

**Thilawa Special Economic
Zone (Zone A) Development**

**Environmental Monitoring Report
(Operation Phase)**



**Myanmar Japan Thilawa
Development Limited.**

April 2019

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1. Executive Summary

The environmental inspection and compliance monitoring program will be implemented under the direction of Ministry of Natural Resources and Environmental Conservation with oversight by Thilawa SEZ Management Committee.

The monitoring record from April 2018 to September 2018 according to the Environment Monitoring Plan is submitted in conformity with the provision of Chapter 9.1, Table 9.1-2 and 9.2, Table 9.2-2 Content of the EIA Report of Thilawa SEZ Development Project (Zone A).

2. Summary of Monitoring Activities

- a) **Progress made to date on the implementation of the EMP against the submitted implementation schedule;**

We already submitted EMP for TSEZ Zone-A as following table.

Report No.	Description	Phase	Submission
1	Environmental Monitoring Report	Phase-1 Operation Phase	April, 2016
2	Environmental Monitoring Report	Phase-1 Operation Phase	October, 2016
3	Environmental Monitoring Report	Phase-1 & 2 Operation Phase	April, 2017
4	Environmental Monitoring Report	Phase-1 & 2 Operation Phase	October, 2017
5	Environmental Monitoring Report	Phase-1 & 2 Operation Phase	April, 2018
6	Environmental Monitoring Report	Phase-1 & 2 Operation Phase	October, 2018
7	Environmental Monitoring Report	Phase-1 & 2 Operation Phase	April, 2019

Report (No.7) is submitted this day attached with Operation Phase implementation schedule. Subsequent Operation Phase reports will be submitted on Bi-Annually.

- b) **Difficulties encountered in implementing of the EMP and recommendations for remedying those difficulties and steps proposed to prevent or avoid similar future difficulties;**

Required clear guideline for the reference and target standard of water (such as surface water, wastewater, ground water etc.) in order to report TSEZ discharging impact.

- c) **Number and type of non-compliance with the EMP and proposed remedial measures and timelines for completion of remediation;**

No.	Parameter	Type of Non-Compliance	Remedial Measures	Remarks
1	Suspended Solids	Exceed target value	Discussed with environmental consultant and expert for the monitoring points sources to	Refer to the attached report of water and wastewater quality report in appendix.
2				



No.	Parameter	Type of Non-Compliance	Remedial Measures	Remarks
	Total Coliform	Exceed target value	analysis the effect and impact	
	Iron	Exceed target value		

d) Accidents or incidents relating to the occupational and community health and safety, and the environment:

There were ten cases of minor accidents and two incidents happened during monitoring period at Thilawa SEZ common area. Each tenant's accidents will report directly to Environmental Section, One Stop Service Center, Thilawa SEZ Management Committee.

e) Monitoring data on environmental parameters and conditions as committed in the EMP or otherwise required.

Please refer to the attached Environmental Monitoring Form.

3. Monitoring Result

Environmental Monitoring plan report for Operation Phase implemented according to the following table, reference on Table 4.2-2, Chapter 4, EIA Report

Monitoring Plan (Operation Phase)

Category	Item	Location	Frequency	Remark
Air Quality	NO ₂ , SO ₂ , CO, TSP, PM ₁₀	Representative point inside TSEZ Zone-A area	1 week each in dry and wet season (First 3 years after operation stage)	August 2018, Air quality monitoring report (Bi-Annually)
Water Quality	Water temperature, pH, SS, DO, BOD, COD, T-coliform T-N, T-P, Color and odor, HS, HCN, Oil and grease, Formaldehyde, Phenols, Cresols Free Chlorine, Zinc, Chromium, Arsenic, Copper, Mercury, Cadmium, Barium, Selenium, Lead and Nickel	Discharging points and reference points (6 points) which including outflow of retention pond to the river (1 point) Well in the Monastery (1 point)	Bi-monthly for water, temperature, pH, SS, DO, BOD, COD, T-Coliform, T-N, T-P, Color and odor Bi-annually for all parameters	April 2018 and August 2018, Water and waste water quality monitoring report (Bi-Monthly) June 2018, Water and wastewater quality monitoring report (Bi-Annually)
Waste	Status of non-hazardous waste management Status of hazardous waste management	Each tenant	Twice/year (Submission of environmental reports by tenants)	General waste disposal record (Waste generated from common area of TSEZ and Admin complex)
Noise and Vibration	Noise level at the monastery and residences to check effect of buffer zone for sound proofing to	Each tenant	One time in each dry and wet season (First 3 years after operation stage)	August 2018, Noise and vibration Monitoring Report (Bi-Annually)
Ground Subsidence	Ground elevation Consumption of ground water amount	Representative site (1 point)	Weekly	Refer to Environmental Monitoring form
Offensive Odor	Status offensive odor control by tenants	Each tenant	Twice/year (Submission of environmental report by tenants)	Refer to Environmental Monitoring form
Bottom Sediment	Combined with water quality monitoring	Same as water quality monitoring	Same as water quality monitoring	Refer to Environmental Monitoring Form



Category	Item	Location	Frequency	Remark
Hydrological situation	Combined with ground subsidence monitoring	Same as ground subsidence monitoring	Same as ground subsidence monitoring	Refer to Environmental Monitoring Form
Risk for infectious disease such as AIDS/HIV	Status of measures of infectious disease	Each tenant	Twice/year (Submission of environmental report by tenants)	Refer to Environmental Monitoring form
Working conditions (including occupational safety)	Prehension of condition of occupational safety and health Prehension of infectious disease	Work site	Twice/year (Submission of environmental report by tenants)	
Accident	Existence of accident	Work site	As occasion arise	-

*Remark: Each locator will report their monitoring result directly to Environmental Section, One Stop Service Center, Thilawa SEZ Management Committee.





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**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Environment Monitoring Form

Environmental Monitoring Plan (Operation Phase)



Environment Monitoring Form

The latest results of the below monitoring items shall be submitted to Authorities on once at Pre-construction phase and on quarterly basis at Construction Phase, and on bi-annually base at Operation Phase. The items, standards to be applied, measurement points, and frequency for each monitoring parameter are established based on the EIA Report for Thilawa Special Economic Zone Development Project (Zone A). Should there be any changes to the original plan, such change shall be reviewed and evaluated by environmental expert.

(1) General
1) Phase of the Project

- Please mark the current phase.

Pre-Construction Phase

Construction Phase

Operation Phase

2) Obtainment of Environmental Permits (Not Applicable)

Name of permits	Expected issuance date	Actual issuance date	Concerned authority	Remarks (Conditions, etc.)
Confirming report of Environmental Impact Assessment		3 rd December 2013	Thilawa SEZ Management Committee	
Notification of the comments of Ministry of Natural Resources and Environmental Conservation regarding with the Standard Change of Wastewater Quality of Industrial Zone, Internal Regulations of Thilawa SEZ Zone-A and Zone-B	5 th January 2018	10 th January 2018	Thilawa SEZ Management Committee	As Attachment



3) Response/Actions to Comments and Guidance from Government Authorities and the Public (Not Applicable)

Monitoring Item	Monitoring Results during Report Period	Duration of Report Period	Frequency
Number and contents of formal comments made by the public		Same timing of submission of Monitoring Report	Upon receipt of comments/complaints
Number and contents of responses from Government agencies			

(2) Monitoring Results

1) Ambient/ Air Quality - February 2019

NO₂, SO₂, CO, TSP, PM10

Location	Item	Unit	Measured Value (Mean)	Measured Value (Min~Max.)	Country's Standard	Target value to be applied	*Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
Centralized Sewage treatment plant area	NO ₂ ¹	ppm	0.061	0.002 - 0.157	Refer to NEQG	< 0.06	Japan	1 week each in dry and wet season	HAZSCANNER, EPAS	
	SO ₂ ²	ppm	0.067	0.00 - 0.662		< 0.04	Japan		HAZSCANNER, EPAS	
	CO	ppm	0.235	0.00 - 0.663		< 10	Japan		HAZSCANNER, EPAS	
	TSP ³	mg/m ³	0.332	0.008 - 2.988		< 0.33	Thailand		HAZSCANNER, EPAS	
	PM10 ⁴	mg/m ³	0.121	0.003 - 1.087		< 0.12	Thailand		HAZSCANNER, EPAS	

*Remark: Referred to the Japan and Thailand Standard (EIA Report, Table 6.4-1) and Air Quality Monitoring Report (February 2019)

¹Remark: NO₂ is excess than target value due to expected reasons i) affected from the operation and construction activities of Zone A's locators ii) daily human activities in Moegyoe Swan Monastery Compound iii) running vehicle on Dagon-Thilawa road and transportation in and around the monitoring area.

***2Remark:** SO₂ is excess than target value due to expected reasons i) affected from the operation and construction activities of Zone A's locators ii) natural origin such as dust from unpaved vacant area iii) combustion of fuel for vehicles on Dagon-Thilawa road and transportation in and around the monitoring area.

***3Remark:** TSP is excess than target value due to expected reasons i) daily human activities in Moegyoe Swan Monastery Compound ii) running vehicle on Dagon-Thilawa road iii) construction activities of Zone A's locators iv) natural origin such as dust from vacant area v) transportation in and around the monitoring area.

***4Remark:** PM10 is excess than target value due to expected reasons i) daily human activities in Moegyoe Swan Monastery Compound ii) running vehicle on Dagon-Thilawa road iii) construction activities of Zone A's locators iv) natural origin such as dust from vacant area v) transportation in and around the monitoring area.

Complains from Residents

- Are there any complains from residents regarding air quality in this monitoring period? Yes, No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Complains from Residents	Countermeasures

2)(a) Water Quality - October 2018

Measuring Point: Effluent of Wastewater (Thilawa SEZ discharging point which need to be monitored according to EIA are SW-1, SW-5 and SW-6. SW-2, SW-3 and SW-4 natural creek water which are combine all the wastewater from the Local industrial water and domestic water from existing living environment are attach as reference points only. GW-1 is also as reference point for monitoring of existing tube well located in the Monastery compound.)

Are there any effluents to water body in this monitoring period? Yes, No

If yes, please attach "Analysis Record" and fill in the items not to comply with Refereed International Standard.





Location	Item	Unit	Measured Value	Country's Standard*6	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-1	pH	-	7.7	6-9	5.0-9.0	>=4	Once in two months	Instrument Analysis Method	
	SS ²	ppm	516	50	Max.50			APHA 2540D Method	
	DO	ppm	7.22	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	9.2	250	Max.70			APHA 5220D Method	
	BOD	ppm	3.2	50	Max.20			APHA-5210B Method	
	T-N	ppm	2	-	Max.80			HACH Method 10072	
	T-P	ppm	0.10	2	Max 8			APHA 4500-PE	
	Color	Co.Pt	2.78	-	-			APHA 2120C	
	Odor	Co.Pt	1	-	-	APHA 2150B			
Total coliforms ³	MPN/100ml	54,000	400	Max.400	7.5×10 ³	APHA 9221B			
SW-5	pH	-	8.9	6-9	5.0-9.0	>=4	Once in two months	Instrument Analysis Method	
	SS ²	ppm	180	50	Max.50			APHA 2540D Method	
	DO	ppm	9.36	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	11.7	250	Max.70			APHA 5220D Method	
	BOD	ppm	3.3	50	Max.20			APHA-5210B Method	
	T-N	ppm	6	-	Max.80			HACH Method 10072	
	T-P	ppm	0.07	2	-			APHA 4500-PE	
	Color	Co.Pt	2.85	-	-			APHA 2120C	
	Odor	Co.Pt	2	-	-	APHA 2150B			
Total coliforms ³	MPN/100ml	92,000	400	Max.400	7.5×10 ³	APHA 9221B			
SW-6	pH	-	7.1	6-9	5.0-9.0	>=4	Once in two	Instrument Analysis Method	

Location	Item	Unit	Measured Value	Country's Standard*6	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	SS	ppm	6	50	Max.50		months	APHA 2540D Method	
	DO	ppm	6.49	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	11.1	250	Max.70			APHA 5220D Method	
	BOD	ppm	0.99	50	Max.20			APHA-5210B Method	
	T-N	ppm	13	-	Max.80			HACH Method 10072	
	T-P	ppm	0.2	2	-			APHA 4500-PE	
	Color	Co.Pt	2.52	-	-	7.5×10 ³		APHA 2120C	
	Odor	Co.Pt	2	-	-			APHA 2150B	
	Total coliforms	MPN/100ml	<1.8	400	Max.400			APHA 9221B	
SW-2 (Reference Point)	pH	-	7.3	6-9	5.0-9.0			Instrument Analysis Method	
	SS ⁴	ppm	92	50	Max.50			APHA 2540D Method	
	DO	ppm	9.18	-	-	>=4		Instrument Analysis Method	
	COD(Cr)	ppm	13.9	250	Max.70			APHA 5220D Method	
	BOD	ppm	2.07	50	Max.20		Once in two months	APHA-5210B Method	
	T-N	ppm	7	-	Max.80			HACH Method 10072	
	T-P	ppm	0.11	2	-			APHA 4500-PE	
	Color	Co.Pt	7.05	-	-			APHA 2120C	
	Odor	Co.Pt	2	-	-			APHA 2150B	
	Total coliforms ⁵	MPN/100ml	> 160,000	400	Max.400			APHA 9221B	
SW-3 (Reference Point)	pH	-	7.1	6-9	5.0-9.0		Once in two months	Instrument Analysis Method	
	SS ⁴	ppm	206	50	Max.50	>=4		APHA 2540D Method	

Location	Item	Unit	Measured Value	Country's Standard*6	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	DO	ppm	5.24	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	14.5	250	Max.70			APHA 5220D Method	
	BOD	ppm	2.55	50	Max.20			APHA-5210B Method	
	T-N	ppm	4	-	Max.80			HACH Method 10072	
	T-P	ppm	0.16	2	-			APHA 4500-PE	
	Color	Co.Pt	4.91	-	-			APHA 2120C	
	Odor	Co.Pt	1.4	-	-			APHA 2150B	
	Total coliforms ⁵	MPN/100ml	>160,000	400	Max.400			APHA 9221B	
SW-4 (Reference Point)	pH	-	7.1	6-9	5.0-9.0			Instrument Analysis Method	
	SS ⁴	ppm	232	50	Max.50			APHA 2540D Method	
	DO	ppm	8.23	-	-	>=4		Instrument Analysis Method	
	COD(Cr)	ppm	9.4	250	Max.70		Once in two months	APHA 5220D Method	
	BOD	ppm	2.62	50	Max.20			APHA-5210B Method	
	T-N	ppm	3.0	-	Max.80			HACH Method 10072	
	T-P	ppm	0.1	2	-			APHA 4500-PE	
	Color	Co.Pt	3.9	-	-			APHA 2120C	
	Odor	Co.Pt	1.4	-	-			APHA 2150B	
	Total coliforms ⁵	MPN/100ml	92,000	400	Max.400			APHA 9221B	
GW-1 (Reference Point)	pH	-	7.8	None	None	5.5~9.0		Instrument Analysis Method	
	SS	ppm	4	(Available Guideline value	(Available Guideline	50	Once in two months	APHA 2540D Method	
	DO	ppm	7.65	value	Guideline	>=4		Instrument Analysis Method	

Location	Item	Unit	Measured Value	Country's Standard*6	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	COD(Cr)	ppm	6.6	determined by	Value	60		APHA 5220D Method	
	BOD	ppm	1.32	MONREC)	determined by	15		APHA-5210B Method	
	T-N	ppm	6.0		MOI)	0.1		HACH Method 10072	
	T-P	ppm	0.10			0.04		APHA 4500-PE	
	Color	Co.Pt	0.27					APHA 2120C	
	Odor	Co.Pt	1.4					APHA 2150B	
	Total coliforms	MPN/100ml	49			7.5×10 ⁵		APHA 9221B	

*1Remark: Referred to the Vietnam Standard (EIA Report), Reference to the Water Quality Monitoring Report, October 2018.

*2Remark: In SW-1 and SW-5, SS are higher than the target value due to the expected reason i) surface water run-off from bare land in Zone A ii) influence by water from the downstream of retention pond (SW-1) due to flow back by tidal fluctuation.

*3Remark: In SW-1 and SW-5, Total coliform are higher than the target value due to the expected reason-i) the potential expected reason might natural bacteria existed in all area of Zone-A because there are various kind of vegetation and creature such as birds, and small animals in and along the retention canals and retention ponds. Total coliform do not affect human health directly, self-monitoring for E.Coli analysis was carried out to identify health impact by coliform bacteria. As for the result of E.Coli for SW1 was 11 & SW5 was 46 and they were under the reference under target value. It is considered that there is no significant impact to human health.

*4 Remark: In SW-2, SW-3 and SW-4, the results of SS are higher than the target value due to the expected reason i) delivered from upstream area such as natural origin and wastewater from local industrial zone which outside of Thilawa SEZ ii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation.

*5Remark: For reference monitoring points (SW-2, SW-3 and SW-4), the result of total coliforms is higher than the standard due to two expected reason: i) runoff of animal waste from the undeveloped area and delivered from local industrial zone and illegal dumping site from outside of Thilawa SEZ in the upstream area ii) delivered from surrounding area by tidal effect. Total coliform do not affect human health directly, self-monitoring for E.Coli analysis was carried out to identify health impact by coliform bacteria. As for the result of E.Coli SW2 was 2, SW3 was 79 and SW-4 was 63 and they were under the reference under target value. It is considered that there is no significant impact to human



Remarks: There is no current country standard but Ministry of Natural Resources and Environmental Conservation submitted the National Emission Quality Guidelines (NEQG) for environmental guidelines. The guidelines filled as the country standards in the environmental monitoring form.

2)(b) Water Quality – December 2018

Measuring Point: Effluent of Wastewater

- Are there any effluents to water body in this monitoring period? Yes, No

If yes, please attach "Analysis Record" and fill in the items not to comply with Referred International Standard.

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-1	Temperature	°C	28	< 3 (increase)	Max 40		Twice in one year	Instrument Analysis Method	
	pH	-	7.4	6-9	5.0-9.0			Instrument Analysis Method	
	SS	mg/l	8	50	Max 50			APHA 2540D Method	
	DO	mg/l	7.93	-	-	>=4		Instrument Analysis Method	
	BOD	mg/l	4.88	50	Max 20			APHA-5210B Method	
	COD(Cr)	mg/l	17.1	250	Max 70*			APHA 5220D Method	
	Total Coliform ¹	MPN/10	540	400	Max 400	7.5×10 ³		APHA-9221B Method	
	T-N	0ml	3.9	-	Max 80			HACH Method 10072	
	T-P	mg/l	0.065	2	-			APHA 4500-P E Method	
	Color	mg/l	3.21	-	Max 150			APHA-2120C Method	
	Odor	Co.Pt	2	-	-			APHA-2150B Method	
	HS ¹²	Co Pt		1	Max 1			HACH 8131 Method	
Oil and Grease	mg/l	< 3.1	10	Max 5		APHA-5520B Method			

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-1	Formaldehyde	mg/l	0.015	-	Max 1		Twice in one year	USEPA Method 420.1 Method	
	Phenols	mg/l	< 0.1	0.5	Max 1			APHA 3120B	
	Free Chlorine	mg/l	< 0.1	0.2	Max 1			HACH 8131	
	Zinc	mg/l	≤ 0.002	2	Max 5			APHA-3120B Method	
	Chromium	mg/l	≤ 0.002	0.5	Max 0.5			APHA-3120B Method	
	Arsenic	mg/l	≤ 0.01	0.1	Max 0.25			APHA-3120B Method	
	Copper	mg/l	≤ 0.002	0.5	Max 1			APHA-3120B Method	
	Mercury	mg/l	≤ 0.002	0.01	Max 0.005			APHA-3120B Method	
	Cadmium	mg/l	≤ 0.001	0.1	Max 0.03			APHA-3120B Method	
	Barium	mg/l	0.03	-	Max 1			APHA-3120B Method	
	Selenium	mg/l	≤ 0.01	0.1	Max 0.02			APHA-3120B Method	
	Lead	mg/l	≤ 0.002	0.1	Max 0.2			APHA-3120B Method	
	Nickel	mg/l	0.002	0.5	Max 0.2			HACH 8027 Method	
	Cyanide	mg/l	< 0.002	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	0.010	1	Max 1			HACH 8131 Method	
	Iron	mg/l	0.276	3.5	Max 3.5			APHA 3120 B ICP Method	
	Total Dissolved Solids	mg/l	364	-	Max 2000			APHA 2540C Method	
Total Residual Chlorine	mg/l	< 0.1	-	Max 0.2		APHA 4500-CI G Method			
Chromium (Hexavalent)	mg/l	< 0.05	0.1	Max 0.1		Spectrometric Method			
Ammonia	mg/l	0.023	10	Max 10		HACH 10205 Method			
Fluoride	mg/l	1.231	20	Max 20		APHA 4110 B Method			





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Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	Silver		≤0.002	0.5	Max 0.5			APHA 3120 B ICP Method	
SW-5	Temperature	°C	29	< 3 (increase)	Max 40			Instrument Analysis Method	
	pH	-	8.9	6-9	5.0-9.0			Instrument Analysis Method	
	SS ²	mg/l	120	50	Max 50			APHA 2540D Method	
	DO	mg/l	9.05	-	-			Instrument Analysis Method	
	BOD	mg/l	12.6	50	Max 20			APHA-5210B Method	
	COD(Cr)	mg/l	27	250	Max 70*	>=4	Twice in one year	APHA 5220D Method	
	Total Coliform ³	MPN/10	92,000	400	Max 400			APHA-9221B Method	
	T-N	0ml	3	-	Max 80			HACH Method 10072	
	T-P	mg/l	0.117	2	-	7.5×10 ³		APHA 4500-P E Method	
	Color	mg/l	3.2	-	Max 150			APHA-2120C Method	
	Odor	Co.Pt	1.4	-	-			APHA-2150B Method	
SW-5	HS	Co Pt		1	Max 1			HACH 8131 Method	
	Oil and Grease	mg/l	<3.1	10	Max 5			APHA-5520B Method	
	Formaldehyde	mg/l	0.094	-	Max 1			USEPA Method 420.1 Method	
	Phenols	mg/l	0.18	0.5	Max 1			APHA 3120B	

