kuwano, etal., 2010).

Type of technique	Liquefaction hazard mitigation techniques
Densification	Sand compaction pile, Vibroflotation, Dynamic
	compaction, Compaction grouting
Soil improvement	Grouting, Replacement
Lowering degree of saturation	Well point
Rapid dissipation of pore water pressure	Gravel drain
Deformation control	Sheet pile wall, Soil cement column wall

 Table 2-3. Examples of liquefaction hazard mitigation techniques

2.1.2.3.5 Mass movements

2.1.2.3.5.1 Subsidence

Metro Manila experiences subsidence but particularly in the western shores of Laguna de Bay as indicated by several data sets, including sea and lake level monitoring, etc. The sites of serious subsidence coincide with the areas with falling groundwater level. Also sites where a high rate of water pumping, and high rate of movement along the fissures in this area. The hazards of subsidence are many, such as: temporary flooding, permanent inundation, fissure formation and differential movement of the ground leading to drastic lowering of the groundwater levels. In addition, sewerage and polluted waters can access aquifers through fissures, and lead to groundwater pollution (Ramos, E.G. 1998).

From a recent report or statement of Dr. Mahar Lagmay (September 2011), many parts of Metro Manila are subsiding. Leveling data from the National Mapping and Resource Information Authority (NAMRIA) reveal areas in Metro Manila that sank 0.68 meter to 1.34 meters in 30 years (from 1979 to 2009). A big part of groundwater subsidence in Camanava (Caloocan, Malabon, Navotas and Valenzuela) is mainly due to excessive groundwater pumping by fishpond operators, according to a study by Rodolfo and Siringan in 2006.

With this phenomenon, the project site is most likely affected, thus proper mitigation in the engineering construction should be implemented. **Figure 2-8** shows a processed radar images taken from space from 2003 to 2009 showed blue areas of greater Metro Manila

that sank. The ground subsidence "hot spots" in the northern part of the metropolis are Navotas, Malabon, Caloocan and Manila, and neighboring areas of Guiguinto, Marilao and Meycauayan in Bulacan. Ground subsidence rates are up to 5.5 to 6 centimeters per year and are highest in Marilao, Meycauayan and Caloocan. The satellite image of Metro Manila shows movement of the ground. Blue areas correspond to sinking ground with the highest rates of subsidence at 5.5 cm per year. The image was processed by Narod Eco of the DOST project team.



Figure 2-8. Satellite image of Metro Manila shows movement of the ground

Blue areas correspond to land sinking up to 5.5 centimeters a year. Red means the ground is moving upward or laterally toward the radar satellite. This image was processed by Narod Eco of the project team of the DOST (contributed image from article of Dr. Lagmay from Philippine Daily Inquirer, 2011)

The circular-shaped pattern of sinking grounds in Metro Manila indicates overpumping of groundwater as the primary cause of subsidence. Unless excessive groundwater withdrawal is curbed in these areas, subsidence will continue. In 20 years, such rates mean that the ground surface will drop by more than a meter. This will aggravate flooding from heavy rainfall and constitute a coastal-dike breach hazard in areas near Manila Bay.

2.1.2.3.5.2 Settlement/expansive soil

Presence of expansive soil may pose ground foundation problems as a result of alternate swelling and contraction attendant with changing moisture content. As such structures foundered on it may in time deform or fail. In general, the distribution of expansive soils within the project area tends to be localized. However, it is necessary to review the geotechnical soil test to identify and map the actual areas potentially underlain by expansive soils. Once these areas are delineated, one or a combination of the remedial measures as mentioned in **Table 2-3** and including enumerated below may be adopted.

- Treatment of the soil by hydrated lime to reduce plasticity, and subsequently placed back in thin compacted lifts of not more than 20cm.
- Footings for shallow foundations (if implemented) must be founded deeply (between 1.2-2.0m) and below the expansive soil layer.

2.1.2.3.6 Flooding and Landslide

Historical Flooding¹

The coastal barangays of Obando, Bulakan, City of Malolos, Paombong, and Hagonoy experience flooding caused by the increasing tides of Manila Bay. There is also 23 days back-flooding from the provinces of Nueva Ecija and Pampanga through the Pampanga River System which affects the municipalities of Pulilan, Calumpit, and Hagonoy as the flood water drain towards Manila Bay.

Based on the Damage Assessment Report (as of November 2011) of the provincial government on typhoons Pedring and Quiel, the said typhoons affected more than 70 percent (395 barangays) of the total barangays in Bulacan involving 824,262 individuals equivalent to more than 27 percent of the total projected population of the province.

All municipalities/cities in Bulacan were affected by typhoon Pedring and Quiel except for the Municipality of Dona Remedios Trinidad. Seven towns namely Balagtas, Bocaue, Calumpit, Hagonoy, Obando, Paombong, and San Miguel reported that 100 percent of their barangays were affected.

In terms of the damages to agriculture, more than 35,776.91 hectares of production land for crops and 9,799.98 for fisheries in all the twenty-four towns in the province were lashed by typhoons Pedring and Quiel. The total damage to crops, poultry and livestock, and

¹ PDPFP of Bulacan, 2010-2030

fishery is estimated at 2.53 billion pesos, wherein about 89 percent is for crops, almost 9 percent for fishery, and 2 percent for poultry and livestock.

2.53 billion pesos, wherein about 89 percent is for crops, almost 9 percent for fishery, and 2 percent for poultry and livestock. As to the extent of damages to infrastructures, about 60-70 kilometers of provincial roads and a total of 5 kilometers of Farm-to-Market Roads (FMR) were affected and damaged by the flooding caused by the typhoons. Further, the 8qu Dam located in San Miguel was also destroyed which worsened the flooding in the municipality.

The estimated cost of damage amounted to about Php 40 million for the 9 provincial road networks; Php 20 million for the FMRs; and more than Php 53 million for the irrigation facilities.

Flood Susceptibility

Based on the map from Mines and Geosciences Bureau (DENR-MGB) the areas susceptible to flooding are all of the municipalities and cities in Bulacan in varying susceptibility levels except for the municipality of Dona Remedios Trinidad which is not susceptible to flooding.

Lower parts of Meycauayan City are susceptible (low susceptibility) to flooding colored in yellow. Upper parts of the city, where the project is located, is classified as 'less likely to be flooded'.

Landslide Susceptibility

Rain-induced map of Meycauayan City shows that Barangay Bahay Pare has low susceptibility to rain-induced landslide.





AREADY FOR GMMA PROJECT: PRELIMINARY FLOOD HAZARD MAP OF BULACAN

Figure 2-9. Flood Hazard Map of Bulacan



Figure 2-10. Landslide and Flood Susceptibility Map (Mines and Geosciences Bureau, 2008)

Environmental Performance Report and Management Plan



Figure 2-11. Flood Hazard Map of Meycauayan City, 2016



Figure 2-12. Rain-induced Landslide Map of Meycauayan City, 2016

2.1.3 PEDOLOGY

Four distinct types of soil classification comprise the soil structure of Meycauayan. These are the Prenza clay loam, Prenza silty loam, Obando fine sandy loam and the Bulacan hyrosol. Prenza clay loam has a characteristic of having volcanic materials and highly suited to rice production. This type of soil generally constitutes the northeastern part of the municipality, representing 39.95 percent of the municipality's total area. The Prenza silty loam is likewise suited to rice and to production of vegetables and this type represents 21.28 percent of the total land area. On the other hand, it can be noted that the Bulacan hydrosol type shares a great percentage of the soil types, which is 28.27 percent. This type of soil is generally found at the northwestern portion of the municipality and usually planted with nipa palm and can produce other aquatic resources. The Obando fine sandy loam is the least type of soil classified in Meycauayan, covering only 10.50 percent of the total land area. This type of soil area. The **Prenze** suited to rice, sugar cane and vegetables (**Table 2-4**, **Figure 2-13**).

SOIL TYPES	BRIEF DESCRIPTION	AREAS (has.)	PERCENT
Prenza Clay Loam	Alluvial deposits of fine loam over clay soil, deep, moderately well drained	1,282.40	39.95
Bulacan Hydrosol	Containing water	907.46	28.27
Prenza Silty Loam	Weakly stratified alluvium, subject to severe seasonal river flooding	683.09	21.28
Obando Fine Sandy Loam	Moderately fine loam, well drained	337.05	10.50
TOTAL		3,210.00	100.00

Source: Meycauayan CLUP (1990

The barangays covered by the soil classification are as follows:

Prenza Clay Loam	-	Pantok, Camalig, Pajo, part of Iba, Perez, Bahay-						
		Pare, part of Libtong, and Bagbaguin						
Prenza Silty Loam	-	Pandayan, Malhacan, part of Iba, part of Libtong,						
		Langka, Lawa, Caingin, Tugatog, and part of Bancal						
Obando Fine Sandy Loam	-	Saluysoy, Longos, Zamora, Poblacion, Gasak,						
	Calvario, Bayugo, Hulo, Banga, part of Bancal							
Bulacan Hydrosol	-	Ubihan, Liputan						
Prenza Silty Loam Obando Fine Sandy Loam Bulacan Hydrosol	-	Pandayan, Malhacan, part of Iba, part of Libtong, Langka, Lawa, Caingin, Tugatog, and part of Bancal Saluysoy, Longos, Zamora, Poblacion, Gasak, Calvario, Bayugo, Hulo, Banga, part of Bancal Ubihan, Liputan						



Figure 2-13. Soil Map of Meycuayan

2.1.4 TERRESTRIAL ECOLOGY

The project is located within an industrial area. The expansion area will utilize the existing parking lot/driveway near the administrative building. Except for grass and ornamental shrubs, no other terrestrial flora and fauna will be affected. As observed in **Figure 2-14**, on the whole, biodiversity is a non-issue in this case. There are no rare or threatened species of flora and fauna that will be affected by the project.

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Figure 2-14. Photo of the expansion area

2.2 WATER

2.2.1 HYDROLOGY/HYDROGEOLOGY

The project area is within the Meycauayan River watershed that drain in a south-westerly direction towards the Obando River before finally emptying to the Manila Bay. Northeast of the project is the Marilao River which also flows in a south-westerly direction, merging with the Meycauayan River towards Obando River. Using ArcGIS 10.1 and National Mapping and Resource Information Authority (NAMRIA) topographic maps, the drainage areas of the Bulacan major river systems were delineated (**Figure 2-17**). It was also noted that the project area is very near the watershed divide of the Marilao and Meycauayan Rivers.

Groundwater Potential

Based on the groundwater availability map shown below, the project area is underlain by local and less productive aquifers. This type of aquifer has very low to moderately high permeability with well yields mostly < 6 L/s.



Figure 2-15. Hydrogeologic / Groundwater Availability Map



Figure 2-16. River Network in Bulacan



Figure 2-17. Watershed/Drainage Map

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2.2.2 OCEANOGRAPHY

Study on Oceanography is not applicable since there is no subsea structure involved in the project.

2.2.3 WATER QUALITY

SAMC has one (1) effluent monitoring station located at the plant main discharge canal. Based on the historical data from March 2012 to June 2016, as reported in their SMR, all are within the DENR standards. **Figure 2-18** to **Figure 2-22** presents the trend results of parameters monitored (COD, BOD, pH, TSS, oil and grease)

The water quality of Steel Asia Manufacturing Corporation and are all within the DENR standards.



Figure 2-18. Monitoring results for COD (Mar 2012 – Jun 2016)



Figure 2-19. Monitoring results for BOD (Mar 2012 – Jun 2016)



Figure 2-20. Monitoring results for pH (Mar 2012 – Jun 2016)



Figure 2-21. Monitoring results for TSS (Mar 2012 – Jun 2016)



Figure 2-22. Monitoring results for Oil and Grease (Mar 2012 – Jun 2016)

Water testing with the additional parameters like DO, Trace metals, coliform, etc. only started March 2017 as required by the MMT in which sample is now being taken from the last tank of the recirculating water system. Since there's no water discharge from the process, this testing may eventually be ceased and was just being done for evaluation purpose of the MMT. Water from canals are rainwater from the plant compound and also

from Bahay Pare community. There are openings in the plant drainage system accommodating rainwater from the barangay.

Water Sampling points are shown below:

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Figure 2-23. Water Quality Sampling Map

Water quality sampling was also conducted at the nearest water body (Bagbaguin Creek) and deep well inside the plant. This will be used as baseline for water quality. Result are summarized below.

Parameter	Test Method	Unit	Deepwell	Bagbaguin Creek
pН	Electrometric Method	-	8.6	9.9
Temperature	Laboratory & Field Method	°C	31.9	28.5
Color	Visual Comparison	TCU	20	150
BOD	Azide Modification Winkler	mg/L	10	333
COD	Open Renwc Mllhod (SM52208)	Mg/L	23	849
DO	Winkler/Titrimetric	mg/L	6.2	<2.0
TSS	Gravimetry	mg/L	4.0	652
Oil & Grease	Gravimetry	mg/L	1.7	3.6
Barium	Hydride Generation	mg/L	<0.08	<0.08
Cadmium	Flame AAS	mg/L	< 0.003	<0.003
Lead	Flame AAS	mg/L	< 0.005	< 0.05
Iron	Flame AAS	mg/L	0.4	8.7
Manganese	Flame AAS	mg/L	0.08	0.9
Nickel	Flame AAS	mg/L	< 0.01	< 0.03
Mercury	Manual Cold Vapor AAS	mg/L	<0.0002	<0.0002
Zinc	Flame AAS	mg/L	<0.007	1.6
Cr ⁶⁺	DiphenylCarbazide	mg/L	<0.003	<0.006
Fecal Coliform	Multiple Tube Fermentation	MPN/100ml	1.1	540,000
Ammonia	Phenate Method	mg/L	0.4	17
Nitrate	Cadmium Reduction Method	mg/L	<0.006	0.5
Chloride	Argentometric Method	mg/L	448	274
Sulfate	Turbidimetric Method	mg/L	<5.0	70
Cyanide	Distillation - ISE	mg/L	<0.02	<0.02
Fluoride	SPADNS Method	mg/L	<0.02	0.7
Phosphate	Stannous Chloride Method	mg/L	0.07	6.2
<u>BTEX</u>				
Benzene	EPA 8260B	µg/L	ND	ND
Ethyl	EPA 8260B	µg/L	ND	ND
Benzene				
m/p-Xylene	EPA 8260B	µg/L	ND	ND
o-Xylene	EPA 8260B	µg/L	ND	ND
Toluene	EPA 8260B	µg/L	ND	86

 Table 2-5. Baseline Groundwater and Surface Water Quality in the Project Site

The project requires water for cooling purposes only. In order to avoid depletion of groundwater, the plant will utilize a Process Water Treatment facility. It will be a circulating water system with filtering and cooling processes. After treatment, fresh and clean water will again be used in the rolling mill equipment and in-line treatment system. A rain catchment pond will be constructed for water management purposes. Since water

is being recycled and there is no discharge, this will be an assurance that water quality in the area will not be depleted and will not deteriorate.

2.2.4 FRESHWATER ECOLOGY

Drainage form the project is directly discharged to the main canal of Ciudad Industria complex prior to Bagbaguin creek. Freshwater study is not applicable for this project.

2.2.5 MARINE ECOLOGY

Marine Ecology study is not applicable since the project does not involve activities, discharges and structure in marine waters.

2.3 AIR

2.3.1 METEOROLOGY/CLIMATOLOGY

2.3.1.1 CLIMATE

The climate at Meycauayan generally falls under Type I based on the Coronas Classification of Philippine Climate which means two pronounced seasons: dry from November to April and wet during the rest of the year. **Figure 2-24** shows the Climate Map of the Philippines. Tables in **Table 2-6** and **Table 2-7** show the climatological normal and extremes at PAGASA Science Garden Synoptic Station (The nearest synoptic station from the project site). This station is 20 km South Southeast (SSE) of the proposed expansion project site.

The eastern portions of the region are directly exposed to the open sea. The presence of this open sea consequently promotes additional amount of sea moisture over Meycauayan. The southwest wind (during the southwest monsoon season) from the South China Sea moves northeastward to the western coasts of the province. The wind arrives at Meycauayan as southwesterly winds. When the southwest monsoon season intensifies, the southwesterly wind is more prevalent. During the transition of the NE monsoon, the NE wind is the most prevalent wind at Meycauayan.



Figure 2-24. Climate map of the Philippines

2.3.1.2 RAINFALL

Projected Rainfall in 2020 and 2050 and Extreme Rainfall Events

Based on a 30-year climatological normal record, (1981-2010) at Science Garden Science Garden, the total annual rainfall is 2574.4 mm. At Science Garden, the amount of rainfall is relatively lower during the months of January and February with an average of 16.6 mm. Based on the same reference, the annual average number of rainy days per year is 153 days or about 42% of the year. **Figure 2-25** shows the monthly average rainfall data.



Figure 2-25. Monthly Average Rainfall (1981-2010)

2.3.1.3 CLIMATOLOGICAL NORMALS AND EXTREMES

The following tables present the climatological normals and extremes from PAGASA Science Garden Synoptic Station.

	Rainf	all	Temperature							Wi	nd		No. Days w/			
Month	Amount	No.	Max	Min	Mean	Dry	Wet	Dew	Vapor	Rel.	MSLP	DIR	SPD	Cloud	TSTM	LTNG
		of				Bulb	Bulb	Pt.	Pressure	Hum.				Amount		
	(mm)	RD	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)	(mbs)	%	(MBS)	(16 pt)	(mps)	(okta)		
JAN	18.5	4	30.6	20.8	25.7	25.3	22.2	20.9	24.6	76	1012.3	N	1	5	1	0
FEB	14.6	3	31.7	20.9	26.3	26.0	22.3	20.8	24.4	73	1012.0	NE	1	5	0	0
MAR	24.8	4	33.4	22.1	27.8	27.6	23.2	21.5	25.4	69	1011.3	SE	1	4	2	1
APR	40.4	5	35.0	23.7	29.4	29.2	24.4	22.7	27.2	67	1009.7	SE	1	4	4	2
MAY	186.7	12	34.7	24.7	29.7	29.3	25.3	23.9	29.5	72	1008.5	S	1	5	12	8
JUN	316.5	18	33.1	24.6	28.8	28.4	25.5	24.5	30.6	79	1008.1	SW	1	6	17	9
JUL	493.3	22	31.9	24.1	28.0	27.5	25.2	24.4	30.5	83	1007.7	SW	2	6	19	9
AUG	504.2	23	31.3	24.2	27.8	27.3	25.2	24.5	30.6	84	1007.4	SW	2	7	17	6
SEP	451.2	22	31.6	24.0	27.8	27.2	25.1	24.4	30.4	84	1010.6	SW	1	6	18	9
OCT	296.6	18	31.6	23.5	27.6	27.0	24.7	23.9	29.5	83	1008.8	N	1	6	11	6
NOV	148.8	14	31.4	22.7	27.1	26.5	24.1	23.2	28.4	82	1010.1	N	1	5	5	1
DEC	78.7	8	30.5	21.6	26.0	25.5	22.8	21.7	25.9	79	1011.5	N	1	5	1	0
ANNUAL	2574.4	153	32.2	23.1	27.7	27.2	24.2	23.0	28.1	78	1009.8	Ν	1	5	107	51

Table 2-6. Climatological Normals (1981-2010, PAGASA Science Garden)

 Table 2-7. Climatological Extremes (1961-2011, PAGASA Science Garden)

MONTH		TEMPERAT	rure (ª	°C)	GREATEST DAILY RAINFALL (MM)		HIGHEST WIND (MPS)			SEA LEVEL PRESSURES (MBS)			
	HIGH	DATE	LOW	DATE	AMOUNT	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE
JAN	34.7	01-17-1998	15.5	01-27-1987	55.8	01-16-1988	24	ESE	01-17-1972	1021.4	01-21-2005	998.8	01-22-1989
FEB	35.6	02-24-1967	15.1	02-04-1987	35.8	02-20-2001	22	SSE	02-02-1992	1020.1	02-08-1973	1002.3	02-09-1985
MAR	36.8	03-26-1983	14.9	03-01-1963	44.8	03-15-1989	26	S	03-16-1992	1021.0	03-05-2005	997.8	03-28-1988
APR	38.0	04-25-1998	17.2	04-05-1963	47.2	04-23-1985	26	SSE	04-07-1992	1016.9	04-05-1998	1001.4	04-16-2007
MAY	38.5	05-14-1987	17.8	05-03-1962	166.0	05-20-1966	40	N	05-10-1992	1015.1	05-28-1986	992.4	05-17-1989
JUNE	38.0	06-02-1993	18.1	06-27-1961	334.5	06-07-1967	37	SW	06-25-1972	1014.9	06-07-1997	978.7	06-26-1993
JULY	36.2	07-20-1998	17.7	07-23-1961	246.4	07-07-2002	36	NNW	07-09-1977	1015.0	07-01-1979	989.2	07-15-1978
AUG	35.8	08-10-1962	17.8	08-23-1964	223.0	08-15-1979	32	N	08-22-2000	1015.3	08-23-2002	994.2	08-24-1978
SEP	35.4	09-04-1988	20.0	09-08-1964	455.0	09-26-2009	35	NE	09-28-2006	1016.0	09-28-1997	987.4	09-30-1995

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монтн		TEMPERA	TURE (°C)	GREATEST DAILY RAINFALL (MM)		HIGHEST WIND (MPS)			SEA LEVEL PRESSURES (MBS)			
	HIGH	DATE	LOW	DATE	AMOUNT	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE
OCT	35.4	10-09-2003	18.6	10-31-1967	209.3	10-18-1975	30	SE	10-11-1989	1016.0	10-25-1986	978.7	10-23-1988
NOV	35.0	11-01-2001	15.6	11-12-1962	169.9	11-20-1966	50	NNW	11-03-1995	1019.1	11-18-1979	883.1	11-02-1995
DEC	34.7	12-15-1997	15.1	12-13-1988	87.2	12-22-1994	22	SE	12-22-1997	1020.0	12-27-2001	998.1	12-02-2004
ANNUAL	38.5	05-14-1987	14.9	03-01-1963	455.0	09-26-2009	50	NNW	11-03-1995	1021.4	01-21-2005	883.1	11-02-1995

2.3.1.4 AMBIENT AIR TEMPERATURE

Temperature

Seasonal changes of atmospheric humidity and cloudiness greatly affect temperature changes in the region. The average monthly maximum temperature at Science Garden ranges from a high of 35°C in the month of April to a low of 30.5°C during the month of December. The highest and lowest mean monthly temperature is 29.7°C and 25.7°C which occurs during the months of May and January, respectively. Being near to the in a coastal region, the annual variation in the mean monthly is insignificant. The mean annual temperature near the project site is 27.7°C with January being the coldest month and April and May being the warmest. The highest temperature ever recorded at Science Garden station is 38.5°C on May 14, 1987 while the coldest is 14.9°C on March 1, 1963.



Figure 2-26. Average Monthly Maximum Temperature (1981-2010, PAGASA Science Garden)

Relative Humidity

Atmospheric moisture content in the tropics is relatively higher than that in the upper latitude towards the continental areas. The Philippines is situated in the tropics, thus, the relative percentage of atmospheric humidity is higher. Relative humidity is expressed in percentage of water vapor present in air which is determined with psychrometric charts with the dry and wet bulb temperatures as input (Perry, 1973). Data on relative humidity as recorded at Science Garden shows the annual average of 78%. The relative humidity for the rest of the year varies slightly from the mean.



Figure 2-27. Relative Humidity (1981-2010, PAGASA Science Garden)

Cloud

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The mean annual cloud amount at Science Garden is 5octas. Cloudy months are from January to December (12 months period).



Figure 2-28. Cloud Amount (1981-2010, PAGASA Science Garden)

2.3.1.5 WIND SPEED AND DIRECTION

Wind vectors and stability conditions are the most important inputs to the assessment of material or pollutant dispersion in the atmosphere by modelling calculations. **Figure 2-29** show the wind vectors summary at Science Garden Synoptic Station for 2016. **Table 2-8**

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present the summaries/percentage frequency values of the wind vectors for historical Climatological Normal (1981-2010). Generally, there are three major air streams that influence the wind pattern of the region. These are the NE wind, SW wind and the easterlies (North Pacific Trades). However, for Science Garden station, the wind regimes are influenced by several factors such as building downwash and mountain ranges among others. At Science Garden station (based on climatological normal), the N wind prevails in the months of October until December. The NE wind prevails in the months of February. The SE wind prevails in the months of March until April. The SW wind prevails in the months of June until September. The mean annual wind speed in the region is 1 mps. In the Dispersion modeling, the recent 2016 Science Garden Data was used using AERMET ver 9.4 to process Surface and Profile met data require by AERMOD. Prevailing wind direction from the ENE and SSE recorded. Other direction from the SSW,S,E etc. were noted. Wind speed on the other hand, recorded at 39.2 % Calms and 31.9% ranges from 0.5 – 2.1 m/s).



Figure 2-29. Wind Rose Direction and Speed, % (2016, Science Garden)



Wind Class Frequency Distribution

Figure 2-30. Wind Class Frequency Distribution Counts, % (2016, Science Garden)

Month	Direction	Speed	Bar Pressure (mb)	Temp (degC)	RH (%)	RainFall (mm)	Cloud Cover	Global Horizontal Radiation (watt/m2)
January	1.4	223.8	1,009.6	27.2	68.5	0.2	5.6	115.2
February	1.40	235.25	1009.86	26.68	67.85	0.62	5.57	150.64
March	1.34	230.46	1008.31	28.03	64.28	0.11	6.09	46.64
April	1.36	290.75	1777.80	53.41	104.42	1.28	7.24	134.86
May	1.29	242.47	1391.41	41.47	85.08	3.10	6.30	156.15
June	1.13	207.67	1004.90	28.72	75.87	5.84	5.03	149.64
July	1.13	233.87	1035.77	28.85	78.55	9.55	4.83	156.15
August	1.39	228.06	1001.64	28.20	83.06	25.17	4.61	149.64
September	1.23	239.00	973.33	28.41	80.37	16.51	5.42	137.31
October	1.19	203.20	1003.62	28.40	77.90	9.85	5.35	113.93
November	1.13	129.67	1005.65	27.83	75.50	3.34	5.54	120.40
December	1.29	213.87	1005.76	27.56	74.87	4.05	4.89	107.52

Table 2-8. Monthly Wind Direction and Speed, % (2016, Science Garden)

2.3.1.6 OTHER METEOROLOGICAL PARAMETERS

Mean Sea Level Pressure

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Mean sea level pressure is also an important input to the assessment of the climate in the area of Meycauyan, Bulacan and the proposed plant site. The passage of the tropical cyclones causes the sea level pressure to drop owing to its cyclonic and divergence of wind. A low pressure area generally indicates the presence of a cyclonic weather disturbance in the northern hemisphere while a high pressure value indicates a divergence of wind or a fair weather condition. **Table 2-9** presents the monthly average values of the mean sea level pressure at Meycauyan.

