Environmental and Social Impact Assessment (ESIA) Report For De Heus Animal Nutritional Feeds Manufacturing Project, Myothar Industrial Zone, Mandalay Region

# PREPARED FOR: De Heus Myanmar Company Ltd.

# PREPARED BY: SEAM Company Ltd.

# 11/27/20





# Contents

1.	EX	ECUTIVE SUMMARY	14
1	.1 Exe	ecutive summary in English version	14
	1.1.1	Context of the project	14
	1.1.2 Pr	resentation of the Project Proponent	14
	1.1.3 Pr	resentation of the Environmental and Social Experts	14
	1.1.4	Overview of Policy, Legal, and Institutional Framework	15
	1.1.5 De	e Heus Myanmar's Environmental & Social Polices and its Standard	15
	1.1.6	Project Description and Alternatives	16
	1.1.7	Description of the Environment	18
	1.1.8	Identififcation of Impacts Assessment	21
	1.1.9 Er	nvironmental and Social Management Plan (ESMP)	22
	1.1.10 0	Cummulative Impact Assessment	24
	1.1.11	Public Consultation and Disclosure	24
	1.1.12 0	Conclusion and Recommendation	25
1	.2 Exe	ecutive summary in Myanmar version	27
2.	INT	TRODUCTION	51
2	2.1 Pre	sentation of the Project Proponent	51
2	2.2 Presen	ntation of the ESIA Consultant	52
3.	PO	LICY, LEGAL, AND INSTITUTIONAL FRAMEWORK	55
3	8.1 Env	vironmental Conservation Law (2012)	55
	3.1.1	Environmental Conservation Rules (2014)	58
	3.1.2	Environmental Impact Assessment Procedures (2015)	58
	3.1.4	Myanmar Constitution Law (2008)	60
3	3.2 Rel	evant Legislation, Laws, Rules and Regulations	60
	3.2.1	The Export and Import Law (2012)	60
	3.2.2	Foreign Investment Law (2012) and Rules (2013)	60
	3.2.3	Foreign Investment Rules (2013)	61
	3.2.4	Myanmar Investment Commission Notification No. 1 of 2013	61
	3.2.5	Prevention of Hazard from Chemicals and Related Substances Law (2013	3)62
	3.2.6	Boiler Law (2015)	62
	3.2.7	Land Acquisition Act (1894)	62
	3.2.8	Myanmar Investment Law (2016)	63
3	3.3 Mis	scellaneous Laws and Regulations	63
	3.3.1	National Food Law (1997)	63

3.3.2	Conservation of Water Resources and Rivers Law (2006)	.63
3.3.4	The Private Industrial Enterprise Law (1990)	.64
3.3.5	Factories Act 1951	.64
3.3.6	Public Health Law (1972)	.64
3.3.7	Law on Health and Safety in the Workplace (2014)	.64
3.3.8	Minimum Wage Law, 2015	.65
3.3.10	Labor Dispute Settlement Law (28 Mar. 2012)	.65
3.3.11 2013)	Animals and Animal-products Import/Export Rules and Regulations (June 65	
3.3.12	The Prevention and Control of Communicable Diseases Law (1995)	.66
3.3.13	Animal Health and Development Law (1993)	.66
3.3.13	The Conservation of Water Resources and Rivers Law (2006)	.67
3.3.14	Race and Religious Protection Laws (2015)	.67
3.3.15 Holidays	The Leave and Holidays Act (1951) and The Law Amending the Leave and s Act (2006)	.67
3.3.16	Myanmar Insurance Law (1993)	.67
3.3.17	Automobile Law (2015) and Motor Vehicle Rules (1989)	.67
3.3.18	Myanmar Fire Brigade Law (2015)	.68
3.3.19	Petroleum and Petroleum Products Law (2017)	.68
3.3.20	Protection and Preservation of Cultural Heritage Law (1998)	.68
3.3.21	The Protection and Preservation of Antique Objects Law (2015)	.68
3.3.22	The Law on Preservation and Protection of Ancient Buildings (2015)	.68
3.3.23	Myanmar Engineering Council Law (2013)	.68
3.3.24	The Employment and Skill Development Law (2013)	.69
3.3.24	Consumer Protection Law (2014) and Amendment (2019)	.69
3.3.25 11.05.20	Workmen Compensation Act, 1923 [Amendment: 24.03.1955, 02.04.1957, 005]	.69
3.4 Inter	rnational and Regional Treaties	.70
3.5 Nati	onal and International Standards and Guidelines	.70
3.6 De I	Heus Myanmar's Health. Safety, and Environmental (HSE) Commitments	.74
3.6.1	De Heus Myanmar's Environmental Policies and Standards	.74
3.6.2	De Heus Myanmar's Social Policies and Standards	.75
3.6.3	Fire Safety	.75
3.6.4	Chemical and Hazardous Materials Safety	.76
3.6.5	Health Standards for Project with Health Impacts	.76
3.6.6	Commitments and Endoserment	.76

4.		PRO	DJECT DESCRIPTION AND ALTERNATIVE SELECTION	80
	4.1	Pro	ect Background	80
	4.2	Тур	e and Size of the Project	80
	4.3	Pro	ect Site Location	80
	4.4 Pr	ojec	t Development and Implementation Time Schedules	84
	4.5	Em	ployment	87
	4.6	Pro	ect Infrastructures	
	4.7	Ma	chineries and Equipment	91
	4.8	Use	of Raw Materials and Resources	92
	4.9	Sou	rce of Electric power supply	94
	4.10	Sou	rce of Water Supply	94
	4.11	Pro	duction Process	96
	4.12	Ger	eration of Wastes and Control Measures	103
	4.13	Alte	ernatives in Consideration	107
	4.14	Cor	nparison and Selection of the Preferred Alternatives	108
5.		DE	SCRIPTION OF THE SURROUNDING ENVIRONMENT	109
	5.1 Se	etting	the Study Limits	111
	5.2	Met	hodology and Objectives	115
	5.3	Phy	sical Components	115
	5.3.	.1	Climate condition	115
	5.3.	.2	Topographic condition and Geological condition	118
	5.3.	.3	Protected area	120
	5.3.	.4	Air Quality, Noise and Vibration Monitoring	121
	5.3.	.5	Soil Quality	133
	5.3.	.6	Water Quality Monitoring	140
	5.4	Bio	logical Components	146
	5.4.	.1	Methodology for Ecological flora and fauna monitoring survey	148
	5.4.	.2	Two seasons monitoring results	150
	5.4.	.3	Generally observed flora and fauna species in both seasons	154
	5.5	Nat	ural Hazards	163
	5.6	Infr	astructure and Services	165
	5.6.	.1	Education	165
	5.6.	.2	Healthcare	165
	5.6.	.3	Waste management	165
	5.6.	.4	Water, Electricity and Energy	165

5.6.5		Infrastructure for economy	166
5.6	.6	Transportation	166
5.7	Soc	io-Economic Components	167
5.7	.1	Population Growth and Distribution	168
5.7	.2	Household Size	170
5.7	.3	Literacy and Education	170
5.7	.4	Livelihood and Income	173
5.7	.5	Other businesses	180
5.7	.6	Humanitarian organizations	180
5.7	.7	Natural disasters	181
5.7	.8	Living conditions and access to public services	181
5.8	Pub	lic Health Components	185
5.8	.1	Birth Rate and Mortality	185
5.8	.2	Morbidity	186
5.9	Cul	tural Components	186
5.9	.1	History of the Location	186
5.9	.2	Cultural Heritage	186
5.9	.3	Description of traditional knowledge, beliefs, and cultural practices	187
5.10	Visi	ual Components including where applicable landscape, city scape and sea scap	ре 188
5.1	0.1	City Scape of Mandalay Region	188
5.1	0.2	City Scape of Project Affected Area	189
5.1	0.3	Landscape Map of Mandalay Region	190
5.1	0.4	Seascape of Mandalav Region	191
6.	IDE	ENTIFICATION AND ASSESSMENT OF ENVIRONMENTAL AND SOCI	AL
IMPAC	TS		192
6.1	Obj	ectives for Conducting ESIA	192
6.2	Met	hodology and Approaches of Impact Assessment	192
6.2	.1	Identification of Impacts	192
6.2	.2	Evaluation of Impact Assessment	193
6.3	Imp	act Assessment for each project phase	194
6.3	.1	Identification of Project Affected Area, Receptors, and Stakeholders	194
6.3	.2	Potential Environmental Impacts and its mitigation measures	195
6.3	.2	Social Assessment and Potential Social Impacts, and its Mitigation Measures 200	3
6.4	Pre-	-construction Phase Impacts	204

6.5	Construction Phase	
6.6 Operation Phase		207
6.7	Decommissioning, closure and post closure phases	211
7.	CUMULATIVE IMPACT ASSESSMENT	213
7.1	Methodology and Approach	213
7.2	Identification of VECs	213
7.3	Determination of Temporal and Spatial Boundaries	214
7.4	Cumulative Impact Assessment	214
7.5	Development of a Management Framework	215
8.	PUBLIC CONSULTATION AND DISCLOSURE	216
8.1	Methodology and Approach	216
8.2	Summary of the Consultation and Activities Undertaken	218
8.3	Key Results of Consultations	220
8.4	Grievance Redress Mechanism (GRM)	221
9.	ENVIRONMENTAL MANAGEMENT PLAN	222
9.1	Environmental Management Plan for Pre-construction Phase of De Heus Project.	223
9.2	Environmental Management Plan for Construction phase of De Heus Project	224
9.3	Environmental Management Plan for Operation phase of De Heus Project	236
9.4	Environmental Management Plan for Decommissioning, closure and post closure phases for De Heus Project	249
9.5	Undertaking	253
9.6	Emergency Management Plan	253
9.6	.1 Accidental Chemicals or Hazardous Materials Spill	253
9.6	.2 Fire Outbreak	254
9.6	.3 Medical Emergency	254
9.5	Undertaking by the Project Proponent	255
9.6	Undertaking by the Consultant	256
10.	CONCLUSION AND RECOMMENDATION	257
11.	REFERENCES	259
12.	ANNEXES	260
12.1	MMID master plan and Master drainage system of De Heus	260
12.2	Photolog for project phases and public consultation meeting	260
12.3	Laboratory analysis results for soil and water	260
12.4	Public Consultation Meeting invitation letter, Meeting minutes and Handout	260
12.5	Public consultation meeting attendant list	260

12.6	MSDS
12.7	PPE for De Heus

# List of Figure

Figure 1: Location of De Heus Myanmar Ltd., Project.	81
Figure 2: Location Map of De Heus Myanmar Ltd., Project	82
Figure 3: Design Layout Plan of DE HEUS Myanmar Co., Ltd.	83
Figure 4: Dump Truck Working during Construction Phase	85
Figure 5: Tower House Construction	86
Figure 6: Bulldozer Working during Construction Phase	86
Figure 7: Site Layout Plan of Project Infrastructures	89
Figure 8: Instructions for the layout plan of project infrastructures	90
Figure 9: Water Tube well location map	95
Figure 10: Production Process Flow Chat of De Heus Myanmar Feed Mill	97
Figure 11: General Production Process Flow Diagram of De Heus Myanmar. Myotha IZ	98
Figure 12: General Layout Plan of Wastewater Plumbing System	105
Figure 13: General Layout Plan of Storm-water Plumbing System	106
Figure 14: Surrounding Environment Map	110
Figure 15: Land Use Map of the DE HEUS MYANMAR Project	112
Figure 16: Land Use Map of the DE HEUS MYANMAR Project	113
Figure 17: Mandalay Myotha Industrial Development Land Use Map	114
Figure 18: Monthly Weather History Graph for September 2017	117
Figure 19: Monthly Weather History Graph for December 2017	118
Figure 20: Geological condition of proposed project area	119
Figure 21: Location map of Minsontaung wildlife sanctuary in Ngahtogyi Township	120
Figure 22: Air monitoring points for De Heus Myanmar project	122
Figure 23: First survey of Ambient Air & Noise Baseline data collection at A1, Wet seas	on
	123
Figure 24: Second survey of Ambient Air & Noise baseline data collection at A1, Dry se	ason
	123
Figure 25: First survey of Ambient Air & Noise Baseline data collection at A2, Wet seas	on
	124
Figure 26: Second survey of Ambient Air & Noise baseline data collection at A2, Dry se	ason
	124
Figure 27: Second survey of Ambient Air & Noise baseline data collection at A3, Dry se	ason
	125
Figure 28: Second survey of Ambient Air & Noise baseline data collection at A3, wet se	ason
	125
Figure 29: Noise monitoring points for De Heus Myanmar project	130
Figure 30: Vibration Monitoring Point	132
Figure 31: Geological Map of Myanmar and approximate area of De Heus Project	134
Figure 32: Soil sample location map at De Heus site (Wet Season)	136
Figure 33: Dry Season Soil sample location map at De Heus site	137
Figure 34: Images of Soil Profile	138
Figure 35: Soil layers and backfilling level of De Heus project site	139
Figure 36: Water Sample Location Map in wet season and dry season for De Heus Myan	mar
Project	142

Figure 37: Major vegetation type of Myanmar; (Sources Kress et al, 2003 of NBSAP 201	15-
20)	147
Figure 38: Wet and dry season Biodiversity Sampling points for De Heus Myanmar pro-	ject
	149
Figure 39: Observed Fauna species during biodiversity survey	156
Figure 40: Observed Flora species during biodiversity survey	158
Figure 41: Myanmar Seismic Zone Map	164
Figure 42: GDP in Nga Zun Township	167
Figure 43: Household distribution in rural and urban of Nga Zun Township	168
Figure 44: Male and Female Distribution in rural and urban area of Nga Zun Township, 2	2017
	169
Figure 45: Education levels of the respondents in the selected study area	172
Figure 46: Cultivated Area (Ac) of Priority Crops in Nga Zun Township	174
Figure 47: Cultivated Area (Ac) of Marketable Crops	174
Figure 48: Production of Meat (Viss)	177
Figure 49: Population based on their Employments	178
Figure 50: Land Utilization of Nga Zun Township.	182
Figure 51: Location map of De Heus project in Nga Zun Township of Mandalay Region	188
Figure 52: Administrative boundary of Nga Zun Township and project affected villages	189
Figure 53: Location map of project affected villages	190
Figure 54: Location map of Na Zun Township in Mandalay Region	191
Figure 55: Impact Assessment Methodology	193

# List of Table

Table 1: Members of Executive Board of De Heus Myanmar Ltd.	52
Table 2: Expert Members of Social and Environmental Associate-Myanmar (SEAM)	52
Table 3: Relevant International and Regional Treaties	70
Table 4: General National Environmental Quality (Emission) Guideline	71
Table 5: General Wastewater Effluent Quality Standards	73
Table 6: National Environmental Quality (Emission) Guidelines Noise Level.	74
Table 7: Planned Construction Period	84
Table 8: List of Planned Human Resources to be appointed during the Production Stage	87
Table 9: List of Major Equipment for Animal Feed Production Process	91
Table 10: Type, Brand, and Capacity of Generators and Boilers	91
Table 11: List of Raw Materials to be used and Quantity Required per Day or per Month	92
Table 12: List of Chemicals for Animals Feeds Nutritional Products	93
Table.13: Process Description of DE Heus Myanmar Feed Mill	99
Table 14: Monthly Weather Condition in September 2017.	115
Table 15:. Monthly Weather Condition in December 2017	116
Table 16: Air Quality Survey Parameter, Equipment and frequency	121
Table 17: Geographic coordinate locations of Air monitoring points	121
Table 18: Air Quality Sampling Plan	126
Table 19: Weather Conditions during the Air Quality Sampling Periods	127
Table 20: Air Pollutant Concentrations	128
Table 21: GPS coordinates of noise sampling points	129
Table 22: Ambient Noise Level Sampling Schedule	131
Table 23: Comparison of Noise Levels with NEQEG	131
Table 24: Result of Vibration	132
Table 25. Soil Sample Location Table for 1 <sup>st</sup> Season and 2 <sup>nd</sup> Season	135
Table 26: Results from soil laboratory analysis for the 1 <sup>st</sup> Season and 2 <sup>nd</sup> Season	139
Table 27: Water Quality Monitoring Survey in 1 <sup>st</sup> Season and 2 <sup>nd</sup> Season	141
Table 28. Onsite Measurement Result for Tube Well - Frst and Second Season water qua	lity
survey	143
Table 29. Onsite Measurement Result for NWR village tube well – First and Second seas	on
water survey	143
Table 30. Water Quality Onsite Measurement Result for Wastewater Pond for the second	
survey	143
Table 31.Water Quality Laboratory Result for Tube Well for First and Second Season Su	rvey
	144
Table 32. Water Quality Laboratory Result for NWR village tube well for First and Second	nd
Season survey	144
Table 33. Water Quality Laboratory Result for Wastewater Pond for the second survey	145
Table 34. Water Quality Laboratory Result (Microbiology) for Tube well at the second	145
Table 35. Water Quality Laboratory Result (Microbiology) for NWR Tube well – the sec	ond
survey	146
Table 36. The coordinate locations of four sample plots in two seasons	148
Table 37. List of flora species observed in four sampling points of wet season survey	150
Table 38. List of commonly observed fauna species in project surrounding area (wet seas	on)
	151

Table 39. List of flora species observed in four sampling points of dry season survey	152
Table 40. List of commonly observed fauna species in surrounding area of De Heus (dry	
season)	153
Table 41: Generally observed Flora and fauna species in and surrounding area of project.	154
Table 42: Distribution of Schools in Nga Zun Township in 2017	165
Table 43: Transportation networks of Nga Zun Township	166
Table 44: Distributions of Bus Gate in Nga Zun Township	167
Table 45: Population distribution of male and female in rural & urban of Nga Zun Towns	hip
(2017)	168
Table 46: Male and Female Ratio in Nawarat Village and Pauk Sein Village	169
Table 47: Distribution of Male and Female in the household in the selected study area	170
Table 48: Distribution of Household Size in the selected study area	170
Table 49: Literacy Rate in Nga Zun Township for 2017	171
Table 50: Registered Children in Nga Zun Township for 2017	171
Table 51: Passed Rate of Matriculation Exam in Nga Zun Township	171
Table 52: Education Level of the Respondents in Selected Study Areas	171
Table 53: Types of the Respondents in the Selected Study Areas	173
Table 54: Age distribution of the Respondents in the Selected Study Areas	173
Table 55: Food Security (Rice) in Nga Zun Township (2017)	175
Table 56: Food Security for Oil in Nga Zun Township (2017)	175
Table 57: Agricultural Machines found in Nga Zun Township (2017)	177
Table 58: Livestock farming in Nga Zun Township	177
Table 59: Distribution of Animals owned by household in the study areas	178
Table 60: Employment of the Households in the Selected Study Areas	179
Table 61: Dissemination of the Farm Products by the Households in the selected villages	179
Table 62: Income distributions by the Households in the Selected Study Areas	180
Table 63: Family owned businesses in Nga Zun Township	180
Table 68. Natural Disasters in Nga Zun Township (2016-2017)	181
Table 65: Kinds of equipment used by Households in the selected study area	182
Table 66: Distribution of Land Size owned by Households in the Selected Study	183
Table 67: Land Acquisition Methods and Registration for Land by Households in selected	b
study area	183
Table 68: Energy Utilization by households in the study areas	184
Table 69: Kinds of energy used by household for their cooking in the study areas	184
Table 70. Water Resources for drinking & daily use of Households in the selected study a	irea
	185
Table 71: Utilization of Solid Waste by Households in the selected study area	185
Table 72: Social Health Index	185
Table 73. Most communicable diseases in Nga Zun Township	186

# LIST OF ABBREVIATIONS

%	Percentage
°C	Degrees Celsius
°F	Degrees Fahrenheit
cm	Centimeter
dB(A)	Decibel unit
ft	Feet
hPa	Hectopascal
in	Inches
in Hg	Inch of Mercury
Kg	Kilogram
Kg/day	Kilogram per day
km	Kilometer
km/hr	Kilometer per hour
Kt:	Kilo Ton
kV	Kilovolts
KVA	Kilo Volt Ampere
mg/m <sup>3</sup>	Milligram per cubic meter
m <sup>3</sup>	Cubic Meter
m <sup>3</sup> /day	Meter cubic per day
mg/l	Milligram per Liter
ml	Milliliter
mmHg	Millimeter of mercury
mph	Miles per hour
mV	Millivolts
MW/h	Mega Watt per Hour
µg/m3	Micro Gram per Cubic meter
µS/cm	Micro Siemens per Centimeter
AOI	Area of influence
BOD	Biochemical Oxygen Demand
CFU	Colony Forming Units
CIA	Cumulative Impact Assessment
CID	Card Identification Number
CO	Carbon Monoxide
CO2	Carbon Dioxide
COC	Chain of custody
COD	Chemical Oxygen Demand
CSR	Corporate Social Responsibilities
DBS	Dry Season Biodiversity Survey
DDGS	Dried Distillers Grain with Soluble
DH	De Heus Myanmar Limited
ECD	Environmental Conservation Department
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan

FIL	Foreign Investment Law
GAD	General Administrative Departments
GDP	Gross Domestic Product
GPS	Global Positioning System
HIV	Human Immunodeficiency Virus
HSE	Health, Safety and Environment
IEE	Initial Environmental Examination
IFC	International Finance Cooperation
ILO	International Labour Organization
IMR	Infant Mortality Rate
IT	Information Technology
IUCN	International Union for Conservation of Nature
IZ	Industrial Zone
LAeq(dBA)	Equivalent Continuous Level Maximum
LDL	Lower Detection Limit
Max	Maximum
MCDC	Mandalay City Development Committee
MIC	Myanmar Investment Commission
Min	Minimum
MMID	Mandalay Myotha Industrial Development
MMR	Maternal Mortality Rate
MOECAF	Ministry of Environmental Conservation and Forestry
MONREC	Ministry of Natural Resources and Environmental Conservation
MSDS	Material Safety Data Sheets
MT	Metric Ton
NEQEG	National Environmental Quality (Emission) Guidelines
NGOs	Non-Government Organization
NO2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NTU	Nephelometric Turbidity Units
O3	Ozone
ORP	Oxidation-Reduction Potential
OSHA	Occupational Safety and Health Administration
pН	Potential of Hydrogen
PM10	Particulate Matter less than 10 micron
PM2.5	Particulate Matter less than 2.5 micron
PPE	Personal Protective Equipment
ppm	Part Per Million
ppt	Parts per thousand
PTN	Palatin Technologies Inc
SO2	Sulfur Dioxide
SOx	Sulfur Oxides
ТВ	Tuberculosis
TCU	True Color Unit
temp	Temperature
TSS	Total Suspended Solid

United Nations Framework Convention on Climate Change
United States
United States Dollar
Valued Ecosystem Components
Vietnam
Wet Season Biodiversity Survey
World Health Organization

# 1. EXECUTIVE SUMMARY

# 1.1 Executive summary in English version

### **1.1.1** Context of the project

De Heus Myanmar, a wholly owned foreign investment from the Netherland, is expanding 600 tons per day capacity animal nutritional feeds manufacturing plant on Plot numbers LG-3(2) and LG-6(2) near Street 26A in Myotha Industrial Zone of Mandalay Region, following the achievements from De Heus Myanmar's manufacturing plant in Myaung Daka Industrial Zone near Yangon. Total area of the manufacturing plant is 6.5 acres.

As per the EIA Procedure (2015), De Heus Myanmar is required to submit ESIA study report to the Ministry of Natural Resources and Environmental Conservation (MONREC) and to obtain an Environmental Compliance Certificate (ECC). According to article 47 of EIA Procedure (2015), it requires to submit Scoping study report.

De Heus Myanmar has commissioned Social & Environmental Associates – Myanmar (SEAM) to conduct an ESIA for the Project in strict compliance to applicable national laws, rules, and regulations issued especially by Environmental Conservation Department (ECD) under the Ministry of Natural Resources and Environmental Conservation (MONREC). SEAM is an established and registered environmental and social consulting firm, but its strong team possesses extensive and distinguished experiences in the trait.

#### **1.1.2 Presentation of the Project Proponent**

De Heus supported Myanmar farmers for several years before having decided to establish the first plant in Myanmar in 2016 with the commitment to bring further professionalization of livestock farming in the country. De Heus introduced its operating activities in Myanmar in 2015, under the name De Heus Myanmar Limited, and has been operating animal nutritional feeds plant in Myaung Dakar Industrial Zone near Yangon, producing 205 tons per day of animal nutritional feeds since 2016.

Following the achievements from De Heus Myanmar's typical manufacturing in Myaung Daka Industrial Zone near Yangon, De Heus Myanmar plans to establish another successive manufacturing plant in Myotha Industrial Zone.

# 1.1.3 Presentation of the Environmental and Social Experts

Presentation of the Environmental and Social Experts Social and Environmental Associate-Myanmar (SEAM), a registered environmental and social consulting firm is working with clients to identify and address the environmental and social impacts in compliance with Myanmar. Its roles are to develop ESIA, RAP, and EMMP to provide technical advice for developing ESMP, and to assist the project's implementation of the environmental and social management program in every possible way in alignment with the requirements adopted by Environmental Conservation Department (ECD) and the implementing agency, Dehus Co. Ltd.

### **1.1.4** Overview of Policy, Legal, and Institutional Framework

The National legal framework of Myanmar and relevant policies of the project with regards to environmental, working conditions, and welfare of workers have been examined. The objective of the national legal framework and the policies are to ascertain avoidance of environmental and social adverse impacts as much as possible, to make proactive mitigation measures as early as applicable, and to maximize positive effects of the project throughout its life.

A brief description of relevant environmental legislations such as Environmental Impact Assessment Procedures (2015), Environmental Impact Assessment Rules and Regulations (2014) and Environmental Conservation Law (2012), the Export and Import Law (2012), and overview of current local and international environmental and social policies including related international or regional convention have been examined. The Environmental and Social Impact Assessment (ESIA) for De Heus Myanmar's project is to be conducted strictly in line with the existing ESIA rules, regulations, and procedure of Myanmar. Furthermore, other relevant existing rules, laws and regulations, and International Conventions, Treaties and Agreements that Myanmar has signed with other countries, have also been mentioned in detail.

In addition to national legislation, the proposed project will be undertaken to comply with a range of international standards and guidelines. These standards and guidelines are set to reinforce national legislations and to ensure that the project is conducted under the best practices in ways that minimize risks, impacts and ensures in compliance with fair practices. In accordance with the stipulated Environmental Impact Assessment Procedure (December 2015), the National Environmental Quality (Emission) Guidelines (NEQEG) was adopted in late December 2015. Although, the NEQEG does not specify any requirement for manufacturing animal nutritional feeds, the proposed project is to follow the general requirements stated in the NEQEG, especially in air quality standards, waste water effluent standards, noise quality standards, and odor quality requirement.

De Heus is always committed to meet the project's health, safety, and environmental (HSE) commitments, not only to avoid adverse environmental impacts and negative social effects from its operations but also to scale up efforts to promote environmental conservation and social developments of the communities. De Heus Myanmar always keeps in mind that considering the life cycle assessment (LCA) of the project (from beginning to end of the project) would result in better environmental and social benefits and thus ensuring sustainable environmental and social development of the communities throughout the project life.

#### 1.1.5 De Heus Myanmar's Environmental & Social Polices and its Standard

De Heus Myanmar makes commitments not only to avoid adverse environmental impacts and negative social effects from its operations but also to scale up efforts to promote environmental conservation and social developments of the communities. Most importantly,De Heus Myanmar plans to set training and promotion programs for its core environmental values and good practices to its workforce and communities. De Heus Myanmar strictly adheres to Myanmar's minimum wage law and prohibition of child labor in any of its operations. Overtime fees as defined by the government of Myanmar will be provided for any overtime work. Standard Personal Protective Equipment (PPE) will be provided adequately. De Heus Myanmar is also committed to provide safe and sound working environment for all employees and all work-related health and safety regulations will be strictly enforced. Moreover, the department has put in place all fire safety procedures, measures, and equipment. Local fire department will make regular inspection and certify the department's fire safety plan.

### 1.1.6 Project Description and Alternatives

The proposed project is the 100% foreign investment by De Heus Myanmar Company Limited with an authorized capital investment of USD 15 Million, leading to manufacture and distribute the animal nutritional feeds products by using automatic process control system. De Heus already have a fully operated plant in Myanug Dagar Industrial Zone for the distribution of lower Myanmar. The driving forces of increasing demand from the upper Myanmar, the proposed plant will be established in Myothar Industrial Zone to fulfill the requirements of the upper Myanmar firms. The production capacity per day is 600 tons in various kinds of animal feed products. The construction phase of the proposed factory was initiated in June 2017, and the commercial running operation stage is commenced in July 2018.

The project site is located at adjacent Plots, LG-3(2) and LG-6(2) of Street 26A, inside Myotha Industrial Zone, Nga Zun Township, Mandalay Region, having a total area of 26,306.26 sqm (6.5 acres). It is approximately 9.59 km away from North-West of Myotha Town, which is about 59.7 km away from South-West of Mandalay City.

The factory will be running on two 8-hour shifts per day basis. The plant will employ a total of 87 peoples, of which 59 peoples are operational workers and 6 are office staff members. The project's infrastructure includes production tower, raw material warehouse, intake building, utilities and transformer room, grain silos, boiler room, liquid tanks area, welfare house, firefighting pump room, water tanks, weighing bridge, offices and a guard house, laboratory rooms, and car parking shelter, etc. The major machineries for the factory are Hydraulic unloading system, Corn dryer, Grain silos, Hammer mill, Mixer and 2 coolers etc.

The basic raw materials for production of animal feeds nutritional products include oil, wheat bran, molasses, corn, and cereals bone meal, bran of cereals, salt and limestone, vitamins and minerals. The electric power supplies during the operational phase will be available from two 1000 KV transformers via MMID source. The plant will put one diesel Denyo generator(110KVA) for emergency backup contingency arrangement. The main sources of water supply are two tube wells with 600 ft. and 500 ft depth each, and two treated water storage water tanks and one raw water storage purpose tank are observed. The plant plans to consume 135 m<sup>3</sup>/day of treated groundwater, and water capacity of 170 m<sup>3</sup> is kept reserve for firefighting purpose.

#### **Production Process**

Imported Materials Receiving and Screening: Sensory evaluation, internal laboratory analysis, independent laboratory analysis, and final inspection will screen quality of the imported materials and make the categorization due to the quality of the materials. Only materials meeting the company's quality standard will be moved to the next step while the rest of the materials with questionable quality will be discarded. Quality control specialists will oversee the process.

Raw Storage Facilities: Most raw materials are placed in storage with normal atmospheric temperature while the temperature sensitive materials are stored in cooler to maintain quality consistency. Each material is checked for required quality before it is used in the production process.

Pre-cleaning and In-taking: magnetic separator and relevant impurity removal steps are involved in the pre-cleaning of raw materials before production. Magnetic separator removes metallic particles. Other cleaning processes remove different impurities from the raw materials. Cross contamination is prevented by thorough pre-cleaning processes. After the cleansing, the materials will be classified using mesh sieve screens to channel either to grinders for stiff materials and mixer bin for materials that are tender.

The major operation processes involve in the production of animal food nutritional feeds are as follows:

- **Imported Materials Receiving and Screening:** Material Qc are responsible for inspection according to the company standards. Once QC passed the materials, the incoming trucks pass through weighbridge for confirming the weight in.
- Cleaning (Magnetic separator and pre-cleaner and sifting in liquid): The material is run through the magnet, the metallic particles (iron) will be retained and removed during cleaning process. All unwanted foreign matters (dust, small stones, trash) are clean and filtered by pre-cleaner.
- **Storage of materials:** The batch of raw material, oil, premix, etc. must be monitored for quality to meet the requirements for quality and feed safety before being put into usage.
- Intake Dosing Bins: Bin containers must have identification codes or equipment codes.
- Weighing (Quantitative Balance): This is the stage where the grinded raw material balanced to mix according to the formula weighing including raw material weight, liquid.
- Sifting RM (Sieves Magnet): Separating impurities from the raw materials
- **Grinding:** All the RM included in the recipe are brough into the hummer mill to get grind.
- Mixing (Dry mixing and Molasses mixing): Mixture of ingredients are mixed thoroughly in enough nutrition components formula. Some products require mixing with molasses.
- **Pelleting:** The mixture will be pelleted after mixing by using die from 2.3, 2.5, 3.2, and 4.0 mm. The Pelleting size depends on each product.

- **Cooling:** The feed after pelleting will be cooled down to minimize high temperature bagging prior putting to the finished product bins.
- **Sieving:** After cooling, the feeds will be passed through the magnet to detect and remove any metal pieces in the feeds, then transferred through the corresponding mesh sieve to remove the pellets.
- Weighing and Packaging products: After dust sieving, products will be moved through automatic scale and be packaged.
- **Storage & Export of products:** The packaged food is stored in the finished product warehouse and its products shall be piling on pallets properly for exporting easier.

Each task is thoroughly explained and shown together with the General Production Process Flow Diagram and table for its description of Animal Nutritional Feed Products, De Heus Myanmar Ltd in Figure (4) and Table (13) of the main report.

### Alternatives in Consideration

De Heus Myanmar has undertaken the project analysis process for the selection of the preferred project site. The management of De Heus Myanmar has considered the following selection criteria in the project analysis process:

- The strategic location of the project site to be considered;
- The logistics conditions of the region and the site; and
- The regional supply and demand of the products, and its market potential in upper Myanmar.

The management of De Heus Myanmar noticed that the project analysis process shows that Myotha Industrial Zone offers everything a potential developer can imagine for its strategic location, easy access to raw material sources in the region, and growing demand and attractive marketing potential for the products with a wealth of raw materials in the upper Myanmar. Hence, De Heus Myanmar decided that Myotha Industrial Zone Project Site to be the best option and planned to establish a new animal nutritional feeds manufacturing plant near Mandalay in upper Myanmar.

In addition to location alternatives, De Heus also considered about production equipment alternatives. In selection of sound equipment, De Heus took into account of efficiency, productivity, power consumption, reliability, environmental friendliness, easy function and maintenance, possibility of easy access to spare parts, and technical operation. Each unit of equipment was selected based on above criteria

# **1.1.7 Description of the Environment**

The potential Area of Influence (AoI) for the project is determined to be within 1.5 km radius of the project due to the physical footprint of the project construction sites, work staging areas within the Myotha Industrial Zone, and areas may be affected during the operational phase as a manufacturing plant. The whole area of the industrial zone consists of abandoned land that could only be suitable for gazing with sporadic appearance of low-lying shrubs and very few dry zone trees. Already dried-up creek even at the near end of monsoon season is

found in the west of the proposed site. Across the industrial zone, an herbal medicinal plantation spreads over a vast extent of land.

Weather conditions of the proposed project location were collected by in-situ measurements and from the weather-underground website (http://www.wunderground.com) and socioeconomic conditions were surveyed through interviews, focus group discussions and relevant local government data sources. Field survey of air quality, noise and vibration, water quality, soil quality, flora and fauna, topography and geology were conducted in or near the project site.

### Climate

The climate in general is the tropical wet and dry. It is hot year-round with slight minor variations. The mean annual temperature of Mandalay Region ranges between 21-degree C and 31-degree C, whilst the coldest period of the year tends to be between November and January and the warmest period of the year is between April and May. The monthly rainfall ranges from 1mm in March to 150 mm in September.

### Land use

The project site was primarily occupied as agricultural and pastures land by the local farmers. Information obtained from the land registration department and agriculture department revealed that the area has been low yield environment for economically viable agriculture. Study from the surveys and interviews with local residents confirm that aside for the use of short-term seasonal pasture for cattle, agriculture was not profitable land use of the project area. The location of the factory and adjacent surrounding of the factory were never part of any agriculture. Now the area has been transferred into the industrial zone consisting well-developed industrial areas.

#### Air quality

The ambient air sampling was conducted in September 2017 during the wet season, and for the dry season in December 2017. 24 hours continuous examination of  $PM_{10}$ ,  $PM_{2.5}$ ,  $NO_2$ , CO and  $SO_2$  were carried out and applied to target value of the standards from WHO and NEQEG. Generally,  $PM_{10}$ ,  $PM_{2.5}$ ,  $NO_2$ , CO and  $SO_2$  levels were founded lower than target values in wet season and  $PM_{2.5}$  and  $SO_2$  levels were higher than target standard value in dry season.

#### Noise and Vibration

Two periods of twelve hours continuous monitoring of noise levels were investigated to have comparisons with the NEQEG limits for day and night. In this study, all ambient noise levels at all sites did not exceed the noise level guidelines. The vibration status of the construction area is monitored in six locations within the project boundary. The measurement is conducted during the daytime of the construction site by BM-6370 vibration meter.

# Water quality

The area falls in the close vicinity of the dry zone and therefore, water scarcity is generally high and competition for water sources is severe in the area. Water quality surveys in two

different seasons were carried out to define the background water quality of the area. Array of water quality parameters specified in National Environmental Quality (Emissions) Guideline (NEQEG) were analyzed in an approved laboratory. The test result of the existing tube well indicates that groundwater level is nearly 100 meters from the surface in the wet season.

### Soil quality

The top layer, sandy soil or granular types, has high content of silt (12%), known as noncohesive soil formed from transportation and deposition. During the wet and dry season's survey, the observation showed that the soil's moisture retaining capacity is high enough to cause erosion due to lack of clay content. Back fill layer and sandy soil type displayed high pH values but low in iron chloride and sulfate, while containing considerable amount of Calcium and Magnesium. Soil test results revealed that the soil was not fertile and was not good for agricultural purposes.

#### Flora and fauna

Flora and fauna surveys were conducted in two seasons (wet and dry). According to the field survey result, 40 flora species and 46 fauna species are observed in both seasons, but in the wet season, there are only 34 flora species and 18 fauna species and in the dry season, 62 flora species and 17 fauna species. The number of fauna species observed in wet season is higher than the dry season.

### Topography and Geology

The area consists of a relatively flat terrain with noticeable gradient toward the west. Elevation of the terrain rises eastward, and Sagaing Ridge could be seen in the east. Vertisol Soils predominate the area. Reddish brown and low plasticity silty clay soil, grey color fine to medium grained sand, and backfill silty sand soil layers are common in the area.

#### Protected area

Minsontaung wildlife sanctuary is the closest protected area for the proposed project area and which is far about 20 miles to the south of the project area and 8 miles from east of Natogyi Township in Myingyan district. Fortunately, the potential impact of proposed project will not be the significant for this protected area as the distance of proposed project area is far enough.

#### Demographic information

The infrastructures and educational condition of the project located area were also identified as demographic baseline information. Health care facility, water resources, electricity and energy sources, including waste management practices of the potential project affected area will be recorded. Major economic activities, transportation and socio-economic conditions of the potential project affected areas will also be recorded as baseline data set of the project.

#### Population

The total population of Nga Zun Township is 140,501 while the survey population in the affected area of the two villages, Nawarat and Pauk Sein, combined is 1944 (888 males and 1056 females). Majority of the population are Burmese and believed in Buddhist.

# Livelihood

The major livelihood of both affected villages is agriculture. 65 percent of the households are farmers. 20 percent of the households engage short term contract works in transportation of brownstones for construction.

# Cultural and Visual Components

No special cultural heritage sites with regards to traditional and rural practices have been expressed in interviews with villagers and stakeholders. The plant will not cause obstruction of any significant views.

### Public Health

The township has one fifty-bed district hospital, two sixteen-bed station hospitals, eight rural health centers, and thirty-two sub-rural health centers employing a total of 33 medical staff, 8 doctors, 18 nurses, and 7 assistant healthcare administrators. Serious medical cases that need advance medical care are transferred to medical facilities in Mandalay.

#### **Social Components**

The information regarding the existing infrastructure and public services in Nga Zun Township include: education, healthcare, waste management system, water, electricity and energy supply, infrastructure for economy, and transportation facility services. A detailed description has been mentioned with statistical tables and charts.

The Nawarat Village and Pauk Sein Village are the two nearest villages situated within 1.5 km away from the project site boundary. These two villages are identified as receptors of socio-economic adverse impacts from the proposed project. The information on socio-economic conditions of Nga Zun Township and these two villages have been collected and thoroughly examined. The information includes: existing census and demographic records, literacy and education level, economic indicators, livelihoods, land use, employment status, family income status, life style and living conditions, access to public services, resources available, health care facilities, birth rate, mortality and morbidity.

It has been found that no special cultural heritage with regards to traditional and rural practices have been expressed in interviews with villagers and stakeholders. Significantly, the project site does not consist of any evidence of cultural and heritage importance, but on condition, that if any chance finds cultural and heritage matters, De Heus will be the main responsible party to treat them with extreme care.

# 1.1.8 Identififcation of Impacts Assessment

The key potential impacts are identified based on the proponent provided project information, onsite technical assessment on every environmental and social components and laboratory analysis results of the project. The amount of natural resource use in production process and types of waste to be generated from the related sources are identified. The proper control measures for avoidance of severe impact are considered systematically by professional judgments, it if not possible to avoid, reducing, reuse, recycle and implementable mitigation measures are identified for every phase of the project. The key potential impacts are

summarized in the following phases; Pre-construction; Construction phase; Operation phase and Decommissioning phase.

Impact identification based on the project activities has been undertaken by projection of potential adverse effects in representative to the extent of possible pollution loads and issues, existing receptors and sensitivity conditions, duration of impacts, planned treatment mechanisms and their capacity, and predicted results for receiving adverse effects for such duration were weighted in the prediction consideration for impacts. In addition, positive, negative, direct impact, indirect impact, and cumulative impacts are all taken into account in identification of the project affected area, receptors, and stakeholders.

Based on these pollution loads, intensity and severity of the impacts, potential impacts with significance and duration projected from weighting matrix in the impact identification section, the project affected area was determined less than 1.5 Km from the project as the odor and air pollution diffusion would not reach with the project's air quality improvement programs. Survey of GIS overlay, topography, and mapping confirm that projection.

#### 1.1.9 Environmental and Social Management Plan (ESMP)

In accordance with its core environmental and social principles and values, De Heus pledges to comply with environmental and social requirements set by Myanmar environmental conservation laws, regulations, and procedures. De Heus willingly has carried out ESIA study early as required by ECD's Procedures and developed prevention and protection mechanisms to avoid and mitigate all potential impacts. As a component of the ESIA study, environmental and social impacts of the project are assessed and projected. The proposed mitigation measures and its management plan are detailed in Environmental and Social Management Plan (ESMP) of main report.

The degree and significance of potential environmental and social impacts for four project phases are thoroughly identified and illustrated. Significant Potential environmental and social impacts during the project phases are as follows:

#### Potential environmental impacts during Pre-construction phase

- effects on terrestrial plants and animal species by land clearing for survey
- minor soil erosion and dust emission with the loss of land cover for survey
- earthen materials and plant debris

# Potential environmental impacts during Construction phase

- loss of terrestrial plants and animals by land clearing
- air pollution and emission by construction activities
- dust from earthwork, loading and unloading related activities
- noise and vibration from construction crews and operations
- top soil degradation and contamination from the earthworks
- water consumption and wastewater generation,
- accidental spills, and
- solid wastes and construction spoils from the construction activities

#### Potential social issues during Construction phase

- conflict between local and migrant workers
- discrimination, gender inequality, and fair treatment

- safe working environment, accidents, and health provision

#### Potential environmental impacts during Operation phase

- intensive energy consumption from the operation process
- air pollutent emissions from boiler fuel rice husk burnig, transportaioin vehicles, back-up generators and grinding and mixing of raw materials
- noise, and vibration pollution from loading and unloading of raw materials and production process machines, back-up generators and vehicles movement
- high water consumption extracted from groundwater, wastewater generation from production process, cleaning process and drain water from rain events,
- operational solid wastes generation from used shipping materials, expired raw materials, packaing materials and discarded solid wastes disposal
- Sewage generation, domestic and office wastes discharge
- Hazardous wastes generation from spent chemical containers, containers for cleaning agents, and sludge from the wastewater treatment
- Oil and grease leakage from machines, equipment, vehicles, fuel and engine oil storage tanks along the operation process

#### Potential social issues during Operation phase

- job competition between local and migrant workers
- Increasing demand for food and shelter with increasing population leading to inflation
- Increasing demand for water, fuel and electricity
- Social and cultural conflict
- Work related injury and accident
- Safety, risks, and health hazards for working environment including traffic accidents
- discrimination, gender inequality, compliance with labor regulations
- Grievance redress mechanism for all stakeholders.

#### Potential environmental impacts during Decommissioning phase

- Air, noise, and vibration pollution during demolition by using heavy equipment and vehicles
- Solid wastes disposal from old machines, scraps of equipment, building debris, scrap metals, domestic and sewage
- Soil and underground water pollution form demolition of chemical storage tanks, laboratory and oil storage tanks
- Certain hazardous wastes from chemicals facilities including laboratory
- Short term water pollution from sediment residuals

#### Potential social issues during Decommissioning phase

- Job loss from De Heus
- Economic opportunity loss for suppliers.

Most of the impacts arising from overall project activities are limited in and around the project site due to the relatively compact size of the project. There are no long-term harmful impacts that cannot be mitigated and controlled for both environmentally and socially.

#### 1.1.10 Cummulative Impact Assessment

As required by the Myanmar's EIA procedures, cumulative impact assessment (CIA) has been carried out for every phase of the project. The environmental, social, and cultural norms were considered in conducting the CIA process. Valued ecosystem components (VEC) have been identified by conducting field surveys, visual inspections, and interviews with the local resident. General findings of VEC are:

- Environmental Sector: VEC for the environmental sector will be not a challenging factor as the project aims to reduce damages and stresses on the environment. The management of plant will closely monitor these VEC and make modifications and alterations as needed.
- Social Sector: Important factor needed to be addressed in the CIA.
- Wildlife Sector: Poses as a critical VEC of the project.
- Plant Species: No plant species fall into critical VEC in the area.

Air quality standard, noise and vibration levels have been already observed to be well below the WHO's standard levels.

The Environmental Management Plan (EMP) is a specific site plan development to ensure that the project is implemented in an environmentally sustainable manner. The EMP for animal feed production plant have been prepared by using the findings of potential environmental impacts during the four project phases, the current conditions of environmental baseline data of air quality, noise levels, water and wastewater quality results and the surrounding area of the project site.

In the EMP, developed for the De Heus animal feed production plant, all possible positive and negative environmental impacts have been systematically explored for each phase of the project. Mitigation and monitoring measures on all negative impacts for each phase have also been identified thoroughly.

# 1.1.11 Public Consultation and Disclosure

The project information was disclosed to understand the potential impacts in the project area. Then, the public consultation was undertaken within communities residing in and around the Project area and interviews were held with community leaders during the scoping stage. Public consultation sessions with Nawarat and Pauk Sein Villages were held at monasteries in villages on September 26, 2017 and at the administrative offices of each villages on December 6, 2017. For both meetings in September 2017 amd in December 2017, about 49 participants in Nawarat village and 74 participants in Pauk Sein village attended the sessions. The third public consultation session was conducted in 4 July 2019 at the administrative offices of the villages, and 20 villagers in Nawarat village and 42 villagers in Pauk Sein villager were participated in the meeting. The discussions were led by a representative from De Heus Myanmar Company Ltd., and a group of consultants from SEAM.

In the public consultation, a representative from the plant presented the operation of the plant, production process, job opportunities, working conditions, the plant's social and environmental commitment, and its core values. The villagers were asked to express their

voices, views, complaints, concerns, needs, and measures that the project has planned for the upcoming project's activities. The project's representative answered the questions raised by the participants and eased their concerns. Some key issues and concerns on the following items raised by the villagers can be noted as:

- a) Employment
- b) Waste management
- c) Environmental conservation management plan
- d) Social-economic networks
- e) Safety and health
- f) Demographic changes
- g) Potential social tensions against migrants.

Based on their concerns, they requested to the proponents to provide transparent information, to construct and operate the plant under current proper laws and regulations, to help develop social welfare, economic and health services, to prioritize jobs for local youth, and ultimately, to take full responsibility on any contamination and pollution caused by the proposed project in their region. The issues and concerns captured during the stakeholder engagement activities have been incorporated into development of ESIA. The information has been used to inform the impact identification and assessment process as well as the identification of management measures and monitoring activities.

The main benefits perceived by the respondents are listed below:

- a) Improvement in living standard of people living in the region
- b) Increase safety measures for the people living in the region
- c) Improvement in town development
- d) Increase in land value, and
- e) Improvement in socio-economic networks for the people living in the region.

For further ongoing consultations, the management of De Heus Myanmar is responsible to establish a committee to receive and respond to public complaints and grievances called complaints and grievances mechanism (CGM). The CGM will address all grievances raised by stakeholders impacted or affected by the project. This includes grievances associated with land acquisition, compensation, livelihood restoration, and environmental and social matters.

#### 1.1.12 Conclusion and Recommendation

This ESIA report has been prepared for De Heus Myanmar Limited to manufacture animal nutritional feed products at Myotha Industrial Zone, Nga Zun Township, near Mandalay, Mandalay Region, upper Myanmar. The report has been developed based on the technical information provided by the project proponent, existing studies and reports relevant to the project, field surveys, baseline environmental monitoring and the stakeholder engagement.

The results of the baseline air quality monitoring indicate that the existing air quality conditions with contribution from burning fields, strong winds, and dusts are at a considerable level. The project proponent's implementation of mitigation measures adopted in the EMP will bring improvements. The impact assessment covers the potential

environmental and social impacts attributable to the project's activities in all phases of its life cycle. The assessment of each impact is based on consideration of the magnitude, duration, extent, and probability of activities to be carried out during operation and decommissioning phases, and mitigation measures to minimize and reduce the impacts have been indicated.

In terms of social aspect, the results from public consultation meeting generally indicate that the project has received favorable support from local people and other stakeholders. It is expected that the proposed animal feed factory will generate local employment opportunities and enhance capabilities and skills for employees who are mainly from the communities nearby. These skills and capacities will remain in the communities and later on, they can utilize their skills and capacities for local developments. Therefore, De Heus should multiply its efforts to recruit its task force from the communities and to build capacity of the local populace. In addition to providing reliable potential employment for youths in the region, the project will also contribute several other social benefits such as: social-economic improvement as well as economic growth improvement in the region, improving local infrastructures, and increasing safety measures for the people living in the region.

Finally, it is suggested that the effective implementation of environmental, health and safety, and social responsibilities throughout the whole life span of the proposed project, is of utmost importance. Therefore, it is strongly recommended that the project proponent should strictly adhere to guidelines provided by the ECD. Once the ESMP is approved by the concerned authorities, it is essential to prove De Heus commitments with actual implementation and work. Appointing well experienced and knowledgeable HSE personnel(s) is one of the main important tasks to be undertaken by the management of De Heus, and the final word of recommendation is to abide the environmental policies, laws, rules, and procedures issued by the Republic of the Union of Myanmar.

# 1.2 Executive summary in Myanmar version

# စီမံကိန်း အကြောင်းအရာ

ဒီဟတ်စ်မြန်မာသည် နိူင်ငံခြားသားအပြည့်အဝပိုင်သည့် နယ်သာလန်နိူင်ငံမှ ရင်းနှီးမြုပ်နှံမှုဖြစ် သည်။ တစ်နေ့လျှင် တန်ချိန် (၆၀၀)ထွက်သော အာဟာရပြည့်ဝသောတိရိစ္ဆာန်အစာ ထုတ်လုပ် သည့်စက်ရုံကို မန္တလေးတိုင်းဒေသကြီး၊ ငါးစွန်မြို.နယ်မြို့သာစက်မှု့ဇုံအတွင်း လမ်းအမှတ် (၂၆-အေ) ရှိ အကွက်အမှတ် LG-၃(၂) နှင့် LG-၆(၂) တွင်စက်ရုံအသစ်တစ်ခု ထပ်မံတည်ဆောက်နိုင်ရေးအတွက် စီစဉ်ဆောင်ရွက်ခဲ့ပါသည်။ ရန်ကုန်တိုင်းဒေသကြီး မြောင်းဒကာစက်မှုဇုန်ရှိ ဒီဟက်စ်မြန်မာ တိရိစ္ဆာန်အစာထုတ်လုပ်ဖြန့်ဖြူးရေး စက်ရုံ၏အောင်မြင်မှုများကို အခြေခံ၍ ဤလုပ်ငန်းကို တိုးချဲ. ဆောင်ရွက်ရခြင်းဖြစ်သည်။

ပတ်ဝန်းကျင်ထိခိုက်မှု့ စီစစ်ရေးလုပ်ထုံးလုပ်နည်း(၂၀၁၅)အရ ဒီဟတ်စ်မြန်မာသည် ESIA လေ့လာ မှု့နှင့်အစီရင်ခံစာကို မြန်မာနိူင်ငံသယံဇာတနှင့် ပတ်ဝန်းကျင်ထိမ်းသိမ်းရေးဝန်ကြီးဌာန(MONREC) သို့ တင်ပြ၍ ပတ်ဝန်းကျင်နှင့်ညီညွတ်ကြောင်း အသိမှတ်ပြု(ECC)ကိုရယူရန်ရှိပါသည်။ ပတ်ဝန်းကျင် လုပ်ထုံးလုပ်နည်း (၂၀၁၅) အခန်း (၄၇) အရ ပထမအဆင့်အနေနှင့်နယ်ပယ်တိုင်းတာသတ်မှတ်ခြင်း (Scoping Report) အစီရင်ခံစာကိုတင်သွင်းရန် လိုအပ်ပါသည်။

ဒီဟက်စ်မြန်မာလီမိတက်သည် သံယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနရှိ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ ချမှတ်ထားသော မြန်မာနိုင်ငံ၏ သဘာဝပတ်ဝန်းကျင်ထိန်း သိမ်းရေးဆိုင်ရာဥပဒေများ၊ စည်းမျဉ်းစည်းကမ်းများ၊ လုပ်ထုံးလုပ်နည်းများနှင့် လိုက်လျောညီထွေ စွာအကောင်အထည် ဖော်ဆောင်ရွက်နိုင်ရေးအတွက် လွတ်လပ်သော တတိယအဖွဲ့အစည်းဖြစ် သည့် Social and Environmental Associates-Myanmar (SEAM) အား အဆိုပြုစီမံကိန်း၏ ပတ်ဝန်းကျင်နှင့်လူမှုစီးပွားဆိုင်ရာသက်ရောက်မှုအား ဆန်းစစ်လေ့လာခြင်း(ESIA)လုပ်ငန်း ဆောင် ရွက်ပေးရန် ရွေးချယ်အပ်နှံခဲ့ပါသည်။

# စီမံကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်သူ

De Heus ကုမ္ပဏီအနေဖြင့် ၂၀၁၆ ခုနှစ်၌ မြန်မာနိုင်ငံတွင် ပထမဆုံးစက်ရုံတည်ဆောက်ရန် မဆုံး ဖြတ်ရသေးခင်အချိန်ကပင် နိုင်ငံအတွင်း၌ မွေးမြူရေးလုပ်ငန်းကျွမ်းကျင်ပညာရှင်များ မွေးထုတ် ပေးမည်ဟူ သည့်ကတိကဝတ်ဖြင့် မြန်မာလယ်သမားများကိုလည်း နှစ်ပေါင်းများစွာကြာသည့်တိုင် အောင် ပံ့ပိုးကူညီပေးခဲ့သည်။ ၂၀၁၅ ခုနှစ်တွင် De Heus Myanmar Limited အမည်ဖြင့် မြန်မာနိုင် ငံ၌ လုပ်ငန်းစတင် လည်ပတ်ခဲ့ပါသည်။ ၂၀၁၆ ခုနှစ်မှ စတင်၍ ရန်ကုန်မြို့အနီး မြောင်းဒကာစက်မှု ဇုန်တွင် (၁)ရက်လျှင် (၂၀၅) တန် ဖြန့်ဖြူးထုတ်လုပ်သည့် တိရစ္ဆာန်အစာစက်ရုံကို လည်ပတ်ဆောင် ရွက်လျှက်ရှိပါသည်။ အဆိုပါ မြောင်းတကာစက်ရုံ၏ ထုတ်လုပ်ဖြန့်ဖြူးမှုလုပ်ငန်းအောင်မြင်မှုရလာဒ် ကိုအခြေပြုလျှက် De Heus Myanmar ကုမ္ပဏီအနေဖြင့် မန္တလေးတိုင်းဒေသကြီးရှိ မြို့သာစက်မှုဇုန် တွင် တိရစ္ဆာန်အစာစက်ရုံကို တိုးချဲ့တည်ဆောက်ရန် စီစဉ်ခဲ့ပါသည်။

တည်ဆောက်ရန် စီစဉ်ခဲ့ပါသည်။

# လူမှုရေးရာနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာဆန်းစစ်မှု ဆောင်ရွက်မည့်အဖွဲ့ အစည်း

SEAM-မြန်မာသည် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားရေးရာသက်ရောက်မှုများကို ဖြေရှင်းဆောင် ရွက်ပေးသည့် အကြံပေးအဖွဲ့အဖြစ် တရားဝင်မှတ်ပုံတင်ထားသည့် အဖွဲ့အစည်းဖြစ်ပြီး စီမံကိန်း အဆိုပြုလုပ်ငန်းရှင်အတွက် လွတ်လပ်သောတတိယအဖွဲ့အစည်းအဖြစ် မြန်မာအစိုးရမှ ချမှတ်ထား သော ပတ်ဝန်းကျင်နှင့်လူမှုဘဝထိန်းသိမ်းမှုဆိုင်ရာ လိုအပ်ချက်များနှင့် စံချိန်စံညွှန်းများနှင့်လိုက် လျောညီထွေစွာ သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုဆန်းစစ်ရေးလုပ်ငန်းများကို အကောင်အ ထည်ဖော်ဆောင်ရွက်ပေးလျှက်ရှိပါသည်။ SEAM ၏ အဓိကလုပ်ငန်းများမှာ သံယံဇာတ နှင့်သဘာဝ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနရှိ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ ချမှတ်ထားသော သတ်မှတ်ချက်များနှင့်အညီ ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားရေးဆိုင်ရာ စီမံခန့်ခွဲရေးအစီအစဉ်များ ချ မှတ်ဆောင်ရွက်ခြင်းဖြင့် စီမံကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်မှုကို ထောက်ပံ့ကူညီရန်၊ ပတ် ဝန်းကျင်နှင့်လူမှုဘဝထိခိုက်မှုများအား ဆန်းစစ်လေ့လာရန်နှင့် ပတ်ဝန်းကျင်နှင့်လူမှုဘဝစီမံခန့်ခွဲမှု ဆိုင်ရာစီမံချက်များဖွံ့ဖြိုးတိုးတက်ရေးအတွက် နည်းပညာအကြံဉာဏ်များ ထောက်ပံ့ပေးရန်တို့ဖြစ် သည်။

# မူဝါဒနှင့် ဥပဒေရေးရာမူဘောင်များ

တိရိစ္ဆာန်အစာစက်ရံ တည်ဆောက်မည့်နေရာနှင့် ပတ်ဝန်းကျင်အခြေအနေများ၊ လုပ်ငန်းဆိုင်ရာ အခြေအနေများနှင့် အလုပ်သမားများ၏ လုပ်ငန်းခွင်ဆိုင်ရာ အကျိုးစီးပွားနှင့်စပ်လျဉ်းသည့် မြန်မာ နိုင်ငံ၏ အမျိုးသားအဆင့်ဥပဒေမူဘောင်များနှင့် ဆက်စပ်မူဝါဒများကို ဆန်းစစ်လေ့လာခြင်းတို့ကို ဆောင်ရွက်ခဲ့ပါသည်။ အဆိုပါမူဝါဒများ၏ အဓိကရည်ရွယ်ချက်များမှာ သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားကို ထိခိုက်စေသည့် သက်ရောက်မှုများကို အတတ်နိုင်ဆုံးရှောင်ရှားရန်နှင့် လျော့ပါးသက် သာစေသည့် နည်းလမ်းများကို တက်နိုင်သမျှကြိုတင်ဆောင်ရွက်ရန်၊ ကောင်းမွန်သောအကျိုးသက် ရောက်မှုများကိုသာ စီမံကိန်း၏သက်တမ်းတလျှောက် အများဆုံးထိန်းသိမ်းထားနိုင်စေရန်တို့ဖြစ်ပါ သည်။

သို့ဖြစ်ပါ၍ အဆိုပြုလုပ်ငန်းနှင့်သက်ဆိုင်သည့် မြန်မာနိုင်ငံ၏ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဝန်ကြီးဌာနမှ ထုတ်ပြန်ပြဌာန်ထားသည့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများ(၂၀၁၅)၊ သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာသက်ရောက်မှုကို အကဲဖြတ်သည့် စည်း မျဉ်းစည်းကမ်းများနှင့် လုပ်ထုံးလုပ်နည်းများ (၂၀၁၄)၊ သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ ဥပဒေ(၂၀၁၂)၊ ပြည်ပပို့ကုန်နှင့်သွင်းကုန်ဥပဒေ(၂၀၁၂)နှင့် အပြည်ပြည်ဆိုင်ရာ(သို့မဟုတ်) ဒေသ တွင်းသဘောတူညီချက်တို့နှင့် ဆက်စပ်လျှက်ရှိသည့် လက်ရှိဒေသတွင်းနှင့် အပြည်ပြည်ဆိုင်ရာ ပတ်ဝန်းကျင်နှင့်လူမှုစီးပွားရေးဆိုင်ရာမူဝါဒများ ဆန်းစစ်လေ့လာမှုစသည့် သဘာဝပတ်ဝန်းကျင် ဆိုင်ရာ စည်းမျဉ်းစည်းကမ်းများ၏ အသေးစိတ်လမ်းညွှန်ဖော်ပြချက်များနှင့်အညီ ဆန်းစစ်လေ့ လာခဲ့ပါသည်။ ဒီဟက်စ်မြန်မာ၏ အဆိုပြုစီမံကိန်းအတွက် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားဆိုင် ရာသက်ရောက်မှုများ အကဲဖြတ်ဆန်းစစ်မူကို မြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင်နှင့်လူမှုစီးပွားအကိုုး သက်ရောက်မှုအား ဆန်းစစ်လေ့လာခြင်း(ESIA)ဆိုင်ရာဥပဒေများ၊ မူဝါဒများနှင့်လုပ်ထုံးလုပ်နည်း များနှင့်အညီ တင်းကျပ်စွာ အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ လုပ်ငန်းသဘာ ဝပေါ်မူတည်၍ အခြားဆက်စပ်သော ဥပဒေများ၊ မူဝါဒများနှင့် လုပ်ထုံးလုပ်နည်းများအပြင် မြန်မာ နိုင်ငံအနေဖြင့် အခြားဆက်စပ်သော ဥပဒေများ၊ မူဝါဒများနှင့် လုပ်ထုံးလုပ်နည်းများအပြင် မြန်မာ နိုင်ငံအနေဖြင့် အခြားသောနိုင်ငံများနှင့် လက်မှတ်ရေးထိုးထားသော သဘောဘူညီချက်နှင့် သဘော တူစာချုပ်များကိုလည်း လိုက်နာနိုင်စေရန်အသေးစိတ်ဖော်ပြထားပါသည်။

အဆိုပြုစီမံကိန်းသည် နိုင်ငံတော်မှ ချမှတ်ပြဌာန်ထားသော မူဝါဒ၊ ဥပဒေ၊ နည်းဥပဒေများအပြင် လို အပ်လျှင် အပြည်ပြည်ဆိုင်ရာ စံချိန်စံညွှန်းနှင့် လမ်းညွှန်ချက်များကိုလည်း သိရှိလိုက်နာဆောင် ရွက်သွားမည်ဖြစ်သည်။ အဆိုပါစံချိန်စံညွှန်းနှင့် လမ်းညွှန်ချက်များသည် အမျိုးသားအဆင့် ပတ်ဝန်း ကျင်ထိန်းသိမ်းရေးဥပဒေကို ပိုမိုအားဖြည့်ခိုင်မာစေပြီး အမှန်တကယ်အကောင်အထည်ဖော်ဆောင် ရွက်နိုင်ရန်နှင့် စီမံကိန်းလုပ်ငန်းများတွင် အမှန်တကယ်လိုက်နာဆောင်ရွက်ခြင်းအားဖြင့် ဆိုးကျိုး သက်ရောက်မှု အနည်းဆုံးဖြစ်စေလျှက် ကောင်းမွန်မျှတမှုရှိသောနည်းလမ်း အလေ့အကျင့်ကောင်း များဖြင့် ရေရှည်ဆောင်ရွက်နိုင် စေရန်ရည်ရွယ်ပါသည်။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများနှင့် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး(ထုတ်လွှတ်မှု)လမ်းညွှန် ချက်များကို ၂၀၁၅ ခုနှစ်၊ ဒီဇင်ဘာလနောင်းပိုင်းမှစ၍ အတည်ပြုလက်ခံကျင့်သုံးခဲ့သော်လည်း အဆို ပါလမ်းညွှန်ချက်များသည် တိရစ္ဆာန်အစာထုတ်လုပ်မှုကဏ္ဍနှင့်ဆိုင်သော လမ်းညွှန်ချက်အသေးစိတ် ဖော်ပြမထားသဖြင့် အဆိုပြုစီမံကိန်းကို ဆောင်ရွက်ရာ၌ လမ်းညွှန်ချက်တွင် ဖော်ပြထားသည့် ယေ ဘုယျလိုအပ်ချက်များဖြစ်သော လေအရည်အသွေးထုတ်လွှတ်မှု၊ စွန့်ပစ်ရေဆိုးများ၊ အသံဆူညံမှု အရည်အသွေးစံနှုန်းများနှင့် အနံအရည်အသွေး လိုအပ်ချက်များအတိုင်း လိုက်နာကျင့်သုံးဆောင် ရွက်ခဲ့သည်။

ဒီဟက်စ်မြန်မာ၏ တိရိစ္ဆာန်အစာ ထုတ်လုပ်ဖြန့်ဖြူးခြင်းလုပ်ငန်းသည် စီမံကိန်းလုပ်ငန်းများ အကောင်အထည်ဖော်ဆောင်ရွက်ရာ ကာလတလျောက်တွင် ဆိုးရွားသောသဘာဝပတ်ဝန်းကျင်

29

ဆိုင်ရာသက်ရောက်မှုများနှင့် လူမှုစီးပွားဆိုင်ရာ ဆိုးကျိုးများကို ရှောင်ရှားစေရန်သာမက သဘာဝ ပတ်ဝန်းကျင်ထိန်းသိမ်းမှုနှင့် လူအဖွဲ့အစည်းအတွက် လူမှုစီးပွားဖွံ့ဖြိုးတိုးတက်မှု တို့အားတိုးမြှင့် ဆောင်ရွက်ရေးအတွက် စီမံကိန်းဆိုင်ရာ ကျန်းမာရေး၊ ဘေးအန္တရာယ်ကင်းရှင်းရေးနှင့် လူမှုပတ်ဝန်း ကျင်ဆိုင်ရာ ကတိကဝတ်များနှင့်အညီ လိုက်နာ ဆောင်ရွက်မည်ဟုကတိပြုပါသည်။ စီမံကိန်းသက် တမ်းတလျှောက် အကဲဖြတ်လေ့လာစောင့် ကြည့်မှုပြုလုပ်ခြင်းသည် ပိုမိုကောင်းမွန်သော ပတ်ဝန်း ကျင်နှင့် လူမှုစီးပွားအကျိုးကျေးဇူးများကိုရရှိစေပြီး လူ့အဖွဲ့အစည်းများအတွက် ရေရှည်တည်တံ့ ခိုင်မြဲသော ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားဖွံ့ဖြိုးတိုးတက်မှုများကို ဖြစ်ထွန်းပေါ် ပေါက်စေသည်ကို သိရှိ နားလည်ထားပြီးဖြစ်ပါသည်။

# ပတ်ဝန်းကျင်နှင့် လူမှုရေးရာ ကတိကဝတ်များ

De Heus Myanmar Co. Ltd သည် လေထုတ်လွှတ်မှုများ၊ ဆူညံမှုအဆင့်ထိန်းသိမ်းခြင်း၊ ရေဆိုးစနစ် ဖယ်ရှားရှင်းလင်းခြင်းများဆောင်ရွက်ခြင်းနှင့် မြေဆီလွှာထိန်းသိမ်းခြင်းအား မျှတစွာဆောင်ရွက် ပေးခြင်းတို့ဖြင့် ပတ်ဝန်းကျင်ဆိုင်ရာကိစ္စရပ်များ တိုးတက်ကောင်းမွန်စေရုံသာမက ပတ်ဝန်းကျင် ဆိုင်ရာထိခိုက်နစ်နာမှုများနှင့်လေထုညစ်ညမ်းမှုများကို ထိန်းသိမ်းကာကွယ်ရန်နှင့် ပိုမိုကောင်းမွန် သော ပတ်ဝန်းကျင်ကောင်းများ တိုးတက်ဖြစ်ထွန်းလာစေရန်တို့အတွက် ရည်ရွယ်၍ လုပ်ကိုင် ဆောက်ရွက် လျှက်ရှိပါသည်။ ထို့ပြင် De Heus Myanmar Co. Ltd သည် စီမံကိန်းဆိုင်ရာ စီမံ ဆောင်ရွက်သူများနှင့် လုပ်သားများအား သဘာဂပတ်ဝန်းကျင်ကိုတန်ဖိုးထားမှုများနှင့် ပတ်ဝန်းကျင် ထိမ်းသိမ်းရေးနည်းလမ်းကောင်းများဆိုင် ရာသင်တန်းများနှင့်အစီအစဉ်များကို ပို့ချဆောင်ရွက် သွားရန် စီစဉ်ထားပါသည်။ ထပ်မံ၍ De Heus Myanmar Co. Ltd သည် မြန်မာနိုင်ငံ၏ အနိမ့်ဆုံး လုပ်ခပေးဆောင်ခြင်းဆိုင်ရာဥပဒေနှင့် မည့်သည့်လုပ်ငန်းတွင်မဆို ကလေးသူငယ်များ အလုပ်ခန့် ထားခြင်းဆိုင်ရာ တားဆီးပိတ်ပင်ခြင်းတို့ကို တင်းတင်းကျပ်ကျပ်ကိုင်တွယ် ဆောင်ရွက်ပါသည်။ လုပ်ငန်းခွင်တွင် အချိန်ပိုဆောင်ရွက်သည့်လုပ်အားခများကိုလည်း မြန်မာနိုင်ငံအစိုးရမှ သတ်မှတ် ထားရှိသောအချိန်ပိုကြေးများအတိုင်း ပေးဆောင်ရပါမည်။ စံချိန်မှီသည့် မိမိကိုယ်ကို အကာအကွယ် ပေးသည့်ကိရိယာများကိုလည်း လုံလုံလောက်လောက်ထားရှိ ဆောင်ရွက်သွားမည် ဖြစ်သည်။ De Heus Myanmar Co. Ltd သည် အလုပ်သမားများအတွက် ဘေးကင်း၍ ကောင်းမွန်သောလုပ်ငန်းခွင် ကို ဖန်တီးပေးသွားမည်ဖြစ်ပြီး ၎င်းတို့၏ကျန်းမာရေးနှင့် လုံခြုံရေးဆိုင်ရာ ကိစ္စများကိုလည်း တင်း ကြပ်စွာ ဆောင်ရွက်သွားမည်ဖြစ်သည်။ တံတာဦးစီးဌာနအနေဖြင့် မီးဘေးအန္တရာယ်ကင်းရှင်းဆိုင်ရာ ကိစ္စရပ်များကိုလည်း လိုက်နာဆောင်ရွက်လျှက် သက်ဆိုင်ရာဒေသရှိ မီးသတ်ဌာနမှ De Heus Myanmar Co. Ltd ၏ မီးဘေးအန္တရာယ်ကင်းရှင်းမူလုပ်ငန်းစဉ်ကို ပုံမှန်စစ်ဆေးဆောင်ရွက်သွားမည် ဖြစ်သည်။

# စီမံကိန်းအကျဉ်းချုပ်နှင့်အခြားဆောင်ရွက်နိုင်မည့်နည်းလမ်းများ

အဆိုပြုစီမံကိန်းသည် ဒီဟက်စ်-မြန်မာကုမ္ပဏီလီမိတက်မှ အမေရိကန်ဒေါ်လာ(၁၅)သန်းဖြင့် ရင်းနှီး မြုပ်နှံထားသည့် နိုင်ငံခြားသားအပြည့်အဝပိုင်ဆိုင်သည့် စီမံကိန်းဖြစ်ပြီး အဆိုပြုစီမံကိန်းရှိ ထုတ် လုပ်မှုလုပ်ငန်းစဉ်အဆင့်ဆင့်တွင် အလိုအလျောက်ထိန်းချုပ်မှုနည်းစနစ်များကို အသုံးပြုပြီး အာဟာ ရပြည့်ဝသော တိရစ္ဆာန် (ကြက်၊ ဝက်၊ ကျွဲ၊ နွား) အစာများ ထုတ်လုပ်ဖြန့်ဖြူးပေးရန် ဖြစ်သည်။ ဒီဟက်စ်-မြန်မာကုမ္ပဏီလီမိတက်သည် မြန်မာနိုင်အောက်ပိုင်းရှိ ရန်ကုန်မြို့အနီး မြောင်းတကာ စက်မှုဇုန်တွင် တိရစ္ဆာန်အစာများထုတ်လုပ်သည့်စက်ရံကို လည်ပတ်ဆောက်ရွက်လျှက်ရှိပါသည်။ ယခုအခါ အထက်မြန်မာနိုင်ငံရှိ တိုးတက်လာသော လူဦးရေနှင့်အညီ လိုအပ်လျှက်ရှိသော အာဟာရ ပြည့်ဝသောအသား(ကြက်၊ဝက်၊ကျွဲ၊နွား)များ ပိုမိုထုတ်လုပ်နိုင်ရေးအတွက် အာဟာရပြည့်ဝသော တိရစ္ဆာန်အစာများ လိုအပ်လျှက်ရှိပါသည်။ သို့ပါ၍ ဒီဟက်စ်-မြန်မာကုမ္ပဏီလီမိတက်မှ ၎င်းတို့ကို ဖြည့်ဆည်းပေးရန်အတွက် တနေ့လျှင် တန်ချိန် (၆၀၀) နှုန်း ထုတ်လုပ်ရန် မျှော်မှန်းသည့် ဤအဆိုပြု စီမံကိန်းကို မြင်းခြံမြို့နယ်ရှိ မြောင်းတကာစက်မှုဇုန်တွင် အကောင်အထည်ဖော်ဆောင်ရွက်ရန် စတင်ခဲ့ခြင်းဖြစ်သည်။ အဆိုပြုစီမံကိန်း၏ စက်ရုံတည်ဆောက်မှုကို ၂၀၁၇ ခုနှစ်၊ ဖွန်လတွင် စတင်ခဲ့ ပြီး ၂၀၁၈ ခုနှစ်၊ ဇူလိုင်လတွင် လုပ်ငန်း စတင်လည်ပတ်နိုင်ရန် မျှော်မှန်းထားပါသည်။

စီမံကိန်းသည် မန္တလေးတိုင်းဒေသကြီး၊ ငါးဇွန်မြို့နယ်၊ မြို့သာစက်မှုဇုန်အတွင်း လမ်းအမှတ် (၂၆-အေ)ရှိ အကွက်အမှတ် LG- ၃ (၂) နှင့် LG -၆ (၂) တွင် တည်ရှိပါသည်။ စုစုပေါင်းရေိယာ ၆.၅ကေ (၂၆,၃ဂ၆.၂၆) စတုရန်းမီတာရှိပါသည်။ စီမံကိန်းသည် မန္တလေးမြို့၏အနောက်တောင်ဘက် (၅၉.၇) ကီလိုမီတာအကွာတွင် တည်ရှိသောမြို့သာမြို့၏ အနောက်မြောက်ဘက် (၉.၅၉) ကီလိုမီတာအကွာ တွင် တည်ရှိပါသည်။