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	Free Chlorine	mg/l	<0.1	0.2	Max 1		Twice in one year	HACH 8131	
	Zinc	mg/l	≤0.002	2	Max 5			APHA-3120B Method	
	Chromium	mg/l	≤0.012	0.5	Max 0.5			APHA-3120B Method	
	Arsenic	mg/l	≤0.01	0.1	Max 0.25			APHA-3120B Method	
	Copper	mg/l	≤0.002	0.5	Max 1			APHA-3120B Method	
	Mercury	mg/l	≤0.002	0.01	Max 0.005			APHA-3120B Method	
	Cadmium	mg/l	≤0.002	0.1	Max 0.03			APHA-3120B Method	
	Barium	mg/l	0.042	-	Max 1			APHA-3120B Method	
	Selenium	mg/l	≤0.01	0.1	Max 0.02			APHA-3120B Method	
	Lead	mg/l	≤0.002	0.1	Max 0.2			APHA-3120B Method	
	Nickel	mg/l	≤0.014	0.5	Max 0.2			HACH 8027 Method	
	Cyanide	mg/l	0.011	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	0.191	1	Max 1			HACH 8131 Method	
	Iron ²⁺	mg/l	5.346	3.5	Max 3.5			APHA 3120B ICP Method	
	Total Dissolved Solids	mg/l	182.2	-	Max 2000			APHA 2540C Method	
	Total Residual Chlorine	mg/l	0.1	-	Max 0.2			APHA 4500-CI G Method	
	Chromium (Hexavalent)	mg/l	< 0.5	0.1	Max 0.1		Spectrometric Method		
	Ammonia	mg/l	0.637	10	Max 10		HACH 10205 Method		
	Fluoride	mg/l	0.415	20	Max 20		APHA 4110 B Method		
	Silver	mg/l	≤ 0.002	0.5	Max 0.5		APHA 3120B ICP Method		
	Temperature	°C	27	< 3 (increase)	Max 40			Instrument Analysis Method	





Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-6	pH	-	6.6	6-9	5.0-9.0		Twice in one year	Instrument Analysis Method	
	SS	mg/l	4	50	Max 30			APHA 2540D Method	
	DO	mg/l	7.23	-	-	>=4		Instrument Analysis Method	
	BOD	mg/l	0.95	50	Max 20			APHA-5210B Method	
	COD(Cr)	mg/l	11	250	Max 70*			APHA 5220D Method	
	Total Coliform ⁺	MPN/10	35,000	400	Max 400	7.5×10 ³		APHA-9221B Method	
	T-N	0ml	13.7	-	Max 80			HACH Method 10072	
	T-P	mg/l	0.338	2	-			APHA 4500-P E Method	
	Color	mg/l	2.07	-	Max 150			APHA-2120C Method	
	Odor	Co.Pt	1	-	-			APHA-2150B Method	
	HS	-	-	1	Max 1		HACH 8131 Method		
	Oil and Grease	mg/l	< 3.1	10	Max 5		APHA-5520B Method		
	Formaldehyde	mg/l	0.004	-	Max 1		USEPA Method 420.1 Method		
	Phenols	mg/l	<0.1	0.5	Max 1		APHA 3120B	Twice in one year	
	Free Chlorine	mg/l	0.1	0.2	Max 1		HACH 8131		
	Zinc	mg/l	0.148	2	Max 5		APHA-3120B Method		
	Chromium	mg/l	≤ 0.002	0.5	Max 0.5		APHA-3120B Method		
	Arsenic	mg/l	≤ 0.01	0.1	Max 0.25		APHA-3120B Method		
	Copper	mg/l	≤ 0.002	0.5	Max 1		APHA-3120B Method		
	Mercury	mg/l	≤ 0.002	0.01	Max 0.005		APHA-3120B Method		
Cadmium	mg/l	≤ 0.002	0.1	Max 0.03		APHA-3120B Method			

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-6	Barium	mg/l	0.012	-	Max 1			APHA-3120B Method	
	Selenium	mg/l	≤ 0.01	0.1	Max 0.02			APHA-3120B Method	
	Lead	mg/l	0.006	0.1	Max 0.2			APHA-3120B Method	
	Nickel	mg/l	0.004	0.5	Max 0.2			HACH 8027 Method	
	Cyanide	mg/l	< 0.002	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	< 0.005	1	Max 1			HACH 8131 Method	
	Iron	mg/l	0.12	3.5	Max 3.5			APHA 3120B ICP Method	
	Total Dissolved Solids	mg/l	426	-	Max 2000			APHA 2540C Method	
	Total Residual Chlorine	mg/l	0.1	-	Max 0.2			APHA 4500-CI G Method	
	Chromium (Hexavalent)	mg/l	< 0.05	0.1	Max 0.5			Spectrometric Method	
	Ammonia	mg/l	< 0.007	10	Max 10			HACH 10205 Method	
	Fluoride	mg/l	1.557	20	Max 20			APHA 4110 B Method	
Silver			≤ 0.002	0.5	Max 0.5			APHA 3120B ICP Method	
SW-2 (Reference Point)	Temperature	°C	24	< 3 (increase)	Max 40			Instrument Analysis Method	
	pH	-	8.2	6-9	5.0-9.0			Instrument Analysis Method	
	SS	mg/l	46	50	Max 30			APHA 2540D Method	
	DO	mg/l	8.44	-	-	>=4		Instrument Analysis Method	
	BOD	mg/l	4.63	50	Max 20			APHA-5210B Method	
	COD(Cr)	mg/l	20	250	Max 70*			APHA 5220D Method	
	Total Coliform ^{mp}	MPN/10	160,000	400	Max 400	7.5×10 ⁵		APHA-9221B Method	
T-N	0ml	1.1	-	Max 80			HACH Method 10072		



Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-2 (Reference Point)	T-P	mg/l	< 0.05	2	-		Twice in one year	APHA 4500-P E Method	
	Color	mg/l	4.13	-	Max 150			APHA-2120C Method	
	Odor	Co.Pt	1.4	-	-			APHA-2150B Method	
	HS	-	-	1	Max 1			HACH 8131 Method	
	Oil and Grease	mg/l	< 3.1	10	Max 5			APHA-5520B Method	
	Formaldehyde	mg/l	0.028	-	Max 1			USEPA Method 420.1 Method	
	Phenols	mg/l	0.4	0.5	Max 1			APHA 3120B	
	Free Chlorine	mg/l	< 0.1	0.2	Max 1			HACH 8131	
	Zinc	mg/l	≤ 0.002	2	Max 5			APHA-3120B Method	
	Chromium	mg/l	≤ 0.002	0.5	Max 0.5		APHA-3120B Method		
	Arsenic	mg/l	≤ 0.01	0.1	Max 0.25		APHA-3120B Method		
	Copper	mg/l	≤ 0.002	0.5	Max 1		APHA-3120B Method		
	Mercury	mg/l	≤ 0.002	0.01	Max 0.005		APHA-3120B Method		
	Cadmium	mg/l	≤ 0.001	0.1	Max 0.03		APHA-3120B Method		
	Barium	mg/l	0.074	-	Max 1		APHA-3120B Method		
	Selenium	mg/l	≤ 0.01	0.1	Max 0.02		APHA-3120B Method		
	Lead	mg/l	≤ 0.002	0.1	Max 0.2		APHA-3120B Method		
	Nickel	mg/l	0.006	0.5	Max 0.2		HACH 8027 Method		
Cyanide	mg/l	0.003	1	Max 1		APHA 4500 CL G Method			
Sulphide	mg/l	0.033	1	Max 1		HACH 8131 Method			
Iron	mg/l	1.462	3.5	Max 3.5		APHA 3120B ICP Method			

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	Total Dissolved Solids ⁷	mg/l	2768	-	Max 2000			APHA 2540C Method	
	Total Residual Chlorine	mg/l	0.1	-	Max 0.2			APHA 4500-Cl G Method	
	Chromium (Hexavalent)	mg/l	< 0.05	0.1	Max 0.5			Spectrometric Method	
	Ammonia	mg/l	0.360	10	Max 10			HACH 10205 Method	
	Fluoride	mg/l	0.490	20	Max 20			APHA 4110 B Method	
	Silver	mg/l	≤ 0.002	0.5	Max 0.5			APHA 3120B ICP Method	
SW-3 (Reference Point)	Temperature	°C	24	< 3 (increase)	Max 40			Instrument Analysis Method	
	pH	-	8.1	6-9	5.0-9.0			Instrument Analysis Method	
	SS ⁵	mg/l	196	50	Max 30			APHA 2540D Method	
	DO	mg/l	8.35	-	-			Instrument Analysis Method	
	BOD	mg/l	3.55	50	Max 20			APHA-5210B Method	
	COD(Cr)	mg/l	16	250	Max 70 ⁴	≥4		APHA 5220D Method	
	Total Coliform ⁶	MPN/10	35,000	400	Max 400		Twice in one year	APHA-9221B Method	
	T-N	0ml	2.1	-	Max 80			HACH Method 10072	
	T-P	mg/l	< 0.05	2	-	7.5×10 ³		APHA 4500-P E Method	
	Color	mg/l	3.22	-	Max 150			APHA-2120C Method	
	Odor	Co.Pt	1	-	-			APHA-2150B Method	
	HS	-	-	1	Max 1			HACH 8131 Method	
	Oil and Grease	mg/l	< 3.1	10	Max 5			APHA-5520B Method	
	Formaldehyde	mg/l	0.014	-	Max 1			USEPA Method 420.1 Method	
	Phenols	mg/l	< 0.1	0.5	Max 1	3		APHA 3120B	





Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-3 (Reference Point)	Free Chlorine	mg/l	< 0.1	0.2	Max 1		Twice in one year	HACH 8131	
	Zinc	mg/l	≤ 0.002	2	Max 5			APHA-3120B Method	
	Chromium	mg/l	0.014	0.5	Max 0.5			APHA-3120B Method	
	Arsenic	mg/l	≤ 0.01	0.1	Max 0.25			APHA-3120B Method	
	Copper	mg/l	≤ 0.002	0.5	Max 1			APHA-3120B Method	
	Mercury	mg/l	≤ 0.002	0.01	Max 0.005			APHA-3120B Method	
	Cadmium	mg/l	≤ 0.002	0.1	Max 0.03			APHA-3120B Method	
	Barium	mg/l	≤ 0.002	-	Max 1			APHA-3120B Method	
	Selenium	mg/l	≤ 0.01	0.1	Max 0.02			APHA-3120B Method	
	Lead	mg/l	≤ 0.002	0.1	Max 0.2			APHA-3120B Method	
	Nickel	mg/l	0.022	0.5	Max 0.2			HACH 8027 Method	
	Cyanide	mg/l	0.015	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	0.05	1	Max 1			HACH 8131 Method	
	Iron ⁸	mg/l	9.232	3.5	Max 3.5			APHA 3120B ICP Method	
	Total Dissolved Solids ⁷	mg/l	3540	-	Max 2000			APHA 2540C Method	
	Total Residual Chlorine	mg/l	0.1	-	Max 0.2			APHA 4500-CI G Method	
Chromium (Hexavalent)	mg/l	< 0.05	0.1	Max 0.5		Spectrometric Method			
Ammonia	mg/l	0.055	10	Max 10		HACH 10205 Method			
Fluoride	mg/l	≤ 0.014	20	Max 20		APHA 4110 B Method			
Silver	mg/l	≤ 0.002	0.5	Max 0.5		APHA 3120B ICP Method			
SW-4	Temperature	°C	25	< 3 (increase)	Max 40			Instrument Analysis Method	

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
(Reference Point)	pH	-	8.2	6-9	5.0-9.0		Twice in one year	Instrument Analysis Method	
	SS ⁵	mg/l	154	50	Max 30			APHA 2540D Method	
	DO	mg/l	7.77	-	-	>=4		Instrument Analysis Method	
	BOD	mg/l	2.58	50	Max 20			APHA-5210B Method	
	COD(Cr)	mg/l	16	250	Max 70*			APHA 5220D Method	
	Total Coliform ⁶	MPN/10	35,000	400	Max 400	7.5×10 ⁵		APHA-9221B Method	
	T-N	0ml	1.6	-	Max 80			HACH Method 10072	
	T-P	mg/l	< 0.05	2	-			APHA 4500-P E Method	
	Color	mg/l	2.63	-	Max 150			APHA-2120C Method	
	Odor	Co.Pt	1.4	-	-			APHA-2150B Method	
	HS	-	-	1	Max 1			HACH 8131 Method	
	Oil and Grease	mg/l	< 3.1	10	Max 5			APHA-5520B Method	
	Formaldehyde	mg/l	0.022	-	Max 1			USEPA Method 420.1 Method	
	SW-4	Phenols	mg/l	0.17	0.5	Max 1			APHA 3120B
(Reference Point)	Free Chlorine	mg/l	< 0.1	0.2	Max 1		Twice in one year	HACH 8131	
	Zinc	mg/l	≤ 0.002	2	Max 5			APHA-3120B Method	
	Chromium	mg/l	0.008	0.5	Max 0.5			APHA-3120B Method	
	Arsenic	mg/l	≤ 0.01	0.1	Max 0.25			APHA-3120B Method	
	Copper	mg/l	≤ 0.002	0.5	Max 1			APHA-3120B Method	
	Mercury	mg/l	≤ 0.002	0.01	Max 0.005			APHA-3120B Method	
	Cadmium	mg/l	≤ 0.002	0.1	Max 0.03			APHA-3120B Method	



Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	Barium	mg/l	0.058	-	Max 1			APHA-3120B Method	
	Selenium	mg/l	≤ 0.01	0.1	Max 0.02			APHA-3120B Method	
	Lead	mg/l	≤ 0.002	0.1	Max 0.2			APHA-3120B Method	
	Nickel	mg/l	0.014	0.5	Max 0.2			HACH 8027 Method	
	Cyanide	mg/l	0.015	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	0.018	1	Max 1			HACH 8131 Method	
	Iron ⁸	mg/l	6.708	3.5	Max 3.5			APHA 3120B ICP Method	
	Total Dissolved Solids ⁷	mg/l	3592	-	Max 2000			APHA 2540C Method	
	Total Residual Chlorine	mg/l	0.1	-	Max 0.2			APHA 4500-CI G Method	
	Chromium (Hexavalent)	mg/l	< 0.005	0.1	Max 0.5			Spectrometric Method	
	Ammonia	mg/l	0.035	10	Max 10			HACH 10205 Method	
	Fluoride	mg/l	0.423	20	Max 20			APHA 4110 B Method	
	Silver		≤ 0.002	0.5	Max 0.5			APHA 3120B ICP Method	
GW-1 (Reference Point)	Temperature	°C	32	None	Max 40			Instrument Analysis Method	
	pH	-	7.7	(Available	5.0-9.0			Instrument Analysis Method	
	SS	mg/l	2	Guideline	Max 30			APHA 2540D Method	
	DO	mg/l	6.51	value	-	>=4	Twice in one	Instrument Analysis Method	
	BOD	mg/l	1.57	determined	Max 20		year	APHA-5210B Method	
	COD(Cr)	mg/l	7.2	by	Max 70 ⁴			APHA 5220D Method	
	Total Coliform ⁶	MPN/10	920	MONREC)	Max 400	7.5×10 ³		APHA-9221B Method	
	T-N	0ml	2.1		Max 80			HACH Method 10072	

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
GW-1 (Reference Point)	T-P	mg/l	0.09		-		Twice in one year	APHA 4500-P E Method	
	Color	mg/l	0		Max 150			APHA-2120C Method	
	Odor	Co.Pt	1.4		-			APHA-2150B Method	
	HS	-	-		Max 1			HACH 8131 Method	
	Oil and Grease	mg/l	< 3.1		Max 5			APHA-5520B Method	
	Formaldehyde	mg/l	0.015		Max 1			USEPA Method 420.1 Method	
	Phenols	mg/l	< 0.1		Max 1			APHA 3120B	
	Free Chlorine	mg/l	< 0.1		Max 1			HACH 8131	
	Zinc	mg/l	< 0.002		Max 5			APHA-3120B Method	
	Chromium	mg/l	≤ 0.002		Max 0.5			APHA-3120B Method	
	Arsenic	mg/l	≤ 0.01		Max 0.25			APHA-3120B Method	
	Copper	mg/l	≤ 0.002		Max 1			APHA-3120B Method	
	Mercury	mg/l	≤ 0.002		Max 0.005			APHA-3120B Method	
	Cadmium	mg/l	≤ 0.002		Max 0.03			APHA-3120B Method	
	Barium	mg/l	0.08		Max 1			APHA-3120B Method	
	Selenium	mg/l	≤ 0.01		Max 0.02			APHA-3120B Method	
	Lead	mg/l	≤ 0.002		Max 0.2			APHA-3120B Method	
Nickel	mg/l	≤ 0.002		Max 0.2		HACH 8027 Method			
Cyanide	mg/l	< 0.002		Max 1		APHA 4500 CL G Method			
Sulphide	mg/l	< 0.005		Max 1		HACH 8131 Method			
Iron	mg/l	0.474		Max 3.5		APHA 3120B ICP Method			



Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	Total Dissolved Solids	mg/l	1,602		Max 2000			APHA 2540C Method	
	Total Residual Chlorine	mg/l	< 0.1		Max 0.2			APHA 4500-Cl G Method	
	Chromium (Hexavalent)	mg/l	< 0.05		Max 0.5			Spectrometric Method	
	Ammonia	mg/l	2.150		Max 10			HACH 10205 Method	
	Fluoride	mg/l	0.059		Max 20			APHA 4110 B Method	
	Silver	mg/l	≤ 0.002		Max 0.5			APHA 3120B ICP Method	

*1Remark: Referred to the Vietnam Standard (EIA Report), Reference to the Water Quality Monitoring Report, December 2018.

*2Remark: In SW-5, suspended solids are higher than the target value due to the expected reason- i) surface water run-off from bare land in Zone A.

*3Remark: In SW-1 and SW-5, Total coliform are higher than the target value due to the expected reason- i) the potential expected reason might natural bacteria existed in all area of Zone A because there are various kinds of vegetation and creature such as birds and small animals in and along the retention canals and retention pond and ii) influence by water from the downstream of retention pond (SW-1). Total coliform do not affect human health directly, self-monitoring for E.Coli analysis was carried out to identify health impact by coliform bacteria. As for the result of E.Coli for SW1 was 4 & SW5 was 7.8 and they were under the reference under target value. It is considered that there is no significant impact to human health.

*4Remark: In SW-6, coliform was higher than target value due to incidental case because total coliform monitoring results in the previous month was complied with target value and we took countermeasure as additional monitoring. Result of additional monitoring was lower than target value (<1.8).

*5Remark: For reference monitoring points (SW-3 and SW-4), the result of suspended solids is higher than the target value due to two expected reason: i) delivered from upstream area such as natural origin and wastewater from the other industrial area outside of Thilawa SEZ and ii) influence by water from downstream of monitoring points due to flow back by tidal fluctuation.

*6Remark: For reference monitoring points (SW2, SW-3 and SW-4), the result of total coliform is higher than the target value due to two expected reason: i) runoff of animal waste from the undeveloped area and delivered from local industrial zone and illegal dumping site from outside of Thilawa SEZ in the upstream area ii) delivered from surrounding area by tidal effect. Total coliform do not affect human health directly, self-monitoring for E.Coli analysis was carried out to identify health impact by coliform bacteria. As for

the result of E.Coli for SW2 was 6.8, SW3 was 26 & SW4 was 32 and they were under the reference under target value. It is considered that there is no significant impact to human health.

^{*7}Remark: For reference monitoring points (SW-2, SW-3 and SW-4), the result of total dissolved solids is higher than the target value due to two expected reason: i) delivered from upstream area such as natural origin and wastewater from the other industrial area outside of Thilawa SEZ and ii) influence by water from downstream of monitoring points due to flow back by tidal fluctuation.

^{*8}Remark: For reference monitoring points (SW-3 and SW-4), the result of iron is higher than the target value due to the expected reason of natural origin (iron can reach out from the soil by run-off).

^{*9}Remark: In GW-1, Total coliform are higher than the target value due to the expected reason- i) the poor maintenance of well which can increase the risk of bacteria and other harmful organisms ii) the well was not operated regularly and didn't use for local people long time. Total coliform do not affect human health directly, self-monitoring for E.Coli analysis was carried out to identify health impact by coliform bacteria. As for the result of E.Coli for GW1 was 11 and it was under the reference under target value. It is considered that there is no significant impact to human health.

^{*10}Remark: In SW-5, iron result is higher than target value due to expected reason of natural origin (iron can reach out from the soil by run-off).

2)(c) Water Quality – Feb 2019

Measuring Point: Effluent of Wastewater

- Are there any effluents to water body in this monitoring period? Yes, No

If yes, please attach "Analysis Record" and fill in the items not to comply with Referred International Standard.