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1961	1015	1012	1014	1011	1009	1009	1009	1008	1009	1010	1013	1012	1011
1962	1013	1015	1012	1012	1010	1010	1007	1009	1010	1010	1011	1014	1011
1963	1014	1015	1014	1012	1010	1009	1010	1009	1009	1012	1013	1013	1012
1964	1014	1015	1014	1011	1009	1009	1010	1008	1008	1009	1009	1012	1011
1965	1013	1013	1013	1012	1010	1010	1009	1010	1010	1012	1012	1013	1011
1966	1015	1013	1011	1010	1009	1010	1008	1008	1008	1011	1009	1010	1010
1967	1013	1013	1012	1011	1009	1008	1007	1007	1009	1009	1011	1013	1010
1968	1012	1014	1012	1012	1009	1010	1008	1007	1008	1011	1013	1013	1011
1969	1013	1013	1013	1012	1009	1009	1008	1009	1007	1010	1011	1012	1010
1970	1013	1013	1011	1011	1009	1009	1009	1007	1008	1008			1010
1971				1009	1008	1009	1007	1009	1008	1008	1011	1011	1009
1972	1012	1011	1012	1012	1009	1008	1005	1009	1009	1012	1012	1013	1010
1973	1013	1014	1013	1011	1010	1008	1008	1008	1010	1008	1009	1011	1010
1974	1011	1011	1012	1010	1009	1007	1008	1006	1009	1006	1008	1011	1009
1975	1013	1013	1011	1010	1009	1008	1009	1007	1009	1008	1011	1011	1010
1976	1012	1012	1011	1011									1012
1977	1011	1013	1014	1011	1009	1009	1007	1008	1007	1011	1011		1010
1978	1013	1015	1011	1011	1008	1008	1007	1006	1007	1007	1011	1013	1010
1979	1014	1012	1012	1010	1009	1009	1008	1008	1009	1009	1010	1013	1010
1980	1013	1013	1012	1011	1009	1009	1008	1008	1010	1010	1009	1010	1010
1981	1011	1008	1012	1011	1008	1007	1007	1006	1008	1009	1010	1013	1009
1982	1013	1012	1011	1011	1009	1008	1007	1007	1009	1010	1011	1012	1010
1983	1014	1014	1013	1010	1009	1009	1008	1008	1008	1009	1010	1012	1010
1984	1011	1011	1011	1009	1008	1007	1007	1005	1009	1008	1010	1010	1009
1985	1012	1008	1011	1007	1008	1006	1007	1006	1008	1008	1011	1011	1009
1986	1012	1012	1011	1010	1008	1007	1008	1005	1008	1010	1009	1013	1009
1987	1014	1015	1013	1011	1010	1008	1008	1009	1008	1009	1008	1011	1010
1988	1011	1011	1009	1009	1007	1007	1007	1008	1006	1005	1009	1011	1008
1989	1010	1010	1009	1008	1007	1007	1006	1006	1007	1008	1010	1012	1008
1990	1011	1013	1012	1009	1007	1006	1006	1005	1007	1009	1009	1012	1009
1991	1012	1012	1011	1009	1008	1008	1007	1006	1007	1007	1010	1012	1009
1992	1014	1012	1012	1009	1008	1006	1008	1006	1007	1007	1011	1012	1009
1993	1011	1011	1010	1008	1007	1006	1005	1005	1007	1008	1007	1007	1008
1994	1011	1011	1012	1009	1006	1009	1007	1007	1009	1010	1013	1013	1010
1995	1014	1013	1012	1011	1011	1009	1010	1009	1009	1009	1010	1012	1011
1996	1012	1013	1011	1009	1009	1010	1006	1008	1007	1009	1009	1012	1010

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1997	1012	1012	1013	1012	1010	1009	1009	1010	1012	1012	1013	1013	1011
1998	1014	1014	1014	1013	1010	1011	1010	1011	1009	1008	1010	1012	1011
1999	1011	1014	1009	1010	1010	1009	1008	1009	1009	1010	1011	1011	1010
2000	1013	1011	1010	1009	1009	1010	1007	1008	1009	1008	1010	1011	1009
2001	1012	1010	1011	1010	1008	1008	1007	1007	1009	1010	1010	1013	1009
2002	1014	1015	1012	1008	1011	1010	1009	1010	1009	1007	1010	1011	1010
2003	1013	1011	1011	1007	1007	1009	1009	1009	1009	1010	1011	1014	1010
2004	1014	1013	1011	1011	1009	1008	1009	1007	1011	1011	1011	1012	1011
2005	1014	1014	1014	1012	1009	1009	1009	1009	1009	1010	1011	1011	1011
2006	1012	1013	1010	1011	1010	1009	1008	1010	1009	1010	1011	1011	1010
2007	1013	1013	1012	1011	1009	1008	1008	1008	1297	1009	1008	1011	1034
2008	1012	1012	1011	1009	1007	1009	1008	1009	1008	1010	1010	1011	1010
2009	1012	1011	1011	1009	1008	1008	1007	1007	1007	1008	1010	1012	1009
2010	1013	1013	1012	1011	1008	1009	1009	1008	1009	1007	1010	1009	1010
MEAN	1013	1012	1012	1010	1009	1008	1008	1008	1014	1009	1010	1012	1010

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2.3.1.7 POTENTIAL IMPACTS AND OPTIONS FOR PREVENTION, MITIGATION AND ENHANCEMENT

Contribution in terms of greenhouse gas emissions

Carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) emissions are all produced during fuel oil combustion. Nearly all of the fuel carbon (99 percent) is converted to CO2 during the combustion process. This conversion is relatively independent of firing configuration. Although the formation of CO acts to reduce CO₂ emissions, the amount of CO produced is insignificant compared to the amount of CO₂ produced. CO₂ emissions for fuel oil vary with carbon content, and carbon content varies between the classes of oil grades.

The estimated computed annual GHG contribution due to fuel combustion is as follows:

Sourco	2016 Data	Expansion	Annual GHGs (tonnes CO2e)			
Source		Expansion	Current	Expansion		
Mill 1 Furnace combustion of fuel oil (liters/yr)	14,284,548	17,400,000	42,119	51,305		
Mill 2 Furnace combustion of fuel oil (liters/yr)		3,900,000		11,499		
Total GHGs (t	42,119	62,805				

Table 2-10. Annual GHG Contribution

Reference Calculation Tool:

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Word Resources Institute (2015) GHG Protocol Tool for Stationary Combustion Ver. 4.1
2.3.2 AIR QUALITY MODELING

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This air modeling report presents the objectives, technical approach, methodology conducted for the combined operation of the 80mt/hr Rolling Mill Furnace No. 1 and 20 MT/hr Rolling Mill Furnace No. 2 along with the fugitive dust emission from inside the building of SteelAsia Manufacturing Corporation (SAMC) located Ciudad Industria Bahay Pare, Meycauayan Bulacan. Two (2) scenarios was considered in this report; (1) Scenario 1: Furnace Stacks for Mills 1 and Mill 2; (2) Scenario 2: Scenario 1 + Building Volume Source Fugitive Dust Emission. Input data in model run will use 2 Units 70 MT/hr Low Sulfur Fuel Oil (LSFO)-fired Furnace (Total of 140 Mt/hr) taken from the High Street Still Mill in Calaca, Batnagas to represent both Meycauayan Mills, 80 MT/hr Rolling Mill No. 1 and 20 MT/hr Rolling Mill No. 2 (Total of 100 MT/hr) to depict worst case. This modeling report is part of the of Environmental Performance Report and Management Plan (EPRMP) for the application of Environmental Compliance Certificate (ECC) of the expansion project. The parameters subject for modeling are Particulate Matter(PM), Carbon Monoxide (CO), Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2), Lead (Pb) and Zinc (Zn) from the operation of above sources. The following are objectives of the study:

- To determine impacts of the project in terms of particulate and gaseous emission from the point and volume sources of the plant by generated 1-hr and 24-hr dispersion of the following criteria pollutants such as the ff: Particulate Matter(PM), Carbon Monoxide (CO), Sulfur Dioxide (SO2), Nitrogen Dioxide (NO2), Lead (Pb) and Zinc (Zn); and
- To determine primary impact area including locations of Area Sensitive Receptors (ARSs) based on maximum ground level concentration (GLC) at selected area receptors; and
- To determine whether the expansion has reached carrying capacity in terms of ambient air quality levels based on the plant's emission sources; and
- To recommend location of air quality monitoring stations.

2.3.2.1 FACILITY BACKGROUND

The proposed expansion Project consists of:

- A. Increase in production capacity of Rolling Mill 1 from 50mt/hr to 80mt/hr Rolling Mill 1, with ECC no. 9504-004-102C will have the following developments:
 - 1. New Pusher Type furnace will replace the current walking hearth furnace
 - 2. New smoke stack with height of 50 meters
 - 3. Additional 2 roughing mill stands
- B. Operation of Rolling Mill 2

Rolling Mill 2, formerly owned by Peninsula Steel Manufacturing was issued with ECC No. 8902-003-107A. It was not operational since its acquisition by SteelAsia. To keep

up with market demand, SteelAsia plans. This project will involve increase in rebar production capacity for Rolling Mill 1 from 50 mt/hr allowed in its existing ECC to 80 Mt/hr and 100,000 MT/year (approximately 20 MT/Hr for Rolling Mill 2).



Figure 2-31. Plant Bearing/Layout of SteelAsia Manufacturing Corporation (SAMC)

2.3.2.2 APPLICABLE STANDARDS

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The relevant guideline values with respect to discharge of pollutants from the source specific air pollutants and their respective averaging times are presented in **Table 2-11** and **Table 2-12**, respectively.

		Short Terr	n		Long Ter	m
Pollutants	ug/Ncm	ppm	Averaging Time	ug/Ncm	ppm	Averaging Time
Suspended						
Particulate Matter						
TSP	230		24-hour	90		1-year
PM10	150		24-hour	60		1-year
Sulfur Dioxide	180	0.07	24-hour	80	0.03	1-year
Nitrogen Dioxide	150		24-hour			
Photochemical	140	0.07	1-hour			
Oxidants as Ozone	60	0.03	8-hour			
Carbon Monoxide	35	30	1-hour			
	mg/Ncm	9	8-hour			

Table 2-11. National Ambient Air Quality Guideline for Criteria Pollutants

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		Short Terr	n	Long Term				
Pollutants	ug/Ncm	ppm	Averaging Time	ug/Ncm	ppm	Averaging Time		
	10							
	mg/Ncm							
Lead	1.5		3-months	1.0	1-year			

Source: Section 12 of RA 8749, Philippine Clean Air Act

Table 2-12. National Ambient Air Quality Standards for Source Specific Air Pollutants fromIndustrial Sources/Operations

	Conce	ntration	Averaging	Methods of Analysis /
Pollutants	ug/Ncm	ppm	Time (min)	Measurements
Ammonia	200	0.28	30	Nesslerization/ Indo Phenol
Carbon Disulfide	30	0.01	30	Tischer Method
Chlorine and Chlorine				
Compounds expressed	100	0.03	5	Methyl Orange
as Cl ₂				
Formaldehyde	50	0.04	30	Chromotropic Acid Method or MBTH Colorimetric Method
Hydrogen Chloride	200	0.13	30	Volhard Titration with Iodine Solution
Hydrogen Sulfide	100	0.07	30	Methylene Blue
Lead	20		30	AAS
Nitrogen Dioxide	375 260	0.20 0.14	30 60	Greiss-Saltzman
Phenol	100	0.03	30	4-Aminoantiphyrine
Cultur Dievide	470	0.18	30	Colorimetric -
Sultur Dioxide	340	0.13	60	Pararosaniline
Suspended Particulate				
Matter				
TSP	300		60	Gravimetric
PM10	200		60	

2.3.2.3 PROCESS FLOW AND AIR EMISSIONS

Fuel Combustion in the Furnace

Billets shall undergo size reduction prior to reheating and rolling. Then the steel bars shall be rapidly cooled then cut into the desired length, sorted, bundled and stockpiled prior to delivery. **Figure 2-32** and **Figure 2-33** shows the typical rolling Mill Steel Manufacturing Process.

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Figure 2-32. Process Diagram Rolling Mill Steel Manufacturing



Figure 2-33. Rolling Mill in Steel Manufacturing



Existing and Proposed Rolling Mill Plants and Related Pollution Control Devices

The proposed expansion Project consists of:

- A. Increase in production capacity of Rolling Mill 1 from 50mt/hr to 80mt/hr Rolling Mill 1, with ECC no. 9504-004-102C will have the following developments:
 - 1. New Pusher Type LSFO Fired furnace will replace the current walking hearth furnace
 - 2. New smoke stack with height of 50 meters
 - 3. Additional 2 roughing mill stands
- B. Operation of Rolling Mill 2

Rolling Mill 2, formerly owned by Peninsula Steel Manufacturing was issued with ECC No. 8902-003-107A. It was not operational since its acquisition by SteelAsia. To keep up with market demand, SteelAsia plans. This project will involve increase in rebar production capacity for Rolling Mill 1 from 50 mt/hr allowed in its existing ECC to 80 Mt/hr and 100,000 MT/year (approx. 20 MT/Hr for Rolling Mill 2).

2.3.2.4 STACK EMISSIONS

Particulate Matter Emissions (PM) in the manufacturing Process

PM composition and emission levels are a complex function of furnace firing configuration, operation, pollution control equipment, and fuel properties. The PM emitted by Low Sulfur Fuel oil (LSFO) furnace primarily comprises carbonaceous particles resulting from incomplete combustion. PM emissions from bunker C burning are related to the oil sulfur content.

Carbon Monoxide Emissions (CO) in the manufacturing Process

The rate of CO emissions from combustion sources depends on the fuel oxidation efficiency of the source. By controlling the combustion process carefully, CO emissions can be minimized. Thus, if a unit is operated improperly or is not well-maintained, the resulting concentrations of CO (as well as organic compounds) may increase by several orders of magnitude. Smaller Furnace, heaters, and furnaces typically emit more CO and organics than larger combustors. This is because smaller units usually have less high-temperature residence time and, therefore, less time to achieve complete combustion than larger combustors.

Nitrogen Oxides Emissions (NOx) in the manufacturing Process

Nitrogen Oxides NOx emissions from bunker C combustion are primarily nitric oxide (NO), with only a few volume percent as nitrogen dioxide (NO2). Nitrous oxide (N2O) is also emitted at a few parts per million. NOx formation results from thermal fixation of atmospheric nitrogen in the combustion flame and from oxidation of nitrogen bound in the coal. Experimental measurements of thermal NOx formation have shown that the NOx concentration is exponentially dependent on temperature and is proportional to nitrogen concentration in the flame, the square root of oxygen concentration in the flame, and the gas residence time. NOx emissions are lower as lower temperatures are applied in low temperature NOx burners applied in Furnace.



Sulfur Oxides Emissions (sox) in the manufacturing Process

Sulfur oxides (SOx) emissions are generated during combustion from the oxidation of sulfur contained in the fuel. The emissions of SOx from conventional combustion systems are predominantly in the form of SO2. Uncontrolled SOx emissions are almost entirely dependent on the sulfur content of the fuel. On average, more than 95 percent of the fuel sulfur is converted to SO2, about 1 to 5 percent is further oxidized to sulfur trioxide (SO3), and 1 to 3 percent is emitted as sulfate particulate.

Emission Load

Input data in Figure below shows the operation of 2 Units 70 MT/hr Low Sulfur Fuel Oil (LSFO)fired (Total of 140 Mt/hr) taken from the High Street Still Mill in Calaca, Batnagas to represent both Meycauayan Mills, 80 MT/hr Rolling Mill No. 1 and 20 MT/hr Rolling Mill No. 2 (Total of 100 MT/hr) to depict worst case scenario in the model run. *Two (2) scenarios was considered in this report; (1) Scenario 1: Furnace Stacks for Mills 1 and Mill 2; (2) Scenario 2: Scenario 1 + Building Volume Source Fugitive Dust Emission.* Modeling Parameters in Particulate Matter(PM), Carbon Monoxide (CO), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Lead (Pb) and Zinc (Zn). The source parameters of the stacks, such as stack height, stack inside diameter; flue gas exit velocity and temperature are summarized in the Table below.

	Stack Temp deg C	Stack Temp. (K)	VFR ((Ncm/Min)	S	Stack Diam (m)	Stack Area (m²)		a Stack Ht. (m)		VEL (m/s)
Mill 1 80 MT/Hr (USED 70 MT/Hr)	428	701	8	841.77		1.74	2.3	8	45.50		5.90
Mill 2 20 MT/Hr (USED 70 MT/Hr)	428	701	9	900.82		1.8	2.54		50.00		5.90
		Cor		oncentration (mg/Ncm)							
	PM		CO	NOx		S	Ox	Pb			Zn
Mill 1 80 MT/Hr (USED 70 MT/Hr)	25		8.00	251.00	251.00		3.00	0).097		0.001
Mill 2 20 MT/Hr (USED 70 MT/Hr)	25		8.00 251.0		38		3.00 (0.097		0.001
			Emission	Rate/Strengt	th (g	/s)					
	PM		CO	NOx		S	Ox		Pb		Zn
Mill 1 80 MT/Hr (USED 70 MT/Hr)	0.35	0.35 0.11		3.52		0	.53	1.3	1.36E-03		1.40E-05
Mill 2 20 MT/Hr (USED 70 MT/Hr)	0.38		0.12	3.77		0	.57	1.46E-03			1.50E-05

Table 2-13	. Point Sou	irce Input	(Scenario 1)
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Note: Data source are from the actual measured parameters



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<u>Table 2</u> HIGH STREET (SPV-AMC), INC. Phoenix Petroterminal & Industrial Park, Brgy. Salong, Calaca, Batangas 70 MT/hr Sanken Furnace									
Run Number Sampling Date Sampling Time	Run 1 29-Oct-16 1535H-1605H	Run 2 29-Oct-16 1616H-1646H	Run 3 29-Oct-16 1658H-1728H	Average	CAA Limit mg/Nm ²				
Volumetric Flow Rate (dec), dicmin	369.7	447.0	457.2	424.6					
Volumetric Flow Rate (actual), acrom	870.3	1,127.1	1,184.2	1,060.5					
Moisture Contout, %	4.7	4.8	5.1	4.9					
Stack Gas Temperature, 9C	391.7	437.8	455.2	428.2					
Carbon Dioxide Concentration, %	13.0	13.0	13.0	13.0	1.24				
Ocygen Concentration, %	7.0	7.0	7.0	7.0					
Process Rate Information Yearly Operating Hoors	8,220	8,220	8,220	8,220					
Sulfur Dioxide (SO ₃) Emissions Concentration, mg/Ncm Mass Emission Rate, kg/hr Annual Emission Rate, MT/yr	38 0.843 6.929	36 0.966 7.941	18 0.494 4.061	31 0.768 6.310	1,500				
Nitrogen Dioxide (NO2) Emissions Concentration, mg/Ncm Mass Emission Rate, kg/hr Annual Emission Rate, MT/yr	251 5.563 45.728	192 5.163 42.440	196 5.364 44.092	213 5.363 44.087	1,000				
Carbon Monoxide (CO) Emissions Concentration, mg/Ncm Mass Emission Rate, kg/hr	4 0.086	6 0.172	8 0.233	6 0.164	500				

Figure 2-34. Stack Test of 70 MT/day Furnace Calaca Plant (SO₂, NO₂, CO)

Run Number Sampling Date Sampling Time	Run 1 29-Oct-16 1049H-1155H	Run 2 29-Oct-16 1302H-1407H	Run 3 29-Oct-16 1423H-1530H	Average	CAA Limit mg/Nm ³
Volumetric Flow Rate (dry), dscmm Volumetric Flow Rate (actual), acmm Moisture Content, % Stack Gas Temperature, % Carbon Dioxide Concentration, % Oxygen Concentration, %	316.0 699.1 9.9 317.6 13.0 7.0	347.3 841.8 10.3 371.1 13.0 7.0	311.3 741.9 10.7 357.6 13.0 7.0	324.9 760.9 10.3 348.8 13.0 7.0	
Process Rate Information Yearly Operating Hours	8,220	8,220	8,220	8,220	
Particulate Matter (PM) Emissions Concentration, mg/Ncm Mass Emission Rate, kg/hr Annual Emission Rate, MT/yr	25 0.468 3.847	17 0.344 2.828	22 0.411 3.378	21 0.408 3.351	150
Lead (Pb) Emissions Concentration, mg/Ncm Mass Emission Rate, kg/hr Annual Emission Rate, MT/yr	0.097 0.001839 0.015117	0.057 0.001188 0.009765	0.010 0.000187 0.001537	0.055 0.001071 0.005806	10
Zinc (Zn) Emissions Concentration, mg/Ncm Mass Emission Rate, kg/hr Annual Emission Rate, MT/yr	<0.001 <0.001 <0.001	<0.001 <0.001 <0.001	<0.001 <0.001 <0.001	<0.001 <0.001 <0.001	100

Figure 2-35. Stack Test of 70 MT/day Furnace Calaca Plant PM, Pb. Zn)

2.3.2.5 SITE DESCRIPTION



The project is located within the 18 hectares property of SAMC in Ciudad Industria Bahay Pare, Meycauayan, Bulacan. The project boundary has coordinates of approximately 14° 46' 0.19" N latitude and 121° 5' 18" E longitude. The site can be reached from Manila through NLEX and then Malhacan Road or through Congressional Extension Road and Manufacturers Avenue. There are land transportation available in the area with several terminals such as one at El Camino Public Market and EMA Town Center. Iba Road is the main road artery to the project site. The access road to the site is within Ciudad Industria.



Figure 2-36. Site Development of SAMC Plant

2.3.2.6 METEOROLOGY

Meteorological Data

Meteorological data such as stability classes and wind speeds, mixing height, cloud cover among other are considered this model run. TIER 3 meteorological data was used. PAGASA NAIA Science Garden Station was the basis for meteorological background of the areas. Generally, the full meteorology was used to cover changes and seasons in the area.



Aermod meteorological data requires Surface characteristics in the form of albedo, surface roughness and Bowen ratio, plus standard meteorological observations (wind speed, wind direction, temperature, and cloud cover), are input to AERMET. AERMET then calculates the PBL parameters: friction velocity (u^*) , Monin-Obukhov length (L), convective velocity scale $(w13^*)$, temperature scale (2), mixing height (z), and surface heat flux (H). These parameters are then passed to the INTERFACE (which is within AERMOD) where similarity expressions (in conjunction with measurements) are used to calculate vertical profiles of wind speed (u), lateral and vertical turbulent fluctuations (Fv, Fw), potential temperature gradient (d2/dz), and potential temperature (2).

Wind Speed and Direction

The wind speed is used to determine: a) plume dilution, and b) plume rise downwind of the stack. These factors in turn affect the magnitude of the distance to the maximum ground level concentration.

Wind data are often recorded at existing plant sites as well as air quality monitoring stations. It is important that an equipment be to record such data. The equipment must properly design, sited, and maintained to record data that are representative of the direction and speed of the plume.



Figure 2-37. Aermod Surface Science Garden 2016





SOUTH

0.50 - 2.10 Calms: 0.01%

Stability

The stability category at any given time will depend upon static stability, thermal turbulence, and mechanical turbulence. It is generally estimated by a method which requires information on solar elevation angle, cloud cover, cloud ceiling height, and wind speed.

Mixing Height

The mixing height is the distance above the ground to which relatively unrestricted vertical mixing occurs in the atmosphere. When the mixing height is low, ambient ground level concentrations will be relatively high because the pollutants are prevented from dispersing upward.

Table 2-14. Aermod Surface Meteorology (SFC)

	Year	Month	Day	Julian Day	Hour	Sensible Heat Flux [W/m^2])	Surface Friction Velocity [m/s]	Convective Velocity Scale [m/s]	Vertical Potential Temperature Gradient above PBL	Height of Convectively- Generated Boundary Layer - PBL [m]	Height of Mechanically- Generated Boundary Layer - SBL [m]	Monin-Obukhov Length (m)	Surface Roughness Length [m]	Bowen Ratio	Albedo	Wind Speed - Ws [m/s]	Wind Direction - Wd [degrees]	Reference Height for Ws and Wd [m]	Temperature - temp [K]	Reference Height for temp [m]	Precipitation Code
Min.	2010	Jan	1	1	1	-999.0	-9.000	-9.000	-9.000	-999.0	-999.0	-99999.0	1.000	2.00	0.16	0.00	0.0	10.0	294.4	2.0	0
Max.	2010	Dec	31	365	24	397.0	2.247	3.211	0.005	4000.0	4000.0	8888.0	1.000	2.00	1.00	12.90	335.0	10.0	305.9	2.0	0
Graph																			V		
1	2010	Jan	1	1	1	-48.1	0.490	-9.000	-9.000	-999.0	824.0	221.4	1.000	2.00	1.00	3.10	141.0	10.0	298.9	2.0	0
2	2010	Jan	1	1	2	-48.1	0.490	-9.000	-9.000	-999.0	824.0	221.7	1.000	2.00	1.00	3.10	138.0	10.0	299.4	2.0	0
3	2010	Jan	1	1	3	-50.9	0.487	-9.000	-9.000	-999.0	816.0	205.0	1.000	2.00	1.00	3.10	144.0	10.0	299.1	2.0	0
4	2010	Jan	1	1	4	-48.1	0.490	-9.000	-9.000	-999.0	824.0	221.6	1.000	2.00	1.00	3.10	143.0	10.0	299.2	2.0	0
5	2010	Jan	1	1	5	-27.6	0.281	-9.000	-9.000	-999.0	398.0	72.8	1.000	2.00	1.00	2.10	93.0	10.0	299.5	2.0	0
6	2010	Jan	1	1	6	-49.8	0.488	-9.000	-9.000	-999.0	819.0	211.4	1.000	2.00	1.00	3.10	142.0	10.0	298.9	2.0	0
7	2010	Jan	1	1	7	-64.0	0.679	-9.000	-9.000	-999.0	1341.0	442.1	1.000	2.00	1.00	4.10	145.0	10.0	297.6	2.0	0
8	2010	Jan	1	1	8	36.5	0.395	0.370	0.005	50.0	686.0	-153.0	1.000	2.00	0.33	2.10	143.0	10.0	299.8	2.0	0
9	2010	Jan	1	1	9	129.9	0.587	1.272	0.005	574.0	1078.0	-140.9	1.000	2.00	0.21	3.10	47.0	10.0	298.6	2.0	0
10	2010	Jan	1	1	10	201.5	0.761	1.742	0.005	951.0	1589.0	-197.5	1.000	2.00	0.18	4.10	141.0	10.0	298.5	2.0	0
11	2010	Jan	1	1	11	253.1	0.614	2.006	0.005	1155.0	1180.0	-82.5	1.000	2.00	0.17	3.10	144.0	10.0	297.6	2.0	0
12	2010	Jan	1	1	12	281.6	0.619	2.202	0.005	1374.0	1168.0	-76.0	1.000	2.00	0.16	3.10	86.0	10.0	298.4	2.0	0
13	2010	Jan	1	1	13	267.3	0.463	2.247	0.005	1539.0	780.0	-33.6	1.000	2.00	0.16	2.10	143.0	10.0	297.9	2.0	0

	Year	Month	Day	Hour	Measurement Height [m]	1, if this is the last (highest) level for this hour, or 0 otherwise	Direction the wind is blowing from for the current level [degrees]	Wind Speed for the current level [m/s]	Temperature at the current level [C]	Standard deviation of the wind direction fluctuations [degrees]	Standard deviation of the vertical wind speed fluctuations [m/s]
Min.	2010	Jan	1	1	10.0	1	0.0	0.00	21.2	99.0	99.00
Max.	2010	Dec	31	24	10.0	1	335.0	12.90	32.8	99.0	99.00
Graph											
1	2010	Jan	1	1	10.0	1	141.0	3.10	25.8	99.0	99.00
2	2010	Jan	1	2	10.0	1	138.0	3.10	26.2	99.0	99.00
3	2010	Jan	1	3	10.0	1	144.0	3.10	26.0	99.0	99.00
4	2010	Jan	1	4	10.0	1	143.0	3.10	26.1	99.0	99.00
5	2010	Jan	1	5	10.0	1	93.0	2.10	26.4	99.0	99.00
6	2010	Jan	1	6	10.0	1	142.0	3.10	25.7	99.0	99.00
7	2010	Jan	1	7	10.0	1	145.0	4.10	24.5	99.0	99.00
8	2010	Jan	1	8	10.0	1	143.0	2.10	26.6	99.0	99.00
9	2010	Jan	1	9	10.0	1	47.0	3.10	25.5	99.0	99.00
10	2010	Jan	1	10	10.0	1	141.0	4.10	25.4	99.0	99.00
11	2010	Jan	1	11	10.0	1	144.0	3.10	24.5	99.0	99.00
12	2010	Jan	1	12	10.0	1	86.0	3.10	25.2	99.0	99.00
13	2010	Jan	1	13	10.0	1	143.0	2.10	24.8	99.0	99.00
14	2010	Jan	1	14	10.0	1	69.0	2.10	25.1	99.0	99.00
15	2010	Jan	1	15	10.0	1	0.0	0.00	24.3	99.0	99.00
16	2010	Jan	1	16	10.0	1	0.0	0.00	26.0	99.0	99.00
17	2010	Jan	1	17	10.0	1	141.0	2.10	25.3	99.0	99.00
18	2010	Jan	1	18	10.0	1	137.0	3.10	25.1	99.0	99.00

Table 2-15. Aermod Profile Meteorology (PFL)

Terrain

Terrain elevations have a large impact on the air dispersion and deposition modelling results and therefore on the estimates of potential risk to human health and the environment. Terrain elevation is the elevation relative to the facility base elevation. Complex Terrain illustrated in Figure below are those elevations defined as anywhere within 50 km from the stack, are above the top of the stack being evaluated in the air modelling analysis. AERMOD executes complex terrain situations. The model utilized elected terrain using SRTM3 terrain data processed by AERMAP terrain processor. This option assumes terrain height exceeds stack base elevation, model receptors are also assumed on elevated terrain. Figure below shows the terrain projections.

The AERMIC terrain pre-processor AERMAP uses gridded terrain data to calculate a representative terrain-influence height, also referred to as the terrain height scale. The terrain height scale, which is uniquely defined for each receptor location, is used to calculate the dividing streamline height. The gridded data needed by AERMAP is selected from Digital Elevation Model (DEM) data. AERMAP is also used to create receptor grids. The elevation for each specified receptor is automatically assigned through AERMAP. For each receptor, AERMAP passes the following information to AERMOD: the receptor's location (x), its height above mean sea level (z), and the receptor specific terrain height scale.



Figure 2-39. Terrain SRTM projection AERMAP ver 9.3

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Figure 2-40. 510 Digitail Terrain SRTM Elevation AERMAP ver 9.3

Other Sources of Air Emissions

Fugitive dust from Building was also considered in the model scenario using estimation based on Cold Milling and Billet cutting operation using US-EPA AP42 Emission Factors.