အာဟာရပြည့်ဝသော တိရစ္ဆာန်အစာထုတ်လုပ်မှုကို အလုပ်ချိန်တစ်နေ့လျှင် (၈) နာရီကြာအလုပ်ချိန် (၂) ချိန်ဖြင့် လုပ်ငန်းလည်ပတ်ဆောင်ရွက်မည်ဖြစ်ပြီး စက်ရုံသည် စုစုပေါင်းလုပ်သားအင်အား (၈၇) ဦးခန့်အပ်နိုင်မည်ဖြစ်ရာ (၅၉) ဦးသည် လုပ်ငန်းလည်ပတ်ဆောင်ရွက်ရမည့် အလုပ်သမားများဖြစ် ပြီး (၆) ဦးသည် ရုံးဝန်ထမ်းများဖြစ်သည်။ စီမံကိန်း၏ အဓိကအခြေခံအဆောက်အဦးများမှာ ထုတ် လုပ်ရေးမျှော်စင်၊ ကုန်ကြမ်းပစ္စည်းများထားရှိသည့်ကုန်လှောင်ရုံ၊ အာဟာရဖြည့်စွက်သည့် အဆောက်အဦး၊ ရေသန့်စက်ရုံ၊ အသုံးအဆောင် ပစ္စည်းကိရိယာများနှင့် လျှပ်စစ်ထရန်စဖော်မာခန်း၊ ပြောင်းအခြောက်ခံစက်၊ အစေ့များသိုလှောင်ရုံ၊ ရေနွေးငွေ့ဘွိုင်လာအခန်း၊ အရည်လှောင်သည့်ကန်၊ ကုန်ချောသိုလှောင်ရုံ၊ မီးသတ်ရေလှောင်ကန်၊ ရေကန်များ၊ စက်ပြင်အလုပ်ရုံများ၊ အလေးချိန် ချိန်တွယ်စက်၊ ရုံးများနှင့် ဧည့်ဂေဟာတစ်ခု၊ ဓါတ်ခွဲခန်းအပြင် လိုအပ်သည့်ပစ္စည်းများနှင့် ကားရပ် နားရန်နေရာများဖြစ်ပါသည်။

အာဟာရပြည့်ဝသော တိရစ္ဆာန်အစာထုတ်လုပ်မှုအတွက် အခြေခံကုန်ကြမ်းများတွင် ဆီ၊ ဂျုံဖွဲနု၊ ကြံ သကာရည်၊ ပြောင်း၊ နှံစားသီးနှံရိုးများ၊ ဆားနှင့် ထုံး၊ ဗီတာမင်နှင့်သတ္တူဓါတ်များ အစရှိသည် တို့ပါ ဝင်ပါသည်။ လျှပ်စစ်ဓါတ်အားကို မန္တလေး-မြို့သာစက်မှုဖွံ့ဖြိုးတိုးတက်ရေးမှတဆင့် (၁၀၀၀) ကီလို ဗို့ရှိသည့် ဓါတ်အားခွဲရုံ(၂)ရုံမှ ရယူသုံးစွဲမည်ဖြစ်သည်။ လျှပ်စစ်ဓါတ်အားပြတ်တောက်မှုဖြစ် ပေါ်ပါက အရေးပေါ်လိုအပ်ချက်အတွက် ဒီဇယ်အင်ဂျင်ဖြင့် မောင်းနှင်မည့် (၁၁၀)KVA ရှိသည့် မီးအားမြှင့်စက် (၁)လုံးကို တပ်ဆင်အသုံးပြုမည်ဖြစ်သည်။ စက်ရံအတွက် လိုအပ်သည့် ရေအသုံးချမှုအတွက် ပေ (၆၀၀)နှင့် (၅၀၀)ပေအနက်ရှိသည့် ရေတွင်း(၂)တွင်းမှ ရေကိုရယူအသုံးပြုမည်ဖြစ်ပြီး အဆိုပါရေကို သိုလှောင်မည့်ကန်(၁) ကန်နှင့် သန့်စင်ထားသည့်ရေကို သိုလှောင်ရန် ကန်(၂) ကန်တို့ ရှိပါသည်။ စက်ရံတွင် ထုတ်လုပ်မှုလုပ်ငန်းစဉ်အတွက် တနေ့လျှင် ရေကုဗမီတာ(၁၃၅) သုံးစွဲမည်ဖြစ်ပြီး မီးလောင်ကျွမ်းမှုဖြစ်ပေါ်က အရေးပေါ်အနေဖြင့် ရေကုဗမီတာ (၁၇၀)ကို အရန်အနေဖြင့် ထိန်းသိမ်း ထားရှိပါသည်။

# ထုတ်လုပ်မှု့ဖြစ်စဉ်

ပြည်ပမှတင်သွင်းလိုက်သော ပစ္စည်းများအားလက်ခံရယူခြင်းနှင့် စိစစ်ခြင်း၊ အာရုံခံအကဲဖြတ်ခြင်း၊ စက်ရုံတွင်းဓါတ်ခွဲခန်းတွင် စမ်းသပ်စစ်ဆေးခြင်းပစ္စည်းများ၏ အရည်အသွေးပေါ် မူတည်၍ အမျိုး အစားခွဲခြားကာ ဓါတ်ခွဲခန်းတွင် စမ်းသပ်စစ်ဆေးခြင်းနှင့် နောက်ဆုံးအဆင့် စစ်ဆေးခြင်းတို့ပြုလုပ် ပြီးသောအခါ တင်သွင်းလိုက်သော ပစ္စည်းများ၏ အရည်အသွေးကို တွေ့မြင်ရပါမည်။ ကုမ္ပဏီ၏ သတ်မှတ်ထားသော စံချိန်စံနှုန်းနှင့် ကိုက်ညီသော အရည်အသွေးပြည့်ဝသော ပစ္စည်းများကိုသာ နောက်တစ်ဆင့်သို့ ပြောင်းရွေ့မည်ဖြစ်ပြီး ကျန်ရှိသော အရည်အသွေးမမှီသော ပစ္စည်းများကို စွန့်ပစ် မည်ဖြစ်သည်။ ထိုထုတ်လုပ်မှုဖြစ်စဉ်အား အရည်အသွေးထိန်းချုပ်သူပညာရှင်မှ ကြီးကြပ်လုပ် ဆောင်မည်ဖြစ်သည်။

ကုန်ကြမ်းသိုလှောင်ရာ အဆောက်အဦးကုန်ကြမ်းအများစုအား ပုံမှန်အပူချိန်ဖြင့် သိုလှောင်ပြီး ထိခိုက်မခံသော ပစ္စည်းများအား သတ်မှတ်ထားသော အရည်အသွေးကိုက်ညီမှုရှိစေရန် အအေး ခန်းတွင် ထား၍ သိုလှောင်ပါသည်။ ထုတ်လုပ်မှု့ဖြစ်စဉ်တွင် ကုန်ကြမ်းများအား အသုံးမချခင်တွင် ပစ္စည်းတစ်ခုချင်းဆီ၏ သတ်မှတ်ထားသော အရည်အသွေးပြည့်မှီမှုရှိစေရန် စစ်ဆေးပါသည်။

ကြိုတင်သန့်စင်ခြင်းနှင့်ထုတ်ပိုးခြင်း ကုန်ကြမ်းပစ္စည်းများထုတ်လုပ်သည့် အဆင့်မတိုင်မှီ ကုန်ကြမ်း ပစ္စည်းများအား သန့်ရှင်းအောင်ပြုလုပ်ခြင်းအဆင့်တွင် သတ္တုဓါတ်ပါသောပစ္စည်းများအား ခွဲခြားခြင်း နှင့်ကုန်ကြမ်းများအား သန့်စင်သောအဆင့်များပါဝင်ပါသည်။ အခြားသောကုန်ကြမ်းများအား သန့်စင် သောလုပ်ငန်းစဉ်တွင်လည်း ကုန်ကြမ်းမှမတူညီသော အညစ်အကြေးများအား ဖယ်ထုတ်သန့်စင်ပေး ပါသည်။ ကုန်ကြမ်းများအား ကြိုတင်သန့်စင်ခြင်းထားခြင်းဖြင့် ကုန်ကြမ်းတွင် ဘက်တီးရီယားများ ပေါက်ဖွားမှု့မှ ကြိုတင်ကာကွယ်ရာရောက်ပါသည်။ ကုန်ကြမ်းပစ္စည်းများကို သန့်စင်ပြီးသောအခါ ဆန်ခါအားအသုံးပြု၍ အရွယ်အစားခွဲခြားကာ ကြိတ်စက်ထဲသို့ ထည့်မည်ဖြစ်သည်။

အာဟာရပြည့်ဝသော တိရစ္ဆာန်အစာထုတ်လုပ်မှုလုပ်ငန်းစဉ်တွင် အဓိကကျသော လုပ်ငန်းစဉ်များမှာ

- **ကုန်ကြမ်းများအား ရယူခြင်းနှင့် စစ်ဆေးခြင်း** အရည်အသွေးထိန်းချုပ်သည့်စက်ဖြင့် ရရှိလာ သည့် ကုန်ကြမ်းများကို စံချိန်စံညွှန်းပြည့်မှီမှုရှိ/မရှိ စမ်းသပ်စစ်ဆေးပါသည်။ စံချိန်စံညွှန်းပြည့် မီသည့် ကုန်ကြမ်းများကို ကုန်ကားများဖြင့်သယ်ယူ၍ အလေးချိန်စစ်ဆေးပါသည်။
- သန့်စင်ခြင်း (သံလိုက်ဆွဲအားဖြင့် ခွဲခြားဖော်ထုတ်ခြင်းနှင့် ကြိုတင်သန့်စင်၍ ဆန်ကာချခြင်း)-ကုန်ကြမ်းများကို သံလိုက်ဆွဲအားဖြင့် သတ္တုဓါတ်ပါသောပစ္စည်းများအား ခွဲခြားဖော်ထုတ်၍ သီး သန့်ထားရှိပါသည်။ မလိုအပ်သည့် ဖုန်မှုန့်များ၊ ကျောက်မှုန်အမွှားများနှင့် အမှိုက်သရိုက်များကို ဧကာဖြင့် စစ်ထုတ်သန့်စင်ပါသည်။
- **ကုန်ကြမ်းများကို သိုလှောင်ထားရှိခြင်း-**တိရစ္ဆာန်အစားအစာများ ဘေးအန္တရာယ်ကင်းရှင်းရေးနှင့် အရည်အသွေးပြည့်ဝစေရေးအတွက် ကုန်ကြမ်းများ၊ ဆီ၊နှင့် အရောအနှောများကို ထုတ်လုပ်မှု လုပ်ငန်းစဉ်တွင် အသုံးမပြုမှီ အရည်အသွေးပြည့်မှီခြင်းရှိမရှိ စောင့်ကြပ်ကြည့်ရှု့ရမည်။
- စစ်ဆေးပြီးကုန်ကြမ်းများထည့်ထားသည့်သေတ္တာများ- သေတ္တာပုံးများကို ခွဲခြားသတ်မှတ်သည့် နံပါတ်များ မှတ်သားထားရမည်။
- အလေးချိန်ချိန်တွယ်ခြင်း(အရေအတွက်ပမာဏ)- ရောနောခြင်းစုပုံထားသော ကုန်ကြမ်းများနှင့် အခြားသော ပါဝင်ပစ္စည်းများကို သတ်မှတ်ထားသည့်အချိုးဖြင့် သမအောင်ရောနောပြီး အလေး ချိန် ချိန်တွယ်မည်ဖြစ်သည်။
- **ဆန်ကာတင်စစ်ဆေးခြင်း** ကုန်ကြမ်းများကို သန့်စင်စေရန် ဆန်ကာဖြင့် စစ်ထုတ်ခွဲခြားပါသည်။
- ကြိတ်ခွဲခြင်း- သန့်စင်ပြီးကုန်ကြမ်းများကို ကြိတ်ခွဲစက်ဖြင့် ကြိတ်ခွဲပါသည်။

- ရောနှောခြင်း (အခြောက်ခံ၍ ရောနှောခြင်းနှင့် အရည်ဖြင့် ရောနှောခြင်း)- ကုန်ကြမ်းများအား အာဟာရပြည့်ဝသည့်ပါဝင်ပစ္စည်းများဖြင့် နံ့စပ်စွာ ရောနှောကြိတ်ပြီး အချို့သောထုတ်ကုန်များ သည် ထိုအဆင့်တွင် (Molasses) အရည် ပိုလိုအပ်မည်ဖြစ်သည်။

- အတောင့်ပုံစံသွင်းခြင်း- ရောနှောပြီးနောက် ကြိုတင်အော်ဒါမှာထားသော အရွယ်အစားအတိုင်း အတောင့်ပုံစံအားထုတ်လုပ်မည်ဖြစ်သည်။ အတောင့်ပုံစံဖော်သော ပစ္စည်းကိရိယာဖြင့် လိုအပ် သော အတောင့်ပုံစံများအတိုင်း ချိန်ညှိကာထုတ်လုပ်မည်ဖြစ်သည်။
- **အအေးခံခြင်း-** ရရှိလာသော အတောင့်များအား အပူချိန်အနည်းဆုံးထားကာ အအေးခံပြီးနောက် လေထုအပူချိန်အားအသုံးပြုကာ ပြန်လည်ပုံဖော်မည်ဖြစ်သည်။
- **ဆန်ခါစစ်ခွဲခြားခြင်း-** အအေးခံပြီး အတောင့်များအား သံလိုက်စက်ဖြင့် သတ္တူအပိုင်းအစများကို စစ်ထုတ်ပြီးနောက် အရွယ်အစားတူညီစေရန် ဆန်ခါဖြင့်စစ်ကာ ခွဲခြားပါသည်။
- ဆန်ခါတင်စစ်ဆေးခြင်းမှ ရရှိလာသောအတောင့်များအား ချိန်တွယ်ခြင်းနှင့် ထုတ်ပိုးခြင်း-ဆန်ခါတင်စစ်ဆေးပြီးနောက် ရရှိလာသည့်အစာတောင့်များကို ချိန်တွယ်၍ ထုတ်ပိုးမည်ဖြစ် သည်။
- သိုလှောင်ခြင်းနှင့် ပြည်ပတင်ပို့ခြင်း- ထုတ်လုပ်မှုဖြစ်စဉ်မှ နောက်ဆုံးရရှိလာသော ပစ္စည်းများ
  အား သေချာစွာထုတ်ပိုးပြီး ကုန်ချောသိုလှောင်ရုံသို့ပို့ဆောင်မည်ဖြစ်သည်။ နောက်ဆုံး ရရှိလာ
  လော ကုန်ချောများအား ဖြန့်ဖြူးမရောင်းချခင်အချိန်တွင် ပစ္စည်းအရည်အသွေးအား စစ်ဆေး
  လော ပညာရှင်မှ အရည်အသွေးပြည့်မှီမှု ရှိ မရှိ စစ်ဆေးမည်ဖြစ်သည်။

ထုတ်လုပ်မှုလုပ်ငန်းစဉ်အဆင့်ဆင့်အား ပုံနှင့်ဇယားတို့ဖြင့် အသေးစိတ်ရှင်းလင်းထားရှိပြီး ၎င်းတို့ကို အစီရင်ခံစာ၏ ပုံ(၄)နှင့် ဇယား(၁၃)တွင် ဖော်ပြထားပါသည်။

# အခြားဆောင်ရွတ်နိုင်မည့် နည်းလမ်းများရွေးချယ်ခြင်း

ဒီဟက်စ်မြန်မာသည် စီမံကိန်းဆန်းစစ်လေ့လာမှုနည်းလမ်းဖြင့် သင့်တော်သော စီမံကိန်းတည်နေ ရာအားစိစစ်ရွေးချယ်ခဲ့ပါသည်။ အောက်ဖော်ပြပါ ရွေးချယ်မှုစံနှုန်းများအတိုင်း လိုက်နာဆောင်ရွက် ခဲ့ပါသည်။

- စီမံကိန်းတည်နေရာသည် အထက်မြန်မာပြည်အတွက် တိရိစ္ဆာန်အစာ ထုတ်လုပ်ဖြန့်ဖြူး ရေးတွင် မဟာဗျူဟာကျသည့် တည်နေရာဖြစ်ခြင်း
- စီမံကိန်းတည်နေရာသည် မန္တလေးတိုင်းဒေသကြီးအတွင်း ကုန်ကြမ်းရရှိနိုင်သောတည်
  နေရာဖြစ်သည့်အပြင် ကုန်စည်ကူးသန်းရေးအတွက် လမ်းပန်းဆက်သွယ်ရေးကောင်း မွန်ခြင်း၊ နှင့်
- အထက်မြန်မာနိုင်ငံတွင် ထုတ်ကုန်ပစ္စည်းများ ဖြန့်ဖြူးနိုင်ရန် ဒေသတွင်းဝယ်လိုအားနှင့် ဈေးကွက် အလားအလာများရှိနေခြင်းတို့ဖြစ်သည်။

စီမံကိန်းဆန်းစစ်လေ့လာမှုလုပ်ငန်းစဉ်အရ အဆိုပြုတိရိစ္ဆာန်အစာစက်ရုံ တည်ဆောက်မည့် မြို့သာ စက်မှုဇုန်သည် မဟာဗျူဟာကျသော တည်နေရာဖြစ်ခြင်း၊ ဒေသတွင်းကုန်ကြမ်းပစ္စည်းများကို အလွယ်တကူရရှိစေခြင်းနှင့် အထက်မြန်မာနိုင်ငံတွင် ကုန်ကြမ်းပစ္စည်းများပေါကြွယ်ဝပြီး ထုတ်ကုန် များအတွက်ဈေးကွက်အလားအလာနှင့် ဝယ်လိုအားများရှိနေခြင်း စသည့်အချက်များကို လေ့လာ တွေ့ရှိရသဖြင့် ရင်းနှီးမြှု့ပ်နှံလိုသူများအတွက် အလားအလာရှိသောနေရာတစ်ခုလည်း ဖြစ်ပါသည်။ ထိုအချက်များကိုအခြေခံ၍ အထက်မြန်မာနိုင်ငံ မန္တလေးမြို့အနီးတွင် တိရစ္ဆာန်အစာ ထုတ်လုပ်မှု စက်ရုံအသစ်တစ်ခု တည်ဆောက်ရန်အတွက် မြို့သာစက်မှုဇုန်စီမံကိန်း နေရာသည် အကောင်းဆုံး ဖြစ်သည်ဟု ဆုံးဖြတ်ခဲ့သည်။

# လက်ရှိသဘာဝပတ်ဝန်းကျင်အခြေအနေ

စီမံကိန်းကြောင့် ထိခိုက်ခံစားရမည့် နယ်ပယ် (AoI) သတ်မှတ်ရာတွင် စီမံကိန်းအခြေစိုက်နေရာ ကုန်ထုတ်လုပ်မည့်ဆောက်လုပ်ရေးလုပ်ငန်းခွင်နေရာ ဆက်စပ်ဧရိယာဖြစ်သည့်ရေအရင်းမြစ်ရယူ သုံးစွဲမည့်နေရာများ ကျေးရွာနှင့်မြေအသုံးချမည့်နေရာများကို လေ့လာပြီး ထိခိုက်ခံစားနိုင်မှု ဧရိယာမှာ စီမံကိန်း၏ဗဟိုမှ (၁.၅) ကီလိုမီတာ အကွာအဝေးထိ ရှိနိုင်မည်ဟု ခန့်မှန်း သတ်မှတ်ခဲ့ သည်။ မြို့သာစက်မှုဇုန်တစ်ခုလုံးရှိ လက်ရှိလေ့လာတွေ့မြင်ရသော သဘာဝပေါက်ပင်နှင့် မြေအခြေ အနေသည် ကျွဲ၊နွားများအတွက် စားကျက်မြေအဖြစ်သာ သင့်လျှော်ပြီး အသုံးချခြင်းမရှိသော စွန့်ပစ် မြေများဖြစ်ပါသည်။ အဆိုပါမြေတွင် မြေလျှောက်ခြုံပုတ်ပင်ငယ်များသာ နေရာကွက်ကြားတွေ့ရှိ ရပြီး ခြောက်သွေ့သောရာသီိ ဥတုဒဏ်ခံနိုင်သည့် ကန္တာရဆူးပင်ငယ်များလည်းအနည်းငယ်တွေ ရှိရပါသည်။ မုတ်သုန်ရာသီကုန်ခါနီးတွင် အဆိုပြုစီမံကိန်း၏ အနောက်ဘက်၌ ရေခန်းခြောက် နေသောချောင်းငယ်ကို တွေ့ရှိရသည်။ စက်မှုဇုန်၏ကပ်ရပ်တွင် ဆေးဖက်ဝင်သောအပင်ငယ်များ နေရာအနှံ့အပြား၌ ကျယ်ပြန့်စွာရှင်သန်ပေါက် ရောက်လျက်ရှိသည့် ပရဆေးဥယျာဉ်တစ်ခုကို တွေ့ ရှိရသည်။

စီမံကိန်းဧရိယာ၏ ရာသီဥတုအခြေအနေကို http://www.wunderground.com မှ စုဆောင်းရရှိခဲ့ပြီး လူမှုစီးပွားဆိုင်ရာအခြေအနေများကို ဒေသခံများနှင့်တွေ့ဆုံမေးမြန်းခြင်းနှင့် အုပ်စုဖွဲ့ဆွေးနွေး အကြံ ဉာဏ်ရယူခြင်းဖြင့်လည်းကောင်း၊ ဒေသခံအစိုးရဌာနများနှင့် မန္တလေးတိုင်းအစိုးရအဖွဲ့၏ သတင်း ဝက်ဆိုဒ်များမှ ဒေသဆိုင်ရာအချက်အလက်များရယူခြင်းဖြင့်လည်းကောင်း ကွင်းဆင်းမှတ်တမ်း ရယူခဲ့ပါသည်။ လေအရည်အသွေး၊ ဆူညံမူနှင့်တုန်ခါမှု၊ မြေအရည်အသွေး၊ ရေအရည်အသွေး၊ ဇီဝမျိုး ကွဲများ၊ မြေမျက်နှာအသွင်အပြင်နှင့်ပထဝီအနေအထားတို့ကို ကွင်းဆင်းလေ့လာခဲ့ သည်။

# ရာသီဥတု
ယေဘုံယျအားဖြင့် လုပ်ငန်းခွင်တည်ရှိရာဒေသ၏ ရာသီဥတုအခြေအနမှာ ပူပြင်းခြောက်သွေ့ပြီး မိုးနည်းသောရာသီဥတုဖြစ်သည်။ အပူချိန်အနိမ့်အမြင့် ပြောင်းလဲမှုအနည်းငယ်သာရှိပြီး တစ်နှစ် ပတ်လုံးအပူချိန်မြင့်မားသော အခြေအနေဖြစ်သည်။ မန္တလေးတိုင်း၏ နှစ်စဉ်ပျမ်းမျှ အပူချိန်မှာ (၂၁) ဒီဂရီစင်တီဂရိတ်နှင့် (၃၁) ဒီဂရီစင်တီဂရိတ်ကြားတွင်ရှိပြီး ဧပြီလမှမေလတို့သည် အပူနွေးဆုံး ကာ လဖြစ်၍ နိုဝင်ဘာလမှ ဇန်နဝါရီလအတွင်းသည် အအေးဆုံးကာလများဖြစ်ကြသည်။ လုပ်ငန်း တည် ရှိရာဒေသ၏ လစဉ်ပျမ်းမျှမိုးရေချိန်မှာ မတ်လတွင်(၁)မီလီမီတာမှ စက်တင်ဘာလတွင် (၁၅၀) မီလီ မီတာထိ ရှိသည်။

### မြေအသုံးပြုမှု

အဆိုပြုလုပ်ငန်းတည်ဆောက်မည့် မြေနေရာသည် မူလက ဒေသခံတောင်သူလယ်သမားများ၏ စိုက် ပျိုးမြေများနှင့် တိရိစ္ဆာန်များလွှတ်ကျောင်းသော စားကျက်မြေများ ဖြစ်ကြပါသည်။ လယ်ယာမြေ မှတ်ပုံတင်ဌာနနှင့် စိုက်ပျိုးရေးဌာနမှရရှိသော အချက်အလက်မှတ်တမ်းများအရ အဆိုပါမြေနေရာ သည် စီးပွားရေးအနေဖြင့် အောင်မြင်ဖြစ်ထွန်းနိုင်ခြေမရှိသော အထွက်နှုန်းနည်းသည့်မြေအမျိုးအ စားဖြစ်ပါသည်။ ဒေသခံပြည်သူများနှင့် တွေ့ဆုံမေးမြန်းခြင်းမှ စိစစ်လေ့လာတွေ့ရှိချက်များအရ စီမံ ကိန်းမြေနေရာသည် ကျွဲနွားများအတွက် ရာသီစာစားကျက်မြေအဖြစ် ယာယီသာ အသုံးပြုနိုင်ပြီး စိုက်ပျိုးဖြစ်ထွန်းမှုမရှိသော မြေအမျိုးအစားဖြစ်ကြောင်း တွေ့ရှိရသည်။ စက်ရုံမြေနေရာနှင့် စက်ရုံ အနီးကပ်လျက်တွင် ရှိသောနေရာသည်လည်း စိုက်ပျိုးမြေမဟုတ်သည်ကို လေ့လာတွေ့ရှိရပါသည်။ ယခုအခါ ထိုနေရာသည် ကောင်းစွာဖွံ့ဖြိုးတိုးတက်သောစက်ရံမြေနေရာများ ပါဝင်သည့် စက်မှုဇုန် တစ်ခုအဖြစ် အသွင်ကူးပြောင်းပြီးဖြစ်ပါသည်။

### လေအရည်အသွေး

အဆိုပြုလုပ်ငန်းတည်ရှိရာနေရာ၏ ပကတိလေထု၏အရည်အသွးကို စိုစွတ်ရာသီအတွက် ၂၀၁ရ ခုနှစ်၏ စက်တင်ဘာလတွင် လည်းကောင်း၊ ခြောက်သွေ့ရာသီအတွက် ဒီဇင်ဘာလတွင်လည်း ကောင်း နှစ်ကြိမ် တိုင်းတာရယူခဲ့ပါသည်။ ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့နှင့် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု)လမ်းညွှန်ချက်များ၏ စံချိန်စံနှုန်းသတ်မှတ်ချက်များနှင့်အညီ PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, CO နှင့် SO<sub>2</sub> တို့ကို (၂၄) နာရီပတ်လုံး စောင့်ကြည့်တိုင်းတာ စစ်ဆေးပါသည်။ ယေဘုံ ယျအားဖြင့် စိုစွတ်ရာသီတွင် PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, CO နှင့် SO<sub>2</sub> တို့၏ ရလဒ်များမှာ သတ်မှတ်စံနှုန်း ထက်နည်းပါးနေသည်ကို တွေ့ရှိရပြီး ခြောက်သွေ့သောရာသီတွင် PM <sub>2.5</sub> နှင့် SO<sub>2</sub> တို့မှာ NEQEG သတ်မှတ်စံနှုန်းထက် များပြားနေသည်ကို တွေ့ရှိရပါသည်။

# ဆူညံမှုနှင့် တုန်ခါမှု

အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး(ထုတ်လွှတ်မှု)လမ်းညွှန်ချက်များနှင့်အညီ အသံဆူ ညံမှုအဆင့်ကို နေ့ပိုင်းအတွက်နံနက်(၆)နာရီမှ ည(၆)နာရီထိ (၁၂) နာရီကြာမျှလည်းကောင်း၊ ညပိုင်း အတွက် ည(၆)နာရီမှ မနက်(၆)နာရီထိ (၁၂)နာရီကြာမျှလည်းကောင်း စောင့်ကြပ်ကြည့်ရှုတိုင်းတာ စစ်ဆေးခဲ့ပါ သည်။ ဤစီမံကိန်းအတွက် အသံဆူညံမှုအဆင့်တိုင်းတာရရှိမှူသည် လမ်းညွှန်းချက်ပါ ဆူညံမှုအဆင့် ထက်ကျော်လွန်ခြင်းမရှိပါ။ ဆောက်လုပ်ရေးလုပ်ငန်းခွင်၏ တုန်ခါမှုအခြေအနေကို စီမံကိန်းနယ်မြေအတွင်း၌ တည်နေရာ(၆)ခုသတ်မှတ်၍ စောင့်ကြည့်စစ်ဆေးခဲ့ပါသည်။ တုန်ခါမှုကို တိုင်းတာရာတွင် ဆောက်လုပ်ရေးလုပ်ငန်းခွင်၏ နေ့ပိုင်းအချိန်၌ BM-6370 တုန်ခါမှုတိုင်းကိရိယာ ဖြင့် တိုင်းတာရယူခဲ့ပါသည်။

### ရေအရည်အသွေး

စီမံကိန်းနယ်မြေသည် အပူပိုင်းဇုံနှင့်အနီးဆုံးတွင် တည်ရှိသောကြောင့် ယေဘုံယျအားဖြင့် ရေရှားပါး မှုမြင့်မားသောဒေသဖြစ်သည်နှင့်အညီ ရေအရင်းအမြစ်ထုတ်ယူသုံးစွဲရာတွင် ယှဉ်ပြိုင်မှုမြင့်မားသော ဒေသဖြစ်သည်။ စီမံကိန်းနယ်မြေ၏ ပကတိရေအရည်အသွေးကို သိရှိရန်အတွက် မြေမျက်နှာပြင် စီးဆင်းရေနှင့် မြေအောက်ရေတို့၏ အရည်အသွေးတိုင်းတာမှုကို နှစ်ရာသီခွဲခြား၍ တိုင်းတာရယူခဲ့ပါ သည်။ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး(ထုတ်လွှတ်မှု)လမ်းညွှန်ချက်တွင် သတ်မှတ် ပြဋ္ဌန်းထားသော ရေအရည်အသွေးလမ်းညွှန်ချက်စံနှုန်းများအတိုင်း တိုင်းတာရယူခဲ့သောရေနမူနာ များအား အသိအမှတ်ပြုဓါတ်ခွဲခန်းတွင် စနစ်တကျပေးပို့စစ်ဆေးပြီး မှတ်တမ်းများရယူခဲ့ပါသည်။ စစ်ဆေးတိုင်းတာချက်အရ အဆိုပြုလုပ်ငန်းတည်ရှိရာနေရာရှိ ရေတွင်းများမှ မြေအောက်ရေ ရရှိနိုင်သော ပျမ်းမျှအနက်မှာ စိုစွတ်သောမိုးရာသီတွင် မြေမျက်နှာပြင်မှ(၁၀၀) မီတာ အကွာအဝေး ထိ ရှိသည်ကို တွေ့ရှိရပါသည်။

# မြေအရည်အသွေး

အဆိုပြုလုပ်ငန်းတည်ရှိရာဒေသ၏ အပေါ်ယံမြေလွှာသည် သဲဆန်သော မြေဆီလွှာဖြစ်ပြီး အစိုင်အခဲ ပုံဆောင်သောသဲကြမ်းများဖြင့် ဖွဲ့စည်းထားသော ရွံ့နွံ့ (၁၂%)ရာခိုင်နှုန်း ပါဝင်သော စည်းကပ်မှုမရှိ သောမြေအမျိုးအစားဖြစ်ကာ ကာလကြာမြင်စွာ တိုက်စားမျှောပါ၍ စုပုံအနည်ကျလာခြင်းကြောင့် ဖြစ်ပေါ်လာသော non-cohesive soil ဟု သတ်မှတ်သည်။ မိုးရာသီနှင့် ခြောက်သွေ့ရာသီတို့တွင် တိုင်းတာရယူခဲ့သော မြေနမူနာ အချက်အလက်များအရ မြေဆီလွှာအစိုဓါတ်ထိန်းသိမ်းနိုင်စွမ်းမြင့် မားပြီး ရွှံစေးမြေပါဝင်မှုအချိုးအစား အလွန်နည်းသောကြောင့် မြေတိုက်စားမှုကို ဖြစ်ပေါ်စေနိုင် ကြောင်းတွေ့ရှိရပါသည်။ အဆိုပြုလုပ်ငန်းတည်နေရာသည် အေခြားနေရာမှသယ်ယူဖြည့်တင်းတား သည့် ဖို့မြေများ(Backfill)နှင့် သဲဆန်သောအောက်ခံ မြေလွှာတွင် pH ပါဝင်မှုမြင့်မားပြီး Iron Chloride နှင့် Sulfate ပါဝင်မှုအနည်းငယ်သာတွေ့ရှိရသော်လည်း Calcium နှင့် Magnesium ပါဝင်မှု ပမာဏများသည်ကိုတွေ့ရှိရပါသည်။ မြေနမူနာများအား ဓါတ်ခွဲခန်းသို့ ပေးပို့စစ်ဆေးတိုင်း တာချက်များအရ သီးနှံစိုက်ပျိုးရေးအတွက် မြေဩဇာ သင့်တင့်ကောင်းမွန်သောမြေ မဟုတ်ကြောင်း တွေ့ရှိရသည်။

### သစ်ပင်ပန်းမာန်နှင့် တိရိစ္ဆာန်များ

အဆိုပြုလုပ်ငန်းတည်ဆောက်မည့် ဒေသ၏ အခြေခံ သဘာဝပေါက်ပင်နှင့် ကျေးငှက်တိရိစ္ဆာန်အမျိုး အစားများကို မတူညီသောရာသီနှစ်ရာသီတွင် ကွင်းဆင်းလေ့လာခဲ့သည့် မှတ်တမ်းများအရ မိုးရာသီ တွင် သစ်ပင်ပန်းမာန် (၃၄)မျိုးနှင့် တိရစ္ဆာန်မျိုးစိတ်(၁၈)မျိုးကို လေ့လာတွေ့ရှိခဲ့ရပြီး ခြောက်သွေ့ရာ သီတွင် သစ်ပင်ပန်း မာန်(၆၂)မျိုးနှင့် တိရစ္ဆာန်မျိုးစိတ်(၁၇) မျိုးတို့ကို လေ့လာတွေ့ရှိရပါသည်။ သစ်ပင်ပန်းမာန်များကို ခြော က်သွေ့သော ဆောင်းရာသီတွင် ပိုမိုများပြားစွာတွေ့ရပါသည်။

### မြေမျက်နှာသွင်ပြင်နှင့် ပထဝီအနေအထား

စီမံကိန်းတည်ရှိရာ မြို့သာစက်မှူဇုန်သည် အတန်အသင့်ညီညာပြန့်ပျူးသော ကုန်းမြင့်မြေပြင်ဧရိယာ ဖြစ်ပြီး အနောက်ဘက်သို့ တဖြည်းဖြည်း မြင့်မားသွားသော မြေမျက်နှာအသွင်အပြင်ရှိသည်။ အဆို ပြုစီမံကိန်း၏ တည်နေရာ မြေမျက်နှာသွင်ပြင်သည် အရှေ့ဖက်၌ ပို၍မြင့်မားပြီး ဆင်ခြေလျောပုံစံ ဖြစ်ကာ ၄င်း၏အရှေ့ အရပ်တွင်ရှိသော စစ်ကိုင်းတောင်တန်းနှင့် ဆက်စပ်လျှက်ရှိသည့် ကုန်းတန်း ဖြစ်သည်။ Vertisol မြေဆီလွှာများသည် စီမံကိန်းနယ်မြေတွင် အများဆုံးတွေ့ရှိရပါသည်။ ယျေဘုံ ယျအားဖြင့် နီညိုရောင်မြေနှင့် low plasticity silty clay soil, မီးခိုးရောင်ရှိသော ဖွယ်သောမြေ (grey color fine to medium grained sand) ပြန်ဖြည့်ထားသည် ဖို့မြေများသည် စေးကပ်ပြီး သဲဆန်သောမြေ(backfill silty sand soil layers) များကို တွေ့ရသည်။

### ကာကွယ်စောင့်ရှောက်ရန်ဒေသများ

မင်းဆုံတောင် တောရိုင်းတိရိစ္ဆာန်ထိန်းသိမ်းရေးဌာနသည် စီမံကိန်းဧရိယာအတွက် အနီးကပ်ဆုံး ကာကွယ်စောင့်ရှောက်ရန် ဧရိယာဖြစ်သည်။ တောရိုင်းတိရိစ္ဆာန်ထိန်းသိမ်းရေးဌာနသည် စီမံကိန်း ဧရိယာ၏ တောင်ဘက်မိုင်(၂၀)အကွာတွင်တည်ရှိပြီး မြင်းခြံခရိုင် အတွင်းရှိ နွားထိုးကြီးမြို့နယ်၏ မြောက်ဘက်(၈)မိုင်တွင်တည်ရှိသည်။ ကံအားလျှော်စွာ ယင်းကာကွယ်စောင့်ရှောက်ရာနေရာသည် စီမံကိန်း၏ ဖြစ်ပေါ် လာနိုင်သောဆိုးကျိုးသက်ရောက်နိုင်သည့် အကွာအဝေးတိုင်းတာမှုဘောင်နှင့် ဝေးကွာသည့်အကွာအဝေးတွင် တည်ရှိနေပါသည်။

### လူဦးရေဆိုင်ရာအချက်အလက်

စီမံကိန်းတည်ရှိရာရှိ အခြေခံအဆောက်အဦနှင့် ပညာရေးအခြေအနေများကို လူဦးရေးဆိုင်ရာ အချက်အလက်အဖြစ် ဖော်ထုတ်ခဲ့ပါသည်။ စီမံကိန်းသက်ရောက်မှုဧရိယာရှိ ကျန်းမာရေး စောင့်ရှောက်ရေးစင်တာ၊ ရေအရင်းအမြစ်များ၊ လျှပ်စစ်သုံးစွဲမှု၊ စွမ်းအင်သုံးစွဲမှု နှင့် အမှိုက်စွန့်ပစ်မှု စီမံခန့်ခွဲမှုအပါအဝင် အချက်အလက်များကို စာရင်းကောက်ယူခဲ့ပါသည်။ စီမံကိန်း၏ သက်ရောက်မှု ဧရိယာအတွင်းရှိ အဓိကစီးပွားရေး လုပ်ဆောင်မှုများ၊ သယ်ယူပို့ဆောင်ရေးနှင့် စီးပွားရေး အခြေအနေများ စီမံကိန်း၏အခြေခံအချက်အလက်များအရ စစ်တမ်းကောက်ယူ ထားပါသည်။

# လူဦးရေနှင့် လူမျိုးများ

အဆိုပြု လုပ်ငန်း တည်ရှိရာ ငါးဇွန်မြို့နယ်တွင် လူဦးရေစုစုပေါင်း (၁၄၀,၅၀၁) ဦးရှိပြီး လုပ်ငန်း၏ သက်ရောက်မှုကို ခံရနိုင်ခြေရှိသော အနီးစပ်ဆုံးရွာများဖြစ်သည့် နဝရတ်ရွာနှင့် ပေါင်စိမ်းရွာ (၂) ရွာ ပေါင်း လူဦးရေစုစုပေါင်းမှာ (၁,၉၄၄) ဦး (ကျား - ၈၈၈ ဦး နှင့် မ- ၁,၀၅၆ ဦး) ရှိပါသည်။ ဗမာလူမျိုး များကို အများဆုံးတွေ့ရှိရပြီး ဗုဒ္ဓဘာသာကို အဓိကအားဖြင့် ကိုးကွယ်ရုံကြည်ကြပါသည်။

# အသက်မွေးဝမ်းကျောင်းလုပ်ငန်း

အဆိုပြုစီမံကိန်း၏ သက်ရောက်မှုခံရနိုင်ခြေရှိသော ဧရိယာအတွင်းရှိ ကျေးရွာ(၂)ရွာ၏ မူလအသက် မွေးဝမ်းကျောင်းလုပ်ငန်းမှာ မြေညံ့များတွင် လယ်ယာကိုင်းကျွန်း စိုက်ပျိုးမွေးမြုရေး လုပ်ငန်းဖြစ်ပြီး (၆၅)ရာခိုင်နှုန်းသော အိမ်ထောင်စုများမှာ လယ်သမားများဖြစ်ကြပါသည်။ ယခုအခါတွင် (၂၀) ရာခိုင် နှုန်းမှာ မြို့သာစက်မှုဇုန်၏ ဆောက်လုပ်ရေးသုံး လမ်းခင်းကျောက်ခဲများ တူးဖော် သယ်ယူပို့ဆောင် သည့်လုပ်ငန်းများအား ကာလတိုစာချုပ်ဖြင့် ဆောင်ရွက်လျက်ရှိပါသည်။ ကျန်(၁၅) ရာခိုင်နှုန်းမှာ နို့စားနွား မွေးမြူရေးလုပ်ငန်းနှင့် တနိုင်တပိုင်ဈေးဆိုင်များ လုပ်ကိုင်လျှက်ရှိပါသည်။

# လူထုကျန်းမာရေး

ငါးဇွန်မြို့နယ်တွင် ကုတင် (၁၅၀) ဆန့် မြို့နယ်ဆေးရုံ (၁) ရုံရှိပြီး ကုတင် (၁၆) လုံးပါ တိုက်နယ် ဆေးရုံ (၂) ရုံ၊ ကျေးလက်ကျန်းမာရေးဌာန (၈) ခု၊နှင့် ကျေးလက်ကျန်းမာရေဌာနခွဲ (၃၂) ခုရှိပါသည်။ တစ်မြို့ နယ်လုံး တွင် ဆရာဝန် (၈) ဦး၊ သူနာပြု(၁၈)ဦးနှင့် လက်ထောက်ကျန်းမာရေးမှူး(၇)ဦး စုစုပေါင်း ကျန်းမာရေးဝန်ထမ်း(၃၃) ဦးရှိပါသည်။ လူနာအတွက် အဆင့်မြင့်ကျန်းမာရေး စောင့် ရှောက်မှုလိုအပ်သည့် အရေးပေါ် အခြေအနေတွင် လူနာအား မန္တလေးမြို့ရှိ အဆင့်မြင့် ဆေးရုံ/ဆေး ခန်းများသို့ လွှဲပြောင်းပေးရပါသည်။

# ယဉ်ကျေးမှုနှင့်ဆိုင်ရာ

ဒေသခံများနှင့်သက်ဆိုင်သူများအား တွေ့ရှိလေ့လာစုံစမ်းရာတွင် အရေးကြီးသောယဉ်ကျေးမှု ဆိုင် ရာအထွတ်အမြတ်ထားရာ နယ်မြေဒေသများ၊အဆောက်အအုံများ မရှိကြောင်း တွေ့ရှိရပါ သည်။

## အမြင်ရှုခင်းနှင့်ဆိုင်ရာ

ဤစက်ရုံသည် မည်သည့် ထင်ရှားသောအမြင်ရှုခင်းများကို ဖုံးကွယ်တားစီးခြင်းမရှိပါ။

### လူမှူစီးပွားရေး

ငါးစွန်မြို့နယ်ရှိ အခြေခံအဆောက်အအုံနှင့် ပုဂ္ဂလိကဝန်ဆောင်မှုလုပ်ငန်းများနှင့် ဆက်စပ်သည့် သတင်း အချက်အလက်များအနေဖြင့် ပညာရေးအခြေအနေ၊ ကျန်းမာရေးဝန်ဆောင်မှုများ၊ စွန့်ပစ် ပစ္စည်းများစီမံခန့်ခွဲမှုစနစ်၊ ရေ၊လျှပ်စစ်နှင့်စွမ်းအင်ရရှိမှုဝန်ဆောင်မှုများ၊ စီးပွားရေးဆိုင်ရာ အခြေခံ အဆောက်အအုံနှင့် သယ်ယူပို့ဆောင်ရေးဝန်ဆောင်မှုများကို အသေးစိတ်လေ့လာ၍ ဇယားများဖြင့် လည်းကောင်း မြေပုံများ ဖြင့်လည်းကောင်း လိုအပ်သလို ဖော်ပြထားပါသည်။

နဝရတ်ရွာနှင့် ပေါက်စိမ်းရွာတို့သည် စီမံကိန်းဧရိယာမှ(၁.၅) ကီလိုမီတာအကွာတွင် အနီးဆုံး တည်ရှိ နေ၍ အဆိုပါရွာ(၂)ရွာအား အဆိုပြုစီမံကိန်း၏ လူမှုစီးပွားဆိုင်ရာ သက်ရောက်မှုတို့ကို လေ့လာဆန်း စစ်ရန် သတ်မှတ်ရွေးချယ်ခဲ့ပါသည်။ ငါးဇွန်မြို့နယ်နှင့် အဆိုပါရွာ(၂)ရွာတို့၏ လူမှုစီးပွားအခြေ အနေများကို ကွင်းဆင်းကောက်ယူစုဆောင်း၍ ကျယ်ကျယ်ပြန့်ပြန်လေ့လာခဲ့ပါသည်။ လူမှုစီးပွား အခြေအနေများကို လေ့လာရာတွင် မြို့နယ်လူဦးရေစာရင်းနှင့် ကျား/မဦးရေမှတ်တမ်းများ၊ စာတက် မြောက်မှုနှင့် ပညာရေး၊ စီးပွားရေး အညွှန်းကိန်းများ၊ နေထိုင်ရပ်တည်မှုအခြေအနေများ၊ မြေအသုံး ချမှု၊ အလုပ်အကိုင်အခြေအနေ၊ မိသားစုဝင်ငွေအခြေအနေ၊ ဘဝအခြေအနေနှင့် လူနေမှုအခြေ အနေများ၊ ပုဂ္ဂလိကဝန်ဆောင်မှုများ၊ သတင်းအရင်းအမြစ်ရရှိမှု၊ ကျန်းမာရေးစောင့်ရှောက်မှုလိုအပ် ချက်များ၊ ဗွေဖွားမှုနှုန်းနှင် သေဆုံးမှုနှုန်း၊ ရောဂါကျရောက်မှု အခြေအနေစသည့် အချက်များပါဝင် ပါသည်။

အဆိုပြုလုပ်ငန်းတည်ရှိရာ မြို့သာစက်မှုဇုန်၏ အနီးဆုံးပတ်ဝန်းကျင်းတွင် အမျိုးသားအဆင့် အထူးကာကွယ်စောင့်ရှောက်ထိန်းသိမ်းရန် လိုအပ်သော ကျေးလက်ဒေသ ဓလေ့ထုံးတမ်းစဉ်လာ များနှင့်စပ်လျဉ်းသည့် ယဉ်ကျေးမှုအမွေအနှစ်များကိုမတွေ့ရှိခဲ့ပါ။ သို့သော် စီမံကိန်းနေရာတဝိုက် တွင် ယဉ်ကျေးမှုအမွေအနှစ်များနှင့်စပ်လျဉ်း၍ တွေ့ရှိခဲ့ပါက ဒီဟက်စ်မြန်မာသည် ၄င်းတို့ကို ထိခိုက်မှုမရှိအောင် အတက်နိုင်ဆုံး ကာကွယ်စောင့်ရှောက်ရန်နှင့် ပြုပြင်ထိန်းသိမ်းရန် အဓိက တာဝန်ရှိဆုံး အဖွဲ့အစည်းအဖြစ် မှတ်ယူထားပါသည်။

### သက်ရောက်မှုများလေ့လာဆန်းစစ်ခြင်း

အဓိကဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများကို စီမံကိန်းအဆိုပြုသူမှပေးသော စီမံကိန်းသတင်း အချက်အလက်၊ ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာအစိတ်အပိုင်းများအားလုံးအတွက် နည်းပညာ ဆိုင်ရာအကဲဖြတ်မှုနှင့် စီမံကိန်း၏ဓါတ်ခွဲခန်းရလဒ်များအပေါ် အခြေပြု၍ ဆုံးဖြတ်ပါသည်။ ထုတ် လုပ်မှုလုပ်ငန်းစဉ်တွင် သဘာဝသယံဧာတအရင်းအမြစ်(ကုန်ကြမ်းပစ္စည်း)များကို အသုံးပြုပြီး ထွက် ရှိလာသော စွန့်ပစ်ပစ္စည်းအမျိုးအစားများကို ခွဲခြမ်းစိတ်ဖြာလေ့လာခဲ့ပါသည်။ စီမံကိန်းလုပ်ဆောင် မှုပေါ်အခြေခံ၍ သက်ရောက်မှုကိုဖော်ထုတ်ခြင်းသည် ဖြစ်နိုင်ခြေရှိသောညစ်ညမ်းမှုများနှင့် ပြဿာ နာများကို ခွဲခြမ်းစိတ်ဖြာခြင်းဖြင့် တည်ရှိနေသော ဒေသခံပြည်သူများနှင့် ပြသာနာဖြစ်နိုင်သော အခြေအနေများ၊ သက်ရောက်နိုင်မှုကာလ၊ စက်ယန္တရားများနှင့် ၄င်းတို့၏စွမ်းဆောင်နိုင်မှုနှင့် ထိုကဲ့ သို့ သက်ရောက်ချိန်အတွက် ဆိုးကျိုးများအား ခန့်မှန်းရမည့်ရလဒ်များကို ထည့်သွင်းစဉ်းစားပါသည်။ ထို့အပြင် စီမံကိန်းထိခိုက်နိုင်သောဧရိယာ၊ လက်ခံသူနှင့်သက်ဆိုင်သူများကို ခွဲခြားသတ်မှတ်ရာတွင် အပြုသဘော၊ အပျက်သဘော၊ တိုက်ရိုက်သက်ရောက်မှု၊ သွယ်ဝိုက်သက်ရောက်မှုနှင့် စုပေါင်းသက် ရောက်မှုများကို ထည့်သွင်းစဉ်းစားသည်။ အဓိကဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုနှင့် စုပေါင်းသက် ရောက်မှုများကို ထည့်သွင်းစဉ်းစားသည်။ အဓိကဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုမှုများကို တည် ဆောက်ရေး အကြိုကာလ၊ တည်ဆောက်ရေးကာလ၊ စက်ရုံလည်ပတ်ခြင်းကာလနှင့် ပိတ်သိမ်းခြင်း ကာလဟူ၍ အပိုင်းခွဲပြီး လေ့လာထားရှိပါသည်။

ထို့ပြင် စီမံကိန်းလုပ်ငန်းဆောင်ရွက်မှုများကြောင့် ဖြစ်ပေါ် လာသည့် သက်ရောက်မှုများကို ဆန်းစစ် လေ့လာရာတွင် ဖြစ်နိုင်ခြေရှိသောအညစ်အကြေးပမာဏနှင့် ဆက်စပ်သက်ရောက်မှုများ၊ ပတ်ဝန်း ကျင်တွင် တည်ရှိနေသောအရာများနှင့် ၎င်းတို့၏တုန့်ပြန်လွယ်သောအခြေအနေများ၊ သက်ရောက်မှု ကာလ၊ ပြုပြင်ထိန်းသိမ်းရေးဆိုင်ရာနည်းလမ်းများနှင့် အဆိုပါနည်းလမ်းများ၏စွမ်းအားတို့နှင့်စပ် လျဉ်းသည့် ဖြစ်ပေါ် လာနိုင်ခြေရှိသည့် ဆိုးရွားသောသက်ရောက်မှုများကို ခန့်မှန်းတွက်ချက်လျှက် ထည့်သွင်းစဉ်းစားဆောင်ရွက်ခဲ့ပါသည်။

ညစ်ညမ်းမှုပမာဏ၊ သက်ရောက်မှုဆိုင်ရာပြင်းအားနှင့် ဖြစ်နိုင်ခြေရှိသော အကျိုးသက်ရောက်မှု တို့ကို အခြေခံ၍ စီမံကိန်းသက်ရောက်မှုဧရိယာကို စီမံကိန်းမှ အနည်းဆုံး (၁.၅) ကီလိုမီတာအကွာ အဝေး သတ်မှတ်၍ တိုင်းတာခဲ့ပါသည်။ အနံ့နှင့်လေထုညစ်ညမ်းမှုပျံ့နှံ့မှုသည် စီမံကိန်း၏ တိုးတက် သောလေထုအရည်အသွေးအစီအစဉ်ကြောင့် သတ်မှတ်ဧရိယာအတွင်း မရောက်ရှိနိုင်ပါ။ စီမံကိန်း တည်နေရာများကို GIS တိုင်းတာခြင်း၊ မြေမျက်နှာသွင်ပြင်နှင့် မြေပုံရေးဆွဲခြင်းဖြင့် အတည်ပြုပါ သည်။

### သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုစီမံခန့်ခွဲမှုအစီအစဉ် (ESMP)

ဒီဟတ်စ်မြန်မာသည် မြန်မာနိုင်ငံ၏ သဘာဝပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဥပဒေများ၊ စည်းမျဉ်းစည်း ကမ်းများနှင့် လုပ်ထုံးလုပ်နည်းများအရ ချမှတ်ပြဌာန်ထားသော ပတ်ဝန်းကျင်နှင့်လူမှုရေးလိုအပ်ချက် များနှင့် လိုက်လျောညီထွေစေရန် အရေးပါသော ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာ စည်းမျဉ်းစည်း ကမ်းများနှင့် တန်ဖိုးများအား အလေးထား လိုက်နာဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။ ထိုပြင်ဒီဟက်စ် သည် ပတ်ဝန်းကျင်နှင့်လူမှုစီးပွားရေးသက်ရောက်မှု အကဲဖြတ်ဆန်းစစ်ချက်ကိုလည်း သယံဇာတ နှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာန၏ လုပ်ထုံးလုပ်နည်းများနှင့်အညီ ဆောင်ရွက်လျှက်ရှိပြီး အလား အလာရှိသော သက်ရောက်မှု အားလုံးကို ရောင်ရှားနိုင်စေရန်နှင့် လျော့ပါးသက်သာစေရန် တားမြစ် ခြင်းနှင့်ကာကွယ်ခြင်းဆိုင်ရာ နည်း လမ်းများကိုလည်း တိုးမြှင့်ဆောင်ရွက်ခဲ့ပါသည်။ ပတ်ဝန်းကျင် နှင့် လူမှုရေးဆိုင်ရာ အကျိုးသက်ရောက်မှု ဆန်းစစ်လေ့လာချက်အနေဖြင့် ပတ်ဝန်းကျင်နှင့်လူမှုရေး အကျိုးသက်ရောက်မှုများကိုလည်း ယခုအစီရင်ခံစာတွင် အကဲဖြတ်လေ့လာတင်ပြထားသည်။ အဆို ပြုထားသော လျော့ပါးသက်သာစေသော နည်းလမ်းများနှင့် ယင်း၏စီမံခန့်ခွဲမှုအစီအစဉ်ကို သဘာဝ ပတ်ဝန်းကျင်နှင့် လူမှုစီမံခန့်ခွဲမှုအစီအစဉ် (ESMP) တွင် အသေးစိတ်ဖော်ပြထားပါသည်။

အဆိုပြုစီမံကိန်း၏ စီမံကိန်းအဆင့် (၄) ဆင့်အတွက် အလားအလာရှိသော ပတ်ဝန်းကျင်နှင့်လူမှုရေး ဆိုင်ရာသက်ရောက်မှုများ၏ ဒီဂရီအဆင့်အလိုက်အရေးပါမှုတို့ကို နှံနှံစပ်စပ်လေ့လာဆန်းစစ် တင် ပြထားပါသည်။ စီမံကိန်းလုပ်ငန်းစဉ်အဆင့်ဆင့်တွင် တွေ့ရှိရနို်င်သော သိသာထင်ရှားသည့် သဘာ ဝပတ်ဝန်းကျင်နှင့် လူမူစီးပွားရေးဆိုင်ရာ သက်ရောက်မှူများမှာ အောက်ပါအတိုင်းဖြစ်ပါ သည်။

### တည်ဆောက်ရေးအကြိုကာလ သိသာထင်ရှားသော ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများမှာ-

- -ကွင်းဆင်းတိုင်းတာ မြေရှင်းလင်းရာ၌ သဘာဝပေါက်ပင်များနှင့် တိရိစ္ဆာန်မျိုးစိတ်များ အပေါ် သက်ရောက်မှုများ၊
- မြေပြင်ကွင်းဆင်းတိုင်းတာဆောင်ရွက်ခြင်း လုပ်ငန်းများကြောင့် အပေါ်ယံမြေလွှာများ ပျက်စီးဆုံးရှုံးမှု ဖြစ်ပေါ် စေ၍ မြေဆီလွှာတိုက်စားမှုနှင့် ဖုန်မှုန့်များထုတ်လွှင့်မှု အနည်းငယ် ဖြစ်ပေါ် လာခြင်း၊
- မြေသားလုပ်ငန်းများဆောင်ရွက်ရာမှ တူးမြေများနှင့် အပင်အကြွင်းအကျန်များ

### တည်ဆောက်ရေးကာလ သိသာထင်ရှားသော ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများမှာ-

- မြေပြင်ရှင်းလင်းဆောင်ရွက်ခြင်းကြောင့် သဘာဝပေါက်ပင်များနှင့် တိရိစ္ဆာန်မျိုးစိတ်များ ပျက်စီးဆုံးရှုံးခြင်း၊
- တည်ဆောက်ရေးလုပ်ငန်းအဆင့်ဆင့်မှ လေထုညစ်ညမ်းမှုကိုဖြစ်စေသည့် အခိုးအငွေ့နှင့် အမှုန်အမွှားများ ထုတ်လွှင့်မှု ဖြစ်ပေါ် စေ ခြင်း၊

- မြေအောက်ရေကို ထုတ်လုပ်မှုလုပ်ငန်းစဉ်တလျောက် အများအပြားထုတ်ယူသုံးစွဲခြင်း၊ ထုတ်လုပ်မှု လုပ်ငန်းစဉ်နှင့် စက်သန့်ရှင်းရေးလုပ်ငန်းများမှ စွန့်ပစ်ရေများထွက်ရှိခြင်း မိုးရေနှင့် ရေနုတ်မြောင်း များမှ စွန့်ပစ်ရေများ စီးဆင်းစေခြင်း

- ကုန်ကြမ်းများအတင်အချပြုလုပ်ခြင်း၊ ယာဉ်များသွားလာခြင်း၊ တိရိစ္ဆာန်အစာထုတ်လုပ်မှု ဖြစ်စဉ်နှင့် အရံထားရှိသော အရေးပေါ်သုံးမီးစက်များမှ ဆူညံမှုနှင့်တုန်ခါမူဆိုင်ရာညစ်ညမ်း မူ များ ထွက်ပေါ် လာခြင်း
- သွားလာမှုမှ လေထုထဲသို့ ညစ်ညမ်းသည့် အခိုးအငွေ့များ ပြာများစွန့်ထုတ်ခြင်း

- ထုတ်လုပ်ရေး လုပ်ငန်းစဉ်မှ စက်ကြီးများ အရေးပေါ်မီးစက်များနှင့်ယာဉ်များ လည်ပတ်
- လုပ်ငန်းလည်ပတ်မှုကာလ သိသာထင်ရှားသော ပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများ-- ထုတ်လုပ်မှုလုပ်ငန်းစဉ်အတွက် စွမ်းအင်သုံးစွဲမှုမြင့်မားခြင်း

# - မတော်တဆ ထိခိုက်မှုဖြစ်ခြင်းနှင့် လုပ်သားများ ကျန်းမာရေးနှင့် လုပ်ငန်းခွင် ဘေးအန္တရာယ် ကင်းရှင်းရေးအတွက်ကြိုတင်ဆောင်ရွက်သင့်သည်များ

- အလုပ်သမားများအကြား ခွဲစားဆက်ဆံခြင်း၊ ကျားမတန်းတူအခွင့်အရေးမရှိခြင်းနှင့် လစာ နှင့် လုပ်ငန်းတာဝန်များ ခွဲဝေရာတွင် မျှတမူမရှိခင်း၊
- ဒေသခံပြည်သူလူထုနှင့် ရွှေ့ပြောင်းလုပ်သားများအကြား သဘောထားကွဲလွဲမှုဖြစ်ပေါ် စေ ခြင်း၊

# တည်ဆောက်ရေးကာလ သိသာထင်ရှားသော လူမှုရေးဆိုင်ရာသက်ရောက်မှုများမှာ-

- ဆောက်လုပ်ရေးလုပ်ငန်းများမှ စွန့်ပစ်ပစ္စည်းအစိုင်အခဲများနှင့် ဆောက်လုပ်ရေးပစ္စည်း အပျက်အ စီးများ စုပုံများပြားလာခြင်း၊
- စက်သုံးဆီနှင့် လောင်စာဆီများ မတော်တဆ ယိုစိမ့်ဖိတ်စင်ခြင်း၊
- ဆောက်လုပ်ရေးလုပ်ငန်းစဉ်များတွင် ရေသုံးစွဲမှုများပြားခြင်းနှင့် စွန့်ပစ်ရေများ ထွက်ပေါ်စေ ခြင်း၊
- ပြင်ပမှမြေများသယ်ယူဖြည့်တင်းခြင်းနှင့် မြေကြီးလုပ်ငန်းများ ဆောင်ရွက်ခြင်းကြောင့် မြေဆီလွှာညစ်ညမ်းစေခြင်းနှင့် အပေါ် ယံမြေလွှာတိုက်စား မှုဖြစ်ပေါ် စေခြင်း
- တည်ဆောက်ရေးလုပ်သားများနှင့် လုပ်ငန်းလည်ပတ်မှုကြောင့် ဆူညံမှုနှင့်တုန်ခါမှုများ ဖြစ်ပေါ် လာခြင်း၊
- အတင်အချပြုလုပ်ဆောင်ရွက်ခြင်း လုပ်ငန်းများကြောင့် ဖုန်မှုန်များ ထွက်ပေါ်ခြင်း၊
- မြေပြုပြင်ခြင်း တူးဆွခြင်းနှင့်မြေဖို့ခြင်းလုပ်ငန်းများ၊ ဆောက်လုပ်ရေးဆိုင်ရာ ပစ္စည်းများ

- ကုန်ကြမ်းများသယ်ယူပို့ဆောင်ရာတွင်အသုံးပြုသည့်ပစ္စည်းများ၊ အရည်အသွေးမပြည့်မီေ တာ့သည့် ရက်လွန်ကုန်ကြမ်းများ၊ ကုန်စည်ထုတ်ပိုးသယ်ဆောင်သည့် အိတ်ခွံဘူးခွံများ၊ လုင်ငန်း လည်ပတ်မှုမှ ထွက်ပေါ် လာသည့် အဆိုင်အခဲစွန့်ပစ်ပစ္စည်းများ စုပုံများပြားလာခြင်း
- ဝန်ထမ်းများနှင့်ရုံးလုပ်ငန်း ဆောင်ရွက်ချက်များကြောင့် ထွက်ပေါ် လာသည့် စွန့်ပစ်အစိုင် အခဲများ၊
- အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများ ဖြစ်သည့် ဓါတုပစ္စည်းထည့်သည့် ဘူးခွံပုံးခွံများနှင့် ရေဆိုးသန့်စင်စနှစ်မှ ထွက်ပေါ် လာသော အနည်အနှစ်များ
- စက်နှင့်ပစ္စည်းကိရိယာများမှ စက်သုံးဆီနှင့် အညစ်အကြေးများ လုပ်ငန်းလည်ပတ်မှုကာလ တလျောက် အကြောင်းအမျိုးမျိုးကြောင့်ဖိတ်စဉ်ခြင်း၊ ယိုစိမ့်ခြင်း

### လုပ်ငန်းလည်ပတ်မှုကာလ သိသာထင်ရှားသော လူမှုရေးဆိုင်ရာ သက်ရောက်မှုများ

- ဒေသခံလူငယ်လူရွယ်များနှင့် ပြင်ပမှပြောင်းရွှေ့လာသူများအကြား အလုပ်အကိုင်အခွင့် အလမ်း အတွက်ယှဉ်ပြိုင်ရခြင်း
- လုပ်ငန်းကြောင့်တိုးပွားလာသော လူဦးရေအတွက် စားနပ်ရိက္ခာနှင့် အခြေခံအဆောက်အအုံ
   နေအိမ်၊ သောက်သုံးရေ၊ လျှပ်စစ်မီး၊ လောင်စာနှင့် ဝန်ဆောင်မှုလုပ်ငန်းများ ပိုမိုလိုအပ်လာ
   ခြင်း ကြောင့် ဒေသခံပြည်သူတို့အတွက် ငွေကြေးတန်ဘိုးကျဆင်းလာပြီး ငွေကြေးဖောင်းပွ
   လာခြင်း
- လူမှုရေးနှင့် ယဉ်ကျေးမှုဓလေ့ထုံးတန်းများအတွက် အငြင်းပွားမှုများ ဖြစ်လာနိုင်ခြင်း
- လုပ်ငန်းခွင်ဆိုင်ရာ လုပ်သားများမတော်တဆထိခိုက်မှုများနှင့် ဒဏ်ရာအနာတရဖြစ်ခြင်း
- ဘေးအန္တရာယ်ကင်းသော လုပ်ငန်းခွင်ဖြစ်စေရန်နှင့် ယာဉ်၊ လမ်းမတော်တဆဖြစ်ခြင်း
- အလုပ်သမားများအကြား ခွဲခြားဆက်ဆံခြင်း၊ ကျားမတန်းတူအခွင့်အရေးမရှိခြင်းနှင့် မမျှတ
   သောလုပ်ငန်းခွင်ဆက်ဆံရေးနှင့် အလုပ်သမားဥပဒေလိုက်နာဆောင်ရွက်ရန် ပျက်ကွက်
   ခြင်း
- လုပ်ငန်းစဉ်တလျောက် ပါဝင်ပတ်သက်သူအားလုံးအတွက် နစ်နာမှုများ ဖြေရှင်းဆောင်ရွက်
   သည့် နည်းလမ်းများလိုအပ်ခြင်း

### လုပ်ငန်းရပ်တန့်မှုကာလ သိသာထင်ရှားသော ပတ်ဝန်းကျင်ဆိုင်ရာသက်ရောက်မှုများ

- စက်ကြီးများနှင့် ယာဉ်များအသုံးပြု၍ အဆောက်အအုံနှင့် သိုလှောင်ရုံများ ဖြိုချခြင်းကြောင့်
   လေထုညစ်ညမ်းမှု၊ ဆူညံ့မှုနှင့် တုန်ခါ မှုဖြစ်ပေါ် လာခြင်း၊
- လုပ်ငန်းပိတ်သိမ်းခြင်းနှင့် အဆောက်အဦးများ ဖြိုဖျတ်ခြင်းမှ ထွက်ပေါ် လာသည့် အပိုင်းအစ များနှင့် သတ္တုအစအနများ စသည့် စွန့်ပစ်ပစ္စည်းများ၊

- ဓါတ်ခွဲခန်းမှထွက်ပေါ် လာသည့် ဓါတုပစ္စည်းများကြောင့် ဖြစ်ပေါ် လာသည့် အန္တရာယ်ရှိသော စွန့် ပစ်ပစ္စည်းများ၊
- စွန့်ပစ်ပစ္စည်းအကြွင်းအကျန်များကြောင့် ဖြစ်ပေါ် လာသည့် မြေထု၊ ရေထု ညစ်ညမ်းမှုများ

### လုပ်ငန်းရပ်တန့်မှုအဆင့်တွင် သိသာထင်ရှားသော လူမှုရေးဆိုင်ရာ သက်ရောက်မှုများ

- လုပ်ငန်းရပ်တန့်သွားလျှင် အလုပ်အကိုင်အခွင့်အလမ်းများ ဆုံးရှုံးသွားခြင်း၊
- ကုန်ပစ္စည်းတင်သွင်းသူများအတွက် စီးပွားရေးအခွင့်အလမ်းများ ဆုံးရှုံးသွားခြင်း

စီမံကိန်းလုပ်ငန်းကို ကျစ်ကျစ်လစ်လစ် စနစ်တကျဆောင်ရွက်ခြင်းဖြင့် သက်ရောက်မှုအများစုသည် စီမံကိန်းနယ်ပယ်၏ အကန့်အသတ်အဝန်းအဝိုင်းအတွင်း၌ ဖြစ်ပေါ် လာနိုင်ပါသည်။ အဆိုပြု စီမံကိန်း လုပ်ငန်းသည် ဒေသ၏သဘာဝပတ်ဝန်းကျင်နှင့် လူမှုရေးတို့အပေါ်၌ ရေရှည်တွင် အန္တရာယ်ဖြစ်စေ နိုင်မည့် ထိန်းချုပ်ကာကွယ်ရန် မစွမ်းသာသော သက်ရောက်မှုများမရှိနိုင်ပါ။

စီမံကိန်းအဆင့် (၄) ဆင့်အတွက် သိသာထင်ရှား၍ ဖြစ်နိုင်ချေရှိသော သက်ရောက်မှုများကို အစီ ရင်ခံစာ၏ အခန်း (၆) ၊ ပိုဒ်ခွဲ (၆.၇) တွင် ဇယား( ၆.၄)မှ (၆.၇)ထိ ဖော်ပြထားပါသည်။

မြန်မာနိုင်ငံ၏ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းများအရ စီမံကိန်းလုပ် ငန်းအဆင့်တိုင်းတွင် သက်ရောက်မှုအကဲဖြတ်ခြင်းလုပ်ငန်းကို ပတ်ဝန်းကျင်၊ လူမှုရေးနှင့် ယဉ်ကျေး မှုထုံးတမ်းစဉ်လာများကို ထည့်သွင်းစဉ်းစားလျှက် ဆောင်ရွက်ခဲ့ပါသည်။ ဒေသခံများနှင့်တွေ့ဆုံမေး မြန်းခြင်း၊ မျက်မြင်စုံစမ်းလေ့လာခြင်းနှင့် ကွင်းဆင်းလေ့လာခြင်းများ ဆောင်ရွက်ခြင်းဖြင့် အရေးပါ သောဂေဟဗေဒဆိုင်ရာ အစိတ်အပိုင်းများ၏ တန်ဘိုးများကို ခွဲခြမ်းစိတ်ဖြာ၍ လေ့လာခဲ့ပါသည်။

အရေးပါသောဂေဟဗေဒဆိုင်ရာ အစိတ်အပိုင်းများ၏ ယေဘုံယျလေ့လာတွေ့ ရှိချက်များမှာ -

ပတ်ဝန်းကျင်ကဏ္ဍ။ ဤစီမံကိန်းသည် ပတ်ဝန်းကျင်အပေါ် ဘေးအန္တရာယ်ဖြစ်မှုများနှင့် စိုးရိမ်ပူပန် မှုများလျှော့ချစေရေးကို ကြိုတင်ထည့်သွင်းစဉ်းစားကာ အလေးပေးဆောင်ရွက်ထားသဖြင့် သဘာဝ ပတ်ဝန်းကျင်အတွက် အရေးပါသောဂေဟဗေဒဆိုင်ရာ အစိတ်အပိုင်းများ၏ တန်ဘိုးကို ထိခိုက်နိင် သည့်ကိစ္စရပ်နှင့် ဖိအားများမရှိနိုင်ပါ။ စက်ရုံစီမံခန့်ခွဲမှုသည် အရေးပါသောဂေဟဗေဒဆိုင်ရာ အစိတ် အပိုင်းများ၏တန်ဘိုးကို ထိခိုက်မှုဖြစ်စေနိုင်သည့် မည်သည့်ထူးခြားပြောင်းလဲမှုမျိုးကိုမဆို နီးကပ် စောင့်ကြပ်ကြည့်ရှု စစ်ဆေးကာ လိုအပ်သော ပြုပြင်မွမ်းမံခြင်းနှင့် ပြောင်းလဲခြင်းများကို လိုအပ်သ လို ဆောင်ရွက်သွားမည်ဖြစ်သည်။

**လူမှုရေးကဏ္ဍ။** ထိခိုက်နို်င်ခြေရှိသောသက်ရောက်မှု အကဲဖြတ်ခြင်းလုပ်ငန်းကို ဆောင်ရွက်ရာတွင် အရေး ကြီးသော လူမှုရေးအချက်များကို လိုအပ်သလို ဖြေရှင်းဆောင်ရွက်ခဲ့သည်။ **သားရိုင်းတိရစ္ဆာန်ကဏ္ဍ၊** စီမံကိန်း၏ အရေးပါသောဂေဟဗေဒဆိုင်ရာ အစိတ်အပိုင်းများကို ၄င်း ဒေသ၏ အခြေခံသတင်းအချက်အလက်များအဖြစ် အလေးထား စူးစမ်းလေ့လာ ရှင်းလင်းတင်ပြခဲ့ သည်။

**အပင်မျိုးစိတ်များ။** စီမံကိန်းနယ်မြေရှိ အရေးပါသော ဂေဟဗေဒဆိုင်ရာအစိတ်အပိုင်းများ၌ အလွန် အရေးပါသည့်ထူးခြားသည့်အပင်မျိုးစိတ်ကိုမတွေ့ရှိရပါ။

**လေအရည်အသွေးစံချိန်စံနှုန်းများ၊** ဆူညံမှုနှင့် တုန်ခါမှုအဆင့်များကို ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့အစည်း ၏ စံချိန်စံညွှန်းများနှင့်အညီ စောင့်ကြည့်လေ့လာခဲ့ပြီး အသေးစိတ်ကို အစီရင်ခံစာ၏ အခန်း (၇)တွင် ရှင်းလင်း ဖော်ပြထားပါသည်။

အဆိုပြု စီမံကိန်းကို အကောင်အထည်ဖော်ဆောင်ရွက်ရာ၌ ပတ်ဝန်းကျင်ရေရှည်တည်တံ့စေရေး အတွက် ထည့်သွင်းစဉ်းစားကာ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုစီမံချက်ကိုစနစ်တကျ ဆောင်ရွက်ထားပြီး ၄င်းစီမံချက်တွင် ထည့်သွင်းရေးဆွဲထားသည့် လုပ်ငန်းစဉ်များအတိုင်း လက်တွေ့အကောင်အထည် ဖော်ဆောင်ရွက်သွား မည်ဖြစ်သည်။ ဒီဟက်စ်တိရစ္ဆာန်အစာထုတ်လုပ်သည့်စက်ရုံ၏ စီမံကိန်းအဆင့် (၄)ဆင့်အတွက် ပတ်ဝန်းကျင်စိီမံခန့်ခွဲမှုအစီရင်ခံစာကို စီမံကိန်း၏ပတ်ဝန်းကျင်နယ်ပယ်ရှိ သဘာ ဝပတ်ဝန်းကျင်ဆိုင်ရာ အခြေခံအချက်အလက်များဖြစ်သော ပတ်ဝန်းကျင် လေထုအရည်အသွေး၊ ဆူညံမှုအဆင့်၊ ရေနှင့်စွန့်ပစ်ရေများ၏ အရည်အသွေး၊ အပင်နှင့်သက်ရှိများကို လေ့လာမှုရလဒ်များ အပါအဝင် ယဉ်ကျေးမှုနှင့်လူမှူစီးပွားဆိုင်ရာ လက်ရှိအခြေအနေများကို ကွင်းဆင်းစစ်ဆေးလေ့လာ ရာတွင် တွေ့ရှိချက်များကို အခြေခံ၍ ဖြစ်နိုင်ချေရှိသော သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာသက်ရောက်မှု များကို ခန့်မှန်တွက်ချက်ပြီး စီမံခန့်ခွဲမှုစီမံချက်ကို ပြုစုရေး သားခဲ့ပါသည်။

အဆိုပါ ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှုစီမံချက်တွင် စီမံကိန်းအဆင့်တိုင်း၏ ဖြစ်နိုင်ချေရှိသော သဘာဝပတ်ဝန်းကျင်ဆိုင်ရာ သက်ရောက်မှုများအားလုံးကို စနစ်တကျဖော်ပြထားပါသည်။ လျော့ ပါးသက်သာမှုနှင့် စောင့်ကြပ်ကြည့်ရှုမှုဆိုင်ရာ နည်းလမ်းများဖြင့် စီမံကိန်းအဆင့်တိုင်းရှိ ဆိုးကျိုးများ အားလုံးကို နှံ့နှံ့စပ်စပ်ဖော်ထုတ်လေ့လာခဲ့ပါသည်။ အသေးစိတ်ကို အစီရင်ခံစာ၏ အခန်း (၈) တွင် ဖော်ပြထားပါသည်။