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-1	pH	-	7.5	6-9	5.0-9.0		Once in two months	Instrument Analysis Method	
	SS ²	ppm	640	50	Max.30			APHA 2540D Method	
	DO	ppm	6.58	-	-	>=4		Instrument Analysis Method	
	COD(Cr)	ppm	20	250	Max.70			APHA 5220D Method	



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Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	BOD	ppm	3.88	50	Max.20			APHA-5210B Method	
	T-N	ppm	13.1	-	Max.80			HACH Method 10072	
	T-P	ppm	0.26	2	-			APHA 4500-P E Method	
	Color	Co.Pt	4.61	-	-	7.5×10 ³		APHA 2120C Method	
	Odor	Co.Pt	1.4	-	-			APHA 2150B Method	
	Total coliforms ³	MPN/100ml	1,600	400	Max.400			APHA 9221B Method	
SW-5	pH	-	8.2	6-9	5.0-9.0			Instrument Analysis Method	
	SS ²	ppm	98	50	Max.30			APHA 2540D Method	
	DO	ppm	6.63	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	52	250	Max.70			APHA 5220D Method	
	BOD	ppm	4.08	50	Max.20	>=4	Once in two months	APHA-5210B Method	
	T-N	ppm	1.6	-	Max.80			HACH Method 10072	
	T-P	ppm	< 0.05	2	-			APHA 4500-P E Method	
	Color	Co.Pt	3.92	-	-			APHA 2120C Method	
	Odor	Co.Pt	2	-	-			APHA 2150B Method	
	Total coliforms	MPN/100ml	350	400	Max.400	7.5×10 ³		APHA 9221B Method	
SW-6	pH	-	7	6-9	5.0-9.0			Instrument Analysis Method	
	SS	ppm	2	50	Max.30	>=4	Once in two months	APHA 2540D Method	
	DO	ppm	7.14	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	19.6	250	Max.70			APHA 5220D Method	
	BOD	ppm	1.71	50	Max.20			APHA-5210B Method	

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	T-N	ppm	13.1	-	Max.80			HACH Method 10072	
	T-P	ppm	0.985	2	-	7.5×10 ³		APHA 4500-P E Method	
	Color	Co.Pt	1.86	-	-			APHA 2120C Method	
	Odor	Co.Pt	2	-	-			APHA 2150B Method	
	Total coliforms	MPN/100ml	< 1.8	400	Max.400			APHA 9221B Method	
SW-2 (Reference Point)	pH	-	7.8	6-9	5.0-9.0			Instrument Analysis Method	
	SS	ppm	28	50	Max.30			APHA 2540D Method	
	DO	ppm	3.97	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	119	250	Max.70			APHA 5220D Method	
	BOD	ppm	15.41	50	Max.20	>=4	Once in two months	APHA-5210B Method	
	T-N	ppm	1.9	-	Max.80			HACH Method 10072	
	T-P	ppm	0.289	2	-			APHA 4500-P E Method	
	Color	Co.Pt	21.86	-	-			APHA 2120C Method	
	Odor	Co.Pt	2	-	-			APHA 2150B Method	
	Total coliforms ⁵	MPN/100ml	>160,000	400	Max.400			APHA 9221B Method	
SW-3 (Reference Point)	pH	-	7.2	6-9	5.0-9.0			Instrument Analysis Method	
	SS ⁴	ppm	254	50	Max.30	>=4		APHA 2540D Method	
	DO	ppm	5.63	-	-		Once in two months	Instrument Analysis Method	
	COD(Cr)	ppm	27.5	250	Max.70			APHA 5220D Method	
	BOD	ppm	3.79	50	Max.20			APHA-5210B Method	
	T-N	ppm	9.1	-	Max.80			HACH Method 10072	



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Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	T-P	ppm	0.155	2	-			APHA 4500-P E Method	
	Color	Co.Pt	3.49	-	-			APHA 2120C Method	
	Odor	Co.Pt	2	-	-			APHA 2150B Method	
	Total coliforms ⁵	MPN/100ml	24,000	400	Max.400			APHA 9221B Method	
SW-4 (Reference Point)	pH	-	7.8	6-9	5.0-9.0			Instrument Analysis Method	
	SS ⁴	ppm	164	50	Max.30			APHA 2540D Method	
	DO	ppm	5.43	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	21.1	250	Max.70			APHA 5220D Method	
	BOD	ppm	2.89	50	Max.20	>=4	Once in two months	APHA-5210B Method	
	T-N	ppm	4.1	-	Max.80			HACH Method 10072	
	T-P	ppm	0.103	2	-			APHA 4500-P E Method	
	Color	Co.Pt	2.63	-	-			APHA 2120C Method	
	Odor	Co.Pt	2	-	-			APHA 2150B Method	
	Total coliforms ⁵	MPN/100ml	92,000	400	Max.400			APHA 9221B Method	
GW-1 (Reference Point)	pH	-	7.9		None	5.5~9.0		Instrument Analysis Method	
	SS	ppm	4	None	None	50		APHA 2540D Method	
	DO	ppm	5.71	(Available	(Available	>=4		Instrument Analysis Method	
	COD(Cr)	ppm	33.5	Guideline	Guideline	60	Once in two months	APHA 5220D Method	
	BOD	ppm	1.56	value	Value	15		APHA-5210B Method	
	T-N	ppm	2.5	determined by	determined by	-		HACH Method 10072	
	T-P	ppm	0.063	MONREC)	MOI)	-		APHA 4500-P E Method	

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	Color	Co.Pt	0.37			-		APHA 2120C Method	
	Odor	Co.Pt	1.4			-		APHA 2150B Method	
	Total coliforms	MPN/100ml	70			7.5×10 ³		APHA 9221B Method	

¹*Remark: Referred to the Vietnam Standard (EIA Report), Reference to the Water Quality Monitoring Report, Feb 2019.

²*Remark: In SW-1 and SW-5, suspended solids are higher than the standard due to the expected reason- i) surface water run-off from bare land in Zone A and ii) influence by water from the downstream of retention pond due to flow back by tidal fluctuation.

³*Remark: In SW1, Total coliform is higher than the standard due to the expected reason i) the potential expected reason might natural bacteria existed in all area of Zone A because there are various kinds of vegetation and creature such as birds, and small animals in and along the retention canals and retention ponds ii) the second suspect might influence by water from the downstream of retention pond (SW1). Total coliform do not affect human health directly, self-monitoring for E.Coli analysis was carried out to identify health impact by coliform bacteria. As for the result of E.Coli for SW1 was 4 and it was under the target value. It is considered that there is no significant impact to human health.

⁴*Remark: For reference monitoring points SW3 and SW-4, the result of suspended solids is higher than the standard due to two expected reason: i) delivered from upstream area such as natural origin and wastewater from the local industrial zone which outside of Thilawa SEZ and ii) influence by water from downstream of monitoring points due to flow back by tidal effect.

⁵*Remark: For reference monitoring points (SW-2, SW-3 and SW-4), the result of total coliforms is higher than the standard due to two expected reason: i) runoff of animal waste from the undeveloped area and delivered from local industrial zone and illegal dumping site from outside of Thilawa SEZ in the upstream area and ii) delivered from surrounding area by tidal effect. Total coliform do not affect human health directly, self-monitoring for E.Coli analysis was carried out to identify health impact by coliform bacteria. As for the result of E.Coli for SW2 was 4, SW3 was <1.8 & SW4 was 14 and they were under the reference under target value. It is considered that there is no significant impact to human health.



3) Soil Contamination (only operation phase)

Situations environmental report from tenants

- Are there any serious issues regarding soil contamination in this monitoring period? Yes, No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Issues on Soil Contamination	Countermeasures
Regular Soil Contamination Monitoring conducted and attached the Report in Appendix.	

4) Noise

Remarks: According to EIA report, Chapter 4- Table 4-2.2, monitoring plan is one time each in dry and wet season (First 3 years after operation stage). In the environmental monitoring report (Phase-1, operation phase) No.1, one time noise and vibration monitoring survey is finished as a record and there is no excess the standard in all of survey points. There is not much operation stage industry in current and monitoring will start after consult with environmental expert.

Noise Level (Along the Thilawa Development Road)

Location	Item	Unit	Measured Value (Mean)	Measured Value (Min~Max)	Country's Standard	Target value to be applied	*Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
NV-1	Leq (day)	dB(A)	58	57-59	N/A	75		One time each in dry and wet season	Sound Level Meter	
	Leq(eve)	dB(A)	57	52-56		70				

*Remark: Referred to the Target Noise Standard (Thilawa SEZ Zone-A EIA Report) and Reference to Noise and Vibration Monitoring Report (August 2018)

Noise Level (Living Environment)

Location	Item	Unit	Measured Value (Mean)	Measured Value (Min~Max)	Country's Standard	*Target value to be applied	Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
NV-2	Leq (day)	dB(A)	62	60-66	N/A	70		One time each in dry and wet season	Sound Level Meter	
	Leq(eve)	dB(A)	57	53-59		65				
	Leq(night)	dB(A)	53	44-57		60				
NV-3	Leq(day)	dB(A)	47	41-52	N/A	70			Sound level Meter	
	Leq(eve)	dB(A)	50	48-51		65				
	Leq(night)	dB(A)	45	41-49		60				

*Remark: Referred to the Target Noise Standard (Thilawa SEZ Zone-A EIA Report) and Reference to Noise and Vibration Monitoring Report (August 2018)

Complains from Residents

- Are there any complains from residents regarding noise in this monitoring period? Yes, No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Complains from Residents	Countermeasures

5) Solid Waste (Disposal from admin complex compound)

Measuring Point: Construction Site (Construction Phase), Storage for Sludge (Operation Phase)

- Are there any wastes of sludge in this monitoring period? Yes, No

If yes, please report the amount of sludge and fill in the results of solid waste management Activities.



Date	Description	No. of Kgs	Remarks
April 2018	General Waste Disposal	1880	Golden Dowa Eco-system Myanmar Co.,Ltd



No.	Date	Description	No. of Kgs	Remarks
2	October 2018	General Waste Disposal	2120	Golden Dowa Eco-system Myanmar Co.,Ltd
3	November 2018	General Waste Disposal	2100	Golden Dowa Eco-system Myanmar Co.,Ltd
4	December 2018	General Waste Disposal	1320	Golden Dowa Eco-system Myanmar Co.,Ltd
5	January 2019	General Waste Disposal	2300	Golden Dowa Eco-system Myanmar Co.,Ltd
6	February 2019	General Waste Disposal	2820	Golden Dowa Eco-system Myanmar Co.,Ltd
7	March 2019	General Waste Disposal	2260	Golden Dowa Eco-system Myanmar Co.,Ltd

Remark: Attached general waste disposal record (Admin Complex Compound) in appendix.

Remark: Admin complex compound waste disposal reported in the Operation phase, Environmental Monitoring Report because the waste from common area of Thilawa SEZ is storing in the admin complex trash storage. Each locator will submit according to ECPP approval for the waste disposal record directly to the Environmental Section, One Stop Service Center, Thilawa SEZ Management Committee.

6) (a) Ground Subsidence and Hydrology- October 2018

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
8-October-2018	-	m3/week	+7.136	m	Once a week	
15-October-2018	-	m3/week	+7.136	m		
22-October-2018	-	m3/week	+7.136	m		
31-October-2018	-	m3/week	+7.136	m		

* Remarks: Attached ground subsidence monitoring status (Operation Phase) in appendix. **There is no ground water consumption in Zone-A industrial area and will monitor and describe the water consumption quantity if using the tube well.**

(b) Ground Subsidence and Hydrology- November 2018

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
9-November-2018	-	m3/week	+7.136	m	Once a week	
16-November-2018	-	m3/week	+7.136	m		
23- November -2018	-	m3/week	+7.135	m		

* Remarks: Attached ground subsidence monitoring status (Operation Phase) in appendix.

(c) Ground Subsidence and Hydrology- Decemberr 2018

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
3-December-2018	-	m3/week	+7.135	m	Once a week	
13- December -2018	-	m3/week	+7.135	m		
20- December -2018	-	m3/week	+7.135	m		
27- December -2018	-	m3/week	+7.135	m		

* Remarks: Attached ground subsidence monitoring status (Operation Phase) in appendix.

(d) Ground Subsidence and Hydrology- January 2019

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
8-January-2019	-	m3/week	+7.135	m	Once a week	
19-January-2018	-	m3/week	+7.135	m		
26-January-2018	-	m3/week	+7.135	m		

* Remarks: Attached ground subsidence monitoring status (Operation Phase) in appendix.





(e) Ground Subsidence and Hydrology- February 2019

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
1-February-2019	-	m3/week	+7.135	m	Once a week	
8-February-2019	-	m3/week	+7.134	m		
15-February-2019	-	m3/week	+7.134	m		
29-February-2019	-	m3/week	+7.135	m		

* Remarks: Attached ground subsidence monitoring status (Operation Phase) in appendix.

(f) Ground Subsidence and Hydrology- March 2019

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
4-March-2019	-	m3/week	+7.135	m	Once a week	
16-March-2019	-	m3/week	+7.136	m		
23-March-2019	-	m3/week	+7.136	m		
30-March-2019	-	m3/week	+7.136	m		

* Remarks: Attached ground subsidence monitoring status (Operation Phase) in appendix.

7) Offensive Odor (only operation phase) Not Applicable at Construction Phase Report

Complaints from Residents

- Are there any complaints from residents regarding offensive odor in this monitoring period? Yes, No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Complaints from Residents	Countermeasures

Situations environmental report from tenants Not Applicable at Construction Phase Report

- Are there any serious issues regarding offensive odor in this monitoring period? Yes, No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Issues on Soil Contamination	Countermeasures

8) Infectious disease, Working Environment, Accident
Information from contractor (construction phase) or tenants (operation phase)

- Are there any incidents regarding Infectious disease, Working Environment, Accident in this monitoring period? Yes, No

If yes, please describe the contents of complains and its countermeasures to fill in below the table.

Contents of Incidents	Countermeasures
An accident was occurred on 15 th Oct 2018 at in front of Gate-2 outside road of Thilawa SEZ Zone-A. Car and motorbike were drove same direction but car was immediately turned to left side to enter canteen and crashed motorbike. No one got injury and car was little damaged.	"MjTD take the action as per following: - We called the Traffic Police and solved this accident.
An accident was occurred on 19 th November 2018 at front of A-21 site in Thilawa SEZ. Car was from Gate-2 to B-12 site and motorbike was A-21 to Gate-2 (Wrong way). So, car and motorbike were crashed face to face. Motorbike driver got leg injury and car and motorbike were damaged.	"MjTD take the action as per following: - We send the motorbike driver to Thanlyin Hospital.
An accident was occurred on 4 th Dec 2018 at Dagon Thilawa road (Dowa road Junction) outside area of Thilawa SEZ Zone-A. One motorbike was driven Dagon Thilawa road on straight and another motorbike was driven from Dowa road. And then, they crashed face to face. One of the motorbike rider was die and another was little injury. The two motorbikes were damaged. "	MjTD take the action as per following: - We called ambulance car and Traffic Police. - Send the injured persons to Thanlyin hospital.
An accident was occurred on 16 th Dec 2018 behind Plot A-17 on Dagon Thilawa road outside area of Thilawa SEZ Zone A. Long vehicle truck was from MITT and taxi car was from	MjTD take the action as per following: - Traffic Police arrived and solved it.





Contents of Incidents	Countermeasures
Aung Tha Pyay traffic point. They crashed face to face. No one get injury and both car were damaged. But taxi driver was run away.	- Traffic Police was carried the taxi car and long vehicle to police station. .
An accident was occurred on 24 th Jan 2019 at back side of Admin Building car parking in Thilawa SEZ Zone A. One car was come from sub gate to Admin Building and another car was going out from car parking. And then, they crashed. Nobody was not injury but one car was damaged.	MjTD take the action as per following: - Negotiate between two parties. - Remind to drive carefully in furture.
An accident was occurred on 25 th Jan 2019 one motorbike was happened the accident in front of Main Gate on Dagon Thilawa road outside area of Thilawa SEZ A. One person got injury.	MjTD take the action as per following: - We called ambulance car. - Send the injured persons to Thanlyin hospital.
An accident was occurred on 3 rd Feb 2019 two motorbikes were happened the accident in front of G&G store on Thilawa Development road outside area of Thilawa SEZ A. They drove same direction from Thilawa Development road. The two persons got small injury and two motorbikes were little damaged.	MjTD take the action as per following: - Negotiate between two parties. - Remind to drive carefully in furture and explained the traffic rule.
An accident was occurred on 8 th Feb 2019 a car and motorbike were happened the accident in front of WPP Junction. They drove same direction from Gate-2. A car showed his turning signal light (left side) but motorbike tried to overtake the left side. So, the motorbike was slipped.Two workers from motorbikes was little injury on hand and leg.	" MjTD take the action as per following: - Negotiate between two parties. - Remind to drive carefully in furture.
An accident was occurred on 19 th Mar 2019 motorbike and car accident case happened in front of Zone-A Gate-2. Motorbike was drove Thilawa Development road on straight line from Myanmar Marine University and car was drove from opposite direction and suddenly turned left for enter Gate-2. Two person from motorbike got injury.	MjTD take the action as per following: - We called ambulance car and Traffic Police. - Send the injured persons to Thanlyin hospital.

Note: If emergency incidents are occurred, the information shall be reported to the relevant organizations and authorities immediately.

End of Document

**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Appendix

Water and Waste Water Monitoring Report

October, 2018

**WATER QUALITY MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
IN THILAWA SEZ ZONE A
(OPERATION STAGE)**

(Bi-Monthly Monitoring)

October 2018

Myanmar Koei International Ltd.



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CHAPTER 1: INTRODUCTION

1.1 General

Thilawa Special Economic Zone (SEZ) is located in southern district of Yangon region and about 23 km southeast of Yangon city. As the developer of Thilawa SEZ, Myanmar Japan Thilawa Development Ltd. (MJTD) has a responsibility to carry out regular monitoring in the industrial area of Zone A in accordance with the approved Environmental Impact Assessment (EIA) report and Environmental Management Plan (EMP). MJTD has implemented monitoring various environmental items with the specified time frame to know the environmental conditions in and around the area. As for the monitoring of the water quality, total seven sampling points are set for water quality survey, named SW-1, SW-2, SW-3, SW-4, SW-5, SW-6, and GW-1 have been monitored in Thilawa SEZ and its surrounding area in timely manner. Among the seven locations, SW-1 and SW-5 are main discharging points of Thilawa SEZ and SW-6 is discharging from centralized Sewage Treatment Plant (STP) which is required to monitor by Environmental Monitoring Plan (EMoP) in EIA report of Thilawa SEZ Zone A. The remaining points SW-2, SW-3 and SW-4 are sampled as a reference monitoring for comparison with discharging points and baseline of discharged creek. Moreover, GW-1 is monitored as a reference of existing tube well which located in the monastery compound. Location of sampling points for water quality monitoring is shown in Figure 1.1-1.



Figure 1.1- 1 Location of Sampling Points of Water Quality Monitoring



CHAPTER 2: WATER QUALITY MONITORING

2.1 Monitoring Items

Sampling points and parameters for water quality monitoring are determined so as to cover the environmental monitoring plan of the EIA report.

Water quality sampling was carried out at seven locations. Among the seven locations, water flow measurement was carried out at four locations (SW-1, SW-4, SW-5 and SW-6) where can be measured by Current Meter. Monitoring items and sampling points are summarized in Table 2.1-1.

Table 2.1-1 Monitoring Items for Water Quality

No.	Parameters	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	GW-1	Remarks
1	pH	○	○	○	○	○	○	○	On-site measurement
2	Water temperature	○	○	○	○	○	○	○	On-site measurement
3	DO	○	○	○	○	○	○	○	On-site measurement
4	BOD (5)	○	○	○	○	○	○	○	Laboratory analysis
5	COD (Cr)	○	○	○	○	○	○	○	Laboratory analysis
6	Total nitrogen	○	○	○	○	○	○	○	Laboratory analysis
7	Suspended solids	○	○	○	○	○	○	○	Laboratory analysis
8	Total coliform	○	○	○	○	○	○	○	Laboratory analysis
9	Total phosphorous	○	○	○	○	○	○	○	Laboratory analysis
10	Color	○	○	○	○	○	○	○	Laboratory analysis
11	Odor	○	○	○	○	○	○	○	Laboratory analysis
12	Escherichia Coli (Self-monitoring)	○	○	○	○	○	○	○	Laboratory analysis
13	Flow Rate	○	-	-	○	○	○	-	On-site measurement

Source: Myanmar Koei International Ltd.

2.2 Description of Sampling Points

The outline of sampling points is mentioned in Table 2.2-1. The photos of conducting field survey at each sampling points are mentioned in Appendix-1.

Table 2.2-1 Outline of Sampling Points

No.	Station	Detailed Information
1	SW-1	Coordinate- N-16° 40' 13.5", E- 96° 16' 39.8"
		Location - Outlet of Retention Pond
		Survey Item – Surface water sampling and water flow rate measurement.
2	SW-2	Coordinate- N-16° 40' 20.69", E- 96° 17' 18.04"
		Location - Upstream of Shwe Pyauk Creek
		Survey Item – Surface water sampling.
3	SW-3	Coordinate- N-16° 40' 5.50", E- 96° 16' 41.60"
		Location - Upstream of Shwe Pyauk Creek, after mixing point of Thilawa SEZ Zone A and Zone B.
		Survey Item – Surface water sampling.
4	SW-4	Coordinate- N-16° 39' 42.84", E- 96° 16' 27.42"
		Location - Downstream of Shwe Pyauk Creek
		Survey Item – Surface water sampling and water flow rate measurement.
5	SW-5	Coordinate- N-16° 40' 10.7", E- 96° 16' 22.6"
		Location - Outlet of Retention Canal
		Survey Item – Surface water sampling and water flow rate measurement.
6	SW-6	Coordinate- N-16° 40' 27.13", E- 96° 16' 30.68"
		Location - Outlet from STP to Retention Pond
		Survey Item – Surface water sampling and water flow rate measurement.
7	GW-1	Coordinate- N-16° 40' 25.10", E- 96° 16' 31.70"
		Location - In Moegyoe Swan Monastery
		Survey Item – Ground Water Sampling

Source: Myanmar Koei International Ltd.



SW-1

SW-1 was collected at the discharge point of retention pond which is located in the east of Moegyoe Swan monastery. This drainage is flowing from north to south and then connected to the Shwe Pyauk creek through earth drain. The water quality of this monitoring point has been influenced by the water from downstream due to flow back by tidal fluctuation. In addition, it seems that a part of wastewater from monastery has reached to the culvert in the SEZ area and discharging to the retention pond.

SW-2 (Reference Point)

SW-2 was collected at the upstream of Shwe Pyauk creek. This sampling point is located at the southeast of Zone A area and at the south of Dagon-Thilawa road. The surrounding area are Zone B in the southwest and local industrial zone in the east respectively.

SW-3 (Reference Point)

SW-3 was collected at the upstream of Shwe Pyauk creek after mixing point of Zone A and Zone B, which is flowing from east to west and then entering into the Yangon River. The distance is about 1.2 km downstream of SW-2. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone B in the south and local industrial zone in the east respectively.

SW-4 (Reference Point)

SW-4 was collected at the downstream of Shwe Pyauk creek, after mixing of discharge water from local industrial zone, construction site of Zone B and Zone A, which is flowing from east to west and then entering into the Yangon River. The distance is about 820 m downstream of SW-3. This sampling point is located at southwest of Zone A area and at the south of Dagon-Thilawa road. The surrounding area are Zone B and local industrial zone in the east respectively.

SW-5

SW-5 was collected at retention canal near main gate of Thilawa SEZ. Most of the water collected in this canal is rain water and domestic wastewater from surrounding. This canal is also connected to the Shwe Pyauk creek. The water quality of this monitoring point may have been influenced by the water from downstream due to flow back by tidal fluctuation.

SW-6

SW-6 was collected at drain outlet of centralized STP which is located in the north of Moegyoe Swan monastery compound and retention pond (SW-1). Then the treated water is flowing to the retention pond.

GW-1 (Reference of Existing Tube Well)

GW-1 was collected from tube well as ground water sample. It is located in the compound of Moegyoe Swan monastery. The surrounding area are Zone A in the west, retention pond in the east and Dagon-Thilawa road in the south respectively.



2.3 Monitoring Method

All water samples were collected with cleaned sampling bottle and analyzed by the following standard method as shown in Table 2.3-1. All samples were kept in iced boxes keeping at 2-4° C and were transported to the laboratory. Among the parameters; water temperature, pH and DO were measured by the on-site instrument “Horiba, U-52” and water flow rate was also conducted by using the on-site instrument “Tamaya Digital Current Meter”.