Source	EMISSION FACTOR RATING	Emission Factor	Unit ^a	Number of Facilities	Number of Tests	Test IDs
Electric arc furnace, ladle metallurgy, and melt shop (SCC 3-04-003-04) Charging, melting, slagging, tapping, ladle transfer to ladle furnace, ladle preheater, alloy addition to ladle furnace, ladle furnace melting, continuous casting Controlled by direct shell evacuation and roof canopy hood exhausted to baghouse	В	2.0E-2	lb/ton	14	28	1.2, 2.1, 2.2, 3.1, 3.2, 3.3, 4.2, 4.3, 4.4, 4.5, 5.1 (2 tests), 6.1, 6.2, 7.2, 7.3, 12.1, 12.2, 12.3, 13.4, 14.1, 14.2, 15.1, 15.2, 16.1, 16.2, 17.1, 21.3
Metallized briquetter (SCC 3-04-003-19) Controlled by wet scrubber	E	1.5E-1	lb/ton	1	5	18.1, 18.4, 18.6, 18.8, 18.9
Reheat furnace, natural gas-fired (SCC 3-04-003-14) Uncontrolled	Е	3.2E-2	lb/ton	1	6	18.2, 18.3, 18.5, 18.7, 18.10, 18.11
Reheat furnace, natural gas-fired (SCC 3-04-003-14) Uncontrolled	Е	3.5E-2	lb/MMBtu	1	1	19.1
Cold reversing mill (SCC 3-04-003-30) Controlled by high efficiency mist eliminator	E	1.9E-2	lb/ton	1	1	20.1
Billet cutting torches, natural gas-fired (SCC 3-04-003-60) Uncontrolled	Е	3.2E-2	lb/ton	1	1	22.1

Figure 2-41. US EPA AP 42 Emission Factors for Area Source in Steel Minimill

Table 2.4C. Endesian Loads	Values Course for	and Duilding (a		C
Table 2-16. Emission Loads	volume Source fro	оm Bullaing (a	dditional for	Scenario Z)

			Cold Reversing Mill	Billet Cutting Torches	Cold Reversing Mill	Billet Cutting Torches			
	MT/yr	Mt/hr	EF (Ib/ton)	EF (Ib/ton)	PM (g/sec)	PM (g/sec)	PM(g/sec)	Area	g/sec- m2
Furance 1 (Mill1)	60,000.00	80.00	0.0192	0.0320	0.19	0.32	0.51	139.00	0.00370
Furance 2 (Mill 2)	100,000.00	20.00	0.0192	0.0320	0.05	0.08	0.13	248.00	0.00052

2.3.2.7 BACKGROUND AIR QUALITY

2.3.2.7.1 Ambient Air Monitoring Stations

Considerations related to air quality monitoring data that is utilized in the air quality dispersion modeling analysis are discussed below.

Modeled ambient air concentrations only reflect the impacts from stationary industrial emission sources. Therefore, "background" concentrations are typically added to the modeled ground-level concentrations. These background concentrations include emissions from other sources (e.g., area and mobile sources, distant point sources, etc.). The background concentrations are summarized in **Table 2-17** below.

					Background		Pred	icted	Backgr Pred	ound + icted
		3/28/2.17			PM-10	Pb*	PM-10	Pb	PM-10	Pb
STATIO		/TIME of			Conc	Conc	Conc	Conc	Conc	Conc
N	LOCATION	Samplin		ong, LAIJ	(ug/N	(ug/N	(ug/N	(ug/N	(ug/N	(ug/N
		9			cm)	cm)	cm)	cm)	cm)	cm)
Station 1	Don Benito Yao Training Center	940-1040	285681	1633496	19	0.03	40	0.0146	59	0.0446
	Front Gate of	1049-								
Station 2	Rolls and Tackles	1149	285917	1633342	9	0.03	40	0.007	49	0.007
Station 3	Motorcycle Parking Area	1305- 1405	285699	1633015	6	0.03	40	0.0146	46	0.007
		1417 to								
Station 4	Near Gate	1517	285558	1632990	17	0.03	10	0.007	27	0.007
					200	23 (30 min)	200	23 (30 min)	200	23 (30 min)
LEGEND): * <0.03 va	lues assum	ed at 0.0	3 ug/Ncm a	t 1 hour a	veraging				0.0164

Table 2-17. PM-10 1 Hr Background Monitoring





Figure 2-42. Location of Background Ambient Sampling Stations for PM-10



Figure 2-43. Location of Background Ambient Lead at 4 Sampling Stations and Predicted Lead(Pb)

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Figure 2-44. Location of Background Ambient PM-10 at 4 Sampling Stations and PM-10

2.3.2.7.2 Methods of Sampling and Analysis

Methods of Sampling and Analysis are based on CFR 40 Part 50 Method in compliance with the methods of analysis under Air Quality Guideline Values and National Ambient Air Quality Standards under DAO 2000-81. Gravimetic for PM-10 while Atomic Absorption Spectroscopy (AAS) for Lead.

2.3.2.7.3 Predicted and Observed Ambient Air Quality

Results are limited to PM-10 and Lead only. Results of predicted and observed are shown above in **Table 2-17**.

2.3.2.8 AIR DISPERSION MODELING

2.3.2.8.1 Model Description

Atmospheric dispersion modeling is a mathematical method of predicting the concentration of the pollutants downwind from the discharge source. The model takes into account a number of factors including emission rate of the pollutant, the height of the stack, building downwash effects, local topography, and meteorology. The main meteorological aspect considered in modeling are wind speed and direction, ambient temperature, atmospheric mixing height and atmospheric stability.

The modeling approach will utilize Tier 4 Sophisticated modelling using site specific Meteorological data the most refined modelling techniques sophisticated and latest



AERMOD ver 9.3 to assess the impact of contaminant emissions. AERMOD ver 9.3 will utilize local meteorological data based on the wind fields of the area and include terrain effects on the wind directions. Local meteorological data sets including site-specific parameters, terrain data and meteorological characteristics should be used, as it more accurately reflects local conditions.

AERMOD ver 9.3 is a TIER 4 complaint software complies with the Environmental Management Bureau (EMB), Memorandum Circular (MC) No. 2008-03 "Guidelines for Air Dispersion Modeling" to meet the requirements under Republic Act(RA) 8749: the Philippine Clean Air Act of 1999 and its Implementing Rules and Regulations (IRR) of Department Administrative Order (DAO) 2000-81.

The model will be generated the following results:

- To generate 1-hr and 24-hr dispersion of the following criteria pollutants and identify peak ground level concentration for Particulate Matter(PM), Carbon Monoxide (CO), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Lead (Pb) and Zinc (Zn):
- To determine ground level concentration at selected area receptors; and
- To determine the best location of the proposed air monitoring stations.

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AERMOD is a steady-state plume model. In the stable boundary layer (SBL), it assumes the concentration distribution to be Gaussian in both the vertical and horizontal. In the convective boundary layer (CBL), the horizontal distribution is also assumed to be Gaussian, but the vertical distribution is described with a bi-Gaussian probability density function (pdf). This behavior of the concentration distributions in the CBL was demonstrated by Willis and Deardorff (1981) and Briggs (1993). Additionally, in the CBL, AERMOD treats "plume lofting," whereby a portion of plume mass, released from a buoyant source, rises to and remains near the top of the boundary layer before becoming mixed into the CBL. AERMOD also tracks any plume mass that penetrates into the elevated stable layer, and then allows it to re-enter the boundary layer when and if appropriate. For sources in both the CBL and the SBL AERMOD treats the Power of lateral dispersion resulting from plume meander. Using a relatively simple approach, AERMOD incorporates current concepts about flow and dispersion in complex terrain. Where appropriate the plume is modeled as either impacting and/or following the terrain. This approach has been designed to be physically realistic and simple to implement while avoiding the need to distinguish among simple, intermediate and complex terrain, as required by other regulatory models. As a result, AERMOD removes the need for defining complex terrain regimes. All terrain is handled in a consistent and continuous manner while considering the dividing streamline concept (Snyder et al. 1985) in stably stratified conditions. Figure **2-45** shows the data flow in AERMOD system. Figure below shows the AERMOD treatment of boundary parameters.



Figure 2-45. Data flow in AERMOD SYSTEM

2.3.2.8.2 Emissions

Emission Load

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Input data in Figure below shows the operation of 2 Units 70 MT/hr (Total of 140 Mt/hr) to represent both 80 MT/hr Rolling Mill No. 1 and 20 MT/hr Rolling Mill No. 2 (Total of 100 MT/hr) to depict worst case scenario in the model run. *Two (2) scenarios was considered in this report; (1) Scenario 1: Furnace Stacks for Mills 1 and Mill 2; (2) Scenario 2: Scenario 1 + Building Volume Source Fugitive Dust Emission.* Modeling Parameters in Particulate Matter(PM), Carbon Monoxide (CO), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Lead (Pb) and Zinc (Zn). The source parameters of the stacks, such as stack height, stack inside diameter; flue gas exit velocity and temperature are summarized in the Table below.

	Stack Temp deg C	St Te (ack mp. K)	VFR (Ncm/Min)	Stack Diam (m)	Sta Ar (n	ack rea n²)	Stack Ht. (m)	VEL (m/s)		
Mill 1 80 MT/Hr (USED 70 MT/Hr)	428	701	01 841.7		7	1.74	2.38		45.50	5.90		
Mill 2 20 MT/Hr (USED 70 MT/Hr)	428 701		900.82		1.8	2.54		50.00	5.90			
					Concentra	itration (mg/Ncm)						
	PM	PM C		0	NOx	SO	ĸ		Pb	Zn		
Mill 1 80 MT/Hr (USED 70 MT/Hr)	25	25 8			251.00	38.00		0.09	97	0.001		
Mill 2 20 MT/Hr (USED 70 MT/Hr)	25	8.00			251.00 38.00		0.09		97	0.001		
				E	mission Ra	ite/Strengt	h (g/s	5)				
	PM		C	0	NOx	SO	K		Pb	Zn		
Mill 1 80 MT/Hr (USED 70 MT/Hr)	0.35		0.11		3.52	0.53		1.36	6E-03	1.40E-05		
Mill 2 20 MT/Hr (USED 70 MT/Hr)	0.38		0.12		3.77	0.57	1.46		6E-03	1.50E-05		

 Table 2-18. Point Source Input (Scenario 1)

Note: Data source are from the actual measured parameters



2.3.2.8.3 Modeling Domain and Receptors

Model domain is 10,000 X 10,000meters area. Center of the domain is the location of Stack of Mill1.



Figure 2-46. Data flow in AERMOD SYSTEM

2.3.2.8.4 Building Downwash

Building Wake Effects (Downwash)

The emission sources at the facility are evaluated in terms of their proximity to nearby structures. The purpose of the downwash evaluation is to determine if stack discharges may become caught in the turbulent wakes generated by these structures. Wind blowing around a structure creates zones of turbulence that are greater than if the structures were absent. The parameterization of building downwash in AUSPLUME is appropriate for use in the turbulent wake region.

Emission sources with a stack height less than the minimum Good Engineering Practice (GEP) stack height may be affected by downwash caused by a nearby structure. Per USEPA guidance, the minimum GEP stack height is determined using the following equation:²



Where:

G = Minimum GEP stack height

²US EPA, Office of Air Quality Planning and Standards, Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised), Research Triangle, North Carolina, EPA 450/4-80-032R, June, 1985.

- H = Height of the structure
- L = Lesser dimension (height or projected width of structure)

This equation is limited to stacks located within 5L of a surrounding structure. Stacks located at distances greater than 5L are not subject to the wake effects of the structure. If there is more than one stack at a given facility, the above equation must be successively applied to each stack. If more than one structure is involved, the equations must also be successively applied to each structure.

The purpose of the downwash evaluation is to determine if stack discharges may become caught in the turbulent wakes generated by these structures. Wind blowing around a structure creates zones of turbulence that are greater than if the structures were absent. Since stack height is less than the building height, building downwash is considered in this modeling. Building dimensions are given on the below table.

		Stack Building	GEP**	Preliminary*
Stack Namo	Stack Hoight	Base Elevation	FON1	GEP Stack
Stack Name	Stack Height	Differences	LQNI	Height Value
STACK2	20.00	-0.37	10.37	65.00
STACK1	50.00	-0.63	10.63	65.00



Figure 2-47. Building No. 1 BPIP AERMOD ver 9.3



Figure 2-48. Building No. 1 BPIP AERMOD ver 9.3

Meteorological Data

Aermod meteorological data requires Surface characteristics in the form of albedo, surface roughness and Bowen ratio, plus standard meteorological observations (wind speed, wind direction, temperature, and cloud cover), are input to AERMET. AERMET then calculates the PBL parameters: friction velocity (u^*) , Monin-Obukhov length (L), convective velocity scale $(w13^*)$, temperature scale (2), mixing height (z), and surface heat flux (H). These parameters are then passed to the INTERFACE (which is within AERMOD) where similarity expressions (in conjunction with measurements) are used to calculate vertical profiles of wind speed (u), lateral and vertical turbulent fluctuations (Fv, Fw), potential temperature gradient (d2/dz), and potential temperature (2).

2.3.2.8.5 Meteorological Input Data

	Year	Month	Day	Julian Day	Hour	Sensible Heat Flux [W/m^2])	Surface Friction Velocity [m/s]	Convective Velocity Scale [m/s]	Vertical Potential Temperature Gradient above PBL	Height of Convectively- Generated Boundary Layer - PBL [m]	Height of Mechanically- Generated Boundary Layer - SBL [m]	Monin-Obukhov Length (m)	Surface Roughness Length [m]	Bowen Ratio	Albedo	Wind Speed - Ws [m/s]	Wind Direction - Wd [degrees]	Reference Height for Ws and Wd [m]	Temperature - temp [K]	Reference Height for temp [m]	Precipitation Code
Min.	2010	Jan	1	1	1	-999.0	-9.000	-9.000	-9.000	-999.0	-999.0	-99999.0	1.000	2.00	0.16	0.00	0.0	10.0	294.4	2.0	0
Max.	2010	Dec	31	365	24	397.0	2.247	3.211	0.005	4000.0	4000.0	8888.0	1.000	2.00	1.00	12.90	335.0	10.0	305.9	2.0	0
Graph																			V		
1	2010	Jan	1	1	1	-48.1	0.490	-9.000	-9.000	-999.0	824.0	221.4	1.000	2.00	1.00	3.10	141.0	10.0	298.9	2.0	0
2	2010	Jan	1	1	2	-48.1	0.490	-9.000	-9.000	-999.0	824.0	221.7	1.000	2.00	1.00	3.10	138.0	10.0	299.4	2.0	0
3	2010	Jan	1	1	3	-50.9	0.487	-9.000	-9.000	-999.0	816.0	205.0	1.000	2.00	1.00	3.10	144.0	10.0	299.1	2.0	0
4	2010	Jan	1	1	4	-48.1	0.490	-9.000	-9.000	-999.0	824.0	221.6	1.000	2.00	1.00	3.10	143.0	10.0	299.2	2.0	0
5	2010	Jan	1	1	5	-27.6	0.281	-9.000	-9.000	-999.0	398.0	72.8	1.000	2.00	1.00	2.10	93.0	10.0	299.5	2.0	0
6	2010	Jan	1	1	6	-49.8	0.488	-9.000	-9.000	-999.0	819.0	211.4	1.000	2.00	1.00	3.10	142.0	10.0	298.9	2.0	0
7	2010	Jan	1	1	7	-64.0	0.679	-9.000	-9.000	-999.0	1341.0	442.1	1.000	2.00	1.00	4.10	145.0	10.0	297.6	2.0	0
8	2010	Jan	1	1	8	36.5	0.395	0.370	0.005	50.0	686.0	-153.0	1.000	2.00	0.33	2.10	143.0	10.0	299.8	2.0	0
9	2010	Jan	1	1	9	129.9	0.587	1.272	0.005	574.0	1078.0	-140.9	1.000	2.00	0.21	3.10	47.0	10.0	298.6	2.0	0
10	2010	Jan	1	1	10	201.5	0.761	1.742	0.005	951.0	1589.0	-197.5	1.000	2.00	0.18	4.10	141.0	10.0	298.5	2.0	0
11	2010	Jan	1	1	11	253.1	0.614	2.006	0.005	1155.0	1180.0	-82.5	1.000	2.00	0.17	3.10	144.0	10.0	297.6	2.0	0
12	2010	Jan	1	1	12	281.6	0.619	2.202	0.005	1374.0	1168.0	-76.0	1.000	2.00	0.16	3.10	86.0	10.0	298.4	2.0	0
13	2010	Jan	1	1	13	267.3	0.463	2.247	0.005	1539.0	780.0	-33.6	1.000	2.00	0.16	2.10	143.0	10.0	297.9	2.0	0

Figure 2-49. Aermod Surface Meteorology (SFC)

	Year	Month	Day	Hour	Measurement Height [m]	1, if this is the last (highest) level for this hour, or 0 otherwise	Direction the wind is blowing from for the current level [degrees]	Wind Speed for the current level [m/s]	Temperature at the current level [C]	Standard deviation of the wind direction fluctuations [degrees]	Standard deviation of the vertical wind speed fluctuations [m/s]
Min.	2010	Jan	1	1	10.0	1	0.0	0.00	21.2	99.0	99.00
Max.	2010	Dec	31	24	10.0	1	335.0	12.90	32.8	99.0	99.00
Graph									V		
1	2010	Jan	1	1	10.0	1	141.0	3.10	25.8	99.0	99.00
2	2010	Jan	1	2	10.0	1	138.0	3.10	26.2	99.0	99.00
3	2010	Jan	1	3	10.0	1	144.0	3.10	26.0	99.0	99.00
4	2010	Jan	1	4	10.0	1	143.0	3.10	26.1	99.0	99.00
5	2010	Jan	1	5	10.0	1	93.0	2.10	26.4	99.0	99.00
6	2010	Jan	1	6	10.0	1	142.0	3.10	25.7	99.0	99.00
7	2010	Jan	1	7	10.0	1	145.0	4.10	24.5	99.0	99.00
8	2010	Jan	1	8	10.0	1	143.0	2.10	26.6	99.0	99.00
9	2010	Jan	1	9	10.0	1	47.0	3.10	25.5	99.0	99.00
10	2010	Jan	1	10	10.0	1	141.0	4.10	25.4	99.0	99.00
11	2010	Jan	1	11	10.0	1	144.0	3.10	24.5	99.0	99.00
12	2010	Jan	1	12	10.0	1	86.0	3.10	25.2	99.0	99.00
13	2010	Jan	1	13	10.0	1	143.0	2.10	24.8	99.0	99.00
14	2010	Jan	1	14	10.0	1	69.0	2.10	25.1	99.0	99.00
15	2010	Jan	1	15	10.0	1	0.0	0.00	24.3	99.0	99.00
16	2010	Jan	1	16	10.0	1	0.0	0.00	26.0	99.0	99.00
17	2010	Jan	1	17	10.0	1	141.0	2.10	25.3	99.0	99.00
18	2010	Jan	1	18	10.0	1	137.0	3.10	25.1	99.0	99.00

Figure	2-50.	Aermod	Profile	Meteorology	(PFL)
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2.3.2.8.6 Modeling Scenarios

The model scenario utilizes 10X`0km Domain using Tier 4 Sophisticated modelling employing site specific Meteorological data particularly the most refined modelling techniques, AERMOD ver 9.3 to assess the impact of contaminant emissions. AERMOD ver 9.3 utilized local meteorological data (Science Garden PAGASA) based on the wind fields of the area and include terrain effects on the wind directions. Local meteorological data sets including site-specific parameters, landuse, terrain data, and meteorological characteristics should be used, as it more accurately reflects local conditions. Building wake effects was also used as advance feature to depict effects of building downwash.

Two (2) scenarios was considered in this report; (1) Scenario 1: Furnace Stacks for Mills 1 and Mill 2; (2) Scenario 2: Scenario 1 + Building Volume Source Fugitive Dust Emission.

2.3.2.8.7 Modeling Results and Discussion

The highest concentration falls within the plants premise at 50 to 500 meters away from the stack of Mill 1. Dispersion model results are presented in 6 km by 6 km. Figure to 5.7 to 5.27 shows the isopleths diagrams of the predicted ambient ground level concentration values for Two (2) scenarios was considered in this report; (1) Scenario 1: Furnace Stacks for Mills 1 and Mill 2; (2) Scenario 2: Scenario 1 + Building Volume Source Fugitive Dust Emission.

PARAMETER	AVERAGING TIME	Distance	Direction	CONC	Standard/GV	
	Hours	meters		ug/NCm	ug/NCm	
TSP (Scenario	1	52.35	WSW	4.27	300	
1)	24	180.94	NNW	0.689	230	
TSP (Scenario	1	405.39	NNE	300.92	300	
2)	24	448.49	NNW	115.39	230	
PM-10	1	52.35	WSW	0.854	150	
(Scenario 1)	24	180.94	NNW	0.137	200	
PM-10	1	405.39	NNE	60.18	150	
(Scenario 2)	24	448.49	NNW	23.07	200	
СО	1	52.35	WSW	1.34	35 mg/Ncm	
	8	180.94	NNW	0.6334	10 mg/Ncm	
NO2	1	448.49	NNW	42.57	260	
	24	180.94	NNW	6.9	150	
S02	1	448.49	NNW	6.41	260	
	24	180.94	NNW	1.04	150	
Pb	1	448.49	NNW	0.1646	20 ug/Ncm *	
	24	180.94	NNW	0.00267	NA	
Zn	1	448.49	NNW	0.00017	NA	
	24	180.94	NNW	0.00003	NA	

Table 2-19. Summary of Maximum Ground Level Concentration

Legend: * 30 min

Total Suspended Particulates (TSP)

The predicted TSP concentrations for 1-hour and 24-hour averaging times are within the DENR NAAQGV & NAAQSSSAPI Standards. Therefore, the proposed TSP emissions will not have significant environmental impact to the ambient air quality. Predicted short term (1 hour) for controlled Total Suspended Particulates (TSP) maximum ground level concentrations considering terrain effects is at 4.27 ug/Ncm located 52 meters WestSouth West (WSW) from the Stack of Furnace 1 (Mill 1). Simulated concentrations for maximum ground level concentration for 1 hour TSP is generally below the National Ambient Air Quality Standards for Source Specific Air Pollutants of 300 ug/Ncm. On the other hand, for



24 hour averaging time, result of the Model run shows that Maximum TSP concentration is 0.689 ug/Ncm located 52 meters WestSouth West (WSW) from the Stack of Furnace 1 (Mill 1). All simulated concentrations were in compliance under the 24 hour standards under the National Guideline Values of 230 ug/Ncm.

Carbon Monoxide (CO)

As presented in Table below, the maximum predicted future 1-hour and 8-hour averaging times CO concentrations will be well within the DENR NAAQGV. Therefore, the proposed CO emissions will not have significant environmental impact to the ambient air quality. Predicted short term (1 hour) for Carbon Monoxide (CO) maximum ground level concentrations considering terrain effects is 1.34 ug/Ncm located 52 meters WestSouth West (WSW) from the Stack of Furnace 1 (Mill 1). All simulated concentrations were in compliance under the 1 hour standards under the National Guideline Values of 35 mg/Ncm. On the other hand, for 8 hour averaging time, result of the Model run shows that maximum ground level concentrations is 1.34 ug/Ncm located 375 meters North North West (NNW) from the Stack of Furnace 1 (Mill 1). All simulated concentrations were in compliance under the National Guideline Values of 35 mg/Ncm.

Sulfur Dioxide (SO₂)

Based on the modeling results, the predicted 1-hour and 24-hour averaging times of SO2 concentrations are within the DENR NAAQGV & NAAQSSSAPI Standards. Predicted short term (1 hour) for Sulfur Oxides (SOx) maximum ground level concentrations considering terrain effects is 6.41 ug/Ncm located 448meters North North West (NNW) from the Stack of Furnace 1 (Mill 1). All simulated concentrations were in compliance under the 1 hour standards under the National Guideline Values of 260 ug/Ncm. On the other hand, for 24 hour averaging time, result of the Model run shows that maximum ground level concentrations is 1.04 ug/Ncm located 180 meters North North West (NNW) from the Stack of Furnace 1 (Mill 1). All simulated concentrations were in compliance under the 24 hour standards under the National Guideline values of 340 ug/Ncm.

Nitrogen Dioxide (NO₂)

Assuming all NOx emitted are converted into NO2, the predicted NO2 concentrations for 1-hour and 24-hour averaging times are within the DENR NAAQGV & NAQSSSAPI Standards. Predicted short term (1 hour) for Nitrogen Oxides (NOx) maximum ground level concentrations considering terrain effects is 42.57 ug/Ncm located 448 meters North West (NNW) from the Stack of Furnace 1 (Mill 1). All simulated concentrations were in compliance under the 1 hour standards under the National Guideline Values of 260 ug/Ncm. On the other hand, for 24 hour averaging time, result of the Model run shows that maximum ground level concentrations is 6.9 ug/Ncm located 180 meters North West (NNW) from the Stack of Furnace 1 (Mill 1). All simulated concentrations were in compliance under the 1 hour standards under the National Guideline Values of 150 ug/Ncm.

Metals Lead (Pb) and Zinc (Zn)

As presented in Table below, the maximum predicted future 1-hour averaging times Lead (Pb) and Zinc (Zn) concentrations will be well within the DENR NAAQGV. Therefore, the proposed Lead (Pb) and Zinc (Zn) emissions will not have significant environmental impact to the ambient air quality. Predicted short term (1 hour) for Lead (Pb) maximum ground

level concentrations considering terrain effects is 0.1646 ug/ located 448 meters North North West (NNW) from the Stack of Furnace 1 (Mill 1). Predicted short term (1 hour) for Zinc (Zn) maximum ground level concentrations considering terrain effects is 0.00017 ug/Ncm located 180 meters North North West (NNW) from the Stack of Furnace 1 (Mill 1).

An overall evaluation of the air dispersion modeling study concluded the following key points:

- The use of the stack Test of 70 MT/hr LSFO-Furnace of HighSteet (SPV-AMC) in Calaca Batangas to represent the Furnace 1 and 2 of Rolling Mill 1 & 2of SAMC is a representative data to depict worst case scenario. Model shows the operation of 2 Units 70 MT/hr (Total of 140 Mt/hr Calaca Data) to represent the combined operation of both 80 MT/hr Rolling Mill No. 1 and 20 MT/hr Rolling Mill No. 2 (Total of 100 MT/hr). Model run has considered 140 Mt/hr to represent only 100 MT/hr operation to present worst case scenario plus Building Fugitive dust and background emissions.
- High Ground Level Concentrations are still within Clean Air Act standards considering Scenario 1 operating 2 X 70 MT/hr = 140 Mt/hr furnaces to represent the 80 Mt/hr Mill 1 + 20 Mt/hr Mill2 = 100 Mt/hr operation of the expansion project of SAMC. However, in Scenario 2 with the inclusion Area source from building fugitives dust emissions, TSP result for 1 hour averaging time is at the borderline of 300 ug/Ncm.
- The highest ground level concentrations (GLCs) of TSP, SO2, NO2, and CO, Pb and Zinc for 1-hour averaging period at any given wind direction in all stations are all below the DENR standard limits of 300 µg/Ncm for TSP, and 340 µg/Ncm for SO2, 260 µg/Ncm for NO2, and 35,000 µg/Ncm for CO, 20 µg/Ncm for Lead. Significant increase for TSP concentration was noted in Scenario 2.
- The ground level concentrations (GLCs) of TSP, SO2, NO2, and CO, Pb, Zn for 24-hour and 8 hour (for CO) averaging period at identified air sensitive receptors are all below the DENR standard limits of 230 μ g/Ncm for TSP, and 180 μ g/Ncm for SO2, 150 μ g/Ncm for NO2, and 10,000 μ g/Ncm for CO.
- The PM-10 and Lead concentration is still within the ambient 1hr standards considering the approximate inclusion background concentration (**Table 2-18**).
- Evaluation of predicted concentrations in relation to geographical locations showed primary zone of impact is within 50 to 500 meters radius of the site, and expected minor long range transportation and dispersion. Areas Sensitive Receptors (ARS) are mostly residential areas.
- Predicted Ambient GLC concentrations in Receptor Areas within the 50 to 500 meters from the stack of Mill1 are still within the standards. GLCs are predominantly dispersed towards the WestSouthWest (WNW) ans NorthNorthWest (NNW) directions. Other significant dispersion are towards the South (S), NorthWest (NW) and SouthEast (SE) directions.
- Aggregated background and predicted Lead concentration (Pb) concentration in 4 monitoring stations are way below the 20 ug/Ncm standard at <0.0164 ugNcm.