### လူထုတွေ့ဆုံဆွေးနွေးပွဲ

စီမံကိန်းပတ်ဝန်းကျင်ဒေသများတွင် ဖြစ်နိုင်ခြေရှိသောသက်ရောက်မှုများကို သိရှိနားလည်စေရန် စီမံကိန်းဆိုင်ရာအချက်အလက်များကို ရှင်းလင်းပြောကြားခဲ့သည်။ ထိုသို့ရှင်းလင်းပြောကြားမှုများပြု လုပ်ရန်အတွက် စီမံကိန်းပတ်ဝန်းကျင်ရှိဒေသခံပြည်သူများနှင့် လူထုတွေ့ဆုံဆွေးနွေးပွဲများ ပြုလုပ်ခဲ့ သည့်အပြင် ကျေးရွာလူထုအကြီးအကဲများနှင့်လည်း တွေ့ဆုံမေးမြန်းမှုများ ပြုလုပ်ခဲ့ပါသည်။ အဆို ပြုလုပ်ငန်း အကောင်အထည်ဖော်ဆောင်ရွက်ရေးနှင့်ပတ်သက်၍ ၂၀၁၇ ခုနှစ်၊ စက်တင်ဘာလ(၂၆) ရက်နေ့၌ စီမံကိန်းသက်ရောက်နယ်မြေများဖြစ်သည့် နဝရတ်ရွာနှင့်ပေါက်စိမ်းကျေးရွာတို့ရှိ ဘုန်းကြီး ကျောင်းဝိုင်းများတွင် အများပြည်သူတို့နှင့် တွေ့ဆုံမေးမြန်းအကြံဉာဏ်ရယူခြင်းကို ဆောင်ရွက်ခဲ့ပါ သည်။

ဖော်ပြပါကျေးရွာများရှိ ရပ်ကွက်အုပ်ချုပ်ရေးမှူးရုံးများတွင် ဒုတိယအကြိမ် လူထုတွေ့ဆုံ ဆွေးနွေး ပွဲကို ဒီဇင်ဘာလ (၆)ရက်နေ့၌ ကျင်းပပြုလုပ်ခဲ့ပါသည်။ အဆိုပါ အစည်းအဝေးများတွင် ဒီဟက်စ်-မြန်မာကုမ္ပဏီမှ ကိုယ်စားလှယ် (၁) ဦးနှင့် Social and Environmental Associate-SEAM မှ တာဝန်ရှိသူများမှ လုပ်ငန်းဆိုင်ရာသတင်းအချက်အလက်များ ရှင်းလင်းပြောကြားခြင်းနှင့် အများ ပြည်သူ၏ သဘောထားအမြင်နှင့် စိုးရိမ်ပူပန်မှုတို့ကို ဆွေးနွေးခဲ့ပြီး တွေ့ဆုံဆွေးနွေးပွဲ (၂) ကြိမ် အတွက် နဝရတ်ရွာမှ (၄၈) ဦးနှင့် ပေါက်စိမ်းရွာမှ (၇၄) ဦးတို့ တက်ရောက်ခဲ့ ကြပါသည်။ တတိယ အကြိမ် လူထုတွေ့ဆုံဆွေးနွေးပွဲကို ၂၀၁၉ ခုနှစ်၊ ဇူလိုင်လ(၄)ရက်နေ့တွင် နဝရတ်ကျေးရွာနှင့် ပေါက်စိမ်းကျေးရွာတို့ရှိ ရပ်ကွက်အုပ်ချုပ်ရေးမှူးရုံးများ၌ အသီးသီးကျင်းပပြုလုပ်ခဲ့ပါသည်။ အဆိုပါ ဆွေးနွေးပွဲသို့ နဝရတ်ကျေးရွာမှ (၂၀)ဦးနှင့် ပေါက်စိမ်းကျေးဂွာမှ (၄၂)ဦး တက်ရောက်ခဲ့ပါသည်။

အများပြည်သူနှင့်တွေ့ဆုံမေးမြန်းအကြံဉာဏ်ရယူရာတွင် စက်ရုံမှ ကိုယ်စားလှယ်သည် စက်ရုံလည် ပတ်မှု၊ ထုတ်လုပ်မှုဖြစ်စဉ်၊ အလုပ်အကိုင်အခွင့်အရေးများ၊ လုပ်ငန်းအခြေအနေများ၊ စက်ရုံ၏ လူမှု ရေးနှင့်ပတ်ဝန်းကျင်ဆိုင်ရာ ကတိကဝတ်များနှင့် စက်ရုံ၏တာဝန်ယူမှု တာဝန်ခံမှုအပိုင်းနှင့် အရေး ကြီးလုပ်ငန်းစဉ်များကို ရှင်းလင်းပြောကြားခဲ့ပါသည်။ တက်ရောက်လာသူ ကျေးရွာသူ/သားများမှ လည်း ၄င်းတို့၏အမြင်သဘောထား၊ စီမံကိန်းဆိုင်ရာ မရှင်းလင်းသည့် သိရှိလိုသည်များ၊ စိုးရိမ်ပူပန် မှုများ၊ လိုအပ်ချက်များနှင့် စက်ရုံ၏လုပ်ငန်း ဆောင်ရွက်ချက်များအတွက် စီစဉ်ထားရှိသည့်နည်း လမ်းများကို စုံစမ်းမေးမြန်းခဲ့ကြပါသည်။ စက်ရုံကိုယ်စားလှယ်အနေဖြင့် တက်ရောက်လာသည့် ရွာသူ/သားများ၏မေးခွန်းများကိုဖြေကြား၍ ၄င်းတို့၏ စိုးရိမ်ပူပန်မှုများကို ဖြေရှင်းနို်င်မည့် နည်း လမ်းများကို ဆွေးနွေးခဲ့ပါသည်။ ကျေးရွာသူ/သားများမှ မေးမြန်းလာသည့် ကိစ္စရပ်များအနက် အရေး ကြီးသော စိုးရိမ်ပူပန်မှုများမှာ-

- ဒေသခံများအတွက်အလုပ်အကိုင်အခွင့်အလမ်းရရှိလိုမှု
- စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု
- ပတ်ဝန်းကျင်ထိန်းသိမ်းမှု စီမံခန့်ခွဲရေးစီမံချက်ဆောင်ရွက်မည့်အခြေအနေ
- လူမှုစီးပွားဆိုင်ရာ ချိတ်ဆက်မှုများနှင့် အလားအလာ
- ဒေသခံများ၏ဘေးအန္တာရာယ်ကင်းရှင်းမှုနှင့် ကျန်းမာရေး
- ဒေသတွင်း လူဦးရေပြောင်းလဲမှုများနှင့် သက်ရောက်မှူများ
- ရွှေ့ပြောင်းလာသူများကြောင့် ဖြစ်နိုင်ချေရှိသော လူမှုရေး ပြဿာနာများ ဖြစ်ကြပါသည်။

ကျေးရွာသူ/သားများသည် သတင်းအချက်အလက်များကို ပွင့်လင်းမြင်သာမှုရှိစေရန်၊ မိမိတို့နိုင်ငံ၏ လက်ရှိ ဥပဒေများနှင့် စည်းမျဉ်းစည်းကမ်းများနှင့်အညီ စက်ရုံတည်ဆောက်၍ လည်ပတ်ဆောင်ရွက် ရန်၊ ဒေသခံ များ၏လူမှုရေးအကျိုးစီးပွား၊ စီးပွားရေးနှင့် ကျန်းမာရေးဝန်ဆောင်မှုများ တိုးတက်ရေး အတွက် ကူညီပေးရန်၊ ဒေသခံလူငယ်များအတွက် အလုပ်အကိုင်ဦးစားပေးရန်နှင့် နောက်ဆုံးအနေ ဖြင့် ၄င်းတို့ဒေသတွင် အဆိုပြု စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သည့် အဆိပ်အတောက်ဖြစ်စေ သည့်အရာများနှင့် ညစ်ညမ်းမှုဖြစ်စေသည့် အရာများကို တာဝန်အပြည့်အဝယူ၍ ဆောင်ရွက်ပေးရန် စသည့်အချက်များကို စီမံကိန်းအဆိုပြုသူများအား တောင်းဆိုခဲ့ပါသည်။ ကျေးရွာသူ/ရွာသားများ၏ မေးခွန်းများနှင့်စပ်လျဉ်း၍ ၄င်းတို့ ရရှိနိုင်သော အဓိကအကျိုးကျေး ဇူးများမှာ-

- ဒေသတွင်း လူနေမှုအဆင့်အတန်း မြှင့်မားလာစေခြင်း၊
- ဒေသတွင်း ပြည်သူများအတွက် ဘေးအန္တရာယ် ကင်းရှင်းရေးနည်းလမ်းများ တိုးတက်လာ စေခြင်း၊
- မြို့ပြ ဖွံ့ဖြိုးတိုးတက်မှု ပိုမိုကောင်းမွန်လာစေခြင်း၊
- မြေတန်ဖိုး မြှင့်တက်လာစေခြင်းနှင့်
- ဒေသတွင်း ပြည်သူများအတွက် လူမှု့စီးပွား ချိတ်ဆက်မှုများ ဖွံ့ဖြိုးတိုးတက်လာစေခြင်း တို့ဖြစ်သည်။

ဒီဟတ်စ်မြန်မာလီမိတက်သည် ပတ်ဝန်းကျင်နှင့်လူမှုစီးပွားဆိုင်ရာသက်ရောက်မှုများ အကဲဖြတ် ဆန်းစစ်မှုအစီရင်ခံစာတွင် ဖော်ပြပါရှိသည်များအတိုင်း လိုက်နာအကောင်အထည်ဖော်ဆောင်ရွက် ရာတွင် စီမံကိန်းလုပ်ငန်းလည်ပတ်ရာ ကာလတလျောက်တွင် အများပြည်သူထိခိုက်နစ်နာမှုကို ဖြစ်စေသောကိစ္စရပ်များအတွက် ဒေသရှိသက်ဆိုင်ရာပါဝင်ဆောင်ရွက်သူများနှင့် စေ့စပ်ညှိနှိုင်းမှု လုပ်ငန်းများတွင် တာဝန်အရှိဆုံးဖြစ်သည့်အားလျော်စွာ ဆွေးနွေးပွဲများတွင် ရရှိမှတ်သားခဲ့သည့် စိုးရိမ်ပူပန်မှုများနှင့်ကိစ္စရပ်များကိုလည်းကောင်း နောင်တွင် ဆက်လက်ဆောင်ရွက်ရန် လိုအပ်သည့် ကိစ္စရပ်များအတွက်သော်လည်းကောင်း တာဝန်ယူ ဆောင်ရွက်သွားမည်ဖြစ်သည်။

ွေး ရှိဆက်လက် ဆွေးနွေးရမည့်အချက်များအတွက် ဒီဟက်စ်မြန်မာ၏ စီမံခန့်ခွဲမှုအနေဖြင့် တိုင် ကြားချက်များနှင့် နစ်နာမှုများ ဖြေရှင်းရေးဆိုင်ရာနည်းလမ်းဖြစ်သည့် လူထု၏တိုင်ကြားချက်များနှင့် နစ်နာမှုများကို မှတ်သား၍ တုန့်ပြန်ဖြေရှင်းပေးရေးအတွက် ကော်မတီတစ်ခုဖွဲ့စည်းရန် တာဝန်ရှိပါ သည်။ တိုင်ကြားချက်များနှင့် နစ်နာမှုများဖြေရှင်းရေးဆိုင်ရာနည်းလမ်းအရ စီမံကိန်းကြောင့် ထိခိုက် မှု (သို့မဟုတ်) အကျိုးသက်ရောက်မှုဖြစ်သည့် ပါဝင်ဆောင်ရွက်သူအားလုံး၏ နစ်နာမှုများကို ဖြေ ရှင်းပေးရမည်ဖြစ်ပြီး မြေပိုင်ဆိုင်မှု၊ လျော်ကြေးပေးမှု၊ လူနေမှုဘဝဖွံ့ဖြိုးတိုးတက်မှု၊ နှင့် ပတ်ဝန်း ကျင်နှင့်လူမှုရေးဆိုင်ရာကိစ္စရပ်များနှင့် စပ်လျဉ်းသည့် နစ်နာမှုများလည်း ပါဝင်ပါသည်။

SEAM

နိဂုံးနှင့် သုံးသပ်အကြံပြုချက်

အထက်မြန်မာနိုင်ငံရှိ မန္တလေးတိုင်းဒေသကြီး၊ မန္တလေးမြို့အနီး ငါးဓါန်မြို့နယ်ရှိ မြို့သာစက်မှုဇုန် တွင် တိရစ္ဆာန်အစာများထုတ်လုပ်မည့် De Heus Myanmar Limited အတွက် ပတ်ဝန်းကျင်နှင့်လူမှု ရေးဆိုင်ရာသက်ရောက်မှုများဆန်းစစ်လေ့လာရေးဆိုင်ရာအစီရင်ခံစာကို ရေးဆွဲခဲ့ပါသည်။ စီမံကိန်း ဆောင်ရွက်သူမှ နည်းပညာဆိုင်ရာအချက်အလက်များ၊ စီမံကိန်းနှင့်ဆက်စပ်သည့်လေ့လာမှု အစီရင် ခံစာများ၊ ကွင်းဆင်းလေ့လာမှုများ၊ ပတ်ဝန်းကျင်လေ့လာဆန်းစစ်ရေးဆိုင်ရာ အခြေခံပြုစောင့်ကြပ် ကြည့်ရှု့မှုများနှင့် လူထုနှင့်ညှိနှိုင်းဆွေးနွေးမှုများကို အခြေခံလျှက် ဤအစီရင်ခံစာကို ရေးသားပြုစုခဲ့ ပါသည်။

လေအရည်အသွေးကို ဆန်းစစ်လေ့လာရာတွင် လယ်ကွင်းများတွင် မီးရှို့ခြင်း၊ လေပြင်းတိုက်ခြင်းနှင့် ဖုန်မှုန်များထွက်ရှိမှုတို့ကြောင့် လက်ရှိလေအရည်အသွေးမှာ ထည့်သွင်းစဉ်းစားစရာဖြစ်သည်။ စီမံ ကိန်းအကောင်အထည်ဖော်ဆောင်ရွက်သူသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တွင် ပါရှိသော လျော့ပါးသက်သာစေသည့်နည်းလမ်းများကို လက်တွေ့အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်းဖြင့် ပတ်ဝန်းကျင်ညစ်ညမ်းမှုများကို လျော့ချစေမည်ဖြစ်သည်။ စီမံကိန်းလုပ်ငန်းအဆင့်အားလုံးရှိ လုပ် ငန်းဆောင်ရွက်ချက်များကို အခြေပြု၍ ဖြစ်နိုင်ချေရှိသော ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာသက် ရောက်မှုများကို ဆန်းစစ်လေ့လာထားပါသည်။ သက်ရောက်မှုများကို အကဲဖြတ်ဆန်းစစ်ရာတွင် သက်ရောက်မှုပမာဏ၊ ကာလ၊ အကျယ်အဝန်း၊နှင့် လုပ်ငန်းလည်ပတ်မှုအဆင့်နှင့် လုပ်ငန်းဖျက်သိမ်း သည့်အဆင့်တို့ရှိ ဖြစ်နိုင်ချေရှိသောဆောင်ရွက်ချက်များကို အခြေခံလျှက် ဆန်းစစ်ခဲ့ပါသည်။ အဆိုပါသက်ရောက်မှုများကို လျော့နည်းစေရန်နှင့် လျော့ချစေရန် လျော့ပါးသက်သာသည့် နည်း လမ်းများကိုလည်း ခွဲခြားဖော်ထုတ်ခဲ့ပါသည်။

လူမှုရေးဆိုင်ရာသက်ရောက်မှုများအနေဖြင့် လူထုတွေ့ဆုံဆွေးနွေးပွဲများ၏ မှတ်တမ်းများအရ စီမံ ကိန်းသည် ဒေသခံပြည်သူများနှင့် ဒေသခံအသိုက်အဝန်းများထံမှာ သင့်တင့်မျှတသောအထောက်အ ပံ့အကူအညီများရရှိထားပါသည်။ ထို့ကြောင့် တိရစ္ဆာန်အစာထုတ်လုပ်သည့်စက်ရံမှ အနီးအနားရှိ ဒေသခံပြည်သူများအတွက် စွမ်းဆောင်ရည်နှင့် ကျွမ်းကျင်မှုတို့ကို မြှင့်တင်ဆောင်ရွက်ပေးခြင်းဖြင့် အလုပ်အကိုင်အခွင့်အလမ်းများ ဖန်တီးပေးလိမ့်မည်ဟု မျှော်လင့်ထားပါသည်။ ဖော်ပြပါ စွမ်းဆောင် ရည်နှင့် ကျွမ်းကျင်မှုတို့သည် ဒေသခံပြည်သူများအသိုက်အဝန်းတွင် ရှင်သန်ကျန်ရစ်ခဲ့မည်ဖြစ်ပြီး နောက်ပိုင်းတွင် ဒေသဖွံ့ဖြိုးတိုးတက်ရေးလုပ်ငန်းများတွင် အသုံးချဆောင်ရွက်သွားနိုင်မည်ဖြစ် သည်။ ထို့ကြောင့် De Heus စက်ရုံသည် ဒေသခံအသိုက်အဝန်းမှ လုပ်သားအင်အားစုဆောင်းရေး နှင့် ဒေသခံလူငယ်များ၏ စွမ်းဆောင်ရည်တည်ဆောက်ရေးတို့ကို အားဖြည့်ဆောင်ရွက်သင့်ပါသည်။ ထိုသို့ စက်ရုံလုပ်ငန်းပတ်ဝန်းကျင်ရှိ ဒေသခံများအတွက် သင့်လျော်အလုပ်အကိုင်များ ဖန်တီးဆောင် ရွက်ပေးခြင်းဖြင့် စက်ရုံစီမံကိန်းဆောင်ရွက်ခြင်းကြောင့် ဒေသတွင်းရှိအခြေခံအဆောက်အအုံများ တိုးတက်များပြားလာခြင်းနှင့် ဒေသခံများအတွက် ဘေးအန္တရာယ်ကင်းရှင်းစေရေးနည်းလမ်းများကို ပိုမိုသိရှိလာစေခြင်းဖြင့် ဒေသခံများ၏ လူမှုစီးပွားဖွံ့ဖြိုးတိုးတက်စေခြင်းမှသည် အဆိုပါ ဒေသတွင်းရှိ စီးပွားရေးဖွံ့ဖြိုးတိုးတက်မှုကို တဖက်တလမ်းမှ အထောက်အကူပြုမည်ဖြစ်သည်။

အဆိုပြုစက်ရံလုပ်ငန်းသက်တမ်းတလျှောက် ပတ်ဝန်းကျင်၊ ကျန်းမာရေး၊ ဘေးအန္တရာယ်ကင်းရှင်း ရေးနှင့် လူမှုရေးဆိုင်ရာ တာဝန်များကို ထိရောက်စွာ အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်းသည် လွန်စွာအရေးကြီးပါသည်။ ထို့ကြောင့် စက်ရံလုပ်ငန်းဆောင်ရွက်သူသည် ပတ်ဝန်းကျင်ထိန်းသိမ်းဦး စီးဌာနမှ ချမှတ်ထားသော လုပ်ထုံးလုပ်နည်းများကို တင်းကျပ်စွာ လိုက်နာဆောင်ရွက်သင့်ပါကြောင်း အခိုင်အမာထောက်ခံပါသည်။ သက်ဆိုင်ရာဌာနမှ ပတ်ဝန်းကျင်နှင့်လူမှုရေးဆိုင်ရာစီမံခန့်ခွဲရေးအစီ အစဉ်ကို အတည်ပြုပြီးပါက စက်ရုံအနေဖြင့် ၎င်း၏ကတိကဝတ်များကို လက်တွေ့အကောင်အ ထည်ဖော်ဆောင်ရွက်သွားရန် အရေးကြီးပါသည်။ အတွေ့အကြုံရှိပြီး ဗဟုသုတကြွယ်သော ကျန်း မာရေး၊ လူမှုရေးနှင့်ပတ်ဝန်းကျင်ဆိုင်ရာဝန်ထမ်းများကို မဖြစ်မနေခန့်အပ်ဆောင်ရွက်သွားပြီး မြန်မာ နိုင်ငံအစိုးရမှ ထုတ်ပြန်ထားသော ပတ်ဝန်းကျင်ဆိုင်ရာမူဝါဒများ၊ ဥပဒေများနှင့် လုပ်ထုံးလုပ်နည်း များကို လိုက်နာဆောင်ရွက်သွားရန်လည်း လိုအပ်ပါကြောင်း သုံးသပ်အကြုံပြုပါသည်။

#### 2. INTRODUCTION

De Heus Myanmar, a wholly owned foreign investment from the Netherland, is expanding its wing in Myotha Industrial Zone near Mandalay by building another 600 tons per day capacity animal nutritional feeds manufacturing plant. In order to respond to increase demands from upper Myanmar, Myo Tha Industrial Zone offers the best option as its convenient location has strategical importance for easy access to abundant raw materials from upper Myanmar. In addition, having located at the junction to support all demands from upper Myanmar, the proposed site adds advantages for economic prospects of the project.

#### 2.1 Presentation of the Project Proponent

De Heus Headquarter is located in the Netherlands and has been in the business of producing animal nutritional feeds over a century. De Heus Group has been listed as one of the top 15 feed suppliers globally. It employed over 5,000 peoples worldwide and has widened its representation in 60 countries. Due to the rapid growth, De Heus Group has networks of manufacturing plants and sale offices in Brazil, Czech Republic, Myanmar, Poland, Portugal, Serbia, South Africa, Spain, The Netherlands, and Vietnam. Experience and further enrichment from researches and developments have put De Heus to be one of the top distributors in animal nutritional feed business globally.

De Heus supported Myanmar farmers for several years before having decided to establish the first plant in Myanmar in 2016 with the commitment to bring further professionalization of livestock farming in the country. De Heus introduced its operating activities in Myanmar in 2015, under the name De Heus Myanmar Limited, and has been operating animal nutritional feeds plant in Myaung Dakar Industrial Zone near Yangon, producing 205 tons per day of animal nutritional feeds since 2016.

Following the achievements from De Heus Myanmar's typical manufacturing in Myaung Daka Industrial Zone near Yangon, De Heus Myanmar plans to establish another successive manufacturing plant in Myotha Industrial Zone.

De Heus Myanmar Limited Office is located at:

No. 12/L, Pyay Nyein Thu Condo Penthouse,

Pyi Thu Street, 7 miles,

Mayangone Township, Yangon.

Telephone: +959420038474/ +959797023466

Email address: aaron.aung@deheus.com Website: <u>www.deheus.com.mm</u>

Executive Board of De Heus Myanmar Ltd. is shown in the following Table:

Name	Citizenship	Position
Mr. Filip August Lauwerysen	The Netherlands	Director
Mr. Gabor Fluit	The Netherlands	Director
Mr. Johan Christian van den Ban	The Netherlands	Director
Mr. Koenraad Jacob De Heus	The Netherlands	Director
U Aye Maung Zan	Myanmar	Director

Table 1: Members of Executive Board of De Heus Myanmar Ltd.

De Heus Myanmar has commissioned Social and Environmental Associate-Myanmar (SEAM) to conduct an ESIA process for the proposed Project in strict compliance with applicable national laws, rules, and regulations issued especially by the Environmental Conservation Department (ECD) under the Ministry of National Resources and Environmental Conservation (MONREC).

#### 2.2 Presentation of the ESIA Consultant

Social & Environmental Associates – Myanmar (SEAM) is an established and registered environmental and social consulting firm, but its strong team possesses extensive and distinguished experiences in the trait. In addition, SEAM offers utmost emphasis and attentive priority for social and environmental assessments and conservation measures to negate potential social and environmental impacts caused by the project's activities. SEAM's members are as follows:

Sr.	SEAM Team members	Degree	Part of the Report Responsible
1	Dr. Zin Mar Lwin	Ph. D (Ensci:); Agri and environmental specialist	Overall review of the report, public consultation, impact assessment, and EMP
2	Dr. Aung Shein	Dr. Engg (Mining); Mine specialist	Socioeconomic and impact mitigation measures; natural environment
3	Mr. Josiah Bowles	M. Sc (W. engineering); Senior field specialist	Environmental impacts assessment, mitigation measures, and EMP formulation, making assessment on wastewater contamination
4	Daw Khing Thwe Oo	M. Sc (Air Quality); Air quality specialist	Air quality monitoring and hazardous waste management
5	Daw Kaythi Soe Myint	<u>M.P.H</u> , B. Sc (Hons) Zoology, Biodiversity, Social and health specialist	Overseeing socio-economic survey and public consultation, making assessment on flora and fauna survey

Table 2:	Expert	Members	of Social	and E	nvironmental	Associate	-Mvanmar	(SEAM)
	r							(~~~~)

Sr.	SEAM Team members	Degree	Part of the Report Responsible
6	U Min Zarni Aung	B.Tech (Mining); Field specialist (air and biodiversity)	Conducting air quality field survey, biodiversity survey, and assisting in public consultations
7	U Nay Soe Tun	B. Sc (Geology); Field specialist (soil)	Conducting field survey for soil and geology, collecting information on current environment, biodiversity survey, and assisting in public consultations
8	U Than Soe	B. Sc (Maths); Technical Assistant for social assessments	Conducting socio-economic surveys and assisting in public consultation
9	U Win Aung	Completed high school; Field Assistant (biodiversity)	Conducting socio-economic surveys, helping with biodiversity survey, and assisting in public consultation
10	U Min Min Oo	B.A (Myanmar); Health and safety specialist	Health and safety policies and inspections
11	Daw Su Su Mon	B.E (Chemical); Water quality specialist	Executing water quality survey, assessing water contamination sources, helping to identify pollution sources, and developing mitigation measures
12	Dr. War War Han	B.V. Sc; Poultry and fowls breeding specialist	Making assessment of chicken hatchery application from the health perspectives
13	Daw Yin Yin Nwet	M.Sc (Agri. Eco.) Social and Public Consultation specialist	Outline a strategy for the most efficient and meaningful consultation, organize the meeting, making assessment of social issues
14	U Khin Zaw	B.Sc (Computer) Technical writer & biodiversity specialist	Proofreading, editing and developing the report, making assessment on biodiversity survey
<mark>15</mark>	Daw Mya Pwint Phyu	M. Sc (Botany)	Overseeing biodiversity studies, drafting biodiversity report, drafting ESMP for biodiversity management, and assisting in drafting ESIA report
<mark>16</mark>	Daw Shwe Sin Htun	BE(Electronics), Diploma in Project Management (ICM)	Water Quality Field Specialist, Social Survey
<mark>17</mark>	Daw Aye Phyo Phyo Khine	MBA	Legal Analysis and Social Assistant

In addition to SEAM's regular social team, it is going to reinforce with public consultation specialists. SEAM is committed to develop objective ESIA, which emphasizes on both adverse impacts and positive outcomes incurred by the project related activities and deals with sufficient mitigation measures to address these adverse impacts.

SEAM is located at No. (76) Myitzuthaka Street, Apine (4), Paukkone, Mingalardon, Yangon

SEAM contact information is as follows: Phone number: 09269410460 and 09795852122 Email: <u>seamgroup@myseam.com</u>

SEAM has been incorporated under the Myanmar Companies Act 1914 on 4 May 2017 as a private company limited by shares and its company registration No. 102690923 has been renewed every year. In compliance to Environmental Conservation Department (ECD) requirement, SEAM has received the Environmental Consultant registration certificates no.00045 from ECD.

#### 3. POLICY, LEGAL, AND INSTITUTIONAL FRAMEWORK

The following section examines the national legal framework of Myanmar and relevant policies of the project with regards to environmental, working conditions, and welfare of workers. The objective of the national legal framework and the policies are to ascertain avoidance of environmental and social adverse impacts as much as possible, to make proactive mitigation measures as early as applicable, and to maximize positive effects of the project throughout its life.

Recently renamed the Ministry of Natural Resources and Environmental Conservation (MONREC), formerly known as the Ministry of Environmental Conservation and Forestry (MOECAF), has been striving to develop environmental conservation and pollution control mechanism. To supplement the Environmental Conservation Law promulgated in 2012, Environmental Impact Assessment (EIA) rules and regulations were enacted in June 2014. EIA Procedure was finalized and stipulated in December 2015. Environmental and Social Impact Assessment (ESIA) for De Heus Myanmar's project has been conducted strictly in line with the existing ESIA rules, regulations, and procedures of Myanmar.

According to the EIA procedure, developed under Annex 1, Section 47 of the Environmental Conservation Law, manufacturing animal nutritional feeds  $\geq$  300 tons/day product or  $\geq$ 600 tons/day if production is operating a maximum of 90 days, require development of ESIA and therefore, the proposed plant with the production capacity of 600 tons/day throughout a year requires to satisfy the ESIA process.

#### **2008** Constitution

Act 45. The Union shall protect and conserve natural environment. Act 390 (B) Every citizen has the duty to assist the Union in carrying out environmental conservation.

#### 3.1 Environmental Conservation Law (2012)

The Environmental Conservation Law (2012) is the main governing law and the principal objectives of this Law are:

- (a) To enable to implement the Myanmar National Environmental Policy
- (b) To enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process
- (c) To enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generations
- (d) To reclaim ecosystems as may be possible which are starting to degenerate and disappear
- (e) To enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially
- (f) To enable to implement for promoting public awareness and cooperation in educational programmes for dissemination of environmental perception and
- (g) To emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefits of present and future generation

In Section 3 of the Environmental Conservation Law (2012), it stipulates the following duties and functions and powers regarding the environmental conservation:

- a) To specify categories and classes of hazardous wastes generated from the production and use of chemicals or other hazardous substances in carrying out industry, agricultural, mineral production, sanitation and other activities.
- b) To prescribe categories of hazardous substances that may affect significantly at present or in the long run on the environment.
- c) To promote and carry out the establishment of necessary factories and stations for the treatment of solid wastes, effluents and emissions which contain toxic and hazardous substances.
- d) To prescribe the terms and conditions relating effluent treatment in industrial estates and other necessary places and building and emissions of machines, vehicles and mechanisms.
- e) To lay down and carry out a system of EIA and SIA as to whether or not a project or activity to be undertaken by any Government department, organization, or person may cause a significant impact on the environment.
- f) To manage to cause the polluter to compensate for environmental impact, cause to contribute fund by the organizations which obtain benefit from the natural environmental service system, cause to contribute a part of the benefit from the businesses which explore, trade and use the natural resources in environmental conservation works.

According to Section 7 (O) of Environmental Conservation Law (2012), duties and power of MONREC indicted that managing to cause the polluter to compensate for environmental impact, cause to contribute fund by the organizations which obtain benefit from the natural environmental service system, cause to contribute a part of the benefit from the businesses which explore, trade and use the natural resources in environmental conservation works.

In concerining with prior permission, the section 24 of (ECL 2012) mentioned that the Ministry may, stipulate terms and conditions relating to environmental conservation. It may conduct inspection whether or not it is performed in conformity with such terms and conditions or inform the relevant Government departments, Government organizations to carry out inspections.

The section 29 of the (ECL 2012) also mentioned that, noo one shall violate any prohibition contained in the rules, notifications, orders, directives and procedures issued under this Law.

For Environmental Quality Standards:

<u>10. The Ministry may, with the approval of the Union Government and the Committee</u> stipulates the following environmental quality standards:

(a) suitable surface water quality standards in the usage in rivers, streams, canals, springs, marshes, swamps, lakes, reservoirs, and other inland water sources of the public

(b) water quality standards for coastal and estuarine areas

(c) underground water quality standards

(d) atmospheric quality standards

(e) noise and vibration standards

(f) emission standards

(g) effluent standards

(h) solid wastes standards

(i) other environmental quality standards stipulated by the Union Government

The Environmental Conservation Law (2012) is the main governing law and the principal objectives of this Law are:

- a) To emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefits of present and future generation; and
- b) To enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially.

The Environmental Conservation Law (2012), in Section 10 also stated the following environmental quality standards:

- a) Suitable surface water quality standards in the usage in rivers, streams, canals, springs, marshes, lakes, reservoirs and other inland water sources of the public;
- b) Water quality standards for coastal and estuarine areas;
- c) Underground water quality standards;
- d) Atmospheric quality standards;
- e) Noise and vibration standards;
- f) Emissions standards
- g) Effluent standards;
- h) Solid waste standards;
- i) Other environmental quality standards stipulated by the Union Government.

In Section 13 of the law stated that the Ministry shall, under the guidance of the Committee, maintain a comprehensive monitoring system and implement by itself or in coordination with relevant Government Departments, and organizations in the following matters:

- a) The use of agro-chemicals which cause to impact on the environment significantly;
- b) Transport, storage, use, treatment and disposal of pollutants and hazardous substances in industries;
- c) Disposal of wastes which come out from exploration, production and treatment of minerals, industrial mineral raw materials and gems;
- d) Carrying waste disposal and sanitation works;
- e) Carrying out development and construction works;
- f) Carrying out other necessary matters relating to environmental pollution.

In Sections 14, 15, and 16, the law also highlights the duties and responsibilities of the project proponents/business owners require the project/business be carried out in a manner that does not cause environmental impacts or damages.

#### 3.1.1 Environmental Conservation Rules (2014)

The basic principles of this Rule stated that how the EIA (ESIA) or IEE report should be prepared and submitted by any organization or person relating to EIA and how they are reviewed and approved by the reviewer of the Government body. Rule 58 mainly deals with how the Ministry shall form the EIA Report Review Body with the experts from the relevant Government Departments, and organizations, whereas Rule 59 mandates on how the submitted EIA report be scrutinized by the assigned personnel of the Ministry. Rule 61 states on how the Ministry may approve and reply on the EIA report or IEE report or EMP report.

58. The Ministry shall form the Environmental Impact Assessment Report Review Body with the experts from the relevant Government departments, Government organizations for reviewing the Environmental Impact Assessment.

59. If the private persons are included in the Environmental Impact Assessment Report Review Body, honorariums, allowances, and aids for them may be borne from the environmental management fund.

60. The Ministry may assign duty to the Department to scrutinize the report of environmental assessment prepared and submitted by a third person or organization relating to environmental impact assessment and report through the Environmental Impact Assessment Report Review Body.

61. The Ministry may approve and reply on the environmental impact assessment report or environmental management plan with the guidance of the Committee.

69. According to EC Rules no 69 (a) and (b) the developer will comply not emit, cause to emit, dispose, and cause to dispose, pile and cause to pile, by any means, the pollutants to environment and the hazardous waste or hazardous material stipulated by notification under the Law and shall not carry out the actions which can be damaged to natural environment which is changing due to ecosystem and such system, except the permission of the relevant Ministry in order to the interest of the public.

#### 3.1.2 Environmental Impact Assessment Procedures (2015)

The EIA Procedures (2015) stipulates the detail procedures to be followed by any organization or person relating to EIA in conducting the EIA process. Generally, according to Section 23 of EIA Procedure (2015), project proposal starts with the screening process and the ECD will determine the need for environmental assessment. The department will determine, taking into account the Articles 25 and 28, a solution to designate the project as one of the following project type:

- 1) An EIA type project, or
- 2) An IEE type project, or

3) A non IEE or EIA type project, and therefore any environmental assessment is not required to undertake.

In Section 24, the EIA Procedures (2015), also states that the Ministry shall approve on whether an EMP will be needed in respect of any project.

23. Screening

(a) The Project Proponent shall submit a Project Proposal in full to the Ministry for preliminary screening. Under the procedure, submission of the Project Proposal shall mean the application for the prior approval.

(b) The Ministry shall send the Project Proposal to the Department in order to determine the category of such project.

24. The Ministry shall select and determine other Projects or economic activities for which the Environmental Management Plan is required to be prepared.

25. The Environmental Impact Assessment shall be carried out if such project is located in regions and areas protected at the National, Regional, and State level including but not limited to areas of conserved forestry and biodiversity, public forest estate, parks including marine parks, mangrove areas, other important coastal areas, nature reserves, forest reserves, landmarks protected for geo-physical purposes, lands protected for scientific purposes, other nature reserves announced by the Ministry. In addition, the said Assessment shall be carried out if such projects are located or situated without limitation in protected cultural and archeology sites or historical sites or if they might have foreseen potential adverse impact thereon (such sites).

28. In screening for a project or project extension as to the type of environmental assessment the Project will require Article 23, the Department shall, with the guidance of the Ministry, consider emergency measures for the project, health and safety of the public, national security, project term, protection of cultural or religious norms, and historical or religious heritage, protection of regions, which can be affected by cyclones, storms, floods, Sagaing Fault, and earth quakes, as well as natural disasters, protection of water sources, and all other important factors that might be considered vital for conservation.

According to the contents of articles 102, the proponent shall bear full legal and financial responsibility for the proponent and its all subcontractor's actions and omissions. The Project Proponent shall fully implement the EMP, all Project commitments, and conditions, shall timely notify and identify Project's potential adverse impacts writing to the Ministry, shall engage in continuous, proactive and comprehensive self-monitoring of the Project and activities, shall notify and identify in writing to the Ministry any breaches of its obligations or other performance failures, shall submit monitoring reports to the Ministry by the completion of the EIA study and its related process of ECC.

#### 3.1.3 National Environmental Policy (1994)

The policy's main objective is to achieve harmony and balance between socio-economic, natural resources and environment through the integration of environmental considerations into the development process enhancing the quality of life of all its citizens.

#### 3.1.4 Myanmar Constitution Law (2008)

In Section 45 of Myanmar Constitution (2008), it has been stated that the Union shall protect and conserve natural environment. In Section 390 (b) it also highlights that every citizen has the duty to assist the Union carrying out the environmental conservation.

#### 3.2 Relevant Legislation, Laws, Rules and Regulations

This Section provides a summary of other relevant national laws, rules and regulations for environmental protection applicable to the proposed project. These include some policies, regulations on environmental impact assessment and environmental management plan, the Export and Import Law (2012), Foreign Investment Law (2012) and Rules (2013), Prevention of Hazard from Chemicals and Related Substances Law (2013), Boiler Law (2015), Land Acquisition Act (1894). Conservation of water resources and rivers law, Land Acquisition Act, Foreign Investment Law, etc.

#### 3.2.1 The Export and Import Law (2012)

The main objectives of this law are as follows:

- a) To enable to implement the economic principles of the State;
- b) To enable to lay down the policies relating to export and import that supports the development of the State;
- c) To cause the policies relating to export and import of the State and activities are to be in conformity with the trade standards; and
- d) To cause to be streamlined and speedy in carrying out the matters relating to export and import.

The law stipulates, in Section 5 that no person shall export and import the restricted, prohibited, and banned goods and Section 6. Without obtaining license, no person shall export or import the specific goods, which is to obtain permission. 6 states that permitted license should be obtained if any organization or person would like to do export and import business in the State.

#### 3.2.2 Foreign Investment Law (2012) and Rules (2013)

8. The investment shall be permitted based on the following principles:

- (a) supporting the main objectives of the economic development plan, business which cannot be affordable and which are financially and technologically insufficient by the Union and its citizen
- (b) development of employment opportunities.

17. Thorough comprehension of all the duties of an investor.

The Foreign Investment Law (FIL) and Rules clarify Myanmar's foreign investment framework. Basic principles of the FIL, in Section 8, stated that the investment be allowed in a manner that: a) supports the primary objectives of the National Economic Development plans, b) protects and conserves the environment and developments to save energy consumption, and c) provides the development of employment activities. Section 17 states the duties and rights for the investors to be followed that the business be carried out in a manner that does not cause environmental pollution or damage according to existing laws.

Rule 54, of Chapter 4 in Foreign Investment Rules (2013) states that the promoter or investor shall:

- (a) Comply with Environmental Protection Law in dealing with environmental protection matters related to the business.
- (b) Carry out socially responsible investment in the interest of the Union and its people.
- (c) Co-operate with authorities for occasional or mandatory inspection.
- (d) Exercise due diligence to be in conformity and harmony with norms and standards prescribed by relevant Union Ministry in conducting construction of factories, workshops, buildings, and other activities.
- (e) Enforce Safety and Health measures in the workplace.
- (f) Exercise in conformity and harmony with terms and conditions, and standards prescribed by relevant Ministry in transporting, storing, and utilizing hazardous, toxic and other similar materials.

In compliance with Foreign Investment Law (2012) and Rules (2013), De Heus Myanmar has sought MIC permit and has assumed ESIA study with independent ESIA consulting group to satisfy MONREC's requirements.

#### **3.2.3** Foreign Investment Rules (2013)

54. If the business of the promoter or investor is necessary to obtain the license or permit from the relevant Union Ministries, Government Departments, and Organizations according to the nature of the investment business or other requirements; or necessary to register, it shall be continued to carry out in accord with the stipulations.

#### 3.2.4 Myanmar Investment Commission Notification No. 1 of 2013

The Myanmar Investment Commission Notification No. 1 approved in 2013 includes a list of Economic Activities (No. 3) which require an EIA. That includes the list of criteria for determination of IEE or EIA requirements. The proposed manufacturing of high-quality animal nutritional feeds lies in the ESIA required category as mentioned above. The ESIA study has been in progress strictly in compliance with the guidance and procedure from ECD.

#### 3.2.5 Prevention of Hazard from Chemicals and Related Substances Law (2013)

The law requires that import, export, and handling of chemicals, related substances, and hazardous materials shall be carried out only with the specific permission from the concerned ministry. The law is stipulated to protect harm to the natural environment and the living beings by those chemicals and related substances.

This law was enacted in August 2013 for the safe use and disposal of hazardous chemicals. The law stipulates how potentially hazardous chemicals should be used, stored, handled, and disposed of. It also mandates the use of international standards for categorizing and labelling chemicals known as the Global Harmonize System of Classification and labelling of chemicals, which is widely used in the ASEAN countries. The main objectives of the law are:

- a) To protect from being damaged the natural environmental resources and being hazardous any living beings by chemical and related substance;
- b) To supervise systematically in performing the chemical and related substances business with permission for being safety;
- c) To perform the system of obtaining information and to perform widely educative and research for using the chemical and related substance systematically;
- d) To perform the sustainable development for the occupational health, safety, and conservation.

De Heus pledges to uphold the requirements and to abide by the law. All chemicals and related substances will be procured as directed and all storages and handling will be in conformity to the requirements.

#### **3.2.6** Boiler Law (2015)

2015 Boiler law requires that a boiler meets the standard, safety, energy efficiency, and maximum life span. The law also requires to renew the certification from the state authorities annually.

The Law was enacted for the safe use of boilers to prevent the country and citizens from hazards caused by boiler accidents, and to reduce the environment, social and health impacts through long-lasting use of boilers Chapter 2 states the main objectives of the law and Chapters 3 and 4 stipulates how boilers should be registered and used in compliance with Myanmar Standards or International Standards within the country. The Law also describes rules and regulations regarding "do's and don'ts" to be followed by the boiler users for effective utilization and maintenance of boilers and efficient use of energy and resources. In addition, the law also highlights the development and provision of boiler technology and experts for proper manufacturing, handling, repair and maintenance of boilers.

#### 3.2.7 Land Acquisition Act (1894)

The law does not specifically define legislations for EIA process. It stipulates that: a) the government holds rights to take over land provided that the compensation 'at market value' is

made to the original land owner; b) no private ownership of land is permitted and that all land must be leased from the Union State.

#### 3.2.8 Myanmar Investment Law (2016)

Myanmar Investment Law (2016) has been enacted to promote sustainable investment to Myanmar without causing harm and adverse effects to the environment and the social conditions of the country. In addition, the law protects investors and their investments, create employment opportunities, and to bridge capacity building for human resources development and technical improvements. With the law, the commission is formed to oversee the foreign investments and protect Myanmar's interests. The factory understands that while doing business for profit, the factory is determined to keep it in line with the Myanmar government's requirements.

#### **3.3** Miscellaneous Laws and Regulations

These Laws and regulations have been issued by the government of the Union of Myanmar, and include National Food Law(1997), Conservation of water resources and rivers law (2006), Social Legislation, the Private Industrial Enterprise Law(1990), Factories Act 1951, Laws on Health and Safety on the workplace (2014), Public Health Law (1972), Minimum Wage Law (2015), The Prevention and Control of Communicable Diseases Law(1995), Animal Health and Development Law (1993), etc.

#### 3.3.1 National Food Law (1997)

This law was enacted for the public to provide food of genuine quality, to protect public from foods that may cause danger or are injurious to health, and to regulate production, import, export, storage, distribution, and sale of food systematically. The law also describes the formation of the Board of Authority and equips its functions and duties.

#### 3.3.2 Conservation of Water Resources and Rivers Law (2006)

The aims of this law are as follows:

- (a) To conserve and protect the water resources and rivers system for beneficial public utilization.
- (b) To protect smooth and safe navigation in waterways along rivers and creeks.
- (c) To contribute to the development of the State economy through improving water resources and rivers system, and
- (d) To protect against environmental impacts.

Hence, this law prohibits disposal of unsatisfactorily treated wastewater into water sources.

#### 3.3.3 Social Legislation

A synopsis has been presented below of the social legislation and regulations that are considered relevant to food industries. The Myanmar has ratified numerous International Labor Organization Convention. According to the Section 21 of Myanmar's Constitution, the government must provide the means to protect workers and must ensure acceptable working conditions for workers.

#### **3.3.4** The Private Industrial Enterprise Law (1990)

The law stipulates that how the private industrial enterprises shall conduct the business in accordance with the following principles:

- a) To enhance the higher proportion of the manufacturing value added on the gross national product and value of services, and to increase the production of the respective economic enterprises which are related to the industrial enterprises;
- b) To acquire modern technical know-how for raising the efficiency of industrial efficiency of industrial enterprises and to establish the sale of finished goods produced by the industrial enterprise not only in the local market, but also in the foreign market;
- c) to cause narrowing down of the gap between rural development and urban development by causing the development and improvement of industrial enterprises;
- d) to cause opening more employment opportunities;
- e) to cause avoidance of or reduction of the use of technical know-how which cause environmental pollution; and
- f) to cause the use of energy in the most economical manner.

#### 3.3.5 Factories Act 1951

The Factories Act 1951 is the principal labor law covering safety, health, welfare and working hours of industrial workers in Myanmar. It is an act to safeguard occupational safety for workers. It stipulates requirements for working hours, working days, overtime, and certain health and safety measures. The provisions entail a healthy and safe environment for workers. Work hours and days of rest in the provision ensure limiting of works to 8 hours a day and 44 hours a week, granting a day off and a specific rate of payment for overtime work. The Factories Act also imposes minimum age limit for laborers. A child under the age of 13 years is prohibited from working in any factory. A child who is between 13 and 15 years of age may work for a maximum of 4 hours a day subject to certain conditions.

#### 3.3.6 Public Health Law (1972)

It offers protection for people's health by regulating the quality and cleanliness of food, drugs, and environmental sanitation. It also guides prevention of epidemic diseases and outlines the regulations for private clinic.

#### 3.3.7 Law on Health and Safety in the Workplace (2014)

The first law on safety and health in workplaces was drafted by the Ministry of Labor, Employment and Social Security and was promulgated in 2014. The law aims to prevent air and water pollution and seeks safety improvement at work sites, including fire prevention, use of personal protective equipment, and emergency preparedness for natural disasters.

#### 3.3.8 Minimum Wage Law, 2015

Myanmar recently promulgated a statutory minimum wage law on August 28, 2015. On the 19<sup>th</sup> March 2013, the Myanmar Parliament approved the 2013 Minimum Wage Bill and a new law on minimum wages (Law No. 7, dated 22 March 2013) came into effect on 4 June 2013. While a proposed general minimum wage has not been released yet, the minimum salary for workers in industrial zones was temporarily set at 56,700 kyat (about 65 USD) per month. In August 2015, National Minimum Wage Committee sets the minimum wage at 4800 Kyats for an eight-hours work day.

This law requires equal treatment of workers without discriminating based on gender. As Minimum Wage Law requires, equal opportunities and pay rate for both sexes, promised minimum wage for workers, and adequate overtime payments will be guaranteed by the factory management. These will be clearly stated in the ESMP and will be implemented throughout the operation. The factory ensures that the workers' minimum wage, currently set at 4,800 Kyats per day, exceeds the rate determined by the minimum wage law. In addition to the minimum wage and fair compensation for overtime fee, the factory offers paid sick leave with reimbursement for medical care.

On 14 May 2018, the National Minimum Wage Committee finally issued Notification 2/2018, repealing and replacing Notification 2/2015. With immediate effect, employees in the entire Republic of the Union of Myanmar – regardless of the location or the type of business – shall enjoy an increased minimum wage of 4,800 Kyat per working day with eight (8) working hours (i.e. 600 Kyat per working hour). Bel Ga's minimal wage and overtime rate are already in line with the Myanmar Government's new requirements.

#### 3.3.9 The Employment and Skill Development Law (2013)

In the bid to create higher employment opportunities, to enhance labour skill developments for workers, and to combat unemployment, the Employment and Skill Development Law was enacted in 2013. In accordance with the law, a central level body will be established to formulate and oversee job creation and skill development. With the skill development scheme, employers are required to conduct on-the job training and offer training and developments to the workers. The factory is committed to skill developments of the workers and has set up plans to offer improvement trainings.

#### 3.3.10 Labor Dispute Settlement Law (28 Mar. 2012)

This Law was enacted in March 2012, for safeguarding the right of workers or having good relationship between employer and workers and making peaceful workplace or obtaining the rights fairly, rightfully and quickly by setting the dispute of employer and worker justly.

#### 3.3.11 Animals and Animal-products Import/Export Rules and Regulations (June 2013)

Import of animals and animal-product requires unexpired license with details documentation of items from the original country. Medical clearance from a certified veterinarian is required

for each type of animals or animal-products. The place of origin should be free from Fowl plague, Salmonella pullorum, Avian Encephalomyelitis, Egg-drop syndrome, Parvo Virus Infectious Anaemia, and Ornithosis diseases at least in the past six months. The importer is required to ensure that these animals or animal-products will not be in touch with other animals. If required, quarantine period of 14 to 30 days will be placed at Myanmar Center for Disease Control station with the cost of the importer. De Heus Myanmar understands the regulatory requirements and adheres to these regulations.

#### 3.3.12 The Prevention and Control of Communicable Diseases Law (1995)

The law was enacted in March 1995 and revised in 2011. It describes functions and responsibilities of health personnel and citizens in relation to prevention and control of communicable diseases and epidemic diseases. It also highlights measures to be taken in relation to environmental sanitation, reporting and control of outbreaks of epidemics and penalties for those fail to comply. The law also authorizes the Ministry of Health to issue rules and procedures when necessary with approval of the government.

Section 5 (a) of Chapter 5 denotes that an authorized health officer shall perform the inspection of the infected house, food processing plant/factory, place of work, markets and shops, other necessary premises, location, buildings and causing sanitation and other necessary measures to be carried out. In Section 5 (i), it clarifies that the health officer shall perform directing the destruction of or ban on the sale of food causing or suspected of causing the spread of a Principal Epidemic Disease or the closure of the factory, mill, place of work, markets or shops producing or selling such food.

The Chapter 4 of the law indicates the measures for the public to, under the supervision and guidance of the authorized health officer, perform the prevention of the Communicable Disease and effective control of Communicable Disease when it occurs.

#### 3.3.13 Animal Health and Development Law (1993)

The law was enacted in November 1993. The main objectives of the law are mentioned in Section 3 of Chapter 2 as follows:

- a) to carry out animal health and development work;
- b) to promote livestock development;
- c) to prevent outbreak of contagious disease in animals and to control the outbreak systematically when it occurs;
- d) to inspect imported animal, animal products and animal feeds;
- e) to issue recommendation certificate concerning animal, animal product and animal feed for export; and
- f) to protect animals by law from being ill-treated.

The law also defines "Animal Feed" as a feed sold on a commercial scale for the purpose of feeding animals and which is scientifically prepared or conventionally mixed or without preparation or mixing.

In Section 5 of Chapter 4 clarifies that the Director General may:

- a) inspect animal feed for domestic sale in the prescribed manner;
- b) prohibit further sale of animal feed if it is found that the animal feed for sale is harmful to animal;
- c) Make a list of animal feed sellers.

Furthermore, Section 6 denotes that a person who sells animal feed, in respect of the animal feed he sells:

- a) submit for inspection by the Department; and
- b) Abide by the prohibition made by the Department in accordance with the law.

The law also describes measures to be taken in relation to punishment and fines for those who fail to comply.

#### 3.3.13 The Conservation of Water Resources and Rivers Law (2006)

The Conservation of Water Resources and Rivers Law was enacted to assure protection and conservation of the natural water systems, to promote sustainable utilization of the sources, to improve navigation, and finally to contribute for the development of the country. The Ministry is tasked with implementation of these requirements and overseeing the effective utilization of all water sources to prevent wasteful acts.

#### 3.3.14 Race and Religious Protection Laws (2015)

Combination of four laws make up Race and Religious Protection Laws signed in effect in 2015. The laws prohibit forced conversion from one faith to another and requires legal approval for interfaith marriages. In addition, the laws make it punishable to exercise monogamy in the country and prohibit extramarital affairs. The factory will strictly abide these requirements.

# 3.3.15 The Leave and Holidays Act (1951) and The Law Amending the Leave and Holidays Act (2006)

The outdated Leave and Holidays Act of 1951 was amended on 20016 covering earned leave for every employee who provides 12 months continuous service, number of leave and holidays, and higher penalty for infringements. The factory will strictly abide by the requirements and will never neglect leave and holidays for its employees.

#### 3.3.16 Myanmar Insurance Law (1993)

Myanmar Insurance Law was enacted to establish state owned insurance for overcoming the cost of damages, liabilities, and losses. The law defines requirements for particular insurances and the amount for coverage. As a private entity, firms and factories may require certain insurances as defined by the relevant authorities. The factory is committed to meet the insurance requirements set by the concerned authorities.

#### 3.3.17 Automobile Law (2015) and Motor Vehicle Rules (1989)

2015 Automobile Law regulates purchasing, registering, operating, proper licensing, and the use of automobiles in general. On the contrary, 1989 Motor Vehicle Rules set details requirements of vehicles, registrations, and licensing for various uses. In addition, the 1989

rules define regulations for pedestrians and cyclists as well. The factory will always be in line with this law for all aspects of the use of automobiles in the factory's operations.

#### 3.3.18 Myanmar Fire Brigade Law (2015)

Fire Brigade Law regulate establishment of fire extinguishing responsibilities and prevention measures to protect fire incidents. The factory is required to meet the fire safety standards and fire fighting measures to prevent and respond accidental fire. The factory instantly seeks the relevant fire brigade's advice and set the cooperation to extinguish any fire together with the fire departments. The factory's fire safety mechanisms are in place and regular training are underway to get ready for the unforeseeable incidents.

#### 3.3.19 Petroleum and Petroleum Products Law (2017)

Fossil fuel, any types of goods extracted from petroleum, import, export, transportation, transit, storage, refinery, possession, distribution, and inspection are covered in this law. The law aims to control such items in business in accordance with the requirements, to guarantee safety in operation, and to guarantee the Union's energy requirements and security. Licenses are required to import, export, operate, store, and transport petroleum and its products. The law also stipulates several prohibitions to prevent any use with ill intention.

#### 3.3.20 Protection and Preservation of Cultural Heritage Law (1998)

In 1998, the *Protection* and *Preservation* of *Cultural Heritage* Regions *Law* was enacted. The aim of this *Law* is to implement the protection and preservation policy with respect to perpetuation of *cultural heritage*.

#### **3.3.21** The Protection and Preservation of Antique Objects Law (2015)

The law promulgated in 2015 aims to implement the policy of protection and preservation for the perpetuation of antique objects, to uplift hereditary pride, and to have public awareness of the vale of antique objects. The law assigns the ministry to protect, preserve, excavate, collect, and research of antique objects. The law prohibits smuggling of antique objects to other countries by all illegal means. The Ministry has the right to protect and preserve antique objects as cultural heritage after transferring it from the relevant owner or the right holder by awarding extra payment for historical and cultural value in addition to well-deserved current price if it is assumed that it may be damaged, decayed, destroyed or to be destroyed if it is moved.

#### 3.3.22 The Law on Preservation and Protection of Ancient Buildings (2015)

The law tasks the ministry to list the ancient buildings, to preserve these heritages, and to protect these ancient cultural heritages. In addition, the ministry is assigned to rehabilitate and maintain the existence of these buildings. The ministry's approval is required to carry out any infrastructure works in the proximity of the ancient buildings. The factory will report to the ministry if any of this legal application needs to be exercised.

#### 3.3.23 Myanmar Engineering Council Law (2013)

The law was stipulated in 2013 to uphold integrity, ethics, and capacity of Myanmar engineers. The law also intends to maintain sustainability of natural resources and human resources and to minimize environmental adverse effects by application of research and development. Standards, requirements, safety, ethics, and directives would be set by the ministry for the peoples with engineering profession. The ministry allows the engineering council to take charge of licensing engineers and upholding engineering capacity to a highest quality.

#### **3.3.24** The Employment and Skill Development Law (2013)

In the bid to create higher employment opportunities, to enhance labour skill developments for workers, and to combat unemployment, the Employment and Skill Development Law was enacted in 2013. In accordance with the law, a central level body will be established to formulate and oversee job creation and skill development. With the skill development scheme, employers are required to conduct on-the job training and offer training and developments to the workers. The factory is committed to skill developments of the workers and has set up plans to offer improvement trainings.

#### **3.3.24** Consumer Protection Law (2014) and Amendment (2019)

On 15 March 2019, the Pyidaungsu Hluttaw passed Law No. 9/2019 on the new Consumer Protection Law 2019 which repeals the previous Consumer Protection Law 2014. The intention of the passing of CPL is to promote and protect the interest of consumers over all goods and services. It will also help to clarify some of the uncertainties and ambiguities under the previous law. In the process of consumer protection, consumer's complaints are the first step of redressal. The guarantees and claimable rights are strongly vested to the consumer regarding goods and services under the Consumer Protection Law.

It provides clearer legal definition and framework for consumer protection and contains 25 chapters and 84 sections which amongst others:

- regulates the rights and obligations of consumers;
- the obligations of entrepreneur;
- mechanisms for resolving disputes between consumers and entrepreneur;
- the role of the government and responsibilities of the Consumer Protection Commission, Consumer Affairs Department, Inspector, Consumer Affairs Committee for the protection of consumers' interests;
- improvement of the quality of goods and services, guarantee; and
- claimable rights of the consumer on goods and services.

As stated earlier, the law contains mandatory labeling requirements such as goods sold to consumers must come with information showing the name, size, net weight, volume, date of manufacture, storage instruction, name and address of the manufacturer, name of the distributor, trademark, expiry date, side effects, adverse reactions and so on, and these must be written in the Myanmar language. These provisions will only be effective from 15 March 2020.

# 3.3.25 Workmen Compensation Act, 1923 [Amendment: 24.03.1955, 02.04.1957, 11.05.2005]

The workmen's compensation act has been enacted since July, 1924. However, it was amended in the years of 1955, 1957, and in May 2005, it has been finally amended. The aim of this act is to provide workmen and/or their dependents some relief in case of accidents arising out of and in the course of employment, and causing either death or disablement of workmen. The employer has to follow the liabilities for compensation in accordance with paragraph (3) of section (2) of this act. The amount of compensation is different based on the case of death related injury, permanent total disablement related to injury, permanent partial disablement due to injury, temporary disablement related to injury, and incapacity of such a nature due to injury. Moreover, on the ceasing of the disablement before the due date of any half-monthly payment, there shall be payable in respect of that half-month a sum

proportionates to the duration of the disablement in that half-month. And the injured workman shall be paid a lump sum compensation representing the probable cost of the supply and renewal of such appliances. This sum shall not exceed ten percent of the compensation payable in respect of the injury.

In terms of calculation for compensation, if the workman has been during a continuous period of not less than twelve months immediately preceding the accident, the monthly wages of the workman shall be one-twelfth of the total wages in the last twelve months of that period. If the whole of the continuous period of service immediately preceding the accident was less than one month, the monthly wages of the workman shall be deemed to be the average monthly amount earned by a workman on the same work by the same employer, or on similar work in the same locality if there was no workman. In other cases, the monthly wages shall be thirty times of the total wages earned in respect of the last continuous period of service immediately preceding the accident, divided by the number of days comprising such period.

#### 3.4 International and Regional Treaties

Myanmar has signed several international treaties related to the environment. However, the contents of those treaties still need to be incorporated into domestic law. Table 3 presents a list of the conventions signed by Myanmar to date that are potentially relevant to the Project.

#### Table 3: Relevant International and Regional Treaties

#### Sr. International and Regional Treaties Signed

- 1 Convention on the Rights of Persons with Disabilities (January 6, 2012)
- 2 International Treaty on Plant Genetic Resources for Food and Agriculture (June 29, 2004)
- 3 Convention on Biological Diversity (February 23, 1995)

#### 3.5 National and International Standards and Guidelines

In addition to national legislation, the proposed project will be undertaken to comply with a range of national and international standards and guidelines. The National Environmental Quality (Emission) Guidelines (NEQEG) (29 December 2015) was issued by the Government of Myanmar to provide standards and guidelines for the regulation and control of air quality standards, noise quality standards, waste water effluent standards, vibration quality standards, liquid discharges from various sources and odor quality requirement. Although, the NEQEG does not specify any requirement for manufacturing of animal nutritional feeds, the proposed project is to follow the general requirements stated in the NEQEG. The National Environmental Quality (Emission) Guidelines contain rules that are general in nature, as well as rules that are industry specific. The following standards and guidelines give some information stated in the NEQEG, about the general requirements regarding the air quality standard, waste water effluent standard, noise quality standard and odor quality standard respectively.

#### 3.5.1 Air Quality Standard

MONREC maintains that a project is required to preserve pre-existing air quality of a site. In accordance with the stipulated Environmental Impact Assessment Procedure (December 2015), National Environmental Quality (Emission) Guidelines (NEQEG) was adopted in late December 2015. Section 2.2 of the NEQEG does not specify particular requirements for manufacturing of animal nutritional feeds and therefore, the project is to follow general requirements stated in the NEQEG Table 4.

Parameter	Averaging period	Guideline value in µg/m <sup>3</sup>
Sulfur dioxide(SO <sub>2</sub> )	24-hour	20
	10 minutes	500
Nitrogen dioxide (NO <sub>2</sub> )	1-year	40
	1-hour	200
Particulate Matter	1-year	20
PM <sub>10</sub>	24-hour	50
Particulate Matter	1-year	10
PM <sub>2.5</sub>	24-hour	25
Ozone	8-hourly daily maximum	100

#### Table 4: General National Environmental Quality (Emission) Guideline

Source: National Environmental Quality (Emission) Guidelines, 2015.

#### 3.5.2 Waste Water Effluent Standards

Section 2.2 of the NEQEG does not specify a particular requirement for manufacturing of animal nutritional feeds and therefore, the project is to follow general requirements stated in the NEQEG. General wastewater effluent standards from the National Environmental Quality (Emission) Guidelines (29<sup>th</sup> December 2015) are illustrated in
ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ

Table **5**.

No	Parameter	Allowable Rate	Unit	Notes
1.	5-day Biochemical oxygen demand	50	mg/L	
2.	Ammonia	10	mg/L	
3.	Cadmium	0.1	mg/L	
4.	Chemical Oxygen Demand	250	mg/L	
5.	Chlorine (total residual)	0.2	mg/L	
6.	Chromium (hexavalent)	0.1	mg/L	
7.	Chromium (total)	0.5	mg/L	
8.	Copper	0.5	mg/L	S.U. <sup>a</sup>
9.	Cyanide (free)	0.1	mg/L	
10.	Cyanide (total)	1	mg/L	
11.	Fluoride	20	mg/L	
12.	Heavy metals (total)	10	mg/L	
13.	Iron	3.5	mg/L	
14.	Lead	0.1	mg/L	
15.	Mercury	0.01	mg/L	
16.	Nickel	0.5	mg/L	
17.	Oil and grease	10	mg/L	
18.	рН	6-9	S.U.a	
19.	Phenols	0.5	mg/L	
20.	Selenium	0.1	mg/L	
21.	Silver	0.5	mg/L	
22.	Sulphide	1	mg/L	
23.	Temperature increase	<3	°C	At the edge of mixing zone
24.	Total coliform bacteria	400	100 mL	
25.	Total phosphorus	2	mg/L	
26.	Total suspended solids	50	mg/L	
27.	Zinc	2	mg/L	

 Table 5: General Wastewater Effluent Quality Standards

Source: National Environmental Quality (Emission) Guidelines, December 2015. S.U.<sup>a</sup> Standard unit

# 3.5.3 Noise Quality Standard

Noise quality assessment needs to meet the guidelines' value to be in compliance with MONREC's NEQEG requirements. Section 2.2 of the NEQEG does not specify particular requirement for manufacturing of animal nutritional feeds and therefore, the project needs to follow general requirements stated in the NEQEG. General guidelines' value Myanmar for noise levels are shown in Table 6.

	One Hour, LAeq (dBA)		
Receptor	Daytime 07:00-22:00	Night-time 22:00 – 07:00	
Residential/ Institutional/ Educational	55	45	
Industrial/ Commercial	70	70	

#### Table 6: National Environmental Quality (Emission) Guidelines Noise Level.

Source: National Environmental Quality (Emission) Guidelines, 2015

## 3.5.4 Odor Requirement

NEQEG requires projects to control odor level not to cause disturbance to the population nearby. The odor level should not exceed 5 to 10 odor unit. Odor level assessment should be included for project with potential for diffusing odor.

#### 3.6 De Heus Myanmar's Health, Safety, and Environmental (HSE) Commitments

De Heus Myanmar will conduct the following tasks for its HSE commitments:

- To develop and implement HSE Program in accordance with OSHA standards.
- To provide monthly HSE training focusing on environment, workplace, and workers' safety.
- To promote programs regarding social activities such as donations, providing needs of nearby peoples and giving job opportunities to nearby community.
- To promote procedures for labor's rights.
- To conduct proper waste management system for disposing solid and liquid wastes to avoid any health risks and to maintain safe, clean, well ventilated, and healthy environmental as well as sanitary conditions.
- To operate its production activities in accordance with the developed EMP guidelines.

## 3.6.1 De Heus Myanmar's Environmental Policies and Standards

De Heus is always committed not only to avoid adverse environmental impacts and negative social effects from its operations but also to scale up efforts to promote environmental conservation and social developments of the communities, in which it operates. De Heus always takes a step further from just setting good ambitions and executes concrete actions to reach these goals. Keeping the core values in mind, De Heus considers sustainability in all its operations, starting from selecting of raw materials, which promise minimal environmental

footprints, and ending in production designs that do not contribute burdens to the environment and the communities. De Heus seeks to enhance improvements to the environment and social development from its manufacturing process.

De Heus operations will always treat air contamination emissions, suppress noise and vibration levels, clean wastewater, manage various wastes, implement proper management of chemicals and hazardous materials, create safe and fair working conditions in the work environment, and apply all necessary emergency response procedures to counter mishaps.

Most importantly, De Heus plans to set as an example for its core environmental values and good practices to its workforce and communities through training and promotion programs to foster sustainable environmental improvements for other industries. De Heus Myanmar's stringent efforts to comply with existing regulations from Myanmar, rigorous monitoring and evaluation programs, and transparent reporting procedures will make it distinguished among the industries.

# 3.6.2 De Heus Myanmar's Social Policies and Standards

De Heus Myanmar's social policies go hand in hand with Myanmar's existing laws and regulations. Myanmar's minimum wage law and prohibition of child labour will be respected in its plant. Appropriate wages and opportunities will be offered commensurate to the technical qualifications. De Heus abides non-discrimination policy in its operations and De Heus is an equal opportunity employer. With strong endorsement to promote gender equality, De Heus will never condone discrimination based on gender. Opportunities will be equally available for women and in addition, some preference will be offered to woman candidates for some positions in office and in operation.

Overtime fees as defined by the government of Myanmar will be provided for any overtime work. Personal Protective Equipment (PPE) will be provided adequately and all employees will be obliged to wear PPE at work without exception. The recorded photos of PPE in **Annex 7** were provided by the factory. De Heus is committed to provide safe and sound working environment for all employees and all work-related health and safety regulations will be strictly enforced. In addition, regular health and safety training will be offered to keep the employees informed. Finally, De Heus is committed to fostering communication and partnership with the communities nearby the plant not only to create cleaner and safer environment but also to achieve stronger and sustainable economy and developments.

## 3.6.3 Fire Safety

De Heus will put in place all fire safety procedures, measures, and equipment. It has been working closely together with fire department to get compliance certificate. Fire extinguishers, emergency exits, emergency lights and alarms, fire escape plans, and gathering grounds are established in the plant. Emergency drills are planned incorporating rapid relocation of employees from danger zones, head counts process for not leaving anyone behind, and rapid response and intervention together with the nearby fire department to extinguish the fire. In addition, local fire department will make regular inspection and certify the plant's fire safety plan. Fire extinguishers will be annually inspected, and certification renewal process will be activated annually. Moreover, fire safety training will be offered

regularly to all staff. Everyone in the plant will be informed of the assembly point and will have to take part in the fire drills.

# 3.6.4 Chemical and Hazardous Materials Safety

Only trained personnel may handle chemicals using proper equipment in the plant. Each chemical arrival and use will be documented properly by using chain of custody (COC) form. Plant management will inspect the forms and chemical storage regularly. Chemicals will be adequately stored in well-ventilated area. MSDS will be made readily available for chemical controllers. Spills will be promptly and adequately dealt with and each incident will be recorded for prevention of recurrence and training purposes. The plant provides emergency shower and eye rinsing station to deter permanent injuries to its employees. Annually, the plant will carry out review procedures to improve its performance in the coming year.

# 3.6.5 Health Standards for Project with Health Impacts.

Although there are no specific laws, guidelines and standards for health for manufacturing animal food nutritional feeds to follow, De Heus Myanmar Ltd. needs to follow other relevant national and international laws, guidelines and standards for health and health impacts. Regarding this aspect, De Heus Myanmar needs to follow the general requirements stated in the following national laws:

- The Public Health Law (1972)
- The National Food Law (1997)
- The Prevention of Hazard from Chemicals and Related Substances Law (2013)
- The Prevention and Control of Communicable Diseases Law (1995)

Other international standards and guidelines referred to outline EMP of the proposed animal nutritional feeds factory project include the following:

- World Health Organization (WHO) Guidelines
- IFC Guidelines for Community Health and Safety
- IFC Guidelines for Occupational Health and Safety

## **3.6.6** Commitments and Endoserment

## a) MOEE's Environmental Commitment

De Heus Myanmar Ltd's goal is not only to prevent environmental adverse impacts and pollutions from its project activities but also to improve existing conditions in the surrounding. De Heus Myanmar Ltd's mission is to enhance environmental improvements by implementing cleaner and safer alternatives. Moreover, it is committed to improve environmental wellbeing by treating all its air emissions, controlling noise level, treating wastewater before disposal if any, and implementing soil conservation appropriately. The company proactively seeks and implements ways to minimize pollutions and wastes, to recycle them, and reuse if applicable. It will always adhere to the environmental safeguards impose by relevant authorities in Myanmar. Regular environmental monitoring will be conducted as clearly specified in the environmental and social management plan (ESMP) of the ESIA.

#### b) De Heus Myanmar Ltd's Social Commitment

De Heus Myanmar Ltd endorses non-discrimination and fair treatment of its employees including disadvantaged individuals. As a wholly owned foreign investment entity, De Heus Myanmar, strictly adheres to Myanmar's Minimum wage law and prohibition of child labour in any of its operations. Appropriate wages will be offered commensurate to the technical qualifications. Gender equality will be carefully implemented in the operations. Overtime fees as defined by the government of Myanmar will be provided for any overtime work performed. Standard Personal Protective Equipment (PPE) will be provided adequately and all employees will be obliged to wear PPE at work without exception. The company is committed to provide safe and sound working environment for all employees and all workrelated health and safety regulations will be strictly enforced.

#### ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ

#### c) <u>Letter of Endorsement by the Project Proponent</u>

To.

Director General Environmental Conservation Department

Date: 27 November 2020.

## Re: Letter of Endorsement for the Environmental and Social Impact Assessment (ESIA) of De Heus Myanmar Limited's Animal Nutritional Feeds Manufacturing Plant

De Heus Myanmar Ltd, the Project Proponent, plans to build a 600 tons per day capacity animal nutritional feeds manufacturing plant in Myotha Industrial Zone near Mandalay in Mandalay Region with the 100% foreign investment of 15 million US\$.

In conformity to the requirements prescribed in the Clause (35) of Environmental Impact Assessment Procedure (2015), the Project Proponent, De Heus Myanmar Ltd, hereby always pledges to conduct Environmental and Social Impact Assessment (ESIA) to prevent, minimize, and mitigate environmental and social adverse impacts, ensures to strictly comply with laws, regulations, treaties, and policies described in the legal session, and undertakes to meet all the obligations stated in environmental and social management plan (ESMP) and monitoring plan to the fullest extent.

Moreover, the project proponent ascertains that any significant shift in planned activities will trigger updating and modification of environmental and social management plan accordingly and that all these detailed developments and updates in ESMP will be reported to ECD in timely manner.

(signature)

(name)

(title of the Project Proponent's responsible person)

#### ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ

#### d) <u>Letter of Commitment by the Consultant</u>

To.

Director General Environmental Conservation Department Ministry of Natural Resources and Environmental Conservation

Date: November 2020.

Re: Letter of Commitment for the Environmental and Social Impact Assessment (ESIA) of De Heus Myanmar Limited's Animal Nutritional Feeds Manufacturing Plant

Dear Sir,

Social and Environmental Associates – Myanmar (SEAM) would like to confirm that the whole conduct of the Environmental and Social Impact Assessment (ESIA) for De Heus Myanmar Limited's Animal Nutritional Feeds Manufacturing Plant strictly complies with the Article (35) of Environmental Impact Assessment Procedure (2015) and all other applicable guidelines including but not limited to Environmental Impact Assessment Guidelines and National Environmental Quality (Emission) Guidelines.

In the preparation of the ESIA, the consultant team upholds the highest standard of accuracy, completeness, and relevancy with the best of its capacity so that the ESIA reflects the reality of the situation on the ground and the measures in the ESMP will effectively maximize prevention, optimize minimization, and improve mitigation for the related project activities.

The consultant team affirms solemnly that specialists with relevant background capacity have contributed for the development of the ESIA for the said project and undertakes without hesitation that any new developments will be incorporated into the ESMP as soon as they emerge.

Yours faithfully,

Josiah Bowels Environmental Consultant Social & Environmental Associates - Myanmar

# 4. PROJECT DESCRIPTION AND ALTERNATIVE SELECTION

# 4.1 Project Background

De Heus Myanmar is expanding its wing in Myotha Industrial Zone near Mandalay by building another 600 tons per day capacity animal nutritional feeds manufacturing plant. Following the achievements from De Heus Myanmar's typical manufacturing in Myaung Daka Industrial Zone near Yangon, De Heus Myanmar plans to establish another successive manufacturing plant in Myotha Industrial Zone, near Myotha Town in Nga Zun Township, Mandalay Region, upper Myanmar.

# 4.2 Type and Size of the Project

The proposed project is the 100% foreign investment by De Heus Myanmar Company Limited with an authorized capital investment of USD 15 Million. The project aim is to manufacture and distribute the animal nutritional feeds products (swine, poultry, and ruminants) by using automatic process control system with computerized production process. The construction phase of the proposed factory was initiated in June 2017, and the commercial running operation stage is commenced in July 2018.