Table 2.3-1 Analytic Method for Water Quality

No.	Parameter	Method
1	Water Temperature	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
2	pH	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
3	Dissolved oxygen (DO)	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
4	BOD (5)	APHA 5210 B (5 days BOD Test)
5	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)
6	Total nitrogen (T-N)	HACH Method 10072(TNT Persulfate Digestion Method)
7	Suspended solids (SS)	APHA 2540D (Dry at 103-105° C Method)
8	Total coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)
9	Total phosphorous (T-P)	APHA 4500-P E (Ascorbic Acid Method)
10	Color	APHA 2120C (Spectrophotometric Method)
11	Odor	APHA 2150 B (Threshold Odor Test)
12	Escherichia Coli	APHA 9221 F (Escherichia Coli Procedure Using Fluorogenic Substrate)
13	Flow Rate	Detection of Electromagnetic Elements (Real-time measurement by UC-200V Digital Current Meters)

Source: Myanmar Koei International Ltd.

2.4 Monitoring Period

Water quality and water flow rate monitoring were conducted on 16th October 2018 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon River, Myanmar on 16th August 2018 is shown in Table 2.4-2.

Table 2.4-1 Sampling Time of Each Station

No.	Station	Sampling Time
1	SW-1	16/10/2018 15:07
2	SW-2	16/10/2018 10:05
3	SW-3	16/10/2018 9:01
4	SW-4	16/10/2018 11:14
5	SW-5	16/10/2018 14:44
6	SW-6	16/10/2018 15:31
7	GW-1	16/10/2018 14:10

Source: Myanmar Koei International Ltd.



Table 2.4-2 Tide Record for Yangon River, Myanmar

Date	Time	Height	Tide Conditions
16/10/2018	03:11	1.77	Low Tide
	08:33	5.02	High Tide
	15:51	1.63	Low Tide
	21:25	4.61	High Tide

Source: Myanmar Port Authority, Tide Table for the Yangon River and Elephant Point, 2018.

2.5 Monitoring Results

Results of water quality monitoring are summarized in Table 2.5-1. Analytical results of the laboratory are described in Appendix-2. The results were compared with the target value of effluent water quality discharging to water body stipulated in the EIA report.

2.5.1 Results of Water Quality at the Outlet of Sewage Treatment Plant of industrial Area of Thilawa SEZ and at the Point before discharging to Creek

As the comparison with the target value, the results of suspended solid (SS) and total coliform were exceeded than the target values.

As for the result of SS, the result at the outlet of the centralized STP (SW-6) complied with the target value. It implied that effluents from each locator were treated well by the STP. On the other hand, results at the monitoring points of retention pond (SW-1) and retention canal (SW-5) before discharging to creek, exceeded the target value due to the expected reasons; i) for SW-1 and SW-5: surface water run-off from bare land in Zone A and ii) influence by water from the downstream of retention pond (SW-1) due to flow back by tidal fluctuation.

As for the result of total coliform of surface water, the result at the outlet of the centralized STP (SW-6) complied with the target value. It may prove that effluents from each locator was treated well by the STP. On the other hand, results at monitoring points of retention pond (SW-1) and retention canal (SW-5) exceeded the target value due to the expected reasons; i) the potential expected reason might natural bacteria existed in all area of Zone A because there are various kinds of vegetation and creature such as birds, and small animals in and along the retention canals and retention ponds and ii) the second suspect might be influence by water from the downstream of retention pond (SW-1).

Since the composition of the total coliform include bacteria from natural origin, and even after Total Coliform do not affect human health directly, self-monitoring for E. Coli analysis was carried out to identify health impact by coliform bacteria. As for the result of E.Coli of surface water, all of results were under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of retention pond (SW-1) and retention canal (SW-5), but it is considered that there is no significant impact on human health.

On the bases of the above examinations, the following actions shall be taken to monitor the impact on human health;

- To continue the self-monitoring for Escherichia coli (E. Coli) level to identify health impact by coliform bacteria (While result of Total coliform are exceeded the target value)

Perhaps, the possibility that water flowing through the retention canals might include overflowed water from some construction sites with insufficient treatment of coliform should not be excluded from the possible cause.



Table 2.5-1 Results of Water Quality Monitoring at Main Discharging Gates and Discharged from Centralized STP

No.	Parameters	Unit	SW-1	SW-5	SW-6	Target Value (Reference Value for Self-Monitoring)
1	Temperature	°C	34	34	31	≤ 35
2	pH	-	7.7	8.9	7.1	6.0-9.0
3	Suspended solid (SS)	mg/L	516.00	180.00	6.00	50
4	Dissolved oxygen (DO)	mg/L	7.22	9.36	6.49	-
5	BOD (5)	mg/L	3.20	3.30	0.99	30
6	COD (Cr)	mg/L	9.2	11.7	11.1	125
7	Total coliform	MPN/ 100ml	54,000	92,000	< 1.8	400
8	Total nitrogen (T-N)	mg/L	2.0	6.0	13	80
9	Total phosphorous (T-P)	mg/L	0.10	0.07	0.20	2
10	Color	TCU (True Color Unit)	2.78	2.85	2.52	150
11	Odor	TON (Threshold Odor Number)	1	2	2	-
12	Escherichia Coli	MPN/100ml	11.0	46.0	< 1.8	(1,000)* (CFU/100ml)
13	Flow Rate	m ³ /s	0.034	0.071	0.030	-

Note: Red color means exceeded value than target value.

*Note: Based on the water utilization at discharged creek, water quality C of quality standard for water baths in Japan, (Ministry of Environment, 1997) is set as a reference value for self-monitoring of E. coli for surface water monitoring. However, due to limitation of capacity for analytical laboratory in Myanmar, the method to analyze the "Colony Forming Unit (CFU)" is not available in Myanmar. Therefore, the results of "Most Probable Number (MPN)" are assumed similar to CFU values and compared with reference values. Once the method to analyze the CFU will be available in Myanmar, the analytical method will be changed.

According to the quality standard for water baths in Japan, (Ministry of Environment, 1997), in case of E.Coli result is exceeding 1,000 CFU/100 ml, since it is assumed unsafety, it is considered unsuitable for water baths.

Source: Myanmar Koei International Ltd.

2.5.2 Results of Reference Monitoring for Comparison with Discharging Points and Baseline of Discharged Creek

Results of water quality monitoring are summarized in Table 2.5-2. The results were compared with the target value of effluent water quality discharging to water body stipulated in the EIA report.

As the comparison with the target value, the results of Suspended Solid (SS) and total coliform were exceeded than the target value. As for the result of SS, results at the surface water monitoring points (SW-2, SW-3 and SW-4) exceeded the target value due to two expected reasons; i) delivered from upstream area such as natural origin and wastewater from local industrial zone which outside of Thilawa SEZ, and ii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation.

As for the result of total coliform of surface water, results at surface water monitoring points (SW-2, SW-3 and SW-4) exceeded the target value due to two expected reasons; i) runoff of animal waste from the developed area and delivered from local industrial zone and illegal dumping site from outside of Thilawa SEZ in the upstream area, and ii) delivered from surrounding area by tidal effect. In addition, the result of



E.Coli of surface water, all of results were under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of SW-2, SW-3 and SW-4, but it is considered that there is no significant impact on human health.

Table 2.5-2 Result of Water Quality Monitoring for Reference Monitoring Points for Comparison with Discharging Points and Baseline of Discharged Creek

No.	Parameters	Unit	SW-2	SW-3	SW-4	GW-1	Target Value (Reference Value for Self- Monitoring)
1	Temperature	°C	31	29	30	34	≤ 35
2	pH	-	7.3	7.1	7.1	7.8	6.0-9.0
3	Suspended solid (SS)	mg/L	92.00	206.00	232.00	4.00	50
4	Dissolved oxygen (DO)	mg/L	9.18	5.24	8.23	7.65	-
5	BOD (5)	mg/L	2.07	2.55	2.62	1.32	30
6	COD (Cr)	mg/L	13.9	14.5	9.4	6.6	125
7	Total coliform	MPN/ 100ml	>160,000	>160,000	92,000	49	400
8	Total nitrogen (T-N)	mg/L	7.0	4.0	3.0	6.0	80
9	Total phosphorous (T-P)	mg/L	0.11	0.16	0.10	0.10	2
10	Color	TCU (True Color Unit)	7.05	4.91	3.90	0.27	150
11	Odor	TON (Threshold Odor Number)	2	1.4	1.4	1.4	-
12	Escherichia Coli	MPN/100 ml* (SW)	2.0	79.0	63.0		(1,000)* (CFU/100ml)
		MPN/100 ml** (GW)				< 1.8	(100)** (MPN/100ml)
13	Flow Rate	m ³ /s	-	-	0.151	-	-

Note: Red colors means exceeded value than target value.

*Note: Based on the water utilization at discharged creek, water quality C of the quality standard for water baths in Japan, (Ministry of Environment, 1997) is set as a reference value of self-monitoring for surface water monitoring. However, due to limitation of capacity for analytical laboratory in Myanmar, the method to analyze the "Colony Forming Unit (CFU)" is not available in Myanmar. Therefore, the results of "Most Probable Number (MPN)" are assumed similar to CFU values and compared with reference values. Once the method to analyze the CFU will be available in Myanmar, the analytical method will be changed.

According to the quality standard for water baths in Japan, (Ministry of Environment, 1997), in case of E.Coli result is exceeding 1,000 CFU/100 ml, since it is assumed unsafety, it is considered unsuitable for water baths.

**Note: Based on the water utilization at monitoring point for ground water, B1(Irrigation water) of National Technical Regulation on Surface Water Quality in Vietnam (No. QCVN 08: 2008/BTNMT) is set as a reference value of self-monitoring for ground water monitoring.

Source: Myanmar Koei International Ltd.



CHAPTER 3: CONCLUSION AND RECOMMENDATIONS

As for the result of SS and total coliform the results at the outlet of the centralized STP (SW-6) complied with the target value of both of them. It may prove that effluent from each locator was treated well by the STP. On the other hand, parameters of SS, total coliform at retention pond (SW-1) and at retention canal (SW-5) were exceeded the target values in this period for main discharging points of Thilawa SEZ Zone A. In addition, according to the result of self-monitoring of E. coli at retention pond (SW-1) and at retention canal (SW-5), result were under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point SW-1 and SW-5, but it is considered that there is no significant impact on human health.

As for parameters of SS and total coliform in surface water were exceeded the target values at reference monitoring points. The expected reasons for exceeding the target values of SS are delivered from upstream area such as natural origin and wastewater from local industrial zone which outside of Thilawa SEZ. The expected reasons for exceeding the target values of total coliform are by natural origin (natural bacteria existed). As mentioned in Section 2.5.2, the result of self-monitoring of E. coli at SW-2, SW-3 and SW-4 were under the reference value. Therefore, although the target value of total coliform was exceeded at reference monitoring point, but it is considered that there is no significant impact on human health. However, it cannot reach to the conclusion of what is the reason to be exceeded the target values, thus the continuous monitoring and yearly trend analysis will be necessary to carry out based on the rainy and dry season data.

As for future subject for main discharging points of Thilawa SEZ Zone A, the following action may be taken to achieve the target levels of SS, total coliform and appropriate water quality monitoring:

- To continue monitoring Escherichia coli (E. coli) level to identify health impact by coliform bacteria; and
- To monitor the possibility of the overflow water from construction sites.
- To monitor the possibility of the domestic wastewater from construction sites.

End of the Document



APPENDIX-1 FIELD SURVEY PHOTOS



FOR DISCHARGING POINTS OF THILAWA SEZ ZONE A



Surface water sampling and onsite measurement at SW-1



Surface water sampling and onsite measurement at SW-5



Surface water sampling and onsite measurement at SW-6



**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGING POINTS AND BASELINE OF DISCHARGED CREEK**



Surface water sampling and onsite measurement at SW-2



Surface water sampling and onsite measurement at SW-3



Surface water sampling and onsite measurement at SW-4



Ground water sampling and onsite measurement at GW-1



APPENDIX-2 LABORATORY RESULTS



FOR DISCHARGING POINTS AND AFTER CENTRALIZED STP



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Lot No E1, Thilawa SEZ Zone A, Yangon Region, Myanmar.
Phone No Fax No: (+95) 1 2309051



Report No. : GEM-LAB-201811002
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001


Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkelapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-1-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810151 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018


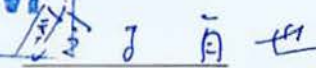
No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	516.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.20	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	9.2	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	2.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.10	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	54000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	2.78	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Assistant supervisor

Approved By :



Tomoya Suzuki
Director





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Report No. : GEM-LAB-201811003
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon. Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-5-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810152 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	180.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.30	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	11.7	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	6.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.07	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	2.85	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	2	0

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Assistant supervisor

Approved By :

Tomoya Suzuki
Director





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Report No. : GEM-LAB-201811004
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001


Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon. Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-6-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810153 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	6.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	0.99	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	11.1	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	13.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.20	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	< 1.8	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	2.52	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	2	0

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

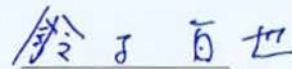
Analysed By :


Ni Ni Aye Lwin

Assistant supervisor



Approved By :


Tomoya Suzuki

Director



**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH DISCHARGING
POINTS AND BASELINE OF DISCHARGED CREEK**

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
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Report No. : GEM-LAB-201811005
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon. Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-2-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810154 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	92.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	2.07	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	13.9	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	7.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.11	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	> 160000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	7.05	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	2	0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.012	0.002

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

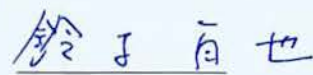
Analysed By :



Ni Ni Aye Lwin
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Report No. : GEM-LAB-201811006
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon. Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-3-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810155 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	206.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	2.55	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	14.5	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	4.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.16	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	> 160000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	4.91	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.4	0.0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.022	0.002

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
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Approved By :

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Report No. : GEM-LAB-201811007
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon. Myanmar.
Project Name : MJTD
Sample Description

Sample Name : MKI-SW-4-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810156 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	232.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	2.62	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	9.4	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	3.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.10	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	3.90	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.4	0.0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.022	0.002

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Assistant supervisor



Approved By :

Tomoya Suzuki
Director





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Report No. : GEM-LAB-201811010
Revision No. : 1
Report Date : 2 November, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description

Sample Name : MKI-GW-1-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810159 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	4.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	1.32	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	6.6	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	6.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.10	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	49	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	0.27	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.4	0

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin

Assistant supervisor



Approved By :

Tomoya Suzuki

Director



**APPENDIX-3 LABORATORY RESULT OF ESCHERICHIA COLI
(SELF-MONITORING)**



FOR DISCHARGING POINTS AND AFTER CENTRALIZED STP



GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
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Report No. : GEM-LAB-201810236
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-1-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810141 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	11.0	1.8

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Assistant supervisor



Approved By :


Kei Nagata
Senior Manager





GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No E1, Thilawa SEZ Zone A, Yangon Region, Myanmar.
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Report No. : GEM-LAB-201810237
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-5-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810142 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	46.0	1.8

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Assistant supervisor



Approved By :


Kei Nagata
Senior Manager





GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
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Report No. : GEM-LAB-201810238
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-6-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810143 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	< 1.8	1.8

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Assistant supervisor



Approved By :


Kei Nagata
Senior Manager



**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH DISCHARGING
POINTS AND BASELINE OF DISCHARGED CREEK**

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No E1, Thilawa SEZ Zone A, Yangon Region, Myanmar.
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Doc No: GEM-LB-R004E/00
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Report No. : GEM-LAB-201810239
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description

Sample Name : MKI-SW-2-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810144 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	2.0	1.8

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


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Doc No: GEM-LB-R004E/00
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Report No. : GEM-LAB-201810240
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-3-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810145 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	79.0	1.8

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

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Report No. : GEM-LAB-201810241
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-4-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810146 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	63.0	1.8

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

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Report No. : GEM-LAB-201810244
Revision No. : 1
Report Date : 30 October, 2018
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-GW-1-1016 Sampling Date : 16 October, 2018
Sample No. : W-1810149 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 16 October, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	< 1.8	1.8

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Assistant supervisor



Approved By :


Kei Nagata
Senior Manager



**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Appendix

Water and Waste Water Monitoring Report

December, 2018

**WATER QUALITY MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
IN THILAWA SEZ ZONE A
(OPERATION STAGE)**

(Bi-Annually Monitoring)

**December 2018
Myanmar Koei International Ltd.**



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CHAPTER 1: INTRODUCTION

1.1 General

Thilawa Special Economic Zone (SEZ) is located in southern district of Yangon region and about 23 km southeast of Yangon city. As the developer of Thilawa SEZ, Myanmar Japan Thilawa Development Ltd. (MJTD) has a responsibility to carry out regular monitoring in the industrial area of Zone A in accordance with the approved Environmental Impact Assessment (EIA) report and Environmental Management Plan (EMP). MJTD has implemented monitoring various environmental items with the specified time frame to know the environmental conditions in and around the area. As for the monitoring of the water quality, total seven sampling points are set for water quality survey, named SW-1, SW-2, SW-3, SW-4, SW-5, SW-6, and GW-1 have been monitored in Thilawa SEZ and its surrounding area in timely manner. Among the seven locations, SW-1 and SW-5 are main discharging points of Thilawa SEZ and SW-6 is discharging from centralized Sewage Treatment Plant (STP) which is required to monitor by Environmental Monitoring Plan (EMoP) in EIA report of Thilawa SEZ Zone A. The remaining points SW-2, SW-3 and SW-4 are sampled as a reference monitoring for comparison with discharging points and baseline of discharged creek. Moreover, GW-1 is monitored as a reference of existing tube well which located in the monastery compound. Location of sampling points for water quality monitoring is shown in Figure 1.1-1.



Figure 1.1-1 Location of Sampling Points of Water Quality Monitoring



CHAPTER 2: WATER QUALITY MONITORING

2.1 Monitoring Items

Sampling points and parameters for water quality monitoring are determined so as to cover the environmental monitoring plan of the EIA report.

Water quality sampling was carried out at seven locations. Among the seven locations, water flow measurement was carried out at two locations (SW-4 and SW-6) where can be measured by Current Meter. Monitoring items and sampling points are summarized in Table 2.1-1.

Table 2.1-1 Monitoring Items for Water Quality

No.	Parameters	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	GW-1	Remarks
1	pH	o	o	o	o	o	o	o	On-site measurement
2	Water Temperature	o	o	o	o	o	o	o	On-site measurement
3	DO	o	o	o	o	o	o	o	On-site measurement
4	BOD (5)	o	o	o	o	o	o	o	Laboratory analysis
5	COD (Cr)	o	o	o	o	o	o	o	Laboratory analysis
6	Total Nitrogen	o	o	o	o	o	o	o	Laboratory analysis
7	Suspended Solids	o	o	o	o	o	o	o	Laboratory analysis
8	Total Coliform	o	o	o	o	o	o	o	Laboratory analysis
9	Total Phosphorous	o	o	o	o	o	o	o	Laboratory analysis
10	Color	o	o	o	o	o	o	o	Laboratory analysis
11	Odor	o	o	o	o	o	o	o	Laboratory analysis
12	Oil and Grease	o	o	o	o	o	o	o	Laboratory analysis
13	Mercury	o	o	o	o	o	o	o	Laboratory analysis
14	Zinc	o	o	o	o	o	o	o	Laboratory analysis
15	Arsenic	o	o	o	o	o	o	o	Laboratory analysis
16	Chromium	o	o	o	o	o	o	o	Laboratory analysis
17	Cadmium	o	o	o	o	o	o	o	Laboratory analysis
18	Selenium	o	o	o	o	o	o	o	Laboratory analysis
19	Lead	o	o	o	o	o	o	o	Laboratory analysis
20	Copper	o	o	o	o	o	o	o	Laboratory analysis
21	Barium	o	o	o	o	o	o	o	Laboratory analysis
22	Nickel	o	o	o	o	o	o	o	Laboratory analysis
23	Cyanide	o	o	o	o	o	o	o	Laboratory analysis
24	Free Chlorine	o	o	o	o	o	o	o	Laboratory analysis
25	Sulphide	o	o	o	o	o	o	o	Laboratory analysis
26	Formaldehyde	o	o	o	o	o	o	o	Laboratory analysis
27	Phenol	o	o	o	o	o	o	o	Laboratory analysis
28	Iron	o	o	o	o	o	o	o	Laboratory analysis
29	Total Dissolved Solids	o	o	o	o	o	o	o	Laboratory analysis
30	Total Residual Chlorine	o	o	o	o	o	o	o	Laboratory analysis
31	Chromium (Hexavalent)	o	o	o	o	o	o	o	Laboratory analysis
32	Ammonia	o	o	o	o	o	o	o	Laboratory analysis
33	Fluoride	o	o	o	o	o	o	o	Laboratory analysis
34	Silver	o	o	o	o	o	o	o	Laboratory analysis
35	Escherichia Coli (Self-monitoring)	o	o	o	o	o	o	o	Laboratory analysis
36	Flow Rate	-	-	-	o	-	o	-	On-site measurement

Source: Myanmar Koei International Ltd.



2.2 Description of Sampling Points

The outline of sampling points is mentioned in Table 2.2-1. The photos of conducting field survey at each sampling points are mentioned in Appendix-1.

Table 2.2-1 Outline of Sampling Points

No.	Station	Detailed Information
1	SW-1	Coordinate- N-16° 40' 13.5", E- 96° 16' 39.8"
		Location - Outlet of Retention Pond
		Survey Item – Surface water sampling.
2	SW-2	Coordinate- N-16° 40' 20.69", E- 96° 17' 18.04"
		Location - Upstream of Shwe Pyauk Creek
		Survey Item – Surface water sampling.
3	SW-3	Coordinate- N-16° 40' 5.50", E- 96° 16' 41.60"
		Location - Upstream of Shwe Pyauk Creek, after mixing point of Thilawa SEZ Zone A and Zone B.
		Survey Item – Surface water sampling.
4	SW-4	Coordinate- N-16° 39' 42.84", E- 96° 16' 27.42"
		Location - Downstream of Shwe Pyauk Creek
		Survey Item – Surface water sampling and water flow rate measurement.
5	SW-5	Coordinate- N-16° 40' 10.7", E- 96° 16' 22.6"
		Location - Outlet of Retention Canal
		Survey Item – Surface water sampling.
6	SW-6	Coordinate- N-16° 40' 27.13", E- 96° 16' 30.68"
		Location - Outlet from STP to Retention Pond
		Survey Item – Surface water sampling and water flow rate measurement.
7	GW-1	Coordinate- N-16° 40' 25.10", E- 96° 16' 31.70"
		Location - In Moegyoe Swan Monastery
		Survey Item – Ground Water Sampling

Source: Myanmar Koei International Ltd.

SW-1

SW-1 was collected at the discharge point of retention pond which is located in the east of Moegyoe Swan monastery. This drainage is flowing from north to south and then connected to the Shwe Pyauk creek through earth drain. The water quality of this monitoring point has been influenced by the water from downstream due to flow back by tidal fluctuation. In addition, it seems that a part of wastewater from monastery has reached to the culvert in the SEZ area and discharging to the retention pond.