Environmental Performance Report and Management Plan Proposed Increase in Production Capacity of the Steel Rolling Mill Project



Figure 2-51. Plot of TSP 1hr Concentration Isopleth



Figure 2-52. Plot of TSP 1hr Concentration Isopleth Google Earth Overlay



Figure 2-53. Plot of TSP 1hr Concentration Isopleth-Scenario 2 (Furnace + Building Volume Source)



Figure 2-54. Plot of TSP 24hr Concentration Isopleth-Scenario 2 (Furnace + Building Volume Source)



Figure 2-55. Plot of PM-10 1hr Concentration Isopleth-Scenario 2 (Furnace + Building Volume Source)



Figure 2-56. Plot of PM-10 1hr Concentration Isopleth-Scenario 2 (Furnace + Building Volume Source)





Figure 2-57. Plot of TSP 1hr Concentration Isopleth-Scenario 2 (Furnace + Building Volume Source) Google Earth Overlay



Figure 2-58. Plot of TSP 24hr Concentration Isopleth-Scenario 2 (Furnace + Building Volume Source) Google Earth Overlay





Figure 2-59. Plot of PM-10 1hr Concentration Isopleth-Scenario 2 (Furnace + Building Volume Source) Google Earth Overlay



Figure 2-60. Plot of PM-10 24 hr Concentration Isopleth-Scenario 2 (Furnace + Building Volume Source) Google Earth Overlay





Figure 2-61. Plot of TSP 24hr Concentration Isopleth





Figure 2-62. Plot of TSP 24hr Concentration Isopleth Google Earth Overlay





Figure 2-63. Plot of CO 1hr Concentration Isopleth



Figure 2-64. Plot of CO 1hrConcentration Isopleth Google Earth Overlay




Figure 2-65. Plot of CO 8hr Concentration Isopleth



Figure 2-66. Plot of CO 8hrConcentration Isopleth Google Earth Overlay

UTM North [m]

1633000

1631000

1629000



1.00

0.90

0.70

0.50

0.40

0.24

at (285489.00, 1633553.00)

[Ev m/Bn]

6.42 ÿ Max

V

Plotfile List: STLASIA_BUL_SCINCEGARDEN MET.AD\S02_01_h1.plt V Q Output Type: Concentration Figure 2-67. Plot of SO2 1hr Concentration Isopleth



Model: AERMOD MPI Version 12060

Figure 2-68. Plot of SO₂ 1 Hr Concentration Isopleth Google Earth Overlay



Figure 2-69. Plot of SO2 1hr Concentration Isopleth



Figure 2-70. Plot of SO₂ 24 hr Concentration Isopleth Google Earth Overlay



Figure 2-71. Plot of NO₂ 1 HR Concentration Isopleth



Figure 2-72. Plot of NO₂ 1 HR Concentration Isopleth Google Earth Overlay



Figure 2-73. Plot of NO₂ 24 HR Concentration Isopleth



Figure 2-74. Plot of NO₂ 24 HR Concentration Isopleth Google Earth Overlay





Figure 2-75. Plot of Lead(Pb) 1 Hr Concentration Isopleth



Figure 2-76. Plot of Lead(Pb) 1 Hr Concentration Isopleth Google Earth Overlay



Figure 2-77. Plot of Lead (Pb) 1 Hr Concentration Isopleth



Figure 2-78. Plot of Lead (Pb) 1 Hr Concentration Isopleth

Summary of 1-hour and 24-hour GLC at Area Sensitive Receptor



The following table summarizes the predicted concentrations at selected area sensitive receptors (ASRs) which are mostly residential areas. **TIER 4** modeling result as presented n table below shows the GLC at selected air sensitive receptor. Results of modeled parameters in all air sensitive receptor are within the DENR standard for 1-hour averaging period of 300 µg/Ncm for TSP, 340 µg/Ncm for SO₂, 260 µg/Ncm for NO₂, and 35,000 µg/Ncm for CO. The calculated 24-hour averaging period is also within the DENR standard of 230 µg/Ncm for TSP, 180 µg/Ncm for SO₂, 150 µg/Ncm for NO₂, and 10,000 µg/Ncm for CO. The graphical figure of the modeling result for1 –hour,8 hout and 24-hour averaging period in area sensitive receptors (ARS) are shown in below.



Figure 2-79. Graph of 1-hour GLC at Air Sensitive Receptor

			UTM Cod	ordinates	PARAMETERS (ug/Ncm)										
Receptor ID	Receptor Description	Barangay	Easting (m)	Northing (m)	TSP 1HR	TSP 24 HR	CO* 1HR	CO* 8 HR	NO2 1HR	NO2 2HR	SO2 1HR	SO2 24HR	Pb 1HR	Zn 1HR	
ASR 1	Residential	Perez	285069	1633425	3.00	0.30	0.50	0.20	30.00	3.00	3.00	0.50	0.005	5.E-05	
ASR 2	Residential	lba	283353	1632973	0.90	0.08	0.30	0.05	9.00	0.80	3.00	0.10	0.004	5.E-04	
ASR 3	Residential	Camalig	282368	1633992	0.60	0.05	0.30	0.05	6.00	0.50	0.90	0.08	0.000	5.E-04	
ASR 4	Residential	Pandayan	281635	1632652	0.50	0.05	0.30	0.05	5.00	0.50	0.90	0.08	0.002	5.E-02	
ASR 5	Residential	Perez	284715	1632272	3.00	0.10	0.50	0.07	30.00	1.00	3.00	0.50	0.005	5.E-05	
ASR 6	Residential	Bagbaguin	285388	1632046	3.00	0.30	0.50	0.07	30.00	3.00	3.00	0.50	0.005	5.E-05	
ASR 7	Residential	Bahay Pare	286874	1634364	1.00	0.08	0.30	0.05	9.00	0.80	3.00	0.50	0.004	5.E-04	
ASR 8	Residential	Bahay Pare	286168	1633223	3.00	0.30	0.50	0.20	30.00	3.00	3.00	0.50	0.007	5.E-07	
ASR 9	Residential	171 North Caloocan	287875	1632605	0.90	0.05	0.30	0.05	9.00	0.50	3.00	0.08	0.002	5.E-04	
ASR 10	Residential	171 North Caloocan	287652	1631554	0.40	0.05	0.30	0.03	6.00	0.50	0.90	0.06	0.002	5.E-02	

 Table 2-20. Summary of Predicted 1-hr and 24-hour GLC at Area Sensitive

Note: a -Coordinates is in UTM Zone 51N, Projection Datum is WGS 1984, b-Calculated using a factor of 0.4 for TSP, SO2, & NO2, and 0.67 for CO as per USEPA Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised.c – Background concentration from DC Station No.02 is added to the 24-hour result except for COd –No available background concentration

2.3.3 AMBIENT NOISE LEVELS

The proposed expansion project site is located within the 18 hectares property of SAMC in Ciudad Industria Bahay Pare, Meycauayan, Bulacan. The project boundary has coordinates of approximately 14° 46′ 0.19″ N latitude and 121° 5′ 18″ E longitude. The site can be reached from Manila through NLEX and then Malhacan Road or through Congressional Extension Road and Manufacturers Avenue. There is land transportation available in the area with several terminals such as one at El Camino Public Market and EMA Town Center. Iba Road is the main road artery to the project site. The access road to the site is within Ciudad Industria. Based on the actual noise monitoring, results show that the noise in the area is in compliance with the standards. Comparative noise regulation of international and local regulations were as follows: Philippine OSHA - 90 dB (A); US OSHA -90 dB (A); and US NIOSH - 85 dB (A). In addition, allowable noise standards under PD 1584 are presented in the Table below.

	DAYTIME	MORNING/ EVENING	NIGHTIME	
AREA CATEGORY	9AM-6PM	5AM-9AM / 6PM-10PM	10PM-5AM	
AA	50	45	40	
School, Hospitals	50		40	
А	55	50	45	
Residential		50	C+	
В	65	60	55	
Commercial	05	00	55	
C	70	65	60	
Light Industrial	70	05	00	
D	75	70	65	
Heavy Industrial	75	70	60	

Table 2-21. Allowable Noise Emission Standards under PD 1584 (dB)

Results for the noise monitoring conducted are shown below. One-hour monitoring was done for Stations 1 and 2and 24-hours monitoring for Station 2.

Table 2-22. Results of baseline noise monitoring at Bulihan Barangay Hall

Sampling Time	npling Time North		East		South		West		Min	Max	Ave	Remarks
1057H-1112H	61.3	69.8	61.9	65.3	65.3	69.5	64.6	68.0	63.6	68.5	66.7	Noise came from vehicles that passed by
1112H-1127H	64.3	69.1	64.9	69.2	65.5	69.7	61.9	68.3	64.3	69.1	67.3	Noise came from vehicles that passed by
1127H-1142H	64.3	69.7	64.7	69.1	65.9	68.5	63.3	67.9	64.7	68.9	67.2	Noise came from vehicles that passed by
1142H-1157H 64.1 69.5 66.3			66.3	70.1	67.9	70.2	67.3	70.0	66.6	70.0	68.6	Noise came from vehicles that passed by
				67.5								

Table 2-23	. Results for	Baseline Noise	Monitoring	along	Plaridel	Bypass Road
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Sampling Time	e North		East		South		West		Min	Max	Ave	Remarks
1212H - 1227H	67.9	70.6	69.3	78.6	68.6	71.4	67.7	70.7	68.4	74.4	72.3	Noise came from vehicles that passed by
1227H - 1242H	68.9	76.1	68.4	74.3	67.4	75.6	64.3	71.8	67.6	74.7	72.5	Noise came from vehicles that passed by
1242H - 1257H	68.2	71.3	69.5	75.7	68.7	76.8	64.6	69.8	68.1	74.3	72.2	Noise came from vehicles that passed by
1257H - 1312H 64.3 74.5 68.7			68.7	74.8	66.9	76.2	55.8	69.2	65.8	74.3	71.9	Noise came from vehicles that passed by
AveLeg												

Table 2-24. Results for 24-hours Baseline Noise Monitoring at Sta a4

Sampling Time	e North		East		South		We	est	Min	Max	Ave	Remarks
1503H - 1703H	54.8	61.3	54.1	59.3	54.5	59.6	60.8	55.9	57.1	59.4	58.4	Noise came from vehicles that passed by
1703H -1903H	58.3	59.2	58.6	60.0	58.2	59.5	57.7	58.2	58.2	59.3	58.8	Noise came from insects and vehicles that passed by
1903H - 2103H	57.5	59.0	56.3	59.8	58.3	59.1	56.5	58.9	57.2	59.2	58.3	Noise came from insects and vehicles that passed by

Sampling Time	No	orth	Ea	st	So	uth	W	est	Min	Max	Ave	Remarks
2103H - 2303H	60.8	61.4	61.0	62.8	61.7	62.8	61.3	61.9	61.2	62.3	61.8	Noise came from insects and vehicles that passed by
2303H - 0103H	58.6	60.1	57.3	58.4	60.5	61.3	61.9	68.5	59.9	64.0	62.5	Noise came from rain
0103H - 0303H	58.4	59.7	58.0	59.9	59.2	60.2	60.8	61.0	59.2	60.2	59.8	Noise came from insects
0303H - 0503H	57.8	58.6	56.7	57.8	60.0	61.9	61.8	62.0	59.5	60.5	60.0	Noise came from insects
0503H - 0703H	58.9	59.2	58.3	59.5	58.9	59.6	59.9	60.4	59.0	59.7	59.4	Noise came from insects
0703H - 0903H	55.3	59.8	59.8	61.4	54.1	59.3	58.7	59.6	57.6	60.1	59.0	Noise came from birds around and vehicles that passed by
0903H - 1103H	49.3	50.3	51.9	59.8	50.6	51.7	48.1	52.4	50.2	55.4	53.5	Noise came from birds around and vehicles that passed by
1103H - 1303H	57.8	62.4	47.5	52.8	46.9	50.1	47.6	50.2	52.8	57.3	55.6	Noise came from birds around and vehicles that passed by
1303H - 1503H	50.1	54.4	44.9	49.9	45.8	49.4	49.6	51.8	48.2	51.8	50.4	Noise came from birds around and vehicles that passed by
									Av	eleq	59.1	

2.3.3.1 NOISE MODEL APPROACH

Model results are based on the propagation of sound through water or air is the "source, path, receiver" model (Richardson 1995). Among basic parameters in this model related to the receiver's perception of loudness are:

source: source level (SL) path or medium: transmission loss (TL), ambient noise level (NL) receiver: signal to noise ratio (SNR), received level (AIL), detection threshold (DT)

A simple definition of sound propagation is:

RL = SL - TL

where $TL = 10 \log (Intensity at 1 meter/Intensity at r meters away from the source, assuming spherical spreading)$

Transmission loss can also be estimated by adding the effects of geometrical spreading, absorption and scattering. For our purposes we'll deal only with spreading (TL_g) and absorption loss (TL_a):

$$TL = TL_g + TL_a$$

where

 $TL_g = 20 \log (r/r_{ref})$

(for geometrical spherical spreading; r is in meters)

Noise is measured in terms of Decibels unit. The equation below expresses the relationship of pressure levels to decibel unit:

$$= \frac{10Log\left(\frac{P}{P_o}\right)}{P_o}$$

Where:

Decibel

$$P_o$$
 = is a reference value

 P_o = is a measured value

CHAPTER 2

For various sources of sound pressures, the total equivalent sound level at the receptor point can be expressed by the following equation:

$$L_{ov} = 10Log\left(10^{\frac{L_{1}}{10}} + 10^{\frac{L_{2}}{10}} + 10^{\frac{L_{3}}{10}} + \dots + 10^{\frac{L_{n}}{10}}\right)$$

Propagation of Sound

The total acoustic energy emitted from a source, can be assumed to propagate in a hemispherical attenuation. At the receptor, the amount of sound pressure level depends on the amount of rated kilowatt power. The intensity can be expressed by the following relationship:

$$I = \frac{W}{4\pi r^2} = = > \text{ (sphere surface area)}$$

where:

W = power in watts

r = radius from the source

If the sound power level is given, then the sound pressure level at the receptor point can be expressed by the following relationship:

$$\begin{split} L_p &= L_w - 10 Log \left(2\pi R^2 \right) \\ L_1 &= L_{w1} - 10 Log \left(2\pi R_1^2 \right) \\ & \text{Where:} \end{split}$$

$$L_p$$
 = sound level pressure, decibel
 L_w = sound power level, decibel
 R = separation distance, meters

Combining terms:

$$L_{x,y} = 10Log \left(10^{[L_{w1} - 10Log(2\pi R_1^2)]/10} + 10^{[L_{w2} - 10Log(2\pi R_2^2)]/10} + 10^{[L_{w3} - 10Log(2\pi R_3^2)]/10}\right)$$

2.3.3.2 RESULTS OF NOISE MODEL

Based on the "Source, Path and Receiver" noise model, major noise source identified were as follows: (1) Reheating Furnace, (2) Rolling Mill, (3) Twin Finishing Blocks, (4) QTB Quenching Line, (4) Cooling Bed, (5) Heavy Duty Stationary Shear, (6) Hydraulic Binding Machine, Transport and Hauling Activities. Model results are based on worst case scenarios

operating 24 hours maximum excluding noise mitigating measures such as noise barriers among others. Noise source are based on worst case theoretical noise levels.

Sound source	Sound power level L_w (dB re 10 ⁻¹² W)
Reheating Furnace	90 dB
Rolling Mill	90 dB
Twin Finishing Blocks	150 dB
QTB Quenching Line,	50 dB
Cooling Bed	50 dB
Heavy Duty Stationary Shear	50 dB
Hydraulic Binding Machine	50 dB
Heavy Truck Engine	90 dB

Table 2-25. Corresponding noise level contribution of different equipment in the Plant



Figure 2-80. Isobel diagram in 200m Domain



Figure 2-81. Isobel diagram in 6000m Domain

Noise sources are based exclusively from plant equipment and transport activities operating at full capacity excluding ambient noise corrections from other industrial, agricultural and roadside sources. Result shows that noise level impacts at full operation will emit less than 50 Decibels 200 meter away from plant sources below the Light and Heavy Industrial Allowable noise level standards of 70 Db for Daytime (9 AM to 6 PM), 65 Db (5-9 AM) /(6-10 PM) for Morning and Evening, and 60 DB for Nighttime (10 PM to 5 AM) pursuant to the Table of Allowable Noise Level, PD 1584. On the other hand, Residential Areas may slightly approach allowable standards of 55 Db for Daytime (9 AM to 6 PM), 50 Db (5-9 AM) /(6-10 PM) for Morning and Evening, and 45 DB for Nighttime (10 PM to 5 AM). Noise mitigation measures are recommended such as construction of concrete perimeter walls as noise barriers, Enclosure of Equipment (Noise Barriers), Maintenance schedules of equipment and transport and hauling measures among others. Baseline and regular self-monitoring of full operation noise sampling is recommended to validate worst case noise.

2.3.4 POTENTIAL IMPACTS AND OPTIONS FOR PREVENTION, MITIGATION AND ENHANCEMENT

In the previous chapter, all the environmental impacts on land, water, air and people during the construction and operational phase have been presented. All the mitigating measures will be implemented by the company, some of which will be monitored and

supervised by the concerned government agencies. The cost of implementation for all the mitigating measures will be integrated in the operational budget of the company to make sure that the proper structures or systems are fully implemented.

	P	hase Oco	currence							
List of Key Impacts	Pre-Construction	Construction	Operation	Abandonment	Discussion/Mitigation Measures					
 Degradation of air quality 		x	x		 Sprinkling of water on grounds to minimize dust Daily road cleaning using the Dulevo 3000 sweeper (vacuum type) Construction area to be enclosed to limit dust inside the area. Tree planting inside plant compound (current total: 163 trees) Following procedures is being implemented: SA-WI-MM-101-53 Recuperator Cleaning & Replacement Furnace Temperature Setting Standards (running & idle settings) Standard Operating Procedure for Furnace Trouble Shooting CCTV view for the Furnace operator for monitoring of smoke quality from stack 					
 Increase in ambient noise level 		x	x		 Limit construction activities to daytime only Construction area to be enclosed to reduce noise emanating from the area More trees will be planted along perimeters nearest to residential area. High perimeter wall 					

Table 2-26. Key impacts and mitigation measures



2.4 PEOPLE

The study focuses on Barangay Bahay Pare, the direct impact barangay of the proposed project. Meycauayan City is considered the social impact area for the proposed project.

2.4.1 METHODOLOGY

Various methods were employed in gathering information on the socio-economic conditions of the impact barangay. These methods include review of secondary data and conduct of perception survey.

Review of secondary data

All secondary data from concerned local government units and other relevant agencies to craft the socioeconomic condition of the impact communities were also studied. These include the following:

- Comprehensive Land Use Plan of Meycauayan City (1999-2004)
- Provincial Development and Physical Framework Plan (2010-2030)
- Socio-Economic Profile of Meycauayan City (2016)
- Philippine Health Statistics (2010, 2012, & 2013)

All available demographic and socio-economic secondary data in print and electronic versions were exhausted in this study.

Perception Survey

A Perception Survey was held in the direct impact Brgy. Bahay Pare in Meycuayan City on May 17, 2017, ensuring that different sectors in their communities are well-represented. Individual Perception Survey Questionnaires were utilized wherein the interviewers filled up/noted the responses of the interviewee/respondents to facilitate time and discourse.

A fixed sample number of 150 respondents was assigned for the Perception Survey.

2.4.2 RESULTS

2.4.2.1 REVIEW OF SECONDARY DATA

2.4.2.1.1 BRIEF HISTORY

During the Spanish Colonization of the country, the town of Meycauayan was established as a settlement by a group of Spanish priests belonging to the Franciscan Order. In 1578, its early inhabitants came into contact with Christianity. In that same year, Father Juan de Placencia and Diego Oropesa built the first church structure, which was believed to be made of nipa and bamboo. Common to all Spanish settlements in that period was the adoption of a patron saint for the newly opened town. Meycauayan has St. Francis of Assisi as the Patron Saint. It was only in 1668, however, that a concrete church structure was erected.



Meycauayan was then one of the largest towns in the province of Bulacan. The towns, which fell under its political jurisdiction, were San Jose del Monte, Bocaue, Valenzuela (formerly Polo), Obando, Marilao, Sta. Maria and Pandi. It was also regarded as the unofficial capital of the province, being the hub of activities brought about by the establishment of the market center and the presence of the Spanish military detachment.

During the revolution, which was set off by the execution of Dr. Jose Rizal in 1896, Meycauayan contributed its share in the fight against the Spanish conquistadores. Among her sons who figured prominently in the revolution were: Andres Pacheco, Ciriaco Contreras, Guillermo Contreras, Guillermo Bonque, and Liberato Exaltacion. There were many others who had joined the revolution and had displayed their exceptional heroism until 1898, when the country gained its independence.

In 1949, a big fire razed the market center and several business establishments in the town, causing setbacks to the development of the municipality. It took several years to recover from the destruction and property losses. However, in the 1960s and early part of 1970s, new hope for the development was ushered in. Reconstruction and rehabilitation of infrastructure facilities were made possible through the assistance of the provincial and national governments. A more sound economic base was established and crop production more than doubled.

On December 10, 2006, by virtue of Republic Act 9356, voters in Meycauayan ratified the conversion of Meycauayan into a component city of Bulacan through another plebiscite. It became the province's third city, joining San Jose del Monte and Malolos.

Today, the city of Meycauayan has transformed into a major economic and industrial hub in the Province of Bulacan and the rest of Region III.

2.4.2.1.2 DEMOGRAPHIC PROFILE

2.4.2.1.2.1 TOTAL POPULATION AND POPULATION DENSITY

Table 2-27 presents the total population of barangays in Meycuayan, Bulacan as of 2015. Barangay Bahay Pare, where the project is located, compose the 5.21% of the total population of Meycauan City. On the other hand, historical data on Barangay Pare population show that significant increase in population happened from 2004-2010.

BARANGAY	Population (August 2015)	Percentage
Bagbaguin	9,281	3.79
Bahay-Pare	12,762	5.21
Bancal	16,032	6.55
Bañga	5,012	2.05
Bayugo	18,394	7.52
Caingin	5937	2.43
Calvario	6,818	2.79
Camalig	7,648	3.12
Hulo	1,959	0.80
Iba	10,921	4.46

 Table 2-27. Total population of Barangays in Meycauayan City, 2015

BARANGAY	Population (August 2015)	Percentage
Langka	5,026	2.05
Lawa	11,908	4.87
Libtong	8,986	3.67
Liputan	1,885	0.77
Longos	3,912	1.60
Malhacan	25,263	10.32
Рајо	6965	2.85
Pandayan	17,693	7.23
Pantoc	11,253	4.60
Perez	18,268	7.46
Poblacion	1,791	0.73
Saluysoy	14,787	6.04
St. Francis (Gasak)	2,207	0.90
Tugatog	6,120	2.50
Ubihan	2,555	1.04
Zamora	11,380	4.65
TOTAL	244,763	100

Source: 2015-2016 Meycuayan Socio Economic Profile





Source: Meycauayan City CLUP 2004, 2010 PSA Population Census, 2015 Meycauayan Socio-economic Profile

The 1995 average household size in Meycauayan is 5.00 (rounded-off from the actual computation of 4.715) persons. Barangays Malhacan, Pandayan, and Bancal are expected to have the biggest increase in households in the period 1995-2004.

This is due to the significant number of squatters in Malhacan and Bancal, as well as migrating residents in the residential subdivisions in Pandayan.

Based on the 1995 Census of population, 86.34 percent of the municipality's total household population spoke Tagalog. Bicol came second with 2.73 percent and Ilocano, third with 2.72 percent (**Table 2-28**).

LANGUAGE/DIALECT	1990	1995	2004	Percent
Tagalog	106,905	118,160	153,531	86.34
Cebuano	3,261	3,604	4,683	2.63
Hiligaynon	397	439	570	0.32
Ilocano	3,363	3,717	4,830	2.72
Ibanag	229	253	329	0.18
Pampango	987	1,091	1,417	0.80
Pangasinan	718	794	1,031	0.58
Waray	2,449	2,707	3,517	1.98
Bicol	3,374	3,729	4,846	2.73
Maguindanao	166	183	238	0.13
Maranao	237	262	340	0.19
Tausug	10	11	14	0.01
Agutaynon	11	12	16	0.01
Aklanon	125	138	180	0.10
Badjao	10	11	14	0.01
Bagobo	104	115	149	0.08
Binisaya	42	46	60	0.03
Bolinao	21	23	30	0.02
Chavacano	32	35	46	0.03
Dumagat	10	11	14	0.01
Ilongot	509	563	731	0.41
Itawis	21	23	30	0.02
Isinal	20	22	29	0.02
Ivatan	52	57	75	0.04
Kinaray-a	21	23	30	0.02
Masbateño	32	35	46	0.03
Pinalawan	10	11	14	0.01
Romblon	32	35	46	0.03
Sama	11	12	16	0.01
Yakan	11	12	16	0.01
Sangil	10	11	14	0.01
Chinese	31	34	45	0.03
English	31	34	45	0.03
German	10	11	14	0.01
Japanese	40	44	57	0.03
Other Foreign Languages	11	12	16	0.01
Other Local Dialects	53	59	76	0.04
Not Stated	460	508	661	0.37
TOTAL	123,816	136,847	177,816	100.00

Table 2-28. Household Population By Mother Tongue, 1990 – 2004

Based on the 1995 Census of population, the population of Meycauayan is generally young. The population between the ages of under 1 - 14 account for 43,413 or 31.67 percent of the 1995 total population. On the other hand, 86,180 or 62.87 percent belong to the 15 - 64 years old age bracket and only 3,742 or 2.73 percent are in the age bracket of 65 years old and above.

In terms of sex distribution, the females slightly outnumbered the male population as there are 68,924 females or 50.28 percent of the municipal household population as against 68,157 or 49.72 percent (**Table 2-29**).

AGE	В	OTH SEXE	S		MALE			FEMALE	
GROUP	1990	1995	2004	1990	1995	2004	1990	1995	2004
All ages	123,816	137,081	178,115	60,959	68,157	88,559	62,857	68,924	89,556
Under 1 year	3,582	3,746	4,867	1,816	1,943	2,420	1,766	1,803	2,447
1 – 4	12,357	13,907	18, 070	6,369	7,248	8,984	5,988	6,659	9,086
5 - 9	14,923	15,571	20,232	7,646	7,991	10,059	7,277	7,580	10,173
10 - 14	13,915	13,935	18,106	7,001	7,075	9,002	6,914	6,860	9,104
15 - 19	12,800	14,824	19,261	6,037	7,124	9,577	6,763	7,700	9,684
20 - 24	12,892	13,922	18,089	6,077	6,777	8,994	6,815	7,145	9,095
25 - 29	11,332	13,050	16,956	5,421	6,378	8,431	5,911	6,672	8,525
30 - 34	10,114	11,102	14,425	5,031	5,553	7,172	5,083	5,549	7,253
35 - 39	8,618	9,593	12,465	4,299	4,788	6,198	4,319	4,805	6,267
40 - 44	7,027	7,640	9,927	3,532	3,840	4,936	3,495	3,800	4,991
45 - 49	4,658	6,258	8,131	2,420	3,124	4,043	2,238	3,134	4,088
50 – 54	3,797	4,228	5,494	1,847	2,110	2,732	1,950	2,118	2,762
55 – 59	2,569	3,249	4,222	1,269	1,580	2,099	1,300	1,669	2,123
60 – 64	1,942	2,314	3,007	869	1,077	1,495	1,073	1,237	1,512
65 and over	3,290	3,742	4,862	1,325	1,549	2,418	1,965	2,193	2,445

 Table 2-29. Population by age and sex group, 1990-2004



Figure 2-83. Population density map of Meycauayan City, 2016

2.4.2.1.2.2 LITERACY

The municipality of Meycauayan has a high percentage of literacy by the 95.78 percent literacy rate based on 1995 Census of population, which could be attributed to the existence of numerous educational institutions and facilities. The same Census revealed that out of the 119,355 population five (5) years old and over, 105,986, are literate and only 5,038 or 4.22 percent are illiterate.

In terms of educational attainment, the 1995 population showed that of the total school age population, 2,871 or 2.40 percent completed the pre-school level, 45,021 or 37.72 percent completed the elementary level; 38,805 or 32.51 percent finished the secondary level; and only 13,989 or 11.72 percent reached the tertiary level. The remaining 5,038 or 4.22 percent of the total school age population account for those who have not completed any grade at all.

2.4.2.1.2.3 HOUSING DATA

Housing needs are among the growing problems which accompanies the increasing population in Bulacan. Although there are number of subdivisions being established in the province that could accommodate the growing numbers of families, the problem is the affordability and capability to avail the housing units offered in the market. In the following table, only 0.59% of the total households were squatters in 2007.

Total	Total occupied	Makeshift / salvaged,	Households who
Household	housing units	improvised materials	are squatters
42,786	41,873	1,647	254

Table 2-30	. Housing	condition in	n Meycauayan	City,	2007
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Source: PDPFP, 2010-2030

2.4.2.1.3 CULTURE AND LIFESTYLE

Bulacan is home to various famous festivals and events such as (www.govisitphilippines.com):

- 1. Sto. Niño Festival (held during Last Sunday of January)
- 2. Carabao Festival (held from May 14-15)
- 3. Obando Fertility Dance (held from May 17 to 19)
- 4. Linggo ng Bulakan (held during September 8 to 15)
- 5. Calumpit Libad Festival (held during June 23 to 24)
- 6. Plaridel Horse Festival (held during December 29 to 30)
- 7. Sto. Niño Festival (held during Last Sunday of January)
- 8. Carabao Festival (held from May 14-15)
- 9. Obando Fertility Dance (held from May 17 to 19)
- 10. Linggo ng Bulakan (held during September 8 to 15)
- 11. Calumpit Libad Festival (held during June 23 to 24)
- 12. Plaridel Horse Festival (held during December 29 to 30)

Meycauayan (Tagalog for "where bamboos thrive") is known not only for its bamboo products but especially its high-end cottage industries: jewelry, especially gold filigree; leather, from the oldest tannery in the country. (Source: http://lifestyle.inquirer.net/216845/why-bulacan-is-the-culture-capital-of-the-philippines)

2.4.2.1.4 PHYSICAL CULTURAL RESOURCES

Minimal number of sources were found regarding the cultural properties and archaeological finds in Meycauayan City. Most of the sources about 40 years ago however indicate finds in Bulacan province.

The following discussion on archaeological finds in Bulacan are lifted from the journal Philippine Studies: *The beginning of Filipino Society and Culture*³.

Philippine Pleistocene tools

"In the Philippines, the earliest surviving tools of ancient man consist of big, crudely worked choppers. The materials used for making these implements were flint, quartz, and chalcedony. In spite of their typological similarity to some dated tools found in. Indonesia and neighboring countries, the Philippine tools have not been dated with certainty.