The major objective of De heus Myanmar is to provide sustainable production of high quality and safe feed by contributing profitability of livestock and aqua farmers: producers of meat, fish, milk, and eggs, aiming for the development of the agricultural sector, economic development in the local communities as well as operating with environmental and animal welfare awareness and care.

The targeted rate of the animal nutritional feeds production is 600 tons per day and the factory will be running on two-8-hour shifts per day basis. The plant will employ a total of 75 people, of which 59 people are operational workers and 6 are office staff members.

## 4.3 **Project Site Location**

The project site is located at adjacent Plots, LG-3(2) and LG-6(2) of Street 26A, inside Myotha Industrial Zone, Ngazun Township, Mandalay Region, having a total area of 26,306.26 m2 (6.5 acres) in which 5297.01 m2 (1.31 acres) is known to be a greenbelt. It is approximately 9.59 km away from North-West of Myotha Town, which is about 59.7 km away from South-West of Mandalay City. The factory falls at the coordinates of 21° 41' 59.62" N and 95° 37' 15.96" E. The project site was primarily occupied as agricultural land and pasture land by the local farmers. Now the area has been transferred into the industrial zone consisting well-developed industrial areas.

The two nearest villages, Nawarat and Pauk Sein, are about 1.15 km away from North-East, and about 3.9 km away from South-West of the proposed project site respectively. The following figures show the location of the De Heus Myanmar Animal Feeds Project Plant Site and land use plan map of Myotha Industrial Zone respectively.



Figure 1: Location of De Heus Myanmar Ltd., Project.



Figure 2: Location Map of De Heus Myanmar Ltd., Project



Figure 3: Design Layout Plan of DE HEUS Myanmar Co., Ltd.

## 4.4 Project Development and Implementation Time Schedules

The following project development phases were conducted by De Heus Myanmar Limited for its management of proposed Project during the project management stage:

- a) Pre-construction phase,
- b) Construction phase,
- c) Operation phase, and
- d) Decommissioning phase.

The main responsible contracting company for the whole project development operation is Antaco contracting company. The recorded photos for pre-construction phase and construction phase were seen in **Annex 2**.

#### a) **Pre-construction Phase**

Before the construction phase starts, soil testing of the project site was conducted. Soil samples were taken and sent to the soil and concrete laboratory of Irrigation Department. Preliminary land surveying and necessary preparatory works for construction phase were carried out. Engineering and Procurement for the construction phase of De Heus Myanmar's animal nutrition feeds plant was established during this phase in March 2017.

## b) Construction Phase

Having established the Engineering and Procurement for the construction phase of De Heus Myanmar's animal nutrition feeds plant, construction and civil works were started in June 2017 and expected to finish in the end of July 2018. Construction and civil works include earth excavation (bulldozing, loading and hauling of excavated earth), piling, plant construction, and hot works (welding works). Excavated earth was dumped at areas where backfilling is required. Foundation works for tower construction were started in July 2017. All the contractors were able to catch up the schedule accordingly by working closely together on site. There will be approximately 100 people working for the construction works including security guards. The construction team is planned to work on one eight- hour shift for 5 days per week basis. Two Denyo brands of 80 KVA generating sets were used for electrical works wherever necessary, and the main water sources are from two tube wells during this period. **Table** 7 shows the planned period of construction works.

Activities	Starting	Ending
Land and Permit	March 2017	May 2017
Engineering and Procurement	March 2017	August 2017
Tower and equipment construction	June 2017	July 2017
Main works on building and operation needs	August 2017	June 2018
IT Software and hardware installation	August 2017	May 2018
Equipment transport and installation	March 2017	November 2017

#### Table 7: Planned Construction Period

Project completion

July 2018



Figure 4: Dump Truck Working during Construction Phase

# ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ



Figure 5: Tower House Construction



Figure 6: Bulldozer Working during Construction Phase

c) Operation Phase

SEAM

The production of animal feeds nutritional products is expected to be commenced in this phase. The target rate of production capacity is 600 tons per day and the production crew will be working on two eight-hour shifts per day basis for six days per week. The plant will employ a total of 75 people, of which 59 are operational workers and 6 are office staff members.

## d) Decommissioning Phase / Rehabilitation Activities

Decommissioning or closure is the final phase. It is often difficult to provide the impact assessments because the conditions are likely to have changed significantly. Decommissioning would have to be undertaken as per approval conditions and ESMP. The De Heus Myanmar Limited will close out the project according to the MIC approval.

## 4.5 Employment

The factory will be running on two 8-hour shifts per day basis and six days a week. Planned human resources to be appointed during the production stage of the plant are illustrated in the following **Error! Reference source not found.**. The plant will employ a total of 87 peoples, o f which 59 peoples are operational workers and 6 are office staff members. It is noted that only one are foreign personnel to be appointed and majorities are local personnel.

Sr. No.	Title	Quantity (No.)	Remarks
1	Managing Director	1	Foreign Personnel
2	Plant Manager	1	Local Personnel
3	Production Supervisor	1	Local Personnel
4	Production Workers	33	Local Personnel
5	Warehouse Workers	11	Local Personnel
6	Maintenance Workers	6	Local Personnel
7	Quality Control (Raw materials + Finished materials + Lab)	7	Local Personnel
8	Quality Assurance	2	Local Personnel
9	IT Personnel	2	Local Personnel
10	Accounting Personnel	4	Local Personnel
11	Purchasing	2	Local Personnel
12	Logistics	2	Local Personnel
13	Human Resources	2	Local Personnel
14	Sales and Marketing	13	Local Personnel

Table 8: List of Planned Human Resources to be appointed during the Production Stage

# 4.6 **Project Infrastructures**

The designed area of the plant includes production tower, raw material warehouse, intake building, utilities and transformer room, corn dryer, grain silos, boiler room, liquid tank area, warehouse for finished products, welfare house, firefighting pump room, water tanks, workshops, weighing bridge, offices and a guard house, laboratory rooms and facilities, and car parking shelter. Layout plan of the project infrastructures are shown in the following figures.



Figure 7: Site Layout Plan of Project Infrastructures



Figure 8: Instructions for the layout plan of project infrastructures

# 4.7 Machineries and Equipment

Machineries involved for the production are intake RM bins, mixer, grinder (hammer mill), sieves and magnets, pelleting machine, cooler, boiler, packaging machine, and forklifts. The list of machineries and equipment required for the proposed animal feeds production factory can be seen in the following Tables.

No.	Main equipment	Country	Brand	<b>Production Type</b>
1	Hydraulic unloading system	Vietnam	Hoa Phu	RM unloading from Truck to intake
2	Corn dryer	China	Gold	Decrease moisture for to get standard parameter
3	Grain silos	Turkey	MYSILO	Storage for corn and wheat
5	Vibrating sieve above HM & 2 Vibrating sieve for pellets	Spain	Roiller	Separation of the different size of RM for Pellets and Hammer Mill
6	Hammer mill	The Netherlands	Van Aarsen	Grinding for RM
	Molasses mixer	The Netherlands	Van Aarsen	mixing for molasses and ground other materials
7	Mixer	The Netherlands	Dinnissen	Mixing all the requires materials for finish product
8	Pellet mill 900 + conditioner + feeder	China	Andritz	Produce for getting different size of different feed type
9	Pellet mill 650 + conditioner + feeder + crumbler	The Netherlands	PTN	Produce for getting different size of different feed type
10	2 coolers	The Netherlands	Geelen	Adjust temperature in order to reach standard temperature before packing

 Table 9: List of Major Equipment for Animal Feed Production Process

Table 10: Type, Brand, and Capacity of Generators and Boilers

Sr	Equipment	Country	Brand	Capacity
1	Boiler	Vietnam	Martech	3 t/hrs.
2	Generators	Vietnam	Kohiler	100 KVA

# 4.8 Use of Raw Materials and Resources

#### Raw Materials Requirement

The basic raw materials for production of animal feeds nutritional products include oil, wheat bran, molasses, corn, and cereals bone meal, bran of cereals, salt and limestone, vitamins and minerals. Some of the raw materials are available locally and others are imported from foreign countries. The required raw materials are listed in the following Table:

Table 11: List of Raw Materials to be used and Quantity Required per Day or per Month

Description	Consumption	Consumption
Description	(T/Month)	(T/day)
PALM OIL (Crude)	5.2	0.17333333
DICALPHOSPH. DIHYDR 18%P	0.406	0.01353333
LIME FINE	68.223	2.2741
SALT-NACL	17.773	0.59243333
SODIUM-BICARBONATE	1.523	0.05076667
Cupric sulphate, pentahydrate 25%	0.275	0.00916667
METHIONIN 99%	6.068	0.20226667
LYSINE SULPHATE 70%	20.158	0.67193333
THREONIN 98%	3.047	0.10156667
TRYPTOPHAAN 98%	0.945	0.0315
CHOLINE CHLORID 60	1.871	0.06236667
ENRADIN F40	0.529	0.01763333
CITIFAC 15% (Cl-4cyc)	0.784	0.02613333
Saligrain G120	0.58	0.01933333
LIMESTONES middle	116.996	3.89986667
DH400 LAYERpx0.50% MY 16/037	23.321	0.77736667
DH500 BROILERpx 0,5% MY 16/038	3.586	0.11953333
DH200 PIGpx 0.50% MY 16/040	7.955	0.26516667
CORN A	534.88	17.8293333
WHEAT 11CP	62.121	2.0707
BARLEY	53.754	1.7918
BROKEN RICE A VN	4.371	0.1457
WHEATBRAN MEAL coarse	136.07	4.53566667
RICE BRAN DEOILED	39.773	1.32576667
DDGS	142.047	4.7349
PALMKERNEL	39.779	1.32596667
SOYBEANMEAL HP 46%	579.861	19.3287
CANOLA	57.773	1.92576667
CORNGLUTEN	123.212	4.10706667
FISHMEAL 60 SEA Myanmar	5.514	0.1838
MEATBONEMEAL50 VN	86.514	2.8838
MOLASSE	0.006	0.0002

From the above raw materials table, barley, canola, corngluten 60 CP, meatbonemeals 50, soybeammeal HP 46%, methionin 99%, wheat 11 CP, and other raw materials will be imported while broken rice, coconut oil, corn, fishmeal, greenbean shell, and lime will be acquired from local suppliers.

The plant plans to extract 135  $m^3/day$  of groundwater from two tube wells for the consumptions for boiler, laboratory, and domestic purposes. Boiler consumption is estimated to be 60  $m^3/day$  while laboratory use will reach 4  $m^3/day$ . The plant will install two 100 KV transformers and the power supply will be from MMID source. Backup generators will be put in place for contingency arrangement. The construction work has been commenced in July 2017 and expected to finish in the end of July 2018. The plant will begin its production operation in July 2018.

# List of Chemicals Required

The following table presents the list of chemicals required to produce the animal feeds nutritional products. Material Safety Data Sheets(MSDS) for the applied chemicals were seen in **Annex 6**.

Sr.	Chemical Names	Concentration	Daily usage
No.			
1	Lead (ii) acetate tri-hydrate	6.25 %	5 ml
2	Phenolphthalein	0.10 %	5 ml
3	Phenol Red	0.10 %	5 ml
4	Methyl Red	0.10 %	5 ml
5	Sodium Hydroxide	0.40 %	5 ml
6	Urea	6.00 %	5 ml
7	Hydrochloric Acid	50 %	100 ml
8	Petroleum Ether	90 %	100 ml
9	Ethanol	99.70 %	100 ml
10	Aluminum		For fumigation, depending on the volume of materials to set fumigated

Table 12: List of Chemicals for Animals Feeds Nutritional Products

## **Resources Requirement**

Resources requirement for the production of animal nutritional feeds products involves electric power supply, water supply, generators for stand-by electric power supply, and fuel oil for emergency electric power supply.

# 4.9 Source of Electric power supply

The electric power supplies for the plant during the operational phase will be from two 1000 KV transformers via MMID source. The plant will put one diesel Denyo generator, having a capacity of 100 KVA for emergency backup contingency arrangement. Two Denyo brand 80 KVA generating sets were used during the construction phase.

# 4.10 Source of Water Supply

There are two treated water storage water tanks and one raw water storage purpose tank. The capacities are 135 m<sup>3</sup> and 170 m<sup>3</sup> for two treated water storage tanks and 56 m<sup>3</sup> for raw water storage tank. The main sources of water supply are from two tube wells, one is about 600 ft. depth and the other is about 500 ft depth. The water from the tube wells is pumped to the raw water storage tank where the water is treated by means of filtration, including chlorine dosing, and iron removing processes and then pumped through to the treated water storage tanks and stored. The plant plans to consume 135 m<sup>3</sup>/day of treated groundwater including the estimated consumption of 60 m<sup>3</sup>/ day for boiler, 4 m<sup>3</sup>/day for laboratory and 6 m<sup>3</sup>/day for domestic purposes. Water capacity of 170 m<sup>3</sup> is kept reserve for firefighting purpose. Tube well which is one of the collected water samples is shown in the following figure.

The water resources of the project effected village: Nawarat village are tube wells ranging from 350 feet to 360 feet within the village for their daily water usage while they rely on the rainfall for their drinking water. Tube wells were observed almost all households in Nawarat village. For another village: Pauk Sein village, the villagers rely on tube wells ranging from 250 feet to 260 feet, and wells with about 40 feet, which could be drawing water by a pail, for their daily water utilitzations. Almost all of households have tube wells in Pauk Sein village. However, they rely on only rainfall and one well near the monestry for their daily drinking water.

# Figure 9: Water Tube well location map



# 4.11 **Production Process**

*Imported Materials Receiving and Screening:* Sensory evaluation, internal laboratory analysis, independent laboratory analysis, and final inspection will screen the quality of the imported materials and make the categorization on the quality of the materials. Only materials meeting the company's quality standard will be moved to the next step while the rest of the materials with questionable quality will be discarded. Quality control specialists will oversee the process.

*Raw Materials Storage Facilities:* Most raw materials are placed in storage with normal atmospheric temperature while the temperature sensitive materials are stored in cooler to maintain quality consistency. Each material is checked for required quality before it is used in the production process.

*Pre-cleaning*: magnetic separator and relevant impurity removal steps are involved in the pre-cleaning of raw materials before production. Magnetic separator removes metallic particles. Other cleaning processes remove different impurities from the raw materials. Cross contamination is prevented by thorough pre-cleaning processes.

*Intake Dosing*: After the cleansing, the materials will be classified using quantitative balance and mesh sieve screens to channel either to grinders for stiff materials or mixer bins for materials that are tender.

*Grinding:* Raw materials will be ground to the required size. Then, the materials will be sent to the next step.

*Mixing:* Ground materials and other ingredients will be fed to mixers for a thorough stirring. Some products will require addition of molasses in this stage.

*Pelleting:* After mixing, pellets will be produced depending on the size of pellets ordered. Pelleting equipment can be adjusted to the required size of pellets. Uniformity of pellet color is important at this stage.

*Cooling:* Pellet outputs are cooled down to a lower degree in a controlled environment and then, will be readjusted in atmospheric temperature.

*Sieving:* Pellets will be sieved to obtain uniform size. Pellets removed from this stage will be recycled.

*Packaging and Storage:* Pellets selected from sieving process will be weighted and packaged. The final product will then be kept in storage before shipping and delivering for use. Quality Control will be checked in the final stage of production and before distribution.

The General Production Process Flow Diagram of Animal Nutritional Feed Products, De Heus Myanmar Ltd., Myotha Industrial Zone is shown in

Figure 11 below.



Figure 10: Production Process Flow Chat of De Heus Myanmar Feed Mill

ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ



Figure 11: General Production Process Flow Diagram of De Heus Myanmar, Myotha IZ

 Table.13: Process Description of DE Heus Myanmar Feed Mill

Step	Detailed description	Recorded Photos
1.	Receiving materials (QC check and so Material Qc are responsible for inspection according to the company standards. Quality of materials: sensory/physical evaluation, internal analysis, or analyzed by the outsource laboratory. Once QC passed the materials, the incoming trucks pass through weighbridge for comfirming the weight in.	zaled trucks)
1.1	Cleaning (Magnetic separator and pre	cleaner and sifting in liquid)
	The material is run through the magnet, the metallic particles (iron) will be retained and removed during cleaning process. Iron fragments which arise from within the system are seperated/ filtered by magnet. All unwanted foreign matters (dust, small stones, trash) are clean and filtered by precleaner. All foreign matters will be filtered and removed during the process of cleaning. For fluids and liquids, there is a sifting before filling into the liquid tanks to remove any unwanted impurities.	<image/>
1.2	Storage of materials	
2	The batch of raw material, oil, premix, etc. must be monitored for quality to meet the requirements for quality and feed safety before being put into usage. Also, corn dryer is used to reduce the moisture level in corn materials before storing into the grain silos. Some of the wet corn received are dried in the corn dryer and stored in the grain silos directly delivered with conveyors. The drying capacity is 120MT/day (6MT/hr), frequency of drying 1X/12hr.	

Step	Detailed description	Recorded Photos
	(intermediate bins)	
	Bin containers must have identification codes or equipment codes. There are 41 dosing silos and designated capacity is 40T/bin. This is a material transfer step required by the specific production plans. Fixed or switch bins can be used depending on actual needs. Intermediate bins to store extra volume of materials to store. There are 36 inter bins and designate capacity is 70T/bin. The bins are used for storing materials such as Soybean meal and broken rice.	<image/>
3.	Weighing (Quantitative Balance)	
	This is the stage where the grinded raw material balanced to mix according to the formula weighing including raw material weight, liquid. There are three dosing weight scales with designated capacity of 1T, 2T, 4T. The micro materials (premix, additives) after weighing need to be used within 10 days' time to avoid denaturing. If the weighed micro materials are over 10 days, QC needs to recheck to make sure the materials are safe enough to use or decide to throw away. Information about concentration, duration of supplement is recognized in PCS software. Request at this stage is that the balance must be regularly monitored and tested, calibrated. Before producing process, a different product formula will automatically apply the system against cross-contamination table to avoid unsafe for the next.	

Step	Detailed description	Recorded Photos
3.1	Sifting RM (Sieves Magnet)	
	Separating impurities from the raw materials Hard materials through the grinder Smooth materials through mixing bin Detect and remove any metal pieces by magnet	
4.	Grinding	
	stage, all the RM included in the recipe are brough into the hummer mill to get grind. Grits grinding of raw materials depends on the rotational speed of the mill and mesh sizes. Grinding capacity is 48T/hr. Grinding size range is 2,3,4,6 mm. Grinding time is estimate 6 min/batch	Image: state stat
5+	Mixing (Dry mixing and	
6.	Molasses mixing) stage, all the necessary ingredients in feed formulations including mixture of materials, some materials are not transferred through fine grinding (eg. wheat bran), vitamins and minerals, and liquid raw materials, etc. will be blended to prepare pelleting. Mixture of ingredients are mixed thoroughly in enough nutrition components formula. This is also the stage of putting the liquid into the product. Some products require mixing with molasses. Total Mixing time (dry+ molasses): 260 seconds.	Image: state stat

Step	Detailed description	Recorded Photos
7.	Pelleting (magnet)	
8.	stage, the mixture will be pelleted after mixing by using die from 2.3, 2.5, 3.2, and 4.0 mm. The pelleting of the feeds uses pellet technology. After the conditioning, there is a magnet to detect and remove the metal pieces in the feed (if any detected). The Pelleting size depends on each product, if achieved ideal size will move to the next stage, if not reach the ideal size, move into recycling. Request at this stage is uniform color, size, harness, PDI, etc. In this stage, conditioning also involved. Conditioner uses steam system from the boiler. Boiler operation designated is 3T/hr. Operation is (2.46T/hr) Cooling	
	At this stage, the feed after pelleting will be cooled down to minimize high temperature bagging prior putting to the finished product bins. Temperature after cooling shall be higher environmental temperature 5 <sup>o</sup> C for pelleting feed.	
9.	Sifting (Sieves Magnet)	
	At this stage, after cooling, the feeds will be passed through the magnet to detect and remove any metal pieces in the feeds, then transferred through the corresponding mesh sieve to remove the pellets, which are not reached the standard size. The products which are not reached will be transferred to recycling. Sieve size (1.6mm,3mm, 4mm,6mm)	B25V01 B25V01 ROLLIER

Step	Detailed description	Recorded Photos
10+11	FP weighing and Packaging products	
	At this stage, after dust sieving, products will be moved through automatic scale and be packaged. While packing, final products QC will take samples to test each batch. Bag size 5kg ,25kg, 50kg / bag	
12.	Storage & Export of products	
	At this stage, after the packaged food is stored in the finished product warehouse to await the results of the laboratory test. Finished products shall be monitored daily by warehouse staff and inform technical department 10 days before the expiry and do not issue for selling or only issue for selling when technical department approves. Finished products shall be piling on pallets properly for exporting easier. Feed will be transferred to the transportation to deliver to customers. Storage of 60 days for a complete compound feed, 75 days for concentrated feed. Storage temperature is the ambient temperature. Perform the tasks per the principle of first in, first out (FIFO)	

## 4.12 Generation of Wastes and Control Measures

De Heus Myanmar is committed to provide safe, sound, and clean sanitary working environment for all employees by conducting the proper safety and waste management systems. The estimated waste generated per day from the whole plant is approximately 1000 kg/day solid and 20m3/day wastewater especially from boiler operation. Generally, solid wastes would be generated from the domestic use and ash from the fuel for boiler operation while the liquid waste would be from the boiler water only with high temperature pollution

characteristic. De Heus Myanmar has constructed the waste handling warehouses where solid and liquid wastes would be stored properly to prevent leaking and hence reducing any health risks and providing better sanitary conditions. Solid wastes are then disposed into the landscape where MMID has provided service for solid waste disposal.

De Heus Myanmar also has constructed six  $-25m^3$  capacity septic tanks and two drainage systems, for disposing all liquid wastes, which include storm-water and domestic wastewater generated by the whole plant. The general plumbing layout plans of these two drainage systems are illustrated below in Figure 12 and Figure 13.



Figure 12: General Layout Plan of Wastewater Plumbing System



Figure 13: General Layout Plan of Storm-water Plumbing System

Having passed through these two drainage systems, all liquid wastes both storm-water and domestic wastewater are put into the septic tanks and then finally pumped into the public drain. Domestic wastewater treatment will be outsourced if needed.

The raw water is analysed to meet the WHO standards and treated thoroughly through carbon filtration, deionization, chlorination, double filtration, and reverse osmosis process.

The plant is also designed and equipped with pest control program and detecting equipment to prevent insects, pests and animals entering the plant.

Regarding health and safety aspects of air pollution issues and dust emission, De Heus Myanmar will conduct monthly training, meetings, and exercises on Health, Safety and Environmental (HSE) guidelines. Furthermore, De Heus Myanmar will also be conducted PPE training for all employees to gain knowledge and awareness of PPE use and its importance and advantages.

# 4.13 Alternatives in Consideration

While De Heus Myanmar's plant in Yangon covers the demands from the region, the marketing potential in the upper Myanmar with a wealth of raw materials is attractive. Myotha Industrial Zone offers everything a potential developer can imagine for its strategic location, easy access to raw material sources in the region, and growing demand for the products. Hence, De Heus decided to open a new manufacturing plant in the industrial zone.

There are many ways to produce animal nutritional feeds but some methods attract a number of objections for their offensive odor and environmental pollutions. De Heus is determined to employ its manufacturing technology with proven record that it does neither emit offensive odor nor contribute environmental pollutions. In addition, keeping its core environmental and social values in mind, De Heus Myanmar's in-house design for manufacturing of animal nutritional feeds must include mechanisms to address all environmental pollutions and social adverse effects.

No other alternative project sites have been proposed other than this project site, located in Myotha Industrial Zone, upper Myanmar, has an opportunity to be the best selection.

However, De Heus Myanmar has under taken the project analysis process for the selection of preferred project site. The management of De Heus Myanmar has considered the following selection criteria in the evaluation process:

- a) The strategic location of the project site to be considered;
- b) The logistics conditions of the region and the site; and
- c) The regional demand and the market potential of the products in upper Myanmar.

The project analysis process shows that Myotha Industrial Zone offers everything a potential developer can imagine for its strategic location, easy access to raw material sources in the region, and growing demand for the products. In addition, having located at the junction to support all demands from upper Myanmar, the proposed site adds advantages for economic prospects of the project.
### 4.14 Comparison and Selection of the Preferred Alternatives

While De Heus Myanmar's plant in Yangon covers the demands from the region, the marketing potential in the upper Myanmar with a wealth of raw materials is attractive. To respond the increase demands from upper Myanmar, Myotha Industrial Zone offers the best option as its convenient location has strategically importance for easy access to abundant raw materials from upper Myanmar. Since there are no other alternative project sites to be compared with the proposed project site, De Heus Myanmar obviously realized that the Myotha Industrial Zone Project Site has an opportunity to be exclusively the most optimum selection. Hence, De Heus decided to select the Myotha Industrial Zone Project Site to establish a new animal nutritional feeds manufacturing plant near Mandalay in upper Myanmar.

In addition to location alternatives, De Heus also considered about production equipment alternatives. In selection of sound equipment, De Heus took into account of efficiency, productivity, power consumption, reliability, environmental friendliness, easy function and maintenance, possibility of easy access to spare parts, and technical operation. Each unit of equipment was selected based on above criteria. As De Heus's management is committed to reduce pollution loads to the best extent in every step of the operation and at the same time, to promote the best productivity level. The list of equipment described in the production process was carefully selected based on the above criteria.

Creating employment opportunities for the local population was also an important alternative that De Heus has considered and implemented in its operation. While recruiting educated workers from the other parts of Myanmar may sound promising, improving relationship with local communities, joining hands to build up development for them, and improving their livelihood, De Heus has been prioritizing to employ more peoples from the local communities. As a requirement, the factory also plans to improve capacity of the labor pool in the area by offering training and providing easy access to job information at the factory.

### 5. DESCRIPTION OF THE SURROUNDING ENVIRONMENT

The De Heus Myanmar project was located in Myo Thar Industrial zone, Nga Zun Township, Mandalay Region. In the eastern part of the project site, Yarzawin Taw Kyaung pagoda in 3.21km away and Myo Thar city in 9.27 km away were observed while Myo Thar Dam was found in 10.79 km away from the northeast. Myaunt Pin Lal Dam in 6.94 km away, Taung Pin Lal Dam in 10.08 km away and Nabuaing village in 9.41km away were located in the southwest part of the project site. Ayeyarwaddy River, Si Mee Khon Jetty, Nga Myar Gyi village, and Si Mee Khon village were seen in 21 km away from the project site. Maung Ka Taw Dam was observed in 12 km away from the project. **Figure 14** shows the existing environment of the project stie.

### ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ



Figure 14: Surrounding Environment Map

#### 5.1 Setting the Study Limits

By the nature of the manufacturing process and project design, the project's area of influence (AOI) is determined to be within 1.5 km radius of the project. Scattered villages are seen at the far outskirt of the industrial zone. Within this AOI, thinly populated Nawarat and Pauk Seinn Villages fall in the project affected area. Neither squatters nor residential settlements could be found in the vicinity of the project site. JAPFA animal feed factory, Biscuit plant, and Plywood factory which has been stopped a while ago, are found near the proposed site. The whole area of the industrial zone consists of abandoned land that could only be suitable for gazing with sporadic appearance of low-lying shrubs and very few dry zone trees. Already dried-up creek even at the near end of monsoon season is found in the west of the proposed site and Ayeyarwaddy River is located 21 km away from the project location. Across the industrial zone, one herbal medicinal plantation spreads over a vast extent of land. **Figure 15** and **Figure16** were shown the land utilization map around the DEHUS Myanmar project.

The industrial zone's establishment attracted national attention with the issues of land grab without fair compensation. Farm lands and grazing lands were seized in the establishment of the industrial zone. However, starting with the new civilian government, negotiations for land compensation have taken place and almost all of land dispute cases have been resolved in accordance with the Land Record Department (*Land dispute in Myotha industrial park nears end*, Myanmar Times, Oct 17, 2017) [https://consult-myanmar.com/2017/10/17/land-dispute-in-myotha-industrial-park-nears-end/].

Information obtained from the land registration department and agriculture department revealed that the area has been low yield environment for economically viable agriculture. Study from the surveys and interviews with local residents confirm that aside for the use of short-term seasonal pasture for cattle, agriculture was not profitable land use of the project area. The location of the factory and adjacent surrounding of the factory were never part of any agriculture. **Figure 17** illustrates Land Use Map of Mandalay Myotha Industrial Development.



Figure 15: Land Use Map of the DE HEUS MYANMAR Project



Figure16: Land Use Map of the DE HEUS MYANMAR Project



Figure 17: Mandalay Myotha Industrial Development Land Use Map

# 5.2 Methodology and Objectives

The environmental study for the proposed project baseline information and its surrounding environment is comprised of physio-chemical, biological, socio-economic and cultural components. The major objectives of the baseline data gathering are to understand the relationship and interaction between the different components and to document the existing environmental conditions of the proposed project area so as to analyze, compare, and monitor the changing condition along the project life cycle and to estimate the potential environmental impacts.

The primary surveys data gathering including on site measurements were conducted in two seasons, monsoon and winter season, for physio-chemical and biological components. The climate, topography, some geomorphological conditions, protected area, hazardous condition and township level demographic information of the project area were gathered from various sources. The existing soil chemical composition, surface and ground water quality, ambient air and noise levels monitoring, and nature of habitat for ecological flora and fauna were identified as the primary baseline conditions of the project. The socio-economic and cultural condition of the project affected communities were gathered with structured interview questionnaire and key information surveys from randomly selected households. The data gathering methodologies for each component are described detail in the subsequent sections of this chapter.

### 5.3 Physical Components

### 5.3.1 Climate condition

Tropical wet and dry climate is the classic climate of the region. The climate is generally hot year-round with slight minor variations. The mean annual temperature of Mandalay Region ranges between 21-degree C and 31-degree C, whilst the coldest period of the year tends to be between November and January and the warmest period of the year is between April and May. The monthly rainfall ranges from 1mm in March to 150 mm in September.

According to the underground webpage for International Weather Report for Myotha Station, in Mandalay region, the monthly weather condition of the survey data gathering periods of September 2017 and December 2017 are described in the following tables and graphs.

Item	September 2017				December 2017			
item	Max	Avg	Min	Sum	Max	Avg	Min	Sum
Temperature								
Max Temperature	98 °F	92 °F	80 °F		84 °F	81 °F	71 °F	
Mean Temperature	89 °F	85 °F	78 °F		76 °F	72 °F	68 °F	
Min Temperature	82 °F	78 °F	75 °F		69 °F	63 °F	57 °F	
Degree Days								
Heating Degree Days (base 65)	0	0	0	0	0	0	0	0
Cooling Degree Days (base	24	20	14	597	12	7	4	100

Table 14: Monthly Weather Condition in September 2017.

ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ

65)								
Growing Degree Days (base 50)	39	35	28	1042	26	22	18	307
Dew Point								
Dew Point	82 °F	78 °F	73 °F		73 °F	66 °F	54 °F	
Precipitation								
Precipitation	0.00 in	0.00 in	0.00 in	0.00 i n	0.00 in	0.00 in	0.00 in	0.00 i n
Snow depth	-	-	-	-	-	-	-	-
Wind								
Wind	12 mph	6 mph	0 mph		9 mph	3 mph	0 mph	
Gust Wind	25 mph	19 mph	14 mph		-	-	-	
Sea Level Pressure								
Sea Level Pressure	29.86 i	29.71 i	29.50 i		30.04 i	29.92 i	29.80 i	
	n	n	n		n	n	n	

Table 15:. Monthly Weather Condition in July 2019

Item	Max	Avg	Min	Sum
Temperature				
Max Temperature	84 °F	81 °F	71 °F	
Mean Temperature	76 °F	72 °F	68 °F	
Min Temperature	69 °F	63 °F	57 °F	
Degree Days				
Heating Degree Days (base 65)	0	0	0	0
Cooling Degree Days (base 65)	12	7	4	100
Growing Degree Days (base 50)	26	22	18	307
Dew Point				
Dew Point	73 °F	66 °F	54 °F	
Precipitation				
Precipitation	0.00 in	0.00 in	0.00 in	0.00 in
Snow depth	-	-	-	-
Wind				
Wind	9 mph	3 mph	0 mph	
Gust Wind	-	-	-	
Sea Level Pressure				
Sea Level Pressure	30.04 in	29.92 in	29.80 in	

#### ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ



Figure 18: Monthly Weather History Graph for September 2017



Figure 19: Monthly Weather History Graph for December 2017

(https://www.wunderground.com/history/airport/VYMD/2017/12/7/MonthlyHistory.html?req\_city=&req\_state= &req\_statename=&reqdb.zip=&reqdb.magic=&reqdb.wmo= 12/14/2017)

#### 5.3.2 Topographic condition and Geological condition

The area consists of a relatively flat terrain with noticeable gradient toward the west. Elevation of the terrain rises eastward, and Sagaing Ridge could be seen in the east. Vertisol Soils predominate the area. Soft sandstone, clays, and soil substrate consisted in Ayeyarwaddian series are very common. Reddish brown and low plasticity silty clay soil, grey color fine to medium grained sand, and backfill silty sand soil layers are common in the area. The top layer, sandy soil or granular type, contain 12% of silt and is known as non-cohesive soil. Soil conditions and landscape without any restraint to control surface runoff, potential to recharge underground water table is almost eliminated leading to constant water shortage in the area. The geological condition of the proposed project area is as shown in the following figure.



Figure 20: Geological condition of proposed project area

### 5.3.3 Protected area

According to the Myanmar protected areas context, current status and challenges report by Istituto Oikos and BANCAS in 2011, Minsontaung wildlife sanctuary is the closest protected area for the proposed project area and which is far about 20 miles to the south of the project area and 8 miles from east of Natogyi Township in Myingyan district. The total area of wildlife sanctuary is 23 km<sup>2</sup> and covered by dry forest, hosting over seventy bird species, including 3 Myanmar endemic species (Whitethroated Babbler, Hooded Treepie and Burmese Bushlark). Barking deers, civets, rodents and bats can be found in the site. The park office documented a checklist for 9 species of amphibians, 26 reptiles and over 50 butterflies' species. Among these, the Burmese Star Tortoise is the most prominent critically endangered species of Minsontaung wildlife sanctuary. This is located at 195 to 375 m above mean sea level and categorized as level IV in IUCN. Occurrence of forest fire outbreaks and poaching of star tortoise to be sold to foreign market are the main threat for this wildlife sanctuary. Local people encroachment for firewood collection and pasture land for their livestock are occasionally threaten to this protected area. Fortunately, the potential impact of proposed project will not be the significant for this protected area as the distance of proposed project area is far enough. The coordinate location of the Minsontaung wildlife sanctuary is described in the following figure.



Figure 21: Location map of Minsontaung wildlife sanctuary in Ngahtogyi Township

# 5.3.4 Air Quality, Noise and Vibration Monitoring

### 5.3.4.1 Air Quality monitoring survey

In the absence of background air quality data, air quality monitoring was conducted to establish baseline air quality. To obtain representative air quality of the whole project area, three sampling sites were chosen, inside the project site, at upwind and downwind locations. The air quality sampling averaging times followed WHO Standards requirements and measured the levels of PM10, PM2.5, NO2 and SO2 in accordance with the NEQEG standards.

The sampling time for each pollutant were set at: 24 hours for PM10, PM2.5, SO2, NO2 and 24 hours for SO2. Ozone is excluded in the monitoring as it is a secondary pollutant and not directly the result of emission from the project. Ozone is the product of many natural chemical and photochemical reactions in the atmosphere in combination with nitrogen oxides and volatile organic compounds from all emission sources. Following instruments were employed for the air quality and noise level surveys.

Study	Parameter	Method / Equipment	Survey frequency
Air Quality	PM 10, PM 2.5	- Nephelometer /HPC600(A)	- 3 station x 3 time
	SO <sub>2</sub> , NO <sub>2</sub> , CO	- 4 in 1 Gas detector	- 24 hours monitoring
			per station
Noise level	- 24-hour noise level	- Empirical data /	- 3station x 3 time
	- Degree of exposure	- CEM(DT-8852) Sound level	- 24 consecutive hours
		meter	collection

Table 16: Air (	Quality Survey	Parameter,	Equipment and	frequency
-----------------	----------------	------------	---------------	-----------

Simple active sampling method, using air sampling pump to pull air through a filter, was employed in the air quality monitoring. Unlike passive sampling, simple active sampling is independent of wind speed and it enables verification for quality and reliability of the results. In this application, the results were organized in a data base and then, statistical analysis were performed.

### Air Monitoring Locations

The ambient air quality assessments were conducted in three locations. The first site was at the eastern part of project site, (site A1), which is located near the construction site of the project, the second place was located at northern part of the project, (site A2), which is located inside the construction site of the project, and the third place was located at southern part of the project, (site A3). The assessment sites and the geographic co-ordinates points are presented in the following table and locations of the project.

Sampling point	GPS Coordinates
A1	21°42'1.68"N 95°37'18.33"E
A2	21°42'2.63"N 95°37'15.86"E
A3	21°41'58.47"N 95°37'17.48"E

Table 17: Geographic coordinate locations of Air monitoring points



Figure 22: Air monitoring points for De Heus Myanmar project



Figure 23: First survey of Ambient Air & Noise Baseline data collection at A1, Wet season



Figure 24: Second survey of Ambient Air & Noise baseline data collection at A1, Dry season



Figure 25: First survey of Ambient Air & Noise Baseline data collection at A2, Wet season



Figure 26: Second survey of Ambient Air & Noise baseline data collection at A2, Dry season

### ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ



Figure 27: Second survey of Ambient Air & Noise baseline data collection at A3, Dry season



Figure 28: Second survey of Ambient Air & Noise baseline data collection at A3, wet season

# **Quality Control**

In order to ensure the integrity of the assessment results, quality control measures were introduced. SEAM employed instruments with valid factory calibration certificates. Regular maintenance and random leak check procedures were conducted throughout the operation of each equipment. Factory calibration certificates are presented in Annex. All activities related to the assessment operations and interruptions if any were recorded and the sampling points were marked with GPS.

To compute hourly and daily averages from the ambient air quality assessment results, the lower detection limit values (LDL) reported in Table were used for data analysis. Values under the detection limit have been substituted by 50% of LDL.

Parameter	Lower Detection limit
PM 10	$0.001 \text{ mg/m}^3$
PM <sub>2.5</sub>	0.001 mg/m <sup>3</sup>
SO <sub>2</sub>	0.001 ppm
NO <sub>2</sub>	0.01 ppm

#### **Data Collection Activities**

24 hours continuous examination of  $PM_{10}$ ,  $PM_{2.5}$ ,  $NO_2$ , CO and  $SO_2$  were carried out using Handheld Particle Counter (CW-HPC600(A)) and 4 in 1 Gas Detector.  $PM_{2.5}$  and  $PM_{10}$  were measured alternatively with Handheld Particle Counter (CW-HPC600(A)) and  $NO_2$ , CO and  $SO_2$  were analyzed with 4 in 1 Gas Detector alternatively.

The ambient air sampling was conducted in September 2017 during the wet season (which coincided with the project pre-construction phase), and in December 2017, the dry season (that was the project's construction phase). The following **Table** described the air quality sampling plan.

Sampling	V	Vet Season (2017	)	Dry Season (2017)			
Parameter	A1	A2	A3	A1	A2	A3	
PM10	26 to 27 Sept	27 to 28 Sept	28 to 29 Sept	3 to 4 Dec	4 to 5 Dec	5 to 6 Dec	
PM2.5	26 to 27 Sept	27 to 28 Sept	28 to 29 Sept	3 to 4 Dec	4 to 5 Dec	5 to 6 Dec	
NO <sub>2</sub>	26 to 27 Sept	27 to 28 Sept	28 to 29 Sept	3 to 4 Dec	4 to 5 Dec	5 to 6 Dec	
SO <sub>2</sub>	26 to 27 Sept	27 to 28 Sept	28 to 29 Sept	3 to 4 Dec	4 to 5 Dec	5 to 6 Dec	
СО	26 to 27 Sept	27 to 28 Sept	28 to 29 Sept	3 to 4 Dec	4 to 5 Dec	5 to 6 Dec	

Table 18: Air Quality Sampling Plan

### Meteorological Data

The meteorological data including air temperature, relative humidity, sea level atmospheric pressure, visibility, wind speed and rainfall for the sampling periods for the specific area were

obtained from the weather-underground <u>http://www.wunderground.com</u> website. A summary of the meteorological conditions was reported in the Table.

Year 2017	Temp. (°F)	Relative Humidity (%)	Sea Level Pressure (in)	Visibility (ml)	Wind Speed (mph)	Rainfall (in)						
Wet Season (Pre-construction Phase)												
September 26	78	98	29.71	3.2	2	Rain,						
			27.11		2	Thunderstorm						
September 27	83	88	29.72	3.9	3	-						
September 28	82	87	29.74	3.7	6	-						
September 29	85	78	29.74	4.1	6	-						
Dry Season (Co	onstruction Ph	nase)			•							
December 3	71	71	29.93	3.9	2	-						
December 4	73	68	29.89	4.0	4	-						
December 5	70	76	29.91	3.7	2	-						
December 6	68	76	29.88	3.5	2	-						

Table	19.	Weather	Conditions	during	the Ai	r Ouality	z Sami	nling	Perio	ds
I able	17.	vv cather	Conditions	uuring	ule Al	Quanty	y Sam	pinig	I CHO	us

Source: Weather underground website (<u>http://www.wunderground.com)</u>

### **Results of Air Quality Measurements**

The data obtained at the three sites during the first survey (wet season) and the second survey (dry season) were analyzed, organized, and compared with the WHO guidelines, Environmental Quality Standard for Air in Japan and NEQEG. The results of the air quality examination were tabulated in the following table.

### 1) Suspended Particulate Matter 10 (PM<sub>10</sub>)

Almost all PM<sub>10</sub> levels were found lower than the environmental standards in Japan, WHO and NEQEG for both seasons (see Table below).

### 2) Suspended Particulate Matter 2.5 (PM<sub>2.5</sub>)

Almost all  $PM_{2.5}$  levels were found lower than the standards from WHO, and NEQEG for wet season (Pre-construction phase). But  $PM_{2.5}$  levels for dry season (Construction phase) during second time monitoring were higher than all standards (see the table). It was concluded that the area had a few emission sources and possibly, the contribution from strong winds and dust in the summer played major role.

### 3) Sulphur dioxide (SO<sub>2</sub>)

The  $SO_2$  levels were found to be lower than the standards from WHO and NEQEG for Wet season (Pre-construction phase). Whereas,  $SO_2$  level in A2 are higher than the NEQEG standards for Dry season (see Table). It was likely that the contribution from burning of fields played major role in the  $SO_2$  levels hike.

# 4) Nitrogen dioxide (NO<sub>2</sub>)

For NO<sub>2</sub>, the hourly concentration was found to be below the NEQEG hourly standard (200  $\mu g/m^3$ ) in both dry season and wet season. No exceedance of WHO standard was observed in both dry season and wet season.

### 5) Carbon monoxide (CO)

The CO levels were found to be lower than the standards of JAPAN as shown in the Table below.

				NEOEC*		WH	O*** Stan	dard				
Parameter	A1	A2	A3	NEQEG*	JAPAN**	Interim 1	Interim 2	Interim 3				
Wet Season (Pre	Wet Season (Pre-construction Phase)											
PM <sub>10</sub> (24 hour) (ug/m3)	12.57	21.57	17.68	50	<100	150	100	75				
PM <sub>2.5</sub> (24 hour) (ug/m3)	14.14	24.47	20.65	25	<35	75	50	37.5				
SO <sub>2</sub> (24 hour) (ug/m3)	15.16	19.43	17.98	20	<100	125	50	-				
NO <sub>2</sub> (1 hour) (ug/m3)	20.47	29.34	22.46	200	<75.26 ~ 110	-	-	-				
CO (1 hour) (ppm)	0.52	0.83	0.63	-	<10							
Dry Season (Co	nstructio	on Phase	)									
PM <sub>10</sub> (24 hour) (ug/m3)	17.61	15.82	30.95	50	<100	150	100	75				
PM <sub>2.5</sub> (24 hour) (ug/m3)	48.67	56.43	76.86	25	<35	75	50	37.5				
SO <sub>2</sub> (24 hour) (ug/m3)	14.73	23.58	18.16	20	<100	125	50	-				
NO <sub>2</sub> (1 hour) (ug/m3)	38.19	46.49	39.12	200	<75.26 ~ 110	-	-	-				
CO (1 hour) (ppm)	2.45	5.84	4.87	-	<10	-	-	-				

Table (	20: A	ir Po	llutant	Concentration	S
I GOIO	-0.1		11 co courte	concentration	0

Note (\*): National Environmental Quality Emission Guideline in Myanmar (2015)

Note (\*\*\*): Environmental Quality Standard for Air in Japan (1973, 1978) Note (\*\*\*): WHO Media Centre (2014) - Standards for ambient (outdoor) air quality and health

### 5.3.4.2 Noise Quality Monitoring Survey

Noise level examinations were coincided with air quality monitoring studies. Noise level assessments were carried out at the vicinity of air quality examinations. Existing noise levels were recorded. A CEM (DT-8852) sound level meter was employed for 24 consecutive hours each at the monitoring location. The locations were selected to be representative to noise sensitive receivers in and around the project site. The degree of effects from the noise level and duration of noise exposure were analyzed using the empirical data obtained from the monitoring.

# Monitoring sites

The noise monitoring campaign was conducted at representative noise sensitive receivers around the project area. The monitoring points were located near the locations of the air monitoring sites and their geographic coordinates are shown in following table. Noise monitoring sites were illustrated in **Figure 29**.

Sampling	Wet Season (Pre-construction Phase)	Dry Season (Construction Phase)	
point	GPS Coordinates	GPS Coordinates	
N1	21°42'1.50"N 95°37'18.50"E	21°42'1.06"N 95°37'18.69"E	
N2	21°42'2.50"N 95°37'15.60"E	21°42'2.60"N 95°37'15.49"E	
N3	21°41'58.35"N 95°37'17.58"E	21°41'57.65"N 95°37'16.71"E	

Table 21: GPS	coordinates	of noise	sampling	points
---------------	-------------	----------	----------	--------



Figure 29: Noise monitoring points for De Heus Myanmar project

### **Monitoring Plan**

The sampling plan for noise level monitoring in N1, N2 and N3 for both seasons is shown in the following table.

Sampling site and Duration	Wet Season (Pre-construction Phase) (2017)			Dry Season (Construction Phase) (2017)		
	N1	N2	N3	N1	N2	N3
Day Time	26	27	28	3	4	5
(7am -10pm)	September	September	September	December	December	December
Night Time	26-27	27-28	28-29	3-4	4-5	5-6
(10pm- 7am)	September	September	September	December	December	December

Tabla	$\gamma\gamma$ .	Ambiant	Noico	Loval	Sampling	Schodulo
rable	LL.	Ambient	noise	Lever	Sampling	Schedule

#### Meteorological Data

The meteorological data for the sampling periods including air temperature, relative humidity, sea level atmospheric pressure, visibility, wind speed and rainfall were obtained from the website Weather underground <u>http://www.wunderground.com.</u> A summary of the meteorological data was provided in the section dedicated to ambient air quality and noise level monitoring.

#### **Result of Baseline Noise Level Assessment**

The noise level data collections were at the approximately same sites used for the air quality monitoring. Two periods of twelve hours continuous monitoring of noise levels were investigated to have comparisons with the NEQEG limits for day and night. In this study, all ambient noise levels at all sites did not exceed the noise level guidelines. A summary of the noise levels recorded was presented in following Table.

Duration	Wet Season			Dry Season			WHO/NEQEG (dBA)	
and Location	N1 (dBA)	N2 (dBA)	N3 (dBA)	N1 (dBA)	N2 (dBA)	N3 (dBA)	Residential/ Institutional/ Educational	Industrial/ Commercial
Day Time (7 am -10pm)	51.68	55.97	47.05	52.29	54.21	50.94	55	70
Night Time (10pm- 7am)	50.77	48.14	48.21	40.28	39.03	38.04	45	70

Table 23:	Comparison	of Noise Levels	with NEQEG
-----------	------------	-----------------	------------

### 5.3.4.3 Vibration monitoring

The ESIA study is conducted during the construction phase of the project and the vibration status of the construction area are monitored in six locations within the project boundary. The measurement is conducted during the daytime of the construction site by BM-6370 vibration meter. The monitoring location points for vibration are shown in the following map.



Figure 30: Vibration Monitoring Point

The vibration results with its coordinates of the measurements were described in the following result table.

Sampling point	Coordinate points	Time of sampling	Vibration levels VEL mm/s
V 1	N 21° 41' 57.6" E 95° 37' 19.0"	10:03 Am	0.08
V2	N 21º 41' 59.6" E 95º 37' 17.5"	10:10 Am	0.22
V3	N 21º 42' 02.1" E 95º 37' 16.4"	10:20 Am	0.11
V4	N 21º 42' 03.9" E 95º 37' 15.9"	10:28 Am	0.13
V5	N 21º 42' 02.5" E 95º 37' 18.3"	10:38 Am	0.41
V6	N 21° 42' 00.8" E 95° 37' 19.0"	10:50 Am	0.11

Table 24: Result of Vibration	Table 24:	Result of	<sup>2</sup> Vibration
-------------------------------	-----------	-----------	------------------------

# 5.3.5 Soil Quality

Geophysical random sampling method was applied in soil condition monitoring. Soil condition monitoring examined the state of soil and the levels of heavy metal contamination. Due to the area coverage and the degree of variation in land use, soil samples were taken from 3 places at the project site to obtain representative information. Samples from the least disturbed places, which were randomly selected, were collected to the depth of 1 meter unless water table is found shallower than the depth. Samples over 10 cm in thickness were taken from all horizons in the pits. Each soil sample for physical and chemical analysis weighed at least 2 Kg. In addition to soil sampling, visual survey of land-use patterns with existing agricultures, water bodies, depth to groundwater table, and irrigation methods were also conducted at the site. Some parameters for the soil survey were examined onsite and the remaining analysis was done at Department of Research and Innovation Analysis Laboratory under the Ministry of Education.

# 5.3.5.1 Geology and Soil Sampling Method

AMS Basic Soil Sampling Kit (a standard soil sampler), which consists of stainless-steel regular soil auger and mud auger with sampling tube, was employed as the soil sample collection equipment. Soil auger sampling tube was supplied for soil sample collection. Soil samples were collected from 1 m depth to ensure from surface contamination. The collected samples were stored in individual clean plastic bags and protected from direct sunlight to prevent any chemical reaction. Onsite analysis was carried out at the site. The collected soil samples were preserved by cooling during the holding time before being sent to the laboratory.

Both wet and dry seasons soil samples were collected from the depth of one meter to avoid surface contamination. Soil samples were taken from random locations of the project site. The collected samples were stored in an individual clean plastic bag, which blocked penetration of direct sunlight. In order to preserve the soil samples from moisture lost and chemical compositions, the soil-samples were kept in cooling box from the time of sampling to the time of arrival to the selected laboratory. Onsite analysis was carried out at the site determine the value of soil pH and moisture. Geological Map of Myanmar and approximate area of De Heus Project were shown in the following figure.



Figure 31: Geological Map of Myanmar and approximate area of De Heus Project

### 5.3.5.2 Sample Locations

To obtain representative soil sample data from the project with considerable land size, the soil samples were taken from three randomly selected parts of the project site. Sample locations and relevant geographic coordinates and maps are shown below:

Sampling Points	Sample Name	Sample Location	GPS Co	ordinates				
1 <sup>st</sup> Season (Wet Season)								
BH-1	Surf Soil1	Outside of Project	21°41'59.91"N	95°37'16.95"E				
BH-2	Surf Soil2	Inside of Project	21°42'2.50"N	95°37'15.60"E				
BH-3	BB 1	Inside of Project	21°42'0.75"N	95°37'18.57"E				
2 <sup>nd</sup> Season (Dry Season)								
BH-1	BH1	Inside of Project	21°42'1.00"N	95°37'19.10"E				
BH-2	BH2	Inside of Project	21°42'2.80"N	95°37'15.60"E				
BH-3	BH3	Inside of Project	21°41'59.90"N	95°37'16.10"E				

Table 25. Soil Sample Location Table for 1<sup>st</sup> Season and 2<sup>nd</sup> Season



95°37'30"E

Figure 32: Soil sample location map at De Heus site (Wet Season)



Figure 33: Dry Season Soil sample location map at De Heus site

### 5.3.5.3 Survey Parameters

In order to set the baseline data for the project, moisture percentage, concentration of iron, calcium, magnesium, chloride, sulphate, phosphorus, nitrogen, zinc, arsenic, lead, and pH conditions were examined at the laboratory. Soil color, texture, and types were identified onsite visual classification (ASTM D-2488).

### 5.3.5.4 Soil Structure

De Heus project area lies on the younger alluvial soil deposit, Geological Map of Burma 2014 (Q<sub>2</sub> Holocene Age).

In the first season, major soil types are predominantly reddish brown, moist, and low plasticity Silty CLAY. The surface layer consisted of grey colour, fine to medium grained sand, and back fill Silty SAND soil. The thickness of the Silty CLAY layer was found between 0.2 meter and 0.5 meter. Below that brown colour Silty CLAY was observed. The top layer, sandy soil or granular types, found to have contained high content of silt (12%) known as non-cohesive soil.



Figure 34: Images of Soil Profile

Due to ongoing construction activities, in the second season, soil sampling points were not identical to the first sampling locations. Both existing soil and ground elevation have been changed due to the consolidated condition caused by the backfilling and compacting activities. Angular soil type, yellowish, moist, fine to medium grained, with Silty SAND was observed at one-meter depth. Non-cohesive soil also known as angular soil is more permeable than the cohesive (fine grained) soil.



Figure 35: Soil layers and backfilling level of De Heus project site

### 5.3.5.5 Soil Quality

The project site and the whole industrials zone lie on the area of predominantly reddish brown, moist and low plasticity Silty Clay soil. After back fill layer, sandy soil layer is usually seen within sampling depth of one meter, followed by Silty Clay soil. The bed rock is light yellowish color sand stones.

The top layer, sandy soil or granular types, has high content of silt (12%), known as noncohesive soil formed from transportation and deposition. The soil's moisture retaining capacity is very low and the susceptibility for erosion is high. The results of the laboratory analysis are seen in **Annex 3**.

During the wet and dry seasons survey, the observation showed that the soil's moisture retaining capacity is high enough to cause erosion due to lack of clay content. The results of the laboratory analysis are shown in the following table:

		1 <sup>st</sup> Season			2 <sup>nd</sup> Season		
No.	Sample Name	Surf	Surf	<b>BB 1</b>	BH1	BH2	BH3
		Soil1	Soil2				
1.	Sampling Depth (m)	1	1.3	1	1	1.3	1
	Results	Value	Value	Value	Value	Value	Value
2.	Calcium as Ca%	1.74	0.78	0.58	1.84	1.85	1.27
3.	Magnesium as Mg%	0.35	0.12	0.12	1.00	0.58	0.47
4.	Chloride as Cl%	0.11	0.07	0.07	0.08	0.05	0.05
5.	Iron as Fe%	2.96	3.19	2.98	2.97	2.64	2.95
6.	Sulphate as SO <sub>4</sub> %	0.16	0.16	0.16	0.11	0.14	0.11
7.	Moisture%	12.38	8.50	13.34	11.39	11.22	14.62
8.	Manganese as Mn (ppm)	755.48	677.69	714.14	0.06	0.06	0.07
9.	PH Value (10% Solution)	8.50	8.85	8.50	9.16	8.98	8.98

Table 26: Results from soil laboratory analysis for the 1<sup>st</sup> Season and 2<sup>nd</sup> Season

The result indicated low concentration of *calcium*, *magnesium*, *chloride*, and *sulphate* in the soil samples. Rich manganese level is considerably high across the site and soil pH levels are considerably high.

Back fill layer and sandy soil type displayed high pH values but low in iron chloride and sulfate, while containing considerable amount of Calcium and Magnesium. Soil test results revealed that the soil was not fertile and was not good for agricultural purposes. Organic content in top soils was rare and therefore, transformation of the area to the industrial estate was not a bad decision.

# 5.3.6 Water Quality Monitoring

To determine the state of water quality for surface water and groundwater, random water sample monitoring was carried out at the water source in the project location. Only water source available on the site was from tube well. One sample from groundwater tube well and another sample from a tube well in Nawarat Village were collected.

# Methodology

Water quality surveys in two different seasons were executed to define the background water quality data of the area. As the project site has already been transformed into a built environment and the exercise was treated as baseline survey in the absence of background scientific data. Field analyses using portable YSI Professional multi-parameter water quality meter and laboratory analysis at a reliable water laboratory were performed in the water quality survey. In addition, visual survey of potential water pollution sources was included in the study. Grab samples were collected in the water quality surveys.

### Water Sample Collection and Analysis

Water quality monitoring survey was done in wet season (1<sup>st</sup> Season) and dry season (2<sup>nd</sup> Season). The water quality survey team strictly followed the guidelines from the Standard Methods in sample collection, handling, storage, and shipping. Samples were collected in pre-cleaned amber bottles. Before each sample was collected, the bottles were rinsed three times with respective samples. GPS identification of the location, sample collection time, and chain of custody were recorded at each step for quality control. (Seen in **Table 27**) The water sample location maps in both seasons were in **Figure 36**.

In addition to the quality control, as a quality assurance exercise, some samples were shipped to a reliable laboratory, MCDC laboratory, for analysis. The laboratory analysis results of collected water samples are described in the following tables and the original lab results are also attached in the annexes. Array of parameters specified in National Environmental Quality (Emissions) Guideline (NEQEG) were analyzed in a laboratory. These parameters will set the state of baseline water quality for the project. These parameters are presented in comparison to NEQEG's Guideline's values.

Sample points	Sample location coordinates	Date of sampling	Time of sampling		
	First season water quality survey, September 2017				
Tube Well (W1)	21°41'58.1" N 95°37'17.0" E	28.9.2017	10:15 am		
NWR village Tube Well (W2)	21°42'10.68" N 95°37'57.08" E	27.9.2017	9:39 am		
	Second season water quality survey. December 2017				
Tube Well (W1)	21°41'58.1" N 95°37'17.0" E	6.12.2017	3:40 pm		
NWR village Tube Well (W2)	21°42'10.68" N 95°37'57.08" E	6.12.2017	2:39 pm		
Wastewater Pond	21°42'04.5" N 95°37'13.7" E	6.12.2017	4:10 pm		

Table 27: Water Quality Monitoring Survey in 1<sup>st</sup> Season and 2<sup>nd</sup> Season



Figure 36: Water Sample Location Map in wet season and dry season for De Heus Myanmar Project

#### Result of First and Second water quality survey

The water quality monitorings were done at tube well in the factory and in Nawarat villages for dry season and wet season. Moreover, wastewater from wastewater pond of the factory was analysed during the second season survey while microbiology for Tube well in the factory and in Nawarat village were analysed at the second survey. The laboratory analysis results were seen in **Annex 3**. The following tables are shown for the onsite measurement results and the laboratory results for both seasons.

Table 28.	Onsite Measurement Result for	Tube Well -	Frst and Second	Season water	quality
	survey				

Field analysis parameter	Unit	Result	
		First Season (Wet Season)	Second Season (Dry Season)
Water Temperature	°C	33.5	29.3
Air Temperature	°C		29.8
Pressure	mmHg	739.5	739.9
Dissolved Oxygen	mg/l	4.40	1.9
Conductivity	µS/cm	15374.0	14575
Total Dissolved Solid	mg/l	8619	8755.50
Salinity	ppt	7.54	7.72
рН	Scale	7.31	6.94
ORP	mV	134.1	57.6

Table 29. Onsite Measurement Result for NWR village tube well – First and Second season water survey

		Result	
Field analysis parameter	Unit	First Season	Second Season
		(Wet Season)	(Dry Season)
Water Temperature	°C	29.1	30.7
Air Temperature	°C		31.33
Pressure	mmHg	736.8	737.4
Dissolved Oxygen	mg/l	4.45	6.18
Conductivity	μS/cm	3811	3817
Total Dissolved Solid	mg/l	2294.5	2249
Salinity	ppt	1.84	1.82
рН	Scale	7.89	7.66
ORP	mV	152.4	121

Table 30. Water Quality Onsite Measurement Result for Wastewater Pond for the second survey

Field analysis parameter	Unit	Result
Water Temperature	°C	23.5
Air Temperature	°C	28.3
-----------------------	-------	-------
Pressure	mmHg	740.8
Dissolved Oxygen	mg/l	4.24
Conductivity	μS/cm	7074
Total Dissolved Solid	mg/l	4719
Salinity	ppt	3.99
pH	Scale	8.25
ORP	mV	92.6

 Table 31.Water Quality Laboratory Result for Tube Well for First and Second Season Survey

I abaratary analysis		Re	sult	WHO Drinking
parameter	Unit	First Season	Second Season	Water Guidelines (Geneva-1993)
рН	_	8.1	( <b>DTy Season</b> ) 7.4	6.5-8.5
Color	Units	>50	Nil	>5-50
Turbidity	NTU	0.39	5	5
Conductivity	µS/cm	7000	7922	-
Total Dissolved Solid	mg/l	4160	3960	1000
Calcium as Ca	mg/l	480	1548	200
Hardness, Total (CaCO <sub>3</sub> )	mg/l	2300	Nil	500
Magnesium as Mg	mg/l	268	772	150
Chloride as Cl	mg/l	300	250	600
Total Alkalinity	mg/l	540	580	500
Iron, Total (Fe)	mg/l	>1.0	0.40	1.0
Manganese (Mn)	mg/l	0.03	Nil	0.5
Sulphate (SO <sub>4</sub> )	mg/l	>400	196	400

Table 32. Water Quality Laboratory Result for NWR village tube well for First and Second Season survey

Laboratory analysis		R	WHO Drinking		
parameter	Unit	First Season (Wet Season)	Second Season (Dry Season)	Water Guideline (Geneva-1993)	
рН	-	7.6	7.5	6.5-8.5	
Color	Scales	5	Nil	>5-50	
Turbidity	NTU	0.49	2	5	
Conductivity	μS/cm	1843	1973		

Total Dissolved Solids	mg/l	1029	987	
Calcium as Ca	mg/l	88	340	200
Hardness, Total (CaCO <sub>3</sub> )	mg/l	580	Nil	500
Magnesium as Mg	mg/l	88	168	150
Chloride as Cl	mg/l	150	30	600
Total Alkalinity	mg/l	360	412	500
Iron, Total Fe	mg/l	0.01	0.17	1.0
Manganese (Mn)	mg/l	0.01	Nil	0.5
Sulphate (SO <sub>4</sub> )	mg/l	<300	110	400

The test result of the existing tube well indicates that groundwater level is nearly 100 meters from the surface. These baseline data will be employed to check the change of water quality trend overtime.

Table 33. Wa	ater Quality Laborato	ry Result for Wastew	vater Pond for the s	second survey
--------------	-----------------------	----------------------	----------------------	---------------

Laboratory analysis parameter	Unit	Result	WHO Drinking Water Guideline (Geneva-1993)
pH	-	8.3	6.5-8.5
Color	TCU	40	15
Turbidity	NTU	82	5
Conductivity	μS/cm	4172	-
Dissolved Solid	mg/l	2086	1000
Calcium Hardness	mg/l	668	-
Magnesium Hardness	mg/l	332	-
Carbonate (CaCO <sub>3</sub> )	mg/l	Nil	-
Chloride as Cl	mg/l	120	250
Total Alkalinity	mg/l	450	500
Iron, Total (Fe)	mg/l	0.72	0.3
Manganese (Mn)	mg/l	0.05	0.05
Sulphate (SO <sub>4</sub> )	mg/l	110	200

Table 34. Water Quality Laboratory Result (Microbiology) for Tube well at the second survey

Laboratory analysis parameter	Unit	Result	WHO Drinking Water Guideline (Geneva-1993)		
Total Coliform Count	CFU/100ml	3	Not detected		
Thermotolerant (fecal)	CFU/100ml	Not detected	Not detected		

Coliform Count		(<1)	
pH		7.4	6.5-8.5
Turbidity	NTU	5	5
Color (True)	TCU	Nil	15
Free Chlorine	mg/l	Nil	-
Total Chlorine	mg/l	Nil	-

Table 35. Water Quality Laboratory Result (Microbiology) for NWR Tube well – the second survey

Laboratory analysis parameter	Unit	Result	WHO Drinking Water Guideline (Geneva-1993)		
Total Coliform Count	CFU/100ml	2	0		
Thermo tolerant (fecal)	CFU/100ml	Not detected	0		
Coliform Count		(<1)			
pH		7.5	6.5-8.5		
Turbidity	NTU	2	5		
Color (True)	TCU	Nil	15		
Free Chlorine	mg/l	Nil			
Total Chlorine	mg/l	Nil			

The area falls in the close vicinity of the dry zone and therefore, water scarcity is generally high and competition for water sources is severe in the area. The plant will extract water from the groundwater sources. However, for the long-term sustainability, water conservation measures and alternative water sources need to be taken into consideration in order to help reduce the tension in the area.

# 5.4 Biological Components

The ecological habitat of the Myotha industrial zone area is already changed by human activities for the development of plot layout for IZ master plan. The immediate project area is already under preconstruction land preparation and earth work, which excavates and refills soil for factory foundation and fencing. The proposed project area is surrounded by operating factories like biscuits and plywood manufacturing industries. The rest of the open plots are covered by small bushes of sparse thorny desert plants and herbs. The general habitat of the proposed project area and its surrounding environment are under dry zone condition with very sparse annual rainfall. The most dominant tree species observed in this area is Toddy palm trees, which has been followed by desert trees species like Shar, Htanaung, thoney desert shrubs and Mayoe bushes. Map for Major vegetation type of Myanmar was shown in the following figure.



Figure 37: Major vegetation type of Myanmar; (Sources Kress et al, 2003 of NBSAP 2015-20)

After many years of reckless and intensive deforestation by all means, the landscape in the area hosts small low-lying shrubs, thinly scattered dry zone thorny plants such as Tectona homiltoniana, Terminalia oliveri, Acacia catechu, and Bauhinia racemose. Bamboo and teak are nowhere to be seen around the project area. The most dominant tree species observed in this area is Toddy plum trees, which has been followed by small leave thorny desert trees species like Shar, Htanaung, thoney desert shrubs and Mayoe bushes.

As the project site is in the tropical dry zone area of Myanmar with very large pastureland area, kinds of domestic livestock species like herd of white colored Myanmar cattle, groups of sheep and dark brown colored goats, and some rabbit are observed as mammal fauna and various bird species can be seen near Myotha IZ. Moreover, oral recollection from the long-term residences revealed that various kinds of deer, hog, rabbit and Felis chaus could be found in the area but intense hunting and lack of serious efforts to make conservation could drive these animals to the brink of extinction. Toads, lizards, and several types of venomous snakes are still present in the area. Egrets, kites, Ciconia nigra, and Ciconia bicolor and King

fisher can be seen in the area. Credible documents of the existing species could hardly be located to help identify the threatened species. It is still a long way away from compiling records of all species' patterns and behaviors to determine adverse impacts on them by development projects.

As mentioned above, the Ayeyarwaddy River is some 15 Km away from the project and therefore, the impacts reaching to the river could not be anticipated. No running creeks or streams could be located. Therefore, determining effects on the marine biota could be impractical.

## 5.4.1 Methodology for Ecological flora and fauna monitoring survey

The flora and fauna species from four points, East, West, South and North, which is 500meter distance from the center of the proposed project area are collected by using measuring tape. The flora and fauna species within the every 10 sqm plots for each point are collected and identified for their habitat nature and species diversity assessment. The biological survey data gathering was conducted at two different seasons in 2017, specifically in September for wet season and in December for dry season. All flora and fauna species from the sample plots observed in each season were identified and listed. In order to get more detail information of existing ecological habitat, the commonly observed trees and animal species were also documented.

As the Myotha Industrial Zone area is already under manmade ecological condition with poor ecological documentation, desktop study and some reliable secondary data sources are also applied to identify the observe flora and fauna species. The coordinate points and location map of the ecological data sampling points are described as follow. Each sampling points is located at 500 m far from the center of the proposed project area. The following table and figure were shown the sampling points for flora and fauna, and its location map of the project.

Sampling points 500 m from De Heus site	Wet season	GPS Coordinate for wet season	Dry season	GPS Coordinate for dry season
South point	WBS	21°41'45.23"N 95°37'23.47"E	DBS	21°41'50.9"N 95°37'34.09"E
North point	WBN	21°42'14.27"N 95°37'8.00"E	DBN	21°42'09.8"N 95°36'58.6"E
East point	WBE	21°42'6.81"N 95°37'31.60"E	DBE	21°42'15.5"N 95°37'26.8"E
West point	WBW	21°42'53.26"N 95°37'0.07"E	DBW	21°41'44.4"N 95°37'04.3"E

Table 36. The coordinate locations of four sample plots in two seasons



Figure 38: Wet and dry season Biodiversity Sampling points for De Heus Myanmar project

## 5.4.2 Two seasons monitoring results

The natural vegetation and biological condition of the De Heus project surrounding area were identified for existing ecological baseline condition. As the whole industrial zone is already under semi-arid dry zone area, the small thorny desert trees species likes acacia bushes are commonly observed. Among these, palm trees are sparsely distributed. Some area has been cleared and land cover vegetation has been changed into IZ plots with bare land condition. In order to get representative biological information, the biological survey data gathering was conducted in both wet and dry season. The number of flora species observed in each 10 square meter plots are identified and counted in both seasons. There were more than 10 flora species observed in both West and South plots, meanwhile very few species are observed in both East and North plots. The number of flora and fauna species in two seasons were listed in the following tables.