SW-2 (Reference Point)

SW-2 was collected at the upstream of Shwe Pyauk creek. This sampling point is located at the southeast of Zone A area and at the south of Dagon-Thilawa road. The surrounding area are Zone B in the southwest, local industrial zone in the east respectively.

SW-3 (Reference Point)

SW-3 was collected at the upstream of Shwe Pyauk creek, after mixing point of Zone A and Zone B, which is flowing from east to west and then entering into the Yangon river. The distance is about 1.2 km downstream of SW-2. This sampling point is located at south of Zone A area and Dagon-Thilawa road. The surrounding area are Zone B in the south, local industrial zone in the east respectively.



SW-4 (Reference Point)

SW-4 was collected at the downstream of Shwe Pyauk creek, after mixing of discharged water from local industrial zone, construction site of Zone B and Zone A, which is flowing from east to west and then entering into the Yangon river. The distance is about 820 m downstream of SW-3. This sampling point is located at southwest of Zone A area and at the south of Dagon-Thilawa road. The surrounding area are Zone B and local industrial zone in the east respectively.

SW-5

SW-5 was collected at retention canal near main gate of Thilawa SEZ. Most of the water collected in this canal is rain water and domestic wastewater from surrounding. This canal is also connected to the Shwe Pyauk creek. The water quality of this monitoring point may have been influenced by the water from downstream due to flow back by tidal fluctuation.

SW-6

SW-6 was collected at drain outlet of centralized STP which is located in the north of Moegyoe Swan monastery compound and retention pond (SW-1). Then the treated water is flowing to the retention pond.

GW-1 (Reference of Existing Tube Well)

GW-1 was collected from tube well as ground water sample. It is located in the compound of Moegyoe Swan monastery. The surrounding area are Zone A in the west, retention pond in the east and Dagon-Thilawa road in the south respectively.



2.3 Monitoring Method

All water samples were collected with cleaned sampling bottles and analyzed by the following standard method as shown in Table 2.3-1. All samples were kept in iced boxes keeping at 2-4° C and were transported to the laboratory. Among the parameters; water temperature, pH and DO were measured by the on-site instrument “Horiba, U-52” and water flow rate was also conducted by using the on-site instrument “Tamaya Digital Current Meter”.

Table 2.3-1 Analytic Method for Water Quality

No.	Parameter	Method
1	Temperature	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
2	pH	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
3	Suspended Solids (SS)	APHA 2540 D (Dry at 103-105°C Method)
4	Dissolved Oxygen (DO)	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
5	BOD (5)	APHA 5210 B (5 Days BOD Test)
6	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)
7	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)
8	Total Nitrogen (T-N)	HACH Method 10072(TNT Persulfate Digestion Method)
9	Total Phosphorous (T-P)	APHA 4500-P E (Ascorbic Acid Method)
10	Color	APHA 2120C (Spectrophotometric Method)
11	Odor	APHA 2150 B (Threshold Odor Test)
12	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)
13	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
14	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
15	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
16	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
17	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
18	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
19	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
20	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
21	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
22	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
23	Cyanide	HACH 8027 (Pyridine-Pyrazalone Method)
24	Free Chlorine	APHA 4500-Cl G (DPD Colorimetric Method)
25	Sulphide	HACH 8131 (USEPA Methylene Blue Method)
26	Formaldehyde	HACH 8110 (MBTH Method)
27	Phenols	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4-AAP With Distillation)
28	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
29	Total Dissolved Solids	APHA 2540C (Total Dissolved Solids Dried at 180°C Method)
30	Total Residual Chlorine	APHA 4500-Cl G (DPD Colorimetric Method)
31	Chromium (Hexavalent)	ISO 11083:1994 (Determination of chromium (VI) Spectrometric method using 1,5-diphenylcarbazide)
32	Ammonia	HACH Method 10205 (Silicylate TNT Plus Method)
33	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)
34	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)
35	Escherichia Coli	APHA 9221 F (Escherichia Coli Procedure Using Fluorogenic Substrate)
36	Flow Rate	Detection of Electromagnetic Elements (Real-time measurement by UC-200V Digital Current Meters)

Source: Myanmar Koei International Ltd.



2.4 Monitoring Period

Water quality and water flow rate monitoring were conducted on 26 December 2018 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon river, Myanmar on 26 December 2018 is shown in Table 2.4-2.

Table 2.4-1 Sampling Time of Each Station

No.	Station	Sampling Time
1	SW-1	26/12/2018 14:42
2	SW-2	26/12/2018 09:49
3	SW-3	26/12/2018 08:51
4	SW-4	26/12/2018 10:43
5	SW-5	26/12/2018 15:07
6	SW-6	26/12/2018 14:20
7	GW-1	26/12/2018 15:42

Source: Myanmar Koei International Ltd.

Table 2.4-2 Tide Record for Yangon River, Myanmar

Date	Time	Height	Tide Conditions
26/12/2018	01:56	0.66	Low Tide
	06:31	5.78	High Tide
	14:46	0.38	Low Tide
	19:11	5.38	High Tide

Source: Myanmar Port Authority, Tide Table for the Yangon River and Elephant Point, 2018.

2.5 Monitoring Results

Results of water quality monitoring are summarized in Table 2.5-1. Analytical results of the laboratory are described in Appendix-2 and Appendix-3. The results were compared with the target value of effluent water quality discharging to water body stipulated in the EIA report.

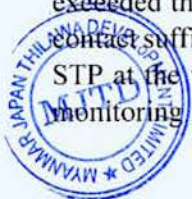
2.5.1 Results of Water Quality at the Outlet of Sewage Treatment Plant of Industrial Area of Thilawa SEZ and at the Point Before Discharging to Creek

(1) Results of Bi Annually Monitoring

As the comparison with the target value, the results of suspended solid (SS), total coliform and iron were exceeded than the target values.

As for the result of SS, the result at the retention pond (SW-1) and the outlet of the centralized STP (SW-6) complied with the target value. The outlet of the centralized STP (SW-6) implied that effluents from each locator were treated well by the STP. On the other hand, results at the monitoring points of retention canal (SW-5) before discharging to creek, exceeded the target value due to the expected reason; surface water run-off from bare land in Zone A.

As for the result of total coliform of surface water, the result at the outlet of the centralized STP (SW-6) exceeded the target value. A possible reason for exceeding the target value is that retained water did not contact sufficiently with chlorine in the chlorine injection tank before discharging to outlet of the centralized STP at the time of sampling. Besides, this exceeding event is incidental case because the total coliform monitoring results in the previous monitoring months complied with the target value. Thus, the impact on



total coliform to the surrounding area is not expected. The results at the monitoring points retention pond (SW-1) and retention canal (SW-5) exceeded the target value due to the expected reasons: i) the potential expected reason might natural bacteria existed in all area of Zone A because there are various kinds of vegetation and creature such as birds, and small animals in and along the retention canal and retention pond and ii) the second suspect might be influence by water from the downstream of retention pond (SW-1).

Since the composition of the total coliform include bacteria from natural origin, and even after total coliform do not affect human health directly, self-monitoring for E. Coli analysis was carried out to identify health impact by coliform bacteria. As for the result of E. Coli of surface water, all of results were under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of retention pond (SW-1), retention canal (SW-5) and the centralized STP (SW-6) but it is considered that there is no significant impact on human health.

On the bases of the above examinations, the following actions shall be taken to monitor the impact on human health;

-To continue the self-monitoring for Escherichia coli (E. Coli) level to identify health impact by coliform bacteria (while result of total coliform are exceeded the target value)

Perhaps, the possibility that water flowing through the retention canals might include overflowed water from some construction sites with insufficient treatment of coliform should not be excluded from the possible cause.

As for the result of the iron, the result at the monitoring point of retention canal (SW-5) exceeded the target value may be due to the influence of natural origin (iron can reach out from the soil by run-off). However, since it cannot reach to the conclusion of what is the reason for this result, the continuous monitoring will be necessary.

(2) Additional Monitoring

Regular water quality monitoring was carried out in accordance with EIA report. In addition to EIA report, additional self-water quality monitoring was also carried out on 4-Feb-2019. As of the water quality monitoring results on 26-Dec-2018, total coliform level exceeded at the outlet of the centralized STP (SW-6). Therefore, results (26-Dec-2018) is compared with results (4-Feb-2019). It can be clearly seen that the result of total coliform is lower in (4-Feb-2019) results. As for the result of total coliform on 26-Dec-2018, this exceeding issue is incidental case because the total coliform monitoring results in the previous monitoring month and additional monitoring result on 4-Feb-2019 complied with the target value. Thus, the impact on total coliform to the surrounding area is not expected.



Table 2.5-1 Results of Water Quality Monitoring at Main Discharging Gates and Discharged from Centralized STP

Sampling Date			26.12.2018	4.2.2019	26.12.2018		4.2.2019	Target Value (Reference Value for Self-Monitoring)
No.	Parameters	Unit	Regular Monitoring ^{*1}	Additional Monitoring ^{*1}	Regular Monitoring ^{*1}		Additional Monitoring ^{*1}	
			SW-1	SW-1	SW-5	SW-6	SW-6	
1	Temperature	°C	28	-	29	27	-	≤ 35
2	pH	-	7.4	-	8.9	6.6	-	6 ~ 9
3	Suspended Solid (SS)	mg/L	8.00	-	120.00	4.00	-	50
4	Dissolved Oxygen (DO)	mg/L	7.93	-	9.05	7.23	-	-
5	BOD (5)	mg/L	4.88	-	12.60	0.95	-	30
6	COD (Cr)	mg/L	17.1	-	27	11	-	125
7	Total Coliform	MPN/100ml	540	350	92,000	35,000	< 1.8	400
8	Total Nitrogen (T-N)	mg/L	3.9	-	3	13.7	-	80
9	Total Phosphorous (T-P)	mg/L	0.065	-	0.117	0.338	-	2
10	Color	TCU (True Color Unit)	3.21	-	3.20	2.07	-	150
11	Odor	TON (Threshold Odor Number)	2	-	1.4	1	-	-
12	Oil and Grease	mg/L	< 3.1	-	< 3.1	< 3.1	-	10
13	Mercury	mg/L	≤ 0.002	-	≤ 0.002	≤ 0.002	-	0.005
14	Zinc	mg/L	≤ 0.002	-	≤ 0.002	0.148	-	2
15	Arsenic	mg/L	≤ 0.01	-	≤ 0.01	≤ 0.01	-	0.1
16	Chromium	mg/L	≤ 0.002	-	0.012	≤ 0.002	-	0.5
17	Cadmium	mg/L	≤ 0.002	-	≤ 0.002	≤ 0.002	-	0.03
18	Selenium	mg/L	≤ 0.01	-	≤ 0.01	≤ 0.01	-	0.02
19	Lead	mg/L	≤ 0.002	-	≤ 0.002	0.006	-	0.1
20	Copper	mg/L	≤ 0.002	-	≤ 0.002	≤ 0.002	-	0.5
21	Barium	mg/L	0.03	-	0.042	0.012	-	1
22	Nickel	mg/L	0.002	-	0.014	0.004	-	0.2
23	Cyanide	mg/L	< 0.002	-	0.011	< 0.002	-	0.1
24	Free Chlorine	mg/L	< 0.1	-	< 0.1	< 0.1	-	1
25	Sulphide	mg/L	0.010	-	0.191	< 0.005	-	1
26	Formaldehyde	mg/L	0.015	-	0.094	0.004	-	1
27	Phenols	mg/L	< 0.1	-	0.18	< 0.1	-	0.5
28	Iron	mg/L	0.276	-	5.346	0.120	-	3.5
29	Total Dissolved Solids	mg/L	364	-	182.2	426	-	2000
30	Total Residual Chlorine	mg/L	< 0.1	-	0.1	0.1	-	0.2
31	Chromium (Hexavalent)	mg/L	< 0.05	-	< 0.05	< 0.05	-	0.1
32	Ammonia	mg/L	0.023	-	0.637	0.007	-	10
33	Fluoride	mg/L	1.231	-	0.415	1.557	-	20
34	Silver	mg/L	≤ 0.002	-	≤ 0.002	≤ 0.002	-	0.5
35	Escherichia Coli	MPN/100ml (SW)	4.0	-	7.8	< 1.8	-	(1000)* (CFU/100ml)
36	Flow Rate	m ³ /s	-	-	-	0.014	-	-

Note: Red color means the exceeded value than target value.

*Note: Based on the water utilization at discharged creek, water quality C of quality standard for water baths in Japan, (Ministry of Environment, 1997) is set as a reference value for self-monitoring of E. coli for surface water monitoring. However, due to limitation of capacity for analytical laboratory in Myanmar, the method to analyze the "Colony Forming Unit (CFU)" is not available in Myanmar. Therefore, the results of "Most Probable Number (MPN)" are assumed similar to CFU values and compared with reference values. Once the method to analyze the CFU will be available in Myanmar, the analytical method will be changed.

According to the quality standard for water baths in Japan, (Ministry of Environment, 1997), in case of E.Coli result is exceeding 1,000 CFU/100 ml, since it is assumed unsafety, it is considered unsuitable for water baths.

Note: *1 Regular water quality monitoring was carried out in accordance with EIA report. In addition to EIA report, additional self-water quality monitoring was also carried out on 4-Feb-2019. As of the water quality monitoring results on 26-Dec-2018, total coliform level exceeded at SW-6. Therefore, results (26-Dec-2018) is compared with results (4-Feb-2019). It can be clearly seen that the result of total coliform is lower in (4-Feb-2019) results.

Source: Myanmar Koen International Ltd.



2.5.2 Results of Reference Monitoring for Comparison with Discharging Points and Baseline of Discharged Creek

Results of water quality monitoring are summarized in Table 2.5-2. The results were compared with the target value of effluent water quality discharging to water body stipulated in the EIA report.

As the comparison with the target value, the results of Suspended Solid (SS), total coliform, iron and total dissolved solids (TDS) were exceeded than the target value. As for the result of SS and TDS, results at the surface water monitoring points (SW-3 and SW-4) for SS and (SW-2, SW-3 and SW-4) for TDS exceeded the target value due to two expected reasons; i) delivered from upstream area such as natural origin and wastewater from local industrial zone which outside of Thilawa SEZ, and ii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation.

As for the result of total coliform of surface water, results at the surface water monitoring points (SW-2, SW-3 and SW-4) exceeded the target value due to two expected reasons; i) runoff of animal waste from the undeveloped area and delivered from local industrial zone and illegal dumping site from outside of Thilawa SEZ in the upstream area, and ii) delivered from surrounding area by tidal effect. The result of total coliform at the reference of existing tube well (GW-1) also exceeded the target value. It may be possible due to expected reasons i) the poor maintenance of well which can increase the risk of bacteria and other harmful organisms ii) the well was not operated regularly and didn't use for local people long time. In addition, the result of E. Coli of surface water and ground water, all of results were under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of SW-2, SW-3, SW-4 and GW-1, but it is considered that there is no significant impact on human health.

As for the result of iron, the result at the monitoring point of surface water monitoring points (SW-3 and SW-4) exceeded the target value may be due to the influence of natural origin (iron can reach out from the soil by run-off). However, since it cannot reach to the conclusion of what is the reason for this result, the continuous monitoring will be necessary.



Table 2.5-2 Result of Water Quality Monitoring for Reference Monitoring Points for Comparison with Discharging Points and Baseline of Discharged Creek

No.	Parameters	Unit	SW-2	SW-3	SW-4	GW-1	Target Value (Reference Value for Self-Monitoring)
1	Temperature	°C	24	24	25	32	≤ 35
2	pH	-	8.2	8.1	8.2	7.7	6 ~ 9
3	Suspended Solid (SS)	mg/L	46.00	196.00	154.00	2.00	50
4	Dissolved Oxygen (DO)	mg/L	8.44	8.35	7.77	6.51	-
5	BOD (5)	mg/L	4.63	3.55	2.58	1.57	30
6	COD (Cr)	mg/L	20	16	16	7.2	125
7	Total Coliform	MPN/100ml	160,000	35,000	35,000	920	400
8	Total Nitrogen (T-N)	mg/L	1.1	2.1	1.6	2.1	80
9	Total Phosphorous (T-P)	mg/L	< 0.050	< 0.050	< 0.050	0.09	2
10	Color	TCU (True Color Unit)	4.13	3.22	2.63	0.00	150
11	Odor	TON (Threshold Odor Number)	1.4	1	1.4	1.4	-
12	Oil and Grease	mg/L	< 3.1	< 3.1	< 3.1	< 3.1	10
13	Mercury	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	≤ 0.002	0.005
14	Zinc	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	≤ 0.002	2
15	Arsenic	mg/L	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01	0.1
16	Chromium	mg/L	≤ 0.002	0.014	0.008	≤ 0.002	0.5
17	Cadmium	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	≤ 0.002	0.03
18	Selenium	mg/L	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01	0.02
19	Lead	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	≤ 0.002	0.1
20	Copper	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	≤ 0.002	0.5
21	Barium	mg/L	0.074	0.06	0.058	0.08	1
22	Nickel	mg/L	0.006	0.022	0.014	≤ 0.002	0.2
23	Cyanide	mg/L	0.003	0.015	0.015	< 0.002	0.1
24	Free Chlorine	mg/L	< 0.1	< 0.1	< 0.1	< 0.1	1
25	Sulphide	mg/L	0.033	0.031	0.018	< 0.005	1
26	Formaldehyde	mg/L	0.028	0.014	0.022	0.015	1
27	Phenols	mg/L	0.4	< 0.1	0.17	< 0.1	0.5
28	Iron	mg/L	1.462	9.232	6.708	0.474	3.5
29	Total Dissolved Solids	mg/L	2.768	3.540	3.592	1,602	2000
30	Total Residual Chlorine	mg/L	0.1	0.1	0.1	< 0.1	0.2
31	Chromium (Hexavalent)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	0.1
32	Ammonia	mg/L	0.360	0.055	0.035	2.150	10
33	Fluoride	mg/L	0.490	≤ 0.014	0.423	0.059	20
34	Silver	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	≤ 0.002	0.5
35	Escherichia Coli	MPN/100ml* (SW)	6.8	26.0	32.0	-	(1000)* CFU/100ml
		MPN/100ml** (GW)	-	-	-	11.0	(100)** (MPN/100ml)
36	Flow Rate	m ³ /s	-	-	0.350	-	-

Note: Red color means the exceeded results than target value.

*Note: Based on the water utilization at discharged creek, water quality C of quality standard for water baths in Japan, (Ministry of Environment, 1997) is set as a reference value of self-monitoring for surface water monitoring. However, due to limitation of capacity for analytical laboratory in Myanmar, the method to analyze the "Colony Forming Unit (CFU)" is not available in Myanmar. Therefore, the results of "Most Probable Number (MPN)" are assumed similar to CFU values and compared with reference values. Once the method to analyze the CFU will be available in Myanmar, the analytical method will be changed. According to the quality standard for water baths in Japan, (Ministry of Environment, 1997), in case of E.Coli result is exceeding 1,000 CFU/100 ml, since it is assumed unsafety, it is considered unsuitable for water baths.

**Note: Based on the water utilization at monitoring point for ground water, B1(Irrigation water) of National Technical Regulation on Surface Water Quality in Vietnam (No. QCVN 08: 2008/BTNMT) is set as a reference value of self-monitoring for ground water monitoring.

Source: Myanmar Koei International Ltd.



CHAPTER 3: CONCLUSION AND RECOMMENDATIONS

As for the result of SS, the results at the retention pond (SW-1) and the outlet of the centralized sewage treatment plant (SW-6) complied with the target value. On the other hand, parameters of SS at retention canal (SW-5) was exceeded.

The result of total coliform at the retention pond (SW-1), at the retention canal (SW-5), and the outlet of the centralized sewage treatment plant (SW-6) were exceeded the target values in this period of monitoring. The result of total coliform at (SW-6) exceeding the target values but the value this event was incidental case and its impact is not expected because the results in the previous monitoring months and results of additional monitoring at the outlet of the centralized STP (SW-6) and retention pond (SW-1) complied with the target value. Since the composition of the total coliform include bacteria from natural origin, and even after total coliform do not affect human health directly, self-monitoring for E. Coli analysis was carried out to identify health impact by coliform bacteria. In addition, according to the result of self-monitoring of E. Coli at retention pond (SW-1), at retention canal (SW-5), and the outlet of the centralized sewage treatment plant (SW-6), results were under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring points SW-1, SW-5 and SW-6, but it is considered that there is no significant impact on human health.

As for the result of iron, the result at the retention canal (SW-5) was exceeded the target value. The expected reasons for exceeding the target value of iron are by natural origin (iron can reach out from the soil by run-off). Japan set effluent standards for two items as follows; i) health item and ii) living environment item. In the health item, there is no standard value for iron. On the other hand, for the living environment item, the standard value for soluble iron level is 10 mg/l. As the comparison with the living environment standard value in Japan, iron result in SW-5 is lower than the standard value. Therefore, it can be considered that there is no significant impact on the living environment.

As for parameters of SS, TDS, total coliform and iron in surface water were exceeded the target values at reference monitoring points. The expected reasons for exceeding the target values of SS at (SW-3 and SW-4) and TDS at (SW-2, SW-3 and SW-4) are delivered from upstream area such as natural origin and wastewater from local industrial zone which outside of Thilawa SEZ. The expected reasons for exceeding the target values of total coliform at (SW-2, SW-3 and SW-4) are by natural origin (natural bacteria existed). As for parameter of total coliform exceeded the target value at reference of existing tube well (GW-1), expected reasons are poor maintenance of well, not operated regularly, not used by local people. It will be recommended to test the tube well for total coliform every year. As mentioned in Section 2.5.2, the result of self-monitoring of E. Coli at SW-2, SW-3, SW-4 and GW-1 were under the reference value. Therefore, although the target value of total coliform was exceeded at reference monitoring point, but it is considered that there is no significant impact on human health. As for the parameter of iron exceeded the target value at reference monitoring points (SW-3 and SW-4), expected reasons are by natural origin (iron can reach out from the soil by run-off). As the comparison with the living environment standard value in Japan, iron results in SW-3 and SW-4 are lower than the standard value. Therefore, it can be considered that there is no significant impact on the living environment. However, it cannot reach to the conclusion of what is the reason to be exceeded the target values, thus the continuous monitoring and yearly trend analysis will be necessary based on the wet and dry season data.