³ Jocano, F. L. (1967). *The beginning of Filipino Society and Culture*. Philippine Studies vol. 15, no. 1 (1967): 9–40



First, most of the tools were surface finds brought to Manila by ditch diggers, farmers, and mining prospectors. Only rarely was controlled excavation of any kind made or any steps taken to do in situ analysis of the geological-artifactual association. Second, the archeological work carried out in the Rizal, Bulacan, and Batangas areas was almost entirely exploration and survey work, in which different sites were examined with almost no systematic digging."

Early New Stone Age

"Tool types. The first known type of implements during the New Stone Age includes roughly flaked tools with ground blades or cutting edges. This type has been called the Bacsonian, a type-classification derived from the name of the place where this Ionn was first recognized and identified, the Bacson Massif of Indo-China. Older scholars call these tools pmbneoliths ("before the neoliths" or polished stone tools). They are found mostly in Bataan, Rizal, and Bulacan provinces. The body of this tool type is not polished."

On the other hand, the following discussions are lifted from the article The Philippines: Archaeology in the Philippines to 1950^4 :

"Beyer further stated that in 1923-1924 he attempted a compilation of all known data on true Philippine stone-age finds, and after a diligent search through the literature, as well as an examination of all rumored finds, he was able finally to accumulate data on some sixty implements that seemed to be genuine prehistoric stone-age artifacts. Of these, he acquired or personally examined about thirty real neolithic implements, scattered over a wide geographic range from Davao to northern Luzon. Most of these tools were obviously middle or late neolithic in type, but they were sufficient to show that the Philippines had a true late stone-age population here, even if the remains were scarce and widely scattered.

Such was the atmosphere, according to Walter Miles (1952: 41), when a turning point came toward the end of 1925. Construction work had already begun on the Novaliches Dam in Rizal Province, and the Novaliches site, that started the Rizal-Bulacan Archaeological Survey, was discovered by accident. Early in 1926 workmen erecting a house found a glass bracelet and a few beads. Not long afterwards, when ground was being levelled for a garage shed, a nest of iron weapons was uncovered containing a considerable quantity of pottery sherds and several dozen beads. It was then that W. S. Boston, general foreman of the dam project, notified the Bureau of Science and Beyer of the University of the Philippines. Subsequent investigation and reconnaissance of the site confirmed the find of ancient burials and habitations.

Further excavations were carried out intermittently until the middle of 1930 to include a narrow strip inside Bulacan Province. Actually, the collecting activities by Beyer's field assistants continued beyond this year. Altogether, a total of 120 sites was surveyed, and in five years of work the collection totalled nearly half a million specimens (Beyer 1947: 231). The magnitude of the survey was highlighted by the fact that it disclosed relics from all the horizons of the prehistoric ages of man.

In addition to the extensive surveys mentioned above, Beyer carried out collecting activities in other Philippine areas, briefly enumerated as follows (Beyer 1947: 207): (1)

⁴ Evangelista, A. E. (1960). The Philippines: Archaeology in the Philippines to 1950. Retrieved July 21, 2017 from https://www.google.com.ph/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=3&ved=0ahUKEwiKiaurgZrVAhVEk5QKHWc7DZ0QFggrM AE&url=http%3A%2F%2Fhl-128-171-57-22.library.manoa.hawaii.edu%2Fbitstream%2F10125%2F16798%2F1%2FAP-v12n1-97-104.pdf&usg=AFQJCNHOnMbBFkeGDb32_1UMnOQaVtd2fA



Visayan Islands collection, 1929-1930, 1936-1939, 1941, especially; (2) special Pugad-Babuy (Bulacan) collection, 1933-1938; (3) special Sta. Mesa and Cubao collections, Rizal Province, 1935-1940; (4) several other collections at intermediate intervals, particularly Pampanga, Camarines Norte, Cavite, Zambales, Sulu, and other places.

The aforementioned archaeological activities have brought to light an appreciable body of information clearly establishing the fact that man is ancient in the Philippines. Evidence has been accumulated that points to cultural stages or horizons extending from mid-Pleistocene times (some 250,000 years ago) to the arrival of the Spaniards in the sixteenth century. Acknowledgment must be made to the patient workers in the disciplines ofgeology, zoology, and palaeontology. It was, for example, the diligent researches by Ralph von Koenigswald on pleistocene man and mammalian fauna in Java that brought him to the Philippines. At the sites worked by Beyer in Rizal and Bulacan, Koenigswald recognized certain implements similar both in material and workmanship to the Java (Sangiran) types. These finds were closely associated with mid-pleistocene stegodon fossils and a number of whole tektites-"curious black balls, cylinders, and fragments of a strange natural glass...." Until this discovery, naturalists and writers had assumed that the larger Asiatic mammals never reached these shores and that this fact argued strongly against there having been any land bridges connecting the Philippines with the continent during Late Tertiary and Pleistocene times (Beyer 1955: 3)."

2.4.2.1.5 SOCIO-ECONOMIC PROFILE

2.4.2.1.5.1 SOCIO-ECONOMIC CONDITION

Year 1968 when Meycauayan was considered like a first class municipality because of the existence of many industries in the area aside from farming and fishing as ordinary source of living in the region.

As the municipality prospers, traditional industries faced new challenges—fine jewelry making, blacksmith, fancy jewelries, wooden shoe making (which is constantly declining), adobe stone quarrying, and its major industry, leather tanning.

Currently, Meycauayan has only 27 big leather tanning companies, which is a drastic reduction in number due to problems posed by scarcity of raw hide and the high cost of leather chemicals which is mostly imported from other countries.

However, employment, being one of the major sources of income of the populace, showed data increase from 44,396 based on 1990 Census to 53,660 based on 1998 projection, with 4.17 percent as annual employment growth rate.

2.4.2.1.5.2 EMPLOYMENT

Above 15 years old are the economically active population who are seeking for work or who are working. Meycauayan's working age population in 1990 and 1995 were 75,749 and 86,180, respectively.

In 1995, the town's labor force participation rate is 60.06%, lower than the provincial rate of 63.40%.

The 2004 expected working age population is 111,977. With the projected 60.06% labor force participation rate, the 2004 labor is estimated at 67,256. If the employment grows to be 94.80%, the projected employed labor force would be 63,757.

	Item	1990 Census	1995	2004 Projection
1.	Total Population	123,982	137,081	178,115
2.	Working Age Population > 15 years of age	75,749	86,180	111,977
3.	Labor Force Participation Rate	61.82	60.06	60.06
4.	Labor Force	46,831	51,762	67,256
5.	Employment Rate	94.80	94.80	94.80
6.	Employed Labor Force	44,396	49,073	63,757

 Table 2-31. Labor and Employment Data in Meycauayan City 1990-2004

2.4.2.1.5.3 AGRICULTURE

Meycauayan has a total land area of 3,210.0 hectares. Of these, only 371.3 hectares or 11.57 percent of the total land area of the municipality, are devoted to agriculture. The seemingly dwindling agricultural land can be attributed to the rapid urbanization and industrialization of Meycauayan, which had led to the conversion of a sizable area of agricultural land to residential, commercial and industrial uses.

Palay being the principal crop is cultivated in unirrigated and partially irrigated field with a total area of 336.65 hectares. Other agricultural crops having a share of 24.75 hectares include corn, leafy vegetable/fruit, and root crops. Irrigation facilities are available in some areas.

In 1997, palay production is placed at 91.49 cavans per hectare. On the other hand, the production yield of fruit trees and other crops are recorded as follows: mango – 1,160.15; atis – 93.65; corn – 5.5; banana – 62.75; guyabano – 70.80; caimito – 157.50; avocado – 133.35; papaya – 138.40; langka – 109.90; tieza – 70.00; guava – 67.50; leafy vegetables – 60.00; fruit vegetables – 75.00; and rootcrops – 195.00 (**Table 2-32**).

CROPS	AREA (IN HECTARES)	PRODUCTION	
Palay (Rainfed and irrigated)	336.650	91.49	cavans/hectare
Fruits	29.200	1,520.70	metric tons
Mango	11.950	1,160.15	metric tons
Atis	1.121	93.65	metric tons
Banana	13.760	62.75	metric tons
Guyabano	0.965	70.80	metric tons
Avocado	1.404	133.35	metric tons
Corn	2.750	5.50	metric tons
Leafy Vegetables	4.000	60.00	metric tons
Fruit Vegetables	5.000	75.00	metric tons

 Table 2-32. Area planted and volume of production

CROPS	AREA (IN HECTARES)	PRODUCTION	
Rootcrops	13.000	195.00	metric tons
TOTAL	390.600		

2.4.2.1.5.4 TRADE AND INDUSTRIES

In 1998, Meycauayan has three thousand five hundred forty-one (3,541) commercial establishments. Of this number, sari-sari stores constitute the highest number with 435 followed by general merchandise with 280 and retailer (miscellaneous) with 264.

Most of these establishments are located within the Central Business District, which covers the whole barangays Poblacion, Banga and Calvario and portion of barangays Bancal, Saluysoy, and Malhacan.

The municipality has one (1) public market, two (2) private markets, eight (8) supermarkets/convenient stores, and five (5) flea markets located at barangays Tugatog, Pandayan (2), Malhacan, and Perez (Sto. Niño).

The area along MacArthur Highway is a favorite spot for movie houses, refreshment parlors and department stores, among others.

The proximity of Meycauayan to Metropolitan Manila has made it an ideal place for business sectors to invest in manufacturing endeavors within the vicinity of the municipality.

As of 1998, the number of establishments involved in manufacturing/industrial activities totaled 709. Jewelry shops numbering 107 dominated the manufacturing sector. On the industrial group, 60 firms engaged in tanneries to which the town is very well known especially during the early days when hide preservation was still crude.

The following table presents the trade and industries present in Meycauayan City as of 2016. As observed, Apartments has the highest number followed by general merchandise.

CATEGORY	TOTAL
I. AGRICULTURE-RELATED BUSINESS	
a. Agricultural Equipment and Supplies	3
b. Feeds dealer/retailer	8
c. Fertilizer dealer/retailer	2
d. Poultry supply	6
e. Poultry/Livestock farm	2
f. Seed dealer	1
g. Slaughterhouse	1
h. Warehouse	38
II. COMPUTER/ELECTRONICS/CELLPHONES/GADGETS	
a. Cellphone store	2
b. Cellphone shop, repair and accessories	14
c. Computer shop/ICT parts-sales	4
d. Electronic center/supplies	6
e. Internet shop/on-line gaming	16
f. Prepaid cards retailer/reloading station	9

Table 2-33. Trade and industries in Meycauayan (2016)

CATEGORY	TOTAL
III. CONSTRUCTION-RELATED TRADING AND SERVICES	
a. Aluminum and glass supplies	7
b. Construction-contractors/developers	49
c. Construction supplies/concrete products	11
d. Drilling/excavations/septic services	1
e. Engineering services	3
f. Gravel and sand supplier	13
g. Hardware/electrical supplies	42
h. Home improvement/ Interior decorating	13
i. Lumber supplies	11
j. Paint center/retailer	5
k. Plumbing services	7
I. Real estate developer/broker	30
m. Roofing supplies and services	1
n. Tile center/ceramic shop	9
IV. FOOD AND BEVERAGE	
a. Bakeshop/bread products retailer	41
b. Cakes/candies/chocolates/pastries retailer	16
c. Carinderia/eatery/barbecue house	42
d. Catering services	6
e. Egg dealer/retailer	1
f. Fast food/burger stand	35
g. Food and drinks retailer	33
h. Fruits and vegetables retailer	9
i. Ice cream/frozen products retailer	6
j. Ice dealer/retailer	2
k. KTV/restobar	11
I. Lechon (manok/baka/baboy) retailer	17
m. liquor/beverage delivery services	12
n. Meat shop/dressed chicken retailer	29
o. Pizza parlor	11
p. Processed food/processed meat retailer	16
q. Restaurant	34
r. Rice dealer/retailer	15
s. Water refilling station	56
V. HEALTH AND PERSONAL CARE SERVICES	
a. Dental clinic	17
b. Dermatological clinic	6
c. Diagnostic clinic	6
d. Lying-in clinic	7
e. Medical clinic	25
f. Medical laboratory	1
g. Multi-specialty clinic	3
h. Optical clinic	10
i. Private hospital	5
j. Veterinary clinic/products and services	9
VI. MERCHANDISER/RETAILER	
a. Acetylene/Oxygen/industrial gas dealer	20
b. Appliance dealer/retailer	9
c. Buy and sell/trading	134
d. Convenience store	5

CATEGORY		
e. Drugstore/pharmacy	52	
f. Dry goods	12	
g. Fire extinguisher dealer	3	
h. Firearms/ammunition dealer/retailer	1	
i. Furniture shop	12	
j. General Merchandise	166	
k. Glassware retailer	1	
I. Grocery store	23	
m. Home decor shop/antique shop	4	
n. Industrial products retailer	21	
o. Junkshop/scrap materials-buy&sell	48	
p. Money changer	8	
q. Plastic ware retailer	22	
r. Retail store/shop	1	
s. Sari-sari store	63	
t. School and office supplies	15	
u. Soap and detergent retailer	4	
v. Bags and footwear store	27	
VII. PERSONAL STORE AND SERVICES		
a. Beauty parlor/barber shop/facial and body care salon	35	
b. Flower shop	2	
c. Garments/upholstery services	29	
d. Gift shop/toy retailer/bazaar	9	
e. Jewelry shop/store/repair	89	
f. Laundry shop	13	
g. Party/wedding planning services	8	
h. Perfume retailer	2	
i. RTW retailer	25	
j. Spa and massage parlor	11	
k. Tailoring services	4	
VIII. PRINT-RELATED BUSINESS		
a. Printing press/printing services/publishing	38	
IX. PROFESSIONAL SERVICES		
a. Accounting firms	161	
b. Consultancy services	32	
c. Funeral parlor/services	5	
d. Law office/Notary public	6	
e. Manpower services/job placement agency	29	
f. Marketing services	49	
g. Pest control srevices	1	
h. Refrigiration/aircon/appliance repair services	2	
i. Schools/learning centers	44	
j. Security services	12	
k. Watch center/repair	4	
I. Welding shop	13	
m. Woodcrafts/iron works	15	
X. RECREATIONAL FACILITIES		
a. Amusement/gaming facilities	14	
b. Cocokpit arena	1	
c. Fitness gym	7	
d. Function hall/clubhouse	5	

CATEGORY	TOTAL
e. Lottery outlet	3
f. Music Studio/Recording	1
g. Resort	5
XI. TRANSPORT-RELATED TRADING AND SERVICES	
a. Auto supply/car and jeep parts and accessories	18
b. Auto-repair shop	23
c. Car wash services	3
d. Fabrication/machine shop	32
e. Gasoline Station	42
f. Hauling services	4
g. Motor works	7
h. Motorcycle/car dealer/sales	29
i. Motorcycle/bicycle parts and supplies	23
j. Surplus spare parts retailer	1
k. Tire/battery supply	
I. Trucking services	
m. Vulcanizing shop	6
XII. UTILITY SERVICES/FACILITIES	
a. Apartment	285
b. Cable TV service provider	3
c. Electric/power company	11
d. Express mail/mailing services	2
e. Hotel/lodging house	6
f. Market/supermarket	3
g. Memorial park services	5
h. Telecommunications company	4
i. Waste management services	1
j. Water utility company	5

Source: 2015-2016 Socio-Economic Profile of Meycauayan City

2.4.2.1.6 BASIC SERVICES

2.4.2.1.6.1 POWER SUPPLY

There are no firms engaged in gas generation in Bulacan while the National Power Corporation (NAPOCOR) is the only firm engaged in power generation. It generates power through the hydropower plant in Angat Dam for distribution by the utility companies or cooperatives like the Manila Electric Company (MERALCO). Currently, there are thirteen (13) MERALCO substations in the Province.

2.4.2.1.6.2 PEACE AND ORDER

The crime statistics in the province of Bulacan based on the historical data from 1996 to 2008 has shown a decreasing trend. In 2008, the Average Monthly Crime Rate (AMCR) recorded at 2.7 or about three occurrences of crimes per 100,000 population, was the lowest rate for the past 12 years.



Figure 2-84. Average Monthly Crime Rate (per 100,000 population)

Source: PDPFP, 2010-2030

The average monthly crime rate in Bulacan at 2.7 crime incidents for every 100,000 population was below the regional and national rate of 4.89 and 6.28 respectively. This favorable rate of the province may be attributed to the effective operations of the Philippine National Police and with the aid of the collective vigilance of the people.



Figure 2-85. Comparative average monthly crime rate

Most crimes reported in the province were Non Index Crimes. These are crimes involving non-aggravated offenses. Based on the Crime Volume Distribution, the City of San Jose Del Monte has the highest number of registered index crime in 2008 with 63 cases.



Index Crimes, on the other hand, are classified as serious and intense assaults. In 2008, the Meycauayan City has the most number of reported cases with 62.

- Crimes Against Women and Children Based on the implementing rules and regulations of RA 9262 or Anti-Violence against Women and their Children, it is the duty and responsibility of the LGU to establish programs that would educate the public on the nature, causes, incidence, and consequences of such violence in order to prevent it from happening. In relation to this, the Provincial Government of Bulacan has been implementing programs such as counselling for abused women and children and referral to different agencies that could provide further assistance. The province has also extended financial assistance to women and children who were abused. For the past three years, the reported crimes against women and children was in the form of sexual violence which includes rape, sexual harassment, acts of lasciviousness, etc. Despite the decrease in the number of reported crimes, this concern still needs to be addressed to effectively protect the welfare of women and children in the province.
- Drug-related Cases The problem on illegal drugs still exists in the province. The most common violation involves selling of illegal drugs, possession of illegal drugs and drug paraphernalia, drug use, and maintenance of drug den. Based on the report of the Bulacan Provincial Police Office (BPPO), the number of persons arrested has declined for the past three years. However, it cannot determine whether the decrease was due to the reduction of violators or otherwise.

On the other hand, the number of detainees in the Bulacan Provincial Jail and Tanglaw Pag-asa Juvenile Center were 963 and five (5), respectively. The problem on illegal drugs needs proper intervention because it has great impact on the peace and order condition of a locality. Nevertheless the PGB is providing financial assistance to support the rehabilitation expenses incorporated in the indigency assistance program.

Police force

The continuous growth of population corresponds to the need to increase the number of police force as well. However, the need for additional police officers has not been satisfied due to the scarcity of police officers available for deployment. With the standard ratio of one police officer for every 1,000 population, the current ratio of police against the population in 2009 is one police for every 3,012 population. Hence the police force backlog in the province will be 1,713, if measured against the 2007 Census of population (2,826,926) by NSO.



UNIT/STATION	TOTAL NUMBER OF EXISTING POLICE FORCE	UNIT/STATION	TOTAL NUMBER OF EXISTING POLICE FORCE
PHQ	71	City of Malolos	66
PHAU	16	Marilao	39
1 st PMG	110	Meycauayan City	52
2 nd PMG	78	Norzagaray	26
Angat	26	Obando	24
Balagtas	25	Pandi	22
Baliwag	47	Paombong	25
Bocaue	40	Plaridel	38
Bulakan	23	Pulilan	39
Bustos	24	City of San Jose Del Monte	68
Calumpit	27	San Ildefonso	28
Doña Remedios Trinidad	23	San Miguel	44
Guiguinto	33	San Rafael	27
Hagonoy	32	Santa Maria	41
TOTAL		1,114	

Table 2-34. Popula	ition by police for	ce by municipality	, Bulacan (2009)
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Source: Bulacan Provincial Police Office, PNP

2.4.2.1.6.3 EDUCATION FACILITIES

The literacy rate in the province exhibited a decreasing trend from 1990 to 2000 surveys. The 97.6 percent literacy rate in 1994 has decreased by almost 2 percentage points in 2000 (95.87). Thus, one out of 10 of the population basically cannot read and write. Although it remains to be above the average norm, the remarkable deterioration of the literacy rate should not be disregarded.

Among the provinces in Central Luzon, Bulacan has been the highest in terms of literacy rate in 1990. However the results of the 1994 and 2000 surveys did not maintain its standing which exhibited the decreasing rates on all of the seven provinces in the region. Despite the decline, Bulacan ranked second in the region with 95.87 percent, which is four percent higher than the literacy rate of the country at 92.3 percent in 2000.



Figure 2-86. Location of higher educational institutions in Bulacan



2.4.2.1.6.4 TRANSPORTATION

Road condition and level of service in bulacan⁵

The road condition of NLEx is still very good as it goes through rehabilitation just last 2005.

The current level of service is almost 33 percent better than the previous level of service.

The Manila North Road runs from Caloocan to Bulacan to far north of Laoag and La Union. The heavy traffic in the said area is considered a major hindrance to increasing economic activities and fast transportation of people and commodities in the province and the region.

The proposed widening of the McArthur Highway, which stretches from Caloocan City to La Union, should speed up travel time from about four hours to two hours in the whole stretch of the road. The road-widening project would increase the road lanes to four, with each measuring 3.5 meters wide. The road will also have shoulders of 1.5 meters wide. If the project is implemented, it would surely bring convenience to the population of Bulacan downward to La Union. This project is expected to bring faster travel time and to be able to buy cheaper vegetables and other farm products from Central Luzon and Baguio.

Several bus companies have set a stop-over in Bulacan by constructing their respective bus terminals for longer distance passenger service. These bus companies are operating with daily trips from Bulacan to different destinations in Metro Manila and vice-versa. At present, there are nine (9) municipalities, which play host to these bus companies, the City of San Jose Del Monte has the most number of terminals with 6 private bus companies.

The main bus lines of Victory Liner and Baliwag Transit that originate from their main terminals in Manila, Pasay, and Quezon City and travel northward to cities and towns in Pampanga, Tarlac, and Zambales, pass through Bulacan via the Tabang exit and Pulilan Exit. Next Table shows the bus terminals in Bulacan.

It is striking to note that, there is no Bus Terminal in City of Malolos, which is supposed to be the center of business in Bulacan and where the provincial government is located. However, there are terminals in Hagonoy and Balagtas, which are considerably near City of Malolos.

In terms of fishports, the municipality of Hagonoy, have 7 fishports, 6 are private while 1 is public which serve as means for transporting people and are used for

⁵ Provincial Development and Physical Framework Plan of Bulacan (2010-2030)

fishlandings. These fishports are located in Barangay Sto. Nino and San Nicolas. There are also fishports in City of Malolos which is specifically located in Barangay Panasahan; in Paombong which is specifically located in Barangay San Jose; and in Obando which is specifically located in Barangay Paliwas. These ports have one public fishport each. However, the ports' capacity is limited such that most of these respond to fish landing requirements of the coastal municipalities.

Internal circulation, routes and facilities

Another principal roads passing through the province are the Manila North Road which runs across the province from Meycauayan City to the town of Calumpit and the Maharlika Highway which connects the province to other parts of Central Luzon. These roads are commonly used for internal circulation or from town to town travel of Bulakenos.

Public transportation within the province is facilitated mostly using inexpensive jeepneys and buses while tricycles are used for short distances.

The Philippine jeepney pass through the major thoroughfares of Bulacan. Various routes from different municipalities provide the province with easy access to the other cities and municipalities. The best way to go on short distances is by motorized tricycles or pedal-powered pedicabs.

Moving around Bulacan by land is easy with national highways connecting the major roads and an extensive public transportation system, which includes buses, jeepneys, and tricycles, which are the main modes of public transportation. Intertown travel of short distances is provided within the town with jeepneys and motorized tricycles.

Aside from the overall road network, through a motor operated banca, Bulakenos also used the river system of the province as a means of transportation. This is present in the coastal towns including Paombong, Hagonoy, Meycauayan City, Bocaue, Bulacan, City of Malolos, and Calumpit. To be able to reach their desired destination, the river system is accessible to these municipalities. The rivers provide access to the different towns in Bulacan and are utilized by the town people.

Roads

The road network and bridges of Meycauayan City (2016) is presented in the following tables.

Length By Type of Pavement (KM)									
Classification	Concrete Asphalt		Gravel		Earth	TOTAL			
National	10.100	kms.	5.750	kms.	3.000	kms.	-	18.850	Kms.

 Table 2-35. Road network in Meycauayan City (2016)

Environmental Performance Report and Management Plan

Proposed Increase in Production Capacity of the Steel Rolling Mill Project

Length By Type of Pavement (KM)										
Classification	Concr	ete	Asph	alt	Grav	el	Ear	th	TOT	4L
Provincial	9.060	kms.	2.150	kms.	0.350	kms.	-		11.560	Kms.
City	92.440	kms.	0.930	kms.	0.355	kms.	-		20.785	Kms.
Barangay	58.250	kms.	3.220	kms.	19.245	kms.	1.7000	kms.	82.415	Kms.
TOTAL	169.850	kms.	12.0500	kms.	22.9500	kms.	1.7000	kms.	133.61	Kms.

Source: 2015-2016 Socio-Economic Profile of Meycauayan City

Bridges (Along National and Provincial Roads)

Table 2-36. Length of existing bridges

Name / Location	Classification (Concrete, Steel, Bailey or Wooden)	Length (Im)	
MacArthur Bridge - Bañga	Concrete	74.60	
Meyc. Bridge - Poblacion	Concrete	59.00	

Source: 2015-2016 Socio-Economic Profile of Meycauayan City

2.4.2.1.6.5 COMMUNICATION

As presented in the following tables, Meycauayan is equipped with various types of communication.

Table 2-37. Telegraph / Telex Station

Location	Facilities Maintained/ Operated	Services Offered	Contact Person	Address
Calvario	Telephone/Fax Computer	Western Union Payment center	Roselyn Libantao	Calvario
L Ca	ocation	alvario Operated Telephone/Fax Computer	Operated Offered alvario Telephone/Fax Computer Western Union Payment center	OcationOperatedOfferedPersonalvarioTelephone/Fax ComputerWestern Union Payment centerRoselyn Libantao

Source: 2015-2016 Socio-Economic Profile of Meycauayan City

 Table 2-38. Express Mail Courier

Name of Company	Location	Contact Person	Address	
LBC Express Central Luzon, Inc.	Calvario	Carlos Araneta	MacArthur Hi-way	
LBC Express Central Luzon, Inc.	Malhacan	Carlos Araneta	Malhacan Road	
LBC Express Central Luzon, Inc.	Camalig	Carlos Araneta	El Camino Rd., Sto. Nino	
JRS Express Bus. Corp.	Saluysoy	Maximiano Mendoza	MacArthrur Hiway	
Wide Wide World Exprress Corp.	Calvario	Rodolfo Reliciano	Maristel Arcade, MacArthur	
			Hway, Calvario	

Source: 2015-2016 Socio-Economic Profile of Meycauayan City

Table 2-39. Telephone System

Name of Company Location	Cell Sites	Contact Person	Address
Digital Telecommunications		Evelyn Cruz	Saluysoy
Philippines, Inc. (DIGITEL)			
Radio City Telephone Company		Arnold Papa	Abangan Sur, Marilao
(RACITEL)			
Digitel Mobile Phils., Inc.	Brgy.	Miles T. Chua	535 R. Valera Cmpd
	Bayugo		
Digitel Mobile Phils., Inc.	Brgy. Caingin		
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Smart Communications, Inc.	Brgy. Camalig	Salvio S. Valenzuela	Lot 7 B102 LVSN Phase 3C
Smart Communications, Inc.	Brgy. Camalig	-	
Globe Telecom	Brgy. Bancal .	Florencio R. Santiago	713 Yakal St.,Bancal Ext.
Globe Telecom	Brgy. Poblacion		
Globe Telecom	Brgy. Pajo	Jose Camaria	Road 2, Pajo
Globe Telecom	Brgy. Lawa		
Globe Telecom	Brgy. Bahay-Pare	James Francisco	138 Fabre St.

Source: 2015-2016 Socio-Economic Profile of Meycauayan City

2.4.2.1.6.6 WATER SUPPLY

Bulacan has sourced its domestic water from the underground through the twenty-two (22) water districts, seventeen (17) Rural Waterworks and Sanitation Association (RWSA), water refilling stations, and public/private deep and shallow wells.

Approximately, the water districts can only cover more than half of the population. The rest of the population is supplied with potable water by the other abovementioned sources. In terms of water tariff, the Meycauayan City and Obando water districts have higher rates compared to the other water districts in the province and even in Central Luzon. This is because the treated bulk water needed by the two (2) water districts is supplied by Maynilad Water Services, Inc. compared to the other water districts, which directly sourced their raw water from the underground.

The source of water supply of Meycauayan City is the Meycauayan Water District that caters 19 barangays. On the other hand, Barangay Bahay Pare and other barangays are being served by the Crystal Liquid Phils., Inc. by 2,157 households.