Sr	Scientific name	Myanmar name	Family	Count	Habits					
10 s	10 sq. m plot in South (500 m radius from the project area)									
1.	Senegalia catechu	Shar-Pin	Fabaceae	1	Т					
2.	Calotropis procera	Ma-Yoe Pin	Asclepiadaceae	2	S					
3.	Prosopis cineraria	Kandarya Pin	Mimosaceae	1	S					
4.	Faidherbia albida	Kandarya pan phyu	Fabaceae	1	S					
5.	Ziziphus jujube Lam	Zee	Rhamnaceae	1	Т					
6.	Convolvulus arvensis L	Ngwe	Convolvulaceae	10	Cl					
7.	Agave de Tequila	Nannat-Ying	Asparagaceae	1	S					
8	Digitaria Haller	Myat Lay gwa	Poaceae	30	Н					
9.	<u>Digitaria ramularis</u>	Myat pan nu	Poaceae	50	Н					
10.	Digitaria sanguinalis	Ga Nan sar myat	Poaceae	20	Н					
11.	Poa annua L.	Cat tail grass	Poaceae	15	Н					
12.	Cynodon dactylon	Myay Zar Myat	Poaceae	10	Н					
13.	Solanum virginianum	Kayankazat sue war	Solanaceae	2	Н					
10 s	q. m plot in West (500 m r	adius from the project	area)							
1.	Gloriosa superba linn	Si-Mi-Tout Pin	Liliaceae	1	Cl					
2.	Azadirachta indica	Ta-Mar Pin	Meliaceae.	1	Т					
3.	Prosopis cineraria	Kandarya Pin	Mimosaceae	5	S					
4.	Ocimum gratissimum L.	Pin-Sein yine	Lamiaceae	25	Н					
5.	Leucaena	Kalar-KingMon	Fabaceae	5	CL					
6.	Agave de Tequila	Nannat-Yaing	Asparagaceae	5	S					
7.	Digitaria Haller	Myat Pin	Poaceae	50	Н					
8.	Ficus carica	Tha-Phan Pin	Moraceae	10	Т					
9.	Cassia mimosoidea L.	Mae-Za-Li	Caesalpiniaceae	1	Т					
10	Vachellia farnesiana	Kandarya sue kyan	Fabaceae	1	S					
11	Acacia victoriae	Kandarya ywat she	Fabaceae	5	S					

### 5.4.2.1 Monitoring results for wet season survey

Tabla	27	List	off	flore	anaciaa	ohearry	ad in	four	complin	na na	ointa	of wat	concon	auruau
rable	57.	LISU	OI I	nora	species	observ	eu m	TOUL	sampin	ig po	omes	or wet	season	survey

Sr	Scientific name	Myanmar name Family		Count	Habits			
10 s	10 sq. m plot in North (500 m radius from the project area)							
1.	Calotropis	Ma-Yoe Pin	Apocynaceae	25	S			
2.	Prosopis cineraria	Thorny tree	Mimosaceae	10	S			
3.	Digitaria Haller	Myat Pin	Poaceae	15	Н			
4.	Vachellia nilotica	Kandar ya pan war	Fabaceae	50	S			
5	Saccharum spontaneum Myat nu Gramineae				Н			
10 s	q. m plot in East (500 m ra	dius from the project	area)					
1.	Calotropis	Ma-Yoe Pin	Apocynaceae	15	S			
2.	Prosopis cineraria	Kandarya Pin	Mimosaceae	2	S			
3.	Vachellia nilotica	Kandar ya pan war	Fabaceae	13	S			
4.	Cenchrus Longispinus	<i>Cenchrus Longispinus</i> Myat pan kaing she Poaceae		11	Н			
5.	5.Tinospora cordifoliaNwe pinMenispermaceae2Cl							
Aquatic Herbs=AH, Climber=CL, Epiphyte=E, Fern=F, Grass=G, Herbs=H, Mushroom=M, S=Shrubs, Small Tree=ST, Tree=T								

Table 38. List of commonly observed fauna species in project surrounding area (wet season)

Sr	Sciontific Nama	Common Namo	Family	IUCN
51.	Scientific Maine	Common Name	ганну	Status
Obs	erved bird Species			
1	Acridotheres tristic	Common Myna/ Za Yat	Sturnidae	NE
2	Columba Livia	Rock Dove	Columbidae	LC
3	Passer domesticus	House Sparrow	Passeridae	LC
4	Centropus sinenisis	Greater Coucal / Myae-bote	Cuculidae	NE
5	Prinia Inornata	Plain Prinia / Mhi Hsee Hnget	Cisticolidae	LC
6	Nectarinia asiatica	Purple Sunbird / Hnarpyisoke	Nectarinidae	LC
7	Halcyon smyrnensis	White Throated Kingfisher	Alcedinidae	LC
Obs	erved Insect Species			
1	Anisoptera	Dragonfly	Aeshnidae	LC
2	Danaus genutia	Common Tiger / butterfly	Nymphalidae	LC
3	Castalius rosimon	Common Pierrot / butterfly	Lycaenidae	NE
4	Juninia atlites	Grey Pansy/ butterfly	Nymphalidae	NE
5	Polistes dominula	Paper Wasps	Vespidae	NE
6	Anthidium Florentinum	Mason bees	Megachilidae	NE
7	Mantis religiosa	Green praying mantis	Mantidae	LC
Obs	erved amphibian species			
1	Pelophylax lateralis	Yellow frog	Ranidae	LC
Obs	erved Livestock Species			
1	Canis lupus	Domestic dog	Canidae	NE
2	Cupra aegagrus	Domestic goat	Bovidae	NE
3	Bos taurus	Cattle	Bovidae	NE
Defin	ition: LC – Least Concern, NE	– Not Evaluated, NT – Near Threaten	ed, DD – Data Defic	rient, VU –
Vulne	erable, EN – Endangered, CR –	$Critically\ Endangered,\ EW-Extinct$	in the Wild, E - Extir	ıct

# 5.4.2.2 Monitoring results for dry season survey

Sr.	Scientific name	Myanmar name	Family	Count	Habits
10 s	q. m plot in South (500 m radi	us from the project a	area)		
1.	Acacia Nilotica	Kan dar Ya pin	Fabaceae	8	Т
2.	Croton tiglium	Ka Na Kho	Euphorbiaceae	30	S
3.	Borassus flabellifer	Taw Htan pin	Arecaceae	1	Т
4.	Panicum virgatum	Thayaphu grass	Poaceae	20	Н
5.	Desmodium gyrans L.	Kho sar pin	Fabaceae	25	Н
6.	Barleria prionitis	Sue padaung war	Acanthaceae	5	Н
7.	Eragrostis cilianensis	Daeoe myat	Graminaceae	100	Н
8	Ocimum gratissiionu	Pin sein yine	Lamiaceae	10	S
9.	Mesosphaerumsuaveolens L	Taw pin sein	Limiaceae	5	S
10.	Digitaria Haller	Myat lay gwa	Poaceae	50	Н
11.	Atriplex nummularia	A-Phyu- Pin	Amaranthaceae	5	S
12.	Acacia catechu	Shar pin	Mimosaceae	2	Т
13.	Digitaria snaguinais	Sin ngo myat	Gramineae	30	Н
14.	Calotropis	Ma yoe pin	Apocynaceae	20	S
15.	Sida spinose L	Pan war lay paung	Malvaceae	15	S
16.	Azadirachta indica	Tamar pin	Meliaceae	2	Т
17.	Lactuca serriola	Mone nyin paung	Asteraceae	15	Н
10 s	q. m plot in West (500 m radiu	is from the project a	rea)		
1.	Chromolaena odorata	Bi zat	Asteraceae	200	S
2.	Acacia catechu	Shar pin 7ft	Mimosaceae	10	Т
3.	Ziziphus oenopalia	Taw zee pin 6ft	Rhamnaceae	10	Т
4.	Abutilon fruticosum	Pan war lay paung	Malvaceae	300	S
5.	Ficus hispida	Taw thaphan	Moraceae	7	S
6.	Bauhinia tomentosa	Swe taw pin	Fabaceae	2	Т
7.	Azadirachta indica	Tamar pin	Meliaceae	1	Т
8.	Urena lobata	Cat se nge	Malvaceae	5	Н
9.	Ocimum gratissiionum	Pin-Sein-Yaing	Lamiaceae	25	S
10	Cardiospermum halicocabum	Kalar-Myat-Si	Sapindaceae	10	CL
11	Croton tiglium	Ka-Na-Kho	Euphorbiaceae	30	S
12	Zizyphus jujube	Zee pin 10ft	Rhamnaceae	10	Т
13	Cynodon doctylon	Myin zar myat	Graminae	150	Н
14	Festuca ovina	Myat the lattan she	Poaceae	100	Н
15	Digitaria snaguinais	Sin ngo myat	Gramineae	50	Н
16	Festuca ovina	Myat thee nyo she	Poaceae	50	Н
10 s	q. m plot in North (500 m radi	us from the project a	area)		
1.	Croton tiglium	Ka na kho 3ft	Euphorbiaceae	80	S
2.	Acacia catechu	Shar pin 10ft	Mimosaceae	3	Т

Table 39. List of flora species observed in four sampling points of dry season survey

Sr.	Scientific name	Myanmar name	Family	Count	Habits
3.	Ziziphus oenopalia	Taw zeepin/Paudpe	Rhamnaceae	5-10	Т
4.	Abutilon fruticosum	Pan war lay paung	Malvaceae	100	Н
5	Desmodium triflorum	Pan Kha yan	Fabaceae	20-50	Н
6	Chloris barbata	Grasses	Gramineae	170	Н
7	Ficus hispida	Taw tha phan/Fig	Moraceae	15	S
8	Thysanolaena latifolia	Tan myat see pin	Poaceae	15-20	S
9	Saccharum spontaneum	Myat Mhwe nu	Gramineae	200	Н
10	Urena Lobata	Cat see nge pan	Malvaceae	50	Н
11	Alysicarpus vaginalis	Than-kyautma naing	Papillionaceae	50	Н
12	Polygonum arenastrum	Myay Kat pin	Polygonaceae	100	Н
13	Vachellia seyal	Kan dar ya ni	Fabaceae	5	Т
14	Azadirachta indica	Tamar Pin	Meliaceae	2	Т
15	Convolvulus arvensis L	Kyauk Yoe New tu	Convolvulaceae	1	CL
10 so	q. m plot in East (500 m radiu	s from the project are	ea)		
1.	Borassus flabellifer	Htan pin/Toddy pal	Arecaceae	4	Т
2.	Vachellia nilotica	Kan-Tar-Ya	Fabaceae	15	Т
3.	Thysanolaena latifolia	Tan myat see pin	Poaceae	10	S
4.	Alysicarpus vaginalis	Than-kyaut manaing	Papillionaceae	200	Н
5.	Caoltropis gigantean	Ma yoe pin	Asclepiadaceae	5	S
6	Euphorbia maculata	Narrow leaf weed	Euphorbiaceae	50	Н
7	Digitaria snaguinais	Sin ngo Myat	Gramineae	50	Н
8	Agrostis gigantea	Daeoo Myat	Poaceae	50	Н
9	Abutilon fruticosum	Pan war lay paung	Malvaceae	70	S
10	Euphorbia hirta	Kywe kyaung minse	Euphorbiaceae	150	Н
11	Galinsoga parviflora	Wat sar pan war	Asteraceae	50	Н
12	Tinospora cordifolia	Unknown nwe pin	Menispermaceae	15	CL
13	Vachellia farnesiana	Kan dar ya 7ft	Fabaceae	10	Т
14	Atriplex nummularia	A-Phyu-Pin	Amaranthaceae	50-70	S
Aqua Tree=	tic Herbs=AH, Climber=CL, Epiph =ST, Tree=T	yte=E, Fern=F, Grass=G, I	Herbs=H, Mushroom	=M, S=Shr	ubs, Small

Table 40. List of commonly observed fauna species in surrounding area of De Heus (dry season)

Sr	Scientific Name	Scientific Name Common Name		IUCN Status			
Bird	Bird Species						
1	Alcedines	Kingfisher	Alcedinidae	LC			
2	Acridotheres tristis	Common Myna	Sturnidae	LC			
3	Cisticola juncidis	Zitting cisticola	Cisticolidae	LC			
4	Centropus bengalersis	Lesser coucal	Cuculidae	LC			
5	Luscinia megarhynchos	Common Nightingale	Muscicapidae	LC			
6	Motacilla alba	White wagtail	Motacillidae	LC			
7	Merops orientalis	Green Bee-Eater	Meropidae	LC			
8	Streptopelia tranguebara	Red turtle dove	Columbidae	LC			

Sr	Scientific Name	Common Name	Family	<b>IUCN Status</b>	
9	Streptopelia orientalis	Oriental Turtle-Dove	Columbidae	LC	
10	Pycnonotus brunnus	Red-Eye Bulbul	Pycnonotidae	LC	
11	Pycnonotus cafer	Red-Vented Bulbul	Pycnonotidae	LC	
12	Passer montanus	Tree sparrow	Passeridae	LC	
13	Psittacula roseata	Blossom-Headed Parakeet	Psittacidae	NT	
Butt	erfly species				
1	Danaus genutia	Common Tiger	Nymphalidae	NE	
2	Polyommatus icarus	Common Blue	Lycaenidae	NE	
3	Zizeeria karsandra	Dark Grass Blue	Lycaenidae	NE	
4	Macrosoma bahiata	Brown Moth	Hedylidae	NE	
Definition: LC – Least Concern, NE – Not Evaluated, NT – Near Threatened, DD – Data Deficient, VU –					
Vulne	erable, EN-Endangered, CR-e	Critically Endangered, EW – Ex	tinct in the Wild, E -	Extinct	

### 5.4.3 Generally observed flora and fauna species in both seasons

In addition to the plot sampling of biological baseline information, some flora and fauna species are identified generally. As the proposed project area is already under dryzone condition, the most prominent flora species are thorny acacia and herb species. The immediate outside of Myotha industrial zone have a private own herbal plantation and known as Kaung Su Aung Plantation. The approximate area is about 4000 acres and some marketable herbal species like Tayote sagar, Shaw phyu, Sharsaung lapat, Makyi and Zee are grown for local and export market. According to local elder, this plantation serve as a natural habitat for some mammal likes Rabbit, backing Deer, Wild dog, and Fox. At the same time, various bird species including Big Owl and House sparrow are hosted. In recent years some Centipede and Millipede species including colorful scorpion species are observed frequently by local people. Moreover, the biological survey was conducted along the access road and immediate De Heus project area, and recorded the flora and fauna species in the following table.

Sr.	Scientific Name	Local Name	Family	Habits	IUCN
511	~~~~~	2000 1 (00000			Status
Obs	erved species				
1	Agrostis gigantea	Myat-Phwar	Poaceae	G	NE
2	Acacia carechu	Shar	Mimosaceae	Т	NE
3	Agave de Tequila	Nar-Nat-Yaing	Asparagaceae	S	LC
4	Acacia aphylla	A-Yoe	Fabaceae	S	VU
5	Atriplex nummularia	A-Phyu-Pin	Amaranthaceae	S	NE
6	Azadirachta indica	Ta-Mar	Meliaceae	Т	NE
7	Aechmanthera tomentosa	Unknown	Acanthaceae	S	NE
8	Bauhinia tomentosa	Swae-Taw-Pin	Fabaceae	Т	NE
9	Borassus flabellifer	Htan-Pin	Arecaceae	Т	Е
10	Barleria prionitis	Unknown	Acanthaceae	S	NE
11	Cynodon doctylon	Myaysar-Myat	Graminae	G	NE

Table 41: Generally observed Flora and fauna species in and surrounding area of project.

Sn	Scientific Nome	Logal Nama	Fomily	Uabita	IUCN
Sr.	Scientific Name	Local Maille	гашпу	nabits	Status
12	Cassia mimosoidea L.	Mae-Za-Li	Caesalpiniaceae	ST	NE
13	Convolvulus arvensis Linn	Ngwe-Pin	Convolvulaceae	CL	NE
14	Centella asiatica	Say-Myin-Kwar	Apiaceae	S	LC
15	Caoltropis gigantean	Ma-Yoe	Asclepiadaceae	ST	NE
16	Chromolaena odorata	Bi-zet	Asteraceae	S	NE
17	Cenchrus Longispinus	Myat-A-Thee	Poaceae	G	NE
18	Cardiospermum	Kalar-Myat-Si	Sapindaceae	CL	NE
	halicocabum				
19	Catapodium marinum	Unknown	Poaceae	G	NE
20	Cyperus longus	Unknown	Cyperaceae	G	LC
21	Croton tiglium	Ka-Na-Kho	Euphorbiaceae	Н	NE
22	Cytisus scoparius	Pal-Pin	Fabaceae	S	NE
23	Echinochloa crus-galli	Unknown	Poaceae	G	NE
24	Echinochloa crus-galli	Unknown	Poaceae	G	NE
25	Festuca ovina	Myat-Thee	Poaceae	G	VCL
26	Frangula	Unknown	Rhamnaceae	Т	LC
27	Gloriosa superba	Si-Mee-Tauk	Colchicaceae	Т	LC
28	Leucas cephalotes Spreng	Pitku-Htik-Pate	Lamiaceae	Н	NE
29	Leucaena	Kalar-KingMon	Fabaceae	Т	NE
30	Mangifera indica L	Thayat	Anacardiaceae	Т	DD
31	Ocimum gratissiionum	Pin-Sein-Yaing	Lamiaceae	S	NE
32	Polygonum arenastrum	Myae-cat-pin	Polygonaceae	S	NE
33	Pulicaria dysenterica	Naykyar paung	Asteraceae	S	NE
34	Solanum virginianum	Kha-Yan-Yaing	Solanales	S	NE
35	Tinospora cordifolia	Ngwe -Pin	Menispermaceae	CL	NE
36	Tamarindus indica	Magyi	Caesalpiniceae	Т	NE
37	Urena Lobata	Kat-Si-Nal	Malvaceae	S	NE
38	Vachellia nilotica	Kan-Tar-Ya	Fabaceae	Т	NE
39	Zizyphus jujube	Zee-Pin	Rhamnaceae	Т	NE
40	Sida cordata	Heart leaf sida	Malvaceae	S	LC
41	Plumeria acutifolia Poir.	Ta yote sa kar	Apocynaceae	Т	LC
42	Aloe vera L	Shar zaung latpat	Asphodelaceae	Н	LC
43	Sterculia foetida L	Shaw phyu	Malvaceae	Т	LC
44	Alysicarpus vaginalis	Than-kt manaing	Papillionaceae	Н	LC
	Fauna species				
45	Millipedes	Ya htar kaung	Arthrosphaera	G	LC
46	Eutropis multifasciata	King lake shaw	Scincidae	Т	LC
Aqua	tic Herbs=AH, Climber=CL, Epi	phyte=E, Fern=F, Gra	uss=G, Herbs=H, Mu.	shroom=M,	S=Shrubs,
Smal	l Tree=ST, Tree=T				• . • • • •
Defir Vul-	utton: LC – Least Concern, NE – arable EN Endangered CP – C	Not Evaluated, $NT - N$	ear Inreatened, DD -	– Data Defic	rient, VU –
vun	erabie, Ew – Enaangerea, CK – C	rincuny Enaangerea, I	L W – Eximci in ine W	ua, E - EXTII	ici



Figure 39: Observed Fauna species during biodiversity survey

Photo (9)	Photo (10)	Photo (11)	Photo (12)
Common Name - Red turtle dove	Common Name - Red-Eye Bulbul	Common Name - Praying Mantid	Common Name - Frog
Family - Columbidae	Family - Pycnonotidae	Family - Mantidae	Family - Ranidae
Genus - Streptopelia	Genus - Pycnnonotus	Genus - Mantis	Genus - Pelophylax
Species - S-tranquebarica	Species - P-brunneus	Species - M.religiosa	Species - P.Lateralis

Photo (1) Photo (2) Photo (3) Photo (4) Scientific Name - Agrostis gigantean Scientific Name - Acacia carechu Scientific Name - Agave de Tequila Scientific Name - Acacia aphylla Family - Poaceae Family Family - Asparagaceae Family - Fabaceae - Mimosaceae - S Habits - G Habits - T Habits Habits - S IUCN - NE IUCN - NE IUCN - LC IUCN - VU Photo (5) Photo (6) Photo (7) Photo (8) Scientific Name - Atriplex nummularia Scientific Name - Azadirachta indica Scient: Name - Aechmanthera tomentosa Scient: Name - Azadirachta indica - Amaranthaceae - Meliaceae Family - Meliaceae Family Family Family - Acanthaceae Habits - T Habits - T Habits - S Habits - S - NE - NE - NE - NE IUCN IUCN IUCN IUCN

Figure 40: Observed Flora species during biodiversity survey

						A Contraction of the second se	
	Photo (9)		Photo (10)		Photo (11)	H	Photo (12)
Scientific Nam	ne - <i>Borassus flabellifer</i>	Scientific Name -	Barleria prionitis	Scientific Nan	ne - Cynodon doctylon	Scienti: Name	- Cassia mimosoidea L
Family	- Arecaceae	Family -	Acanthaceae	Family	- Graminae	Family	- Caesalpiniaceae
Habits	- T	Habits	- S	Habits	- G	Habits	- ST
IUCN	- E	IUCN	- NE	IUCN	- NE	IUCN	- NE
		AND DE LE					
	Photo (13)		Photo (14)		Photo (15)	I	Photo (16)
Scientific Nam	e - Convolvulus arvensis	Scientific Name -	- Centella asiatica	Scienti: Name	- Caoltropis gigantean	Scienti: Name -	- Chromolaena odorata
Linn Family	- Convolvulaceae	Family -	Apiaceae	Family	- Asclepiadaceae	Family	- Asteraceae
Habits	- CL	Habits -	- S	Habits	- ST	Habits	- S
IUCN	- NE	IUCN	- LC	IUCN	- NE	IUCN	- NE





Photo (33)	Photo (34)	Photo (35)	Photo (36)
Family - Asteraceae	Family - Solanales	Family - Menispermaceae	Family - Caesalpiniceae
Habits - S	Habit - S	Habit - CL	Habit - T
IUCN - NE	IUCN - NE	IUCN - NE	IUCN - NE
Photo (37)	Photo (38)	Photo (39)	Photo (40)
Scientific Name - <i>Urena Lobata</i>	Eamily - Eabaceae	Scientific Name - <i>Zizyphus jujube</i>	Scienti: name - Galinsoga parviflora
Habit - S	Habit - T	Habits - T	Habit - H
IUCN - NE	IUCN - NE	IUCN - NE	IUCN - LC

## 5.5 Natural Hazards

Myanmar regularly experiences cyclones, storm surges, floods, landslides, earthquakes, and drought and forest fires. Over the last 10 years, Myanmar has been impacted by two major earthquakes, three severe cyclones, floods and other smaller-scale hazards.

Myanmar is one of the earthquake prone countries since it is in the Alpide Earthquake Belt and has already experienced many destructive earthquakes and for examples are Innwa earthquake (1839), Bago earthquake (1930), Sagaing earthquake (1956), and Maymyo earthquake (1912). All these events are of the magnitude  $\geq 7.0$  (Mw). The deadliest earthquake happened in Myanmar is the Bago earthquake (1930) which has been structed on May 30 and the magnitude is 7.3 Mw. It caused 500 deaths in Bago and 50 in Yangon, and many buildings were damaged. Phyu earthquake on December 3, 1930 is originated in the southern segment of Sagaing Fault. According to the Myanmar Seismic Zone Map (2005) in **Figure** 41, Myingyan township fall into strong zone ranging from 0.2 g to 0.3g. Moreover, the township is located not far away from the Sagaing fault.



Figure 41: Myanmar Seismic Zone Map

## 5.6 Infrastructure and Services

## 5.6.1 Education

As of 2017, the total number of educational institutions is 143 with 23,151 students and 1091 teachers. The educational institutions include high school, sub-high school, middle school, sub-middle school, post primary school, primary school, pre-primary school and Monastic school in Nga Zun Township. The following table shows the Distribution of Schools in Nga Zun Township in 2017.

		No.				Ratio
NT-	Catalania		Area	No. of	No. of	(Teacher:
INO.	Categories		(Acre)	teachers	Students	Students)
1	High School	6	42.44	218	7,035	1:32
2	Sub-High School	6	27.68	113	2,712	1:24
3	Middle School	6	12.49	69	1,717	1:25
4	Sub-Middle School	10	19.68	95	2,198	1:23
5	Post Primary School	21	21	145	3,103	1:21
6	Primary School	77	77	389	5,383	1:14
7	Pre-Primary School	7	-	7	88	1:12
8	Monastic school	10	-	55	915	1:17
	Total	143	200.29	1,091	23,151	1:21

Table 42: Distribution of Schools in Nga Zun Township in 2017

Source: http://www.mdyregion.gov.mm

# 5.6.2 Healthcare

The township has one fifty-bed district hospital, two sixteen-bed station hospitals, eight rural health centers, and thirty-two sub-rural health centers employing a total of 33 medical staff, 8 doctors, 18 nurses, and 7 assistant healthcare administrators. Serious medical cases that need advance medical care are transferred to medical facilities in Mandalay.

## 5.6.3 Waste management

For the town, there are 44 vehicles that are employed to handle municipal solid wastes and 2 pumping trucks for removing septic tanks. 8 permanent employees are working in the township for the sanitation related tasks.

# 5.6.4 Water, Electricity and Energy

Electricity is mainly provided through a 33 kV/11 government power grid. Statistic showed that the power supply for 6,830 households is provided by on 36 solar panels and 32 fossil fuel electricity generators. For fuel energy supply, nine privately owned gas stations are in operation currently serving 10,368 gal per year of gas and 3,240 gal per year of diesel.

No public water supply is in existence. The water sources are obtained from groundwater with tube wells. Water supplies for 2,208 households in town are served from three deep tube wells and ten water harvesting ponds.

For agricultural irrigation, three river-water pumping irrigation systems, two privately owned dams, and 2 publicly owned canals serve 12,500 acres, 1125 acres, and 3200 acres, respectively.

## 5.6.5 Infrastructure for economy

There is only one guesthouse/inn in the town. Under the local brand of a cooperative unit, there are 169 cooperatives in the town. Three markets, one Myanmar Economic bank, and 291 shops are serving commodities in the area. Type of shops includes gold shops (6), electrical appliance stores (18), phone & its equipment shops (22), book stores (4), drug stores (13), restaurants (18), tea houses (24), general stores (12), agricultural equipment and products shops (9), hardware and construction stores (10), rice stores (60), and garment shops (70).

## 5.6.6 Transportation

The Ayeyarwady River plays a major role in transportation of goods and peoples through Mandalay Region, especially the waterway from Ngan Myar to Kyaut Ta Lone village covering a distance of 21 miles. Bagan-Mandalay railway runs through Gune Kan to Aung Chan Tar village. A total of 37 bridges (less than 50 feet) support smooth transportation of intra and out of town travel. Waterway, Railway, and inter- and intra- township roads and streets networks in Nga Zun Township are summarized as follow:

No.		Categories	From		То	Distance (Mile)
a.	Wa	iterway				
	1.	Ayeyarwaddy River	Ngan Myar	-	Kyaut Ta Lone	21
b.	<u>Rai</u>	ilway and Station				
	1.	Bagan-Mandalay	Gune Kan	-	Aung Chan Thar	11/6
c.	Bus	s Way (Inter Townships)				
	1.	Myotar-Ngazun-Sagaing	Myotar	-	Kyauttalone	22/1
	2.	Myingyan-Myotar-TadaOo	Phyu Twin Khong	-	Gyun Kan	14/6
d.	Bus	s Way (Intra Townships)				
	1. N	Nganzun-Sagaing				29
	2. N	Nganzun-Tha Ta Oo-Mandalay				43
	3. N	Nganzun-Myotha-Myingyan				45

Table 43: Transportation networks of Nga Zun Township

Source: http://www.mdyregion.gov.mm

Bus lines link the town to Yangon, Mandalay, and other towns and cities across the country. A total of seven bus lines serving 21 air-conditioned buses and seven light trucks have been observed in the bus terminal as shown in the Table below.

No	Name of Gate	From	То	Kind of Vehicles	No. of Vehicles
1	Ngazun-Man	Ngazun	Mandalay	Light Truck	7
2	Shwesatkyar	Ngazun	Yangon	Air-con Bus	3
3	Settmu OoYin Man	Myotar	Mandalay	Air-con Bus	8
4	Nganmyar-Man	Nganmyar	Mandalay	Air-con Bus	2
5	Pyi Tar Aung	Thayatchopin	Mandalay	Air-con Bus	2
6	Myo Taw	Thayatchopin	Mandalay	Air-con Bus	3
7	Pyae Sone Aung	Moe Taung	Mandalay	Air-con Bus	3

Table 44: Distributions of Bus Gate in Nga Zun Township

Source: http://www.mdyregion.gov.mm

#### 5.7 Socio-Economic Components

The project site in Myotha Industrial Zone, 59.7 km. South-West of Mandalay is situated in Myotha Town, near Nga Zun Township in the Mandalay Region. The population of Mandalay Region is estimated around 6.2 million, the second most populated city in Myanmar. Even though Mandalay's population density is as high as 200 peoples per sq. km, the area around the industrial zone is thinly populated.

The current population of Nga Zun Township is 140,501, marking as the smallest township in Myingyan District of Mandalay Region followed by Nahtoe Gyi Township. The population of Nga Zun represents 16 percent of the district's population and approximately 0.53 percent of the district's gross domestic product (GDP). The distribution of each sector (Goods, Trade and Service) in Net Gross Domestic Product (GDP) at Nga Zun Township is shown in **Figure** 42. Per capita income in Nga Zun Township is 814,945 Kyats in 2016-17.





Nawarat and Pauk Sein Villages, located within 1.5 Km from the project site boundary, are identified as receptors of socio-economic impacts from the project. Nawarat Village, 1.15 km

North-East of the proposed project site, belongs to Kywe Sein Village Tract of Myotha, Nga Zun Township. The total number of households in the village is 120. Pauk Sein Village, 3.9 km South-West of the proposed project site, belongs to Pauk Sein Village Tract in Nga Zun Township. The village consists of 216 households.

## 5.7.1 Population Growth and Distribution

## a. Nga Zun Townhip

The width of Nga Zun Township is 355.99 square miles in size, involving in 0.623 square miles for township area and 355.37 square miles for village area consisting of 44 village groups and 158 villages. Overwhelming the majority of Nga Zun Township are Buddhists (99%) while the rest constitutes Islam. The population growth rate is 0.44% and the ratio of male and female is 1:1.1. The distribution of household for rural and urban area of Nga Zun Township can be seen in the following Figure 43.



Figure 43: Household distribution in rural and urban of Nga Zun Township

The data from **Table 45** indicates that the total population of male and female in rural areas are much more than those of in urban areas. The total populations of male and female above 18 years old were 93,565 and below 18 years old were 46,936 in both urban and rural areas.

In **Figure 44**, shows that 67 percent of the populations were above 18 years old, and 33 percent were under 18. The relatively low proportion of population under 18 was due to the low fertility level. It also indicates the percentage of male and female (above and below 18 years old) in rural areas is more than those of in urban areas. In rural areas, percentage of female (above and under 18 years old) is greater than percentage of male (above and under 18 years old). For the urban area, the similar trend was observed.

Table 45: Population distribution of male and female in rural & urban of Nga Zun Township (2017)

No.	Cotogorios	Above 18 years		<b>Below 18 years</b>			Total			
	Categories	Male	Female	Total	Male	Female	Total	Male	Female	Total
1	Urban	1,654	2,000	3,654	1,583	1,988	3,571	3,237	3,988	7,225
2	Rural	41,202	48,709	89,911	21,309	22,056	43,365	62,511	70,765	133,276
	Total	42,856	50,709	93,565	22,892	24,044	46,936	65,748	74,753	140,501

Source: http://www.mdyregion.gov.mm



Figure 44: Male and Female Distribution in rural and urban area of Nga Zun Township, 2017

### b. Village Tract

A brief discussion on the demographic factors of the survey population in the affected area is needed for the study. The total population of the two villages combined is 1944 (888 males and 1056 females). Nawarat village has 840 (444 males and 396 females). Pauk Sein village has 1104 (444 males and 660 females). The ratio of male and female (1:1.3) in the total population of the two villages indicates that female population (53.46 %) is dominant in the study area. (See **Table** 46)

		Nawarat Village Pauk Sein Village			<b>D</b> -41 Total		
No.	Categories	No. of People	%	No. of People	%	Both	%
1.	Male	444	52.86	444	40.22	888	46.54
2.	Female	396	47.14	660	59.78	1056	53.46
3.	<b>Total Population</b>	840	100	1104	100	1944	100
4.	Male & Female Ratio	1.12:1		1:1.5		1:1.3	

Table 46: Male and Female Ratio in Nawarat Village and Pauk Sein Village

Source: Based on Survey, 2017

The distribution of male and female in a household study finds that 53 percent of the total households have 1 or 2 males, 28.89 percent with 3 or 4 males and 17.78 percent with 5 or 6 males. While 37 percent of the households have 1 or 2 females, 41.67 percent with 3 or 4 females and 21.11 percent with 5 or 6 females. This result coincides with the male and female ratio. (See **Table** 47)

	Family Member								
No.	Group between gories 1 & 2		Group between 3 & 4			Group between 5 & 6			
Categories									
	Pauk Sein	Nawarat	Both	Pauk Sein	Nawarat	Both	Pauk Sein	Nawarat	Both
1. Male (%)	66.67	40	53	27.78	30	28.89	5.56	30	17.78
2. Female (%)	44.44	30	37	33.33	50	41.67	22.22	20	21.11

Table 47: Distribution of Male and Female in the household in the selected study area

Source: Based on Survey (2017)

#### 5.7.2 Household Size

The term "household" is generally used to refer to a social group of people who live, work, and eat together (Siegel and Swanson, 2004). For the purpose of this study, the term "household size" has been used to refer to the number of peoples who usually resides in the household and shares household expenses ('common' kitchen) (Kamuzora, 2002). This definition puts together people like parents, children, and any other person who cooperate in the daily economic and social life.

No		Nawarat Village	Pauk Sein Village	Average
110.	Household Size	%	%	on Both %
1.	1-3	0	27.78	13.89
2.	4-7	60	61.11	60.50
3.	8-11	40	11.11	25.5

13.89

60.56

25.56

100

100

Table 48: Distribution of Household Size in the selected study area

Total Source: Based on Survey (2017)

The survey of the distribution of household size, ranging from 1-3, 4-7, and 8-11 members, found that 60.56 percent of households have between 4 and 7 family members followed by households with between 8 and 11 family members (26.56%) and households with between 1 and 3 members (13.89%)(see Table 48). The average household size (5.7 per household) in the study areas is greater than the national average household size (4.9 per household) in rural areas. Higher fertility rate is obvious in this area.

100

#### 5.7.3 Literacy and Education

#### Literacy in Nga Zun Township а.

Education is a very important characteristic of a person as it determines his/her level of understanding and interaction with the surrounding environment (URT, 2003a). Also, education is the most important tool for developing human skills, knowledge and liberating people from poverty (URT, 1999).

The overall literacy rate in Nga Zun Township is 100% (SeeTable **49**). At the age of five, every boy and girl registered for the school 2016-17 educational years (See **Table** 50). The percentage of high school students who passed the matriculation exam for 2016-17 is 37.27% in **Table** 51.

No.	Total Population	Above (15) years old	Literate Population	Literacy Rate
Total	140,501	105,221	105,221	100%

Table 49: Literacy Rate in Nga Zun Township for 2017

Source: http://www.mdyregion.gov.mm

#### Table 50: Registered Children in Nga Zun Township for 2017

No.	5 y	ears old Child	lren	Regist	ered Childro	en	0/2	
	Male	Female	Total	Male	Female	Total	70	
Total	1,430	1,450	2,880	1,430	1,450	2,880	100%	
0	1	1 .						

Source: http://www.mdyregion.gov.mm

Table 51: Passed Rate of Matriculation Exam in	1 Nga Zun	Township
--	-----------	----------

No.	201	5-2016			2016	-2017		0/
	Attendance List	Take exam	Pass	%	Attendance List	Take Exam	Pass	70
Total	1,490	1,435	541	37.7	1,720	1,653	583	35.27
<b>C</b> 1	1 1	•						

Source: http://www.mdyregion.gov.mm

#### b. Village Tract

Analysis of education level in the rural areas is of particular importance as it can be used to interpret increased skills levels. The data can be useful for productive investment.

Education land	Name of	_ Average on	
Education level	Nawarat Village %	Pauk Sein Village %	Both %
Monastery Education	50	50	50
Primary (0-4)	10	33.33	21.67
Middle (5-8)	30	16.67	23.33
High School (9-10)	10	0	5
Total	100%	100%	100%

Table 52: Education Level of the Respondents in Selected Study Areas

Source: Based on Survey (2017)



Figure 45: Education levels of the respondents in the selected study area

The study of education level of the respondents in both villages showed that 50 percent of the population had completed monastery education, 23.33 percent with middle school education level, and 21.67 percent with primary school education level. The rest, 5 percent, had completed high school education (See **Table** 52 and **Figure 45**).

Monastery education, available in the villages, is supposed to be equivalent to public primary school education. Students who completed primary education have to go Myotha town for continuing their middle school and high school education. Only a few students pursued university or college level education.

76.11 percent of the respondents were heads of household followed by sons or daughters of the household (12.78%), wives of household (8.33%), and sons in law or daughters in law (2.78%) (See **Table** 53).

Age distribution of the respondents showed that 49.45 percent of the total respondents were over 51 years old, 37.22 percent were between 41 and 50 years old, 5.56 percent were between 30 and 40 years old, and 7.78 percent were between 21 and 30 years old. The majority of elder villagers had only monastery education in the village (see **Table** 54).

	Name of th	e Village	- Total
<b>Types of Respondents</b>	Nawarat Village	Pauk Sein Village	10tai %
	%	%	/0
Head of Household	80	72.22	76.11
Partners (Wives)	-	16.67	8.33
Son/Daughter	20	5.56	12.78
Son in Law/Daughter in Law	-	5.56	2.78
Total	100%	100%	100

Table 53: Types of the Respondents in the Selected Study Areas

Source: Based on Survey (2017)

Table 54: Age distribution of the Respondents in the Selected Study Areas

	Name of the Village		
Age	Nawarat Village	Pauk Sein Village	10tai %
21.20	70	70	7 70
21-30 years	10	5.56	1.18
31-40 years	-	11.11	5.555
41-50 years	30	44.44	37.22
above 51 years	60	38.89	49.45
Total	100%	100%	100

Source: Based on Survey (2017)

#### 5.7.4 Livelihood and Income

#### a. Agriculture and Forestry

Being located on the immediate bank of the Ayeyarwaddy River, Nga Zun is offered with fertile land and abundant water source for its agriculture. 3.99% of the total area is covered by forest.

Seven out of top ten Myanmar national priority crops, rice, peanut, sesame, sunflower, green gram, mung bean, pigeon pea, cotton, sugarcane and corn, are cultivated in Nga Zun Township in 2017. Sesame saw the highest cultivation (53%) followed by pigeon bean (27%) in rainy season (See **Figure** 46).



Figure 46: Cultivated Area (Ac) of Priority Crops in Nga Zun Township

Other commercial crops, onion (48%) and watermelon (54%), are cultivated in both rainy and summer seasons (See **Figure 47**). Mango is also a popular perennial fruit cultivated area of 681 acres. Small amount of summer rice, sunflower, green gram and seed corn cultivation were also observed in Nga Zun.



Figure 47: Cultivated Area (Ac) of Marketable Crops

Per capita consumption of rice in Nga Zun rural and urban areas are respectively 15 and 12 Tinn (Tinn - Myanmar measurement of rice). With regard to food security, rice production in Nga Zun Township is low (27.05%), partly due to lack of local production (See **Table** 55). Per capita consumption of oil is 6 viss and total production in Nga Zun is 3,979.89 Metric Ton. The surplus of cooking oil is 2,608.27 Metric Ton. The excess of cooking is high (290.16%) (**Table** 56). Total number of agricultural machineries in Nga Zun Township can be seen in

Table 57. In addition, there are 71.896 ploughs, 71,596 harrows, 82,113 cows and 397 buffalos in the official record but the credibility and the state of up to date of these official data can be questionable. Main forest products are thanatkha plants (Limonia Accidissima) and bamboo, totaling weight of 350 viss and 40,000 bamboo sticks respectively.

No.	Categories	Unit	2016-17
1	Total population		140,020
2	Per capital consumption		
	Rural	Basket	15
	Urban	Basket	12
3	Demand for Rice	Basket	2,078,757
	Total Cultivated Acre	Ac	6,784
	Productivity	Basket	84.3
4	Rice Production	Basket	571,891.2
5	Paddy for next season	Basket	13,568
6	Used Rice	Basket	2,112,677
7	Surplus Rice	Basket	-1,540,786
8	Food Security	%	27.05%

Table 55: Food Security (Rice) in Nga Zun Township (2017)

Source: http://www.mdyregion.gov.mm

#### Table 56: Food Security for Oil in Nga Zun Township (2017)

No.	Categories	Unit	2016-17
1	Total Population		1,420,020
2	Per Capital Consumption	Viss	6
3	Demand for Oil	Ton	1371.62
4	Oil Production	MT	3,979.89
5	Waste	Tin	144,546
6	Oil crops for next season	Tin	98,975
7	Used Oil	MT	1,371.62
8	Surplus Oil	MT	2,608.27
9	Food Security	%	290.16

Source: http://www.mdyregion.gov.mm

No.	Categories	Government	Private
1	Tractor trailer	1	293
2	Manual Hand tractor	1	0
3	Combine Harvester	1	3
4	Harvester	0	5
5	Thrasher	0	467
6	Water Pump	1	1,634

Table 57: Agricultural Machines found in Nga Zun Township (2017)

Source: http://www.mdyregion.gov.mm

#### b) Livestock

The number of livestock animals in Nga Zun Township in 2017 can be seen in **Table** 58. Chicken, beef, pork, sheep and goat meat were the leading products in 2017 (See **Figure** 48). Total egg production from chicken and duck are 4,885,026 (97%) and 133,943 (3%), respectively. From the 35,463 cows, a total of 9,209,883 Viss of milk production was recorded in 2017.

No.	Animal	Number
1.	Buffalo	360
2.	Cow	85,696
3.	Pig	30,832
4.	Sheep/Goat	95,893
5.	Chicken	717,318
6.	Duck	7,997

Table 58: Livestock farming in Nga Zun Township

Source: http://www.mdyregion.gov.mm



Figure 48: Production of Meat (Viss)

In the effected villages, the distribution of animals' study shows that about 54 percent of the households have cows and nearly 8 percent raises pigs. Cows are favor over pigs for livestock breeding. On the other hand, 38 percent of the households in the study do not own any animals (See **Table 59**).

No.		Name of th	Name of the Village	
	Categories	Nawarat Village %	Pauk Sein Village %	%
1.	Cow	30	77.78	53.89
2.	Pig	10	5.56	7.78
3.	No	60	16.67	38.33
	Total	100	100	100

Table 59: Distribution of Animals owned by household in the study areas

Source: Based on Survey (2017)

### c) Employment

Local administrative information from 2016-2017 fiscal year stated that the employment rate of Nga Zun Township is 97%. 90,317 peoples are reportedly employed, especially in agriculture sector. And also stated that the un-employment rate is about 3.5% of the total population. The following table shows the distributions of employment by sector in Nga Zun Township. Majority of the population (55%) was involved in agriculture sector while some (15%) worked in livestock breeding (See **Figure** 49).



Figure 49: Population based on their Employments

The major livelihood of both affected villages is agriculture. 65 percent of the households are farmers. 20 percent of the households engage short term contract works in transportation of brownstones for construction. Some are livestock breeders in their backyards or store owners. The major types of crops cultivated in the villages are peanut, pigeon pea, and corn and sometimes sesame. (See **Table** 60).

		Name of the Village		
No.	Income Source	Nawarat %	Pauk Sein %	Both %
1.	Farming	30	100	65
2.	Mainly transportation of brownstone although Farming	40	0	20
3.	Other Business (transportation of brownstone, Shopkeeper & Milk Breeding)	30	0	15
	Total	100	100	100

## Table 60: Employment of the Households in the Selected Study Areas

Source: Based on Survey (2017)

**Table** 61 shows the information of the farm products by households in the Nawarat village and Pauk Sein village. 51.98 percent of the households sell their farm products in Mandalay markets for better price than local markets. Only 17.06 percent of the households sell their farm products in local markets while 12.69 percent just use their farm products for their own needs. A few households sell their farm products to the merchants while some sell extra farm products both locally and in Mandalay.

		Name of	the Village	— <b>—</b> • •			
No.	Categories	Nawarat Village	Pauk Sein Village	Total			
		%	%	/0			
1	Mandalay Market	42.86	61.11	51.98			
2	Local Market	28.57	5.56	17.06			
3	Daily Usage	14.29	11.11	12.69			
4	Merchants	14.29	0	7.14			
5	Mandalay & Local Market	0	11.11	5.56			
6	Local Market & Daily Usage	0	5.56	2.78			
7	Mandalay Market & Daily Usage	0	5.56	2.78			
	Total	100	100	100			

Table 61: Dissemination of the Farm Products by the Households in the selected villages

Source: Based on Survey (2017)

#### d) Income

The following **Table** 62 shows income distributions of the households in the study areas. Over half of the households (58.33%) in the villages earn between 100,000 and 300,000 Kyats per month. About one fourth of the household (26.11%) earn between 300,000 and 500,000 Kyats per month, and a few households (10.56%) in the villages makes between 500,000 and 700,000 Kyats per month. 10 percent of the households in Nawarat village earn between 700,000 and 900,000 Kyats per month but no one in Pauk Sein Village makes that amount of income.
	Name of the		
Income Distribution	Nawarat Village %	Pauk Sein Village %	Both %
Income between 1 & 3 lakh	50	66.67	58.33
Income between 3 & 5 lakh	30	22.22	26.11
Income between 5 & 7 Lakh	10	11.11	10.56
Income between 7 & 9 Lakh	10	-	5
Total	100	100	100

Table 62: Income distributions by the Households in the Selected Study Areas

Source: Based on Survey (2017)

According to the survey results, despite most family's desire to save money for their future, only one fifth of the households in the villages are able to save money for donation, property, and other needs. Most of the households struggle to meet their end needs.

### 5.7.5 Other businesses

Four other factories are currently in operation at Myo Tha Industrial Zone; JAPFA producing animal feeds; LOTUS for ply wood production, Dingwan biscuit, and Myan-Thai JV for concrete pole production.

In Nga Zun Township, one publicly owned Tropical Bio Technology Plant for cotton milling with 5 employees; one privately owned San Pya furnace producing factory with 35 employees; two workshops for furnace with 29 employees; one workshop for sunflower processing with 19 employees; five workshops for milk processing with 31 employees, and eight Digital Lace workshops with 144 employees are recorded. Summary of family owned businesses observed in the township by 2017 can be seen in the following table;

No.	Туре	Number	Employees
1.	Garment factories	25	50
2.	Goldsmith	8	18
3.	Bakeries	6	30
4.	Handicraft businesses (Hat)	6	30
5.	Handicraft businesses (gold)	3	15
6.	Dry Milk processing	5	15
	Total	53	168

Table 63: Family owned businesses in Nga Zun Township

Source: http://www.mdyregion.gov.mm

### 5.7.6 Humanitarian organizations

According to Regional Information of Nga Zun Township, total of five Non-Government Organization (NGOs) are stationed in the area. These are the local branch of women affair organization with 17,480 members, maternal and child affair organization with 90,897 members, retired soldier affair association with 31 members, Red Cross with 329 members, and fire brigade with 828 members. In addition, four locally organized community welfare programs are in operation.

# 5.7.7 Natural disasters

Located in the natural disaster-prone central part of Myanmar, natural disasters are usual in Nga Zun. Water Level of the Ayeyarwaddy River in monsoon season can grow to 1150 cm, which leads to dangerous floods. The following table shows the list of natural disasters happened in Nga Zun Township during 2016 and 2017.

No.	Туре	Times	Building	Loss (Value)
			(Destroyed)	Million Kyats
1.	Storm	5	385	34.507
2.	Earthquake	1	1	0.27
3.	Flooding	2	2	31.097
4.	Fire	3	6	1.139
	Total	11	394	67.013

Table 64. Natural Disasters in Nga Zun Township (2016-2017)

Source: http://www.mdyregion.gov.mm

# 5.7.8 Living conditions and access to public services

### a) Religious institutions

Seven pagodas are locally known out of a total of 427 pagodas and stupas. There are 254 monasteries with 851 monks and 78 novices, and 2 nunneries with 668 nuns. Islam is a minority religion served by three mosques in the area. Overwhelming majority of the two affected villages are Buddhists. No other religion was identified.

### b) Sports, Entertainment, media and communications

An arena and gymnasia are available for sports or entertainment events. Popular sports include football, volley, basketball, and tennis. A park for recreation and a movie theatre for entertainment were observed. Locally available new media include Myanma Alin, Yadanapone, Union Daily, Doe Kyae Ywar, 7 Day, Thurira Naywin, and Thantawsint. Twelve copiers and six video production businesses are found in the town.

For information and entertainment in the effected villages, one third of the households depend on TV, while another one third obtains information from radio programs. Some households use both TV and radio. The rest of the population read newspaper and journals, and some choose to rely on words of mouth. Increasing trend in the use of mobile phone is observed in Nawarat while Pauk Sein remains conservative approach to the new technologies. (See **Table 65**)

#### ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ

		Name of	T-4-1	
No.	Categories	Categories Nawarat Village Pa		10tai 0/
		%	%	70
1.	TV	30	33.33	31.67
2.	TV & Internet	20	5.56	12.78
3.	Radio	50	11.11	30.56
4.	Newspaper & Journal	0	27.78	13.89
5.	Others (from other people)	0	22.22	11.11
	Total	100	100	100

Table 65: Kinds of equipment used by Households in the selected study area

Source: Based on Survey (2017)

### c) Land use and its ownership

Out of arable land, (65%) is used for agriculture involving 63% of net sown area and 2% of fallow land. The agricultural wasteland includes pasture, factories, resident areas of the township and villages (8%) while non-arable land covers 26%. The following Figure 50 shows the land utilization of Nga Zun Township based on the regional information from the township administrative body.



Figure 50: Land Utilization of Nga Zun Township.

In the affected villages, the major asset is land. The study shows that 35 percent of the household's own lands between 4 - 7 acres, 20.56 percent between 1 and 3 acres, 16.11 percent between 8 and 11 acres, 10 percent between 31 and 40 acres, 7.78 percent between 21 and 30 acres, and 5 percent between 41 and 50 acres. **Table** 66 shows the acreage of land ownership by households in the study area.

Land Siza	Name of the	Dath	
(Acre)	Nawarat	Pauk Sein	
(incre)	%	%	/0
1-3	30	11.11	20.56
4-7	20	50	35
8-11	10	22.22	16.11
12-15	-	5.56	2.78
16-20	-	5.56	2.78
21-30	10	5.56	7.78
31-40	20	-	10
41-50	10	-	5
Total	100%	100%	100%

Table 66: Distribution of Land Size owned by Households in the Selected Study

Source: Based on Survey (2017)

Land ownership in both villages is that of customary land tenure. It means through inheritance. The study finds that 85 percent, averaged for both villages, land transitions are through inheritance. The study also shows that some households do not have access to land. Table.71 shows the methods used to acquire land by households in the study villages.

Regarding the proof of ownership for land, 72.22 percent of the households have land-registration certificates and 22.28 percent do not have land registration (See **Table 67**). Surveys found that no other way of land ownership transaction is possible. Renting, clearing no man's land, and borrowing from relatives or neighbors (which can be found generally in other rural areas) are not exercised in the area.

	Name of		
Categories	Nawarat Village	Pauk Sein Village	Total
	%	%	%
Land Acquisition Method			
Inheritance	70	100	85
Purchasing	-	-	0
Nil	30	-	15
Total	100	100	100
<b>Registration for Land</b>			
Yes	60	94.44	77.22
No	40	5.56	22.78
Total	100	100	100

Table 67: Land Acquisition Methods and Registration for Land by Households in selected study area

Source: Based on Survey (2017)

# d) Energy Utilization

While electricity is available for Nawarat village from the national grid, in Pauk Sein village, 28 percent rely on battery, 50 percent use solar, and 22 percent depend on candlelight and firewood. The difference in source of energy means varying degrees of living conditions. (See **Table 68**)

		Name of t	Name of the Village		
No.	Categories	Nawarat Village	Pauk Sein Village	10tai 0/	
		%	%	70	
1.	Electricity	100	0	50	
2.	Battery Pot	0	27.78	13.89	
3.	Solar	0	50	25	
4.	Others(Candle)	0	22.22	11.11	
	Total	100	100	100	

Table 68: Energy Utilization by households in the study areas

Source: Based on Survey (2017)

In Pauk Sein, all households rely on the firewood for cooking. Although electricity is available in Nawarat Village, only 10 percent of households rely on electricity and 30 percent use firewood for cooking. The rest of the households use the charcoal, gas, and firewood. The following **Table** 69 from the study areas demonstrates the distribution of energy usage for cooking by the households.

		Name of	Dath	
No.	Categories	Nawarat Village	Pauk Sein Village	DOUI %
		%	%	70
1.	Firewood	30	100	65
2.	Electricity	10	0	5
3.	Charcoal & Electricity	20	0	10
4.	Firewood, Charcoal & Gas	10	0	5
5.	Firewood, Charcoal & Electricity	20	0	10
6.	Firewood & Electricity	10	0	5
	Total	100	100	100

Table 69: Kinds of energy used by household for their cooking in the study areas

Source: Based on Survey (2017)

### e) Water resource

Deep tube wells serve as major water source for the villages. 82 percent of the total households use them. About 8 percent of both villages rely on lagoon and 20 percent of the Nawarat's households depend on the common water storage (See Table 70).

### ESIA Report for Animal Nutritional Feeds Manufacturing Project, Myotha IZ

		Name of t	Tatal	
No.	Categories	Nawarat Village %	Pauk Sein Village %	10tai %
1.	Deep tube well	70	94.44	82.22
2.	Lagoon	10	5.56	7.78
3.	Common water storage source	20	0	10
	Total	100	100	100

Table 70. Water Resources	for drinking & daily use	e of Households in the selected	study area
---------------------------	--------------------------	---------------------------------	------------

Source: Based on Survey (2017)

### f) Solid Waste

In the study areas, 46 percent of the households use solid waste to make compost for their farms while 45.56 percent burn the wastes. A few households dump in the stream near the villages and some household dispose in common dumping grounds (See **Table** 71). Proper sanitation and waste management systems have not been put in place in the area yet.

Table 71: Utilization of Solid Waste by Households in the selected study area

		Name of t	Total	
No.	Categories	Nawarat Village	Pauk Sein Village	
		%	%	70
1.	Burning	30	61.11	45.56
2.	Farmyard Manures	70	22.22	46.11
3.	Throwing in the stream	0	16.67	8.33
	Total	100	100	100

### 5.8 Public Health Components

### 5.8.1 Birth Rate and Mortality

According to the data from Mandalay Region Government Office as of 2017, the average population growth rate was 0.44% in Nga Zun Township. In the same year, 1604 births and 598 infant deaths were recorded. In 2017, 234 people settled in the area and 616 people migrated out for various reasons. Mortality is the measure of death per population over time and it is a key indicator of population health. The birth rate is (11.8%), maternal mortality rate (MMR) is (1.2%) and infant mortality rate (I.M.R) is (3.6%) (See **Table** 72).

	No. of	No. of		1000 Live Bi	rths	
No.	Maternal	Child	Birth Rate	Maternal mortality rate (MMR)	I.M.R	Abortion Rate
1.	902	1625	11.8	1.2	3.6	3.3

Table 72: Social Health Index

Source: http://www.mdyregion.gov.mm

# 5.8.2 Morbidity

Morbidity is the state of being in poor health both acute and chronic diseases. Many of the leading causes of morbidity in Myanmar are associated with communicable diseases and pregnancy/child birth. Summary of the most communicable diseases in Nga Zun Township can be seen in **Table** 73 for the year of 2017. There is no credible record for accidences.

No.	Disease	Number	Number of death
1.	Diarrhoea	1585	-
2.	TV	90	-
3.	Dysentery	480	-
4.	Hepatitis	4	-
5.	HIV	4	

Table 73. Most communicable diseases in Nga Zun Township

Source: http://www.mdyregion.gov.mm

In the two villages of interest, there is no reliable document to record the level of chronic diseases. Also, there is no government health care center or private medical clinic in the villages. If people get sick, they have to go to the nearest health care canter in other places such as Myotha town or Kywe Sein village. For serious or life-threatening medical emergencies, the villagers go to Ngazun or Myingyan hospital. Sometimes, they need to be admitted to the hospital in Mandalay.

Common health complaints are seasonal flues, headache, and cold fever. Some peoples complain diabetes, hypertension, and coronary hearth diseases as common.

### 5.9 Cultural Components

### 5.9.1 History of the Location

In the era of Along Sithu monarchical dynasty, Ngazun was known as Ngaton. With times, the name of the town became Ngazun. The name, Ngazun Village, appeared in stone scripts of Aha Thaman monastery at Pagan, under the reign of former Myanmar King Narathiha, in Myanmar calendar year 612. Seventeen years after the fall of the last Myanmar King Thibaw in, 1885, Ngazun village was transformed as a township. Current Ministry of Interior officially called as Ngazun Township of Sagaing district in Sagaing Region, with the order dated on 30, June 1972. The transfer of Ngazun from Sagaing district of Sagaing region to Myinchan district of Manadalay region took place with the order from interior ministry [reference number (100/ 23-45/U 1) dated on January 1<sup>st</sup>, 2000].

# 5.9.2 Cultural Heritage

Tangible cultural heritage concerns are:

- Archaeological resources (e.g. sites, artefacts, ruins);

- Above ground Ancient structures (e.g. monuments, buildings, and facilities over 100 years old); and
- Living heritage sites (e.g. monasteries, temples, cemeteries, shrines, and sacred sites)

Living heritage sites, well known to the local residents, are pagoda complexes, shrines, and monasteries, located within human settlements.

- 1. Shin Pin Moe Kaung (Nga Zun)
- 2. Shwe Mote Htaw (Latt Pan Kyinn)
- 3. Shwe Gu Gyi (Tharr Kyin)
- 4. Shin Pin Sein Nyaoe Shin (Taung Pyin)
- 5. Shin Pin Ku Ni (Nga Zun)
- 6. Shin Pin Tein Taw (Nga Myar)
- 7. Shin Pin Thant temples (Nga Myar)

### 5.9.3 Description of traditional knowledge, beliefs, and cultural practices

Although no special cultural heritage with regard to tradition and ritual practices were mentioned in interviews with villagers and stakeholders, common festivals and religious events are water festival, Myanmar New Year, full moon day of Tabaung, and taking monastic order ceremony. Pagoda complexes and monasteries are the center of religious life.

Project site does not consist any evidence of cultural and heritage importance. However, any chance find cultural and heritage matters will be treated with extreme care and will be conserved. If there is any event of chance find, relevant authorities such as cultural and heritage departments and archeology department will be informed immediately, and any project activity will be put on a halt until the clearance is granted by the authorities concerned.

# 5.10 Visual Components including where applicable landscape, city scape and sea scape using three dimensional models



### 5.10.1 City Scape of Mandalay Region

Figure 51: Location map of De Heus project in Nga Zun Township of Mandalay Region



### 5.10.2 City Scape of Project Affected Area

Figure 52: Administrative boundary of Nga Zun Township and project affected villages



### 5.10.3 Landscape Map of Mandalay Region

Figure 53: Location map of project affected villages



### 5.10.4 Seascape of Mandalay Region

Figure 54: Location map of Na Zun Township in Mandalay Region

# 6. IDENTIFICATION AND ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS

### 6.1 Objectives for Conducting ESIA

In accordance with its core environmental and social principles and values, De Heus pledges to comply environmental and social requirements set by Myanmar environmental conservation laws, regulations, and procedures. De Heus has made strong commitment to avoid adverse environmental and social impacts from its operations. Only after De Heus has exhausted all alternatives and options to avoid adverse impacts, De Heus would proactively seek equivalent mitigation measures to negate its footprints in every stage of the project. Hence, De Heus willingly has carried out ESIA study early as required by ECD's Procedures and developed prevention and protection mechanisms to avoid and mitigate all potential impacts. As a component of the ESIA study, environmental and social impacts of the project are assessed and projected.

### 6.2 Methodology and Approaches of Impact Assessment

The assessment of environmental impacts is carried out in two steps: identification of impacts and evaluation of impact assessment. These two steps were described as follows.

# 6.2.1 Identification of Impacts

The project's environmental and social impacts assessments involve study of existing environmental and social conditions, examination of project's production processes and pollution generation potentials, and thorough investigation of project's environmental pollution control systems and social management plans including working environment, health, and safety measures. Impacts and pollution potentials from every stage of the project' cycle, namely pre-construction phase, construction phase, operation phase, and decommissioning phase, are envisaged and measured to formulate effective environmental and social management plan (ESMP).

Secondary information necessary to use in the impact assessments were obtained from various sources. Desktop study about the project area described general conditions of the project area. Air, noise, and vibration surveys, water and groundwater quality assessment, soil condition examination, biological and forestry surveys, socio-economic surveys, and public consultations conveyed existing data for the environmental impact assessments. Two environmental studies covering different seasons and three public consultations have been included in the ESIA.

The project proponent provides all necessary detail information including but not limited to project background, project planning, all project development activities, project operation processes, and its environmental control systems and waste management together with all environmental and social safeguards policies. These data together with background data, which have been established from the field surveys, facilitate the environmental team to assess environmental and social impacts. Integrating comprehensive background data and assessments of potential impacts enhance the environmental team and the project proponent to develop meaningful and practical ESMP that is relevant to the project and its projected impacts.

### 6.2.2 Evaluation of Impact Assessment

The methodological approach followed is adapted from the impact assessment methods recommended by the World Bank (1991) and the International Finance Corporation (December 1998). The approach used to assess the project's environmental impacts determines the Intensity, Extent, and Duration of the anticipated positive or negative impact. These three qualifiers are grouped under one synthesis indicator, the significance of the impact. This indicator provides an overall assessment of the anticipated impacts on a given environmental component. The following figure schematically presents the basis process leading to an assessment of the impact's significance.

Although the impacts on the physical environment are described and quantified as accurately as possible, they cannot be assigned a value in and of themselves.



Figure 55: Impact Assessment Methodology

### 6.3 Impact Assessment for each project phase

The degree and significance of environmental impacts for each project phases are identified employing practically obtained baseline data, studies of project processes, and operations, and planned pollution control practices.

Environmental assessments for the project establish the existing background conditions by studying the level of air quality, noise and vibration status, soil quality, water quality, and degree of biodiversity, which may not be plausible at this stage as the environmental conditions have been altered to a significant level over a long period of time. Two separate field surveys have been carried out in two different seasons to establish the background environmental status.

### 6.3.1 Identification of Project Affected Area, Receptors, and Stakeholders

In the absence of reliable scientific background data for all environmental and social conditions of the project area, environmental and social impact assessment team had to come up with a more contemporary approach to define project affected area and to identify stakeholders. A number of existing models could have been used to compute the affected area but such realistic background information to be fed for models to process is not available and hence, the outcomes from such projections could be far from practical. Thus, employment of models to compute project affected area got abstained for the project.

Identification of the project activities, projection of potential adverse effects in representative to the extent of possible pollution loads and issues, existing receptors and sensitivity conditions, duration of impacts, planned treatment mechanisms and their capacity, and predicted results for receiving adverse effects for such duration were weighted in the prediction consideration for impacts. In addition, positive, negative, direct impact, indirect impact, and cumulative impacts are all taken into account in identification of the project affected area, receptors, and stakeholders. Magnitude of the impacts, likelihood of the occurrence, intensity and severity of the issue based on the estimated negative results, and degree of confidence were included in the fundamental prediction of rating significance. Based on the environmental and social characteristics of the project area observed and researched in the environmental and social field surveys, affected areas were identified.

Thorough examination of the animal feed project's production process, raw materials use, and resources consumption, air pollution, wastewater generation, solid wastes, odor, social impacts stemming out of job competition between local residents and immigrants, lost of gazing ground coverage, and a few other minor issues were envisioned. The potential impacts were identified with weighting methods. Receptors were identified for this project as ambient atmosphere, water bodies, remaining biodiversity or species in the ecosystem, soil and land in the area, and the communities in the area.

Based on these pollution loads, intensity and severity of the impacts, potential impacts with significance and duration projected from weighting matrix in the impact identification section, the project affected area was determined less than 1.5 Km from the project as the odor and air pollution diffusion would not reach with the project's air quality improvement programs. Survey of GIS overlay, topography, and mapping confirm that projection. Therefore, Nawarat Village and Pauk Sein Village fall in the project affected area. Based on

the background information and data from environmental and socio-economic surveys, the environmental and social consultant team identifies that villagers from above two villages, workers and residents in the Myotha Industrial Zone, famers using the project area as a pasture for cattle, the industrial zone itself, and relevant regional government authorities including local ECD, MCDC, and the others as stakeholders.

Hence, focus for the scoping of this particular ESIA is determined as follows:

Different studies existing conditions from the first environmental and social surveys helped to identify areas that needed to be emphasized for the ESIA studies. The landscape, existing vegetation and ecology, being away from vulnerable water resources, and distant locations of residential areas were factors considered together with the significance of the potential adverse impacts from the factory's establishment and operation to determine the depth and breadth of the subsequent environmental and social investigations. Within the domain of the extent of pollutions, the consultant group determined that air pollution stemming from odor generation, waste disposal issues, water contamination, and very likely social tension cause by lack of employment to the population and by misunderstanding between communities and the migrant workers. Therefore, subsequent investigations will be mostly focused on these areas.

Time boundaries – The study will examine existing conditions and possible adverse effects within the timeframe of prior state to the establishment of the factory state and the post prediction after the decommissioning.

### 6.3.2 Potential Environmental Impacts and its mitigation measures

The project's environmental and social impacts assessments involve study of existing environmental and social conditions, examination of project's production processes and pollution generation potentials, and thorough investigation of project's environmental pollution control systems and social management plans including working environment, health, and safety measures. Impacts and pollution potentials from every stage of the project' cycle, namely pre-construction phase, construction phase, operation phase, and decommissioning phase, are envisaged and measured to formulate effective environmental and social management plan (ESMP).

Secondary information necessary to use in the impact assessments were obtained from various sources. Desktop study about the project area described general conditions of the project area. Air, noise, and vibration surveys, water and groundwater quality assessment, soil condition examination, biological and forestry surveys, socio-economic surveys, and public consultations conveyed existing data for the environmental impact assessments. Two environmental studies covering different seasons and three public consultations have been included in the ESIA.

The project proponent provides all necessary detail information including but not limited to project background, project planning, all project development activities, project operation processes, and its environmental control systems and waste management together with all environmental and social safeguards policies. These data together with background data, which have been established from the field surveys, facilitate the environmental team to assess environmental and social impacts. Integrating comprehensive background data and assessments of potential impacts enhance the environmental team and the project proponent to develop meaningful and practical ESMP that is relevant to the project and its projected impacts.

In determining impact severity and significance, duration, intensity of impacts, potential risks associated with the impacts, seriousness, and degree of uncertainty were considered based on the practice of production process, materials input, envisaged pollution types and loads. Weighting matrix was employed in determination for the potential impacts projection. The matrix helped environmental and social consultant team to determine the level of severity and significance of each impact.

In the pre-construction phase of the project, following minor issues are envisioned in the survey:

- effects on terrestrial plants and animal species by land clearing for survey activities of the project site
- lesser degree of soil erosion and dust emission with the loss of land cover plants in the surveying activities
- earthen materials and plant debris

Pre-construction phase site assessment activities would not cause considerable level of environmental impacts. Regardless of very low-level impacts, De Heus planned to carry out mitigation measures to negate the effects.

- Assessing, marking, and careful removal plant species of any important value
- Replanting these plants and conserving the plant coverage, and assessing wildlife activities
- Careful removal of top soil for conservation, and placement of wind and rain cover on the disturbed places
- Top soils removed, and plant debris will be conserved for covering of exposed places

In the construction phase of the project, following causes are identified:

- loss of terrestrial plants and animals by land clearing
- air pollution emissions stemming out of increase use of construction machineries,
- dust produced in the earthwork related activities and loading and unloading of construction raw materials,
- associated noise and vibration from construction crews and operations,
- top soil degradation and soil contamination from the earthworks,
- water consumption and wastewater generation,
- accidental spills, and
- solid wastes and construction spoils from the construction activities.

In accordance with De Heus's conduct under its environmental policy guideline, it carefully tendered and selected the construction firm with track record of environmentally conscientious approaches for the construction of the plant. In addition, the tender agreements thoroughly laid out necessary measures to prevent above identified issues proactively. Detail extents of these measures are tabulated in the following environmental and social management plan. As the construction crews have been provided temporary worker camp with viable water supply and well-managed sanitation facilities sufficient to the population, De Heus prevents wastewater pollution at the site. Enough trash bins have been supplied throughout the camps and regular trash collections have been arranged with a relevant municipal agency.

In order to negate the effects in the construction phase, the following mitigation meaures will be applied:

- Management program to reduce number of vehicle trips and improvement to the sufficiency of the trip planning are integrated and implemented.
- Equipment and machine operations are closely monitored, reviewed, scheduled, and minimized.
- All construction materials are required cover for shipments. 2.5 -meter-high screens are erected along the peripheral of construction activities.
- Water is frequently (3 times per day) sprayed to unpaved roads especially in construction site.
- These operations will be limited to mid-day working hours, and noise barriers will be erected to suppress the noise level.
- No unloading will be permitted at late night.
- Stockpiles of construction materials will be housed in designated areas, where land clearing and construction will be taken place.
- Protective landscape planning and leaving buffer zone with constructions controlling runoff will be implemented.
- Water conservation applications will be put in place throughout the site, and workers will be trained to shut off the tabs after each use.
- Not much consumption of water is envisaged for the crews and management, as they will be housed in a separate camp, where all water saving measures will be applied.
- Apply spill remedies as specified and clean up immediately.
- Incidents are to be documented and reported to the management.
- Rinse and wash the persons affected and provide immediate referral for medical care.
- Construction debris and discarded materials will be stored properly and sold for reuse.
- All by-product materials will be recycled and sold, and non-reusable debris and concrete pieces will be discarded to MMID designated area

In the operation phase of the project, production of animal nutritional feeds employs only high-end imported materials and therefore, following impacts could be determined:

- intensive energy consumption from the operation process
- air pollutent emissions from boiler fuel rice husk burnig, transportaioin vehicles, back-up generators and grinding and mixing of raw materials
- noise, and vibration pollution from loading and unloading of raw materials and production process machines, back-up generators and vehicles movement

- high water consumption extracted from groundwater, wastewater generation from production process, cleaning process and drain water from rain events,
- used shipping materials and solid wastes generated from the work places and office functions,
- chemical containers and discarded hazardous materials,
- operational solid wastes generation from used shipping materials, expired raw materials, packaing materials and discarded solid wastes disposal
- Sewage generation and domestic and office wastes discharge
- Hazardous wastes generation from spent chemical containers, containers for cleaning agents, and sludge from the wastewater treatment
- Oil and grease leakage from machines, equipment, vehicles, fuel and engine oil storage tanks along the operation process

The following mitigitation measures will be applied in the operation phase:

- De Heus also endorses energy saving mechanisms and exercises it religiously.
- Unnecessary lights and office electrical instruments will be turned off while not in use.
- Energy consumption will be closely monitored and evaluated for improvements.
- Ensure exhaust gases from rice husk burning for boiler are passed through cyclone and wet scrubber for capturing fine particulate matter and controlling flue gas
- Idling will be prohibited and all vehicles in association with the plant are required to do regular maintenance.
- Operation of shipping and handling at night will not be permitted unless absolutely necessary.
- Provision of adequate air circulation or chemical treatment, and regular cleaning and disposal of discarded spoil and expired raw materials
- Noise and vibration will not be envisaged from the production operation itself, and containing noisy operations in a confined area
- Provision of noise protection PPE for workers who have long-term exposure
- Back-up generators will be kept in a confined space
- Water saving mechanisms will be put in place and awareness raising programs will be provided to the employees.
- Water consumption will be monitored closely, and evaluation will be carried out to find ways to reduce water consumption.
- Treated wastewater will be reused for appropriate purposes.
- Apply spill remedies as specified and clean up immediately and incidents are to be documented and reported to the management.
- Rinse, wash, and treat persons affected immediately with ample of water and transfer them for immediate medical care
- Used shipping materials and discarded materials will be recycled.
- The expired or spoiled raw material will be sold to fertilizer manufacturers, and these materials will be kept properly before being sold,
- Non-reusable solid waste will be disposed employing a proper disposal agency.

- Practice waste segregation of biodegradable and non-biodegradable for different disposal methods
- Paper and plastic waste will be collected separately for recycling purpose.
- Enough trash bins will be distributed throughout the plant.
- Provide clean and safe environmental conditions with proper sewage management practice
- Manage with the help of industrial zone municipal sewage management team, if required
- Ensure transportation, handling, storage and dispose of any hazardous chemical and wastes by trained workers with proper PPE
- Spent chemical containers and containers for cleaning agents will be returned to suppliers as much as possible.
- Protect leaching and surface runoff from hazardous waste storage area into public drain
- Ensure oil trapping equipment and timing maintenance practices for all machines and vehicles
- Prompt cleaning of oil and fuel spills, and proper disposal of rags and sand contaminated with oil.

As De Heus pledges not to contribute to environmental degradation, it adopts and implements mechanisms to efficiently deal with these issues. Detail extent of these implementation mechanisms will be tabulated in the following environmental and social management plan (ESMP).

In decommissioning phase of the project, De Heus considers that the plant will be transferred to the next inline ownership or the relevant administrative body. Therefore, any significant impacts cannot be imagined. However, just in case, the plant needs to be demolished completely, possible extent of the following impacts is identified and prepared:

- Air, noise, and vibration pollution from demolition of infrastructures and use of heavy equipment and vehicles
- Occupational Health and safety, Safety and security due to withdrawing machines and equipment, demolition of the factory buildings, storage tanks, and wastewater collection tanks
- Traffic accident and injury due to project withdrawing vehicles and equipment
- Solid wastes consisted of building debris and scrap metals
- Certain hazardous wastes from chemicals facilities including laboratory
- Short term water pollution from sediment residuals

The following mitigation measures in order to reduce the environmental effects and the resideual effects will be done during the decommissioning phase:

- Provide proper notification prior to demolition, and strictly avoid the free open burning of solid waste materials at the project site.
- Apply dust control by placing screen covers and barriers along the site.

- Ensure that machines and equipment are properly maintained for minimum generation of noise and vibration, and use of noise and exhaust control devices for combustion engines.
- Hire well trained workers with qualified supervisor to avoid risk and accidents
- Provision of PPE equipment to crews
- Ensure use of self-protection equipment and use of safe and effective machines in all demolition process
- Ensure pre-submitting rules and compliance of the contractor before starting the demolition process
- Hire experienced and skillful contractors for withdrawing demolishing equipment
- Comply local traffic rules and regulation
- Restricted speed limit for demolishing vehicles and loading vehicles
- Demolition debris and ruins of the building will be recycled, and recycle solid wastes from demolition process and dispose at a designated area
- Used containers and expired chemical wastes will be disposed properly
- Prior and environmentally conscious removal and clean-up of chemicals and dangerous substances
- Systematic removal of all storage tanks,

If the plant has to be demolished instead of handover, De Heus plans to hire competent contractor experienced in demolishing a plant of this scale. Air, noise, and vibration control measures will be imposed in the demolition process. Building debris and ruins will be hauled under secure cover for potential sites, where they can be reused. Any materials involving chemicals and hazardous materials will be disposed employing MCDC's hazardous material disposal team and the site. Water pollution will be contained by treating wastewater flow from the site before the final removal. Any environmental pollution associated with the use of heavy equipment and vehicles will be controlled by the same management practices described in the previous phases.

### 6.3.2 Social Assessment and Potential Social Impacts, and its Mitigation Measures

De Heus is determined not to adversely affect communities but to bring social development wherever it works. Hence, it has assessed all potential adverse social impacts and made all prior prevention applications to counter them. Social assessment examines existing socioeconomic conditions, operation implementation practices, De Heus's social, health, and safety policies, and operation procedures.

De Heus has identified relevant government agencies including township General Administrative Departments (GAD), Mandalay region ECD, industrial zone management, farmers, workers, and nearby villages within 1.5 Km radius of the project site as stakeholders. Project affected persons are identified as workers, farmers and villagers from the nearby two villages.

In the pre-construction phase of the project, neither noticeable social impacts nor health and safety issues would be involved as the activities involved in surveying will be a negligible degree. Therefore, no social issue will be addressed for this particular phase.

In the construction phase, following potential social issues are identified:

- conflict between migrant workers and local communities,
- community outreach programs and contractor's role in addressing conflicts,
- discrimination, gender inequality, and fair treatment including overtime assignments, and
- safe working environment, accidents, and health provision.

De Heus is aware of potential tension and conflicts between migrant workers from construction firms and the local communities. De Heus promotes hiring of workers from the communities as best as possible but for the trained and experienced construction crews from the contractors, De Heus requires that the contractors keep the crews in their worker camps with tight supervision of in and out activities. The camps were placed on a rented space in a secure distant from communities nearby. The communities have been invited to sell their products in the camp, but the camp residents have to obey the time restriction imposed for outside excursions. In addition, the contractors have been tasked to listen communities' complaints with regard to their presence and required to address the complaints.

The following mitigation meaures will be done to negate the social effect during the construction phase:

- Local hire is encouraged, and contractors are asked to include local hires.
- The contractors are to reach out to communities to listen their concerns and find solutions.
- Any social conflict with local communities should be reported immediately and prompt attention to settle the conflict would be developed.
- De Heus is an equal opportunity employer and therefore, encourages peoples with disabilities to work relevant to their skills.
- Lower rate based on gender is strictly prohibited
- In compliance to Myanmar Government's labor rules, overtime compensation should be defined in accordance with the national regulation.
- PPE requirements are to be met at all cost in work zone, and anyone without sufficient PPE will not be permitted to work and there is no exception.
- Regular health and safety training will be offered.
- Any work-related incident will be reported promptly, and the injured worker will be provided immediate medical attention at an appropriate medical facility.

In the operation phase, following potential social issues are identified:

- job creation and employment opportunities for local peoples
- conflict or tension between migrant workers and local communities,

- discrimination, gender inequality, and fair treatment including overtime assignments,
- safe working environment, accidents, and health provision, and
- Grievance redress mechanism for all stakeholders.

De Heus will actively reach out to communities to detect any dissent they may have. It will make every effort to resolve these issues early. In addition, De Heus pays attention to the welfare of its employees and will listen to their issues. It will encourage its employees to speak up and speak out without fear of reprisal. Issues raised will be dealt with swiftly and fairly in transparent manner.

During the operation phase, the following mitigation measures will try to be done to reduce the social effects:

- Prioritize job opportunities to the potential project affected local communities by providing proper trainings
- Regular contact with local administrative units for recruitments
- Ensure management to reach out to communities to listen their concerns and find solutions.
- Any social conflict with local communities will be required to report immediately and promptly. Prompt attention to settle the conflict would be developed.
- De Heus is an equal opportunity employer and therefore, encourages peoples with disabilities to work relevant to their skills.
- Lower rate based on gender distinction is strictly prohibited and De Heus takes seriously that women are entitled to equal pay rate with men in the same job function.
- Cross departments monitoring will be exercised to encourage competition for safe working conditions, and incentives building for road safety.
- Provision of first aid kit and CPR training, and the factory provides health care service or clinic.
- Training program for firefighting, flash flood and earthquake events are encouraged. PPE requirements are to be met at all cost in work zone.
- Any reprisal will be subjected to prompt investigation and severe penalty.
- Open discussion, complaint box, and labor council or labor union will be allowed in the plant
- The plant will establish grievance redress mechanism in transparent manner and receive any complaint that communities and stakeholders have to make.

In the decommissioning phase of the project, the significant social components will be as follows:

- Unemployment from losing jobs for the De Heus's employees
- Economic opportunity loss for the peoples from nearby and raw material suppliers.

During the decommissioning phase of the project, the following migitation measures will be applied to negate the social effects:

- Inform all employees of the plan at least 6 months ahead of the process, and offer transfer job opportunities at other De Heus's plants
- Compensate in accordance with Myanmar legal requirements for those who choose not to seek transfer of jobs
- Inform the communities and raw materials suppliers ahead of the time of decommissioning, and offer assistance and help to local communities and raw material suppliers
- Make links and connections with other factories that could purchase the raw materials

De Heus does not have any intention to leave behind any adverse impacts even from its departure from the site. De Heus has envisioned that unemployment issues and economic potential loss will be issues to face in the area. Therefore, De Heus has adopted its departure plan to fade out its operation step by step in order to minimize the social harm to the communities that work with De Heus for a long time. The employees will be given sufficient notice ahead of its departure and they will be provided alternatives to continue their work at different De Heus's plants or leaving with adequate compensation. The local communities and raw material suppliers will be offered helps to reduce direct economic impacts on them.

The potential impacts from different phases are identified using chain matrix for each project activities. The degree of significance is considered with the sum of score for magnitude, duration, extent, and intensity of the project activities in different phases. The project is comprised of three phases excluding the preconstruction phase. The significant levels of potential impacts are illustrated as follow.