As for future subject for main discharging points of Thilawa SEZ Zone A, the following action may be taken to achieve the target levels of SS, total coliform and appropriate water quality monitoring:

- To continue monitoring Escherichia coli (E. Coli) level to identify health impact by coliform bacteria; and
- To monitor the possibility of the overflow water from construction sites.
- To monitor the possibility of the domestic wastewater from construction sites.



APPENDIX-1 FIELD SURVEY PHOTOS



FOR DISCHARGING POINTS OF THILAWA SEZ ZONE A



Surface water sampling and onsite measurement at SW-1



Surface water sampling and onsite measurement at SW-5



Surface water sampling and onsite measurement at SW-6

**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGING POINTS AND BASELINE OF DISCHARGED CREEK**



Surface water sampling and onsite measurement at SW-2



Surface water sampling and onsite measurement at SW-3



Surface water sampling and onsite measurement at SW-4





Ground water sampling and onsite measurement at GW-1

APPENDIX-2 LABORATORY RESULTS



FOR DISCHARGING POINTS AND AFTER CENTRALIZED STP

DOWA

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motivate our planet
Doc No: GEM-LB-RC04E/00
Page 1 of 1

Report No. : GEM-LAB-201901121
Revision No. : 1
Report Date : 14 January, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No. 1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MITD
Sample Description
Sample Name : MKI-SW-1-1226
Sample No. : W 1812255
Waste Profile No. :
Sampling Date : 26 December, 2018
Sampling By : Customer
Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	8.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	4.88	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	17.1	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	540	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
6	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	3.9	0
7	Total Phosphorous	APHA 4500-P-E (Ascorbic Acid Method)	mg/l	0.065	0.050
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	3.21	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TCN	2	0
10	TDS	APHA 2540 C (Total Dissolved Solids Dried at 180°C Method)	mg/l	364	-
11	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
13	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
14	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
15	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
16	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
17	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
19	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.03	0.001
20	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.002	0.002
21	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
22	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.276	0.002
23	Cyanide	HACH 8027 (Pyridine -Pyrazolone Method)	mg/l	< 0.002	0.002
24	Ammonia	HACH Method 10205 (Silicylate TNT Plus Method)	mg/l	0.023	0.020
25	Hexavalent Chromium (Cr6+)	ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazole)	mg/l	< 0.05	0.05
26	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	1.231	0.014
27	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
28	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
29	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.010	0.005
30	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.015	0.003
31	Phenols	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual: 4AAP With Distillation))	mg/l	< 0.1	0.1

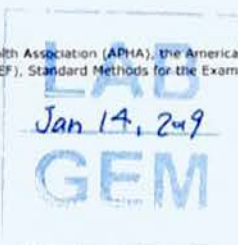
Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :



Ni Ni Aye Lwin
Supervisor


Jan 14, 2019

Approved By :



Tomoya Suzuki
Director Jan 14, 2019



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone A
(Bi-Annually Monitoring in FY December 2018)



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Report No. : GEM-LAB-201901122
Revision No. : 1
Report Date : 14 January, 2019
Application No. : 0049-C001

Analysis Report

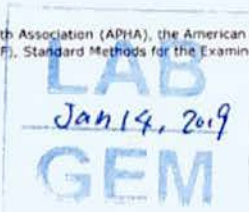
Client Name : Myanmar Koei International LTD (MKI)
Address : No. 1A /2B, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW 5-1226 Sampling Date : 26 December, 2018
Sample No. : W 1812256 Sampling By : Customer
Waste Profile No. : Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	120.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	12.60	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	27	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
5	Oil and Grease	APHA 5520B (Partition Gravimetric Method)	mg/l	< 3.1	3.1
6	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	3	0
7	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.117	0.050
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	3.20	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.4	0
10	TDS	APHA 2540 C (Total Dissolved Solids Dried at 180°C Method)	mg/l	182.2	-
11	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
13	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
14	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.012	0.002
15	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
16	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
17	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
19	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.042	0.001
20	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.014	0.002
21	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
22	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	5.346	0.002
23	Cyanide	HACH 8027 (Pyridine -Pyrazolone Method)	mg/l	0.011	0.002
24	Ammonia	HACH Method 10205 (Silicylate TNT Plus Method)	mg/l	0.637	0.020
25	Hexavalent Chromium (Cr6-)	ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using L-5-diphenylcarbazide)	mg/l	< 0.05	0.05
26	Fluoride	APHA 4510 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	0.415	0.014
27	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
28	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
29	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.191	0.005
30	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.094	0.003
31	Phenols	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4MAP With Distillation))	mg/l	0.18	0.1

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director Jan 14, 2019



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone A
(Bi-Annually Monitoring in FY December 2018)

DOWA

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Doc No: GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201901123
Revision No. : 1
Report Date : 14 January, 2019
Application No. : 0049-C001

Analysis Report

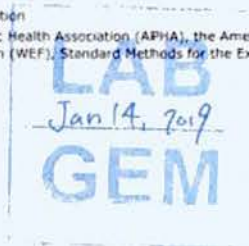
Client Name : Myanmar Koei International LTD (MKI)
Address : No. 1A /2B, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-6-1226
Sample No. : W-1812257
Waste Profile No. :
Sampling Date : 26 December, 2018
Sampling By : Customer
Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	4.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	0.95	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	11	0.7
4	Total Coliform	APHA 9221 B (Standard Total Coliform Fermentation Technique)	MPN/100ml	35000	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
6	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	13.7	0
7	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.338	0.050
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	2.07	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0
10	TDS	APHA 2540 C (Total Dissolved Solids Dried at 180°C Method)	mg/l	426	-
11	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.148	0.002
13	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
14	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
15	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
16	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
17	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.006	0.002
18	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
19	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.012	0.001
20	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.004	0.002
21	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
22	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.120	0.002
23	Cyanide	HACH 8027 (Pyridine -Pyrazolone Method)	mg/l	< 0.002	0.002
24	Ammonia	HACH Method 10205 (Silicylate TNT Plus Method)	mg/l	0.007	0.020
25	Hexavalent Chromium (Cr6+)	ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide)	mg/l	< 0.05	0.05
26	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	1.557	0.014
27	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
28	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
29	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	< 0.005	0.005
30	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.004	0.003
31	Phenols	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation))	mg/l	< 0.1	0.1

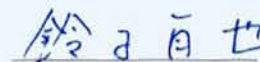
Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director Jan 14, 2019





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Report No. : GEM-LAB-201902074
Revision No. : 1
Report Date : 11 February, 2019
Application No. : 0049-C001

Analysis Report

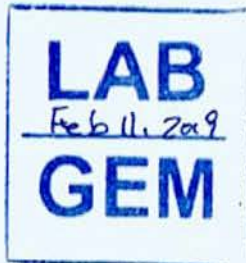
Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-6-0204 Sampling Date : 4 February, 2019
Sample No. : W-1902014 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 4 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	< 1.8	1.8

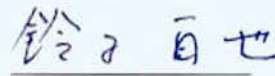
Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director Feb 11, 2019



**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGING POINTS AND BASELINE OF DISCHARGED CREEK**

DOWA

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Doc No: GEM-18-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201901124
Revision No. : 1
Report Date : 14 January, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /2B, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-2-1226
Sample No. : W-1812258
Waste Profile No. :
Sampling Date : 26 December, 2018
Sampling By : Customer
Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	46.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	4.63	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	20	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	160000	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
6	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.1	0
7	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	< 0.050	0.050
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	4.13	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.4	0
10	TDS	APHA 2540 C (Total Dissolved Solids Dried at 180°C Method)	mg/l	2768	-
11	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
13	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
14	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
15	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
16	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
17	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
19	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.074	0.001
20	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.006	0.002
21	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
22	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	1.462	0.002
23	Cyanide	HACH 8027 (Pyridine-Pyrazolone Method)	mg/l	0.003	0.002
24	Ammonia	HACH Method 10205 (Siliclylate TNT Plus Method)	mg/l	0.360	0.020
25	Hexavalent Chromium (Cr6+)	ISO 11363-1994 (Determination of chromium(VI) Spectrometric method using 1,5-Diphenylcarbazide)	mg/l	< 0.05	0.05
26	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	0.490	0.014
27	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
28	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
29	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.033	0.005
30	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.028	0.003
31	Phenols	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation))	mg/l	0.4	0.1

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition


Analysed By :



Ni Ni Aye Lwin
Supervisor

LAB
Jan 14, 2019
GEM

Approved By :


Tomoya Suzuki
Director Jan 14, 2019



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone A
(Bi-Annually Monitoring in FY December 2018)

DOWA

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Doc No: GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201901125
Revision No. : 1
Report Date : 14 January, 2019
Application No. : 0049-CD01

Analysis Report

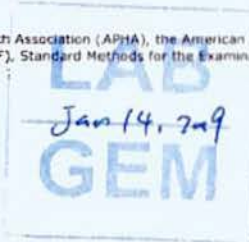
Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /2B, Mya Thidar Housing, Ward 11, South Dikalepa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-3 1226
Sample No. : W-1812259
Waste Profile No. :
Sampling Date : 26 December, 2018
Sampling By : Customer
Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	196.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.55	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	16	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	35000	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
6	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	2.1	0
7	Total Phosphorous	APHA 4500 P-E (Ascorbic Acid Method)	mg/l	< 0.050	0.050
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	3.22	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0
10	TDS	APHA 2540 C (Total Dissolved Solids Dried at 180°C Method)	mg/l	3540	-
11	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
13	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
14	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.014	0.002
15	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
16	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
17	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
19	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.06	0.001
20	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.022	0.002
21	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
22	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	9.232	0.002
23	Cyanide	HACH 8027 (Pyridine -Pyrazolone Method)	mg/l	0.015	0.002
24	Ammonia	HACH Method 10205 (Silicylate TNT Plus Method)	mg/l	0.055	0.020
25	Hexavalent Chromium (Cr6+)	ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide)	mg/l	< 0.05	0.05
26	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	≤ 0.014	0.014
27	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
28	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
29	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.031	0.005
30	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.014	0.003
31	Phenols	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual: 4AAP With Distillation))	mg/l	< 0.1	0.1

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director Jan 14, 2019



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone A
(Bi-Annually Monitoring in FY December 2018)

DOWA

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Dow No. GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201901126
Revision No. : 1
Report Date : 14 January, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-4-1226
Sample No. : W-1812260
Waste Profile No. : -

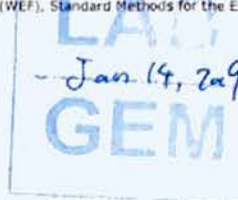
Sampling Date : 26 December, 2018
Sampling By : Customer
Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	154.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	2.58	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	16	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	35000	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
6	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.6	0
7	Total Phosphorus	APHA 4500 P E (Ascorbic Acid Method)	mg/l	< 0.050	0.050
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	2.63	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TDN	1.4	0
10	TDS	APHA 2540 C (Total Dissolved Solids Dried at 180°C Method)	mg/l	3592	-
11	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
13	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	< 0.01	0.01
14	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.008	0.002
15	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
16	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
17	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
19	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.058	0.001
20	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.014	0.002
21	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
22	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	6.708	0.002
23	Cyanide	HACH 8027 (Pyridine -Pyrazalone Method)	mg/l	0.015	0.002
24	Ammonia	HACH Method 10205 (Silicylate TNT Plus Method)	mg/l	0.035	0.020
25	Hexavalent Chromium (Cr6+)	ISO 11081 1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide)	mg/l	< 0.05	0.05
26	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	0.423	0.014
27	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
28	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
29	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.018	0.005
30	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.022	0.003
31	Phenols	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation))	mg/l	0.17	0.1

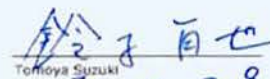
Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Supervisor


- Jan 14, 2019

Approved By :


Tomiyo Suzuki
Director
Jan 14, 2019



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone A
(Bi-Annually Monitoring in FY December 2018)



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Report No. : GEM-LAB-201901129
Revision No. : 1
Report Date : 14 January, 2019
Application No. : 0049 C001

Analysis Report

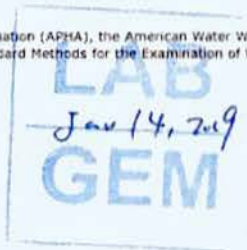
Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description :
Sample Name : MKI-GW-1-1226 Sampling Date : 26 December, 2018
Sample No. : W-1812263 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	2.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	1.57	0.00
3	COD (Cr)	APHA 5220C (Close Reflux Colorimetric Method)	mg/l	7.2	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	920	1.8
5	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
6	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	2.1	0
7	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.09	0.050
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	0.00	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TCN	1.4	0
10	TDS	APHA 2540 C (Total Dissolved Solids Dried at 180°C Method)	mg/l	1602	-
11	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
13	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
14	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
15	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
16	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
17	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
19	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.08	0.001
20	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
21	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
22	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.474	0.002
23	Cyanide	HACH 8027 (Pyridine -Pyrazolone Method)	mg/l	< 0.002	0.002
24	Ammonia	HACH Method 10205 (Silicylate TNT Plus Method)	mg/l	2.150	0.020
25	Hexavalent Chromium [Cr6+]	ISO 11081:1994 (Determination of Chromium(VI) Spectrometric method using 1,5-diphenylcarbazide)	mg/l	< 0.05	0.05
26	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	0.059	0.014
27	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
28	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
29	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	< 0.005	0.005
30	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.015	0.003
31	Pheno's	USEPA Method 420.1 (Phenols (Spectrophotometric, Manual 4AAP With Distillation))	mg/l	< 0.1	0.1

Remark : LOQ - Limit of Quantization
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director Jan 14, 2019



**APPENDIX-3 LABORATORY RESULT OF ESCHERICHIA COLI
(SELF-MONITORING)**



FOR DISCHARGING POINTS AND AFTER CENTRALIZED STP

DOWA

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Doc No: GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201901111
Revision No. : 1
Report Date : 15 January, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD

Sample Description

Sample Name : MKI-SW-1-1226 Sampling Date : 26 December, 2018
Sample No. : W-1812245 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	4.0	1.8

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

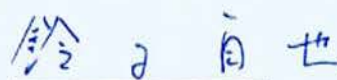
Analysed By :



Ni Ni Aye Lwin
Supervisor



Approved By :



Tomoya Suzuki
Director Jan 15, 2019





GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No F1, Thilawa SEZ Zone A, Yangon Region, Myanmar
Phone No Fax No: (+95) 1 2309051



Report No. : GEM-LAB-201901112
Revision No. : 1
Report Date : 15 January, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description

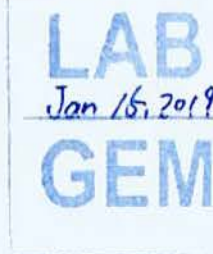
Sample Name : MKI-SW-5-1226 Sampling Date : 26 December, 2018
Sample No. : W-1812246 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Cell Procedure Using Fluorogenic Substrate	MPN/100ml	7.8	1.8

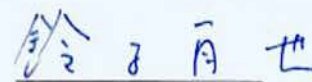
Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF); Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director Jan 15, 2019





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Report No. : GEM-LAB-201901113
Revision No. : 1
Report Date : 15 January, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD


Sample Description

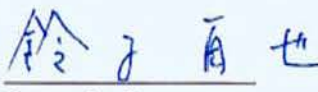
Sample Name : MKI-SW-6-1226 Sampling Date : 26 December, 2018
Sample No. : W-1812247 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	< 1.8	1.8

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


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Jan 15, 2019
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**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGING POINTS AND BASELINE OF DISCHARGED CREEK**

DOWA

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Doc No: GEM-LB-R004E/00
Page 1 of 1

Report No. : GEM-LAB-201901114
Revision No. : 1
Report Date : 15 January, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-2-1226 Sampling Date : 26 December, 2018
Sample No. : W-1812248 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	6.8	1.8


Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

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Report No. : GEM-LAB-201901115
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Report Date : 15 January, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description

Sample Name : MKI-SW-3-1226 Sampling Date : 26 December, 2018
Sample No. : W-1812249 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	26.0	1.8

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

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Page1of1

Report No. : GEM-LAB-201901116
Revision No. : 1
Report Date : 15 January, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD

Sample Description

Sample Name : MKI-SW-4-1226 Sampling Date : 26 December, 2018
Sample No. : W-1812250 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	32.0	1.8

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

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Report No. : GEM-LAB-201901119
Revision No. : 1
Report Date : 15 January, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-GW-1-1226 Sampling Date : 26 December, 2018
Sample No. : W-1812253 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 26 December, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	11.0	1.8

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

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Tomoya Suzuki
Director Jan 15, 2019



**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Appendix

Water and Waste Water Monitoring Report

February, 2019

**WATER QUALITY MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
IN THILAWA SEZ ZONE A
(OPERATION STAGE)**

(Bi-Monthly Monitoring)

February 2019

Myanmar Koei International Ltd.



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CHAPTER 1: INTRODUCTION

1.1 General

Thilawa Special Economic Zone (SEZ) is located in southern district of Yangon region and about 23 km southeast of Yangon city. As the developer of Thilawa SEZ, Myanmar Japan Thilawa Development Ltd. (MJTD) has a responsibility to carry out regular monitoring in the industrial area of Zone A in accordance with the approved Environmental Impact Assessment (EIA) report and Environmental Management Plan (EMP). MJTD has implemented monitoring various environmental items with the specified time frame to know the environmental conditions in and around the area. As for the monitoring of the water quality, total seven sampling points are set for water quality survey, named SW-1, SW-2, SW-3, SW-4, SW-5, SW-6, and GW-1 have been monitored in Thilawa SEZ and its surrounding area in timely manner. Among the seven locations, SW-1 and SW-5 are main discharged points of Thilawa SEZ and SW-6 is discharged from centralized Sewage Treatment Plant (STP) which is required to monitor by Environmental Monitoring Plan (EMoP) in EIA report of Thilawa SEZ Zone A. The remaining points SW-2, SW-3 and SW-4 are sampled as a reference monitoring for comparison with discharged points and baseline of discharged creek. Moreover, GW-1 is monitored as a reference of existing tube well which located in the monastery compound. Location of sampling points for water quality monitoring is shown in Figure 1.1-1.



Figure 1.1-1 Location of Sampling Points of Water Quality Monitoring

CHAPTER 2: WATER QUALITY MONITORING

2.1 Monitoring Items

Sampling points and parameters for water quality monitoring are determined so as to cover the environmental monitoring plan of the EIA report.

Water quality sampling was carried out at seven locations. Among the seven locations, water flow measurement carried out at four locations (SW-1, SW-4, SW-5 and SW-6) where can be measured by Current Meter. Monitoring items and sampling points are summarized in Table 2.1-1.

Table 2.1-1 Monitoring Items for Water Quality

No.	Parameters	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	GW-1	Remarks
1	pH	○	○	○	○	○	○	○	On-site measurement
2	Water Temperature	○	○	○	○	○	○	○	On-site measurement
3	DO	○	○	○	○	○	○	○	On-site measurement
4	BOD (5)	○	○	○	○	○	○	○	Laboratory analysis
5	COD (Cr)	○	○	○	○	○	○	○	Laboratory analysis
6	Total Nitrogen	○	○	○	○	○	○	○	Laboratory analysis
7	Suspended Solids	○	○	○	○	○	○	○	Laboratory analysis
8	Total Coliform	○	○	○	○	○	○	○	Laboratory analysis
9	Total Phosphorous	○	○	○	○	○	○	○	Laboratory analysis
10	Color	○	○	○	○	○	○	○	Laboratory analysis
11	Odor	○	○	○	○	○	○	○	Laboratory analysis
12	Escherichia Coli (Self-monitoring)	○	○	○	○	○	○	○	Laboratory analysis
13	Flow Rate	○	-	-	○	○	○	-	On-site measurement

Source: Myanmar Koei International Ltd.

2.2 Description of Sampling Points

The outline of sampling points is mentioned in Table 2.2-1. The photos of conducting field survey at each sampling points are mentioned in Appendix-1.

Table 2.2-1 Outline of Sampling Points

No.	Station	Detailed Information
1	SW-1	Coordinate - N - 16° 40' 13.5", E - 96° 16' 39.8"
		Location - Outlet of Retention Pond
		Survey Item - Surface water sampling and water flow rate measurement.
2	SW-2	Coordinate - N - 16° 40' 20.69", E - 96° 17' 18.04"
		Location - Upstream of Shwe Pyauk Creek
		Survey Item - Surface water sampling.
3	SW-3	Coordinate- N - 16° 40' 5.50", E - 96° 16' 41.60"
		Location - Upstream of Shwe Pyauk Creek, after mixing point of Thilawa SEZ Zone A and Zone B.
		Survey Item - Surface water sampling.
4	SW-4	Coordinate- N - 16° 39' 42.84", E - 96° 16' 27.42"
		Location - Downstream of Shwe Pyauk Creek
		Survey Item - Surface water sampling and water flow rate measurement.
5	SW-5	Coordinate- N - 16° 40' 10.7", E - 96° 16' 22.6"
		Location - Outlet of Retention Canal
		Survey Item - Surface water sampling and water flow rate measurement.
6	SW-6	Coordinate- N - 16° 40' 27.13", E - 96° 16' 30.68"
		Location - Outlet from STP to Retention Pond
		Survey Item - Surface water sampling and water flow rate measurement.
7	GW-1	Coordinate- N - 16° 40' 25.10", E - 96° 16' 31.70"
		Location - In Moegyoe Swan Monastery
		Survey Item - Ground Water Sampling.

Source: Myanmar Koei International Ltd.



SW-1

SW-1 was collected at the discharge point of retention pond which is located in the east of Moegyoe Swan monastery. This drainage is flowing from north to south and then connected to the Shwe Pyauk creek through earth drain. The water quality of this monitoring point has been influenced by the water from downstream due to flow back by tidal fluctuation. In addition, it seems that a part of wastewater from monastery has reached to the culvert in the SEZ area and discharging to the retention pond.

SW-2 (Reference Point)

SW-2 was collected at the upstream of Shwe Pyauk creek. This sampling point is located in the southeast of Zone A area and at the south of Dagon-Thilawa road. The surrounding areas are Zone B in the southwest and local industrial zone in the east respectively.

SW-3 (Reference Point)

SW-3 was collected at the upstream of Shwe Pyauk creek after mixing point of Zone A and Zone B, which is flowing from east to west and then entering into the Yangon River. The distance is about 1.2 km downstream of SW-2. This sampling point is located in the south of Zone A area and Dagon-Thilawa Road. The surrounding areas are Zone B in the south and local industrial zone in the east respectively.

SW-4 (Reference Point)

SW-4 was collected at the downstream of Shwe Pyauk creek, after mixing of discharge water from local industrial zone, construction site of Zone B and Zone A, which is flowing from east to west and then entering into the Yangon River. The distance is about 820 m downstream of SW-3. This sampling point is located in the southwest of Zone A area and in the south of Dagon-Thilawa road. The surrounding areas are Zone B and local industrial zone in the east respectively.