Name of Water Utility Service Provider	Location	Service Area	SC Billed	No. of Pop'n. Served	Ave. Monthly Consumption per Capita (cu. m.)
Meycauayan Water District	Poblacion	1. Bagbaguin/(Sto. Niño Phase 5)			
		2. Bancal			
		3. Banga			
		4. Bayugo			
		Northville 3 – Bayugo			
		5. Caingin			
		6. Calvario			
		7. Hulo			
		8. Iba			
		9. Lawa (Meyland Subdivisions)			
		10. Langka			
		11. Libtong			

 Table 2-40. Water Utility Service Providers, 2014

Name of Water Utility Service Provider	Location	Service Area	SC Billed	No. of Pop'n. Served	Ave. Monthly Consumption per Capita (cu. m.)
		12. Longos			
		13. Malhacan (inclusive of St. Francis P2 – Annex)			
		14. Pandayan (inclusive of St. Michael and St. Francis Subd.)			
		15. Pantoc (incl. La Brezza)			
		16. Poblacion			
		17. Saluysoy			
		18. St. Francis (Gasak)			
		18. Tugatog			
		19. Zamora			
Crystal Liquid Phils., Inc.	Pantoc	Brgy. Pantoc, Camalig, Bahay-Pare, Pajo, Perez, Portion of Sitio Mane		2,157 Hhs	

Source: 2015-2016 Socio-Economic Profile of Meycauayan City

Table 2-41. Households (HH) with access to safe water, 2008

Household	Level I	Level III	HH with access to safe water	%	HH without access to safe water	%
49,561	9,913	39,648	49561	100	-	-

Source: PDPFP, 2010-2030

2.4.2.1.7 HEALTH AND SANITATION

Based on the following table, 50 tons of garbage volume are being collected every day in Meycauayan City. The Materials Recovery & Composting Facility of the city is located in Pajo with 4.3 hectares total area.

Table 2-42. Garbag	e disposal in	Meycauayan	City, 2016
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Type of Waste Facility	Location	Area	No. of Garbage Truck	Collection Schedule	Monthly Garbage Fee	Daily Volume of Garbage
Materials Recovery						
& Composting	Pajo	4.3 has.	8 (City owned)	daily	-	50 tons per day
Facility						

Source: 2015-2016 Socio-Economic Profile of Meycauayan City

Year	Livebirths	Total deaths	Infant Deaths	Fetal Deaths	Maternal Deaths		
2010	3,149	1,032	71	14	1		
2012	4,002	1,250	80	25	0		

Table 2-43. Mortality in Meycauayan City, 2010-2013

HADTED 2	Environmental Performance Report and Management Plan
MAPIER 2	Proposed Increase in Production Capacity of the Steel Rolling Mill Project

20133,8551,27379143Source: 2010-2013 Philippine Health Statistics, Department of Health

Selected Causes of Death	Number
Intestinal Infectious Disease	3
TB All forms	74
Septicemia	13
Rabies	1
Dengue	2
HIV Disease	1
Malignant Neoplasm	93
Malignant Neoplasm of the Trachea, Bronchus and Lung	30
Malignant Neoplasm of Breast	33
Leukemia	6
Diabetes	73
Nutritional Deficiency	8
Diseases of the Heart	308
Cerebro Vascular Disease	130
Pneumonia	105
Chronic Lower Respiratory Disease	53
Gastric, Duodenal and Peptic Ulcer	8
Liver Disease	19
Acute Pancreatitis	6
Nephritis, Nephrotic Syndrome & Nephrosis	37
Cond. originating in the perinatal pd.	38
Congenital Anomalies	12
Transport Accidents	8
Accidental drowning and submersion	2
Assault	25
Other causes of death	185

Source: 2013 Philippine Health Statistics, Department of Health

2.4.2.2 PERCEPTION SURVEY

The survey was divided into three major components, namely (1) Socio-Demographic Profile of respondents (2) Disaster Response and (3) Perception on the proposed project.

2.4.2.2.1 DEMOGRAPHIC PROFILE OF RESPONDENTS

Gender

The respondents were composed of 22% male and 78% female.



Figure 2-87. Gender of respondents

Age

Most of the respondents interviewed were in the 20-40 age group (55%); followed by the 41-60 age group (36%); with only 2% exceeding the age of 71.



Figure 2-88. Age of the Respondents

Birth Place

As observed in **Figure 2-89**, 38% of the people interviewed were born in the barangay they lived in today. 36% are migrants from Luzon, from Visayas (23%), and Mindanao (3%).



Figure 2-89. Place of Birth of Respondents

Civil Status

Seventy-nine percent (79%) of the total respondents interviewed are married.



Figure 2-90. Civil Status of Respondents

Religion

Ninety-three percent (93%) of the total respondents interviewed are Roman Catholic practitioners.



Figure 2-91. Religion of Respondents

Ethnicity

No respondent answered that they are a part of an Indigenous People's Group.

Settlement History

Thirty-three percent (33%) of the total respondents have resided in the Barangay for 1-10 years already. Moreover, approximately 20% of the total respondents have been living in the barangay for 11-20 years.



Figure 2-92. Years of Residence in the Barangay

2.4.2.2.2 SOCIO-ECONOMIC PROFILE OF RESPONDENTS

Income, Livelihood and Employment

The majority primary means of living is from salary work (52%), followed by business with 18%. Only 2% of the respondents answered farming as their primary source of livelihood. Seventy-two percent (72%) of the respondents stated that the husband is the primary earner in the household while Thirty percent (30%) has the wife as the primary earner.



Figure 2-93. Main Source of Livelihood of Respondents



Figure 2-94. Primary earner in the household

The monthly poverty threshold for a family of five, according to NSO, is an average income of P8,022 per month. This amount is enough to cover a single family's basic food and non-food needs. Poverty threshold refers to the minimum income a family or individual must earn in order to be considered "not poor".

In **Figure 2-95**, it is observed that 57% of the respondents earn at most 1,000 to 4,999 pesos per month. Moreover, 29% indicated that their monthly income is 5,000 to 9,999 pesos while only 15% of the respondents claim that they receive higher than the poverty threshold. Hence, more than 80% of the interviewed respondents are classified as "poor".



Figure 2-95. Monthly income of respondents

Housing Condition

Forty-six percent (46%) own their land, 6% are tenants only, and 34% renting. On the other hand, 62% of respondents planted vegetables as well as banana, and root crops.



Figure 2-96. Landholding Status of Respondents



Figure 2-97. Major Crops of Respondents

Educational Attainment

Largest percentage (52%) of the respondents are High School graduates followed by Elementary graduates (27%).



Figure 2-98. Educational attainment of respondents

Health Profile

CHAPTER 2

For the previous year, 61% of the respondents have at least one of their household members who got ill. Fever and Upper Respiratory combined are the most prevalent in the area, with 39% and 27% respectively. Majority (63%) of the respondents stated that the primary source of treatment for such illnesses in the household was in the Barangay Health Center.







Figure 2-100. Common illness in the barangay



Figure 2-101. Source of treatment for illness of respondents

Environmental Health and Sanitation

Based on the following figures, 100% of the total number of respondents has access to improved sanitation facilities. Unsanitary practices and facilities may cause diseases and infections that are detrimental to health and might even cause death.

Moreover, 43% of respondents have access to water supply system while 57% use deep well.

Environmental Performance Report and Management Plan

Proposed Increase in Production Capacity of the Steel Rolling Mill Project



Figure 2-102. Type of toilet facility used by respondents



Figure 2-103. Source of water supply

2.4.2.2.3 DISASTER RESPONSE

CHAPTER 2

All respondents (100%) in the impact barangays have experienced typhoon/storm and even flooding and landslides. They declared that typhoons last from 2 to 3 days. Such calamities have affected lives, health, properties, environment, food supplies, livestock and infrastructures.

Eighty (80%) of the respondents stated that the level of response for disasters is adequate in which they have attributed to the quick response of the LGU DRMM, DSWD, NGO and

media. One hundred percent (100%) stated that level of community participation for disasters is also adequate due to unity.

In terms of disaster preparation, Barangay Bagumbayan and Naneng conducts trainings and seminars for its community members.

2.4.2.2.4 PERCEPTION

Perceived Community Problems

Sixty-two percent of the total number of respondents stated that livelihood is the biggest problem faced by their community. This is followed by peace and order in the impact areas, cleanliness and sanitation, and health. These problems may have been induced by their income and the situation of the environmental health and sanitation in the community.

Project Awareness and Acceptability

Eighty-one percent of the total number of respondents was aware of the proposed project. Most of them knew about the project from the barangay. However, details regarding specific designs / plans of the project are unknown to them.

Perceived Positive and Negative Impacts of the Project

The respondents' perceive benefits from the proposed expansion project are:

- 1. Possible employment opportunities
- 2. Increase in land tax
- 3. Improvement of government services (through community projects)
- 4. Progress in the community
- 5. Electrification or cheaper electricity fees
- 6. River and flood control

On the other hand, the perceived negative effects of the project to the community are:

- 1. Negative effect on air quality
- 2. Occurrence of flooding, hazards, and other risks
- 3. Damage/Destruction of the surrounding environment

2.4.2.3 ENVIRONMENTAL PERFORMANCE

Summarized in the following table is the comparison of socio-demographic data on years before the issuance of ECC for the project and the latest available socio-demographic data:

Parameters	<1996 (ECC for	Present (2016/2017)	Remarks
Population	2,221 (1995) in Barangay	12,762 (2015) in	Historical data on Barangay Pare
	Bahay Pare	Barangay Bahay Pare	population show that significant increase
			based on Table 2-27 . Increase in
			employment opportunities have increased
			in-migration in the Barangay alone. It

Table 2-45. Comparison of Socio-Demographic Data

Parameters		<1996 (ECC for	Present (2016/2017)	Remarks
				should be noted that as of 2016, there are
				5 manufacturing companies that operate
				in the barangay including the SteelAsia
				Rolling Mill Project.
Households/ in	۱-	445 (1995) in Barangay	2,553 (2015) in Barangay	Increased by approximately 82%.
migration		Bahay Pare	Bahay Pare	Increase in employment opportunities
				have increased in-migration in the
				Barangay alone. It should be noted that as
				of 2016, there are 5 manufacturing
				companies that operate in the barangay
				including the SteelAsia Rolling Mill
				Project. Average household size stayed
				the same (5 persons/household).

Note: No other baseline data available for comparison for previous and present socioeconomic parameters.

Increase in population is one of the observable changes in Meycauayan, specifically in Barangay Bahay Pare where the project is located. Local economy has improved due to continuous development of Meycauayan which will result to improved basic social services such as health and education facilities. In addition, social development programs/projects conducted and currently implemented by SAMC have provided additional livelihood opportunities and improvement to basic services in the impact areas. These are:

- 1. Training for Bokashi Balls Making as alternative livelihood;
- 2. Adopt-a-school Program;
- 3. Assistance to fiestas and sports fests;
- 4. Adopt-a-river Program with EMB by using Bokashi Balls;
- 5. Rainforestation activities of the Angat Watershed;
- 6. Regular donation of medicines to Health Center; and
- 7. Health and safety training for employees

Complete details of the implemented and ongoing SDP projects and programs are presented in **Table 5-1**.

2.4.3 POTENTIAL IMPACTS AND OPTIONS FOR PREVENTION, MITIGATION AND ENHANCEMENT

2.4.3.1 DISPLACEMENT OF SETTLERS

There will be no expansion of the project in terms of project size. The project The project is located within the 18 hectares property of SAMC hence will not displace residents during expansion.

2.4.3.2 IN-MIGRATION

The company will priotize hiring of local residents of the impact areas. If, in the event that there are no qualified applicants from the host barangay or municipality, the company will

encourage that migrant workers will participate in social activities and social development programs to interact with the community.

2.4.3.3 CULTURAL/LIFESTYLE CHANGE

With additional need for manpower and social development projects, there will be a change that would improve the standard of living of the community brought about by stable jobs and higher household incomes. Improvement in incomes, education and infrastructures are expected. Education, Information, and Communication Programs as well as participation to livelihood projects will be encourage and implemented by the proponent.

2.4.3.4 IMPACTS ON PHYSICAL CULTURAL RESOURCES

The project site is not part of an important feature or landscape nor a potential archaeological site. Moreover, the site is zoned as an industrial area. Nonetheless, during project development, if the contractor happens to discover artifacts, bones or other objects of interests, the Archaeological/Paleontological Chance Find Procedure shall be followed such as suspension of all digging; drilling and other earthmoving activities, securing the site, and informing the local police, among others. This Chance Find Procedure, lifted from Asian Development Bank study as indicated below, shall be attached for the contractor to be made aware of:

Chance Archaeological/Paleontological Finds Procedure for Subprojects

- This procedure shall be made known to the Local Government Unit (LGU) Contract Administrator, the Contractor, the Site Engineer, all Construction Foremen and all On-Site Supervisors.
- 2. A copy of this procedure shall be made available at the construction site at all times.
- 3. Upon discovery of artifacts, bones or other objects of interests, all digging, drilling and other earthmoving activities within the radius of 10 meters from the discovery point shall be immediately suspended. The highest ranking officer of the Contractor present at the site must impose the suspension of activities and immediately inform the LGU Contract Administrator or if not available, the highest ranking LGU officer available.
- 4. The highest ranking officer of the Contractor at the construction site with or without the LGU Contract Administrator or LGU representative shall immediately take photographs of the artifacts, bones or other objects of interest. The photographs must be taken at close-ups and at distant range or at wide-shots placing the objects at the approximately the same point and position where they were found and showing other markers.
- 5. The highest ranking officer of the Contractor at the site must ensure that the site is secured and any artifacts, bones or objects of interests already removed from the site must also be placed in a secured place or container.
- 6. The LGU Contract Administrator and/or highest ranking Officer from the LGU shall immediately report the discovery simultaneously to: (a) the Regional Project Coordination Office (RPCO) Social and Environmental Safeguards (SES) Officer and Engineer or if not available, the highest available ranking Officer of the RPCO; and, consistent with RA 8492, (b) to the National Museum.

The following are the contact numbers of the Archaeology Division of the National Museum:

Email: archaeology@nationalmuseum.gov.ph Telephone Numbers Curator: (+632) 527-03-08 Administrative: (+632) 527-12-35 Records Section: (+632) 527-11-40

Source: Asian Development Bank (2012). Environment Safeguards: A Good Practice Sourcebook Draft Working Document⁶

2.4.3.5 GENERATION OF LOCAL BENEFITS FROM THE PROJECT

The benefits of the project will include items from the existing SDP containing the recommended programs and projects that the different sectors themselves identified.

Likewise, these plans and programs were reviewed in reference with the Municipal Development Plans as well as the provisions of the Local Government Code (RA 7160) under which both laws mandated benefits for the host communities.

⁶ Retrieved July 21, 2017 from https://www.adb.org/documents/environment-safeguards-good-practice-sourcebook

The Social Development Plan prepared for this project considered the articulated wishes of the community and Local Government of the impact areas, their concerns and issues concerning the environment, health and vulnerable groups and the measures to address them as recommended in the EIS. Focus will be centered on the mitigating measures to abate the possible negative impacts of the project and enhance the positive impacts.

2.4.3.6 TRAFFIC CONGESTION

It is inevitable that there will be an increase in vehicular traffic especially during construction stage wherein use of heavy duty vehicles are needed. Such situation will pose risks to the residents living along the periphery of the road and school children crossing the streets. The proponent will strictly comply with traffic rules and implement speed limits to ensure safety of the potentially affected communities.

CHAPTER 3 ENVIRONMENTAL MANAGEMENT PLAN

The Impacts Management Plan (IMP) provides the Projects key components that will likely to be affected and the corresponding mitigation and enhancement principles, practices, and technologies aimed to minimize and/or eliminate the potential impacts to the environment.

The proposed Project will inevitably create various impacts, both positive and negative, throughout the Pre-Construction, Construction, Operations, and Abandonment phases. This IMP will aim to mitigate and enhance the negative and positive impacts of the Project, respectively.

An analysis of the impacts identified is shown in **Table 3-1**.

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Construction Ph Site Preparation / Construction Activities	ase Land - Geology	 Modification of existing topography Minimal increase in soil erosion 	 Proper planning and close supervision during preconstruction activities Adopt erosion control measures(i.e. coconet) 	Proponent's Environmental Unit	Php3M – implementation of site preparation adhering to best engineering practices and maintenance	Project Development Budget Contractor's contract
	Water Quality	Sedimentation/ Siltation	 Implementation of proper engineering control designs and measures for potential erosion and siltation 	Project development team, PCO, Contractor	Php3M – implementation of site preparation adhering to best engineering practices and maintenance	Project Development Budget Contractor's contract
		 Generation of wastes 	 Implementation of the documented Waste Management Program (SA-IMS- CP-216) Materials Recovery Facility (recover recyclable wastes) Hazardous Waste Containment Facility 	Project development team, PCO, Contractor	Php50,000 / Year – provision for proper solid waste disposal	Project Development Budget Contractor's contract
	Air and Noise Quality	 Generation of dust 	 Sprinkling of water along exposed areas especially during dry season; Road dust cleaning using the existing vacuum type mechanical street sweeper Vehicle speed limit at 10pkh inside plant compound 	Project development team, PCO, Contractor	Php50,000/ year – operational expenses	Project Development Budget Contractor's contract
		Increase in noise level	 Maintain equipment deployment schedule which, if possible, limits the construction activity only during daytime Regular maintenance of vehicles and construction equipment 	Project development team, PCO, Contractor	Php2,000,000 / year –cost of maintenance of heavy equipment	Project Development Budget Contractor's contract

Table 3-1. Impact Management Plan

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
						Compliance to RA 8749 and its IRR
	People	 Generation of solid and hazardous waste 	 Implementation of the documented Waste Management Program (SA-IMS- CP-216) Materials Recovery Facility (recover recyclable wastes) Hazardous Waste Containment Facility 	Proponent's Environmental Unit/ PCO	Php50,000 / Year – provision for proper solid waste disposal	Project Development Budget Compliance to RA 9003 and its IRR Contractor's contract
		 Increase of job and business opportunities 	 Continuous implementation of local hiring policy. Comply with local ordinances on providing local community employment opportunities Coordinate with LGU 	Proponent / Contractor		Part of the Project Cost; Compliance to Local and National Laws
		 Occupational safety and health 	 General EHS Guidelines for Contractors Conduct of EHS risk assessment for contractors scope of work and their potential impact both to contractors' workers & SAMC workers Implementation of the Work Permit system Requirement of Safety Officers employed by contractors to be on duty on site 	Proponent	Php100,000/ year –Safety and health program will cover this activities	MOA with contractors ECC
		Additional Revenue for the LGU	Pay the taxes required by law	Proponent		ECC
		Other Livelihood Opportunities	Conduct of livelihood trainings for the affected community	Proponent	Php500,000/ year – SDP budget will be utilized for the	ECC, SDP

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
					implementation of activities such as, livelihood programs, education assistance, medical assistance, IEC, among others.	
		Increase in traffic volume	 Implementation of traffic scheme 	Proponent	Php100,000/ year –Safety and health program will cover these activities	ECC
Operation Phase	e					
	Water Quality	Generation of wastes	 Implementation of the documented Waste Management Program (SA-IMS- CP-216) Materials Recovery Facility (recover recyclable wastes) Hazardous Waste Containment Facility 	PCO, Admin	P500,000 annually for waste handling and disposal	Annual Admin & HES Budget
	Air Quality	Source Emission (Mill 1 and Mill 2 Furnace)	 Periodic maintenance of Furnace and Cleaning of Stacks. Periodic maintenance of Recuperator Use of Low Sulfur Fuel Oil (LSFO) or Special Fuel Oil 60 (SFO -60) with Sulfur content < 1% PLC automatic air-fuel ratio valve Standard Furnace Temperature Settings (Running & Idle States) Provision of Green Buffer Zone to serve as Air Pollution and GHG sink (currently has 163 trees inside plant compound) To consider the use of pollution control such as scrubber or other pollution control device to mitigate SO₂ stack 	PCO, Maintenance Department, PDN	P3M annually	Annual Production and Maintenance Budget

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			emission (should actual test results exceed standards). This is to note that the predicted ambient ground level SO ₂ concentration complies the National Ambient Air Quality Standards for Source Specific Air Pollutant (NAAQSSSAP).			
	Air Quality	Vehicular Emission (Delivery Trucks and Hauling Trucks)	 Check PETC certificates of vehicles. Check Vehicles to emission control such as Catalytic converter and muffler for cars, trucks etc (Hauler accreditation procedure) Semi-annual Physical Truck Inspection Checklist (Contracted Haulers) Periodic Maintenance of in-house vehicles Planting of trees along perimeter 	Logistics (Contracted Haulers) Motorpool Admin	P300k/yr	Annual Production and Maintenance Budget
	Noise Quality	Noise generation	 Enclosed mill building To reconstruct current perimeter wall of 2.5 meter high to 3.5 meters Regular maintenance of vehicles Implement noise protection measures such as PPEs and enclosures Provision of Effective Enclosure such as Noise Barriers Maintain equipment deployment schedule. 	PCO, Maintenance Dept.	Included in the operation cost	Annual Maintenance Budget
	People	 Generation of solid and hazardous waste 	 Implementation of the documented Waste Management Program (SA-IMS- CP-216) Materials Recovery Facility (recover recyclable wastes) 	PCO, Admin	MRF : P250k for relocation Handling & Disposal : P500k annually	Admin Annual Budget

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
		Increase of job and business opportunities	 Hazardous Waste Containment Facility Continuous implementation of Local hiring policy. Coordinate with LGU 	Proponent / Contractor	N/A	Part of the Project Cost; Compliance to Local and National Laws
		Occupational safety and health (potential injuries due to accidents)	 Implementation of an Occupational Health & Safety Management System complying to OHSAS 18001 Semi-annual review and updating of documented hazard-risk assessment to address significant risks Analysis of annual WEM (Work Environment Measurement) results which provides current conditions about noise, ventilation, heat stress, illumination, dust. Establishment of action plans on failed results Strict implementation of wearing Personal Protective Equipment (PPE) as per the established PPE Matrix Ensure operators of heavy equipment and critical machines are all competent & authorized Work Permit system for dangerous works like hotworks, work at heights, confined space, working at high voltage areas Annual safe work load test for cranes and DOLE Permit to Operate for mechanical equipment Monthly inspection of fire alarms and fire fighting equipment, 	Proponent	PPE: P1.3M annually Signages: P100,000 annually Building & grounds maintenance: P2.4M annually Annual Physical Examination: P500,000 annually	MOA with contractors ECC

Project Phase / Environmental Aspect	Environmental component likely to be affected	Issues/ Potential Impact	Options for Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
		 Additional Revenue for the LGU Other Livelihood Opportunities 	 Regular safety & housekeeping inspection by Core team lead by the Safety Officers Regular inspection of machine guards Annual Physical Examination for all employees 3 fulltime Safety Officers 3 health officers (Occupational nurses) on duty 24-7 Occupational doctor on duty 12 hrs a week Deployment of Emergency Response Team in cases of emergencies; conduct of regular emergency drills Pay the taxes required by law Conduct of livelihood trainings for the affected community 	Proponent Proponent	Additional of P5M annually P150,000 for the 1 st yr (Bokashi Balls making)	ECC ECC, SDP
			,		()	
Plant closure	People	 Loss of livelihood of local work force 	Provide and develop sustainable livelihood programs and alternative livelihood training programs	Proponent	Php1M / year – SDP budget will be utilized for the implementation of activities such as, livelihood programs, education assistance, medical assistance, IEC, among others.	ECC, Rehabilitation / Abandonment Plan / SDP



SAMC also implements the following Carbon Neutral initiatives:

Project Description	Timeline	Reduction Potential per year	CO2e annual reduction (CO2e tons/yr)
Replacement of G.I. roofing and sidings with thermoplastic roofing sheets and skylights in every column of M1 Rolling Mill	To be completed September 2017	155,520 kwh	85.2
150KW solar panel installation at Auxilliary Building Replacement of light bulbs with LED	started February 2017, to be completed June 2018	870,000 kwh	476.76
Replacement of the old furnace of M1 with a more efficient furnace equipment (from current 32li/mt to 29li/mt)	October 2017	1.8M liters of Fuel oil	5,307.43
TOTAL			5,869.39

Carbon offsetting by tree planting is also underway. SteelAsia is a partner with the Bulacan State University (BSU) and the Gurong Nagbabalik Sa Bayan in the Angat Dam Rainforestation Project called Punuan sa Kagubatan. The project involves planting trees on some 25 hectares of the Angat Watershed over 5 years and training the Dumagats to take care of these trees. Tree planting was completed for the first 5 hectares last year with total of over 5,000 trees with potential carbon offset of 200 tons per year.

CHAPTER 4 ENVIRONMENTAL RISK ASSESSMENT AND EMERGENCY RESPONSE POLICY AND GENERIC GUIDELINES

4.1 ENVIRONMENTAL RISK ASSESSMENT (ERA)

CHAPTER 4

Annex 2-7e of the RPM DAO 2003-03 provides the guide in determining the level of coverage for projects handling, storing, and using hazardous substance and mixtures. The degree of ERA preparation is provided by the following level of coverage:

Level 1: Preparation of an Emergency/Contingency plan

Level 2: Preparation of an Emergency/Contingency plan and ERA Report

However, a Risk Screening Study is the initial step for determining whether or not the proposed project will reach these levels. The following are steps for conducting the RSS:

- Identifications of the major substances that will be used in the project;
- Presentation of the physical and chemical properties of these substances;
- Discussion of the hazards associated with these substances during accidents;
- Categorization of the major substances used, handled, or stored at the facility; and
- Determination of the amounts of these substances if it will reach or exceed the threshold limit of Levels 1 and 2.

Hazards	Exposure Pathway and Potential Receptors	Adverse Impact
Noise	Workers' exposure is experienced from equipment, machines, vehicles and human activities.	Nuisance and annoyance problem to workers/personnel and to the nearest downwind community. Transient and permanent noise- induced hearing loss to workers at site.
Dust	Community and workers exposure will be experienced during the construction phase. Exposure pathways are through inhalation and skin contact.	Nuisance and annoyance. Exacerbation of respiratory symptoms and diseases (i.e. cough and asthma).
Air pollutants (Sox, NOx and CO)	Workers and community exposure to vehicle emission and source specific emission (i.e. gen set and furnace).	Increased susceptibility tobacterial infections of lungs. This may aggravate existing respiratory and cardiovascular conditions. Irritation of the respiratory tract and may result to coughing.
Particulates (PM10 and TSP)	Workers and community exposure to minute particles from hauling and delivery trucks and source specific emissions.	Exposure may cause irritation of eyes, skin, throat or may affect the respiratory system.
Oil and Grease	Workers involved in the repair and maintenance of vehicles,	Contact may cause skin irritation/dermatitis.

Table 4-1. Hazard Identification, Characterization and Assessment

CHAPTER 4

Proposed Increase in Production Capacity of the Steel Rolling Mill Project

Hazards	Exposure Pathway and Potential Receptors	Adverse Impact
	equipment and machines will be	
	exposed through skin contact.	
Fall, slips, and other	Workers are largely affected by	Fatalities
accidents	means of physical contact with	Burns
	hard or heavy objects.	Injuries in any parts of the body.

The contribution of the plant to the existing environmental pollution is found on **Table 4-2.**

Air Pollutants	Health Effects	Exposure Limits *
NO ₂	Possible increase in upper respiratory tract infection especially among children <2 years old.	0.053 ppm (200ug/m ³) Annual arithmetic mean
SO ₂	Increase respiratory symptoms like cough, colds, difficulty of breathing, wheezing and bronchitis more common among children and the elderly.	0.03 ppm (365 ug/m ³) 24 hour averaging
PM ₁₀	Increase in respiratory symptoms like cough, colds, difficulty of breathing, wheezing and bronchitis more common among children and the elderly.	Standard for PM ₁₀ 150ug/m ³ 24 hour averaging

Table 4-2. Air pollutants

Source: National Ambient Air Quality Standards, 1987. US

The Proponent will implement mitigating measures to maintain the safe level of emissions, by providing anti-pollution measures and strictly follow the Environmental Management Plan through periodic monitoring of air pollutants.

4.2 EMERGENCY RESPONSE POLICY AND GUIDELINES

4.2.1 Purpose

The purpose of this plan and procedure is to:

- Safeguard human lives in the event of fire or/and explosion, or any oil/chemical spill that may cause injuries to person/s or/and damages to plant, equipment and environment.
- To establish a systematic and proper line of communication and responsibility towards orderly evacuation, rescue and recovery.
- Safeguard the environment against contamination of any possible spillage during storage, handling and transfer of any quantity of chemical/ oil.

4.2.2 Emergency Identification

It is the responsibility of the Safety Officer/Engineer and members of the Health & Safety

- Committee to identify and evaluate emergencies with potential risks and come up with a conclusion if a certain emergency will have high impact to Steel Asia, thus a need for a preparedness and response procedures.
- When identifying potential emergency situations, consideration should be given to
- emergencies that may occur during both normal operations and abnormal conditions (e.g. operation start-up or shut-down, construction or demolition activities).
- Identification process should consider emergencies that can be associated with specific activities, equipment or workplaces.