The degree of impact has been classified as:

- Low (L) impacts are very minimal and negligible. (VL: very low).
- Medium (M) a degree of impacts but that can be mitigated easily
- High (H) some degrees of impacts and serious measures are required to address
- Severe (S) very significant impacts to an irreversible extent that should be avoided at all cost.

### **Sub-categories in Defining Degree of Impacts**

Magnitude: ranges from 1 to 10. 1 is the lowest possible magnitude and 10 is the highest magnitude of the impact.

Duration: measures the period of impact caused by activities. It also will be set from 1 to 10, depending on the duration of impact and the load. Highest pollution with long term will be shown as higher number, 8 or 9 or 10.

Extent: describes the spread of impact. Site specific impact will be shown as 1 while local impact will be described as 2. The impact reaching regional, national, and transboundary levels will be shown as 3, 4 and 5 respectively.

Intensity: illustrates the magnitude of impacts. It will range from 1 to 10 while 1 is the lowest and 10 will be highest.

The sum of these for each activity will portray the degree of impacts. The score of the sum up to 8 will be defined as very low (VL), up to 10 will be set as low (L), up to 15 will be deemed

as medium (M), up to 20 will be set as high (H), and higher than 20 will be treated as severe (S).

# **6.4 Pre-construction Phase Impacts**

In preconstruction phase, land assessment and construction surveys were carried out.

Potential	Project	Magnitude	Duration	Extent	Intensity	Sum of	Degree of
Impact	Activities					score	Significant
Loss of	Site clearing	1	1	1	1	4	VL
terrestrial	for assessments						
habitat	and surveys						
Soil erosion	Partial land	1	1	1	1	4	VL
	leveling and						
	removing plant						
	cover						
Dust emission	Surveying	1	1	1	1	4	VL
/soil erosion	activities and						
	soil						
	exacerbation						
Disposal of	Site clearing	1	1	1	1	4	VL
earthen	for assessment /						
materials and	tree cutting						
plant debris							

# 6.5 Construction Phase

Impact	Project Activities	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Significant
Loss of terres	trial habitat						
Loss of terrestrial habitat	Land clearing for construction activities,	4	5	2	4	15	М
Air Pollution							
Air pollution emission	Uses of construction equipment	1	3	2	1	7	VL
	Construction vehicles movement	2	3	2	2	9	L
	Back-up generators	2	3	1	1	7	VL
Dust emissions	Shipping, loading and unloading of construction	3	3	1	2	9	L

Impact	Project Activities	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Significant
	materials						
	Stockpiles of construction materials	2	3	1	2	8	VL
	Excavating soils and activities related to earthworks	3	3	2	2	10	L
	Leaving exposed earth surface	2	3	1	2	8	VL
	Construction operations	3	3	2	2	10	L
Soil erosion, o	legradation ar	d contamin	ation				
Top soil degradation and soil	Stockpiles of construction materials	2	3	1	2	8	VL
contamination by earthworks	Compaction from vehicle activities	1	4	1	2	8	VL
	Excavation of soils and activities related to earthworks	2	3	2	4	11	М
	Construction activities and crew's movement	3	4	2	1	10	L
	Disposal of construction spoils	2	5	1	2	10	L
Noise emissio	n and Vibratio	n					
Noise and vibration	Unloading construction materials	2	3	2	2	9	L
	Earth works	3	3	2	3	11	М
	Foundation pile driving operation	2	4	1	2	9	L

Movements of heavy vehicles331310 $L$ Construction activities and construction crew442212MBack-up generator23117VIWater consumption and wastewater generationConstruction crew342312MConstruction consumption operations342312MConstruction consumption and wastewater generationConstruction operations342312MConstruction and management crews22116VISurface flow and runoffRain events in monsoon22116VIAccidental spillsConstruction related chemicals and cleaning agents23117VISolid wastes and consite maintenance operations23117VISolid wastes goniseConstruction and andivisies maintenance operations342211MSolid wastes goniseConstruction anterials342211MShipping materials13116VI	Impact	Project Activities	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Significant
Construction activities and construction crew442212MBack-up generator23117VIWater consumption and wastewater 		Movements of heavy vehicles	3	3	1	3	10	L
Back-up generator23117VIWater consumption and wastewater generationConstruction operations342312MWater consumption and wastewater 		Construction activities and construction crew	4	4	2	2	12	М
Water consumption and liquid waste generationWater consumption and wastewater generationConstruction operations342312MCleaning activities23128VICleaning activities22116VIConstruction and management crews22116VISurface flow 		Back-up generator	2	3	1	1	7	VL
Water consumption and wastewater generationConstruction 	Water consum	nption and liq	uid waste ge	eneration				
and wastewater generationCleaning activities23128VIConstruction and management crews22116VISurface flow and runoffRain events in monsoon22116VIAccidental spillsConstruction related chemicals and cleaning agents23117VISolid wastes and construction spillsConstruction related chemicals and cleaning agents23117VISolid wastes and construction spillsConstruction activities342211MSolid wastes and construction spoilsShipping materials13116VI	Water consumption	Construction operations	3	4	2	3	12	М
Construction and management crews22116VISurface flow 	and wastewater generation	Cleaning activities	2	3	1	2	8	VL
Surface flow and runoffRain events in monsoon22116VIAccidental spillsConstruction related chemicals and cleaning agents23117VIvehicles and onsite maintenance operations23117VISolid wastes and construction spoilsConstruction activities342211M		Construction and management crews	2	2	1	1	6	VL
Accidental spillsConstruction related chemicals and cleaning agents23117VIViela chemicals and cleaning agentsConstruction spills23117VIVehicles and 	Surface flow and runoff	Rain events in monsoon	2	2	1	1	6	VL
vehicles and onsite maintenance operations23117VISolid waste generationSolid wastes and construction spoilsConstruction activities342211MShipping materials13116VI	Accidental spills	Construction related chemicals and cleaning agents	2	3	1	1	7	VL
Solid waste generationSolid wastes and construction spoilsConstruction activities342211MMathematical spoilsShipping materials13116VL		vehicles and onsite maintenance operations	2	3	1	1	7	VL
Solid wastes and construction spoilsConstruction activities342211MMathematical activitiesShipping materials13116VL	Solid waste ge	eneration	Γ	Γ	[	Γ		
spoils Shipping 1 3 1 1 6 VI materials	Solid wastes and	Construction activities	3	4	2	2	11	М
	spoils	Shipping materials	1	3	1	1	6	VL
Construction23117VLand management crews<		Construction and management crews	2	3	1	1	7	VL
Discarded containers 2 3 1 1 7 VL   Social and Occupational health and safety impact	Social and Oc	Discarded containers	2 alth and safe	3 etv impact	1	1	7	VL

Impact	Project Activities	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Significant
Social adverse effects	Tension and conflicts between migrant workers and local communities	2	4	2	2	10	L
Discrimination, gender equality, compliance with labor regulations	Refusal for workers with disabilities, discrimination over gender regard to pay rate and opportunities, disregards to overtime compensation	2	3	2	1	8	VL
Job	Competition	2	2	2	1	7	VL

3

1

1

7

VL

2

between local and migrant workers

Disregard to

use PPE, work related

injuries, sickness, and fire incident

#### 6.6 **Operation Phase**

competition

Safety, risks,

and health

hazards

Potential Impact	Related Activity	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Significant
Intensive energ	gy consumption						
Energy consumption	High energy uses in production processes	3	8	2	3	16	Н
Ambient air po	ollution						
Air pollutant emissions	Rice husk burning in boiler operation	3	4	2	2	11	М
	Vehicle	2	3	2	2	9	L

Potential	Related	Magnitude	Duration	Extent	Intensity	Sum of	Degree of
Impact	Activity					score	Significant
	operations for shipping and receiving activities and transportation of employees.						
	Grinding and mixing of raw materials	2	4	1	1	8	VL
Offensive odor	emission						
Odor emission	From raw materials like dry fish, shrimp, fish- byproducts and animal- byproducts, molasses	2	4	1	1	8	VL
Noise pollution	n and vibration ris	k					
Noise and vibration	Loading and unloading of raw materials and production process include- ng grinding, mixing, pelleting, and sieving	2	4	1	2	9	L
	Vehicle movement and transportation	1	4	2	1	8	VL
	Boiler operation	2	4	1	1	8	VL
	Grading and mixing of raw materials	1	4	1	1	8	VL
	Back-up generators and boilers	2	3	1	1	7	VL
Ground water	extraction						
Water consumption	Extraction of groundwater	2	4	2	1	9	L
wastewater ge	meration and run	on overnow					

Potential Impact	Related Activity	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Significant
Wastewater generation	Production process and cleaning	2	5	2	2	11	М
Storm water runoff	Drain water	2	4	2	2	10	L
Accidental spills and leakage	Cleaning agents, Oil and fuel storage tanks	1	3	1	1	6	VL
Production and	d domestic solid w	aste generatio	on				
Operational Solid wastes generation	Used shipping materials, discarded solid wastes	1	5	2	1	9	L
	Expired and discarded raw materials	2	3	1	1	7	VL
	Domestic and office wastes	1	4	1	1	7	VL
	Packaging materials	2	4	1	1	8	VL
Sewage generation	Septic tanks for Office and workers	2	3	1	1	7	VL
Hazardous was	ste generation						
Hazardous wastes	Spent chemical containers, containers for cleaning agents, and sludge from the wastewater treatment facility	2	4	1	1	8	VL
Oil and grease leakage Social and Hea	Machines, equipment, vehicles, fuel and engine oil storage tanks along the operation process	1	3	1	2	7	VL

Potential	Related	Magnitude	Duration	Extent	Intensity	Sum of	Degree of
Impact	Activity					score	Significant
Job opportunity and priority status for local residents	Job competition between local communities and migrant workers	2	5	3	3	13	М
Increasing demand for food and shelter, Cost leading to inflation	Competition between Migrant laborers and communities	2	4	2	2	10	L
Increasing demand for water, fuel and electricity	Competition between Migrant laborers and communities	2	4	2	2	10	L
Social and cultural conflict	Tension and conflicts between migrant workers and local communities	2	5	2	2	11	М
	Housing, transportation, social welfare, insurance, labor	1	4	2	2	9	L
Occupational l	nealth and safety						
Work related Injury and accident	Poor awareness on environmental issue, weak understanding on risky working environment, exposure to chemicals	2	3	1	1	7	VL
	Loading and unloading, Operating and maintenance on grinder, mixer, pallet maker	2	3	1	1	7	VL

Potential Impact	Related Activity	Magnitude	Duration	Extent	Intensity	Sum of	Degree of Significant
	and boiler					score	Significant
	Work load and over working hours	1	4	1	1	7	VL
Safety, risks, and health hazards	Disregard to use PPE, work related injuries, sickness, and fire incident and natural disaster	1	4	1	1	7	VL
	Traffic and road sharing	1	4	2	1	8	VL
Discriminatio n, gender equality, compliance with labor regulations	Refusal for workers with disabilities, discrimination and gender inequality, disregard to overtime compensation	1	4	2	1	8	VL
Grievance condition	Any complaints and issues from any stakeholders including De Heus 's employees	2	4	1	1	8	VL

# 6.7 Decommissioning, closure and post closure phases

Potential Impact	Related Activity	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Impact
Occupational Health and safety	Removing machines and equipment	2	2	1	1	6	VL
Safety and security	Demolition of the factory buildings	2	2	1	1	6	VL

Potential Impact	Related Activity	Magnitude	Duration	Extent	Intensity	Sum of score	Degree of Impact
	Demolition of storage tanks and waste water collection tanks	2	2	1	1	6	VL
	Exposure with hazardous chemical residues	2	2	1	1	6	VL
Traffic accident and injury	vehicles, equipment	1	2	2	1	6	VL
Soil and underground water pollution	Demolition of chemical storage tanks and oil storage tanks	1	2	1	1	5	VL
	Closure of laboratory and waste water treatment facility	2	2	2	1	7	VL
Solid wastes disposal	old machines, scraps of equipment, scrap metals, domestic wastes from demolition process	2	2	2	2	8	VL
	Demolition Wastes of storage house and worker accommodations	2	2	1	2	7	VL
	Domestic and sewage waste	2	2	2	1	7	VL

# 7. CUMULATIVE IMPACT ASSESSMENT

Despite being individual project involving no assistance from any international development funding agency, cumulative impact assessment (CIA) has been carried out for the project's each component as required by Myanmar EIA's procedure. While the environmental conservation wing of the Myanmar Government may not strongly view the urgent need for CIA of this specific small-scale project, the completeness of the project's ESIA will be fulfilled with the inclusion of CIA for the project.

### 7.1 Methodology and Approach

For every component of the project, namely construction, operation, and decommissioning, impacts leading to cumulative footprints on the environment, social sector, and cultural norms are taken into account in the CIA.

First, identification of valued ecosystem components (VECs) that are critical within temporal and spatial boundaries of the project affected area takes into account of historical and current conditions. In the absence of historical and scientific research data, the consultant team carried out field surveys, visual inspections, and interviews with local residents and relevant agencies to obtain practically realistic data of VECs.

Computation of incremental impacts combines current contributing factors and project's foreseeable actions. The outcome is employed to make projection of cumulative impacts. The aggregation of impacts on each VEC has been given emphasis in the CIA. Significance of cumulative effects on each VEC and residual footprints over the project's timeframe is assessed and mitigation measures and management mechanisms for cumulative impacts are developed to address the issues.

### 7.2 Identification of VECs

The area has already been heavily transformed into an abandoned zone with low lying shrubs that can only be used as firewood. Survey findings and oral history together with information obtained from various sources revealed that no plant species in the area fall into critical VEC in the area. No animal in the list of endangered species is present. While particular animal species may not be at risk from the planned project, it has been noted from observations and interviews that wild animals have migrated to the other side of the industrial zone. Increased human activities together with booming infrastructures in the industrial zone may further pose as factors driving the wildlife out of the area. Wildlife could be a potentially critical VEC for every phase of the all industrial establishment in the area.

A broad range of social issues ranging from forceful land acquisition to shifts in living has been detected during the assessments. While the trend of effects with the project will definitely be opposite of the past sufferings, this social sector related VEC will be too significant to be overlooked in the CIA. Public consultations and discussions with sources in the area affirm that this particular VEC needs to be set as priority in the management plan.

Other environmental VECs such as air quality, noise and vibration levels, soil conditions, and water quality are considered by employing actual field survey findings and projected outputs from each phase of the project. However, with the lack of background reliable data and

resources, modeling will not be included in the measures for accumulation of the relevant impacts.

### 7.3 Determination of Temporal and Spatial Boundaries

The scale and nature of the project and its potential contributing factors, findings from the studies and the existing environment, historical and present status of the site, and demarcated jurisdictional sectors have been taken into account in determination of temporal and spatial boundaries.

The project site itself is 6.5 acres and total work force will consist of 59 staff running two shifts per day. The construction phase began nearly at the end of 2017 and the plant is planned to be in operation in July 2018. The plant with 600 tons per day final production capacity employing air quality control and wastewater treatment mechanisms will not contribute much pollution loads into the environment. For the sake of environmental and social assessments, the basic boundary for study area is extended to 1.5 Km radius from the project site. Depending on the particularly interested VEC of the project, the relevant boundary will be readjusted in accordance with the nature of the VEC of interest.

### 7.4 Cumulative Impact Assessment

In the environmental studies, assessments of air quality and noise and vibration levels observed that existing levels were well below WHO's Standard Levels. Project plan confirms project activities involving pre-construction phase with site assessment, construction activities, production operations, and decommissioning phase with demolition of existing infrastructures. Due to the nature of the project, its scale, and activities involved, predefined spatial and temporal boundaries seem to be sufficient.

As identified earlier, wildlife poses as a critical VEC of the project. From the beginning of the site assessment to the end of decommissioning phase, already dwindling wildlife population will encounter increasing threats of growing human presence and erection of permanent infrastructure as blockages to their routine activities and livelihoods. The trend of these threat will keep growing with the development of the project and therefore the measures to address these are essential.

Social sector VEC will be another important factor that needs to be addressed in the CIA. Forceful land acquisition marred this particular VEC from the beginning of the establishment of the industrial zone. Despite reaching settlement of some land issues, social impacts have been paramount. Inequality, depriving local communities' opportunities, tensions, and conflicts will be faced through the project's life. While the trend may not be ascending, similar trend will be expected. The project plans to tackle these adverse impacts.

VEC for environmental sector will not be much challenged as the project aims to reduce stress on the environment. Regardless of its policies and its mitigation measures, the plant will closely monitor these VECs and make modification and alteration as needed.

### 7.5 Development of a Management Framework

The project has developed a management framework to counter the issues described in the CIA.

To address the threat on wildlife, the project plans to establish greenbelts and increase safe passages for the wildlife movements. In addition, the project will restrict movements of vehicles and human so that these won't disturb wildlife activities. Encroachment of areas observed for wildlife will also be respected. These measures have been integrated in the ESMP of the project as well.

While the project itself is not responsible for the existing social tension, the project will help the local communities in resolving land issue related to the project site. The project has developed social impacts for each phase of the project and these have been integrated in the ESMP. The project will carry out all measures proposed in the ESMP and will stick to the ESMP.

For the environmental factors, the project will regularly monitor the effects and adjustments will be executed in order to preserve the current state of environment. Finally, the project will always evaluate all VECs and situations to be able to amends in its practices and to find ways to improve performance for its environmental commitments.
### 8. **PUBLIC CONSULTATION AND DISCLOSURE**

Part of Environmental and Social Impact Assessment (ESIA), several public consultations were carried out in strict compliance with Myanmar National Environmental Impact Assessment Procedure. The public consultations for De Heus Myanmar Company Ltd. aim to:

- a. Provide information related to upcoming production process
- b. Explain the affected peoples about detail operation and potential adverse impacts
- c. Offer the opportunities for the potentially affected peoples to raise their issues and concerns, and to promote their participations in the project
- d. Present the plan (ESMP) to assure that their concerns have been considered and addressed in the actual operation programs
- e. Document the issues, concerns, and suggestions raised by the potentially affected peoples to make changes in the implementation plan accordingly.

The consulting firm, Social & Environmental Associate – Myanmar (SEAM), role is to facilitate the public consultation processes and to document and record the exchange of ideas and concerns.

# 8.1 Methodology and Approach

Identification of project affected peoples is dependent of the project size and the nature of the project. With the compact size and environmentally minded nature of the production, the project impact area will not extend beyond 1.5 Km radius from the centre of the project. With that, the potential key receptors for the environmental and social impacts of the proposed Animal Nutritional Feeds Manufacturing Project are identified. All villages within 1.5 Km radius of the proposed project are included in the assessment. For this Animal Nutritional Feeds Manufacturing project in Myotha Industrial Zones, two villages, namely Nawarat Village and Pauk Sein Village fall in this category.

After demarcating the boundary for project affected area, key stakeholders including project affected peoples are determined. SEAM identified that the key stakeholders involved in this process are villagers from nearby Nawarat, and Pauk Sein Villages, relevant local administrative departments, shop owners and squatters in the surrounding areas, regional Environmental Conservation Department (ECD, Myotha), the industrial zone management committee of Myotha Industrial Zone, and all relevant agencies and organizations. SEAM made sure to include every key stakeholder in the consultation process and to follow proper public consultation requirements.

Dissemination of information for the project was carried out at least two weeks ahead of the consultation schedules in order to maintain prior and informed requirements. All targeted villages and villagers together with relevant agencies were informed and invited for the consultations once in September and again in December 2017. The information dissemination and invitations were documented.

In order to grasp the general livelihood conditions of the affected communities and surrounding areas, socio-economic surveys were conducted in September 2017. The survey

findings are incorporated in the earlier section, Socio-Economic Components, of this report. In order to gather comprehensive issues and concerns from the key stakeholders for the project, random groups were selected for interviews and discussions from the broader number of shop owners and squatters in the surrounding areas. In the interviews and subsequent discussions, the project related information was explained, and the concerned issues were requested to discuss.

Following the proper public consultation procedures, SEAM had disseminated information related to the project's operation and plan, and invitation for the public consultations nearly four weeks ahead of the actual meetings, in September 2017, December 2017 and July 2019. The verbal invitation was also given to key stakeholders within the random survey activities throughout the areas. Invitation extended to the authorized persons of the villages in the area.

In addition, relevant local representatives of general administrative department and Myotha Industrial Zone management committee were met separately to receive their suggestions and concerns. In general, positive comments and enthusiasm for development and job opportunities were expressed in all these discussions. The plant's obligatory requirement for use of PPE (Personal Protective Equipment) at all time attracted special attention.

Public consultations were conducted in monasteries of the two villages in late September and early December 2017 to disclose information to the public and collect feedbacks on the project. In the public consultation, a representative from the plant presented the operation of the plant, production process, job opportunities, working conditions, the plant's social and environmental commitment, and its core values. The public was invited after presentation to voice their thoughts and concerns. The project's representative answered the questions raised by the participants and eased their concerns.

SEAM's role in the public consultation was to disclose the findings of environmental and social assessment, and to document the public consultation. SEAM did neither promote nor shield the plant from the public interests. The whole events of public consultations were documented.

During the first publication meeting in 26 September 2017, 19 villagers in Nawarat village and 24 villagers in Pauk Sein Village attended to the public consultations for Environmental and Social Impact Assessment (ESIA). The 2<sup>nd</sup> public consultation session with Nawarat and Pauk Sein Villages were held at monasteries in villages on December 6, 2017. About 30 participants in Nawarat village and 43 participants in Pauk Sein village attended the sessions.

In 4 July, 2019, third public consultation meeting was conducted again for finalizing the feedbacks from the affected villages. Third public consultation meeting was done in the same places likely the second consultation meeting. During third public consultation meeting which was held in the morning in Pauksein village and in the afternoon in Nawarat village on the date of 4 July, 2019, 20 villagers in Nawarat village and 42 villagers in Pauk Sein village were attended. The summary of the meetings is described in the following section, and the invitation letters, the attendance and photos of the meetings are provided in the **Annex 2, 4 and 5**. The demographic information of the villages is illustrated in the socio-economic section of this report.

The discussions were led by a representative from De Heus Myanmar Company Ltd., and a group of consultants from SEAM. The role of SEAM team in the public consultations was to facilitate the consultation and to document the concerns and answers, which were discussed in the meetings. The team also took the role in defusing tension and seeking options to solve gridlocks.

## 8.2 Summary of the Consultation and Activities Undertaken

Individuals and small group discussion sessions with the villagers in September, December 2017 and July, 2019 revealed their existing concerns to loss of grazing land for their animals in the surrounding environment of the villages.

Most of the villagers expressed about odour, noise, wastewater and unknown diseases related to factories. They also expressed about the concerns on the animals and plants around the villages and loss of the existing plant species. Some described worries about social demographic change such as religion and culture impact from the plant's migrant workers.

Some mentioned that the potential social tensions with migrant workers for economic reasons or unspecified incidents (minor petty cash stealing to criminal acts) during the construction and operation of the plant. In addition, some were worried about imposing restrictions to their territories.

Impacts of increasing traffic and safety on public road were also raised. A few warned for appropriate protection of cultural and religious sites and objects if they are detected.

The project manager, on behalf of the project proponent, presented the production process, environmental and social management programs, the project's core values, and the job opportunities.

As nutritional food demands become higher in upper Myanmar, one way to meet such demands is to increase the nutritional food produced from the animals by manufacturing the nutritional feed for Chicken, Pig, Goat, Cow, and Quail with modern technology. For this reason, Animal Nutritional Feeds Manufacturing Plant was constructed in Myotha Industrial Zone. De Heus Company based in Holland plans to make test running of the Animal Nutritional Feeds Manufacturing Plant in the beginning of June 2018.

Regarding to the production process, there are two types of product such as powder and pellet for feed. For processing the powder, there is no need to use water and just utilize the cornstarch, rice starch, broken rice and a few chemicals with the least risk.

In the feed pellet production, water is applied systematically to boiler. It will use two tubed wells with 6 inches without draining out the effluent from its production. The waste water from the restaurant and the people in the plant will be systematically drained out with the water sanitary machines. The effluent from the toilet will be settled into one place, and then the relevant municipal waste disposal unit will collect it for proper management of wastes. Otherwise, waste products will be piled in the designated area; the municipal waste disposal unit will collect it according to their routines. De Heus will contract it out with the municipal waste disposal unit.

The industrial zone management committee has been urged to take proactive actions and approaches.

Noise level to a disturbing degree was brought up in several discussions and the planned production process made it clear to the peoples that this operation will not contribute to the noise pollution. Optimism for job opportunities and business development were raised in a number of discussions.

Participants suggested that De Heus give job opportunities to youths from their villages and lessen strict education level requirements to secure a job. The villagers repeatedly asked that it is better to consider local human resources even during the construction period and not to emphasize on age level with job. The main reason is that farming opportunities became less after sharing farm land areas for Myotha Industrial Zone. And some complaints are that they want equal job opportunities for male and female without discrimination.

The project manager stated that De Heus certainly plans creation of job opportunities for the local peoples with some education, and local job seekers with suitable qualification will be given priority in the recruitment process and invited youths with a specific level of education to apply. Many participants expressed satisfaction with the project's willingness to listen their concerns.

When the project manager stated that the recruitment company will undertake to hire the labour at the basic level, the responsible person of the villages mentioned that it is important to network the recruitment company with the responsible person of the villages so that it will source local resources.

One participant suggested creating a job-network program similar to JAFPA, a recently established company that it has a job program that connects between the recruitment company and the villages to offer jobs to the local villagers. The job-network becomes a good source of job opportunities for locals.

The project manager stated that they take notes on their suggestions and will try to arrange a job program connecting to the recruitment company with the villages for offering jobs to the local villagers.

Some villagers asked, "Is there any life insurance offered by the employer of the plant?" The project manager replied that they have a plan to make contract with the life insurance company based on the national labour law. The company will follow the guidelines from national labour law in adjusting the basic salary rate, working hours, and charges for overtime. The company will arrange the capacity building program for the employees as per needed when the plant starts to operate.

Most villagers requested to give attention to monitor the treatment of wastewater and to divert the wastewater away from the drinking water tube-well to ensure safety of public health both for the present and future. Prevention of contamination on local natural Lake Maung Ma Khan from the plant wastewater was demanded.

In accordance with De Heus's core environmental and social commitments, it will never involve in disposing wastes recklessly. De Heus plans to contract with relevant municipal waste disposal agency for proper management of wastes.

The disposal of waste issue was raised due to unease with offensive odour, potential health threats and the spread of flies and mosquitos.

After learning that De Heus's environmental values does not allow disposal of wastes and it disposes wastes properly by contracting a proper municipal waste management service, the participants asked whether other industries could follow suit for proper waste disposal. De Heus does not have the authority to manage other industries but advised that the issue is important that it raises to the relevant authorities and the industrial zone management.

When the participants asked whether the project's CSR program is able to help their communities' urgent needs, the project manager replied that the management would look into the possibilities to help the communities. However, as the project has just commenced setting up the plant, it will take sometimes to do so.

The participants expressed that no one objects the existence of the industrial zone and the operating of industries in the area. However, they want to see these industries bring actual developments to the communities in the area as well.

The project manager stated that business opportunities will be significant to support the project's daily operation. Any job opportunities and business availability will be given preference for the local communities.

For the plant's social and environmental commitment, the representative from Nawarat village suggests to De Heus that it donates an emergency vehicle to their social community, which lacks an emergency vehicle. The villagers also want training program for them so that they can be qualified for the potential jobs in the future.

The project manager expressed that De Heus is open to all communities in the area to bring up any issues, complaints, or concerns with the project and will investigate and address the issues raised. Optimism was expressed by the participants for potential job and business opportunities to local communities.

In addition, grievance redress mechanism for the project was explained to the stakeholders. Anyone who has issue with the project or any of the components can lodge complaints through the village administrative committee. The project will deal with all complaints filed and find solutions to the complaints. For ongoing cases, the concerned party can bring up to the higher authorities if satisfactory solution has not been reached. The project is committed to find solutions and is willing to communicate with any stakeholders.

The project management can be reached by phone, mail, and other means as the convenient of the communities. The project management will always respond to any concerns transparently and timely manner.

### 8.3 Key Results of Consultations

The project's CSR programs need to emphasize the following points:

- To network the recruitment company with the responsible person of the villages in order to provide job opportunities to the grass roots level.
- To offer job with suitable education level to youths in the villages without discriminating male and female.
- To create job opportunities for the other villagers who are unfortunate to have certain degree of education that the company seeks.
- To give attention to the treatment of wastewater and to divert the waste water away from the drinking water tube well by ensuring safety of public health for both present and future.
- To develop environmental conservation management plan to take actions against impacts on the natural environment such as plants, animals and historical building.
- To involve nearby communities' urgent needs such as socio economics development, to make donation to local social welfare community, and to support religion, health and education events.
- To consider social demographic changes and to establish closer ties with the communities in dealing with issues.

### 8.4 Grievance Redress Mechanism (GRM)

De Heus will establish a GRM in order to handle public complaints and community complaints. Its GRM program was explained during public consultation meetings. The local residents can file complaints through village administrative bodies or in complaint boxes or by phone. Whenever a complaint is received, De Heus's management will document the complaint, initiate investigation, and together with relevant village administrative body and the person(s) who files complaint, solution will be sought. When the solution is not resolved by the person(s), it will be reported to higher management of De Heus for better solution. Employees working for De Heus can also file complaints and their complaints will also be resolved in the same manner. All complaints, handling of the complaints, resolutions, and follow up measures will be documented.

# 9. ENVIRONMENTAL MANAGEMENT PLAN

Environmental and Social Management Plan (ESMP) is developed based on the finding from environmental and social impacts identified in the earlier impact assessment session. The holistic ESMP addresses these environmental and social issues to avoid as much as feasible and only if the options for avoidance have been exhausted, to mitigate to the optimally plausible extent.

ESMP has employed all the best management practices to minimize and mitigate the potential impacts. With the application of these best management practices, the project aims to meet the guideline standards described in National Environmental Quality (Emission) Guideline (NEQEG) and to implement De Heus's environmental and social standards. All these best management practices tabulated in the ESMP will be religiously undertaken by the project in each phase of the project. In addition, De Heus is committed to make reviews and re-examination of the efficiency of these practices on the basis of regular monitoring results. Practically feasible adjustments and modifications will be made with the emergence of available best management practices and applications.

The ESMP indicates De Heus's commitment to avoid, minimize, and mitigate footprints of environmental and social impacts as the result of the project. De Heus plans to implement these applications in respective phase of the project.

Potential Adverse Effects	Mitigation measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
Loss of terrestrial habitats – from site clearing and assessment	<ul> <li>Assessing, marking, and careful removal plant species of any important value</li> <li>Replanting these plants and conserving the plant coverage</li> <li>Assessing wildlife activities</li> </ul>	Existence of plant species that are in critical state Appearance of wildlife activities and movements	The project management	Before the site clearing and after the construction	500
Soil erosion – from partial land leveling and removing spoils	<ul> <li>Careful removal of top soil for conservation</li> <li>Placement of wind and rain cover on the disturbed places</li> <li>Reuse of removed topsoil for vegetation</li> </ul>	Exposed soil surfaces Signs of soil degradation Forming channels from erosion	The project management	After site clearing and once a month before the completion of the construction	500
Dust emission – from soil exacerbation	<ul> <li>Wetting exposed soil during the survey period</li> <li>Placing removed plants and shrubs on exposed soil</li> </ul>	Increase in dust and particles	The project management	After site clearing and once a month before the completion of the construction	100
Disposal of earthen materials and plant debris – from land clearing /tree cutting	- Top soils removed, and plant debris will be conserved for covering of exposed places	Unattended disposed materials	The project management	After site clearing and once a month before the completion of the construction	100

## 9.1 Environmental Management Plan for Pre-construction Phase of De Heus Project

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
Loss of terrestrial ha	abitat				
Loss of terrestrial habitat by land clearing for construction activities	<ul> <li>Make pre-assessment of tree coverage and of known animal species of importance and document them</li> <li>Try to conserve as much number of trees and plants as possible and regrow them in the factory</li> <li>Save top soils for reapplication in the green belt.</li> <li>Setting up passages for wildlife in and around the compound.</li> </ul>	Tree coverage in the factory plot Presence of wild life species and activities in the factory area	De Heus's project management	Assessment prior to the construction and once a month monitoring	Already covered in the pre- construction assessment cost
Air Pollution					
Air pollution emission from the uses of construction equipment, cranes, heavy vehicles, welding machines, and steel cutter	<ul> <li>Management program to reduce number of vehicle trips and improvement to the sufficiency of the trip planning are integrated and implemented.</li> <li>Equipment and machine operations are closely monitored, reviewed, scheduled, and minimized.</li> <li>Green belt around the compound is established to function as a buffer and carbon absorber.</li> </ul>	SOx, NOx PM <sub>2.5</sub> , PM <sub>10</sub> , Ozone	Main contractor and its subcontractors	Monthly, [Air quality test will be carried out once a month during the construction period and NEQEG standard will be in compliance.	To be included in construction cost.
Emission from	- Prohibit idling of vehicles when not in use.	SO <sub>2</sub> , NO <sub>2</sub>	Main contractor	Monthly	To be

## 9.2 Environmental Management Plan for Construction phase of De Heus Project

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
vehicle operations (trucks, cars, crane and motorcycles exhausts),	<ul> <li>Vehicles activities are managed with operational plan to reduce number of trips.</li> <li>All vehicles are maintained regularly to reduce pollution loads from their emissions.</li> <li>Transportation is provided for all workers from camp to reduce the number of transport vehicles.</li> </ul>	PM <sub>2.5</sub> , PM <sub>10</sub> , Ozone	and its subcontractors	Keep record of vehicle activities management and maintenance for environmental review and auditing.	included in construction cost.
Emission from backup generators	<ul> <li>De Heus requires contractors to install and use generator with the best energy efficiency rating and the least emission quality.</li> <li>In addition, the generators will be operated only when power supply from the national grid is cut off.</li> </ul>	SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>2.5</sub> , PM <sub>10</sub> , Ozone	Main contractor and its subcontractors	Monthly Keep record of generator fuel used, total operation hours per month and maintenance for environmental review and auditing.	To be included in construction cost.
Dust emissions from shipping, loading and unloading of construction materials, Stockpiles of	<ul> <li>All construction materials are required cover for shipments. 2.5 -meter-high screens are erected along the peripheral of construction activities.</li> <li>Water is frequently (3 times per day) sprayed to unpaved roads especially in construction site.</li> </ul>	<ul> <li>PM<sub>2.5</sub>, PM 10, NO<sub>x</sub>, and SO<sub>x</sub></li> <li>Moisture level in top soil</li> <li>Placement of covers on exposed soils</li> </ul>	Main contractor and its subcontractors	Monthly Daily checking on effectiveness of water spraying practice and making	Appropriatel y budgeted in the construction cost

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
construction materials Excavating soils and activities related to earthworks Leaving exposed earth surface and Construction operations	<ul> <li>Education and training will be provided for relevant staff in suppressing dust.</li> <li>Spraying of water will be applied before unloading to suppress dust.</li> <li>Stockpiles for sand, dust, and gravel will be kept under the covers.</li> <li>Spraying of water will be required first before each earthwork and the materials will be carefully moved to a stockpile.</li> <li>Land clearing will be arranged immediately before the construction and spraying of water the application.</li> </ul>			adjustments.	Allocated
	cover before construction.				
Soil erosion, degrada	ation and contamination				
Top soil erosion, degradation and soil contamination by following earthworks Stockpiles of construction materials	<ul> <li>Stockpiles of construction materials will be housed in designated areas, where land clearing and construction will be taken place.</li> <li>Protective landscape planning and leaving buffer zone with constructions controlling runoff will be implemented.</li> <li>Construction of temporary sedimentation</li> </ul>	Sheet, ray, and gully erosion on slope and sedimentation and turbidity in nearby water ways	Main contractor and its subcontractors	Weekly monitoring on stockpiling of construction material and disposal of excavated soil. Monthly	Appropriatel y budgeted in the construction cost

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
	<ul> <li>pond along the water way will be considered depending on the accumulation rate.</li> <li>Regreening on disturbed surfaces with locally adapted plant species to prevent erosion.</li> </ul>			monitoring on soil erosion potential sources.	
Compaction from vehicle activities and soil contamination	- Vehicles parking areas and movements will be restricted to clearly marked or designated areas in order to reduce soil compaction and top soil degradation.	Construction site vehicle packing area Tyre marks and disturbances on undesignated places for parking or traffic activities.	Main contractor and its subcontractors	Weekly monitoring	Appropriatel y budgeted in the construction cost
Excavation of soils and activities related to earthworks	<ul> <li>In each and every earthwork, top soils will be carefully peeled off and stored properly.</li> <li>Spraying water will be applied to the top soil layers at regular time interval to maintain acceptable moisture level.</li> <li>Each earthwork will be closely supervised by a trained engineer and removed soils will be placed properly for later reuse.</li> <li>Top soil layers that have been carefully peeled off and stored will be reutilized in greening of the plant and if excess is available, will properly be placed in the surrounding or will be donated to the</li> </ul>	Soil stock pile, Dust dispersal, General soil moisture content, Top soil and subsoil for different use	Main contractor and its subcontractors	Weekly monitoring	A portion of construction cost.

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
	villagers for uses in their plantation.				
Construction activities and crew's movement	<ul> <li>Construction activities and crew activities will be strictly confined to the area where the plants will be put in place.</li> <li>Activities outside of the project boundary will be minimized to protect soil compaction and top soil degradation by rule and regulation.</li> </ul>	Construction activities Evidence of activities outside of the construction zone	Main contractor and its sub- contractors	Weekly monitoring	Appropriatel y budgeted in the construction cost
Disposal of construction spoils	<ul> <li>Construction spoils will be placed only in a designated area.</li> <li>The materials will be reused for landfilling and land application.</li> <li>If there is demand, these spoils will be sold.</li> </ul>	Type of spoils High and slope of construction spoils stock pile Potential land filling site	Main contractor and its sub- contractors	Monthly	A portion of construction cost.
Noise emission and V	Vibration				
Noise emission and vibration risk from unloading construction materials, earth works, foundation pile driving operation,	<ul> <li>These operations will be limited to mid-day working hours.</li> <li>Noise barriers will be erected to suppress the noise level.</li> <li>No unloading will be permitted at late night.</li> <li>Careful and proper unloading arrangements will be applied.</li> <li>All earthwork activities will be carried out behind the cover of noise barriers.</li> </ul>	Day and night time noise emission level should not exceed 70dBA for Industrial and commercial area. Vibration risk should not exceed 2.5 to 10 mm/s for	Main contractor and its sub- contractors	Monthly monitoring on noise level with NEQEG limit. Frequent checking and careful supervising on noise emission	To be included in construction cost.

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
	<ul> <li>Careful management will be applied to reduce noise and vibration.</li> <li>Latest silent foundation-pile driving methods will be applied.</li> <li>Pile driving activities will be arranged in normal working hours and behind sound barriers.</li> <li>Vibration will be monitored not to exceed the acceptable threshold.</li> </ul>	construction period earth working and piling in non- sensitive commercial area.		activities and vibration risk. Record keeping.	
Noise emission from movements of heavy vehicles, construction activities and construction crew,	<ul> <li>Trip management will be strictly applied to safe fuel and to achieve efficiency at the same time, to minimize the noise and vibration levels.</li> <li>Regular maintenance will be required to maintain smooth operation of vehicles and not to generate excessive noise and vibration.</li> <li>In addition, heavy vehicles will be operated in daytime only.</li> <li>The peripheral will be covered with sound barriers for the noise emission activities.</li> <li>Construction activities will be carried out behind the cover of sound barrier screens.</li> <li>Crews will be educated to lower noise level to the best possible extent.</li> </ul>	Day and night time noise emission level should not exceed 70dBA for Industrial and commercial area.	Main contractor and its sub- contractors	Regular monitoring on trip management and vehicles maintenance practices. Monthly monitoring on construction activities and noise safety of construction crew. Record keeping for environ- mental auditing.	To be included in construction cost.

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
Noise emission from Back-up generator	<ul> <li>Application of modern generator with least noise and vibration levels has been in place.</li> <li>In addition, sound absorbing control rooms will be established for housing the back-up generator.</li> <li>Cleaning and regular maintenance will be conducted.</li> </ul>	Day and night time noise emission level should not exceed 70dBA for Industrial and commercial area.	Main contractor and its sub- contractors	Quarterly monitoring on noise level of back-up generator and maintenance. Record keeping on total volume of fuel used per month for emission auditing.	A portion of construction cost.
Water consumption	and liquid waste generation				
Water consumption and wastewater generation from Construction operations	<ul> <li>Water conservation applications will be put in place throughout the site.</li> <li>Workers will be trained to shut off the tabs after each use.</li> <li>Not much consumption of water is envisaged for the crews and management, as they will be housed in a separate camp, where all water saving measures will be applied.</li> </ul>	Water joints, broken pipes and taps	Main contractor and its sub- contractors	Daily and Weekly Record keeping on total volume applied in every phase of construction for environmental auditing and review.	A portion of construction cost.
Effluent discharge from cleaning activities of	- Cleaning of vehicles and construction equipment will be carried out in designated places only.	Collection of spent water Water saving	Main contractor and its sub- contractors	Monthly	A portion of construction cost.

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
construction and management crews	<ul> <li>The used water will be saved for reuse in construction activities or for spraying the ground.</li> <li>Minimal usage is expected as they will be put in temporary worker camps.</li> <li>Water saving education will be given and the workers will be reminded repeatedly to shut of valves after each use.</li> </ul>	equipment Education materials			
Surface flow and runoff from Rain events in monsoon	<ul> <li>Drainage will be put in place at the beginning of the construction to properly channel water to nearby drainage systems.</li> <li>Rain water will also be harvested to use in the plant development.</li> </ul>	Drainage channel to final discharge	Main contractor and its sub- contractors	Monthly	A portion of construction cost.
Accidental spills of Construction related chemicals and cleaning agents	<ul> <li>Apply spill remedies as specified and clean up immediately.</li> <li>Incidents are to be documented and reported to the management.</li> <li>Rinse and wash the persons affected and provide immediate referral for medical care.</li> <li>Handling and storage will be conducted by well-trained person with close supervision of HSE manager.</li> <li>Systematic dispose of empty containers in designated area and some will be recycled.</li> </ul>	Transportation, Handling, storage and final disposal of chemical and its empty container, Safety plan.	Main contractor and its sub- contractors	Weekly interval Record keeping on any events and frequent inspection on safety plan.	A portion of construction cost.

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
Effluent discharge from vehicles and onsite maintenance operations	<ul> <li>All maintenance operations are required to place secure ground cover before the work.</li> <li>Spills are required to clean up and report to the management.</li> </ul>	Disposal and refute management from repair shop activities and sources of spills	Main contractor and its sub- contractors	Weekly - Record keeping on any events and frequent inspection on safety plan.	A portion of construction cost.
Solid waste generatie	on				
Solid wastes and construction spoils from construction activities Shipping materials	<ul> <li>Construction debris and discarded materials will be stored properly and sold for reuse.</li> <li>All by-product materials will be recycled and sold.</li> <li>Non-reusable debris and concrete pieces will be discarded to MMID designated area.</li> </ul>	Reusable and non- reusable debris	Main contractor and its sub- contractors	Monthly	Management cost
Domestic waste generation from construction workers and management crews	<ul> <li>Wastes will be kept properly in trash bins.</li> <li>These wastes will be separated, and wet wastes will be collected regularly by nearby municipal department while the recycle materials will be sold.</li> <li>Sufficient trash bins will be placed throughout the plant.</li> </ul>	Waste segregation practices and trash bins and collection frequency and volume of waste per month	Main contractor and its sub- contractors	Monthly, Record keeping for estimated volume of domestic solid waste generated from the whole construction period.	A portion of construction cost
Non-degradable discarded containers	- Chemicals and fuel related containers will be returned to their origin while the other containers will be sold to recycle.	Empty and expired containers	Selected contractors,	Monthly	Management cost

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
Social and Occupati	onal health and safety impact		1	1	I
Social adverse effects by tension and conflicts between migrant workers and local communities	<ul> <li>Local hire is encouraged, and contractors are asked to include local hires.</li> <li>Contractors' experienced workers are confined in worker camps.</li> <li>Cross visit is allowed but time restriction is imposed.</li> <li>The contractors are to reach out to communities to listen their concerns and find solutions.</li> <li>Any social conflict with local communities should be reported immediately and prompt attention to settle the conflict would be developed.</li> </ul>	Total number of local laborers and migrant laborers Gender ratio	Main contractor and its sub- contractors	Monthly Record keeping for environmental review and auditing.	A portion of construction cost.
Discrimination, gender equality, compliance with labor regulations, refusal for workers with disabilities, disregards to overtime compensation	<ul> <li>De Heus is an equal opportunity employer and therefore, encourages peoples with disabilities to work relevant to their skills.</li> <li>Lower rate based on gender is strictly prohibited and De Heus takes seriously that women are entitled to equal pay rate with men in the same job function.</li> <li>In compliance to Myanmar Government's labor rules, overtime compensation should be defined in accordance with the national regulation.</li> </ul>	Working hours Leave and holiday Pay rates for different genders, Worker rights Pay scale and basic salary Overtime rate per hours	Main contractor and its sub- contractors	Monthly	A portion of construction management cost

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
Job competition between local and migrant workers	<ul> <li>Prioritize local laborers as both daily workers and managerial levels if they have equal qualification</li> <li>Provide training to local youth for required skills</li> <li>Communicate with local or village administrative authority for local labor recruitment opportunities</li> <li>Equal pay scale for both local and migrant workers</li> </ul>	Local and migrant ratio Skill requirement Labor registration Pay scale	Main contractor and its sub- contractors	Monthly	To be included in construction cost.
Land dispute and involuntary resettlement	<ul> <li>Acquired land legally</li> <li>Consult with land owners until final agreement has been reached.</li> <li>Provision of proper resettlement or compensation plan</li> <li>Prior clarification and agreement between land owners and developer</li> </ul>	Land acquisition documents Any complaint during construction period Resettlement plan	De Heus manager	Semiannually	A portion of land acquisition cost
Safety, risks, and health hazards from refusal to use PPE, work related injuries, sickness, and fire incident	<ul> <li>PPE requirements are to be met at all cost in work zone.</li> <li>Anyone without sufficient PPE will not be permitted to work and there is no exception.</li> <li>Regular health and safety training will be offered.</li> <li>Strict enforcement of these policies will be</li> </ul>	Personal protection equipment Work permit Certificate for some risky and chemical related works, Social welfare,	Main contractor and its sub- contractors	Monthly	A portion of construction management cost

Potential Adverse Effects	Measures adopted	Monitoring indicators	Responsible Party	Implementation schedule	Budget Allocated
	<ul> <li>applied, and close monitoring will be executed daily.</li> <li>Any work-related incident will be reported promptly, and the injured worker will be provided immediate medical attention at an appropriate medical facility.</li> <li>Health services will be offered for the employees.</li> <li>Sick leaves will be granted given that medical certificate be presented afterward.</li> <li>Fire safety equipment will be installed adequately, and renewal will be carried out annually.</li> <li>Fire department's requirement for emergency exits and fire preparation will be provided.</li> <li>Emergency drills will be carried out and everyone will be informed of safe assembly points, head counts responsibility, and immediate contact with the closet fire department.</li> </ul>	Insurance, First aid kit, Health care services Firefighting equipment Annual recertification			

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
Intensive energy cor	sumption				•
High energy uses in	- De Heus employs equipment based on high	Total power	De Heus plant	Monthly	500
production	energy efficiency rating.	consumption of	manager		
processes	- Decisions for instruments are made based on	equipment and			
	low power consumption and energy efficiency.	machines			
Electric power	- De Heus also endorses energy saving				
competition with	mechanisms and exercises it religiously.	Power saving			
local community	- Unnecessary lights and office electrical	hours per day			
	instruments will be turned off while not in use.				
	- Energy consumption will be closely monitored				
	and evaluated for improvements.				
Ambient air pollutio	on				
Air pollutant	- Ensure exhaust gases from rice husk burning for	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> ,	Competent air	The monitoring will	2000
emissions from	boiler are passed through cyclone and wet	NO <sub>2</sub>	quality	be conducted every	
rice husk burning in	scrubber for capturing fine particulate matter		monitoring	six months for both	
boiler operation,	and controlling flue gas		firm	inside and outside of	
Vehicle operations	- Idling will be prohibited.			the factory and the	
for shipping and	- To reduce number of vehicle uses, car polling			monitoring results	
receiving activities	and taking ferries will be encouraged.			will be reported to	
and transportation	- All vehicles in association with the plant are			ECD.	
of employees.	required to do regular maintenance.				
	- Operation of shipping and handling at night will				
	not be permitted unless absolutely necessary.				
	- Water spraying along the unpaved roads				

# 9.3 Environmental Management Plan for Operation phase of De Heus Project

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
	- Prohibit vehicles standing, loading and				
	unloading process at undesignated areas				
Fugitive dust	- Minimizing the size of exposed areas	PM 2.5, PM 10,	Independent	To conduct	The cost will
emission from	- Dust causing materials will be covered	Fugitive dust	and	monitoring inside	be covered in
grinding and mixing	- Operations of these processes will be carried out		competent air	and outside of the	regular air
of raw materials	in a controlled environment.		quality	factory semi-	quality
			monitoring	annually.	monitoring
			firm		stated above.
Offensive odor emiss	sion				•
Odor emission from	- Ensure possibility for proper drying of these	Odor levels	Competent air	Monthly	US \$ 500
raw materials like	materials in a controlled environment	should not exceed	quality		
dry fish, shrimp,	- Usual employment of first-in, first-out system	five to ten	monitor		
fish-byproducts and	- Proactive identification of potentially offensive	odorant units,			
animal-byproducts,	odors sources	Presence of			
molasses and	- Provision of adequate air circulation or chemical	offensive odor in			
wastewater	treatment	the area			
collection pond	- Regular cleaning and disposal of discarded spoil	Public reaction to			
	and expired raw materials	the odor			
Boiler fuel burning	- Adequately maintain smoke stack emission with	Presence of	Competent	Semi-annually	US \$ 1000
Waste water system	modern technique	offensive odors	environmental		
	- Ensure sufficient aeration in wastewater storage	Bubbles pluming	monitor		
	pond	out of wastewater			
		ponds			
Noise pollution and	vibration risk				
Noise emission and	- Noise and vibration will not be envisaged from	Day and night	De Heus HSE	Biannual	US\$ 1000
vibration from	the production operation itself	time noise	unit	monitoring.	

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
Loading and	- Ensuring that the noise levels should comply	emission level		environmental	
unloading of raw	within standard of Myanmar's noise level	should not exceed		auditing.	
materials and	guidelines for industrial areas,	70dBA for			
production process,	- Raising noise barrier wall for the particular	Noise levels at			
Grinding, mixing,	noisy equipment	industrial and			
pelleting, and	- Containing noisy operations in a confined area	commercial area.			
sieving.	- Provision of noise protection PPE for workers	Hearing			
Vehicle movement	who have long-term exposure	protection			
and transportation	- Growing trees along the fence of the factory as a	equipment and			
	living noise barrier buffer and air pollution	Setting			
	absorber.	requirements for			
		taking regular			
		breaks.			
Back-up generators	- Quiet and energy efficient generators will be	Day and night	De Heus's	Monthly monitoring	US \$ 500
and boilers	used for back-up power supply.	time noise levels	plant manager		
	- These will not be operated unless absolutely				
	necessary.				
	- Back-up generators will be kept in a confined				
	space				
	- Sound suppression and absorption measures will				
	be put in place in the generator room.				
	- Generator uses will be documented and fuel				
	consumption will be monitored and evaluated				
	regularly.				
Grading and mixing	- Noise and vibration associated from these	Noise emission	Competent	semi annually	US\$ 500
of raw materials	processes will be controlled with employment of	level higher than	environmental		

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
	appropriately quiet equipment and following of	70dBA	monitor		
	proper operational procedures.				
	- Operations of these processes will be carried out				
	in a controlled environment.				
Ground water extra	ction				
Water consumption for the factory operation from the extraction of groundwater	<ul> <li>The plant will shift to municipal water supply as soon as it is available.</li> <li>Changes in groundwater level will be monitored and will make necessary plan.</li> <li>Water saving mechanisms will be put in place and awareness raising programs will be provided to the employees.</li> <li>Water consumption will be monitored closely, and evaluation will be carried out to find ways to reduce water consumption.</li> <li>Treated wastewater will be reused for appropriate purposes</li> </ul>	Water volume meter at the inlet, The rate of water consumption per working hour, Shifts in ground water level and quality	Competent environmenta l monitor	semiannually, [Samples will be sent to a reliable laboratory and the results will be report to ECD. NEQEG standard will be applied]	US \$ 1000
Waste water genera	tion and storm water runoff				
Wastewater generation and	- Spent water used in cleaning operation of the production processes will be appropriately	BOD <sub>5</sub> , Active ingredients/	Competent environmenta	Semi - annually	US \$ 2000
overflow	treated.	antibiotics, COD,	1 monitor		
	- Effluent of treated wastewater will be recycled	Oil and grease,			
	for uses while the sludge will be handed over to	pH, Temperature			
	a relevant municipal agency for disposal.	increase, Total			
	- Domestic sewage from the plant will be kept in	coliform bacteria,			
	septic tank and then, will be pumped out by	Total nitrogen,			

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
	MCDC when full.	Total Phosphorus,			
	- No wastewater will leave the plant untreated.	TSS and other			
		parameters			
		identified by			
		NEQEG general			
		standard			
Storm water runoff	- Drain water from roof and drainage will be	Efficiency of	Competent	Monthly monitoring	US \$ 800
and overflow from	channeled out to the industrial drainage system.	drainage channels	environmental		
drainage channels	- Regular maintenance on drainage channels and	Leakage from	monitor		
	protect surface flow	waste water			
	- The plant will maintain green coverage in the	treatment			
	compound to encourage groundwater recharge	facilities to runoff			
	from rain events.	drain			
	- Reuse water for garden greening and	Standing water			
	firefighting purposes				
	- No wastewater will drain into storm water				
	drains and public water ways				
Accidental spills	- Apply spill remedies as specified and clean up	Chemicals, Oil	De Heus HSE	Monthly monitoring	US\$ 1000
and leakage of	immediately.	and Grease Spill	manager.		
cleaning agents, Oil	- Incidents are to be documented and reported to	sources			
and fuel storage	the management.	Handling, storage			
tanks	- Rinse, wash, and treat persons affected	and distribution			
	immediately with ample of water and transfer	process (chain of			
	them for immediate medical care.	custody)			
	- Proper disposal of rags and sand contaminated	Spill response			
	with oil.	procedures and			

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
	- Ensure chemical and diesel storage tank shall be	preparedness			
	located away from any water sources and				
	sensitive area				
	- Water contaminated with cleaning agent will be				
	properly treated and handed over to the				
	hazardous waste management facilities properly				
<b>Biodiversity degrad</b>	ation				
Terrestrial Habitat	- Replanting of trees along the perimeters of the	Planting trees	De Heus plant	Biannual monitoring	US \$ 1000
lost by Land used	factory to establish buffer zones for birds and	Buffer area	manager		
and land covered	some other species	Hunting			
changed	- Leaving green buffer plantation area with highly	prevention			
	adaptable tree species will be useful not only for	Green passages			
	living organism but also for noise prevention				
	and air pollutant absorption.				
	- Prohibit hunting in nearby areas				
	- Leaving open field area between the buildings				
	for rainwater percolation and riparian for some				
	living things.				
	- Creating green passages for animal species				
	around the plant and other areas				
Degradation of	- Redirecting natural stream along the soil	Stream direction	De Heus plant	Monthly monitoring	US \$ 500
shallow stream	gradient with proper lining wall	Seasonal stream	manager		
caused by land	- Leaving natural wetland area if possible	The rate of			
filling	- Leading natural surface stream into main drain	sedimentation			
	of IZ				
	- Allowing rainwater percolation through natural				

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
	steam for water recharging habit				
Production and dom	estic solid waste generation	·		·	
Operational solid	- Used shipping materials and discarded materials	Total volume	De Heus	Monthly monitoring	US \$ 1000
wastes generation	will be recycled.	Type of wastes	factory		
from used shipping	- The expired or spoiled raw material will be sold	and management	manager		
materials, discarded	to fertilizer manufacturers.	practices			
solid wastes,	- These materials will be kept properly before	Storage practices			
expired and	being sold.	Handling			
discarded raw	- Non-reusable solid waste will be disposed	practices			
materials and	employing a proper disposal agency.	Disposal sites			
packaging materials	- Spoilable wastes will be stored in non-leachable				
	HD polyethylene sheet or concrete ponds to				
	prevent leaching into soil				
	- Some wastes will be kept under proper cover				
Domestic and office	- Practice waste segregation of biodegradable and	Waste	De Heus	Monthly monitoring	US \$ 500
wastes,	non-biodegradable for different disposal	segregation	factory		
packaging materials	methods	For biodegradable	manager		
	- Paper and plastic waste will be collected	and non-			
	separately for recycling purpose.	biodegradable			
	- Solid wastes will be kept in sufficient trash	Waste collecting			
	containers after being separated for recyclable	system			
	materials.				
	- Enough trash bins will be distributed throughout				
	the plant.				
	- A relevant municipal authority will be				
	contracted for regular collection and disposal at				

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
	proper places.				
	- Prohibit open dumping, burning, and disposal at				
	non-designated areas				
Sewage generation	- Provision of enough toilet and septic tanks for	Efficiency of	De Heus plant	Monthly monitoring	US \$ 500
from septic tanks of	the workers	toilet and septic	manager	Documenting	
Office and work	- Ensure regular cleaning practices	tanks		sewage management	
places	- Prohibit leaching and surface runoff	Maintenance		practices	
	- Provide clean and safe environmental conditions	practices			
	with proper sewage management practice				
	- Manage with the help of industrial zone				
	municipal sewage management team, if required				
Hazardous waste ge	neration			·	
Hazardous wastes	- Ensure transportation, handling, storage and	Check the list of	Competent	Semi-annual	US \$ 1500
from spent chemical	dispose of any hazardous chemical and wastes	major chemicals	environmental	monitoring and	
containers and	by trained workers with proper PPE	applied in	monitor	reporting by	
containers for	- Spent chemical containers and containers for	production		Independent party.	
cleaning agents,	cleaning agents will be returned to suppliers as	process with			
failed electric bulbs,	much as possible.	MSDS sheets for			
tubes, battery, and	- Protect leaching and surface runoff from	all empty			
paint	hazardous waste storage area into public drain	chemical bags,			
	- Containers that may neither pose hazards nor	boxes, tins, and			
	health risks will be sold for recycling.	containers			
	- Containers that cannot be returned to the				
	suppliers will be disposed at MCDC's hazardous				
	disposal site properly.				
Oil and grease	- Ensure oil trapping equipment and timing	Oil and grease	De Heus plant	Monthly monitoring	To be

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
leakage from	maintenance practices for all machines and		manager		included in
Machines,	vehicles				internal
equipment,	- Prompt cleaning of oil and fuel spills.				management
vehicles, fuel and	- Proper disposal of rags and sand contaminated				cost.
engine oil storage	with oil.				
tanks along the	- Installing oil and grease traps along the drain of				
operation process	machine workshop				
	- Contaminated water drain from machinery will				
	directly lead into waste water treatment facility.				
Social and Health in	npact				-
Alienating local	- Prioritize job opportunities to the potential	Internship	De Heus	Quarterly	US\$ 2000
communities	project affected local communities by providing	program	factory	monitoring	
	proper trainings	Skill and	manager		
Job competition	- Regular contact with local administrative units	qualification			
between local and	for recruitments	training			
migrant labors	- Creation of suitable job opportunities for local	Gender equality			
	women will be encouraged.	programs,			
Required	- Employment from local labor pool will be	Training program			
qualification	preferred if they have equal qualification				
	- In addition, purchasing local products will be				
	encouraged to help local economy.				
	- Ensure equal payment for same position of local				
	and migrant workers				
	- Provision of welfare equivalent to labor law,				
	rules and regulation				
Increase in demand	- Provision of transportation and accommodation	Relevant policies	De Heus plant	Semi-annual	US \$ 500

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
for food and shelter	for workers	Accommodations	manager	monitoring	
Cost leading to	- Priority hiring of local labor is encouraged.				
inflation	- Purchasing local products and encouraging local				
	trade.				
Increasing demand	- Encourage sustainable utilization practices for	Energy	De Heus's	Semi-annual	US \$ 300
for water, fuel and	water, fuel and electricity and adopt energy and	consumption and	plant manager	monitoring	
electricity	water conservation and saving programs.	effects of energy			
	- Prohibit firewood gathering from nearby natural	and water saving			
	vegetation.	programs			
	- Help with alternative fuel sources or more				
	energy efficient fuels				
Social and cultural	- Ensure management to reach out to communities	Community	De Heus plant	Quarterly	US\$ 500
conflict and	to listen their concerns and find solutions.	concerns	manager	monitoring	
tension between	- Any social conflict with local communities will	Number of			
migrant workers	be required to report immediately and promptly.	conflict			
and local	Prompt attention to settle the conflict would be				
communities,	developed.	Dos and Don'ts			
vendors and social	- Cultural and social orientation training programs				
and health services	for new employees				
Lack of job	- Awareness and training for preventing taboos				
opportunities for	and insults will be offered and upgraded				
local communities	regularly.				
	- The plant will establish good relationship and				
	regular communication with local communities.				
	- Controlling workers not to disturb cultural and				
	religious believe of local communities.				

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
Occupational health	and safety			·	
Work related injury	- Awareness training programs will be conducted.	Number of	De Heus's	Semi-annually	500
and accidents,	- Cross departments monitoring will be exercised	incidents	plant manager		
dangerous working	to encourage competition for safe working	Severity of	and respective		
environment,	conditions.	incidents and	area		
exposure to	- Programs with attractive incentives will be	handling methods	supervisors		
chemicals	implemented to step up improvements.				
	- Incentives building for road safety.				
Incidents and	- Ensure tool box meeting in every workday	Training	De Heus	Monthly	US\$ 500
emergency cases	morning before commencement of work	programs	factory		
from operation and	- Provision of first aid kit and CPR training	First aid kit	manager		
maintenance	- If possible,	Clinic			
	- The Factory provides health care service or clinic.	Notice board			
	- Training program for firefighting, flash flood	Responsible team			
	and earthquake events are encouraged.	List of hospitals			
Safety, risks, and	- PPE requirements are to be met at all cost in	Type of PPE for	De Heus	Quarterly	US \$ 500
health hazards	work zone.	different works	factory	monitoring by	
Lack of PPE	- Anyone without sufficient PPE will not be	HSE training and	manager and	independent party.	
Work related	permitted to work and there is no exception.	workers'	HR manager,	Record keeping and	
injuries, sickness,	- Regular health and safety training will be	understanding	Operation	reporting to ECD.	
and fire incidents	offered.	Appropriate	managers,		
and natural disasters	- Strict enforcement of these policies will be	leaves and R&R	worker		
	applied, and close monitoring will be executed	for workers	themselves,		
	daily.	Sufficient fire			
	- Any work-related incident will be reported	extinguishers			
	quickly, and the injured workers will be	Emergency drills			

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
	provided immediate medical attention at an				
	appropriate medical facility.				
	- Health services will be offered for the employees.				
	- Sick days will be granted given that medical				
	certificate be presented afterward.				
	- Fire safety equipment will be installed				
	sufficiently, and renewal will be carried out				
	annually.				
	- Fire department's requirement for emergency				
	exits and fire preparation will be provided.				
	- Emergency drills will be carried out and				
	everyone will be informed of safe assembly				
	points, head counts, responsibility, and				
	immediate contact with the closet fire				
	department.				
Traffic and road	- Prohibit long standing or loading vehicles on the	Vehicles control	De Heus plant	Quarterly	US \$200
congestion and	public roads	procedures	manager	monitoring	
incidents	- Limit speed of factory related vehicles	Speed limit			
	- Employ only licensed drivers	Road notices			
	- Posting road signs near the sensitive area like	signs			
	school and hospital	Incident records			
	- Provision of road safety awareness training to				
	nearby communities				
Discrimination,	- De Heus is an equal opportunity employer and	Cases of	De Heus's	Monthly	
gender equality,	therefore, encourages peoples with disabilities to	irregularities	Plant manager		
Refusal for workers	work relevant to their skills.	Different			

Potential Adverse	Measures adopted	Monitoring	Responsible	Implementation	Budget
Effects		indicators	Party	schedule	Allocated
with disabilities,	- Lower rate based on gender distinction is strictly	payment system			
discrimination over	prohibited and De Heus takes seriously that	Past abuses			
gender regarding	women are entitled to equal pay rate with men in				
pay rate and	the same job function.				
opportunities,	- In compliance to Myanmar Government's labor				
disregards to	rules, overtime compensation should be defined				
overtime	in accordance with the national regulation.				
compensation					
Grievance condition	- Employees will be encouraged to raise any issue	Complaints,	De Heus	Quarterly	
For any complaints	or complaint they may have.	Working	factory	monitoring by	
and issues from any	- These issues will be swiftly and fairly dealt with	environment	grievance	Independent party,	
stakeholders	in transparent manner.	issues	redress		
including De Heus	- Any reprisal will be subjected to prompt	Social welfare	committee		
's employees	investigation and severe penalty.	issue, land	and local		
	- Open discussion, complaint box, and labor	dispute, labor	community		
	council or labor union will be allowed in the	right, leave	representative		
	plant		, worker		
	- The plant will establish grievance redress		representative		
	mechanism in transparent manner and receive				
	any complaint that communities and				
	stakeholders have to make.				
	- The committee will document the complaints				
	received and find solutions and if not resolved,				
	these issues will be referred to upper				
	management for settlement.				

Potential Adverse Effects	Measures adopted	Monitoring parameter	Responsible Party	Monitoring Frequency	Budget Allocated		
Occupational Health and safety							
Health and safety issues caused by dis-assembling machines and equipment, Demolition of the factory infrastructures, storage tanks, and wastewater basins, Demolition process and exposure to chemical residues, Traffic and road	<ul> <li>Hire certified contractor with trained workers to avoid risk and accidents</li> <li>Obligatory use of relevant personal protection equipment</li> <li>Ensure complete understanding and acquaintance to ESMP prior to the commencement of demolition process</li> <li>Fully comply with both De Heus's corporate health and safety policies and ILO policies</li> <li>Firmly secure, tie down, and cover equipment and vehicles in transportation</li> <li>Hire experienced and licensed drivers for transportation of materials and demolished subjects</li> <li>Ensure full compliance to local traffic rules and regulations</li> <li>Inform local traffic control and law enforcement for the planned activities</li> <li>Speed limit for all vehicles</li> </ul>	Contractor's track records and experience Contractor's accident reports, records, and training offered Drivers' competency, Driving habits, licenses, and checklist	De Heus plant manager	Weekly monitoring until the end of decommission			
Effects on son and groundwater							

## 9.4 Environmental Management Plan for Decommissioning, closure and post closure phases for De Heus Project

Potential Adverse Effects	Measures adopted	Monitoring parameter	Responsible Party	Monitoring Frequency	Budget Allocated		
by residues of abandoned oil and chemical storage areas, laboratory and waste water treatment facility, sewage	<ul> <li>Contract a competent certified agent with relevant experience for the tasks</li> <li>Prior and environmentally conscious removal and clean-up of chemicals and dangerous substances</li> <li>Systematic removal of all storage tanks</li> <li>Reclaiming the site to bring back to the conditions prior to the project</li> </ul>	Demolition debris Spills Remains of chemicals and containers	De Heus's project management	Twice during the demolition period.	1000		
Solid wastes							
Solid wastes disposal from demolition debris and ruins, domestic wastes, outdated machines, wastes from storage facilities and worker accommodations	<ul> <li>Demolition debris and ruins of the building will be recycled</li> <li>Recycle solid wastes from demolition process and dispose at a designated area</li> <li>Used containers and expired chemical wastes will be disposed properly</li> <li>Prevent open dumping and burning at public area</li> <li>Systematic transportation of solid wastes</li> <li>Provision of proper sanitary treatment for the sewage and residues</li> </ul>	Waste types and management measures Collecting frequency	De Heus's project management	Monitoring along the demolishing process until final disposal site to ensure that not to disturb nearby environment	US \$2000		
Impact on Air Quality							
Demolishing of buildings and	- Provide proper notification prior to demolition.	Demolition debris,	De Heus project manager	Weekly Throughout the	-		

Potential Adverse Effects	Measures adopted	Monitoring parameter	Responsible Party	Monitoring Frequency	Budget Allocated
infrastructures and transportation of demolished wastes and debris	<ul> <li>Strictly avoid the free open burning of solid waste materials at the project site.</li> <li>Apply dust control by placing screen covers and barriers along the site.</li> <li>Spray dust control substances and water regularly before the process</li> </ul>	waste types Exposed surface		decommissioning- phase.	
Impact on Noise and	I Vibration		1	1	
Noise and Vibration due to the operation of demolishing activities working with heavy machinery and equipment.	<ul> <li>Ensure that machines and equipment are properly maintained for minimum generation of noise and vibration.</li> <li>Use of noise and exhaust control devices for combustion engines.</li> <li>Prepare well planned schedules by consulting local communities prior to demolition.</li> <li>The project proponent must take a responsibility to comply with the relevant legislation regarding noise and vibration standards</li> </ul>	Type of machines and equipment, to be used, and type of wastes and debris to be handled. Type of noise, vibration, and exhaust control devices to be used.	De Heus project manager	Weekly Throughout the decommissioning- phase.	
Unemployment					
Loss of jobs and unemployment	<ul> <li>Inform all employees of the plan at least 6 months ahead of the process</li> <li>Offer transfer job opportunities at other De Heus's plants</li> </ul>	Documenting unemployment situation Prior counselling and	De Heus project manager	Monthly throughout the decommissioning phase	-
Potential Adverse Effects	Measures adopted	Monitoring parameter	Responsible Party	Monitoring Frequency	Budget Allocated
--	--	--	----------------------------	---	---------------------
	<ul> <li>Compensate in accordance with Myanmar legal requirements for those who choose not to seek transfer of jobs</li> <li>Offer help and assistant programs for other job opportunities</li> <li>Create employment opportunity networks so that those who loss jobs will have easier opportunities to seek other jobs</li> </ul>	statistics Employment opportunities network Meeting with other potential employeers			
Lack of income					
Economic potential loss for communities and raw material suppliers	<ul> <li>Inform the communities and raw materials suppliers ahead of the time of decommissioning</li> <li>Offer assistance and help to local communities and raw material suppliers</li> <li>Make links and connections with other factories that could purchase the raw materials</li> <li>Secure deals with other potential purchasers for the local products with some forms of incentives</li> </ul>	Number of counselling meetings with communities and raw materials suppliers Meetings with other potential purchasers	De Heus project manager	Monthly throughout the decommissioning phase	-

## 9.5 Undertaking

De Heus is committed to meet requirements from Myanmar National Requirements setby ECD. De Heus will implement every step mentioned in the ESMP and fulfill De Heus's environmental and social commitments for betterment of the communities and localities it operates. De Heus will file semi-annual reports to ECD for its ESMP developments and monitoring.

By submitting this ESMP, De Heus undertakes responsibilities to comply and meet all these stated operations and procedures. De Heus makes the assurance that everyone working under the supervision of De Heus will adhere to stated commitments described in the ESMP.

De Heus will religiously follow the monitoring schedule set in the ESMP and document the results to report to ECD and relevant authorities. De Heus will strive to achieve prevention of environmental and social impacts together with the cooperation and guidance from the ECD.

## 9.6 Emergency Management Plan

De Heus's emergency management plan covers all possible emergencies that can be encountered at the plant. De Heus's Emergency Management Plan serves as the primary tool to deal with emergencies, when they occur.

## 9.6.1 Accidental Chemicals or Hazardous Materials Spill

De Heus's rigorous principles for storage of chemicals and hazardous materials, regular practical training and semi-annual renewal training for handling of chemicals and hazardous materials, strict rule to handle chemicals and hazardous materials only by trained personnel, and sufficient documentation procedures for chemicals and hazardous materials will proactively prevent or at least minimize spill incident. Spill response procedures are visibly posted on walls.

As soon as a spill is reported, the area will be isolated and non-essential personnel will be restricted from access to the area. If required, all employees except those who will respond to contain spills will be asked to move to the assembly point until the clear signal is given to get back to work. If the accident causes injuries and needs medical attention, this incident will also trigger medical emergency. Injuries and medical attention needs will be handled strictly in line with the plant's medical emergency guidelines.

As soon as spill incident is reported, incident assessment will be carried out to determine appropriate response procedures. If the spill can be contained by in-house trained technicians, the spills will be contained using the materials provided readily for accident response. If outside assistance is required by the size or degree of hazards, relevant environmental agency will be promptly informed and invited to deal with the spill.

Showers and eye washes to rinse spilled materials from human body, spill control materials, material safety data sheets for all relevant chemicals, and emergency contact numbers will be made readily available near the storage for chemicals and hazardous materials and the places, where these materials are utilized.

Incident report and follow-up assessment are required for every incident big and small. Scientific laboratory grade face masks, sufficient ammonium, and high-power blower will always be kept ready to contain accidental formalin spills.

#### 9.6.2 Fire Outbreak

De Heus's incorporate fire exits, fire alarm system, placement of fire extinguishers, and fire management plan in its operation. Materials that can fuel fire are required to store properly. Renewal of fire extinguishers and of fire response training annually, regular annual inspection from fire department, and fire drills will be carried out. Contact numbers to nearby fire departments will be placed on walls. Smoke detectors are put in place and are checked regularly for their performance. Smokers will be allowed only in a designated smoking room.

Fire escape routes will be lit when fire alarm is sounded. All employees except specifically trained first responders for fire emergency will have to exit the buildings and are required to report at assembly point. Head counts will be carried out to identify missing persons at the assembly point.

Security team will contact fire department as soon as the alarm goes off. First responder team will check buildings to assess the degree of the fire. Containment will be executed if feasible. As soon as the fire department reaches the site, the first responder team will brief the fire department to carry on. No one will be allowed back in the production until safe signal is given by the fire department. Thorough fire investigation will follow after an incident for lesson learned and for better preparedness.

Fire safety evaluation will be carried out yearly and improvement will be carried out in the plant to prevent fire outbreak.

#### 9.6.3 Medical Emergency

When a medical condition emerges, depending on the seriousness of the medical incident, the medical emergency condition will be triggered. The seriousness of sickness should be determined by medical professionals but not by the plant's personnel.

The patient will be attended by a designated person who has received basic medical training and the patient will be escorted immediately to a nearest health care provider. The designated person will accompany the patient. Gathering around the patient will not be permitted as that can block air flow and make the problem worst. The patient will be given enough rest and day off to recover as required by recommendation of a medical physician. The plant will cover cost for medical emergency and treatment. If it is a work-related injury, the plant will cover all medical cost and lost days.

If sickness is detected in more than one-person, necessary emergency assessment will be carried out while the rest of the employees will be collected in the assembly point. Only after thorough assessment and inspections are carried out and necessary action has been executed, employees will be allowed back in.

#### Monitoring and Reporting Procedure

The project will take charge of regular monitoring and inspection in conjunction with the designated environmental consultant. Check list and specification for regular monitoring

programs will be developed and the project's team will be trained for monitoring and inspection of the work. The project team will carry out weekly monitoring requirements using the check list and with the supervision of De Heus's management level, it will take corrective actions for any infringements that detects. The finding will be reported to the project management. More experienced and trained team will carry out thorough inspection and monitoring as specified in the ESMP. In addition, a competent environmental firm will be contracted to carry out environmental quality monitoring for ambient air quality, noise and vibration, soil, and water quality. Results of monthly findings will be reported to ECD and the relevant parties, and corrective actions will be developed as required based on the conclusion of the findings. The project's management will be responsible for issuance of report for biannual environmental and social monitoring and progress. The firm will also update the ESMP with the close assistance from the environmental consultants and the updated ESMP will be submitted to ECD for review and comments.