SW-5

SW-5 was collected at retention canal near main gate of Thilawa SEZ. Most of the water collected in this canal is rain water and domestic wastewater from surrounding. This canal is also connected to the Shwe Pyauk creek. The water quality of this monitoring point may have been influenced by the water from downstream due to flow back by tidal fluctuation.

SW-6

SW-6 was collected at the drain outlet of centralized STP which is located in the north of Moegyoe Swan monastery compound and retention pond (SW-1). Then the treated water is flowing to the retention pond.

GW-1 (Reference of Existing Tube Well)

GW-1 was collected from tube well as ground water sample. It is located in the compound of Moegyoe Swan monastery. The surrounding areas are Zone A in the west, retention pond in the east and Dagon-Thilawa road in the south respectively.



2.3 Monitoring Method

All water samples were collected with cleaned sampling bottles and analyzed by the following standard method as shown in Table 2.3-1. All samples were kept in iced boxes keeping at 2-4° C and were transported to the laboratory. Among the parameters; water temperature, pH and DO were measured by the on-site instrument “Horiba, U-52” and water flow rate was also conducted by using the on-site instrument “Tamaya Digital Current Meter”.

Table 2.3-1 Analytic Method for Water Quality

No.	Parameter	Method
1	Water Temperature	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
2	pH	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
3	Dissolved Oxygen (DO)	Instrument Analysis Method (Horiba, U-52, Multi Water Quality Checker)
4	BOD (5)	APHA 5210 B (5 Days BOD Test)
5	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)
6	Total Nitrogen (T-N)	HACH Method 10072(TNT Persulfate Digestion Method)
7	Suspended Solids (SS)	APHA 2540D (Dry at 103-105°C Method)
8	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)
9	Total Phosphorous (T-P)	APHA 4500-P E (Ascorbic Acid Method)
10	Color	APHA 2120C (Spectrophotometric Method)
11	Odor	APHA 2150 B (Threshold Odor Test)
12	Escherichia Coli	APHA 9221 F (Escherichia Coli Procedure Using Fluorogenic Substrate)
13	Flow Rate	Detection of Electromagnetic Elements (Real-time measurement by UC-200V Digital Current Meters)

Source: Myanmar Koei International Ltd.

2.4 Monitoring Period

Water quality and water flow rate monitoring conducted on 13 February 2019 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon River, Myanmar on 13 February 2019 is shown in Table 2.4-2.

Table 2.4-1 Sampling Time of Each Station

No.	Station	Sampling Time
1	SW-1	13/02/2019 10:56
2	SW-2	13/02/2019 14:31
3	SW-3	13/02/2019 09:26
4	SW-4	13/02/2019 13:24
5	SW-5	13/02/2019 11:22
6	SW-6	13/02/2019 10:27
7	GW-1	13/02/2019 16:01

Source: Myanmar Koei International Ltd.

Table 2.4-2 Tide Record for Yangon River, Myanmar

Date	Time	Height	Tide Conditions
13/02/2019	04:27	0.76	Low Tide
	09:34	4.29	High Tide
	16:31	0.96	Low Tide
	22:04	4.64	High Tide

Source: Myanmar Port Authority, Tide Table for the Yangon River and Elephant Point, 2019.



2.5 Monitoring Results

Results of water quality monitoring are summarized in Table 2.5-1. Analytical results of the laboratory are described in Appendix-2 and Appendix-3. The results were compared with the target value of effluent water quality discharging to water body stipulated in the EIA report.

2.5.1 Results of Water Quality at the Outlet of Sewage Treatment Plant of Industrial Area of Thilawa SEZ and at the Point before Discharging to Creek

As the comparison with the target value, the results of suspended solid (SS) and total coliform exceeded than the target values.

As for the result of SS, the result at the outlet of the centralized STP (SW-6) complied with the target value. It implied that effluents from each locator was treated well by the STP. On the other hand, results at the monitoring points of retention pond (SW-1) and retention canal (SW-5) before discharging to creek, exceeded the target value due to the expected reason; for SW-1 and SW-5: surface water run-off from bare land in Zone A.

As for the result of total coliform of surface water, the result at the outlet of the centralized STP (SW-6) complied with the target value. It may prove that effluents from each locator was treated well by the STP. On the other hand, results at monitoring points of retention pond (SW-1) exceeded the target value due to the expected reason; the potential expected reason might natural bacteria existed in all area of Zone A because there are various kinds of vegetation and creature such as birds, and small animals in and along the retention canals and retention ponds.

Since the composition of the total coliform include bacteria from natural origin, and even after total coliform do not affect human health directly, self-monitoring for E. Coli analysis was carried out to identify health impact by coliform bacteria. As for the result of E.Coli of surface water, all of results were under the reference value. Therefore, although the target value of total coliform exceeded at monitoring point of retention pond (SW-1), but it is considered that there is no significant impact on human health.

On the bases of the above examinations, the following actions shall be taken to monitor the impact on human health;

- To continue the self-monitoring for Escherichia coli (E. Coli) level to identify health impact by coliform bacteria (While result of Total coliform exceeded the target value)

Perhaps, the possibility that water flowing through the retention canals might include overflowed water from some construction sites with insufficient treatment of coliform should not be excluded from the possible cause.

Table 2.5-1 Results of Water Quality Monitoring at Main Discharged Gates and Discharged from Centralized STP

No.	Parameters	Unit	SW-1	SW-5	SW-6	Target Value (Reference Value for Self-Monitoring)
1	Temperature	°C	33	32	30	≤ 35
2	pH	-	7.5	8.2	7.0	6 – 9
3	Suspended Solid (SS)	mg/L	640.00	98.00	2.00	50
4	Dissolved Oxygen (DO)	mg/L	6.58	6.63	7.14	-
5	BOD (5)	mg/L	3.88	4.08	1.71	30
6	COD (Cr)	mg/L	20	52	19.6	125
7	Total Coliform	MPN/100ml	1,600	350	< 1.8	400
8	Total Nitrogen (T-N)	mg/L	13.1	1.6	13.1	80
9	Total Phosphorous (T-P)	mg/L	0.26	< 0.050	0.985	2
10	Color	TCU (True Color Unit)	4.61	3.92	1.86	150
11	Odor	TON (Threshold Odor Number)	1.4	2	2	-
12	Escherichia Coli	MPN/100ml	4.0	9.2	< 1.8	(1,000)* (CFU/100ml)
13	Flow Rate	m ³ /s	0.032	0.011	0.036	-

Note: Red color means exceeded value than target value.

*Note: Based on the water utilization at discharged creek, water quality C of quality standard for water baths in Japan, (Ministry of Environment, 1997) is set as a reference value for self-monitoring of E. coli for surface water monitoring. However, due to limitation of capacity for analytical laboratory in Myanmar, the method to analyze the "Colony Forming Unit (CFU)" is not available in Myanmar. Therefore, the results of "Most Probable Number (MPN)" are assumed similar to CFU values and compared with reference values. Once the method to analyze the CFU will be available in Myanmar, the analytical method will be changed.

According to the quality standard for water baths in Japan, (Ministry of Environment, 1997), in case of E.Coli result is exceeding 1,000 CFU/100 ml, since it is assumed unsafety, it is considered unsuitable for water baths.

Source: Myanmar Koei International Ltd.

2.5.2 Results of Reference Monitoring for Comparison with Discharged Points and Baseline of Discharged Creek

Results of water quality monitoring are summarized in Table 2.5-2. The results were compared with the target value of effluent water quality discharging to water body stipulated in the EIA report.

As the comparison with the target value, the results of Suspended Solid (SS) and total coliform exceeded than the target value. As for the result of SS, results at the surface water monitoring points (SW-3 and SW-4) exceeded the target value due to two expected reasons; i) delivered from upstream area such as natural origin and wastewater from local industrial zone which outside of Thilawa SEZ, and ii) influence by water from the downstream of monitoring points due to flow back by tidal fluctuation.

As for the result of total coliform of surface water, results at surface water monitoring points (SW-2, SW-3 and SW-4) exceeded the target value due to two expected reasons; i) runoff of animal waste from the undeveloped area and delivered from local industrial zone and illegal dumping site from outside of Thilawa SEZ in the upstream area, and ii) delivered from surrounding area by tidal effect. In addition, the result of E.Coli of surface water, all of results were under the reference value. Therefore, although the target value



of total coliform exceeded at monitoring point of SW-2, SW-3 and SW-4, but it is considered that there is no significant impact on human health.

Table 2.5-2 Result of Water Quality Monitoring for Reference Monitoring Points for Comparison with Discharged Points and Baseline of Discharged Creek

No.	Parameters	Unit	SW-2	SW-3	SW-4	GW-1	Target Value (Reference Value for Self- Monitoring)
1	Temperature	°C	28	27	30	35	≤ 35
2	pH	-	7.8	7.2	7.8	7.9	6 ~ 9
3	Suspended solid (SS)	mg/L	28.00	254.00	164.00	4.00	50
4	Dissolved oxygen (DO)	mg/L	3.97	5.63	5.43	5.71	-
5	BOD (5)	mg/L	15.41	3.79	2.89	1.56	30
6	COD (Cr)	mg/L	119	27.5	21.1	33.5	125
7	Total coliform	MPN/ 100ml	> 160,000	24,000	92,000	70	400
8	Total nitrogen (T-N)	mg/L	1.9	9.1	4.1	2.5	80
9	Total phosphorous (T-P)	mg/L	0.289	0.155	0.103	0.063	2
10	Color	TCU (True Color Unit)	21.86	3.49	2.63	0.37	150
11	Odor	TON (Threshold Odor Number)	2	2	2	1.4	-
12	Escherichia Coli	MPN/100 ml* (SW)	4.0	< 1.8	14.0	-	(1,000)* (CFU/100ml)
		MPN/100 ml** (GW)	-	-	-	2.0	(100)** (MPN/100ml)
13	Flow Rate	m ³ /s	-	-	0.128	-	-

Note: Red colors means exceeded value than target value.

*Note: Based on the water utilization at discharged creek, water quality C of the quality standard for water baths in Japan, (Ministry of Environment, 1997) is set as a reference value of self-monitoring for surface water monitoring. However, due to limitation of capacity for analytical laboratory in Myanmar, the method to analyze the "Colony Forming Unit (CFU)" is not available in Myanmar. Therefore, the results of "Most Probable Number (MPN)" are assumed similar to CFU values and compared with reference values. Once the method to analyze the CFU will be available in Myanmar, the analytical method will be changed.

According to the quality standard for water baths in Japan, (Ministry of Environment, 1997), in case of E.Coli result is exceeding 1,000 CFU/100 ml, since it is assumed unsafety, it is considered unsuitable for water baths.

**Note: Based on the water utilization at monitoring point for ground water, B1(Irrigation water) of National Technical Regulation on Surface Water Quality in Vietnam (No. QCVN 08: 2008/BTNMT) is set as a reference value of self-monitoring for ground water monitoring.

Source: Myanmar Koei International Ltd.



CHAPTER 3: CONCLUSION AND RECOMMENDATIONS

As for the result of SS and total coliform the results at the outlet of the centralized STP (SW-6) complied with the target value of both of them. It may prove that effluent from each locator was treated well by the STP. On the other hand, parameters of SS at retention pond (SW-1) and at retention canal (SW-5) exceeded the target values, and parameters of total coliform at retention pond (SW-1) exceeded the target values in this period for main discharged points of Thilawa SEZ Zone A. In addition, according to the result of self-monitoring of *E. coli* at retention pond (SW-1), result was under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point SW-1, but it is considered that there is no significant impact on human health.

As for parameters of SS and total coliform in surface water exceeded the target values at reference monitoring points. The expected reasons for exceeding the target values of SS are delivered from upstream area such as natural origin and wastewater from local industrial zone which outside of Thilawa SEZ. The expected reasons for exceeding the target values of total coliform are by natural origin (natural bacteria existed). As mentioned in Section 2.5.2, the result of self-monitoring of *E. coli* at SW-2, SW-3 and SW-4 were under the reference value. Therefore, although the target value of total coliform exceeded at reference monitoring point, but it is considered that there is no significant impact on human health. However, it cannot reach to the conclusion of what the reason to be exceeded the target values is, thus the continuous monitoring and yearly trend analysis will be necessary to carry out based on the rainy and dry season data.

As for future subject for main discharged points of Thilawa SEZ Zone A, the following action may be taken to achieve the target levels of SS, total coliform and appropriate water quality monitoring:

- To continue monitoring *Escherichia coli* (*E. coli*) level to identify health impact by coliform bacteria; and
- To monitor the possibility of the overflow water from construction sites.
- To monitor the possibility of the domestic wastewater from construction sites.

End of the Document



APPENDIX-1 FIELD SURVEY PHOTOS



FOR DISCHARGED POINTS OF THILAWA SEZ ZONE A



Surface water sampling and onsite measurement at SW-1



Surface water sampling and onsite measurement at SW-5



Surface water sampling and onsite measurement at SW-6

**FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH
DISCHARGED POINTS AND BASELINE OF DISCHARGED CREEK**



Surface water sampling and onsite measurement at SW-2



Surface water sampling and onsite measurement at SW-3



Surface water sampling and onsite measurement at SW-4



Ground water sampling and onsite measurement at GW-1

APPENDIX-2 LABORATORY RESULTS



FOR DISCHARGED POINTS AND AFTER CENTRALIZED STP

DOWA

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Doc No: GEM-LB-R004E/00
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Report No. : GEM-LAB-201902203
Revision No. : 1
Report Date : 27 February, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon. Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-1-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902121 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

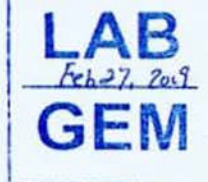
No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	640.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.88	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	20	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	1600	1.8
5	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	13.1	0
6	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.26	0.050
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	4.61	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.4	0

Remark : LOQ - Limit of Quantitation

APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director Feb 27, 2019



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone A
(Bi-Monthly Monitoring in FY February - 2019)



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Doc No: GEM-LB-R004E/00
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Report No. : GEM-LAB-201902207
Revision No. : 1
Report Date : 27 February, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon. Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-5-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902125 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	98.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	4.08	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	52	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	350	1.8
5	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.6	0
6	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	< 0.050	0.050
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	3.92	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	2	0

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director Feb 27, 2019





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Report No. : GEM-LAB-201902208
Revision No. : 1
Report Date : 27 February, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon. Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-6-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902126 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	2.00	...
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	1.71	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	19.6	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	< 1.8	1.8
5	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	13.1	0
6	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.985	0.050
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	1.86	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	2	0

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

Ni Ni Aye Lwin
Supervisor



Approved By :

Tomoya Suzuki
Director Feb 27, 2019



FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH DISCHARGED POINTS AND BASELINE OF DISCHARGED CREEK

DOWA

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Report No. : GEM-LAB-201902204
Revision No. : 1
Report Date : 27 February, 2019
Application No. : 0049-C001


Analysis Report

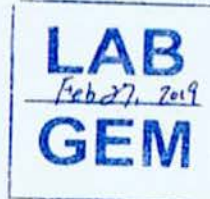
Client Name : Myanmar Koel International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-2-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902122 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	28.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	15.41	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	119	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	> 160000	1.8
5	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.9	0
6	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.289	0.050
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	21.86	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	2	0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002

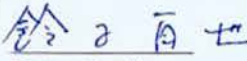
Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director Feb 27, 2019





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Report No. : GEM-LAB-201902205
Revision No. : 1
Report Date : 27 February, 2019
Application No. : 0049-C001


Analysis Report

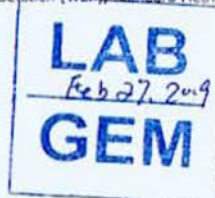
Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-3-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902123 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	254.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.79	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	27.5	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	24000	1.8
5	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	9.1	0
6	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.155	0.050
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	3.49	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	2	0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	3.200	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.012	0.002


Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


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Approved By :


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Director Feb 27, 2019



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone A
(Bi-Monthly Monitoring in FY February - 2019)



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Doc No: GEM-LB-R004E/00
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Report No. : GEM-LAB-201902206
Revision No. : 1
Report Date : 27 February, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon. Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-4-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902124 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	164.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	2.89	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	21.1	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
5	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	4.1	0
6	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.103	0.050
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	2.63	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	2	0
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
10	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.014	0.002

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

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Approved By :

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Director Feb 27, 2019





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Report No. : GEM-LAB-201902211
Revision No. : 1
Report Date : 27 February, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No. 1A /28, Mya Thidar Housing, Ward 11, South Okkalapa Township, Yangon, Myanmar.
Project Name : MJTD
Sample Description
Sample Name : MKI-GW-1-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902129 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	4.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	1.56	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	33.5	0.7
4	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	70	1.8
5	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	2.5	0
6	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.063	0.050
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	0.37	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.4	0

Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :

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Approved By :

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Director Feb 27, 2019



**APPENDIX-3 LABORATORY RESULT OF ESCHERICHIA COLI
(SELF-MONITORING)**



FOR DISCHARGED POINTS AND AFTER CENTRALIZED STP

DOWA

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Report No. : GEM-LAB-201902111
Revision No. : 1
Report Date : 19 February, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-1-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902111 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F. Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	4.0	1.8

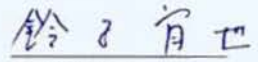
Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


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Director Feb 19, 2019





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Report No. : GEM-LAB-201902115
Revision No. : 1
Report Date : 19 February, 2019
Application No. : 0049-C001

Analysis Report

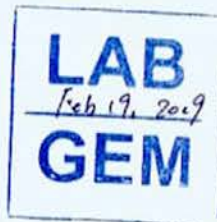
Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /2B, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description :
Sample Name : MKI-SW-5-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902115 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	9.2	1.8


Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director Feb 19, 2019



FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH DISCHARGED POINTS AND BASELINE OF DISCHARGED CREEK



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Report No. : GEM-LAB-201902112
Revision No. : 1
Report Date : 19 February, 2019
Application No. : 0049-C001


Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-2-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902112 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	4.0	1.8

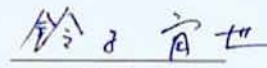
Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


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Supervisor



Approved By :


Tomoya Suzuki
Director Feb 19, 2019





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Report No. : GEM-LAB-201902113
Revision No. : 1
Report Date : 19 February, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-3-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902113 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	< 1.8	1.8

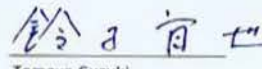
Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director Feb 19, 2019





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Report No. : GEM-LAB-201902114
Revision No. : 1
Report Date : 19 February, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koel International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-SW-4-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902114 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	14.0	1.8


Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director Feb 19, 2019



Water Quality Monitoring Report for Development of Industrial Area in Thilawa SEZ Zone A
(Bi-Monthly Monitoring in FY February - 2019)

DOWA

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Report No. : GEM-LAB-201902119
Revision No. : 1
Report Date : 19 February, 2019
Application No. : 0049-C001

Analysis Report

Client Name : Myanmar Koei International LTD (MKI)
Address : No.1A /28, Mya Thidar Housing, Ward 11, South Okkalapa.
Project Name : MJTD
Sample Description
Sample Name : MKI-GW-1-0213 Sampling Date : 13 February, 2019
Sample No. : W-1902119 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 13 February, 2019

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	2.0	1.8

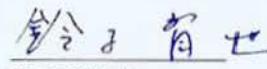
Remark : LOQ - Limit of Quantitation
APHA - American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 22nd edition

Analysed By :


Ni Ni Aye Lwin
Supervisor



Approved By :


Tomoya Suzuki
Director Feb. 19. 2019



**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Appendix

Air Quality Monitoring Report

February, 2019

**AIR QUALITY MONITORING
REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
THILAWA SEZ ZONE A
(OPERATION STAGE)**

(BI-ANNUALLY MONITORING)

**February 2019
Myanmar Koei International Ltd.**



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2.4 Monitoring Method

Monitoring of CO, NO₂, TSP, PM₁₀ and SO₂ were conducted by referring to the recommendation of the United States Environmental Protection Agency (U.S. EPA). The Haz-Scanner EPAS was used to collect ambient air pollutants. The EPAS measures automatically every five minutes and directly reads and records onsite for CO, NO₂, TSP, PM₁₀ and SO₂. Due to the limitation of the analytical equipment in Myanmar, TSP results were calculated as predicted value which is based on the results of PM₁₀. Therefore, the result of TSP was evaluated using the estimated TSP concentration values. The state of air quality monitoring is shown in Figure 2.4-1.

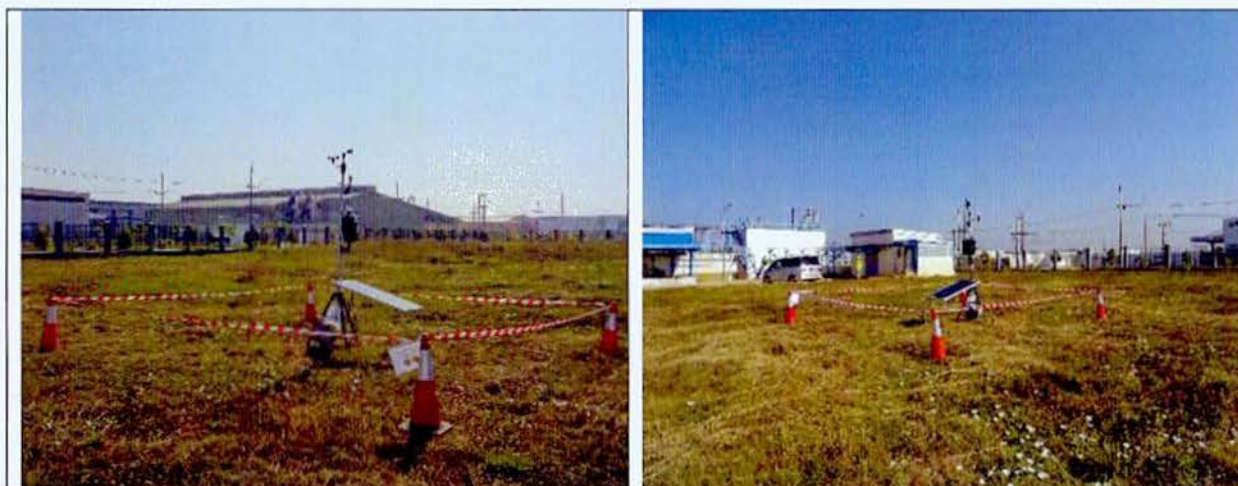


Figure 2.4-1 Status of Air Quality Monitoring Point

2.5 Monitoring Results

The daily average value of air quality monitoring results of CO, NO₂, TSP, PM₁₀ and SO₂ are described in Table 2.5-1. Comparing with the target value of CO, NO₂, TSP, PM₁₀ and SO₂ prescribed in EIA report for Thilawa SEZ development project Zone A, concentration of CO was lower than the target value, while concentration of NO₂ measured results for three days, TSP measured values for five days, PM₁₀ measured values for five days and SO₂ measured values for seven days exceeded the target value.