Following information should be considered in the identification of potential emergency situations:

History	At least one occurrence from the past in the site or in other similar site / organization
Legal Requirement	Required by applicable law to have emergency preparedness procedures
Geographical Location	If the emergency is highly potential due to the location of the site
Presence of material / equipment that can trigger or worsen the emergency	Available in the site in significant quantity
EHS risk assessment	Identified as emergency situation in at least one area and risk level is at least moderate

• In combination to above considerations, the severity of the consequence should be considered as per below table:

Rating	Description
5 - Severe	<i>Can cause severe environmental damage, e.g. permanent / long-term environmental damage; multiple fatalities</i>
4 - Major	Can cause environmental damage, but the damage is not permanent or is only medium term.; Single fatality, permanent total disability, severe occupational diseases or health concerns
3 - Moderate	Can cause environmental damage, but such damage is short term and always repairable; Temporary partial disability, permanent partial disability
2 - Minor	Can result in environmental change, but the effect of such change is easily recoverable or self-recovering, and there is no lasting impact; Minor injury e.g. cuts and bruises
1 - Insignificant Positive	None of the relevant parameters exist at a level that cannot cause environmental change, or may results in a positive environmental effect; No injury, minor discomfort or nuisance e.g. odor

Table 4-3. Severity of Consequence

- Emergency risks will be assessed using **Annex A: SA-IMS-FRM-010** Potential Emergency Risk Assessment *in SA-IMS-CP-220.*
- If any of the condition listed under 4.2.4 is satisfied, rate Probability with "1". Otherwise, input "0".
- Risk value is equal to the product of Probability and Severity.
- If the risk value is at least 3, the potential emergency becomes significant and there's a need for the establishment of a preparedness and response procedures.

4.2.3 Responsibilities

The emergency response team is group of people who will respond or control to all emergency situations like fire, chemical spill and other emergency situation inside the plant as identified to be have a significant risk to plant operations

4.2.3.1 Team Structure and Responsibilities

In keeping with the internal responsibility system and best practice, all workplace parties have an important role in emergency preparedness and response. These workplace parties include employers, emergency response teams, OH&S committees, workers, managers and supervisors. The development and implementation of an effective emergency management response is a team effort that requires the participation and consultation of all workplace parties. One way of ensuring best practice is to follow these roles and responsibilities of workplace parties.

Emergency Response Teams should:

- a) Participate in specialized emergency response training as coordinated by the OH&S committee.
- b) Activate and administrate the ERP in consultation with the employer.

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- c) Report the emergency to all workers and external agencies.
- d) Control and take command of the situation.
- e) Coordinate all emergency activities.
- f) Order evacuation of all workers and visitors, and confirm completion of evacuation.
- g) Request external aid from mutual agreement partners in consultation with employer.
- h) Provide the list of hazardous materials to emergency responders.
- i) Direct equipment shut-downs.
- j) Initiate rescue operations, including the retrieval of specialized equipment and PPE for the internal emergency response team and workers.
- k) Attend to casualties.
- I) Issue the all-clear to workers when it is safe to return to the building.
- m) Coordinate property clean-up.
- n) Review results of emergency exercises and drills with all workers, employer emergency and OH&S committee.

Note: Safety Officer will oversee the overall duties and responsibilities of the ER Team

The Emergency Response Team composed of:

Emergency Response <u>Commander</u> with duties and responsibilities of:

- a) Activate the response team to all emergency situations.
- b) Direct and support the activities of the ERT and maintain an effective emergency response to reduce the loss of life and property and the cleanup operations.
- c) Evaluate the severity, potential impact, safety concerns and response requirement based on the information provided.
- d) Know the normal work location for all the members of the ERT and how to contact them at work and at home. To maintain and periodically update a directory of this information.
- e) Develop and maintain an Emergency Response Plan.
- f) Develop and periodically rehearse a plan to evacuate and/or search the building.
- g) Must be able to gain access to all parts of the building.
- h) Must know and be able to demonstrate to others the use of all emergency equipment in the plant.
- i) Know the location of valuable or sensitive areas in the plant and develop a plan to quickly secure those areas.
- j) Select and train any additional ERT Members necessary to carry out the responsibilities of the position.
- k) Confirm safety aspects at site, including need for Personal Protective Equipment, sources of ignition and potential need for evacuation.
- I) Communicate and provide incident briefing to company superiors, as appropriate
- m) Coordinate/complete additional internal and external notifications.

The <u>ERC</u> should always be responsible for directing the response activities and should assume the duties of all the primary positions until the duties can be delegated to other qualified personnel. The more knowledgeable individuals are of their roles and

responsibilities during an emergency event, the better prepared a team can be to implement a streamlined response.

Organizational and Manning of the Plant Fire Brigade

- a. Fire Marshal Shall have an over-all administrative and supervisory control of the Fire Brigade Organization, responsible for the implementation of the Fire Prevention measures within and outside the building, for maintaining an up to date records of the Fire Brigade Organization, shall conduct periodic evaluation of the equipment available and its replacement of missing and correction of inoperative equipment and call immediate attention of the establishment head, any situation likely to reduce the effectiveness of firefighting operation.
- b. Deputy Fire Marshal Assists Fire marshal in enforcing instructions
- c. Fire Hose Crews They are members of the fire brigade whose duty is to combat the fire using the fire hose/water from the fire hydrant. The organization and activities of each member of the Fire Hose Team shall be:
 - a. Hydrant Man He pulls out the hose from the hose Cabinet or stand. He sees to it that sufficient lengths of hose are laid out connected. He is the one who shall commission or decommission the line on signal or instructions from the nozzle man.
 - b. Nozzle Man Initially charge of the laying out of the fire hose. He is to ensure the right type of nozzle is coupled or connected to the hose line. He is the only person who can signal or give instruction to the Hydrant man to open the hydrant valve.
 - c. Back Up To The Nozzle Man Assist in laying out the required hose. He may be required to get additional length of hoses to ensure maneuverability of the nozzle man. He is provided all the necessary assistance to the Nozzle Man to ensure expeditious movement in attacking or withdrawing from the area of fire.
- d. Fire Extinguisher Crews They are members of the firefighting team whose duty is to provide initial firefighting action using the extinguishers in the area. The first reaction to a fire emergency is to secure the right extinguisher and combat the fire. Tight after the exhausting the content of the extinguisher, they're to assist and serve as back-up to Fire Hose crews.

Spill Response Team

Individuals who are properly trained in controlling and proper clean-up of minor spill.

- a. Spill Response Team Leader Evaluate the hazard (s) at the scene; advise on clean up procedure, protective clothing and emergency response equipment investigate the incident & suggest preventive methods and fully understand and be well verse in any spill operations.
- b. Spill Response Team Assistant Leader Shall assist and assume all the duties and responsibilities of Spill Response Team Leader in his absence in all emergency situations.
- c. Spill Response Team Members Assist the Spill Response Team Leader in all activities involving emergency spill response.

Communication Team

In normal situation, is responsible for the dissemination of information regarding the over-all plan, function and responsibilities of each individual in case of emergency. Should emergency in fire occur, in charge of immediate sounding of fire alarm system;

call fire station for assistance; wait for and direct responding units to the specific location of the fire.

Security, Traffic and Crowd Control

Secure and cordon (put barrier) area where incident is in progress; Prevent looters, entry curious onlookers and other persons not involved in the operation to avoid hampering movements of ER team and other units; Secure/salvage valuables to minimized damages and losses, direct traffic emergency vehicles, and have control over assembly area, or as cleared by <u>ERC.</u>

a. Responsibilities of Assembly Area Leader

- The Assembly Area Leader in the event of an evacuation should immediately coordinate with the Evacuation Leader to obtain the head count. The Assembly Area Leader should:
- Track the number, names and department of missing employees along with the location that they were last seen.
- Track the number, names and types of injuries associated with any injured personnel reporting to the Assembly Area
- Ensure that all employees remain to their assigned Assembly Area.
- Once the building or area has been cleared for re-entry the Emergency Response Team Leader should authorize the Assembly Area Leader to inform the Evacuation Leader to direct the employees back to their respective areas.

Medical Team

Responsible for the immediate administration of all emergency medical treatments to injured persons and seeing to it that all seriously injured are stabilized and brought to the nearest medical unit or hospital for treatment. Composed of the company nurse and registered First Aiders.

Evacuation Team

Takes charge to locate and extricate victim of endangered areas then stabilize victims and bring them to safe place; must conduct searches for employees reported missing and shall coordinate/assist officer to rescue trapped personnel

- a. Area Supervisor as the Evacuation Leader
 - Upon initiation of an evacuation and rescue the Evacuation Leader should ensure that all work is stopped and that all employees, visitors and contractors evacuate the area or building quickly and in orderly manner using the pre-designated evacuation route.
 - Evacuation leader should close the door being sure not to lock it.
 - Once at the Assembly Area, take a headcount of the employees, visitors and contractors that have reported to the Assembly Area.
 - Determine how many people are missing; their names and the locations that they were last seen and report the head count status to the Assembly Area Leader
 - When the Emergency Response Team Leader has cleared an area for re-entry is sure to explain to the employees why an area is safe for upon re-entering the building.

4.2.4 Emergency Command Center

In cases of emergencies, SAMC Admin office is assigned as the command center. It is where the analysis and command will take place during an emergency while the ERT deal with the incident. The center will be equipped with the necessary communication facilities to inform, monitor and received feedback from the field, from the corporation and the external bodies concern about the emergency situation. All emergency databases will be made available at this office which includes:

- Material safety and data sheet (for toxic and hazardous materials)
- Emergency procedures
- Area maps and layout
- Personal development
- Emergency contact list
- Emergency transportation Vehicle
- Equipment data and its respective operating manuals

4.2.5 Emergency Response Procedure

4.2.6 Communication Procedure

- a. Internal Emergency Notification
 - Once an employee identifies an emergency situation the employee must report the situation to his immediate superior immediately. The immediate superior informs the <u>ERC.</u>
 - Give the following information to the immediate superior, be as specific as possible
 - Your name Work Area Nature of problem (fire, spill, employee injury, etc.)
 - If the employee is on the phone and in a safe location stay on the telephone until the <u>ERC</u> indicates that you can hang up.
- b. Implementation of Emergency Response Plan
 - Upon receiving the internal notification, the <u>ERC</u> will activate the Emergency Response Team.
 - <u>ERC</u> should immediately report to the Emergency Command Center (Admin Office) ready to provide assistance.
 - If necessary, the Safety Officer will contact local responsible agency (Fire dept., Police Dept., Hospital) refer to Emergency Hotline.
 - If deemed necessary, the <u>ERC</u> will announce an evacuation.
- c. ERT Communication Procedure
 - The <u>ERC</u> will assess the situation and implement the appropriate emergency response. And shall gather and analyze all information available to help determine the appropriate action.

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- The <u>ERC</u> shall maintain communication at the Emergency Command Center.
- The <u>ERC</u> will issue clear instruction to the ERT members and other appropriate Company Personnel and be sure they are understood.
- The <u>ERC</u> will ensure that fire; explosions and hazardous materials releases do not occur or re-occur by implementation of preventive measures such as shutdown of operations, containment of chemicals or a shutdown of utilities.
- The <u>ERC</u> will ensure that ERT members entering any hazardous use the buddy system and will not allow entry into dangerous areas without communication capability.
- Once the Emergency is over, the <u>ERC</u> shall ensure the all emergency and production equipment is clean, decontaminated and fit for use before normal operations are resumed.
- <u>ERC</u>through Assembly /Evacuation Area Leader will inform and update Managers and Supervisors; this information will be disseminated to their respective subordinates.
- d. Media Communication

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- The <u>management representative</u> shall act as the public relations representative during the incident.
- The <u>ERC</u> will ensure that the public relations representative receive accurate and updated information regarding the emergency incident.
- Employees shall not engage in any dialog with any press or media representative. Company employees should refer press and media representative to the *ERC* and HRAD Manager

4.2.7 Evacuation Procedure

In advance, each employee shall:

- Be familiar with the building evacuation plan
- Recognize the sound of the evacuation alarm
- Know at least two ways out of the building from your regular work space.

Evacuation plan must be posted in the workplace, and made available to emergency responders when they arrive on the scene. The plan must include primary and secondary routes, location of fire extinguishers, fire alarms, fire hose cabinets, emergency exits and assemble areas

a. Primary and Secondary Escape Routes

Primary and Secondary Escape Routes for all areas must be determined to ensure the evacuation of all employees in a timely and orderly manner. It is important to identify assistance to those individuals who require it when leaving a building.

b. Emergency Exits

Emergency Exits must be clearly marked with signs and evacuation routes large enough to accommodate the numbers of evacuating people. The Evacuation Team ensure they do not expose workers to additional hazards and are clear of obstruction at all times (e.g. not being used for additional storage areas). Workplace inspections must check all emergency exits, equipment and signage to ensure they are being properly maintained.

c. Emergency Lighting

An emergency lighting system should be installed to keep work areas and evacuation routes well-lit when lights are unavailable in a power outage.

d. Assembly Area

All workers must be accounted for in each assembly area nearest to the workplace. See evacuation plan

Building may be evacuated in the event of the following:

- Fire and Explosions
- Hazardous Material Release
- Natural Disaster
 - Earthquake
 - Typhoon
 - Flood
- Bomb Threat
- Power Failure

Evacuation may be announced by any of the following means of communication

- Public Address System
- Fire Alarm System

When you hear the evacuation alarm or are told to evacuate the building

- Remain calm
- Immediately cease all operations that may become hazardous
- Leave quickly, without running
- During normal business hours the Supervisor in each area is responsible for ensuring that all employees evacuate the area. In addition, every employee should check that all others in the area are leaving as instructed.
- During other than normal business hours, quickly check nearby restrooms, copier rooms, closets, etc. for personnel as you exit.
- Accompany and assist handicapped personnel, visitors, and any coworkers who appear to need direction or assistance.
- Shut all doors behind you as you go. Closed doors can slow the spread of fire, smoke, and water.
- Proceed as quickly as possible, in an orderly manner. Do not push or shove. Hold handrails when you are walking on stairs.
- Once outside, move away from the building to the designated assembly area.
- Contact your supervisor or Evacuation Assembly Area Leader if you are not familiar with the assembly area locations(s) for your building.

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4.2.8 Medical Emergency

The range of medical emergencies can be vast and can include heart attack, airway blockage, epileptic fits or seizures, unconsciousness, absent pulse, uncontrolled bleeding, and possibly, serious injury due to an accident. Each type of incident will present varying conditions and behaviours.

- The area Supervisor or the person discovering the injury must immediately call the First Aider or member of medical Team in the area if an injury or illness occurred to conduct first aid.
- If the injury requires minor First Aid Treatment minor worker is to be assisted by nominated first aid aider.
- If the injured victim needs medical assistance, the ambulance service is to be called or the injured worker can be transported to the nearest medical center, hospital etc if the health and safety of the injured person will not be compromised.
- The Nurse on duty or representative should assist the victim during transport to the nearest hospital.

4.2.9 Chemical/Oil Spill

Response to chemical spills is dependent on several factors: nature and type of substance, amount spilled, area in which spill occurs, number of persons affected/involved etc.

Procedures for minor spill/oil spill (<200 litres)

- Alert supervisor (if possible)
- Contain spill (if spill is observed to be spreading) with appropriate absorbent (saw dust/rugs)
- Use PPE when trying to contain spill. Avoid direct contact with oil/chemicals.
- Dispose soiled absorbents into disposal bags or empty drum and seal.
- Inform DENR EMB for investigation and disposal. (If chemical /oil is classified as hazardous)

Procedures for major spill/oil spill (>200 litres)

- The informant should alert personnel in the vicinity by shouting and/or using the paging system
- He should, with the assistance of the personnel in the vicinity (if any) contain the spill with appropriate chemical absorbent.
- The informant should not come into direct contact with the chemicals. Use proper PPE. If not sure, evacuate immediately and inform the Safety Officer and/or ERT Leader.
- The area where chemical spill occurred should be sealed and nobody is allowed to go close without wearing the proper PPEs.
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- In case of accident where a person has been hit by chemical spill proper care should be given and immediately brought to the nearest hospital for treatment.
- Check immediately the area for any incompatible substances.
- Check for any possibility of spilled chemicals/substances entering any drains, and protect where possible.
- All collected spill chemical should be contained in sealed containers.
- PCO shall be involved in case of emergency.

Monitoring and Control

- Area in-charge during spillage is the Spill Control Leader and in coordination with PCO and SO.
- Monitoring of spillage is conducted by PCO and S.O.

4.2.10 Natural Disaster

4.2.10.1 Earthquake

Employees should be informed about the following guidelines during an earthquake.

If you are inside the building:

- DROP to the ground; take COVER by getting under a sturdy table or other piece of furniture; and HOLD ON until the shaking stops. If there isn't a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.
- Stay away from heavy equipment, glass and chemical storage areas. If in chemical storage area, get out, move and take then cover.
- Move to an inner wall or hallway, the inner core of the building is the strongest and least likely to collapse.
- If not under cover, place anything handy such as coat, magazine or cardboard box over your head and face as shield.
- Do not rush outside doors and stairs maybe broken. The greatest danger from falling debris is just outside doorways and close to outer walls while the ground is shaking

If you are outside the building:

- Stay there but move away from buildings, wall power pole and lamppost.
- Once in the open area, stay there until the shaking stops. The greatest danger exists directly outside buildings, at exits and near exterior walls.

If you are in a moving car:

- Stop the car as soon as possible in a safe manner.
- Do not stop under on an overpass or bridge or near tall building or walls.
- Stay in your car because it is a great shock absorber.
- Be prepared for aftershocks that may be quite strong and cause even more damage due to the already weakened



After the quake:

Inside the Plant the ERT shall be activated to perform the following procedures:

Note: Expect aftershocks. These secondary shockwaves are usually less violent than the main quake but can be strong enough to do additional damage to weakened structures and can occur in the first hours, days, weeks or even months after the quake.

- Check the injured personnel. Do not move the seriously injured unless they are in immediate danger.
- Evacuate and take headcount to determine that everyone is accounted for. Search for missing personnel in the area they were last seen.
- Remove debris piece, starting from the top of the pile.
- Check cabinet and chemical storage areas. Open the doors slowly and watch for falling objects spills, fires and leaks. Place an "X" on the areas that you have searched already.
- Notify Local Emergency Response Agencies in case of major fires, spills, leaks and serious injuries.
- Do not allow re-entry into the building until it has been declared safe for occupancy

4.2.10.2 Typhoon

General Procedure

- The Safety Officer shall obtain weather forecast from PAG-ASA (Phil. Atmospheric Geophysical and Astronomical Services Administration). He shall continue to monitor the incoming severe weather.
- Forty-eight hours prior to the arrival of severe weather the ERT Leader shall survey the plant to determine area that may require tie downs, shutdown of equipment and clean o material or debris.
- Maintenance Personnel shall be advised to check the building especially the roof condition and ensure that electrical outlets and wiring would not be soaked from rainwater.
- The Area Supervisor shall ensure that emergency light in his area is functional and flashlight is readily available
- The ERT shall be assembled and stationed as observers in key areas to render assistance where needed.
- In case of severe weather where employees will be advised to evaluate the plant, the HR Personnel shall provide means of transportation.
- Before and after severe weather the Safety Officer shall continually assess the situation and determine if shutdown in necessary particularly if power is disrupted.
- As soon as possible, after the weather clears, all area supervisors shall prepare a damage report for the Plant Manager.
- Maintenance Department will make repairs in order of plant priorities.

Employees Emergency Procedure

When at Work:

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- Do not GO outside unless notified by the Safety Officer that it is SAFE to do so.
- Should work stoppage be declared, determine the NAME of the resource person and the TIME and DATE when work will resume.
- Resume work on specified DATE and TIME.

When going to work

- Collect accurate information from TV, radio or other related organizations and agencies.
- Call the HRAD to confirm any information on work stoppage
- Determine the NAME of the resource person and the time when work will resume.
- Resume work on specified DATE and TIME.

4.2.10.3 Flood

Where flooding is not likely occurrence, it may still occur especially due to rupture of water lines. The following procedures shall be followed:

Notify the ERT leader and evacuate the area immediately.

- Plant Manager shall evaluate the situation and take appropriate action. Particular precautions must take to assure that the flooded area is not electrically energized before entering.
- Maintenance Department shall be informed for equipment repairs or deenergizing.
- Safety Officer shall provide warning sign indicating the slipping hazard on floor spaces.

4.2.11 Civil Disturbance

4.2.11.1 Receiving the threat

Key employee like receptionist or secretary should be informed of the detailed procedures for receiving a threat.

Written Threat

• If a bomb threat is received in writing it should be kept including any envelope, container or accompanying materials. Unnecessary handling must also be avoided and every effort made to preserve possible evidence such as fingerprints, handwriting, paper and postmarks.

Telephone Threat

- The person receiving the call should not disconnect the caller, remain calm and try to find out the information detailed on the checklist below. If not able to fill out checklist during the call then complete the checklist as soon as possible after the threat, while details are still fresh in memory
- Record the time and exact words of the massages with particular emphasis on the description and location of the device.

- Elicit as much information as possible from the caller such as time of explosion, location and bomb specification and why bomb is planted.
- Note the sex of the caller, an impression about his/her age, any peculiarities of voice or speech such as hoarseness, shrillness, speech impediment, accent, dialects, signs of intoxication, irrationality and any pet phrases or other mannerisms.

Responding to the threat / Plans for a response to a threat should include:

- Notify the Operation Manager, ERC, Safety Officer and Security Officer.
- Safety Officer or Security Officer shall immediately call the Local Law Enforcement to inform the situation.
- Follow the Police Department instructions closely.
- Do not hesitate to evacuate the facility if there is any reason to believe that the threat is real.
- ERC shall provide the plant lay out to the Police Respondent for their thorough search of key and critical areas.
- If an appropriate search has failed to confirm the existence of a bomb, emergency police crew and ERT should stand by until it is reasonably certain the limit of threat has passed.

4.2.11.2 Discovery of a bomb

In the event that a bomb or anything resembling a bomb is discovered follow the following action:

- Evacuate the area immediately
- Do not disarm or move the device.
- Call the Bomb Disposal Unit of the Police
- Alert the ERT to stand by.

4.2.12 Power Failure

- a. If power failure occurs remain calm.
- b. Wait for instructions from your Operation Leader and stay in your premises for further report of the situation.
- c. The electrical maintenance personnel shall switch off all facilities, machine and equipment to protect it from current surges when power returns.

4.2.13 Fire and Explosion

If you discover a Fire:

- a. Pull the nearest fire alarm
- b. Check to see if anyone is in immediate danger.
- c. If it is a very small and controllable fire, attempt to put out the fire ONLY if you have been properly trained in fire extinguisher use and only if it can be done without risk to your safety and health and to others.



- d. For those who have been trained in safely operating fire extinguisher, remember to read the label on the fire extinguisher prior to discharge to ensure that the extinguishing materials is appropriate for that particular type of fire
- e. Do not attempt to fight the fire alone or without having at least two other escapes routes.
- f. If the fire is uncontrollable, evacuate the area immediately.
- g. Notify or call immediately the Safety Officer and/or Security Officer or the SIC

If trapped in a Room/Building:

- a. Stay calm. Do not panic.
- b. If all exits or stairways are blocked, go to the nearest room and close the door. Keep all doors and windows closed.
- c. Stuff objects, such as wet cloth towels, into openings to prevent smoke from entering the area.
- d. If the room has a window, hang a cloth or other object out of the window to signal that the room is occupied. DO NOT LEAVE WINDOWS OPEN.
- e. Wet clothing if possible. Wrap wet clothing around face to minimize smoke inhalation.
- f. Fill sinks and tubs with water if possible to maintain a supply of water.
- g. If smoke enters the room prior to the arrival of assistance, keep your head no more than 8-12 inches off the floor where the air is less toxic.
- h. Shout at regular intervals to alert emergency personnel of your location.
- i. If there is a telephone, call Emergency Hotline (See Annex B), and advise them of your location and that all exits are blocked. Remain calm, stay on the line as long as possible and wait for the arrival of assistance.

If Caught in Smoke:

- a. Drop to hands and knees and crawl toward exit
- b. Stay low, as smoke will rise to ceiling level,
- c. Hold your breath as much as possible.
- d. Breathe shallowly through nose, and use a filter such as a shirt or towel.

If Forced to Advance through Flames:

- a. Hold your breath.
- b. Move quickly.
- c. Cover your head and hair.
- d. Keep your head down and your eyes closed as much as possible.

If your Clothing or Hair Catches on Fire:

- a. Do not panic.
- b. Stop.
- c. Drop to the ground or floor; roll around until the flames are out.
- d. Make sure you cover your face and mouth. You will want to protect your face from

Note:



After every drill or actual emergency, generated waste will be disposed of properly in accordance with MSDS or any known legal requirements and risk assessments made prior the execution of the exercises.

Safety Officer shall review the adequacy and effectiveness of the emergency and response procedures and decide if there's a need for revision or not, using attached forms as maybe applicable.

Identified Emergencies	Frequency
Fire & Explosion	Twice a year*
Earthquake	Twice a year*
Chemical/Oil Spill	Once a year
Medical Emergency	Once a year
Typhoon	Once every two (2) years
Flood	Once every two (2) years
Civil Disturbance	Once every two (2) years
Power Failure	Once every two (2) years

Table 4-4. Emergency Drill Frequency

* reference: PD 1185 Fire Code of the Phils.

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Functional and procedural flow chart during an Emergency

Figure 4-1. Functional and Procedural Flow Chart during an Emergency





Figure 4-2. Emergency Response Team

CHAPTER 5 SOCIAL DEVELOPMENT PLAN / FRAMEWORK (SDP) AND IEC FRAMEWORK

5.1 SOCIAL DEVELOPMENT PLAN (SDP)

Social development plan (SDP) aims to assess and identify the basic needs of the communities which will be affected by the project. SDP should be patterned in the Municipal and Barangay Development Plans of the host communities and in accordance with the mandated Corporate Social Responsibility.

It aims to establish a strong relationship between the Project Proponent, community institutions, and stakeholders towards the goal of achieving an improved quality of life of the residents of the host localities. A list of already implemented programs is included in the annexes.

The Social Development Programs/Projects already implemented by SAMC are presented inTable 5-1.

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Year	Category	Program/Project	Status of Implementation	No. of Beneficiaries
2017	Environment	Adopt-a-River Program	Ongoing	Meycuayan & Marilao residents
2017	Health	Donations of Medicines and Medical Supplies	Started June 6, 2017, semi-annual	Bahay Pare Health Center
2016	Health	Medical and Dental Mission	completed	219 Bahay Pare residents
2016	Environment	Punuan parasa Kagubatan / Rainforestation of the Angat Watershed	Ongoing, 5 yr plan	People dependent on water supply from Angat dam; Dumagat people residing in the area
2016	Education	Donations of plastic playground set and airconditioning unit thru SteelAsia Credit Cooperative (SACC)	Completed	Bahay Pare Day Care Center – around 100 pupils
2014	Education	Skills Training Program (Rolling Mill & Basic Safety Course)	Completed	104 Plaridel residents
2014	Education	TESDA Skills Training (SMAW)	Completed	46 Plaridel residents
2014	Health	Assistance to BFP Meycauayan (donation of basketball ring, lending of hardhats during the fire competitions/Olympics)	Completed	BFP Meycauayan
Yearly	Entertainment	Annual financial assistance during fiesta	Ongoing / Annual	Bahay Pare residents
Yearly	Entertainment	Annual donation of raffle prizes during Christmas Party	Completed	Brgy. Bahay Pare, Meycauayan CENRO, Region 3 EMB
2011	Education	Donations of school supplies	Completed	Bahay-Pare Elementary School
2010	Education	Donations of school supplies	Completed	Pantoc Elementary School (Kindergarten and Grade 1 students)
2009	Education	Donations of goodies and 2 computer sets	Completed	Pajo Elementary School (Kindergarten students)

Table 5-1. SDP Projects/Programs implemented by SAMC

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Concern	Responsible Entity/ Beneficiary	Government Agency/ Non Government Agency	- Proponent	Indicative Timeline	Source of Fund
Employment and livelihood opportunities • Bokashi Balls Making	 Qualified residents of Baranggay Bahay Pari 	Mayor/ Brgy. Chairman	Community Relations and Development Officer	To start training Q3 2017	Proponent
Education and recreation	 Assistance to development of school facilities – Adopt a School Program Assistance to barangay/city events such as fiestas and sports fest 	 DepEd Bahay Pari Elementary School Sports and recreation department of barangay/city 	Community Relations and Development Officer	Q3 YR 2017	Proponent
Rehabilitation of polluted bodies of water Through the Adopt a River Program of the EMB and by using Bokashi Balls (PBiA)	 Surrounding residents near the river to be adopted 	 EMB Region 3 Brgy Bahay Pa PBiA 	Resident ri Manager	MOA signed last June 7; activities to commence Q3 2017	Proponent
Reforestation /National Greening Program - Punuan parasa Kagubatan / Rainforestation of the Angat Watershed	 People dependent on water supply from Angat dam Dumagat people residing in the area 	• Gurong Nagbabalik sa Bayan (BSU)	Community Relations and Development Officer	A 3yr plan (launched Sept. 2016)	Proponent
Health of Nearby Residents – regular donation of medicines to Health Center	Brgy Bahay Pari	Mayor/ Brgy. Chairman (Hea Officer)	Resident Alth Manager	Semi-annual	Proponent
Health and safety training for	Project employees	Barangay	Community	Pre-	Proponent

Table 5-2. Indicative Social Development Plan

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employees	 Barangay affected by the project 	Disaster Management • City Health Officer	Relations and Development Officer	construction Pre- operations 	
Payment of financial obligations to the city	 Assessor's Office Permits and License Office 	Assessor Head, permits and licenses office	Admin	 Pre- construction Pre- Operations Operations 	Proponent



5.2 INFORMATION AND EDUCATION CAMPAIGN (IEC)

A comprehensive and intensive Information Education Communication (IEC) Campaign to better inform and educate the communities and the general public as to the objective, necessity and benefits of the project, as well as the processes involved for the construction and operation of the project.