#### 9.5 Undertaking by the Project Proponent

The project is committed to meet requirements set by Myanmar ECD. The project will implement every step mentioned in the ESMP and fulfill the project's environmental and social commitments for betterment of the communities and localities it operates. The project will file annual reports to ECD for its ESMP developments and monitoring.

By signing underneath and submitting this report, the project undertakes responsibilities to comply and meet all these stated operations and procedures. The project makes the assurance that everyone working under the supervision of the project will adhere to stated commitments described in the ESMP. The project will religiously follow the monitoring schedule set in the ESMP and document the results to report to ECD and relevant authorities. The project will strive to achieve prevention of environmental and social impacts together with the cooperation and guidance from the ECD. In addition, the project provides assurance that necessary modification and updates will be carried out when new unexpected issues emerge. All these issues will be dealt with adequately and documented properly.

Signature of the director Name: -----Designation: -----Date: -----

#### 9.6 Undertaking by the Consultant

By signing this report, the consultant acknowledges that the assessment, the report, and ESMP are developed in truthful manner to the best of the consultant's knowledge in compliance to all requirements adopted by ECD. The consultants have exhausted their best possible capacity to form complete environmental and social guidelines for the operation of this particular project.

Signature of the key consultant
Name:
Designation:
Date:

### 10. CONCLUSION AND RECOMMENDATION

This ESIA report has been prepared for De Heus Myanmar Limited to manufacture animal nutritional feed products at Myotha Industrial Zone, Nga Zun Township, Mandalay Region, near Mandalay, upper Myanmar. The report has been developed based on the technical information provided by the project proponent, existing studies and reports relevant to the project, field surveys, baseline environmental monitoring and the stakeholder engagement. For this report, the assessment of potential environmental impacts and the preparation of Environmental and Social Management Plan (ESMP) have been conducted in compliance with Environmental Impact Assessment Procedures (2015), NEQEG Standards, and other International Standards and Guidelines and applicable best management practices are compiled for implementation plan.

The results of the baseline air quality monitoring indicate that the existing air quality conditions with contribution from burning fields, strong winds, and dusts are at a considerable level. The project proponent's implementation of mitigation measures adopted in the EMP will bring improvements.

Measurement of baseline noise levels for day and night time shows that the levels were lower than the standards of WHO and NEQEG Guidelines. However, the project should make efforts to maintain suppressing the noise level to the acceptable degree in the production operation.

The impact assessment covers the potential environmental and social impacts attributable to the project's activities in all phases of its life cycle. The assessment of each impact is based on consideration of the magnitude, duration, extent, and probability of activities to be carried out during operation and decommissioning phases. Qualitative and quantitative assessments of impacts have been presented, significance of each potential impact has been identified, and mitigation measures to minimize and reduce the impacts have been indicated. All these impacts during operation and decommissioning phases can be achieved by strict adherence to the proper implementation of mitigation measures from the ESMP.

In terms of social aspect, the results from stakeholder engagement (public consultation meeting) generally indicate that the project has received favorable support from local people and other stakeholders. It is expected that the proposed animal feed factory will generate local employment opportunities and enhance capabilities and skills for employees who are mainly from the communities nearby. These skills and capacities will remain in the communities and later on, they can utilize their skills and capacities for local developments. Therefore, De Heus should multiply its efforts to recruit its task force from the communities and to build capacity of the local populace. In addition to providing reliable potential employment for youths in the region, the project will also contribute several other social benefits such as: social-economic improvement as well as economic growth improvement in the region, improving local infrastructures, and increasing safety measures for the people living in the region.

Finally, it is suggested that the effective implementation of environmental, health and safety, and social responsibilities throughout the whole life span of the proposed project, is of utmost

importance. Therefore, it is strongly recommended that the project proponent should strictly adhere to guidelines provided by the ECD. Once the ESMP is approved by the concerned authorities, it is essential to prove De Heus commitments with actual implementation and work. Appointing well experienced and knowledgeable HSE personnel(s) is one of the main important tasks to be undertaken by the management of De Heus, and the final word of recommendation is to abide the environmental policies, laws, rules, and procedures issued by the Republic of the Union of Myanmar.

## 11. **REFERENCES**

A Checklist of the Trees, Shrubs, Herbs, and Climbers of Myanmar. Contributions from the United States National Herbarium. Volume 45: 1-590

Forest Department and IUCN, October 2015. National Strategy for Biodiversity Action Plan.

Franz Steiner Verlag, Stuttgart 2017: SOCIO-ECONOMIC ATLAS OF MYANMAR

http://botany.si.edu/myanmar/#top

http://medplants.blogspot.com/2012/06/ageratum-conyzoides-visamusti-jungli.html

http://www.iucnredlist.org/search

http://www.mdyregion.gov.mm/ေဒသဆိုင္ရာ-အခ်က္အလက္မ်ား/ျမင္းၿခံခရိုင္/ငါန္းဇြန္ၿမိ<sup>®</sup>႕နယ္.html

http://www.naturespot.org.uk/taxonomy/term/19206

http://www.onlineplantguide.com/Index.aspx

http://www.wunderground.com

https://consult-myanmar.com/2017/10/17/land-dispute-in-myotha-industrial-park-nears-end/2017/land-dispute-in-myotha-industrial-park-nears-end/2017/land-dispute-in-myotha-industrial-park-nears-end/2017/land-dispute-in-myotha-industrial-park-nears-end/2017/land-dispute-in-myotha-industrial-park-nears-end/2017/land-dispute-in-myotha-industrial-park-nears-end/2017/land-dispute-in-myotha-industrial-park-nears-end/2017/land-dispute-in-myotha-industrial-park-nears-end/2017/land-dispute-in-myotha-industrial-park-nears-end/2017/land-dispute-in-myotha-industrial-park-naars-end/2017/land-dispute-in-myotha-in

https://en.wikipedia.org/wiki

Istituto Oikos and BANCA (2011). Myanmar Protected Areas: Context, Current Status and Challenges. Milano, Italy: Ancora Libri.

Kamuzora, C.L. (2002). "Poverty and Family Size Patterns: Comparison Across African Countries", Research No. 01.3 Mkuki na Nyota Publishers, Dar es Salaam.

- Siegel Jacob, S and Swanson David. A. (2004). "*The Methods and Materials of Demography*". Elservier Academic Press, San Diego, California, USA.
- United Republic of Tanzania (URT), (1999). National higher education policy, 1999. Dar es Salaam: Ministry of Science, Technology, and Higher Education
- United Republic of Tanzania (URT), (2003a). "Integration of Population Variables in Development Planning", Part Two, Planning Commission, Dar es Salaam.
- Lwin, Z. Mar.2007. Assessment on Plant Species Diversity of Home Garden in Pyinmana Area. Master thesis pg 57-64.

မြန်မာစိုက်ပျိုးရေးလုပ်ငန်း၊ ၂၀၀၀။ မြန်မာနိုင်ငံအတွင်းရှိ အရေးကြီးအပင်များ၏ ရုက္ခဗေဒဆိုင်ရာ အမည်များနှင့် မျိုးရင်းအမည်များ။ လယ်ယာစိုက်ပျိုးရေးနှင့် ဆည်မြောင်းဝန်ကြီးဌာန။

Land dispute in Myotha industrial park nears end, Myanmar Times, Oct 17, 2017 https://consult-myanmar.com/2017/10/17/land-dispute-in-myotha-industrial-park-nears-end/

#### 12. ANNEXES

- 12.1 MMID master plan and Master drainage system of De Heus
- 12.2 Photolog for project phases and public consultation meeting
- 12.3 Laboratory analysis results for soil and water
- 12.4 Public Consultation Meeting invitation letter, Meeting minutes and Handout
- 12.5 Public consultation meeting attendant list
- 12.6 MSDS
- **12.7 PPE for De Heus**

# ANNEX 1

MMID master plan and Master drainage system of De Heus



## SLOPE STANDARD:

			SLOPE(%)	
TYPE	DIAMETER FILLING DEGREE		MINIMUM	MAXIMUM
	DN100	0.7	0.5	5
	DN125	0.7	0.5	5
	DN150	0.7	0.5	5
STORMWATER PIPE	DN200	0.7	0.5	5
	DN300	0.7	0.5	5

#### SLOPE STANDARD:

		FILLING DEGREE	SLOPE(%)		
TYPE	DIAMETER		MINIMUM	MAXIMUM	
	DN50	0.7	0.5	5	
	DN80	0.7	0.5	5	
DRAINAGE PIPE	DN100	0.7	0.5	5	
	DN125	0.7	0.5	5	
	DN150	0.7	0.5	5	
	DN200	0.7	0.5	5	

## LINETYPE:

1

LINETYPE	ANNOTATION
	WELL WATER PIPE
	IRRIGATION WATER SUPPLY PIPE
	DOMESTIC WATER SUPPLY PIPE
	DOMESTIC WASTEWATER PIPE
<u> </u>	SOIL PIPE
	VENT PIPE
	STORMWATER PIPE

2

ABBREVIATION:				
ABBREVIATION	ANNOTATION			
WEP	WELL WATER PIPE			
IR	IRRIGATION WATER SUPPLY PIPE			
CW	DOMESTIC WATER SUPPLY PIPE			
WP	DOMESTIC WASTEWATER PIPE			
SP	SOIL PIPE			
VP	VENT PIPE			
RWP	STORMWATER PIPE			
PPR	PPR PIPE			
uPVC	uPVC PIPE			
HDPE	HDPE PIPE			
DI	DUCTILE-IRON PIPE			
DN	NORMINAL DIAMETER			
PN	NORMINAL PRESSURE			
FD	FLOOR DRAIN			
RD	ROOF DRAIN			
LG	LEAFGUARD			
VC	VENT CAP			
МН	MANHOLE			
U/G	UNDERGROUND			
A/C	AT CEILING			
A/F	ABOVE FLOOR			
C/F	CONCEAL FLOOR			
T/A	TO ABOVE			
T/B	TO BELOW			
F/A	FROM ABOVE			
F/B	FROM BELOW			

## WATER SUPPLY SYSTEM SANITARY WARE SPECIFICATION LIST:

TYPE OF SANITARY WARE	WATER SUPPLY FLOW (I/s)	LOADING UNITS	DIAMETER (mm)	
LAVATORY	0.15	1½ TO 3	FROM 10 TO 15	
URINAL	0.004	NORMALLY DISREGARDE	FROM 10 TO 15	
WATER CLOSET	0.1	2	FROM 10 TO 15	
SINK	0.2	3	15	
REFERENCE TO TABLE 4, 20 BS 6700 :1987				

## DRAINAGE SYSTEM SANITARY WARE SPECIFICATION LIST:

DISCHARGE UNITS	DIAMETER (mm)
0.3	FROM 40 TO 50
0.3	50
2	100
0.5	50
	0.3 0.3 2 0.5

REFERENCE TO TABLE 2 BS EN 12056-2 :2000

#### PP-R PIPE SPECIFICATION (DIN 8077):

OUTSIDE DIAMETER (NORMINAL DIAMETER)	INSIDE
20	
25	
32	
40	
50	
63	
75	
90	
110	
160	

## HDPE PIPE SPECIFICATION (ISO 4427): RC PIPE SPECIFICATION (ASTM C76):

OUTSIDE DIAMETER (NORMINAL DIAMETER)	INSIDE DIAMETER	OUTSIDE DIAMETER	NORMINAL DIAMETER	INSIDE DIAMETER
63	53.6	445	300	305
75	63.8	533	375	381
90	76.6	593	450	457
110	93.8	711	525	533
125	106.6	800	600	610
140	119.4	889-890	675	686
160	136.4	978-1085	750	762
180	153.4	1156-1188	900	914
200	170.6	1334-1442	1050	1067
225	191.8	1473-1511	1200	1219

## NOTES, LEGEND AND ABBREVIATION

UPVC PIPE SPECIFICATION (ASTM 2241): INSIDE DIAMETER (NORMINAL DIAMETER) OUTSIDE DIAMETER E DIAMETER 16.2 34 25 20.4 42 32 26.2 49 40 32.6 60 50 40.8 76 65 51.4 90 80 61.4 114 100 73.6 140 125 90.0 168 150 130.8 220 200

## NOTES:

INDOOR PLUMBING SYSTEM
MATERIAL OF PIPE
GALVANIZED IRON PIPE USED FOR WATER SUPPLY PIPE FROM DRILL WELL TO DOMESTIC WATER TANK.
PN10-PPR PIPE USED FOR COLD WATER SUPPLY IN PROJECT ACEPTABLE OTHER PIPE IS INDICATED ON DRAWING.
INDOOR DRAINAGE SYSTEM
MATERIAL OF PIPE
DRAINAGE PIPE, VENT PIPE SIZE FROM 150 TO BELOW USE uPVC-PN9, PN10.
DRAINAGE PIPE, VENT PIPE SIZE FROM 200 TO ABOVE USED HDPE PN16 PIPE.
STORM-WATER DRAINAGE SYSTEM
VẬT LIỆU ÔNG MATERIAL OF PIPE
STORM WATER PIPE SIZE FROM 200 TO BELOW USED uPVC-PN9, PN10 PIPE.
STORM WATER PIPE SIZE FROM 300 TO ABOVE USED CENTRIFUGAL REINFORCED CONCRETE PIPE.
THE OTHERS
1. DIAMETER, LENGTH, LEVEL OF PIPE ON LAYOUT AND SECTION MEASURING BY MM.
2. DOMESTIC WATER SUPPLY PIPE LEVEL BY CENTER OF PIPE LEVEL
3. DRAINAGE PIPE LEVEL BY BOTTOM OF PIPE AND SLOPE OF PIPE.
4. PLUMBING SYSTEM DESIGNED BY BRITISH STANDARD OR CURRENT WATER SUPPLY STANDARDS.
5. DRAINAGE SYSTEM DESIGNED BY BRITISH STANDARD OR CURRENT DRAINAGE STANDARDS.
3. WATER SUPPLY PIPE REPRESENT ON THE DRAWING IS NORMINAL DIAMETER
7. DRAINAGE PIPE REPRESENT ON THE DRAWING IS NORMINAL DIAMETER
8. THE CONTRACTOR SUPPLY AND INSTALL THE NECESSARY EXPANSION PIPE THOUGH THIS PIPE HAS OR HASN'T REPRESENT ON THE DRAWING, TO AVOID TEMPERTURE EXPANSION ON THE PIPE AND OTHER JOINTING.
10. ON BUILDING OPERATIONS, THE OPEN-ENDED PIPE MUST SUITABLE SEALING TO ANTI THE PENETRATION BY OUTSIDE CONTAMINANT.
11. ALL THE FITTINGS ACCOMPANYING THE PIPE.
12. PIPE AND FITTINGS SUPPLY BY SAME MANUFACTURER.
13. THE CONTRACTOR MUST FINISHED WITH HEAT INSULATION PAINT FOR PIPE ABOVE ROOF.

6

#### SYMBOL:

SYMBOL	ANNOTATION
$\bowtie$	GATE VALVE
$\overrightarrow{\square}$	CHECK VALVE
$\sim \rightarrow$	FLOAT VALVE
$\mathbf{\Phi}$	BOOSTER PUMP
$\downarrow$	Y-STRAINER
$\sim$	FLEXIBLE JOINTS
<b>P</b> X	PRESSURE GAUGE
$\rightarrow$	FLOW DIRECT
	MANHOLE

5

4

3

0	
CD00 07.07.17 CONSTRUCTION DOCL	IMENTATION
ISSUED	
FOR CONSTR	
COPYRIGHT: ABBO Jsc reserves all rights	to these drawings,
may be reproduced, modified, transmitted of any means for any purpose without the prior	r used in any form by written consent of
ABBO Jsc other than for the sole purpose for drawings, design and/or other data are provided and the sole purpose for drawings.	r which such ded.
DIMENSIONS: Contractors shall work from f	igured dimensions on site. Discrenancies
must be reported immediately to ABBO Jsc proceeding on relevant work.	for clarification before
	<i>a</i> 12
de heu	S
DE HEUS MYAN	MAR Ltd.
PLOT NO (S), 306-307 AND 308, MYAUNG HMAWBI TOWNSHIP, YANGON, MYANMAR	DAKAR INDUSTRIAL ZONE
MANAGING DIRECTOR	
MR. JOHAN CHRISTIAAN VAN DEN BAN	
DESIGN CONSULTANT	
ABBO	2
ABBO INVESTMENT CONSULTAN	CY & ENGINEERING JSC
1st FL, 140 NGUYEN VAN THU ST., DAKAO W TEL: +84.28.39106445 - FAX: +84.28.39106445	ARD, DIST. 1, HCMC, VIET NAM
GENERAL DIRECTOR	u u u
PRESIDED BY	
	ung
DESIGNED BY NGUYÊN THANH TIÌNG	lung
CHECKED BY	
DOAN QUOC THUAN	
PROJECT NAME	
DE HEUS FEE	
IN MANDA	
MYOTHA INDUSTRIAL PARK (MMID), MYO MANDALAY REGION, MYANMAR	
GENE	RAL
SHEET TITLE	
	SYSTEM
	ABBREVIATION
, • <b>_</b> • • • • • • • • • •	
SHEET NO	

т
1.

7

7





3

<sup>8</sup> A1 (841x594 MM) / A3 (420x297 MM)





# ANNEX 2

. Photolog for project phases and public consultation meeting



Photo 1: Front view of Myotha Industrial Park

Photo 2: Plans of Myotha Industrial Park

Photo 3: Public Notice Board for Factory Layout Plan

Photo 4: De Heus Animal Feed Manufacturing Project Layout Plan and Site Safety Signs



Photo 5: Pre-Construction Period soil excavation and fencing

Photo 6: Construction Phase foundation work and worker with proper PPE

Photo 7: Construction Phase foundation development

Photo 8: Construction phase safety management and registration gate for crews



Photo 9: Construction phase notifications at project entrance

Photo 10: Land Levelling and Soil Stock Piles in the project site

Photo 11: Construction Phase Tower house installing

Photo 12: Construction Phase workers transportation vehicle stand



Photo 13: Construction crews

Photo 14: Project Site Safety Notices for crews

Photo 15: Soil sample collection

Photo 16: Water sample collection and onsite analysis



Photo 17: Survey for Biodiversity baseline data gathering

Photo 18: Flora Sample collection for onsite and offsite identification

Photo 19: Identification of ground cover and type of vegetation

Photo 20. Observed natural vegetation in De Heus project's surrounding area



Photo 21: Onsite identification on flora species of project surrounding area

Photo 22: Key Informant interview at Nawarat village

Photo 23: Key informant interview at Pauk Sein village Photo 24: Public Consultation Meeting at Nawarat Village's Monastery



Photo 25: Consultation of Proponent in Public Consultation Meeting at Natwarat Village

Photo 26: Discussion of Third Party SEAM in Public Meeting at Nawarat Village

Photo 271: Public Consultation Meeting in Pauk Sein Village Monastery

Photo 28: Explanation by Third party SEAM in Public Meeting at Pauk Sein Village



Photo 29: Participants in Public Consultation Meeting at Pauk Sein Village Photo 30: Consultation of Project proponent in Public Meeting at Pauk Sein Village Photo 31: Air Quality Monitoring Team

Photo 32: Observed Soil Type

**Recorded Photos of Public Consultation Meetings in Nawarat Village and Pauk Sein Village** 



# ANNEX 3

Laboratory analysis results for soil and water

1<sup>st</sup> Season Soil Laboratory Analysis Result



Method/ Equipment used; Arthur I Vogel, F.A.A.S

Tested by: Daw Khin Thida Myo

Daw Htike Htike Oo

Our Reference: 1402

Date: 1, 11.17

Checked by: Dr. Khin Aye Tue

Technical Director: U Win Khaing Moe

#### 1<sup>st</sup> Season Soil Laboratory Analysis Result



Remark: Results valid for the received sample only.

Method/ Equipment used: Arthur I Vogel, F.A.A.S

Tested by: Daw Khin Thida Myo

Daw Htike Htike Oo

Our Reference: 1402 Date: 1.11.17

Checked by: Dr. Khin Aye Tue Technical Director: U Win Khaing Moe

#### 1<sup>st</sup> Season Soil Laboratory Analysis Result



Not a Certificate of Conformance စံချိန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: Results valid for the received sample only.

Method/ Equipment used: Arthur I Vogel, F.A.A.S

Tested by: Daw Khin Thida Myo

Daw Htike Htike Oo

Our Reference: 1402 Date: 1,11.17

Checked by: Dr. Khin Aye Tue Technical Director: U Win Khaing Moe

2<sup>nd</sup> Season Soil Laboratory Analysis Result



Technical Director: U Win Khaing Moe

Daw Htike Htike Oo

 Our Reference:
 1555

 Date:
 26
 12
 2017

2<sup>nd</sup> Season Soil Laboratory Analysis Result



Not a Certificate of Conformance စံခိုန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: Results valid for the received sample only.

Method/ Equipment used: Arthur I Vogel, F.A.A.S

Tested by: Daw Khin Thida Myo

Daw Htike Htike Oo

Our Reference: 1555 Date: 26.12.2017

Checked by: Dr. Khin Aye Tue

5:9

Technical Director: U Win Khaing Moe

2<sup>nd</sup> Season Soil Laboratory Analysis Result

	RNMENT OF THE REPUBLIC OF THE MINISTRY OF EDUCATION EPARTMENT OF RESEARCH AND I ANALYSIS DEPARTMENT No.(6) KABA AYE PAGODA ROAD,	UNION OF MYANMAR N NNOVATION YANGON
Reference: Social & Environmento	l Associates- Myanmar	
Sample: Soil		
3	RESULT	
Sample No.		1526/17-18
Job No.		J-1571
Sample Marked.		BH-3
Manganese as Mn	(%)	0.07
Calcium as Ca	(%)	1.27
Magnesium as Mg	(%)	0.47
Iron as Fe	(%)	2.95
Sulphur as S	(%)	0.11
Chloride as Cl	(%)	0.05
Moisture	(%)	14.62
H Value (10% Solution)		9.09

Not a Certificate of Conformance စံခိုန်စံညွှန်းကိုက်ညီကြောင်းထောက်ခံချက်မဟုတ်ပါ

Remark: Results valid for the received sample only.

Method/ Equipment used: Arthur I Vogel, F.A.A.S

Tested by: Daw Khin Thida Myo

Daw Htike Htike Oo

Our Reference: 1555 Date: 26,12,2013

1 Checked by: Dr. Khin Aye Tue

Technical Director: U Win Khaing Moe

SITE NAME	:	DE HEUS Myotha
WORKS	:	Land Filling
TEST NO.	:	Test Point 1
DATE		5/3/2017

CBR TEST DATA					
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	5.2	205	3.0	68.48	1
1.0	12.8	440	3.0	146.56	1000
1.5	19.6	649	3.0	216.43	
2.0	25.7	837	3.0	279.10	
2.5	31.2	1007	3.0	335.61	34
3.0	35.3	1133	3.0	377.73	
4.0	41.5	1324	3.0	441.43	1000
5.0	47.2	1500	3.0	499.99	33
7.5	57.8	1827	3.0	608.90	32
10.0	67.0	2110	3.0	703.42	31
12.5	73.0	2295	3.0	765.06	29



ODR OI

Checked by.

hida) Staff Officer (Civil) Irrigation Department

Tested by.

t Shwe) (Mvi Soil & Concrete Laboratory Irrigation Department

SITE NAME	:	DE HEUS Myotha
WORKS	:	Land Filling
TEST NO.	:	Test Point 2
DATE	•	5/3/2017

	CBR TEST DATA				
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	6.5	246	3.0	81.83	10 A. 10
1.0	12.0	415	3.0	138.34	
1.5	18.5	615	3.0	205.12	
2.0	22.6	742	3.0	247.25	
2.5	25.7	837	3.0	279.10	28
3.0	28.7	930	3.0	309.92	
4.0	33.4	1075	3.0	358.21	Provide States
5.0	37.5	1201	3.0	400.33	27
7.5	45.7	1454	3.0	484.58	26
10.0	51.9	1645	3.0	548.28	24
12.5	57.0	1802	3.0	600.68	23



Checked by.

Thida) (Khi n Staff Officer (Civil) Irrigation Department

Tested by.

(Myint Shwe) S.A.E (Lab:) Soil & Concrete Laboratory Irrigation Department

SITE NAME	:	DE HEUS Myotha
WORKS	:	Land Filling
TEST NO.	:	Test Point 3
DATE		5/3/2017

CBR TEST DATA					
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	15.0	507	3.0	169.16	12
1.0	24.7	806	3.0	268.82	
1.5	29.5	954	3.0	318.14	
2.0	32.4	1044	3.0	347.93	
2.5	35.0	1124	3.0	374.65	37
3.0	36.8	1179	3.0	393.14	
4.0	38.6	1235	3.0	411.63	
5.0	40.1	1281	3.0	427.05	28
7.5	42.4	1352	3.0	450.68	24
10.0	44.6	1420	3.0	473.28	21
12.5	47.0	1494	3.0	497.94	19



Checked by.

(Khin Thida) Staff Officer (Civil) Irrigation Department

Tested by.

(Mynet Shwe) S.A.E (Lab:) Soil & Concrete Laboratory Irrigation Department

SITE NAME	:	DE HEUS Myotha
WORKS	:	Land Filling
TEST NO.	:	Test Point 4
DATE		5/3/2017

CBR TEST DATA					
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	4.3	178	3.0	59.23	
1.0	8.2	298	3.0	99.30	
1.5	13.0	446	3.0	148.62	
2.0	17.0	569	3.0	189.71	
2.5	21.0	692	3.0	230.81	23
3.0	23.8	779	3.0	259.58	
4.0	27.5	893	3.0	297.59	
5.0	30.0	970	3.0	323.28	22
7.5	35.0	1124	3.0	374.65	20
10.0	39.3	1256	3.0	418.83	18
12.5	43.2	1377	3.0	458.90	18



Checked by.

(Khin Thida) Staff Officer (Civil) Irrigation Department Tested by.

(*Inymi Shwe*) S.A.E (Lab:) Soil & Concrete Laboratory Irrigation Department

SITE NAME	:	DE HEUS Myotha
WORKS	:	Land Filling
TEST NO.	:	Test Point 5
DATE	:	5/3/2017

CBR TEST DATA					
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	5.5	215	3.0	71.56	
1.0	12.0	415	3.0	138.34	1. 1.
1.5	19.2	637	3.0	212.32	
2.0	24.3	794	3.0	264.71	12-11
2.5	28.0	908	3.0	302.73	30
3.0	31.0	1001	3.0	333.55	
4.0	34.5	1109	3.0	369.51	
5.0	37.5	1201	3.0	400.33	27
7.5	42.2	1346	3.0	448.62	24
10.0	45.8	1457	3.0	485.61	21
12.5	48.5	1540	3.0	513.35	20



Checked by.

(Khin Thida) Staff Officer (Civil) Irrigation Department Tested by.

(Mytet Shwe) S.A.E (Lab:) Soil & Concrete Laboratory Irrigation Department

SITE NAME	:	DE HEUS Myotha		
WORKS	:	Land Filling Test Point 6		
TEST NO.	:			
DATE	:	5/3/2017		

CBR TEST DATA					
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	18.0	600	3.0	199.99	
1.0	28.2	914	3.0	304.78	1000
1.5	36.2	1161	3.0	386.98	
2.0	42.0	1340	3.0	446.57	
2.5	46.7	1485	3.0	494.85	49
3.0	50.5	1602	3.0	533.90	
4.0	57.0	1802	3.0	600.68	
5.0	63.3	1996	3.0	665.41	44
7.5	72.2	2271	3.0	756.85	40
10.0	76.9	2415	3.0	805.13	35
12.5	81.3	2551	3.0	850.34	33



Checked by.

(Khin Thida) Staff Officer (Civil) Irrigation Department

Tested by.

(Myint Shwe) S.A.E (Lab:) Soil & Concrete Laboratory Irrigation Department

SITE NAME	:	DE HEUS Myotha		
WORKS	:	Land Filling		
TEST NO.	:	Test Point 6		
DATE	:	5/3/2017		

CBR TEST DATA					
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	18.0	600	3.0	199.99	
1.0	28.2	914	3.0	304.78	
1.5	36.2	1161	3.0	386.98	
2.0	42.0	1340	3.0	446.57	
2.5	46.7	1485	3.0	494.85	49
3.0	50.5	1602	3.0	533.90	
4.0	57.0	1802	3.0	600.68	
5.0	63.3	1996	3.0	665.41	44
7.5	72.2	2271	3.0	756.85	40
10.0	76.9	2415	3.0	805.13	35
12.5	81.3	2551	3.0	850.34	33



Checked by.

(Khin Thida) Staff Officer (Civil) Irrigation Department

Tested by.

(Myint Shwe) S.A.E (Lab:) Soil & Concrete Laboratory Irrigation Department
SITE NAME	:	DE HEUS Myotha
WORKS	:	Land Filling
TEST NO.	:	Test Point 7
DATE	:	5/3/2017

CBR TEST DATA					
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	3.2	144	3.0	47.93	Dr. Tan N
1.0	7.3	270	3.0	90.05	
1.5	11.5	400	3.0	133.21	
2.0	15.0	507	3.0	169.16	1
2.5	17.7	591	3.0	196.90	20
3.0	19.8	655	3.0	218.48	
4.0	23.6	773	3.0	257.52	
5.0	26.0	847	3.0	282.18	19
7.5	29.8	964	3.0	321.22	17
10.0	32.4	1044	3.0	347.93	15
12.5	33.8	1087	3.0	362.32	14



Checked by.

(Khin Thida) Staff Officer (Civil) Irrigation Department Tested by. (*htytut Shwe*) S.A.E (Lab:) Soil & Concrete Laboratory Irrigation Department

SITE NAME	:	DE HEUS Myotha
WORKS	:	Land Filling
TEST NO.	:	Test Point 8
DATE		5/3/2017

CBR TEST DATA					
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	5.5	215	3.0	71.56	1
1.0	13.6	464	3.0	154.78	
1.5	21.0	692	3.0	230.81	
2.0	26.7	868	3.0	289.37	
2.5	30.8	994	3.0	331.50	33
3.0	32.8	1056	3.0	352.04	
4.0	36.0	1155	3.0	384.92	
5.0	37.8	1210	3.0	403.42	27
7.5	40.6	1297	3.0	432.18	23
10.0	41.6	1327	3.0	442.46	19
12.5	42.0	1340	3.0	446.57	17



CBR 33 %

Checked by.

Thida) (Khin Staff Officer (Civil) Irrigation Department Tested by. ve) Lab:) Soil & Concrete Laboratory Irrigation Department

SITE NAME	:	DE HEUS Myotha
WORKS	:	Land Filling
TEST NO.	:	Test Point 9
DATE		5/3/2017

CBR TEST DATA					
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	10.2	360	3.0	119.85	
1.0	16.6	557	3.0	185.60	
1.5	21.5	708	3.0	235.95	
2.0	25.3	825	3.0	274.99	1.00
2.5	28.5	924	3.0	307.87	31
3.0	30.8	994	3.0	331.50	Contraction of
4.0	35.0	1124	3.0	374.65	
5.0	37.8	1210	3.0	403.42	27
7.5	42.5	1355	3.0	451.70	24
10.0	45.2	1438	3.0	479.44	21
12.5	47.5	1509	3.0	503.07	19



Checked by.

(Khin Thida) Staff Officer (Civil) Irrigation Department

Tested by. (*Dynit Shwe*) SA.E (Lab:) Soil & Concrete Laboratory

Irrigation Department

SITE NAME	:	DE HEUS Myotha
WORKS	:	Land Filling
TEST NO.	:	Test Point 10
DATE		5/3/2017

CBR TEST DATA					
Penetration (mm)	Load Dial Reading	Load (lb)	Area of Piston (in <sup>2</sup> )	Stress (psi)	CBR (%)
0.0	0.0	0	3.0	0.00	
0.5	2.0	107	3.0	35.60	
1.0	5.3	209	3.0	69.51	Sec. 2
1.5	8.2	298	3.0	99.30	
2.0	10.5	369	3.0	122.93	1-
2.5	12.7	437	3.0	145.53	15
3.0	14.4	489	3.0	163.00	
4.0	17.4	581	3.0	193.82	
5.0	19.6	649	3.0	216.43	14
7.5	24.2	791	3.0	263.69	14
10.0	28.2	914	3.0	304.78	13
12.5	31.5	1016	3.0	338.69	13



CBR 15 %

Checked by.

(Khin Thida) Staff Officer (Civil) Irrigation Department

Tested by.

(Aryther Shwe) S.A.E (Lab:) Soil & Concrete Laboratory Irrigation Department

# CBR TEST MAP SC: 1/1000

1.00

N2402000M

A average ichies

Netuj 200M

N24018SON

Stol SOON

401750A

2

DSON



LEGEND Wall Ince Read Electric Post i): anage Bore Hole Contour Major Prainage Bed Level 300 Contour Minor ter as Ground Elevation Project Boundary A Gind name D: Cut - Filled height (m) B: (md area (m2) D Cut (ABA C Cut - Filled volume (m3) DE D = 0; Filled 1911 C + 0: Cat E Existing level (m) C 0: Filled F. Design level (m) •T Location of CHR test TORO OS C2 17 TENDER DOOLMENT AT ON MARN DATE DE NORAPTION. ISSUE PORPOSE TENDER DOCUMENTATION COPYRIGHT ABBO accreances all rights to these ocaways design and/or any other data contained netwin. No part of those may be reproduced, modifier, transmitten or used in any exercicy any means the any publics without the only withen tombers of ABBO use other than the sole publics to which such drawings, orsign and/or other data are provided. DATENSION'S Contractors shall work from figured dimensions only Contractors must chinol all dimensions line size. Discretionalises must be reported immediately to ABBO the fex clambodium petitien proceeding on serviced wore in mani-THE EMPLOYER de heus DE HEUS MYANMAR LTD. Plot No.12, 305-307 and 305. Manuag Descriptional Lare Month Concerns Asperman Per tote 1507 1 PROJECT MANAGER STEFAN VAN DEN BOGA ARD DESIGN CONSULTANT ABBO AB60 Investment Consultancy & Engineering JSC. 140 Nguyen Van Thu St. Dakas Ward, Des 1, Ho Ct. Minn Cty, Vietnam 141 + 848 8 9106445 - Fax - 84,8 9106447 - Email intro@ietho.com vir GENERAL DIRECTOR NGUYEN SUONG KIFM PHONG PRESIDED 8" DOAN QUOC THUAN DE SIGNED BY TRAN CAO HONG NGOC CHECKED BY DOAN QUOC THUAN PROJECT DE HEUS FEED MILL IN MANDALAY Metho Industral Pari, Visiona Townsher, Mandaka Regions GRADING SHEET NAME CBR TEST MAP SHEET NO DH9-CI-01-11.03-TD00 8 AT \$841+564 \$4545 ( 43+220+297 \$444)







## ANDALAY CITY DEVELOPMENT COMMITTEE WATERA AND SANITATION DEPARTMENT WATER LABORATORY WATER BACTERIOLOGICAL EXAMINATION

Source of Water

Report On

Brought by

Tested on

#### **RESULT OF ANALYSIS**

. . . . . . .

Standard Plate Count

Portable Coliform Count

515		

Escherichia coli Count

.....Isolated.....

Remark Tested By <u>במספר ביר</u> גרפאלאויי גרפאלאויי גרפאלאויי גרפאלאויי גרפאלאויי גרפאלאויי גרפאלאויי גרפאלאויי גרפאלאויי גרפאלאויי

## MANDALAY CITY DEVELOPMENT COMMITTEE WATER AND SANITATION DEPARTMENT WATER LABORATORY

Day

0000

\* 60

စာအမှတ်\_

ရက်စွဲ

Your reference	Social & ]	Environmental assoc	iales Myanma	r Co;Ltd (NWY)
Our reference				
Report on		ONE		Sample of Water
		(Number)		
Brought by	ဒေါ်စုစုမွန်	at	on	1.10.2017
			(Time)	(Date)
Tested on	1.10.2017	at		
	(Date)	(Time)		

Sampling Points Sampling Time and Date		Tube Well	W.H.O Standard	
			Desirable	Imperative
<b>Physical Examination</b>	Unit			
-P <sup>H</sup>	Scale	7.6	7-8.5	6.5-9.2
-Color	Units	5	>5	50
-Turbidity	N.T.U	0.49	5	25
-Conductivity	microS/cm	1843		
-Total Dissolved Solids	(mg/l)	1029		
-Total Suspended Solids	(mg/l)	-		
Chemical Analysis				
-Calcium as Ca	(mg/l)	88	75	200
-Hardness, Total(CaCO3)	(mg/l)	580	100	500
-Magnesium as Mg	(mg/l)	88	30	150
-Chloride as Cl	(mg/l)	150	200	600
-Total Alkalinity	(mg/l)	360	200	500
-Iron, Total (Fe)	(mg/l)	0.01	0.1	1.0
-Manganese (Mn)	(mg/l)	0.01	0.05	0.5
-Sulphate(SO <sub>4</sub> )	(mg/l)	<300	200	400
-Nitrogen Nitrate (N-NO3)	(mg/l)			10

Remark	Unsat	Unsatisfactory				
	Cmemeral		26m			
Tested by	0105 2 0 5 1 m	Approved by	ဌာနခွဲမှူး			
105000 25	ခက္ရန် စရတ္ နီ <b>၊ စ အီ ရ</b>		ေရဖြန့် ဖြူးရေးဌာန ခွဲ			

## MANDALAY CITY DEVELOPMENT COMMITTEE × WATER LABORATORY WATER BACTERIOLOGICAL EXAMINATION

0 ×

e0300

<sup>ဌာန၊မ</sup>လွန်ရေ

Source of Water	Social & Environmental associales Myanmar Co;Ltd			
	(De Heus)			
Report On			Sample of Water	
	(Numbe	er)		
Brought by	ເອງີອຸອຸຊູຣ໌at on1.10.2017.			
	(Date)	(Time)	(Date)	
Tested on	1.10.2017	at		
	(Date)	(Time)		

## **RESULT OF ANALYSIS**

Standard Plate Count	
Portable Coliform Count	
Escherichia coli Count	Isolated

Remark	Unsatisfactory		
Tested By	A Conemenso initia a a a a a a a a a a a a a a a a a a a	Approved By	<b>ဌာနစွဲမှူး</b> ရေဖြန့်ဖြူးရေးဌာနစွဲ

## MANDALAY CITY DEVELOPMENT COMMITTEE WATER AND SANITATION DEPARTMENT WATER LABORATORY

ရက်စွဲ		Lit Litboltin		
Your reference	Social & Environmen	tal associales Myar	nmar Co;Ltd	(De Heus)
Our reference		••••••	••••••	••••••
Report on		ONE		Sample of Water
		(Number)		
Brought by	ဒေါ်စုစုမွန်	at	on	1.10.2017
			(Time)	(Date)
Tested on	1.10.2017	at		
	(Date)	(Time)		

Sampling Points		Tube	W.H.O	Standard
		Well		
Sampling Time and D	ate		Desirable	Imperative
<b>Physical Examination</b>	Unit			
-Р <sup>н</sup>	Scale	8.1	7-8.5	6.5-9.2
-Color	Units	>50	>5	50
-Turbidity	N.T.U	0.39	5	25
-Conductivity	microS/cm	7000		
-Total Dissolved Solids	(mg/l)	4160		
-Total Suspended Solids	(mg/l)	-		
Chemical Analysis				
-Calcium as Ca	(mg/l)	480	75	200
-Hardness, Total(CaCO3)	(mg/l)	2300	100	500
-Magnesium as Mg	(mg/l)	268	30	150
-Chloride as Cl	(mg/l)	300	200	600
-Total Alkalinity	(mg/l)	540	200	500
-Iron, Total (Fe)	(mg/l)	>1.0	0.1	1.0
-Manganese (Mn)	(mg/l)	0.03	0.05	0.5
-Sulphate(SO4)	(mg/l)	>400	200	400
-Nitrogen Nitrate (N-NO3)	(mg/l)	-		10

#### Unsatisfactory

. . . . . . . . . . . .

Con energi

Tested	by

Remark

Approved by....

ရေဖြန့်ဖြူးရေးဌာနခွဲ





WW1217 071



Laboratory Technical Consultant: U Saw Christopher Maung B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001. Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001 Issue Date - 01-12-2012 Effective Date - 01-12-2012 Issue No - 1.0/Page 1 of 1

#### WATER QUALITY TEST RESULTS FORM

Client	Social & Environmental Associates - Myanmar Co.,Ltd.
Nature of Water	Wastewater
Location	Myotha MMID
Date and Time of collection	6.12.2017 (4:06 PM)
Date and Time of arrival at Laboratory	7.12.2017
Date and Time of commencing examination	8.12.2017
Date and Time of completing	10.12.2017

#### **Results of Water Analysis**

#### WHO Drinking Water Guideline (Geneva - 1993)

рН	8.3		6.5 - 8.5
Colour (True)	40	TCU	15 TCU
Turbidity	82	NTU	5 NTU
Conductivity	4172	micro S/cm	
Total Hardness		mg/l as CaCO <sub>3</sub>	500 mg/l as CaCO <sub>3</sub>
Calcium Hardness	668	mg/I as CaCO <sub>3</sub>	
Magnesium Hardness	332	mg/l as CaCO <sub>3</sub>	
Total Alkalinity	450	mg/I as CaCO <sub>3</sub>	
Phenolphthalein Alkalinity		mg/l as CaCO <sub>3</sub>	
Carbonate (CaCO <sub>3</sub> )	Nil	mg/l as CaCO <sub>3</sub>	_
Bicarbonate (HCO <sub>3</sub> )		mg/I as CaCO <sub>3</sub>	4 <sup>3</sup>
Iron	0.72	mg/l	0.3 mg/l
Chloride (as CL)	120	mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO <sub>4</sub> )	110	mg/l	200 mg/l
Total Solids		mg/l	1500 mg/l
Suspended Solids		mg/l	
Dissolved Solids	2086	mg/l	1000 mg/l
Manganese	0.05	mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	,
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by Signature:

Name:

(m.o) Zaw Hein Oo B.Sc (Chemistry)

Approved by Signature: Name:

Soest + Soe Thit B.E (Civil) 1980,

**Technical Officer** 

**ISO TECH Laboratory** 

(a division of WEG Co.,Ltd.) Sr. Chemist ISO TECH Laboratory No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.

Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com





W1217 215



Laboratory Technical Consultant: U Saw Christopher Maung B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001. Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001 Issue Date - 01-12-2012 Effective Date - 01-12-2012 Issue No - 1.0/Page 1 of 1

#### WATER QUALITY TEST RESULTS FORM

	Social & Environmental Associates - Myanmar Co.,Ltd.		
Nature of Water	Tube Well Water		
Location	De Heus, MMID		
Date and Time of collection	6.12.2017 (3:40 PM)		
Date and Time of arrival at Laboratory	7.12.2017		
Date and Time of commencing examination	8.12.2017		
Date and Time of completing	10.12.2017		

#### **Results of Water Analysis**

~...

#### WHO Drinking Water Guideline (Geneva - 1993)

рН	7.4		6.5 - 8.5
Colour (True)	Nil	TCU	15 TCU
Turbidity	5	NTU	5 NTU
Conductivity	7922	micro S/cm	
Total Hardness		mg/l as CaCO <sub>3</sub>	500 mg/l as CaCO <sub>3</sub>
Calcium Hardness	1548	mg/l as CaCO <sub>3</sub>	
Magnesium Hardness	772	mg/l as CaCO <sub>3</sub>	
Total Alkalinity	580	mg/l as CaCO <sub>3</sub>	
Phenolphthalein Alkalinity		mg/l as CaCO <sub>3</sub>	
Carbonate (CaCO <sub>3</sub> )	Nil	mg/l as CaCO <sub>3</sub>	
Bicarbonate (HCO <sub>3</sub> )		mg/l as CaCO <sub>3</sub>	
Iron	0.40	mg/l	0.3 mg/l
Chloride (as CL)	250	mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO <sub>4</sub> )	196	mg/l	200 mg/l
Total Solids		mg/l	1500 mg/l
Suspended Solids		mg/l	
Dissolved Solids	3960	mg/l	1000 mg/l
Manganese	Nil	mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	<b>y</b>
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

**Tested by** Signature:

(m.0) Zaw Hein Oo Name: B.Sc (Chemistry) Sr. Chemist

Approved by Signature: Name:

Boestil Soe Thit B.E (Civil) 1980,

**Technical Officer ISO TECH Laboratory** 

(a division of WEG Co.,LISO TECH Laboratory No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.

Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com







Laboratory Technical Consultant: U Saw Christopher Maung B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001. Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001 Issue Date - 01-1-2016 Effective Date - 01-1-2016 Issue No - 1.0/Page 1 of 1

M1217 002

#### WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	Social & Environmental Associates - Myanmar Co., Ltd.		
Nature of Water	Tube Well Water		
Location	De Heus, MMID		
Date and Time of collection	6.12.2017 (3:40 PM)		
Date and Time of arrival at Laboratory	7.12.2017		
Date and Time of commencing examination	7.12.2017		
Date and Time of completing	8.12.2017		

#### **Results of Water Analysis**

#### WHO Drinking Water Guideline (Geneva - 1993)

Total Coliform Count	3	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	Not detected (<1)	CFU/100ml	Not detected
рН	7.4		6.5 - 8.5
Turbidity	5	NTU	5 NTU
Colour (True)	Nil	тси	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.

- : This certificate is issued only for the receipt of the test sample.
- : < Less than

**Tested by** 

Signature:

Name:

m.0) Zaw Hein Oo B.Sc (Chemistry)

Sr. Chemist

**ISO TECH Laboratory** 

Approved by

Signature:

soe the

Name:

Soe Thit B.E (Civil) 1980, **Technical Officer ISO TECH Laboratory** 

#### (a division of WEG Co., Ltd.)

No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar. Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com





W1217 216



Laboratory Technical Consultant: U Saw Christopher Maung B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001. Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar) WTL-RE-001 Issue Date - 01-12-2012 Effective Date - 01-12-2012 Issue No - 1.0/Page 1 of 1

#### WATER QUALITY TEST RESULTS FORM

Client	Social & Environmental Associates - Myanmar Co.,Ltd.			
Nature of Water	Tube Well Water			
Location	Natwatyat Village			
Date and Time of collection	6.12.2017 (2:39 PM)			
Date and Time of arrival at Laboratory	7.12.2017			
Date and Time of commencing examination	8.12.2017			
Date and Time of completing	10.12.2017			

#### **Results of Water Analysis**

#### WHO Drinking Water Guideline (Geneva - 1993)

рН	7.5		6.5 - 8.5
Colour (True)	Nil	TCU	15 TCU
Turbidity	2	NTU	5 NTU
Conductivity	1973	micro S/cm	
Total Hardness		mg/l as CaCO <sub>3</sub>	500 mg/l as CaCO <sub>3</sub>
Calcium Hardness	340	mg/l as CaCO <sub>3</sub>	
Magnesium Hardness	168	mg/I as CaCO <sub>3</sub>	
Total Alkalinity	412	mg/I as CaCO <sub>3</sub>	
Phenolphthalein Alkalinity		mg/I as CaCO <sub>3</sub>	
Carbonate (CaCO <sub>3</sub> )	Nil	mg/l as CaCO <sub>3</sub>	
Bicarbonate (HCO <sub>3</sub> )		mg/l as CaCO <sub>3</sub>	
Iron	0.17	mg/l	0.3 mg/l
Chloride (as CL)	30	mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO <sub>4</sub> )	110	mg/l	200 mg/l
Total Solids		mg/l	1500 mg/l
Suspended Solids		mg/l	
Dissolved Solids	987	mg/l	1000 mg/l
Manganese	Nil	mg/l	0.05 mg/l
Phosphate	1. The 4.7	mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by Signature:

Name:

King (m.o) Zaw Hein Oo B.Sc (Chemistry) Sr. Chemist

Approved by Signature: Name:

Soest

Soe Thit B.E (Civil) 1980, Technical Officer ISO TECH Laboratory

(a division of WEG Co., Ltrso TECH Laboratory No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.

Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com



FIED 50 9001.2008 Cert. No.688283

Laboratory Technical Consultant: U Saw Christopher Maung B.Sc Engg: (Civil), Dip S.E (Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001. Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001 Issue Date - 01-1-2016 Effective Date - 01-1-2016 Issue No - 1.0/Page 1 of 1

M1217 003

#### WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	Social & Environmental Associates - Myanmar Co.,Ltd.
Nature of Water	Tube Well Water
Location	Natwatyat Village
Date and Time of collection	6.12.2017 (2:39 PM)
Date and Time of arrival at Laboratory	7.12.2017
Date and Time of commencing examination	7.12.2017
Date and Time of completing	8.12.2017

#### **Results of Water Analysis**

#### WHO Drinking Water Guideline (Geneva - 1993)

			and the second
Total Coliform Count	2	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	Not detected (<1)	CFU/100ml	Not detected
рН	7.5		6.5 - 8.5
Turbidity	2	NTU	5 NTU
Colour (True)	Nil	тси	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.

- : This certificate is issued only for the receipt of the test sample.
- : < Less than

**Tested by** 

Signature:

Name:

2.07 Zaw Hein Oo **B.Sc** (Chemistry) Sr. Chemist

**ISO TECH Laboratory** 

Approved by

Signature:

Name:

Socat Soe Thit B.E (Civil) 1980, Technical Officer **ISO TECH Laboratory** 

#### (a division of WEG Co., Ltd.)

No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar. Ph: 01-640955, 09-73225175, 09-73242162, Fax: 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

## MINISTRY OF HEALTH AND SPORTS PUBLIC HEALTH LABORATORY

35th St. Bet: 64th x 65th St, Mandalay. 2 02-39839

0

Lab Code No	0115717
Date of Report	8.8.17
Area	Cooper Sig

	N	lo Post	Result	Maximum Permissible Level	Unit
	1	. Appearance	clear		
	2	Colour (Platinum, Cobolot Scale	5	50	Units
	3.	Purbidity (Silcoda Scale Unit)		25	NTU
	4.	PH value	6.5	6.5 to 9.2	
I LE	5.	Total Solids	2199	1,500	mg/l
	6.	Total Hardness (as CaCO3)	840	500	mg/l
	7.	Total Alkalinity (as CaCO3)	1040	950	mg/l
8	3.	Calcium as Ca	820	200	mg/l
ç	Э.	Magniesium as Mg	10	150	mg/l
1	0.	Chloride as Cl	480	600	mg/l
1	1.	Sulphate as SO4	294	400	mg/l
2	.	Total Iron as Fe	Nil	1	mģ/l
	The state of the	and the second designed and the second s	and a second and the second side of the second	the design of the second se	

Remarks: chemically Unpotable: M.B.; B.S. M.Med.Sc (Microbil Assistant Director Public Health Laborator Mandalay

## ANNEX 4

## Public Consultation Meeting invitation letter, Meeting minutes and Handout



## အစည်းအပေးဖိတ်ကြားလွာ

မွန္တလေးတိုင်းဒေသကြီး၊ မြို့သာစက်မှုဇုန်အတွင်း De Heus Myanmar Co Ltd မှ မြေကွက်အမှတ် LG-3(2) လမ်းအမှတ် - ၂၆အေတွင် တည်ဆောက်မည့် တိရိစ္ဆာန်အစာ စက်ရုံစီမံကိန်း လည်ပတ်ဆောင်ရွက်နိုင် ရေးအတွက် ပတ်ဝန်းကျင်နှင့် လူမှရေးထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်း (ESIA) ဆိုင်ရာ အချက်အလက်များနှင့် အဆိုပြုစက်ရုံ၏ လုပ်ငန်းလည်ပတ်မှဆိုင်ရာ အချက်အလက်များကို ရှင်းလင်းတင်ပြနိုင်ရန်နှင့် အများပြည်သူတို့၏ အမြင်သဘောထားရယူခြင်း အခ မ်းအနား (Public consultation meeting) သို့ တက်ရောက်ပေးနိုင်ပါရန် လေးစားစွာ ဖိတ်ကြားအပ်ပါသည်။

- နေ့ရက်
- ၂၀၁၇ ခုနစ်၊ ဒီဇင်ဘာလ ( ၆ ) ရက်။ ။ နံနက် ၉ း ပပ နာရီမှ ၁၂ း ပပ နာရီအထိ ။ နဝရတ်ကျေးရွာ အုပ်ချုပ်ရေးမှူးရုံး

အချိန် နေရာ

အစည်းအပေးဖိတ်ကြားလွှာ မွန္တလေးတိုင်းဒေသကြီး၊ မြို့သာစက်မှုဇုန်အတွင်း De Heus Myanmar Co Ltd မှ မြေကွက်အမှတ် LG-3(2) လမ်းအမှတ် - ၂၆အေတွင် တည်ဆောက်မည့် တိရိစ္ဆာန်အစာ စက်ရုံစီမံကိန်း လည်ပတ်ဆောင်ရွက်နိုင် ရေးအတွက် ပတ်ဝန်းကျင်နှင့် လူမှရေးထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်း (ESIA) ဆိုင်ရာ အချက်အလက်များနှင့် အဆိုပြုစက်ရုံ၏ လုပ်ငန်းလည်ပတ်မှဆိုင်ရာ အချက်အလက်များကို ရှင်းလင်းတင်ပြနိုင်ရန်နှင့် အများပြည်သူတို့၏ အမြင်သဘောထားရယူခြင်း အခ မ်းအနား (Public consultation meeting) သို့ တက်ရောက်ပေးနိုင်ပါရန် လေးစားစွာ ဖိတ်ကြားအပ်ပါသည်။ ၂၀၁၇ ခုနှစ်၊ ဒီဇင်ဘာလ ( ၆ ) ရက်။ နေ့ရက် ။ နေလည် ၁ း ပပ နာရီမှ ၃ း ပပ နာရီအထိ ။ ပေါက်စိမ်း ကျေးရွာ အုပ်ချုပ်ရေးမှူးရုံး အချိန် နေရာ



## အစည်းအဝေးဖိတ်ကြားလွှာ

မန္တလေးတိုင်းဒေသကြီး၊ မြို့သာစက်မှုဇုန်အတွင်း De Heus Myanmar Co Ltd မှ မြေကွက်အမှတ် LG-3(2) လမ်းအမှတ် - ၂၆အေတွင် တည်ဆောက်မည့် တိရိစ္ဆာန်အစာ စက်ရုံစီမံကိန်း လည်ပတ်ဆောင်ရွက်နိုင်ရေးအတွက် ပတ်ဝန်းကျင်နှင့် လူမှုရေးထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်း (ESIA) ဆိုင်ရာ အချက်အလက်များနှင့် အဆိုပြုစက်ရုံ၏ လုပ်ငန်းလည်ပတ်မှုဆိုင်ရာ အချက်အလက်များကို ရှင်းလင်းတင်ပြနိုင်ရန်နှင့် အများပြည်သူတို့၏ အမြင်သဘောထား ရယူခြင်းအခမ်းအနား (Public consultation meeting) သို့ တက်ရောက်ပေးနိုင်ပါရန် လေးစားစွာ ဖိတ်ကြား အပ်ပါသည်။

- နေ့ရက် ။ ၂၀၁၉ ခုနှစ်၊ ဇူလှိုင်လ ( ၄ ) ရက်။
- အချိန် ။ နံနက် ၁၀း ၀၀ နာရီမှ ၁၂း ၀၀ နာရီအထိ
- နေရာ ။ **ပေါက်စိမ်း**ကျေးရွာ အုပ်ချုပ်ရေးမှူးရုံး

အစည်းအဝေးဖိတ်ကြားလွှာ မန္တလေးတိုင်းဒေသကြီး၊ မြို့သာစက်မှုဇုန်အတွင်း De Heus Myanmar Co Ltd မှ မြေကွက်အမှတ် LG-3(2) လမ်းအမှတ် - ၂၆အေတွင် တည်ဆောက်မည့် တိရိစ္ဆာန်အစာ စက်ရုံစီမံကိန်း လည်ပတ်ဆောင်ရွက်နိုင် ရေးအတွက် ပတ်ဝန်းကျင်နှင့် လူမှုရေးထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ငန်း(ESIA)ဆိုင်ရာ အချက်အလက်များနှင့် အဆိုပြုစက်ရုံ၏ လုပ်ငန်းလည်ပတ်မှုဆိုင်ရာ အချက်အလက်များကို ရှင်းလင်းတင်ပြနိုင်ရန်နှင့် အများပြည်သူတို့၏ အမြင်သဘောထား ရယူခြင်းအခမ်းအနား (Public consultation meeting) သို့ တက်ရောက်ပေးနိုင်ပါရန် လေးစားစွာ ဖိတ်ကြားအပ် ပါသည်။ နေ့ရက် ၂၀၁၉ ခုနှစ်၊ ဇူလှိုင်လ (၄) ရက်။ Ш အချိန် နေ့လည် ၁းဂ၀ နာရီမှ ၃း၀၀ နာရီအထိ Ш နဝရတ်ကျေးရွာအုပ်ချုပ်ရေးမှူးရုံး နေရာ 

De Heus Myanmar Limited အနေဖြင့် အကောင်ထည်ဖော်ဆောင်ရွက်နေသည် တိရိစ္ဆာန်အစားအစာထုတ်စက်ရုံ၏ လုပ်ငန်းလည်ပတ်မှုဆိုင်ရာအချက်အလက်များ ရှင်းလင်းတင်ပြခြင်း

(၁) စီမံကိန်းအကြောင်းအရာ

De Heus Myanmarသည် တစ်နေ့ လျှင် တန်ရိန် ၆၀၀ ထွက်ရှိမည့် တိရိစ္ဆာန်အစားအစာထုတ် စက်ရုံကို မွန္တလေးမြို့အနီးရှိ မြို့သာစက်မှုဇုန်တွင် တည်ဆောက်ရန် စီစဉ်ဆောင်ရွက်လျှက်ရှိပါ သည်။ ရန်ကုန်တိုင်း မှော်ဘီမြို့နယ် မြောင်းတကာစက်မှုဇုန်တွင် လည်ပတ်နေသော De Heus Myanmar တိရိစ္ဆာန်အစာ ထုတ်လုပ်ဖြန့် ဖြူးသည့် စက်ရုံ အောင်မြင်လာသည်နှင့်အမျ မြန်မာနိုင်ငံ တဝှမ်းလုံးသို့ ထုတ်လုပ်တင်ပို့ဖြန့်ဖြူးနိုင်ရေးအတွက် အထက်မြန်မာပြည် မြို့သာစက်မှုဇုံတွင် လည်း အောင်မြင်သည့် တိရိစ္ဆာန်အစာထုတ်လုပ်သည့်စက်ရုံ တည်ဆောက်ရန် အစီအစဉ်ရေး ဆွဲခဲ့ပါသည်။ မြို့သာစက်မှုဇုံ၏ တည်နေရာသည် အထက်မြန်မာပြည်၏ တိုးပွားလာသော တိရွိစွာန်အစာ ပယ်လိုအားစျေးကွက်ကို ပိုမိုဖြည့်တင်းနိုင်ရေးအတွက် လိုအပ်သော ကုန်ကြမ်းများ အလုံအလောက်ရရှိနိုင်ရန် လွယ်ကူအဆင်ပြေသည့့်နေရာတစ်ခု ဖြစ်သောကြောင့် အစာစက်ရုံ လုပ်ငန်းအတွက် သင့်တော်သော တည်နေရာအဖြစ် ရွေးချယ်ခဲ့ပါသည်။ မြို့သာစက်မှုဇုန်သည် အထက်မြန်မာပြည်၏ တိရိစ္ဆာန်အစာဝယ်လိုအားကို ထောက်ပံ့ဖြန့် ဖြူးရာတွင် အချက်အချာ နေရာဖြစ်ပြီး စီးပွားရေးအရ အရေးပါသည့် နေရာတစ်ခုဖြစ်သည်။

အဆိုပြုစီမံကိန်းသည် မန္တလေးတိုင်းဒေသကြီးမြို့သာစက်မှုဇုံအတွင်း (၂၆) လမ်း၊ အကွက်အမှတ် LG-3(2) နှင့် LG-6(2) တွင်စတင်တည်ဆောက်မည်ဖြစ်ပြီး တည်နေရာအားဖြင် မြောက်လတ်တီ ကျူ 21°41'58.47"N နှင့် အရှေ့လောင်ဂျီကျူ 95°37'17.48"E တို့တွင် တည်ရှိပြီး စီမံကိန်း၏ စုစုပေါင်းမြေစရိယာမှာ (၆.၅) စက ကျယ်ဂန်းပါသည်။ တိရိစ္ဆာန်အစာ ထုတ်လုပ်သည့်စက်ရုံဖြစ်သ ည်နှင် အညီ စက်ရုံတည်ဆောက်မှတွင် ကုန်ကြမ်းကြိတ်ခွဲစက်၊ ရောနှောစက်၊ ဇကာများ၊ အဆိုင်အ ခဲပုံသွင်းစက်များ ရေနွေးငွေ့သုံးဘွိုင်လာ၊ အခြောက်စံစက်၊ သယ်ယူဝို့ဆောင်ပေးသည် အလို လျောက်ရွေ့ရှား ကွန်ဗေယာများအပါဝင် ပါကင်ထုတ်ပိုးသည့် စက်များထည့်သွင်း တည်ဆောက် သွားမည် ဖြစ်ပါသည်။ ထို အပြင် ထုတ်လုပ်မှုမျှော်စင်၊ ကုန်ကြမ်းသိုလှောင်ရုံ၊ ပြောင်းဖူး အခြောက် ခံစက်၊ ကောက်ပဲသီးနံ သိုလှောင်ရုံ၊ ဘွိုင်လာခန်း၊ အရည်ကန်များ နေရာ၊ ကုန်ချောသိုလှောင်ရုံ၊ ဓါတ်ခွဲခန်း၊ ရုံးများနှင့် လုံခြုံရေးဂိတ်တို ပါဂင်ပါသည်။ စက်ရုံလည်ပတ်ရာတွင် အလုပ်သမားပေါင်း (၅၈)ယောက်နှင့် ရုံးထိုင် (၈)ယောက်ဖြင့် လည်ပတ်နိုင်ရန် စီစဉ်ထားပါသည်။ စက်ရုံသည် တစ်ပါတ်လျှင် (၆)ရက်နှင့် တစ်ရက်လျှင် အလုပ်ချိန် ၈ နာရီ ဖြင့် အဆိုင်း(၂)ဆိုင်းခွဲ၍ လည်ပတ်ပါ မည်။ အဆိုပြုစက်ရုံ တည်ဆောက်ရေး အတွက် မြေယာပြုပြင်ခြင်းကို ၂၀၁ဂ ခုနှစ် ဇူလိုင်လတွင် စတင်အကောင်အထည်ဖော်လျက်ရှိပြီး ၂၀၁၈ ခုနှစ် ဇူလိုင်လတွင် စတင်လည်ပတ်နိုင် စေရန် ရည်ရွယ်ထားပါသည်။

1

အဆိုပြုထားသည့် တိရိစ္ဆာန်အစာ စက်ရုံစတင်လည်ပတ်ပါက တစ်ရက်လျှင် ရေလိုအပ်ချက် ၁၃၅ ကုဗမီတာကို ၆ လက်မ အဝီစိတွင်းနှစ်တွင်းမှ ထုတ်ယူသုံးဆွဲသွားမည်ဖြစ်ပါသည်။ လိုအပ်သော လျှပ်စစ်ဓါတ်အားကို မြို့သာ စက်မှဇုန် ဓါတ်အားလိုင်းမှ ရယူသုံးဆွဲမည်ဖြစ်ပြီး ၁၀၀ ကီလိုဗို့ ထရန်စဖော်မာ နှစ်လုံးဖြင့် ဓါတ်အားခွဲ ရယူအသုံးပြုသွားမည်ဖြစ်ပါသည်။ လျှပ်စစ်စွမ်းအင်လို အပ်ချက်အတွက် ဒီဇယ်ဂျင်နရေတာ ၂ လုံးကို အရေးပေါ် အသုံးပြုရန် အရံအားဖြင့် ထားရှိ မည်ဖြစ်ပါသည်။ အမိုက်သရိုက်နှင့် အညစ်အကျေးများကို တည်ဆောက်ရေးလုပ်ငန်းစတင်ချိန်မှ လုပ်ငန်းလည်ပတ်သည့်ကာလနှင့် ပိတ်သိမ်းသည့်ကာလအထိ စနစ်တကျ စွန့်ပစ်သွားရန် တာဝန်ယူဆောင်ရွက်မည်ဖြစ်ပါသည်။

တိရိစ္ဆာန်အစာ ထုတ်လုပ်သော နည်းလမ်းများစွာရှိသည့်အနက် ယခုအဆိုပြုသော စက်ရုံသည် အနီးပတ်ဝန်းကျင်ရှိ ဒေသခံကျေးရွာများနှင့် လူထုအတွက် လူမှစီးပွားရေးနှင့် ကျန်းမာရေးကို ထိ စိုက်စေနိုင်သော အမှန်အမွှား၊ အနံ့အသက်ဆိုးများနှင့် ရေဆိုး ရေညစ်များ မထွက်ရှိနိုင်အောင် ခေတ်မှီနည်းပညာများဖြင့် ကြိုတင်ကာကွယ် တည်ဆောက်လည်ပတ်သွား မည့် စက်ရုံဖြစ်ပါသည်။ ဒေသခံလူထုအား သင့်တော်သော အလုပ်အကိုင်အခွင့်အလမ်းများလည်း ဖန်တီးပေးနိုင်ရန် ရည်ရွယ်ပါသည်။ အဆိုပြု စက်ရုံသည် မိမိတို့လုပ်ငန်းလည်ပတ်ခြင်းကြောင့် ဖြစ်ပေါ်လာနိုင်သည့် ပတ်ဝန်းကျင်ဆိုင်ရာ ညစ်ညမ်းမှများကို တားဆီးကာကွယ်ရန် အတွက် စိုင်မာသော မူဝါဒဖြင့် တာဝန်ယူဆောင်ရွက်ရန် စီစဉ်ဆောင်ရွက်ထားရှိပြီး လူမှုစီးပွားဆိုင်ရာ ထိခိုက်မှများ မရှိစေရန် ထည့်သွင်းစဉ်းစာ အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။ သိုဖြစ်ပါ၍ အဆိုပါ စက်ရုံအတွက် သဘာဝပတ်ဝန်းကျင်နှင့် လူမှစီးပွားရေးဆန်းစစ်မှ လုပ်ငန်းမျာကို မြန်မာနိုင်ငံ၏ ချမှတ်ထားသော သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဆိုင်ရာ ဥပဒေ နည်းဥပဒေများအတိုင်း လိုက်နာ ဆောင်ရွက် အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။



ပုံ (၁) De Heus Myanmar စက်ရုံတည်နေရာ

သတ်မှတ်ရက်	လုပ်ငန်းအဆင့်	ဖြစ်ပေါ် လာနိုင်သည် ့ထိခိုက်မှု	လျော့ပါးသက်သာစေသောနည်းလမ်းများ	စောင့်ကြည့်လေ့လာစစ်ဆေးရြင်း
လေအရည်	ဆောက်လုပ် ရေး	- ဆောက်လုပ်ရေးလုပ်ငန်းသုံး	- ဆောက်လုပ်ရေးလုပ်ငန်းများ မီးခိုးထုတ်လွှ	- အမြင်ဖြင့် စောင့်ကြည့်စစ်ဆေး ခြင်း
အသွေး	ကာလ	ယာဉ်ယွန္တရားများမှ လေထု ညစ်ညမ်းသည်	တ်မှုသက်သာစေသည့် ယာဉ်ယွန္တရားများ	- စောင့်ကြည့်စစ်ဆေးရန် ရွေးချယ်ထား သော
		မီးခိုးများ ထုတ်လွှတ်မှု ယာယီ	အသုံးပြု၍ ထိန်းချပ်ခြင်း	သတ်မှတ်ချက်များအား နမူနာ ကောက်ယူခြင်း
		တိုးလာနိုင်သည်	- လိုအပ်သောပစ္စည်းများသာ သယ်ဆောင်စေခြင်း	နှင့် ခွဲခြမ်းစိတ်ဖြာ စစ်ဆေးခြင်း
		- မီးစက်မှ လေထုညစ်ညမ်းသည့် မီးခိုးများ	- ယာဉ်များ၏အရှိန်နှုန်း သတ်မှတ်ပေး ခြင်း	- (တစ်လတစ်ကြိမ် စစ်ဆေးရန်)
		ထုတ်လွှတ်မှု ဖြစ်စေ သည်	- ဆူညံမှုအားနည်းသည့် မီးစက် အမျိုးအစားသာ	- ယာဉ်အရည်အသွေး ပုံမှန်စစ်ဆေး ခြင်း
		- ယာဉ်သွားလာမှုများကြောင့်	အသုံးပြုစေခြင်း	- တစ်နှစ်လျှင် နှစ်ကြိမ် စစ်ဆေးရန်
		ဖုန်မှုန့် များဖြစ်ပေါ် လာနိုင်သည်	- ရေဖြန်းပေးခြင်း(တစ်ရက်လျှင် တစ်ကြိမ်)	- လုံခြုံရေးပန်ထမ်းမှ စောင့်ကြည့်ရန်
			- ဆောက်လုပ်ရေးပစ္စည်းများ သယ်ဆောင်ရာ	
			တွင် အဖုံးအုပ်ပြီး သယ်ဆောင်ခြင်း	
	လုပ်ငန်းလည်	- လမ်းပန်းဆက်သွယ်ရေး ကောင်းမွန်လာသဖြင့်	- စက်ရုံအလုပ်သမားများ အတွက် ပို့/ကြို	- အမြင်ဖြင့် စောင့်ကြည့်စစ်ဆေး ခြင်း
	ပတ် ခြင်းကာလ	ယာဉ်သွားလာမှုနှုန်း ပိုမိုများပြား လာနိုင်ပြီး၊	ကားစီစဉ်ပေးခြင်း	- စောင့်ကြည့်စစ်ဆေးရန် ရွေးချယ်ထား သော
		လေထုညစ်ညမ်းမှု တိုးလာနိုင်ခြင်း	- ယာဉ်များ၏အရှိန်နှုန်း သတ်မှတ်ပေး ခြင်း	သတ်မှတ်ချက်များအား နမူနာ ကောက်ယူခြင်း
		- မီးစက်မှ လေထုညစ်ညမ်းသည့် မီးခိုးများ	- လမ်းတစ်လျှောက်	နှင့် ခွဲခြမ်းစိတ်ဖြာ စစ်ဆေးခြင်း
		ထုတ်လွှတ်မှု ဖြစ်စေ သည်	လေအရည်အသွေး စောင့်ကြည်္ စစ်ဆေးခြင်း	- (တစ်နစ်လျှင်နှစ်ကြိမ် စစ်ဆေးရန်)
		- ယာဉ်သွားလာမှုများကြောင့်	- မီးစက်အသုံးပြုသည် ့မှတ်တမ်းနှင့်	- ယာဉ်အရည်အသွေး ပုံမှန်စစ်ဆေး ခြင်း
		ဖုန်မှုန့် များဖြစ်ပေါ် လာနိုင်သည်	ဆီသုံးစွဲသည့် မှတ်တမ်း စနစ်တကျ	
			ထားပေးခြင်း	- လစဉ်စစ်ဆေးရန်
			- ရေဖြန်းပေးခြင်းဖြင့်လည်းကောင်း (တစ်ရက်လျှင်	
			တစ်ကြိမ်)	

## ဇယား (၁) De Heus Myanmar တိရိတ္ဆန်အစာစက်ရုံ၏ ပတ်ပန်းကျင်နှင့် လူမှုစီးပွားထိခိုက်မှ ဆန်းစစ်ခြင်းဆိုင်ရာ အချက်အလက်များ

သတ်မှတ်ချက်	လုပ်ငန်းအဆင့်	ဖြစ်ပေါ် လာနိုင်သည် ထိုခိုက်မှု	လျော့ပါးသက်သာစေသောနည်းလမ်းများ	စောင့်ကြည့်လေ့လာစစ်ဆေးခြင်း
ဆူညံသံ နှင့်	ဆောက်လုပ်ဓ	- ဆောက်လုပ်ရေးလုပ်ငန်း လုပ်ဆောင်ချိန်တွင်	- ဆူညံမှုသံ နှင့် တုန်ခါမှု သက်သာစေသည့်	- အမြင်ဖြင့် ကြည့်ရှုစစ်ဆေးခြင်း
တုန်ခါမှု	ရးကာလ	စက်ပစ္စည်း ကိရိယာများမှ ဆူညံမှု အသံ များ	စက်ပစ္စည်းများ အသုံးပြုခြင်း	- အသံထွက်ပေါ် မှုနှုန်းအားစစ်ဆေးခြင်း
		ယာယီတိုးလာနိုင်ပါသည်	- အသံလုံနံရံများတပ်ဆင်ခြင်း	
	လုပ်ငန်းလည်	- ယာဉ်သွားလာမှုနှုန်းပိုမို များပြား လာနိုင် ေသာ	- စည်းကမ်းများ စနစ်တကျ သတ်မှတ် ပေးခြင်း	- ဆူညံသံ နှင့် တုန်ခါမှု ကိုစစ်ဆေးခြင်း
	ပတ် ခြင်းကာလ	ကြောင့် ဆူညံသံ နှင့် တုန်ခါမှု	- ဟွန်းသံတားမြစ်ခြင်းများ၊ ဂန်ပိုမတင်ရ	
		တိုးလာနိုင်ပါသည်	စည်မျဉ်းသတ်မှတ်ခြင်း	
ရေအရည်	ဆောက်လုပ်ရေး	- ဆောက်လုပ်ရေးလုပ်ငန်း နှင့်	- ဆောက်လုပ်ရေးသုံးပစ္စည်များ ဆေးကြော	- အမြင်ဖြင့် ကြည့်ရှစစ်ဆေးခြင်း
အသွေး	ကာလ	ယာယီအလုပ်သမားများ နေထိုင်	သည့်နေရာ သတ်မှတ်ပေး ခြင်း၊ အသုံးပြုပြီး	
		သည့်အဆောင်များ ရှိခြင် း	ပါက ရေပိုက်များကို သေချာပြန်ပိတ်စေခြင်း	
		ကြောင့် ရေသုံးစွဲမှု နှင့် ရေစွ န့် ထုတ်မှုများ	- ရေနတ်မြောင်းများ ထားရှိပေးခြင်း	
		ရှိလာနိုင်ခြင်း		
	လုပ်ငန်းလည်	- စက်ပစ္စည်း ဆေးကြောခြင်း	- မြို့တော်စည်ပင်သာယာ၏ ရေဆိုးသန့်စင်မှု	- အမြင်ဖြင့် ကြည့်ရှုစစ်ဆေးခြင်း
	ပတ် ခြင်းကာလ		စည်းမျဉ်းအတိုင်း သန့်စင်ခြင်း	- စောင့်ကြည့်စစ်ဆေးရန် ရွေးချယ်ထား သော
			- ရေဆိုးစစ်ကန်အသုံးပြုခြင်း	သတ်မှတ်ချက်များအား နမှုနာ ကောက်ယူခြင်း
				နှင့် ခွဲခြမ်းစိတ် ဖြာစစ် ဆေးခြင်း
မြေအရည်	ဆောက်လုပ်ရေး	- ဆောက်လုပ်ရေးပစ္စည်း သို လှောင်ရန်	- ကျွမ်းကျင်သော အင်ဂျင်နီယာများမှ သင့်တော်	- အမြင်ဖြင့် ကြည့်ရှုစစ်ဆေးခြင်း
အသွေး	ကာလ	ဂိုဒေါင်တည် ဆောက် ခြင်းကြောင် <sub>-</sub> မြေအရ	သော မြေနေရာပေါ် တွင်	
		ည်အသွေး ထိခိုက်နိုင်ခြင်း	သာ ဆောက်လုပ် စေခြင်း	- အမြင်ဖြင့် ကြည့်ရှုစစ်ဆေးခြင်း
		- ကားပါကင်များ တည်ဆောက် ခြင်းကြောင့်	- လမ်းအမှတ် အသားများ ရှင်းလင်းစွာ	
		မြေအရည်အသွေး ထိခိုက်နိုင်ခြင်း	ကန့်သတ် ပေးထားခြင်း	

သတ်မှတ်ချက်	လုပ်ငန်းအဆင့်	ဖြစ်ပေါ် လာနိုင်သည် ့ထိခိုက်မှု	လျော့ပါးသက်သာစေသောနည်းလမ်းများ	စောင့်ကြည့်လေ့လာစစ်ဆေးခြင်း
စွန့်ပစ်အမှိုက်	ဆောက်လုပ်ရေး	- ဆောက်လုပ်ရေးလုပ်ဆောင် နေစဉ်အတွင်း	- ဆောက်လုပ်ရေးအပျက်အစီးများ ပြန်လည်	- တစ်လတစ်ခါ ကြည်ရှုစစ်ဆေးခြင်း
	ကာလ	လူသုံးအမှိုက် နှင့် ဆောက်လု ပဲရေးလုပ်ငန်း	အသုံးပြုရန် စနစ်တကျ သိမ်းဆည် းထား	
		သုံး စွန့် ပစ်အမှိုက်များ ထွက်ရှိနိုင်ခြင်း	ရန်နှင့် ပြန်လည် ရောင်းချခြင်း 	
	<u> న</u> మ్రంగ్	- အသုံးပြုသော ကုန်ပစ္စည်းများ		
	ခြင်းကာလ	အစွန့်ပစ်အမှိုက်များထွက်ရှိနိုင် ခြင်း		
		- ထုတ်ပိုးသယ်ဆောင်သော ပစ္စည်းအခွံများ		
အွန္တရာယ်ရှိ	<u>న</u> మ్రంల్	- ဓါတုဗေဒပစ္စည်းထည့်သော ပုံးများ၊ ဘူးခွံများ	- ဘူးခွံများ တင်သွင်းသူထံသို့ သက်ဆိုင်သော	- သက်ဆိုင်သော အဖွဲ့အစည်းမှ စောင့်ကြည့်
သောစွန့်ပစ်	ခြင်းကာလ	ကို ရေဆေး ကြောခြင်း	ဓါတုဗေဒ ဆေးကြောသည့် အရည်များ	စစ်ဆေးခြင်း
ပစ္စည်းများ			အသုံးပြုပေးခြင်း	
			- စွန့်ပစ်ရမည်ဆိုပါက မြို့တော်စည်ပင်သာ	
			ယာ၏ လမ်းညွှန် ချက်အတိုင်း စွန့်ပစ် ခြင်း	
လုပ်ငန်းခွင်	ဆောက်လုပ်ရေး	- ဓါတုဗေဒပါဂင်သော ဘူးများ မတော်တဆ	- ယိုဖိတ်သော နေရာကို ချက်ချင်းဆေး	- သက်ဆိုင်သော အဖွဲ့ အစည်းမှ စောင့်ကြည့်
အန္တရာယ်	ကာလ	ယိုဖိတ်မှုဖြစ်ခြင်းမှ လည်း	ကြောခြင်း	စစ်ဆေးခြင်း
ကင်းရှင်းရေး		အွန္တရာယ် ဖြစ်ပေါ် နိုင်သည်	- သက်ဆိုင်သော စီမံခန့်ခွဲမှု ဌာနသို့	
			ယင်းဖြစ်စဉ်ကို အကြောင်းကြားခြင်း	
			- လူပေါ် သို့ ယိုဖိတ်ခဲ့ပါက ရေဖြင့်	
			ဆေးကြောပြီး ဆေးရုံ/ဆေးခန်းသို္ ချက်ချင်းပို	
			့ဆောင်နိုင်ရန် စီစဉ်ထားခြင်း	

သတ်မှတ်ချက်	လုပ်ငန်းအဆင့်	ဖြစ်ပေါ် လာနိုင်သည် ထိုခိုက်မှု	လျော့ပါးသက်သာစေသောနည်းလမ်းများ	စောင့်ကြည့်လေ့လာစစ်ဆေးခြင်း
	လုပ်ငန်းလည်	- ဘေးကင်းလုံခြုံမှု၊ အွန္တရာယ် နှင့် ကျန်းမာရေး	- ဘေးကင်းလုံခြုံမှု၊ အွန္တရာယ် နှင့် ကျန်းမာရေး	- လုပ်ငန်းခွင်ကြီးကြပ်သူမှ စစ်ဆေးခြင်း
	ပတ်ခြင်းကာလ	အွန္တရာယ်များ	အန္တရာယ်အတွက် ဂန်းထမ်းများအား PPE	
			ပတ်စုံများ စနစ်တကျပတ်ဆင်ခြင်း	
			- မီးဘေးအွန္တရာယ်အတွက် သက်ဆိုင်ရာမီး	
			သတ်ဌာနနှင့် ဆက်သွယ်၍ သင်တန်း	
			များ ပေးခြင်း	
			- ရှေးဦးပြုစုခြင်းသင်တန်းများ ပေးခြင်း	
			- အရေးပေါ် အချက်ပေးစနစ်များ တပ်ဆင်ခြင်း	
လုပ်ငန်းခွင်	ဆောက်လုပ်	- ဘေးကင်းလုံခြုံမှု၊ အွန္တရာယ် နှင့် ကျန်းမာရေး	- ပတ်ဂန်းကျင်ညစ်ညမ်းမှု ဖြစ်စေသည်	-
ဆိုင်ရာထိ	ရေး ကာလ နှင့်	အွန္တရာယ်များ	အကြောင်းအရာအချက်အလက်များကို	
ခိုက်နိုင်မှ နှင်	လုပ်ငန်းလည်		ဂန်းထမ်းများနားလည်သိရှိအောင် သင်တန်း	
အလုပ်အကိုင်အ	ပတ် ခြင်းကာလ		များစီစဉ်ပေးခြင်း	
ခွင့်အလမ်းများ			- လုပ်ငန်းခွင်တာပန်ရှိသူအနေဖြင့် ဒေသခံများ ကို	
			ဦးစားပေးအလုပ်အကိုင်အခွင့်အလမ်း	
			ဖန်တီးပေးခြင်း	
			- ဒေသထွက်ပစ္စည်းများကို ဂယ်ယူအ	
			သုံးပြုစေရြင်း	
			- ဒေသခံ၏စိုးရိမ်ပူပန်မှုများကို အချိန်နှင့်	
			တပြေးညီဖြေရှင်းပေးခြင်း	

#### Record of Public Consultation Meeting at "Pauk Sein Village", Mandalay

Time : 13:00pm to 15:00pm

Date :  $6^{th}$ , Dec 2017

Venue : Monastery at Pauk Sein Village

Meeting Agenda:

- 1. Document distribution
- 2. Introduction made by Plant Manager from De Heus
- 3. Presentation made by SEAM
- 4. Question and Answer

#### Presentation of Project- Description by Plant Manager

Ko Than Win Zaw, Plant Manager, was presented about why De Heus is expanding new plant here and give a heads up of Test Run in mid-June 2018. The major products are animal feeds for poultry, hog/swine, goat, cow and duck feeds. The plant will produce two types of animal feeds, namely, flour and pellet. While flour production does not need water and pellet production needs water.