These shall be done thru distribution and posting of written materials such as brochures, newsletters, media statements and articles, bulletins and posters, and online presence. Also as well as non-written types such as fora, symposia, community discussions and hearings, audio visual presentations (such as PowerPoint and DVD), radio and TV programs and/or guestings, etc. The IEC materials and activities will also serve as a venue for continuous dialogue, feedback and check and balance mechanism for the parties involved.

CHAPTER 5Environmental Performance Report and Management PlanRolling Mill of Steel Asia Manufacturing Corporation Project

Year	IEC Program / Key Messages	Target Audience / Participants	Status of Implementation	
2017	FGD on the Technical Aspects of the LGU and Residents of Barangay Baha		Ongoing	
	project	Pare		
Year long	Plant Tours / Technical Aspects of Rolling Mill Operations	College Students Nationwide	Ongoing	
2017	Facebook Page / Updates on SteelAsia's	Netizens	Ongoing	
2017	activities and changes	TVC IIZCHO		
2011	Website / About SteelAsia as company, updates	Netizens	Ongoing	
2017	Video clips featured in "The Breaking Point", a public service show in PTV 4	PTV 4 viewers	Ongoing	

CHAPTER 5 Environmental Performance Report and Management Plan Rolling Mill of Steel Asia Manufacturing Corporation Project

Table 5-4. Information, Education and Communication Plan

Target Sector Identified as Needing Project IEC	Major Topics of Concern Regarding the Project	IEC Scheme/ Strategy/ Method	Information Medium	Indicative Timeline and Frequency	Status	Indicative Cost
Local Government Officials of Meycauayan		Group Methods			A Pre-Scoping IEC was conducted Sept. 5, 2016	For FGD, cluster, meetings, leaflets and audio-visual
Barangay Officials of Barangay Bahay Pare Residents of Barangay Bahay Pare	Technical Aspects of the project: Emission from chimney	Multi-Media	Julti-Media Julti-Media	At least one month before actual construction	Discussions already ongoing with Brgy Officials	presentation including venue, materials and snacks at 100 participants at 1,000 per participants, about Php 100,000
Barangay Officials of Neighboring Barangays	control device Rolling Mill Process			During Construction		Around 100 participants at 200 per participants about Php20,000
Schools and other Organizations				During Operations	Plant Tours is regularly being hosted by SAMC	Around 3500 participants annually at P50 for snacks per about Php175,000
Meycauayan LGU and residents, employees	Rolling Mill Process and updates on SAMC	Print	Newsletter	During Operations, Monthly	First issue to be released August 2017	P100,000 annually
Meycauayan LGU and residents, customers, employees, all interested to SAMC	Rolling Mill Process and updates on SAMC	Internet	Website and Facebook Page	May 2017	Operational already	Minimal cost as existing IT resources is being used



CHAPTER 6 ENVIRONMENTAL COMPLIANCE MONITORING

6.1 ENVIRONMENTAL PERFORMANCE

The status of compliance to the ECC conditionalities and the attainment of EMP commitments are shown on **Table 6-1**.

ECC/EMP Condition/Requirement Categorization	NO.	ECC CONDITION	STATUS OF COMPLIANCE (if complying)	REMARKS
Project Coverage	1	This certificate shall cover the construction and operation of a Rolling Mill Plant using one (1) unit Walking hearth Furnace with a production capacity fifty (50) tons per hour of steel products	Yes	The total production from January to June year 2016 is 221,383.694 metric ton
Institutional arrangements necessary for implementation of environmental management measures	2	A properly designed perimeter wall of sufficient height shall be constructed and trees should be planted along the wall to augment its buffet capacity.	Yes	Trees are planted besides perimeter wall of the plant.
Institutional arrangements necessary for implementation of environmental management measures	3	Adequate mitigating measures should be provided to prevent noise/air and water pollution.	Yes	Air, Noise and water pollution is within DENR target standards.
Institutional arrangements necessary for implementation of environmental management measures	4	Proper maintenance of pollution control equipment and facilities shall be carried out at all times to attain maximum efficiency.	Yes	Continuous monitoring and maintenance of pollution control equipment. See picture of pollution control device during replacement (recuperator).
Institutional arrangements necessary for implementation of environmental management measures	5	An adequate settling pond shall provided for the process cooling water and no effluent from the same shall be discharged into any receiving water body without prior treatment and if it has not met DENR standards.	Yes	Settling pond is provided inside the plant for the process cooling water and no effluent from the same shall be discharged into any receiving water body.
Institutional arrangements necessary for implementation of environmental management measures	6	Proper collection and disposal of solid wastes particularly sludges from the settling pond and mill scales shall be effected.	Yes	Continuous collection of solid waste materials and transfer to waste management area with appropriate and proper documents.

Table 6-1	Summarv	status d	of FCC an	d FMP	Compliance
	Summary	status (IU LITE	compliance

ECC/EMP Condition/Requirement Categorization	NO.	ECC CONDITION	STATUS OF COMPLIANCE (if complying)	REMARKS
Institutional arrangements necessary for implementation of environmental management measures	7	The proponent shall monitor regularly the noise levels, stack emissions and effluents, ambient air and water quality following the submitted/accepted monitoring program and using monitoring equipment duly authorized by DENR.	Yes	Continues monitoring Air, Noise, water quality, stack emission pollution is within DENR target standards. 3 rd party testing (DENR accredited)
Institutional arrangements necessary for implementation of environmental management measures	8	Noise levels, emissions and effluents generated shall conform to DENR set standards.	Yes	Air, Noise and water pollution is within DENR target standards.
Institutional arrangements necessary for implementation of environmental management measures	9	An Environmental Unit (EU) shall created by the management to handle the environment-related aspects of the project. The EU shall submit environmental/monitoring reports to the EMB and DENR-EMPAS Region III on a guarterly basis.	Yes	The company has designated a PCO who shall perform and carry out the duties of EU.
Other sectoral requirements mandated by other agencies to be complied with	10	Qualified local residence shall be given priority in employment.	Yes	Company HR and Admin prioritize the hiring of personnel leaving near the plant or within Bulacan area.
Other sectoral requirements mandated by other agencies to be complied with	11	Safety gadgets shall be provided to all workers to prevent health and occupational hazards.	Yes	Plant personnel protective equipment PPE is given to the plant employee at a given task. And it can be seen in the pant PPE matrix for personnel guidance.
Institutional arrangements necessary for implementation of environmental management measures	12	On the spot monitoring and inspection may be conducted by the EMB, DENR Region III anytime in coordination with the concerned groups	Yes	Ocular inspection and meeting conducted by the DENR region 3 and DENR Central last January 8, 2016. See Attached document.
Standard DENR requirements on the transfer of ownership	13	Transfer of ownership of this project carries the same conditions in this ECC for which written notification shall made within fifteen (15) days from such transfer.	Yes	There is No transfer of ownership was been made.

6.1.1 Water Quality Monitoring

The graphical trends illustrate the performance of the parameters affected by the project. The water quality of Steel Asia Manufacturing Corporation and are all within the DENR standards.



Figure 6-1. Water Quality (2012-2016) - COD



Figure 6-2. Water Quality (2012-2016) - BOD



Figure 6-3. Water Quality (2012-2016) - pH



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Figure 6-4. Water Quality (2012-2016) - TSS



Figure 6-5. Water Quality (2012-2016) - Oil and Grease

Sample is being taken only from the last tank of the cooling water system as the plant is not discharging any wastewater. The results on June 14, 2016 are within the set standards and with mean values at the following percentage levels from the maximum permissible limit indicated in DAO 35:

Table 6-2. Water Quality Monitoring					
Parameter (Conventional Pollutants)	Mean Values (as of Sept. 2015)	DENR			
рН	7.24	6.5-9			
Temp	35	-			
Color	35	150			
BOD	17	50			
COD	39	100			
TSS	18	70			
Oil & Grease	2.2	5			

6.1.2 Ambient Air Quality Monitoring

SMOKE STACK TESTING RESULTS

Rolling Mill 1



Figure 6-6. Ambient Air Quality (2014-2017) - PM



Figure 6-7. Ambient Air Quality (2014-2017) – SO_2



Figure 6-8. Ambient Air Quality (2014-2017) - CO

AMBIENT AIR TESTING RESULTS

- Station 1 Near Smoking Area
- Station 2 Near Don Benito Yao Training Center
- Station 3 Between Training Center & Maintenance Office
- Station 4 In front Rolls and Tackle Building



Figure 6-9. Ambient Air Quality (2014-2016) – TSP



Figure 6-10. Ambient Air Quality (2014-2016) - SO₂



Figure 6-11. Ambient Air Quality (2014-2016) - NO₂

The ambient air quality parameters of Steel Asia Manufacturing Corporation are all within the DENR standards. Observed Ambient Air Concentrations of TSP, SO₂, NO₂ (2016) and in comparison, with National Ambient Guidelines Values (NAAGV) shown below:

Station Number	STATION DESCRIPTION	TIME/DATE OF SAMPLING	TSP µg/Ncm	SO2 µg/Ncm	NO2 µg/Ncm
1	Near Smoking Area	January 27, 2016	106	24	20
2	Near M2 Staff House	January 27, 2016	89	22	18
3	Between training center and Maintenance office	January 27, 2016	119	26	22
4	In front of Rolls and tackle building	January 27, 2016	286	28	23
	DENR Standard (NAAQGV)	1 - Hour Sampling	300	340	260

able 6-3. Ambient Air	· Quality	Monitoring	(2016)
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The ambient noise quality of Steel Asia Manufacturing Corporation in which two stations (3 and 4) slightly exceeded the DENR standards. Some contributing factors which affect the results that exceeded were due to Trucks passing, forklift activities, water pump motor, production and cooling tower area.

Station No.	Station Description	Time/Date of Sampling	Noise Level (dBA)	DENR STANDARD Maximum Allowable Noise Level, dBa (Class C light Industry)	REMARKS
1	Near Smoking Area	January 27, 2016	62.6	70	Within
2	Near M2 Staff House	January 27, 2016	68.8	70	Within
3	Between training center and Maintenance office	January 27, 2016	68.6	70	Within
4	In front of Rolls and tackle building	January 27, 2016	69.3	70	Within

Table 6-4.	Ambient Noise	Ouality	Monitoring	(2016)
		2		(/

The Stack emission result for 50 MT/Hr Centro Combustion Reheating Furnace are within the DENR standard. The test results are compared with the National Emission Standard identified in IRR Part VII Rule XXV Table 2.

Run Number Sampling Date Sampling Time	Run 1 07/15/13	Run 2 07/15/13	Run 3 07/15/13	AVERAGE	CAA Limit Mg/Nm3
Particulate Emissions Concentration, mg/Ncm	29	22	23	25	150
Sulfur Dioxide (SO2) Concentration, mg/Ncm	940	809	906	885	1,500
Carbon Monoxide (CO) Concentration, mg/Ncm	88	86	85	86	500

Table 6-5. Stack Emission Result for 50 MT/Hr Centro Combustion Reheating Furnace

6.1.3 Ambient Noise Quality Monitoring

AMBIENT NOISE TESTING RESULTS

Reference for year 2014 to 2016

Station 1 – Near Smoking Area Station 2 – Near Don Benito Yao Training Center Station 3 – Between Training Center & Maintenance Office Station 4 – In front Rolls and Tackle Building



Figure 6-12. Ambient Noise Quality (2014-2017) – Daytime

Note: Results exceeds EQPL caused by vehicles (Trucks, PUJ, Tricycle) pass through Bahay Pare road.

Reference for year 2017

Station 1 – Don Benito Yao Training Center Station 2 – Front Gate of Rolls & Tackle Station 3 – Near Motorcycle Parking Area Station 4 – Near Gate 1



Figure 6-13. Ambient Noise Quality (2016-2017) – Evening Time

Note: Results exceeds EQPL and limits caused by vehicles (Trucks, PUJ, Tricycle) pass through Bahay Pare road.

6.1.4 Emission Load Monitoring

COMPARATIVE EMISSION ESTIAMTE USING EMISSION FACTOR AND STACK TEST DATA

				EMISSIC	ON LOAD		
AP 42 EF EMISSION LOAD		Fuel Cons.		PM	CO	NOx	SOX
Fuel Cons.	Lit/yer	gal/yr	Fuel Type	tons/year			
Furnace 1 (50mt/hr) Existing	14,200,000.00	3,751,651.25	LSFO	3.4	8.5	34.0	244.5
Furnace 1 (50mt/hr to 80 mt/hr)	17,400,000.00	4,597,093.79	SFO	3.4	8.5	34.0	244.5
Furnace 2 (20mt/hr)	3,900,000.00	1,030,383.09	SFO	3.4	8.5	34.0	244.5
				6.8	17.0	67.9	488.9

EMISSION ESTAMATE USING ACTUAL STACK TEST BULACAN PLANT USING HIGH STREET CALACA DATA

	Stack Temp	Stack	VFR	Stack	Stack	Stack Ht.	VEL						
	deg C	Temp. (K)	(Ncm/Min)	Diam (m)	Area (m ²)	(m)	(m/s)						
Mill 1 80 MT/Hr (USED 70													
MT/Hr) 600 MT/yr	428	701	841.77	1.74	2.38	45.50	5.90						
Mill 2 20 MT/Hr (USED 70													
MT/Hr) 100 MT/yr	428	701	900.82	1.8	2.54	50.00	5.90						
			Concentratio	on (mg/Ncm)									
	PM	CO	NOx	SO2	Pb	Zn							
Mill 1 80 MT/Hr (USED 70							1						
MT/Hr)	25	8.00	251.00	38.00	0.097	0.001							
Mill 2 20 MT/Hr (USED 70							1						
MT/Hr)	25	8.00	251.00	38.00	0.097	0.001							
		Emission Rate/Strength (g/s)											
	PM	CO	NOx	SO2	Pb	Zn							
Mill 1 80 MT/Hr (USED 70													
MT/Hr)	0.35	0.11	3.52	0.53	1.36E-03	1.40E-05							
Mill 2 20 MT/Hr (USED 70													
MT/Hr)	0.38	0.12	3.77	0.57	1.46E-03	1.50E-05							
			Annual Emissi	on Load (T/Y)									
	PM	CO	NOx	SO2	Pb	Zn							
Mill 1 80 MT/Hr (USED 70							T						
MT/Hr)	9.5	3.0	95.1	14.4	0.037	0.000							
Mill 2 20 MT/Hr (USED 70													
MT/Hr)	10.1	3.2	101.7	15.4	0.039	0.000							
Mill 1 80 MT/Hr (USED 70 MT/Hr) Mill 2 20 MT/Hr (USED 70 MT/Hr) Mill 2 20 MT/Hr (USED 70 MT/Hr)	0.38 PM 9.5 10.1	0.12 CO 3.0 3.2	3.77 Annual Emissi NOx 95.1 101.7	0.57 on Load (T/Y) SO2 14.4 15.4	1.46E-03 Pb 0.037 0.039	1.50E-05 Zn 0.000 0.000							

MT/HR	HRS /Y EAR	MT/YR	HR/day
80	7,500	600,000	21
20	5,000	100,000	14

6.2 SELF-MONITORING PLAN

Table 6-1 presents the Environmental Monitoring Plan (EMoP) for the proposed Project. The EMoP presents a set of critical environmental parameters that the Proponent will monitor regularly to ensure environmental compliance and sustainability of project operations. It will ensure compliance to the following existing laws and permits:

- PD 984 Pollution Control Decree of 1978
- PD 1586 Philippine Environmental Impact Statement System
- RA 6969 Toxic Substances, Hazardous and Nuclear Control Act of 1990
- RA 8749 Philippine Clean Air Act of 1999
- RA 9275 Philippine Clean Water Act of 2004

The EMoP includes specific management schemes per Environmental Quality Performance Level (EQPL) range. The EQPL is designed to provide the Proponent management measures for specific environmental aspects by determining the level of alertness, action/s that need to be implemented at the occurrence of a particular emergency or event, and to prevent exceedance in the environmental standards set by the DENR.

The information that will be obtained during the EMoP implementation will provide significant information 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.

Proposed Increase in Production Capacity of the Steel Rolling Mill Project

			Sampling and Measurement Plan			Annual		-	EQPL	. Management Schem	ne		
Environmental	Potential	Parameter to be				Lead	Estimated		EQPL Range			Management Measur	e
Aspect	Impact	Monitored	Method	Frequency	Location	Person	Cost	Alert	Action	Limit	Alert	Action	Limit
WATER													
-	Effluent Water	pН	Grab Sampling	Quarterly	1 Station	PCO/	P70,000	SAMC do	not discharge	6.0 - 9.0	No action needed	No action needed	No action needed
	(no water	Temperature (°C)				MMT		water from	process, thus	3 (max rise)	since not being	since not being	since not being
	discharge but	TSS	DENR AO					EQPL was	not defined;	150	discharged	discharged;	discharged
	water sample to	Oil & Grease	2016-08 Class					water sample	is being taken	10			
	be taken from	BOD	С					from the las	t tank of the	100			
	the last water	Cd	-					water recyclin	ig system.	0.005			
	tank of the	Pb								0.30			
	cooling water	Cr								0.10			
	system);	Phenolic								0.05			
	monitoring later	Substance											
	to be decided by	Cyanide	-							.1			
	stoppod based	Surfactants	-							1.5			
	on trend of	Barium	-							3			
	results	Iron	-							1.5			
	results	Lead								0.05			
		Manganese								0.2			
		Nickel	-							0.2			
		Mercury								0.02			
		Zinc								2			
		Fecal Coliforms								200			
		Ammonia								0.05			
		Chloride								350			
		Sulfate								275			
		Dissolved Oxygen								5			
		Flouride								1			
		Nitrate								7			
		Phospate								0.5			
AIR	1	1	1	1	1	T	1	1	T	1	T	T	1
	Air Quality (Ambient)	SO₂ (µg/Ncm)	DENR AO 2000-81 Rule XXVI, Sec.1	Semi Annual	4 station (hourly)	PCO/ MMT	P50,000	289 (1hr)	306 (1hr)	340 (1hr)	Check weather condition during sampling and if location is	Check weather condition during sampling and if location is	Check weather condition during sampling and if location is
											downwind of the		

Table 6-6. Environmental Monitoring Plan

En la martal	Detected	Demonstructure has	Sampling	and Measurem	nent Plan	Annual EQPL Management Scheme				e				
Environmental	Potential	Parameter to be	Mathad	Frequency	Location	Lead	Estimated		EQPL Range		ľ	lanagement Measur	9	
Aspect	impact	wontored	Method	riequency	Location	reison	Cost	Alert	Action	Limit	Alert	Action	Limit	
		NO ₂ (µg/Ncm)	DENR AO 2000-81 Rule XXVI, Sec.1	Semi Annual	4 station (hourly)	PCO/ MMT		221 (1hr)	234 (1hr)	260 (1hr)	area. Check possible source of pollution including external factors. Check status of furnaces for any upset of off-	possible source of pollution including external factors. Check status of furnaces for any upset of off-	downwind of the area. Conduct site visit at said sampling stations and hire a 3 rd party DENR accredited	downwind of the area. Conduct site visit at said sampling stations and hire a 3 rd party DENR accredited
		TSP (µg/Ncm)	DENR AO 2000-81 Rule XXVI, Sec.1	Semi Annual	4 station (hourly)	PCO/ MMT		255 (1-hr)	270 (1-hr)	300 (1-hr)	operating parameters and have it adjusted accordingly as	sampling firm to confirm by checking emission of	sampling firm to confirm by Checking emission of	
		PM ₁₀ (μg/Ncm)	DENR AO 2000-81 Rule XXVI,	Semi Annual	4 station (hourly)	PCO/ MMT		170 (1-hr)	180 (1-hr)	200 (1-hr)	needed.	ordingly as emission of ded. Conduct adjustment of the unit's operation per operating manual.	smoke stack Conduct adjustment of the unit's operation per operating manual. Temporarily stop certain aspect of operation unless the problem has been resolved.	
	Air Quality (Source Specific)	Furnace (Mill1 and 2) Stack + genset Emission: PM (mg/Ncm)	DENR AO 2000-81 Rule XXV, Sec.1;	Furnace Stack – see ECC condition	Mill 1 & 2 Stack and Genset Stack	PCO/ MMT	P60,000 /stack	128 (85%)	135 (90%)	150	Check status of furnaces for any upset of off- operating	Hire a 3 rd party stack testing firm as per DAO 2013- 26 for stack	Hire a 3 rd party Stack testing firm as per DAO 2013- 26 for stack	
		Furnace (Mill1 and 2) Stack + genset Emission: SO ₂ (mg/Ncm)	NESSAP	Genset -1 st year and 2 years				630 (80%)	665 (95%)	700	parameters and have it adjusted accordingly as needed.	emission testing. Conduct proper and regular maintenance of	emission testing. Conduct proper and regular maintenance of	
		Furnace (Mill1 and 2) Stack + genset Emission: NO ₂ (mg/Ncm)		thereafter (MC 2007- 03)				850 (85%)	9000 (90%)	1,000	Coordinate with operations and verify the status of engines or any	combustion furnace. Clean inside stack walls.	combustion furnace. Temporarily stop operation unless	
		Furnace (Mill1 and 2) Stack + genset Emission: CO						425 (85%)	420 (90%)	500	upset of off- operating parameters and have it adjusted		the problem has been resolve.	

CHAPTER 6

Environmental	Detential	Devenue fan fa ha	Sampling	and Measuren	nent Plan	Land	Annual			EQPL	. Management Schen		
Aspect	Potential	Parameter to be	Mathad	Frequency	Location	Lead	Estimated		EQPL Range			Management Measure	9
Aspect	impact	womtored	Methou	riequency	Location	reison	Cost	Alert	Action	Limit	Alert	Action	Limit
		(mg/Ncm)									accordingly as		
											needed.		
		Noise	Portable Noise	Semi	2 stations	PCO	P10,000	Daytime -	Daytime -	Daytime -	Conduct survey at	If source of noise	Conduct noise
		(Decibels dBA)	sampler	Annual	(hourly)			60dB	63	70	sampling station	is from Mill, inform	sampling in the
											to verify	the plant manager	presence of the
			NPCC Class C		1 station			Night-time –	Night-time –	Night-time –	complaints as per	to provide noise	DENR and 3rd
			for industrial		(24 hours)			55dB	58	60	Noise Level	mitigation	party
			area								Monitoring and	measures.	environmental
											Measurement	Conduct noise	firm. Inform the
											Procedure. Check	monitoring to	operation or the
											the sound level	verify if the level is	area owner to
											using sound	aiready with the	stop activity
											neter. Determine	noise is not from	unless noise
											possible cause.	nlant inform the	measure has
												MMT regarding	heen installed or
												the possible	the source of
												source of noise for	noise has been
												the group's	corrected. Upon
												investigation and	installation of
												coordination with	noise mitigation
												LGU.	measures
													conduct noise
													monitoring to
													verify if the noise
													level is already
													within limits.
PEOPLE								1004	1004				
	Exposure of	Sate person-	Incident	Annually	Project Site	MMT	Part of the	10%	10%	Major	Conduct re-	Inspect the area	Hire 3 rd party
	employees and	hours, injury, near	reporting,				monitoring	increase in	increase in	accidents	training of the	wherein most	safety practitioner
	trie local	miss and other	survey, include				TUNG OT IVIIVI I	injury, near	injury, near	sucn as	workers on safety	accident	to conduct safety
	community to	salely	and Safaty					misses and	misses and	avalacion	rules and	Conduct	audit in the plant
	operation	indices Hoolth	Plan of the					accidente	nilliui accidente	explosion,	Conduct	monitoring	SILE.
	operation	statistic	propopont					accidents.	accidents.	eit.	invostigation	monitoring.	
	Community	Sidiisiic.	Inpute from the	Quartarly	Direct and	мит	Dart of the	Incroaco	Complainta	Multiplo	Talk with the least	Intensify IEC and	Conduct nublic
	Community			Quarterry	Indirect			level of	lodged by		stakeholders to		bearing if
			workers who		munect		www.buuyet	sickness	louged by	lodged by	check their stand	relations	necessary II
			WUINCIS WIIU					310111033		louyeu by	UNGON UNGIN SIGNU		necessary.

CHAPTER 6

En la sur stat	Potential Parameter to be Sampling and Measurement Plan Annual EQPL Mar	. Management Schem	anagement Scheme											
Environmental	Potential	Parameter to be	Mathad	E		Leasting	Lead	Estimated		EQPL Range			Management Measur	
Aspect	Impact	Monitored	tored Method Frequency Loc	Location Person	Location Person	Cost	Alert	Action	Limit	Alert	Action	Limit		
			attends the		Impact			such as flu	the	the	on the issues to			
			regular MMT		Community			as result of	community	community	property address		l	
			meetings					the health			it.		l	
								and social					l	
								survey						

6.3 MULTI-SECTORAL MONITORING FRAMEWORK

The company is responsible for inviting stakeholders to be members of the Multipartite Monitoring Team (MMT). It actually encourages groups from the community to nominate their representatives. A general committee composed of these representatives was already established. **Table 6-7** shows the current composition of the MMT.

Likely Members or Representatives	Basis for Priority Selection	MMT Role	Scope of Responsibilities	
Proponent	Proponent	Fund Provider	Provide administrative support for the committee	
EMB-RO, DENR	EIA System Implementer	Lead Agency	Chair of the committee	
PENRO, DENR	Other Related Regulations	Alternate to EMB-RO	Assumes chairmanship in the absence of EMB-RO	
LGs, PEMO, BENRO, CENRO and other Government Agency	Policy Makers and Administrators	Sectoral Representative	Committee Member	
Women	Empower their value in the society	Sectoral Representative	Committee Member	

 Table 6-7. Multi-Partite Monitoring Team Composition

Pursuant to DAO 2017-15, a new MMT will be reconstituted. **Table 6-4** shows the MMT composition to be established:

Likely Members or Representatives	Basis for Priority Selection	MMT Role	Scope of Responsibilities
Meycauayan City ENRO	DAO 2017-15 section 16	LGU representative / Chair	DAO 2017-15 Section 17; Conduct quarterly ocular visit, may observe sampling activities, prepare & submit semi-annual reports to EMB; institute environmental emergency and complaints receiving and management mechanism
Rural Health Unit Chief		LGU representative/ Member	
Bahay Pari Baranggay Captain		LGU representative/ Member	
LGU accredited NGO		Member	
Women Sector		Member	
Related Govt. Agency (TBD)		Member	

 Table 6-4. Multi-Partite Monitoring Team Composition as per DAO 2017-15

6.4 ENVIRONMENTAL GUARANTEE AND MONITORING FUND COMMITMENTS

In the current MMT MOA, the Proponent already allotted an Environmental Guarantee Fund of P500,000 intended to rehabilitate components of the environment and compensate damage/s to properties to be adversely affected by the project. The company has also allocated Environmental Monitoring Funding in the amount of P500,000 for activities to be



done by the MMT and replenish the same when necessary. However, the stated amounts on the said funds are only indicative, the new MMT to be formed pursuant to DAO 2017-15 will evaluate and recommend the final amount of EMF and EGF fund to be put up for the proposed expansion.

CHAPTER 7 ABANDONMENT/DECOMMISSIONING/ REHABILITATION POLICY

The formulation of the detailed decommissioning plan will be done by the proponent within the specified timeframe as part of the post-ECC requirement. It will be submitted for approval to the EMB and concerned local government agencies on the activities such as Environmental Site Assessment to determine contaminants left by the operation, method and equipment to be used for dismantling of structures, clean-up or remediation plan and demobilization scheme before proceeding.

Demobilization during post construction will be conducted by the contractors as per SAMC requirements which include all activities and costs for transport of all construction equipment used, all excess materials, disassembly and transport of temporary facilities (office, stock room, quarters, etc.) used during construction, removal and disposal of all construction debris and general clean-up of construction site. SAMC will also require its contractor to post performance bond together with the 10% retention to take care of any defects and damages left behind after demobilization.

Considering that the project has a lifespan of 50 years, continuous maintenance, enhancement and upgrading will be done to ensure high production efficiency, environmentally compliant and safe facility. Structures and plant equipment will be assessed regularly for the project to continue its operation beyond its lifespan.

CHAPTER 8 INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

The proponent in coordination with the concerned government agencies and local government unit/s will conduct monitoring of the project. This is necessary in order to determine if the Proponent is implementing the prescribed mitigating measures recommended in the Environmental Compliance Certificate (ECC) of the project.

The company has appointed 2 regular Pollution Control Officer (PCO)/Safety Officer, who is part of the Health, Environment, and Safety Department (HES). His responsibility is for the formulation and implementation of environmental conservation and health/safety programs. The PCO is responsible for the monitoring not only of the entire plant area but also of the installed machineries, equipment and utilities of both Mill 1 and Mill 2. He makes representation with the local government units and non-government organizations and submits the required reports on the operation and maintenance of the building, installed machineries, equipment and utilities with the regional office of DENR-EMB. The implementation of the company's entire environmental management and monitoring program shall fall under his direct supervision. He reports functionally to the HES Department Head and administratively to the Resident Manager.

The company implements a certified Environmental Management System as per ISO 14001:2015 which ensures that all systems established are implemented and maintained and being monitored and regularly audited in compliance to environmental legal requirements. The QMS Specialist is the champion for the IMS and internal audits that is also under the HES Department.



Figure 8-1. Organizational Chart