The plant will extract groundwater from two tube wells with 6 inch-diameter tube. Waste water from plant and worker usage will be clean through the water cleaning system. Solid waste will be dump at industrial zone designated area where municipal cleaning service will take care.

Production is set at 600 tons per day, about 18000 tons per month. De Heus will employ 58 employees and has contracted an employment service company.

#### **Presentation of Third Party by SEAM**

Dr Zinmar Lwin, as representative of SEAM, explained about SEAM, and introduced De Heus Co.,Ltd. And its plans to open new plant in the industrial zone and how SEAM is responsible for the study of environmental and social impact assessment for De Heus. And then, asked locals feedback, concerns and including employment opportunities.

#### **Question & Answer**

**Q** : Using 6 inch-diameter tube for water is not an issue. Don't want to question about environmental issues related to the plant. But for employment, opportunities should be given to locals, and consider their skill levels. Brought up an example of JAPFA, recently established company, whose manager met directly with locals and accepted job applications. In the same way, De Heus' contractor, Human Resources, needs to be explained and meets with locals, suggested.

A1(PM): Propose to announce jobs through village chief.

- A2(SEAM): De Heus has appointed SEAM to study ESIA report and to advise environmental conservation for the plant. De Heus is committed not to adverse environmental impacts and negative social effects from its operations. In case, signs of impacts effected to locals or environment from Industrial Zone, locals should collectively inform Industrial Zone management. For employment, if the plant hires people from other places and bring them here, the plant will have housing responsibilities. So hiring locals makes more sense and set as priority.
- **Q** : Since De Heus will contract out Human Resources to a thirty party, he was asking the name of the company. He also wanted De Heus to considers young graduates with job positions relevant to their studies such as accounting study to appoint as accountant. Brought up again JAPFA, recently established company in the Industrial Zone, which works well with locals transparently.
- A(PM): There are two types of employment. Fifty eight will be directly hired from the company, and low level ones will be hired through an employment agency. The plant will start operating first week of June 2018. The development of plant will increase job opportunities. It will be strictly in compliance with Myanmar existing labor law, work hours, minimum wage, over time payment. Training will be provided as needed.
- **Q** : De Heus should hire young work force with education and work skills from Pauk Sein village and understand uncommon behaviors and improper language usage of villagers, influenced by tradition and social economic conditions. And does the plant have health insurance?
- A(PM): Understand local's tradition and language usage. While working for the plant, they will improve proper usage of language and work skill. For health, the plant will buy work place health insurance. The third party employment agency will be required to buy insurance for its workers. The plant will do medical checkup for every staff and will hire only with pass result.

Discussion is concluded here.

SEAM - Social & Environmental Associate Myanmar

PM - Plant Manager

#### Record of Public Consultation Meeting at "Nawarat Village", Mandalay

Time : 9:00am to 12:00am

Date :  $6^{th}$ , Dec 2017

Venue : Monastery in Nawarat village

Meeting Agenda:

- 1. Document distribution
- 2. Introduction made by Plant Manager from De Heus
- 3. Presentation made by SEAM
- 4. Question and Answer

#### **Presentation of Project- Description by Plant Manager**

Ko Than Win Zaw, Plant Manager, briefly presented about De Heus based in the Netherlands, and the project new plant here. The new plant will begin operation in new site in the middle of June 2018. It will employ 58 employees, including twelve technicians and four women office staff.

It is accepting new CVs with minimum grade ten education.

#### **Presentation of Third Party by SEAM**

Dr Zinmar Lwin, as representative of SEAM, presented about the role of SEAM, and talked about how SEAM is responsible for environmental and social impact assessment study on behalf of De Heus. Regards to the De Heus new plant, presents environmental and social impacts, and welcome questions and concerns about it.

#### **Questions & Answers**

**Q** : Demand jobs for the villagers and want no impact on the village fresh water lake.

He also asked to reduce minimum grade ten education for employment.

- A(PM): De Heus has contracted a Human Resources company to manage employment and will introduce with the village for hiring process.
- **Q** : Request rural development and health care needs.
- A1(SEAM): The new plant is not just profit oriented, but also efforts to promote environmental conservation and social developments of the communities in which it operates and full compliant with Myanmar Law. It considers local employment as priority but locals have to keep up with the plant rules and regulations.
- A<sub>2</sub>(PM): Plant's solid waste will be dump in the designated area of Industrial Zone with contracted management from Municipal garbage cleaning services. Plant's waste water and domestic waste water will be cleaned through the water cleaning facility.
- **Q** : Explained about traditional livelihoods are getting scarcity due to development of Industrial Zone and repeated request for jobs opportunities for locals.

- A(SEAM): Suggestion for local employment will be included in EIA report. And personally advised the plant including job training.
- **Q** : Ask a question regards to limitation of age to work for the plant
- A(SEAM): Responded that in compliance with Myanmar existing law and no gender discrimination. There will be another consultation like this, and with or without the Plant Manager, Third Party will explain the EIA report that time, how it is written, what included and not.
- **Q** : Local Social organization needs a car donation.
- A(PM): Responded that he will report it to upper level management.

The discussion is concluded here.

SEAM - Social & Environmental Associate Myanmar

PM - Plant Manager

## ANNEX 5

Public consultation meeting attendant list



De Heus တိရိစ္ဆာန်အစာစက်ရုံ**အ်** ပတ်ပန်းကျင်နှင့် လူမှုရေးထိခိုက်မှုဆန်းစစ်ခြင်း ( ESIA ) ပတ်သက်၍ ကျင်းပပြုလုပ်သည့် လူထုတွေ့ဆုံပွဲအခမ်းအနားသို့ တက်ရောက်လာသူများစာရင်း

Time= 10:30 Am

ရတ်စွဲ။၂<u>၆.၀.၇.၂၀၁</u>၂

စဉ်	కాలన్ 🔒	ကျေးရွာ/ အဖွဲ့အစည်း	ဖုန်းနံပါတ်	လက်မှတ်
<b>Э</b> 11.	J- 35 7- 9	bollor	793986554	3. 33: 4
Ju	2)5~2	10105	09.4736799	102 318 A
24	1911, 100: 2:	rogo	09.45714403	2 612 62,3
911	i Energine	20102	09.4 544110	268 mm
Ju	33and:	\$ <del>090</del> 5	09.2002	
Ea.	300 22	ų	09.258251108	သက်မြို
J.	သန်းသိုးတို့	40905	09-440175166	Hor
ดบ	Ja & E. E.	<u> </u>	09-798572098	82
<u>e</u> y	900,		0979647792	the second secon
204	<u>~ cçcç:</u>	N	04.428479772	<u>8</u>
ລວ,	<u>~ පු</u> ති භාදි	1	04-798823121	
DJy	- 25 . 05 ·	<b>4</b>	asone	part
254	y &:06:	ц		AE
<u>S</u> G h	<u>າວຣະອີ</u> ້	1		BE:P=
<u>~ 8</u> ~	2 . De me		OBJOJEOJONE	A.
26	<u>~ n eq:</u>	ц	00990000000000000000000000000000000000	R'
<u>29</u>	* 2580819E	<b>k</b> *	09-966951609	Vain
DOL	* <u> </u>		09-798823121	Se .
) Ct	· @: 98;	ч	09-798912 811	De me



De Heus တိရိစ္ဆာန်အစာစက်ရုံ၏ ပတ်ဂန်းကျင်နှင့် လူမှုရေးထိန်က်မှုဆန်းစစ်ခြင်း ( ESIA ) ပတ်သက်၍ ကျင်းပပြုလုပ်သည့် လူထုတွေ့ဆုံပွဲအစမ်းအနားသို့ တက်ရောက်လာသူများစာရင်း Time 02:00pm

ရက်စွဲ။ <u>၂၉-0 [. 10)</u>

စဉ်	కాటన్ 🍻	ကျေးရွာ/ အဖွဲ့အစည်း	ဖုန်းနံပါတ်	လက်မှတ်
24	£-0-33	637 m26.		(2)
du	રુ-હર્રાદ:	и		698
24	S. mport	u		CartosE.
9 11	E Org	in		at the second
<u> ၂</u> .,	Er of yt	n		- AL
G (1	2.051.85	لر		2 de
21	£. 81026	h	-	18 A 8
ଭା	E-G. G. S.	n		-BE
P.y	Fogf:Gtr.	ų		Tun
$\mathfrak{D}^{\mathfrak{n}}$	F. 9.90	ű.		* E
231	on Eit	×.	-	C 2)
برد	そうきょ	L.		જર્ફ.
27,	fi onstini	ų		P342
291	1203.021	ĸ		۵٤,
2 <b>9</b> .	Some Eccel	<i>ن</i> ر		సి
26.	J. Gr Esa	k		
۲۲.	2. 109/103 E	2	าดดบริงรุว-า	- OL
لير	GNG FC		490406408	· A E'
36	n 331; 6 m			
10-	65304= 35			6 3m 8 Q
11.	65:07			PLI,
15,	1	2	196176500	O-H
14.	shop.			1 8:

á.



De Heus တိရိတ္ဆန်အစာစက်ရုံ၏ ပတ်ပန်းကျင်နှင့် လူမှုရေးထိခိုက်မှုဆန်းစစ်ခြင်း ( ESIA ) ပတ်သက်၍ ကျင်းပပြုလုပ်သည့် လူထုတွေ့ ဆုံပွဲအခမ်းအနားသို့ တက်ရောက်လာသူများစာရင်း

ange G. 2 J. 102 2

⊙ෙවු	အမည်	ကျေးရွာ/ အဇွဲ့အစည်း	ဖုန်းနံပါတ်	လက်မှတ်
<u>Э</u> ц.	STE	2075	902507107.	ā,
94	n sofie 8:	ч	og n	13 Q
2'1	" 508.	u	102521570	
9"	1. 2. 2. 09?	n	281 pc 600 tc	0
၅ ແ	60363630	L.	0944997250	Sea
G1 .	658-505	h	109 × 1	5
2"	สโอออร์าเนอ	h	09 ×	
<u></u> .	ostio on	ц	oq	e, or
Bu	2 B	u	×	6 912
204	13 22 E Brip?	n	ø	မခု င်မဆုခ်'
33	Sug: Busse	u		25681:20
270	3 54420			6 30 Km
22.	122 95 64.	r		206, 2630;
SG a	පනළිගල ද	n	478769789	େ କ୍ରିତ୍
29.	Jeci	h		en la
১৫	रेल गुंधुड en	4		(cz:
PC	3 70 -300	ų		205:
261	67 60062	n		600


De Heus တိရိစ္ဆာန်အစာစက်ရုံ၏ ပတ်ပန်းကျင်နှင့် လူမှုရေးထိနိက်မှုဆန်းစစ်ခြင်း ( ESIA ) ပတ်သက်၍ ကျင်းပပြုလုပ်သည့် လူထုတွေ့ဆုံပွဲအခမ်းအနားသို့ တက်ရောက်လာသူများစာရင်း

ရက်စွဲ။ 🧟 ၁၂ ၂၀၁၇

စဉ်	కాలన్	ကျေးရွာ/ အဖွဲ့အစည်း	ဇုန်းနံပါတ်	လက်မှတ်
39.	Grange and Brand	අංගුනි	0940255309	5 Illen
11	fortas	л	09	Br canfrod
2"	E off- I onl	K	0942849792	2857
<b>G</b> 4	E Of Georg	u	0926107643	s Phyo
)"	5 as NEEP	×	0 4 p2 60 3 8 2 5	' Zib
69	503503	a	09,794774277	
241	of of it	u	0978473863	el: 2:
อน	S. S. C. E.	ĸ	256613225	8:
C II	est 30 fr	(1	19.90B22]2	063
20"	208:06:26	N	19610909	ARE
22.	P. State	4	of gatessis	, Mr 72 -
»Lc	5 62502	h	n 2	aut.



De Heus တိရိတ္ဆန်အစာစက်ရုံ၏ ပတ်ပန်းကျင်နှင့် လူမှုရေးထိခိုက်မှုဆန်းစစ်ခြင်း ( ESIA ) ပတ်သက်၍ ကျင်းပပြုလုပ်သည့် လူထုတွေ့ဆုံပွဲအခမ်းအနားသို့ တက်ရောက်လာသူများစာရင်း

ang ( - 2 1-1027

	စဉ်	కాలన్	ကျေးရွာ/ အဇွဲ့အစည်း	ဇုန်းနံပါတ်	လက်မှတ်
Ľ	J 4 .	र्टर भेलिस	61~86		R D
7	9 a	6370ह. जु	61~8~		:30
7	2"	82:3US	020080		zur
7	94	( s 3 ?	ન્યુ પ ટુન		6
٢	91	R. on of.	~		e esps
7	G" .	E (28-22.	× .		
7	2"	5 08 mg	4	No.	987
	ை	2 antets	u		Gonth
	6"	Good Aler Aler	×.	996923230	B°.
	<i>х</i> о"	Boig cc G	L.	45902992	26
	در	nev ?.	5	j2556666	in
	LC	GV25005'	۲	r	Q {-
	×	. છે જે દું હુ દ	. 4		( ja E
	Þç	ost e f.	h	-	(2)
	29	Dr D d. B.E.			
	36	Zioc: sof			-
	Ø	2.05.002			
	SA	, after			
	90	J. 082.031.			
	79	- 3 cC = 16			
	72-	· Giler: 135			
	12	Har WE			



De Heus တိရိစ္ဆာန်အစာစက်ရုံ၏ ပတ်ပန်းကျင်နှင့် လူမှုရေးထိရိက်မှုဆန်းစစ်ခြင်း ( ESIA ) ပတ်သက်၍ ကျင်းပပြုလုပ်သည့် လူထုတွေ့ဆုံပွဲအခမ်းအနားသို့ တက်ရောက်လာသူများစာရင်း

ရက်စွဲ။ - - ၁၂-၂၀၁၇

24 (2) E (2) E (2) 24 St 2 4 2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	EMPS ONABE:12/ 2010 ENATES: *-		E.
111 58 2405 2 2" 637 630	6070585:- "-	-	2/45
2" (3) (5) (5) (5) 4" (0) (6) (5) (5) (5) (5) (5) (5) (5) (5) (5) (5	601~1805-u-		
Gu eseg.		-	63-1
au esterior	winse		533 :
7. 00.03.00	େ ସେଦ୍ୟେନ୍ତ		
હતાં હરો કેર્સ છે. તે	egleregre		
24 g. 25. 2 f. m	52		
on 2. 36 : 202	<u>``</u>		
En Breerse			
· 480:30:19 1100			
Don grace Che			300 E GE
2J" zzz	-		મુર્વુ દ
27" g: 255 63	5 . 57~85		S: softer
Jeu g: Eune o	or Bar B.		2 ando
291 B: Gant co	en en en	0978292929185	green E ce es
SEN Zisiegn E:	ญาษุธิย:		နှိုးသဲ ချောင်း
つわれ えいのかると	ଚୌଟ୍ଟ ଓ ଓ	09798882558	600
Jan 637 22 5-28	જી જે		225:
opa estera	en en en en	÷ .	စိုးစို မ



အကြံပြုချက်များရှိပါက ရေးသားအကြံပြုပေးစေလိုပါသည်။

အကြံပြုလိုသည့်အကြောင်းအရာ

ရက်စွဲ။

2" P. OE. 2 0E. 23 1. 6.3! J. S. m. 20%. 2. 8:25: 29E ----Gau Most. D ( - GSTIDGAS Je rowbibs

လက်မှတ်

အမည်

ကျေးရွာ / အဖွဲ့ အစည်း





De Heus တိရိစ္ဆာန်အစာစက်ရုံ၏ ပတ်ဝန်းကျင်နှင့် လူမှုရေးထိခိုက်မှုဆန်းစစ်ခြင်း(ESIA) လုပ်ငန်းနှင့် စပ်လျဉ်းသည့် လူထုတွေ့ဆုံဆွေးနွေးပွဲအခမ်းအနားသို့ တက်ရောက်လာသူစာရင်း

ရက်စွဲ- ၄ . ၅. ၂၀၁၉

စဉ်	အမည်	ကျေးရွာ/အဖွဲ့ အစည်း	ဖုန်းနံပါတ်	လက်မှတ်
IIC	2:235:32	30708	06 262C 8059999	9:235:2
JII	Note Burger	4	୦ଌୣୣଌୠୄ୶୵୬୦୯୯୭	constituto
511	9:0809:	10905	09922479712	60
<b>9</b> 1	June 18.	11	0612012200	ifimae
၅။	Bigosore	C1 .	09798883171	
ତ୍ୟ	いなううろうろう	"	09-440175166	than
<u> ୧</u> ୩	£:205: VV	. 4	2901001906	top.
ରା	3:00	20105	0979647792	vB.
ତା	9:108:8=	N		bE-3:
lloc	182: 62:2:	h	09-457144032	- G= 3 61 - 194
SOL	75382:	N	09.798572098	æ:
၁၂။	9:0022	и	08990032603	02:
၁၃။	8:68:	1	09-798912811	Biz.
၁၄။	Garidor	20905		·1202
၁၅။	1222 \$ GB:	*1		2.28:1032
၁၆။	63T \$0E:	H	094025121570	08:
၁၇။	12 ODEranliae	и	77 8764785	Cé
ວຄ။	637.2	u	402507107	°E
၁၉။	เวกาเร.	n		isolas.
Joi	33325.608:	11		608:

# NO. 76, Myit Zu Tha Ka Street, Sector 4, Pauk Kone, Mingalardon Township, Yangon.

# Office : +95 9 795852122, +95 9 269410460 Email : seamgroup@myseam.com

Viber: +95 9 269410460 Web : www.myseam.com





De Heus တိရိစ္ဆာန်အစာစက်ရုံ၏ ပတ်ဝန်းကျင်နှင့် လူမှုရေးထိခိုက်မှုဆန်းစစ်ခြင်း(ESIA) လုပ်ငန်းနှင့် စပ်လျဉ်းသည့် လူထုတွေ့ဆုံဆွေးနွေးပွဲအခမ်းအနားသိ တက်တောက်တောက်

ရက်စွဲ- ၄ . ၅- ၂၀ ၁၉

စဉ်	အမည်	ကျေးရွာ/အဖွဲ့ အစည်း	ဖုန်းနံပါတ်	လက်မှတ်
IIC	63721658	ergegez-		zus
JII	631.068	N		ezuser
511	ල ද ල ද ල ද ල ද	enra Ass	0.	CE E
۶ <b>۱</b>	19608-0	U	~~~~~	øg:
၅။	6382822008:	u	190	.30
GII	6122237=Q.	ч	996923230	e-
<b>?</b> "	1200E-	·	GJJJJ222	li
ରା	138868	N		DE
GII	5310E:52	41		30
IIOC	そううそ:56	ashis:	C. L.	Jessfred
IICC	· CY ZE	n		NEE
၁၂။	8.600 28	υ.	06 Ja ever 1930	oonfo
JSC	6318-2-12	Jan A M	. /	828.3
၁၄။	- 2: 08: B.E			Sec Of
၁၅။	Easters	u	09781919185	Easter
၁၆။	esten-08	0.1483:	•	6310
၁၇။	Prosesper	n		Energy E
ວດແ	638225-082	u		222?
၁၉။	8-0260	u		2:00.00
Joi	6383:5 - 2	u		818:
Jou	123565	N		Q.S.
JJu	808202	न्मिलिर्भ.		08.

# NO. 76, Myit Zu Tha Ka Street, Sector 4, Pauk Kone, Mingalardon Township, Yangon.

# Office : +95 9 795852122, +95 9 269410460 Email : seamgroup@myseam.com

Viber: +95 9 269410460 Web : www.myseam.com Social & Environmental Associates - Myanmar Co., Ltd. (SEAM)



De Heus တိရိစ္ဆာန်အစာစက်ရုံ၏ ပတ်ဝန်းကျင်နှင့် လူမှုရေးထိခိုက်မှုဆန်းစစ်ခြင်း(ESIA) လုပ်ငန်းနှင့် စပ်လျဉ်းသည့် လူထုတွေ့ဆုံဆွေးနွေးပွဲအခမ်းအနားသို့ တက်ရောက်လာသူစာရင်း

900g- 9.9.303C

စဉ်	အမည်	ကျေးရွာ/အဖွဲ့အစည်း	ဖုန်းနံပါတ်	လက်မှတ်
IIC	Ed ora	engue 82:	•	E
JII	3:100	"		197
511	3-278	PULSI MISS	On.	-9B
<b>6</b> 1	f:Genteo	"	NO.	BE
၅။	61226335:637:	ч	100	Two
Gı	g.631E.	N		2318:
<b>?</b> "	ଦେଇଟିଟି 🗸	• •		SE.
ຄແ	13 sombles	n and a second sec		Ec.
ତା	દાઅદ સુદ 2	n	499490400	3E
IIOC	1203:06-	1		08:
IICC	637505:06.	41		e32E
၁၂။	3: Rome	ч		R
၁၃။	2:0281.			જર્ફ.
၁၄။	628 8-22	u.		8:
၁၅။	2. 28625	ų		30000
၁၆။	631028-	u		િર્ષ્ટ
၁၇။	12228-30=34061	RI.	4107029922	08.
ວ໑ແ	603	И		G
၁၉။	GIDEOELAB	n		06:
JOII	128-gus	n.		Sel

# NO. 76, Myit Zu Tha Ka Street, Sector 4, Pauk Kone, Mingalardon Township, Yangon.

# Office : +95 9 795852122, +95 9 269410460 Email : seamgroup@myseam.com

Viber: +95 9 269410460 Web : www.myseam.com

# ANNEX 6

Material Safety Data Sheets

No.	Chemical Name	Unit	Dilution Use Solution	Daily Use
<u>1</u>	Aluminum Phosphate	mg		For Fumigation only (routinely based on the total volume tons)
2	Ethyl Alcohal	ml	99.70%	100 ml
<u>3</u>	Hydrochloric Acid	ml	50%	100 ml
<u>4</u>	Lead (ii) acetate Trihydrate	g	6.25%	5 ml
<u>5</u>	Methyl Red	g	0.10%	5 ml
<u>6</u>	Petroleum Ether	ml	90%	100 ml
<u>7</u>	Phenol Red	g	0.10%	5 ml
<u>8</u>	Phenolphthalein	g	0.10%	5 ml
<u>9</u>	Sodium Hydroxide	g	0.40%	5 ml
<u>10</u>	Urea	g	6.00%	5 ml

## MSDS for De Heus Animal Feed Manufacturing Project





Health	2
Fire	0
Reactivity	0
Personal Protection	E

## Material Safety Data Sheet

#### Ammonium phosphate dibasic MSDS

Section 1: Chemical Product and Company Identification				
Product Name: Ammonium phosphate dibasic	Contact Information:			
Catalog Codes: SLA4714, SLA1528, SLA3034	Sciencelab.com, Inc.			
CAS#: 7783-28-0	Houston, Texas 77396			
RTECS: Not available.	US Sales: 1-800-901-7247			
TSCA: TSCA 8(b) inventory: Ammonium phosphate dibasic	Order Online: Sciencel ab com			
CI#: Not available.	CHEMTREC (24HR Emergency Telephone), call:			
Synonym:	1-800-424-9300			
Chemical Formula: (NH4)2HPO4	International CHEMTREC, call: 1-703-527-3887			
	For non-emergency assistance, call: 1-281-441-4400			

Section 2: Con	nposition	and In	formatio	n on l	ngredie	ents
----------------	-----------	--------	----------	--------	---------	------

#### Composition:

Name	CAS #	% by Weight
Ammonium phosphate dibasic	7783-28-0	100

Toxicological Data on Ingredients: Ammonium phosphate dibasic: ORAL (LD50): Acute: 3000 mg/kg [Rat].

#### Section 3: Hazards Identification

#### Potential Acute Health Effects:

Very hazardous in case of eye contact (irritant). Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator). Inflammation of the eye is characterized by redness, watering, and itching.

#### Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

#### Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

#### Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

#### Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

#### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

#### Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

#### Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

#### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

#### Section 6: Accidental Release Measures

#### Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

#### Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

#### Section 7: Handling and Storage

#### Precautions:

Do not ingest. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

#### Section 8: Exposure Controls/Personal Protection

#### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

#### Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

#### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

#### Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 132.06 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: Decomposes.

Critical Temperature: Not available.

Specific Gravity: 1.619 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

#### Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

#### Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 3000 mg/kg [Rat].

Chronic Effects on Humans: Causes damage to the following organs: lungs, mucous membranes.

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

#### Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

#### Section 13: Disposal Considerations

Waste Disposal:

#### Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

#### Section 15: Other Regulatory Information

#### Federal and State Regulations:

Pennsylvania RTK: Ammonium phosphate dibasic Massachusetts RTK: Ammonium phosphate dibasic TSCA 8(b) inventory: Ammonium phosphate dibasic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R38- Irritating to skin. R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

#### Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

#### Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:35 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.





Health	2
Fire	3
Reactivity	0
Personal Protection	Е

## Material Safety Data Sheet Ethyl alcohol 200 Proof MSDS

Section 1: Chemical Product and Company Identification		
Product Name: Ethyl alcohol 200 Proof	Contact Information:	
Catalog Codes: SLE2248, SLE1357	Sciencelab.com, Inc.	
CAS#: 64-17-5	Houston, Texas 77396	
RTECS: KQ6300000	US Sales: 1-800-901-7247	
TSCA: TSCA 8(b) inventory: Ethyl alcohol 200 Proof	International Sales: 1-281-441-4400 Order Online: Sciencel ab com	
Cl#: Not applicable.	CHEMTREC (24HB Emergency Telephone) call:	
Synonym: Ethanol; Absolute Ethanol; Alcohol; Ethanol	1-800-424-9300	
200 proof; Ethyl Alcohol, Anhydrous; Ethanol, undenatured; Dehydrated Alcohol; Alcohol	International CHEMTREC, call: 1-703-527-3887	
Chemical Name: Ethyl Alcohol	For non-emergency assistance, call: 1-281-441-4400	
Chemical Formula: CH3CH2OH		

Section 2: Composition and Information on Ingredients			
Composition:			
	Name	CAS #	% by Weight
	Ethyl alcohol 200 Proof	64-17-5	100

Toxicological Data on Ingredients: Ethyl alcohol 200 Proof: ORAL (LD50): Acute: 7060 mg/kg [Rat]. 3450 mg/kg [Mouse]. VAPOR (LC50): Acute: 20000 ppm 8 hours [Rat]. 39000 mg/m 4 hours [Mouse].

#### Section 3: Hazards Identification

#### Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

#### Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified PROVEN for human. DEVELOPMENTAL TOXICITY: Classified Development toxin [PROVEN]. Classified Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE]. The substance is toxic to blood, the reproductive system, liver, upper respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

#### Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

#### Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

#### Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

#### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

#### Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

#### Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

#### Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 363°C (685.4°F)

Flash Points: CLOSED CUP: 12.78°C (55°F). OPEN CUP: 17.78°C (64°F) (Cleveland).

Flammable Limits: LOWER: 3.3% UPPER: 19%

Products of Combustion: These products are carbon oxides (CO, CO2).

#### Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials.

#### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of heat, of oxidizing materials, of acids.

#### Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

#### Special Remarks on Fire Hazards:

Containers should be grounded. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME Vapor may travel considerable distance to source of ignition and flash back. May form explosive mixtures with air. Contact with Bromine pentafluoride is likely to cause fire or explosion. Ethanol ignites on contact with chromyl chloride. Ethanol ignites on contact with iodine heptafluoride gas. It ignites than explodes upon contact with nitrosyl perchlorate. Additon of platinum black catalyst caused ignition.

#### Special Remarks on Explosion Hazards:

Ethanol has an explosive reaction with the oxidized coating around potassium metal. Ethanol ignites and then explodes on contact with acetic anhydride + sodium hydrosulfate (ignites and may explode), disulfuric acid + nitric acid, phosphorous(III) oxide platinum, potassium-tert-butoxide+ acids. Ethanol forms explosive products in reaction with the following compound :

ammonia + silver nitrate (forms silver nitride and silver fulminate), iodine + phosphorus (forms ethane iodide), magnesium perchlorate (forms ethyl perchlorate), mercuric nitrate, nitric acid + silver (forms silver fulminate) silver nitrate (forms ethyl nitrate) silver (l) oxide + ammonia or hydrazine (forms silver nitride and silver fulminate), sodium (evolves hydrogen gas). Sodium Hydrazide + alcohol can produce an explosion. Alcohols should not be mixed with mercuric nitrate, as explosive mercuric fulminate may be formed. May form explosive mixture with manganese perchlorate + 2,2-dimethoxypropane. Addition of alcohols to highly concentrate hydrogen peroxide forms powerful explosives. Explodes on contact with calcium hypochlorite

#### Section 6: Accidental Release Measures

#### Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

#### Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

#### Section 7: Handling and Storage

#### Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

#### Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Do not store above 23°C (73.4°F).

#### Section 8: Exposure Controls/Personal Protection

#### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

#### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Use a respirator if the exposure limit is exceeded.

#### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

#### Exposure Limits:

TWA: 1900 (mg/m3) from OSHA (PEL) [United States] TWA: 1000 (ppm) from OSHA (PEL) [United States] TWA: 1900 (mg/ m3) from NIOSH [United States] TWA: 1000 (ppm) from NIOSH [United States] TWA: 1000 (ppm) [United Kingdom (UK)] TWA: 1920 (mg/m3) [United Kingdom (UK)] TWA: 1000 STEL: 1250 (ppm) [Canada]Consult local authorities for acceptable exposure limits.

#### Section 9: Physical and Chemical Properties

#### Physical state and appearance: Liquid. (Liquid.) Odor:

Mild to strong, rather pleasant; like wine or whiskey. Alcohol-like; Ethereal, vinous.

Taste: Pungent. Burning.

Molecular Weight: 46.07 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 78.5°C (173.3°F)

Melting Point: -114.1°C (-173.4°F)

Critical Temperature: 243°C (469.4°F)

Specific Gravity: 0.789 (Water = 1)

Vapor Pressure: 5.7 kPa (@ 20°C)

Vapor Density: 1.59 (Air = 1)

Volatility: Not available.

Odor Threshold: 100 ppm

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.3

lonicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

#### Solubility:

Easily soluble in cold water, hot water. Soluble in methanol, diethyl ether, acetone.

#### Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, heat, sources of ignition.

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

#### Special Remarks on Reactivity:

Ethanol rapidly absorbs moisture from the air. Can react vigorously with oxiders. The following oxidants have been demonstrated to undergo vigorous/explosive reaction with ethanol: barium perchlorate, bromine pentafluoride, calcium hypochlorite, chloryl perchlorate, chromium trioxide, chromyl chloride, dioxygen difluoride, disulfuryl difluoride, fluorine nitrate, hydrogen peroxide, iodine heptafluoride, nitric acid nitrosyl perchlorate, perchloric acid permanganic acid, peroxodisulfuric acid, potassium dioxide, potassium perchlorate, potassium permanganate, ruthenium(VIII) oxide, silver perchlorate, silver peroxide, uranium hexafluoride, uranyl perchlorate. Ethanol reacts violently/expodes with the following compounds: acetyl bromide (evolves hydrogen bromide) acetyl chloride, aluminum, sesquibromide ethylate, ammonium hydroxide & silver oxide, chlorate, chromic anhydride, cyanuric acid + water, dichloromethane + sulfuric acid + nitrate (or) nitrite, hydrogen peroxide, sulfuric acid, iodine + methanol + mercuric oxide, manganese perchlorate + 2,2-dimethoxy propane, perchlorates, permanganates + sulfuric acid, potassium superoxide, potassium tert-butoxide, silver & nitric acid, silver perchlorate, sodium hydrazide, sulfuric acid + sodium dichromate, tetrachlorisilane + water. Ethanol is also incompatible with platinium, and sodium. No really safe conditions exist under which ethyl alcohol and chlorine oxides can be handled. Reacts vigorously with acetyl chloride

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

#### Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3450 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 39000 mg/m3 4 hours [Mouse].

#### Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified PROVEN for human. DEVELOPMENTAL TOXICITY: Classified Development toxin [PROVEN]. Classified Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE]. Causes damage to the following organs: blood, the reproductive system, liver, upper respiratory tract, skin, central nervous system (CNS).

#### Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

#### Special Remarks on Toxicity to Animals:

Lowest Published Dose/Conc: LDL[Human] - Route: Oral; Dose: 1400 mg/kg LDL[Human child] - Route: Oral; Dose: 2000 mg/ kg LDL[Rabbit] - Route: Skin; Dose: 2000 mg/kg

#### Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenic) Causes adverse reproductive effects and birth defects (teratogenic), based on moderate to heavy consumption. May cause cancer based on animal data. Human: passes through the placenta, excreted in maternal milk.

#### Special Remarks on other Toxic Effects on Humans:

Acute potential health effects: Skin: causes skin irritation Eyes: causes eye irritation Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea, and alterations in gastric secretions. May affect behavior/central nervous system (central nervous system depression - amnesia, headache, muscular incoordination, excitation, mild euphoria, slurred speech, drowsiness, staggaring gait, fatigue, changes in mood/personality, excessive talking, dizziness, ataxia, somnolence, coma/ narcosis, hallucinations, distorted perceptions, general anesthetic), peripherial nervous system (spastic paralysis)vision (diplopia). Moderately toxic and narcotic in high concentrations. May also affect metabolism, blood, liver, respiration (dyspnea), and endocrine system. May affect respiratory tract, cardiovascular(cardiac arrhythmias, hypotension), and urinary systems. Inhalation: May cause irritation of the respiratory tract and affect behavior/central nervous system with symptoms similar to ingestion. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may casue dermatitis, an allergic reaction. Ingestion: Prolonged or repeated ingestion will have similiar effects as acute ingestion. It may also affect the brain.

#### Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 14000 mg/l 96 hours [Rainbow trout]. 11200 mg/l 24 hours [fingerling trout].

BOD5 and COD: Not available.

#### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

#### Section 13: Disposal Considerations

#### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

#### Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Ethanol UNNA: 1170 PG: II

#### Special Provisions for Transport: Not available.

#### Section 15: Other Regulatory Information

#### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Ethyl alcohol 200 Proof (in alcoholic beverages) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Ethyl alcohol 200 Proof (in alcoholic beverages) Connecticut hazardous material survey.: Ethyl alcohol 200 Proof Illinois toxic substances disclosure to employee act: Ethyl alcohol 200 Proof Rhode Island RTK hazardous substances: Ethyl alcohol 200 Proof Pennsylvania RTK: Ethyl alcohol 200 Proof Proof Florida: Ethyl alcohol 200 Proof Minnesota: Ethyl alcohol 200 Proof Massachusetts RTK: Ethyl alcohol 200 Proof Massachusetts spill list: Ethyl alcohol 200 Proof New Jersey: Ethyl alcohol 200 Proof TSCA 8(b) inventory: Ethyl alcohol 200 Proof

#### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

#### Other Classifications:

#### WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

#### DSCL (EEC):

R11- Highly flammable. S7- Keep container tightly closed. S16- Keep away from sources of ignition - No smoking.

#### HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

#### Personal Protection: E

#### National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

#### Specific hazard:

#### Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

#### Section 16: Other Information

#### References:

-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. HSDB, RTECS, and LOLI databases.







## Material Safety Data Sheet Hydrochloric acid MSDS

#### Section 1: Chemical Product and Company Identification Product Name: Hydrochloric acid Contact Information: Sciencelab.com, Inc. Catalog Codes: SLH1462, SLH3154 14025 Smith Rd. CAS#: Mixture. Houston, Texas 77396 US Sales: 1-800-901-7247 RTECS: MW4025000 International Sales: 1-281-441-4400 TSCA: TSCA 8(b) inventory: Hydrochloric acid Order Online: ScienceLab.com CI#: Not applicable. CHEMTREC (24HR Emergency Telephone), call: Synonym: Hydrochloric Acid; Muriatic Acid 1-800-424-9300 Chemical Name: Not applicable. International CHEMTREC, call: 1-703-527-3887 Chemical Formula: Not applicable. For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients			
Composition:			
Name	CAS #	% by Weight	
Hydrogen chloride	7647-01-0	20-38	
Water	7732-18-5	62-80	
Texted a leaf of here directly the descent ship idea (AAO // OSO). A set of 4704 sees 0.5 here (Dei)			

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

#### Section 3: Hazards Identification

#### Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

#### Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

#### Section 4: First Aid Measures

#### Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

#### Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

#### Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

#### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

#### Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

#### Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

#### Serious Ingestion: Not available.

#### Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

#### Special Remarks on Fire Hazards:

Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammable gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgCIO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

#### Section 6: Accidental Release Measures

#### Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

#### Large Spill:

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

#### Section 7: Handling and Storage

#### Precautions:

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

#### Section 8: Exposure Controls/Personal Protection

#### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

#### Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

#### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

#### Exposure Limits:

CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

#### Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

#### Boiling Point:

108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

#### Melting Point:

-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

#### Specific Gravity:

1.1- 1.19 (Water = 1) 1.10 (20% and 22% HCI solutions) 1.12 (24% HCI solution) 1.15 (29.57% HCI solution) 1.16 (32% HCI solution) 1.19 (37% and 38% HCI solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

#### Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:

Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

#### Corrosivity:

Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

#### Special Remarks on Reactivity:

Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the following can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

#### Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

#### Toxicity to Animals:

Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

#### Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

#### Other Toxic Effects on Humans:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

#### Special Remarks on Toxicity to Animals:

Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

#### Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (fetoxicity). May affect genetic material.

#### Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

#### Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

#### Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

#### Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

#### Section 15: Other Regulatory Information

#### Federal and State Regulations:

Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances: Hydrochloric acid: 5000 lbs. (2268 kg)

#### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

#### WHMIS (Canada):

CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

#### DSCL (EEC):

R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

#### HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

#### Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

#### References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 05:45 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.





Health2Fire1Reactivity0Personal<br/>ProtectionE

## Material Safety Data Sheet Lead acetate trihydrate MSDS

Section 1: Chemical Product and Company Identification		
Product Name: Lead acetate trihydrate	Contact Information:	
Catalog Codes: SLL1246, SLL1624	Sciencelab.com, Inc.	
CAS#: 6080-56-4	Houston, Texas 77396	
RTECS: OF8050000	US Sales: 1-800-901-7247	
TSCA: TSCA 8(b) inventory: No products were found.	International Sales: 1-281-441-4400	
Cl#: Not available.	CHEMTREC (24HR Emergency Telephone), call:	
Synonym: Lead Acetate; Lead (II) trihydrate; Acetic acid lead (II) selt trihydrate	1-800-424-9300	
Chaminal Names Land Appinio Tribudatio	International CHEMTREC, call: 1-703-527-3887	
Chemical Name: Lead Acetate Trinydrate	For non-emergency assistance, call: 1-281-441-4400	
Chemical Formula: Pb(CH3COO)2.3H2O		

# Section 2: Composition and Information on Ingredients Composition: Xame % by Weight Lead acetate trihydrate 6080-56-4 100

Toxicological Data on Ingredients: Lead acetate trihydrate: ORAL (LD50): Acute: 4665 mg/kg [Rat].

#### Section 3: Hazards Identification

#### Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

#### Potential Chronic Health Effects:

Hazardous in case of skin contact (permeator), of ingestion, of inhalation. CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. TERATOGENIC EFFECTS: Classified POSSIBLE for human. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE]. The substance may be toxic to blood, kidneys, the nervous system, the reproductive system, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

#### Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

#### Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

#### Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

#### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

#### Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. Seek medical attention.

#### Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

#### Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2). Some metallic oxides.

#### Fire Hazards in Presence of Various Substances:

Slightly flammable to flammable in presence of heat. Non-flammable in presence of shocks.

#### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

#### Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

#### Special Remarks on Explosion Hazards: Not available.

#### Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

#### Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

#### Precautions:

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

#### Section 8: Exposure Controls/Personal Protection

#### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

#### Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

#### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

#### Exposure Limits:

TWA: 0.05 (mg (Pb)/m) from OSHA (PEL) [United States] TWA: 0.15 (mg/m3) from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

#### Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid.)

Odor: Acetic (Slight.)

Taste: Not available.

Molecular Weight: 379.32 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: Decomposition temperature: 100°C (212°F)

Melting Point: 75°C (167°F)

Critical Temperature: Not available.

Specific Gravity: 2.55 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Soluble in cold water.

#### Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, and incompatible materials

Incompatibility with various substances: Reactive with acids.

Corrosivity: Not available.

Special Remarks on Reactivity: Incompatible with Bromates, Phenol Chloral Hydrate, sulfides, and acids.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

#### Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 4665 mg/kg [Rat].

#### Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. TERATOGENIC EFFECTS: Classified POSSIBLE for human. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE]. May cause damage to the following organs: blood, kidneys, the nervous system, the reproductive system, central nervous system (CNS).

#### Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

#### Special Remarks on Chronic Effects on Humans:

May affect genetic material based on animal data May cause cancer (tumorigenic) based on animal data. May cause adverse reproductive effects (female/male fertility and other female/male effects) and birth defects based on animal data. Passes through the placental barrier in animal. Excreted in maternal milk in animal.

#### Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause severe local irritation. Eyes: May cause local irritation or abrasion. Lead acetate can produce encrustation of the comea with direct eye exposure. Inhalation: Can be absorbed through the respiratory system. May cause respiratory tract irritation (local irritation of the bronchia, and lungs). Symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. Also see symptoms of ingestion. Ingestion: May cause gastrointestinal tract irritation. May affect behavior/brain, metabolism, liver, cardiovascular system, urinary system, and blood. Ingestion can result in lead colic, headache, abdominal cramps, nausea, muscle weakness, depression, "lead line" on the gums, metallic taste, loss of appetite, insomnia, dizziness, high lead levels in the blood and urine, with shock, coma and death in extreme cases. Chronic Potential Health Effects: Skin: May be absorbed through the skin on prolonged exposure. See symptoms of ingestion. Ingestion/Inhalation: The hallmarks of chronic lead poisoning are peripheral motor polyneuropathy, ANEMIA, KIDNEY DAMAGE, HYPERTENSION. Also see symptoms of acute poisoning.

#### Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

#### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

#### Special Remarks on the Products of Biodegradation: Not available.

#### Section 13: Disposal Considerations

#### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

#### Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Lead acetate UNNA: 1616 PG: III

Special Provisions for Transport: Marine Pollutant

#### Section 15: Other Regulatory Information

#### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Lead acetate trihydrate California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (female) which would require a warning under the statute: Lead acetate trihydrate California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Lead acetate trihydrate California prop. 65 (no significant risk level): Lead acetate trihydrate: 0.023 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Lead acetate trihydrate California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Lead acetate trihydrate Connecticut hazardous material survey .: Listed as Acetic Acid, lead (2+) Salt Illinois toxic substances disclosure: Listed as Acetic Acid, lead (2+) Salt Illinois chemical safety act: Listed as Acetic Acid, lead (2+) Salt New York release reporting list: Listed as Lead acetate Pennsylvania RTK: Listed as Acetic Acid, lead (2+) Salt Minnesota: Lead Acetate Massachusetts RTK: Listed as Lead acetate; Listed as Acetic Acid, Lead Salt Massachusetts spill list: Listed as Acetic Acid, lead Salt; Listed as Lead Acetate New Jersey: Listed as Lead acetate New Jersey spill list: Listed as Lead acetate Louisiana spill reporting: Listed as Acetic Acid, lead (2+) Salt; Listed as Lead Acetate; Listed as Acetic Acid, Lead Salt California Director's List of Hazardous Substances: Listed as Lead acetate SARA 313 toxic chemical notification and release reporting: Lead compounds CERCLA: Hazardous substances. Listed as Acetic Acid, lead (2+) Salt; Listed as Lead Acetate: 10 lbs. (4.536 kg)

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

#### Other Classifications:

#### WHMIS (Canada):

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

#### DSCL (EEC):

R33- Danger of cumulative effects. R48/22- Harmful: danger of serious damage to health by prolonged exposure if swallowed. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. R61- May cause harm to the unborn child. R62- Possible risk of impaired fertility. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S53- Avoid exposure - obtain special instructions before use. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

#### Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:56 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.





Health	2
Fire	1
Reactivity	0
Personal Protection	Е

## Material Safety Data Sheet Methyl red MSDS

## Section 1: Chemical Product and Company Identification

Product Name: Methyl red

Catalog Codes: SLM2305

CAS#: 493-52-7

RTECS: DG8960000

TSCA: TSCA 8(b) inventory: Methyl red

CI#: Not available.

Compositio

Synonym: C.I. Acid Red 2; Benzoic Acid, 2-((4-dimethylamino)phenyl)azo)-; 2-Carboxy-4'-(dimethylamino)azobenzene; 4'-Dimethylaminoazobenzene-2-carboxylic acid; C.I. 13020; C.I. Red 2; o-((p-(Dimethylamino)phenyl)azo)benzoic acid; p-(Dimethylamino)phenyl)azo)benzoic acid; Methyl Red, Neutral

Chemical Name: 2-((4-(Dimethylamino)phenyl)azo)benzoic acid

Chemical Formula: C15-H15-N3-O2

Contact Information:

Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396

US Sales: 1-800-901-7247 International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients		
n:		

Name	CAS #	% by Weight
Methyl red	493-52-7	100

Toxicological Data on Ingredients: Methyl red LD50: Not available. LC50: Not available.

#### Section 3: Hazards Identification

#### Potential Acute Health Effects:

Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation.

#### Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to liver. Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

#### Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

#### Serious Skin Contact: Not available.

#### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

#### Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

#### Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2), nitrogen oxides (NO, NO2...).

#### Fire Hazards in Presence of Various Substances:

Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

#### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

#### Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Special Remarks on Explosion Hazards: Not available.

#### Section 6: Accidental Release Measures

#### Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

#### Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

#### Section 7: Handling and Storage

#### Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Wear suitable protective clothing. If you feel unwell, seek medical attention and show the label when possible. Keep away from incompatibles such as oxidizing agents, reducing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

#### Section 8: Exposure Controls/Personal Protection

#### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

#### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

#### Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystals solid or Powdered solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 269.3 g/mole

Color: Violet or Red. Bluish-purple.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: 179°C (354.2°F) - 182 C

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: 9.3(Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Insoluble in cold water, hot water. Soluble in very hot acetone, benzene, chloroform, acetic acid, alcohol, lipids. Slightly soluble in petroleum ether.
## Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

#### Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

#### Toxicity to Animals:

LD50: Not available. LC50: Not available.

#### Chronic Effects on Humans:

CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: liver.

#### Other Toxic Effects on Humans:

Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant), of inhalation.

Special Remarks on Toxicity to Animals: Not available.

#### Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenic). May cause cancer based on animal test data. No adequate data found for humans.

#### Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: May cause eye irritation. This product contains an anionic dye. Similar dyes have not cause injury to cornea or conjunctivia in documented exposure cases with human or rabbit eyes. Inhalation: May cause respiratory tract and mucous membrane irritation. Ingestion: May cause gastrointestinal (digestive) tract disturbances. Chronic Potential Health Effects: Prolonged or repeated exposure may cause liver damage The toxicological properties of this substance have not been fully investigated.

#### Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

#### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

## Section 13: Disposal Considerations

#### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.





2

3

0

J

## **Material Safety Data Sheet** Petroleum ether MSDS

Product Name: Petroleum ether	Contact Information:
Catalog Codes: SLP3409, SLP1381, SLP5005	Sciencelab.com, Inc.
CAS#: 8032-32-4	Houston, Texas 77396
RTECS: OI6180000	US Sales: 1-800-901-7247
TSCA: TSCA 8(b) inventory: Petroleum ether	International Sales: 1-281-441-4400
CI#: Not applicable.	Order Online: ScienceLab.com
Synonym: Ligroine;	1-800-424-9300
Chemical Name: Not available.	International CHEMTREC, call: 1-703-527-3887
Chemical Formula: Not available.	For non-emergency assistance, call: 1-281-441-4400

Composition:					
	Name	CAS #	% by Weight		
	Petroleum ether	8032-32-4	100		

Toxicological Data on Ingredients: Petroleum ether LD50: Not available. LC50: Not available.

## Section 3: Hazards Identification

#### Potential Acute Health Effects:

....

Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

#### Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance may be toxic to skin, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

## Section 4: First Aid Measures

#### Eve Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Get medical attention.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

#### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

#### Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

#### Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

#### Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 288°C (550.4°F)

Flash Points: CLOSED CUP: Lower than -18°C (0°F).

Flammable Limits: LOWER: 1.1% UPPER: 5.9%

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Extremely flammable in presence of open flames and sparks.

#### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

#### Fire Fighting Media and Instructions:

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

#### Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

## Large Spill:

Flammable liquid, insoluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

#### Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible.

#### Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

## Section 8: Exposure Controls/Personal Protection

## Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

#### Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves (impervious).

#### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

#### Exposure Limits:

TWA: 300 from ACGIH (TLV) [United States] [1995] TWA: 1370 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

#### Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Slight.

Taste: Not available.

Molecular Weight: Not available.

Color: Clear Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 60°C (140°F)

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: 0.7 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.9 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water.

## Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

## Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

#### Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute toxicity of the vapor (LC50): 3400 4 hours [Rat].

Chronic Effects on Humans:

DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. May cause damage to the following organs: skin, eyes, central nervous system (CNS).

#### Other Toxic Effects on Humans:

Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

## Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

#### Section 13: Disposal Considerations

Waste Disposal:

## Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Petroleum distillate, n.o.s. (Ligroin) UNNA: UN1268 PG: II

Special Provisions for Transport: Not available.

## Section 15: Other Regulatory Information

#### Federal and State Regulations:

Pennsylvania RTK: Petroleum ether TSCA 8(b) inventory: Petroleum ether

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

## Other Classifications:

WHMIS (Canada): CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

#### DSCL (EEC):

R11- Highly flammable. R36- Irritating to eyes. R40- Possible risks of irreversible effects. R63- Possible risk of harm to the unborn child.

## HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: j

## National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 4

Reactivity: 0

Specific hazard:

## Protective Equipment:

Gloves (impervious). Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 01:40 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.







## Material Safety Data Sheet Phenol red MSDS

Section 1: Chemical Product and Company Identification			
Product Name: Phenol red	Contact Information:		
Catalog Codes: SLP1927, SLP3736	Sciencelab.com, Inc.		
CAS#: 143-74-8	Houston, Texas 77396		
RTECS: SJ7490000	US Sales: 1-800-901-7247		
TSCA: TSCA 8(b) inventory: Phenol red	International Sales: 1-281-441-4400		
CI#: Not available	Order Online: ScienceLab.com		
Synonym: Phenolsulfonphthalein	CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300		
Chemical Name: Not available.	International CHEMTREC, call: 1-703-527-3887		
Chemical Formula: C19H14O5S	For non-emergency assistance, call: 1-281-441-4400		

## Section 2: Composition and Information on Ingredients

## Composition:

Name	CAS #	% by Weight
Phenol red	143-74-8	100

Toxicological Data on Ingredients: Phenol red LD50: Not available. LC50: Not available.

## Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of eye contact (irritant), of ingestion. Slightly hazardous in case of skin contact (irritant, permeator), of inhalation.

### Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

## Section 4: First Aid Measures

#### Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

#### Skin Contact:

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

#### Ingestion:

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

## Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

#### Section 6: Accidental Release Measures

#### Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

#### Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

## Section 7: Handling and Storage

#### Precautions:

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing If you feel unwell, seek medical attention and show the label when possible.

#### Storage:

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

## Section 8: Exposure Controls/Personal Protection

#### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

## Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

## Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties
Physical state and appearance: Solid.
Odor: Not available.
Taste: Not available.
Molecular Weight: 354.38 g/mole
Color: Not available.
pH (1% soln/water): Not available.
Boiling Point: Not available.
Melting Point: Decomposes.
Critical Temperature: Not available.
Specific Gravity: Not available.
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Volatility: Not available.
Odor Threshold: Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicity (in Water): Not available.
Dispersion Properties: Not available.
Solubility: Very slightly soluble in cold water.
Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

## Section 11: Toxicological Information

Routes of Entry: Eye contact. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans: The substance is toxic to lungs, mucous membranes.

Other Toxic Effects on Humans:

Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant, permeator), of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

## Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

## Section 13: Disposal Considerations

Waste Disposal:

#### Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

## Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Phenol red

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

## Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 11:18 AM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.





Health Fire Reactivity Personal Protection

## Material Safety Data Sheet Phenolphthalin MSDS

Section 1: Chemical Product and Company Identification

Product Name: Phenolphthalin Catalog Codes: SLP4753 Synonyms:

## Contact Information:

Sciencelab.com, Inc. 14025 Smith Rd.

Houston, Texas 77396 US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

CAS#	Chemical Name	Percent	EINECS/ELINCS
81-90-3	Phenolphthalin	100.0	201-384-4

Hazard Symbols: None listed.

Risk Phrases: None listed.

## Section 3: Hazards Identification

EMERGENCY OVERVIEW: Appearance:

Target Organs: Kidneys, central nervous system, none.

Potential Health Effects: The toxicological properties of this material have not been investigated. Use appropriate procedures to prevent opportunities for direct contact with the skin or eyes and to prevent inhalation.

## Section 4: First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid. Get medical aid immediately.

Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water. Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Get medical aid if irritation or symptoms occur.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.

Notes to Physician: Treat symptomatically and supportively.

## Section 5: Fire and Explosion Data

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Use water spray to keep fireexposed containers cool. Containers may explode in the heat of a fire. This chemical poses an explosion hazard.

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For small fires, use water spray, dry chemical, carbon dioxide or chemical foam. Use water spray to cool fire-exposed containers. Water may be ineffective.

Flash Point: Not available.

Autoignition Temperature: Not available.

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: ; Flammability: ; Instability:

#### Section 6: Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Sweep up, then place into a suitable container for disposal.

## Section 7: Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

Storage: Not available.

## Section 8: Exposure Controls/Personal Protection

Engineering Controls: Good general ventilation should be sufficient to control airborne levels. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

#### Exposure Limits:

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Phenolphthalin	none listed	none listed	none listed

OSHA Vacated PELs: Phenolphthalin: No OSHA Vacated PELs are listed for this chemical.

## Personal Protective Equipment:

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

## Section 9: Physical and Chemical Properties

Physical State: Liquid

Appearance: light yellow

Odor: Not available.

pH: Not available.

Vapor Pressure: Not available.

Vapor Density: 2.1

Evaporation Rate: Not available.

Viscosity: Not available.

Boiling Point: Not available.

Freezing/Melting Point: Not available.

Decomposition Temperature: Not available.

Solubility: Insoluble.

Specific Gravity/Density: Not available.

Molecular Formula: C20H16O4

Molecular Weight: 320.33

## Section 10: Stability and Reactivity Data

Chemical Stability: Stable.

Conditions to Avoid: Incompatible materials.

Incompatibilities with Other Materials: Strong oxidizing agents.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, acrid smoke and fumes.

Hazardous Polymerization: Will not occur.

## Section 11: Toxicological Information

## RTECS#:

CAS#: 81-90-3 unlisted.

LD50/LC50: Not available.

Carcinogenicity: CAS# 81-90-3: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No information available.

Teratogenicity: No information available.

Reproductive Effects: No information available.

Neurotoxicity: No information available.

Mutagenicity: No information available.

Other Studies: No data available.

## Section 12: Ecological Information

## Section 13: Disposal Considerations

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14: Transport Information					
	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				No information available.
Hazard Class:					
UN Number:					
Packing Group:					

## Section 15: Other Regulatory Information

US FEDERAL:

TSCA: CAS# 81-90-3 is listed on the TSCA inventory.

Health & Safety Reporting List: None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules: None of the chemicals in this product are under a Chemical Test Rule.

Section 12b: None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule: None of the chemicals in this material have a SNUR under TSCA.

SARA:

CERCLA Hazardous Substances and corresponding RQs: None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances: None of the chemicals in this product have a TPQ.

SARA Codes: CAS # 81-90-3: acute, chronic, flammable.

Section 313: No chemicals are reportable under Section 313.

Clean Air Act: This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.

Clean Water Act: None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA. OSHA: None of the chemicals in this product are considered highly hazardous by OSHA.

STATE: CAS# 81-90-3 is not present on state lists from CA, PA, MN, MA, FL, or NJ. California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations:

European Labeling in Accordance with EC Directives:

Hazard Symbols: Not available.

Risk Phrases:

Safety Phrases: S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection): CAS# 81-90-3: No information available.

Canada - DSL/NDSL: CAS# 81-90-3 is listed on Canada's DSL List.

Canada - WHMIS: This product has a WHMIS classification of D2B.

Canadian Ingredient Disclosure List:

Exposure Limits:

## Section 16: Other Information

Created: 02/14/2005 10:16 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.





Health	3
Fire	0
Reactivity	2
Personal Protection	J

## Material Safety Data Sheet Sodium hydroxide MSDS

Section 1: Chemical Product and Company Identification				
Product Name: Sodium hydroxide	Contact Information:			
Catalog Codes: SLS3298, SLS1081, SLS2503, SLS3925, SLS1705	Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396			
CAS#: 1310-73-2 RTECS: WB4900000	US Sales: 1-800-901-7247 International Sales: 1-281-441-4400			
TSCA: TSCA 8(b) inventory: Sodium hydroxide	Order Online: ScienceLab.com			
Cl#: Not available.	CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300			
Synonym: Caustic Soda Chemical Name: Sodium Hydroxide	International CHEMTREC, call: 1-703-527-3887			
Chemical Formula: NaOH	For non-emergency assistance, call: 1-281-441-4400			
Section 2: Composition and Information on Ingredients				

Composition:				
	Name	CAS #	% by Weight	
	Sodium hydroxide	1310-73-2	100	

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available.

## Section 3: Hazards Identification

## Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

## Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to mucous membranes, upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

## Section 4: First Aid Measures

#### Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

#### Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

#### Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

#### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

#### Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

#### Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

#### Serious Ingestion: Not available.

## Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: metals

#### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

#### Fire Fighting Media and Instructions: Not available

#### Special Remarks on Fire Hazards:

sodium hydroxide + zinc metal dust causes ignition of the latter. Under proper conditions of temperature, pressure and state of division, it can ignite or react violently with acetaldehyde, ally alcohol, allyl chloride, benzene-1,4-diol, chlorine trifluoride, 1,2 dichlorethylene, nitroethane, nitromethane, nitroparaffins, nitropropane, cinnamaldehyde, 2,2-dichloro-3,3-dimethylbutane. Sodium hydroxide in contact with water may generate enough heat to ignite adjacent combustible materials. Phosphorous boiled with NaOH yields mixed phosphines which may ignite spontanously in air. sodium hydroxide and cinnamaldehyde + heat may cause ignition. Reaction with certain metals releases flammable and explosive hydrogen gas.

#### Special Remarks on Explosion Hazards:

Sodium hydroxide reacts to form explosive products with ammonia + silver nitrate. Benzene extract of allyl benzenesulfonate prepared from allyl alcohol, and benzene sulfonyl chloride in presence of aquesous sodium hydroxide, under vacuum distillation, residue darkened and exploded. Sodium Hydroxde + impure tetrahydrofuran, which can contain peroxides, can cause serious explosions. Dry mixtures of sodium hydroxide and sodium tetrahydroborate liberate hydrogen explosively at 230-270 deg. C. Sodium Hydroxide reacts with sodium salt of trichlorophenol + methyl alcohol + trichlorobenzene + heat to cause an explosion.

## Section 6: Accidental Release Measures

#### Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

#### Large Spill:

Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

#### Precautions:

Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, acids, alkalis, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic. Deliquescent.

## Section 8: Exposure Controls/Personal Protection

#### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

#### Personal Protection:

Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

#### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

#### Exposure Limits:

STEL: 2 (mg/m3) from ACGIH (TLV) [United States] TWA: 2 CEIL: 2 (mg/m3) from OSHA (PEL) [United States] CEIL: 2 (mg/ m3) from NIOSHConsult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Deliquescent solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 40 g/mole

Color: White.

pH (1% soln/water): 13.5 [Basic.] Boiling Point: 1388°C (2530.4°F)

Melting Point: 323°C (613.4°F)

Critical Temperature: Not available.

Specific Gravity: 2.13 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

## Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture, moist air

Incompatibility with various substances:

Highly reactive with metals. Reactive with oxidizing agents, reducing agents, acids, alkalis, moisture.

Corrosivity: Not available.

#### Special Remarks on Reactivity:

Hygroscopic. Much heat is evolved when solid material is dissolved in water. Therefore cold water and caution must be used for this process. Sodium hydroxide solution and octanol + diborane during a work-up of a reaction mixture of oxime and diborane in tetrahyrofuran is very exothermic, a mild explosion being noted on one occassion. Reactive with water, acids (mineral, non-oxidizing, e.g. hydrochloric, hydrofluoric acid, muriatic acid, phosphoric), acids (mineral, oxidizing e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic e.g. acetic acid, benzoic acid, formic acid, methanoic acid, oxalic acid), aldehydes (e.g. acetaldehyde, acrolein, chloral hydrate, foraldehyde), carbamates (e.g. carbanolate, carbofuran), esters (e.g. butyl acetate, ethyl acetate, propyl formate), halogenated organics (dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene), isocyanates (e.g. methyl isocyanate), ketones (acetone, acetophenone, MEK, MIBK), acid chlorides, strong bases, strong oxidizing agents, strong reducing agents, flammable liquids, powdered metals and metals (i.e aluminum, tin, zinc, hafnium, raney nickel), metals (alkali and alkaline e.g. cesium, potassium, sodium), metal compounds (toxic e.g. berylium, lead acetate, nickel carbonyl, tetraethyl lead), mitrides (e.g. potassium nitride, sodium nitride), nitriles (e.g. acetonitrile, methyl cyanide), nitro compounds (organic e.g. nitrobenzene, nitromethane), acetic anhydride, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, hydrosulfuric acid, oleum, propiolactone, acylonitrile, phorosous pentoxide, chlorosubenzene, cinnamaldehyde. Reacts with formaldehyde hydroxide to yield formic acid, and hydrogen.

Special Remarks on Corrosivity: Very caustic to aluminum and other metals in presence of moisture.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

#### Toxicity to Animals:

LD50: Not available. LC50: Not available.

#### Chronic Effects on Humans:

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. May cause damage to the following organs: mucous membranes, upper respiratory tract, skin, eyes.

#### Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

#### Special Remarks on Toxicity to Animals:

Lowest Published Lethal Dose: LDL [Rabbit] - Route: Oral; Dose: 500 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material. Investigation as a mutagen (cytogenetic analysis)

## Special Remarks on other Toxic Effects on Humans:

### Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

#### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

## Section 13: Disposal Considerations

#### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sodium hydroxide, solid UNNA: 1823 PG: II

Special Provisions for Transport: Not available.

## Section 15: Other Regulatory Information

#### Federal and State Regulations:

Illinois toxic substances disclosure to employee act: Sodium hydroxide Illinois chemical safety act: Sodium hydroxide New York release reporting list: Sodium hydroxide Rhode Island RTK hazardous substances: Sodium hydroxide Pennsylvania RTK: Sodium hydroxide Minnesota: Sodium hydroxide Massachusetts RTK: Sodium hydroxide New Jersey: Sodium hydroxide Louisiana spill reporting: Sodium hydroxide California Director's List of Hazardous Substances: Sodium hydroxide TSCA 8(b) inventory: Sodium hydroxide CERCLA: Hazardous substances.: Sodium hydroxide: 1000 lbs. (453.6 kg)

#### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

#### Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

## DSCL (EEC):

R35- Causes severe burns. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37/39- Wear suitable gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

## Protective Equipment:

Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:32 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.





## Material Safety Data Sheet Urea MSDS

Section 1: Chemical Product and Company Identification			
Product Name: Urea	Contact Information:		
Catalog Codes: SLU1063, SLU1132, SLU1093, SLU1162	Sciencelab.com, Inc.		
CAS#: 57-13-6	14025 Smith Rd. Houston, Texas 77396		
RTECS: YR6250000	US Sales: 1-800-901-7247		
TSCA: TSCA 8(b) inventory: Urea	International Sales: 1-281-441-4400 Order Online: ScienceLab.com		
Ciff. Net susible			
CI#: Not available.	CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300		
Synonym: Carbamide			
Chemical Name: carbonyldiamide	International CHEMTREC, call: 1-703-527-3887		
Chemical Formula: (NH2)2CO or CH4N2O	For non-emergency assistance, call: 1-281-441-4400		

## Section 2: Composition and Information on Ingredients

#### Composition:

Name	CAS #	% by Weight
Urea	57-13-6	100

Toxicological Data on Ingredients: Urea: ORAL (LD50): Acute: 8471 mg/kg [Rat]. 11000 mg/kg [Mouse].

### Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

#### Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, cardiovascular system. Repeated or prolonged exposure to the substance can produce target organs damage.

## Section 4: First Aid Measures

#### Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

#### Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

## Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

## Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

## Serious Inhalation: Not available.

#### Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

## Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2), nitrogen oxides (NO, NO2...).

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of heat.

#### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

#### Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

#### Section 6: Accidental Release Measures

#### Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

#### Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

## Section 7: Handling and Storage

#### Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice

immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

## Section 8: Exposure Controls/Personal Protection

## Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

## Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

## Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties			
Physical state and appearance: Solid. (Crystals solid.)			
Odor: Almost odorless; May gradually develop slight odor of ammonia, especially in presence of moisture.			
Taste: Cooling. Saline			
Molecular Weight: 60.06 g/mole			
Color: White.			
pH (1% soln/water): Not available.			
Boiling Point: Not available.			
Melting Point: 132.7°C (270.9°F)			
Critical Temperature: Not available.			
Specific Gravity: 1.323 (Water = 1)			
Vapor Pressure: Not applicable.			
Vapor Density: 2.07 (Air = 1)			
Volatility: Not available.			
Odor Threshold: Not available.			
Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -2.1			
Ionicity (in Water): Not available.			
Dispersion Properties: See solubility in water.			
Solubility: Easily soluble in cold water, hot water.			

## Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, excess dust generation, incompatible materials.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not available.

#### Special Remarks on Reactivity:

Hygroscopic. Aborbs moisture from air. Reacts violently with Gallum Perchlorate. Reacts with chlorine to form chloramines. It also reacts with the following: sodium hypochlorite, sodium nitrate, calcium hypochlorite, NaNO2, P2CI5, nitrosyl perchlorate, strong oxidizing agents (permanganate, nitrate, dichromate, chloride)

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

## Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 8471 mg/kg [Rat].

#### Chronic Effects on Humans:

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. May cause damage to the following organs: blood, cardiovascular system.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

## Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (fetotoxicity) and genetic material (mutagenicity) based on animal studies. Passes through the placental barrier in human and is present in breast milk.

#### Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes skin irritation. Eyes: Causes eye irritation. Inhalation: Causes irritation of the respiratory tract, nose, and throat, coughing and sneezing. May also affect blood, metabolsim and urinary system. Ingestion: Causes digestive (gastrointestinal) tract irritation with nausea, vomiting, and diarrhea. May affect behavior (altered sleep time, change in motor activity), cardiovascular system (heart rate), and the brain. May also affect the blood and may cause tumorigenic effects. Chronic Potential Health Effects: Prolonged exposure may cause adverse reproductive effects. Laboratory experiments on animals have resulted in mutagenic effects. Prolonged exposure or exposure at high concentrations may cause eve damage.

#### Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

## Section 13: Disposal Considerations

#### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

## Section 15: Other Regulatory Information

## Federal and State Regulations:

Minnesota: Urea TSCA 8(b) inventory: Urea

#### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

#### Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

#### DSCL (EEC):

R36/38- Irritating to eyes and skin. R40- Possible risks of irreversible effects. S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

#### Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

## Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:32 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

# ANNEX 7

Personal Protective Equipment provided by De Heus

PERSONAL PROTECTIVE EQUIPMENT PROVIDED BY DE HEUS			
No.	Types of PPE	Images	
1.	<ul> <li>Eye Protection</li> <li>Eye goggle – to prevent particulates, infectious fluids, chemicals from striking the eyes.</li> <li>Face shield - to protect entire face from impact hazard</li> </ul>	Eye goggles Face shield	
2.	<ul> <li>Respiratory protection</li> <li>Face Masks and Dust respirator – to prevent from the dust and any air borne hazards</li> </ul>	Face Mask     Dust respirator       Image: Construction of the second sec	
3.	<ul> <li>Head protection</li> <li>Hard hats - to protect the head from falling objects, impact with other objects, debris, rain and electric shock</li> </ul>	Hats for Production (orange)Image: Constraint of the second s	
4.	<ul> <li>Foot Protection</li> <li>Safety shoes – to protect the foot from falling objects or compression, to protect against punctures from below</li> </ul>	Safety Shoes	
5.	<ul> <li>Hand Protection</li> <li>Rubber gloves and latex gloves - to protect hands while performing tasks involving chemicals and electrical work</li> </ul>	Rubber gloves     Latex gloves       Image: Constraint of the second seco	
6.	<ul> <li>Body Protection</li> <li>Protective clothing – to prevent exposure to sharp knives, temperature extremes, contact with chemicals, contact with rough or abrasive surface</li> </ul>	Protective Clothing: Coveralls Safety Vests	