Regarding the calculation of predicted TSP concentration, the correlation value between PM₁₀ and TSP of ambient air quality guideline value in Thailand as below;

$$330 \mu\text{g}/\text{m}^3 \text{ (TSP standard value in Thailand)} / 120 \mu\text{g}/\text{m}^3 \text{ (PM}_{10} \text{ standard value in Thailand)} = 2.75$$

(Correlation value)

Table 2.5-1 Air Quality Monitoring Result (Daily Average)

Date	CO	NO ₂	TSP	PM ₁₀	SO ₂
	ppm (0.235 mg/m ³)	ppm (0.106 mg/m ³)	mg/m ³	mg/m ³	ppm (0.109 mg/m ³)
06 ~ 07 February, 2019	0.206 (0.235 mg/m ³)	0.056 (0.106 mg/m ³)	0.220	0.080	0.042 (0.109 mg/m ³)
07 ~ 08 February, 2019	0.258 (0.296 mg/m ³)	0.084 (0.158 mg/m ³)	0.349	0.127	0.057 (0.148 mg/m ³)
08 ~ 09 February, 2019	0.270 (0.309 mg/m ³)	0.060 (0.113 mg/m ³)	0.335	0.122	0.062 (0.164 mg/m ³)
09 ~ 10 February, 2019	0.159 (0.182 mg/m ³)	0.038 (0.072 mg/m ³)	0.182	0.066	0.040 (0.105 mg/m ³)
10 ~ 11 February, 2019	0.212 (0.243 mg/m ³)	0.063 (0.119 mg/m ³)	0.463	0.168	0.070 (0.182 mg/m ³)
11 ~ 12 February, 2019	0.270 (0.309 mg/m ³)	0.072 (0.135 mg/m ³)	0.442	0.161	0.105 (0.275 mg/m ³)
12 ~ 13 February, 2019	0.267 (0.306 mg/m ³)	0.056 (0.105 mg/m ³)	0.334	0.122	0.095 (0.249 mg/m ³)
7 Days Average Value	0.235 (0.269 mg/m ³)	0.061 (0.115 mg/m ³)	0.332	0.121	0.067 (0.176 mg/m ³)
Target Value	10 (11.45 mg/m ³)	<0.06 (0.11 mg/m ³)	<0.33	<0.12	<0.04 (0.11 mg/m ³)

Note: The target value of CO, NO₂ and SO₂ were converted to ppm units from mg/m³.
Red color mentions the exceeded value for NO₂, TSP, PM₁₀ and SO₂.

Wind direction and wind speed were measured at AQ-1. Hourly average values of measured wind direction and wind speed data are described in Appendix 1. Status of air quality monitoring point and wind direction are described in Figure 2.5-1.

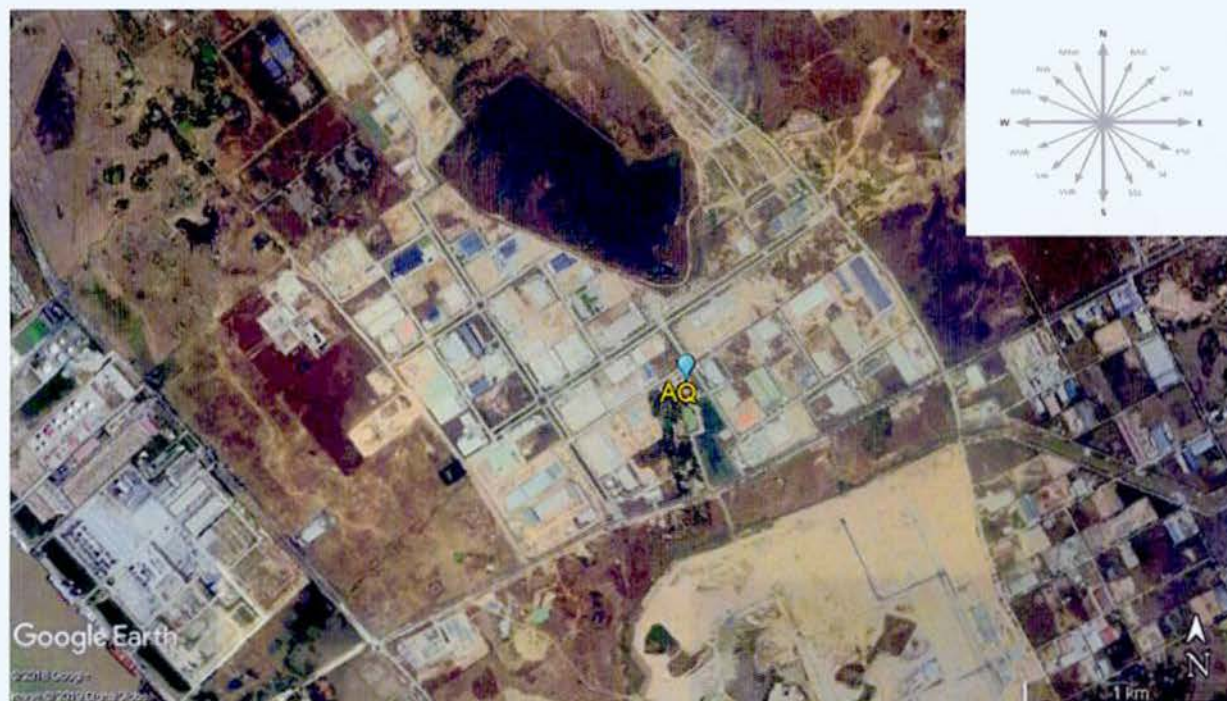


Figure 2.5-1 Status of Air Quality Monitoring Point and Wind Direction at AQ-1

Remark: **N** North **NNE** North-Northeast **NE** Northeast **ENE** East-Northeast **E** East **ESE** East-Southeast **SE** Southeast **SSE** South-Southeast
S South **SSW** South-Southwest **SW** Southwest **WSW** West-Southwest **W** West **WNW** West-Northwest **NW** Northwest **NNW** North-Northwest



NO₂

Overall summary of total exceeded hours from Day 1 to Day 7 for NO₂ are shown in Table 2.5-2. Based on the summary table of wind direction appearance ratio of total exceeded hours for NO₂, the total exceeded hours for seven days were 84 hours. After detailed analysis of the NO₂ exceeded time according to the wind direction, most exceeded hours are come from West-Southwest (WSW) and some exceeded hours are come from Southeast (SE), Southwest (SW) and West (W). Possible emission sources are affected from the operation and construction activities of Zone A's locators, daily human activities in Moegyoe Swan Monastery Compound, running vehicles on Dagon-Thilawa road and transportation in and around the monitoring area.

Table 2.5-2 Summary of Wind Direction Appearance Ratio at AQ-1 (NO₂ Exceeded hours)

Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
Total (Times)	2	1	4	4	3	0	8	7	6	5	9	20	10	3	1	1	84
Appearance Ratio	2%	1%	5%	5%	4%	0%	10%	8%	7%	6%	11%	24%	12%	4%	1%	1%	100%
Avg Value of Exceeded hours	0.154	0.147	0.102	0.132	0.133	0.000	0.114	0.110	0.107	0.104	0.096	0.109	0.110	0.103	0.142	0.150	-
Avg Value (Daily)	0.154	0.147	0.102	0.107	0.098	0.002	0.066	0.044	0.056	0.058	0.073	0.080	0.046	0.042	0.020	0.150	-

Red color mentions the most exceeded appearance ratio for NO₂

The result of wind direction for NO₂ is shown in Figure 2.5-2. The air quality monitoring from 6 February 2019 to 13 February 2019 suggested that the prevailing wind direction is from West-Southwest (WSW) to West (W).



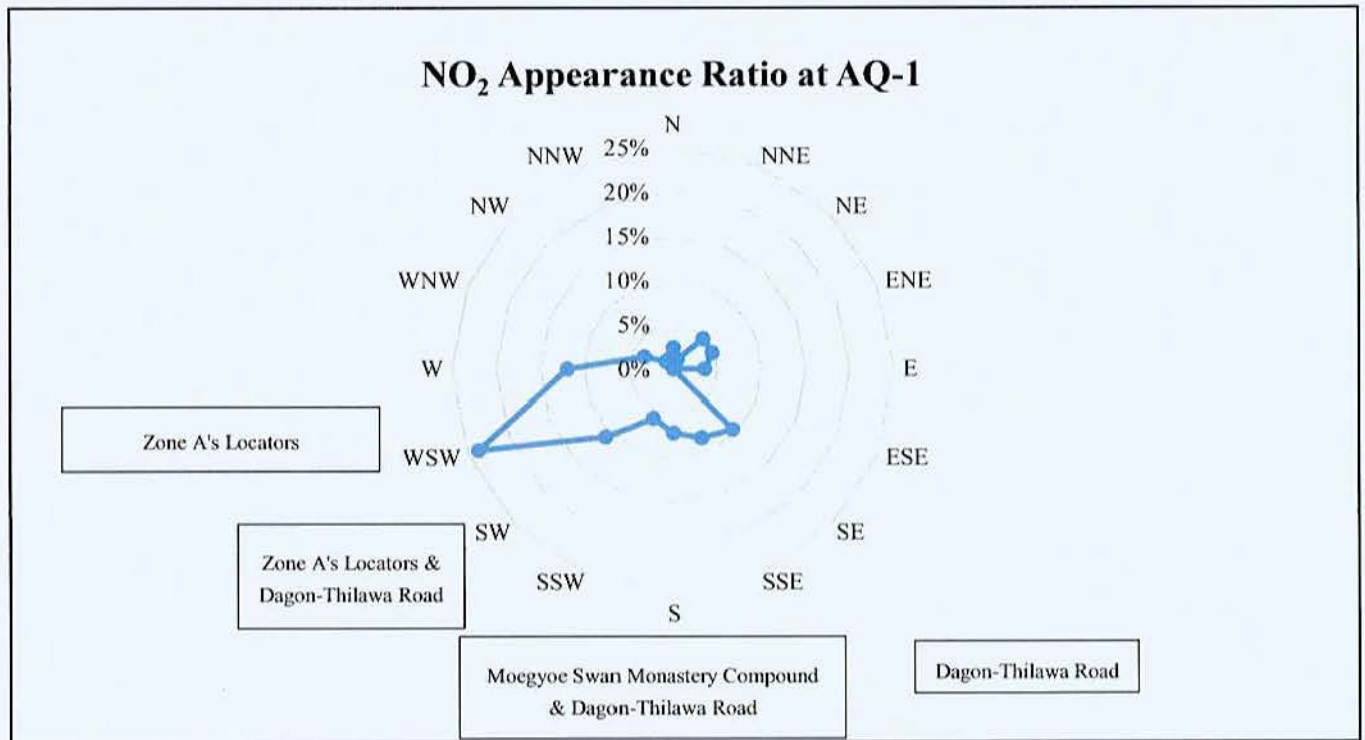


Figure 2.5-2 Wind Direction for NO₂ at AQ-1

TSP

Overall summary of total exceeded hours from Day 1 to Day 7 for TSP are shown in Table 2.5-3. Based on the summary table of wind direction appearance ratio of total exceeded hours for TSP, the total exceeded hours for seven days were 64 hours. After detailed analysis of the TSP exceeded time according to the wind direction, most exceeded hours are come from unpaved vacant area, daily human activities in Southeast (SE) and South-Southeast (SSE) and some exceeded hours are come from Southwest (SW) and West-Southwest (WSW). Possible emission sources are affected from daily human activities in Moegyoe Swan Monastery Compound, running vehicles on Dagon-Thilawa road, construction activities of Zone A's locators, natural origin such as dust from unpaved vacant area and transportation in and around the monitoring area.

Table 2.5-3 Summary of Wind Direction Appearance Ratio at AQ-1 (TSP Exceeded hours)

Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
Total (Times)	2	1	4	4	4	0	11	11	4	4	5	5	4	2	2	1	64
Appearance Ratio	3%	2%	6%	6%	6%	0%	17%	17%	6%	6%	8%	8%	6%	3%	3%	2%	100%
Avg Value of Exceeded hours	0.830	0.401	0.496	0.733	0.464	0.000	0.646	0.671	0.509	0.594	0.440	0.395	0.506	0.923	0.396	0.606	-
Avg Value (Daily)	0.830	0.401	0.496	0.632	0.430	0.078	0.538	0.454	0.292	0.318	0.296	0.237	0.195	0.311	0.199	0.606	-

Red color mentions the most exceeded appearance ratio for TSP

The result of wind direction for TSP is shown in Figure 2.5-3. The air quality monitoring from 6 February 2019 to 13 February 2019 suggested that the prevailing wind direction is from Southeast (SE) to South-Southeast (SSE).



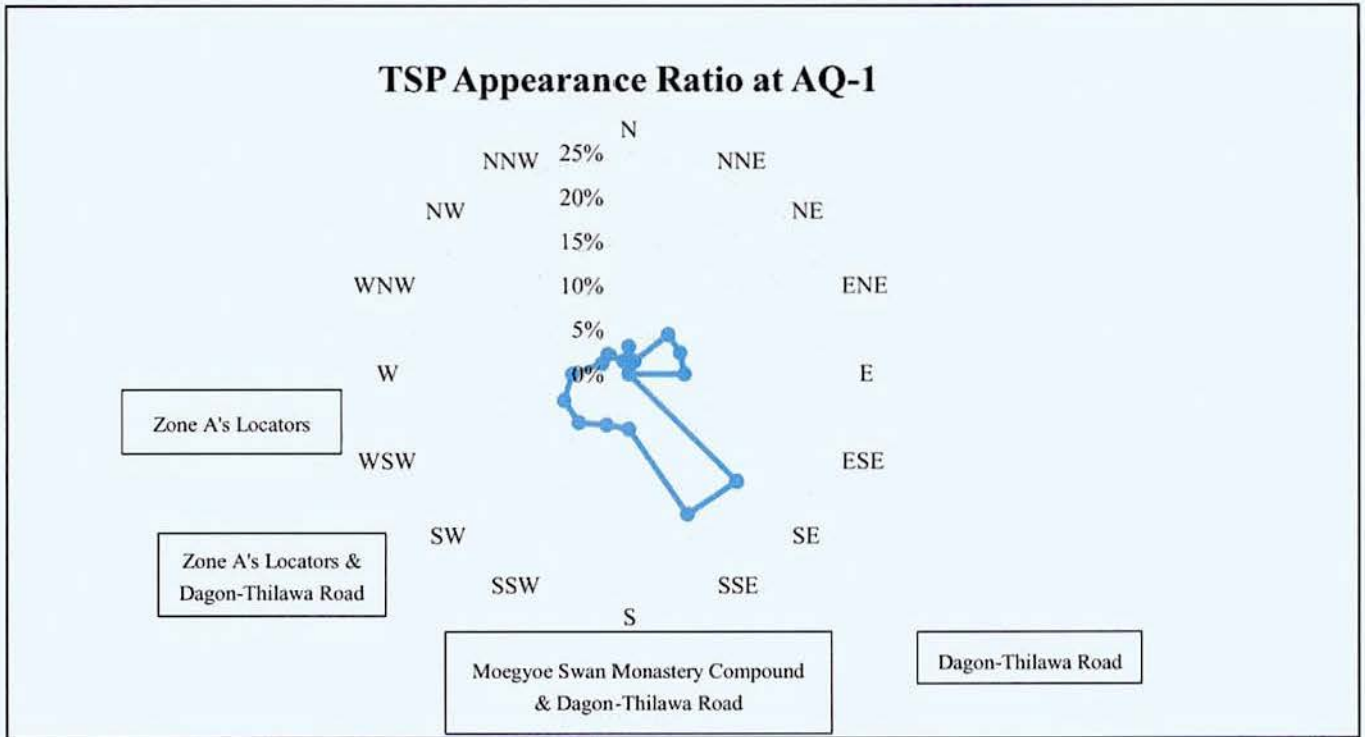


Figure 2.5-3 Wind Direction for TSP at AQ-1

PM₁₀

Overall summary of total exceeded hours from Day 1 to Day 7 for PM₁₀ are shown in Table 2.5-4. Based on the summary table of wind direction appearance ratio of total exceeded hours for PM₁₀, the total exceeded hours for seven days were 64 hours. After detailed analysis of the PM₁₀ exceeded time according to the wind direction, most exceeded hours are come from Southeast (SE) and South-Southeast (SSE) and some exceeded hours are come from Southwest (SW) and West-Southwest (WSW). Possible emission sources are affected from daily human activities in Moegyoe Swan Monastery Compound, running vehicles on Dagon-Thilawa road, construction activities of Zone A's locators, natural origin such as dust from unpaved vacant area and transportation in and around the monitoring area.

Table 2.5-4 Summary of Wind Direction Appearance Ratio at AQ-1 (PM₁₀ Exceeded Hours)

Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
Total (Times)	2	1	4	4	4	0	11	11	4	4	5	5	4	2	2	1	64
Appearance Ratio	3%	2%	6%	6%	6%	0%	17%	17%	6%	6%	8%	8%	6%	3%	3%	2%	100%
Avg Value of Exceeded hours	0.302	0.146	0.184	0.266	0.169	0.000	0.235	0.244	0.185	0.216	0.160	0.144	0.184	0.336	0.144	0.220	-
Avg Value (Daily)	0.302	0.146	0.180	0.230	0.156	0.028	0.196	0.165	0.106	0.115	0.108	0.086	0.071	0.113	0.072	0.220	

Red color mentions the most exceeded appearance ratio for PM₁₀

The result of wind direction for PM₁₀ is shown in Figure 2.5-4. The air quality monitoring from 6 February 2019 to 13 February 2019 suggested that the prevailing wind direction is from Southeast (SE) to South-Southeast (SSE).



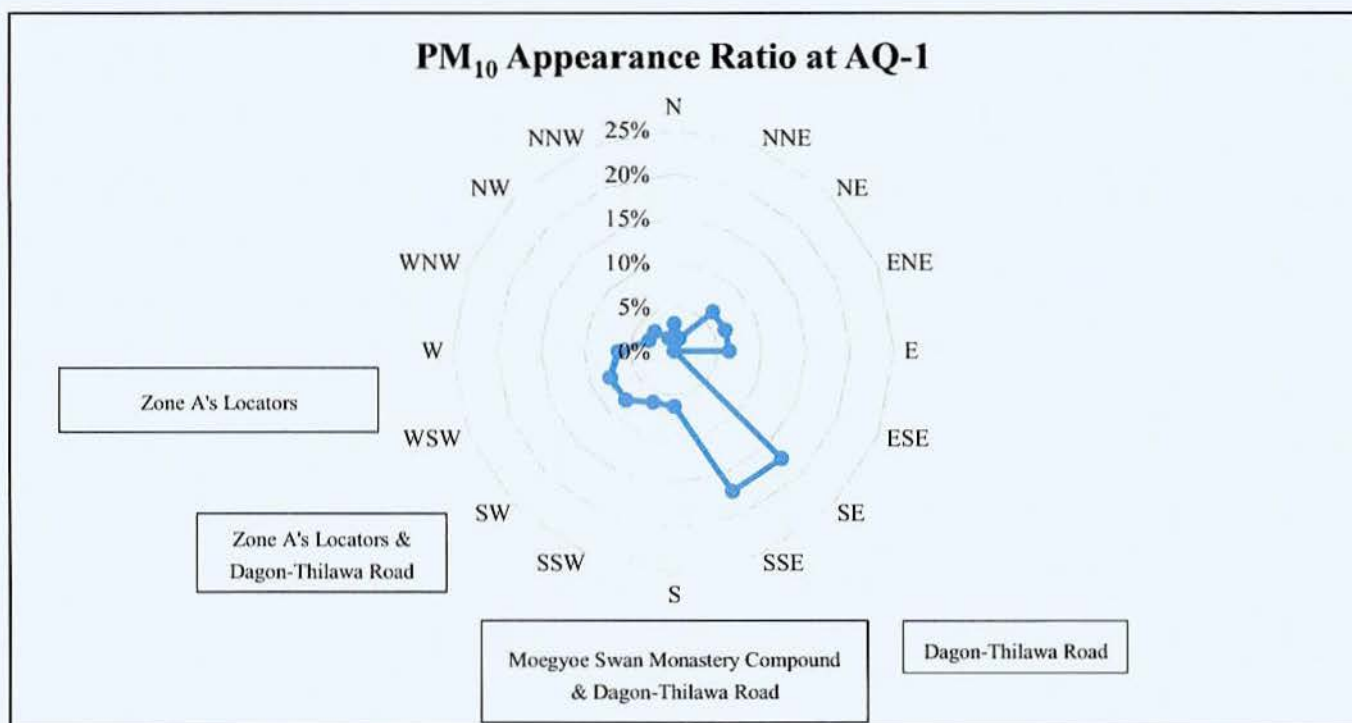


Figure 2.5-4 Wind Direction for PM₁₀ at AQ-1

SO₂

Overall summary of total exceeded hours for Day 1 to Day 7 for SO₂ are shown in Table 2.5-5. Based on the summary table of wind direction appearance ratio of total exceeded hours for SO₂, the total exceeded hours for seven days were 109 hours. After detailed analysis of the SO₂ exceeded time according to the wind direction, most exceeded hours are come from West-Southwest (WSW) and some exceeded hours are come from Southeast (SE), South-Southeast (SSE), Southwest (SW) and West (W). Possible emission sources are affected from the operation and construction activities of Zone A's locators, natural origin such as dust from unpaved vacant area, combustion of fuel for vehicles on Dagon-Thilawa road and transportation in and around the monitoring area.

Table 2.5-5 Summary of Wind Direction Appearance Ratio at AQ-1 (SO₂ Exceeded Hours)

Direction	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
Total (Times)	2	1	3	4	4	1	12	16	7	8	12	23	11	2	2	1	109
Appearance Ratio	2%	1%	3%	4%	4%	1%	11%	15%	6%	7%	11%	21%	10%	2%	2%	1%	100%
Avg Value of Exceeded hours	0.103	0.053	0.058	0.070	0.083	0.043	0.171	0.122	0.094	0.109	0.100	0.072	0.113	0.061	0.066	0.069	-
Avg Value (Daily)	0.103	0.053	0.053	0.061	0.068	0.014	0.139	0.090	0.055	0.079	0.092	0.059	0.047	0.018	0.015	0.069	-

Red color mentions the most exceeded appearance ratio for SO₂

The result of wind direction for SO₂ is shown in Figure 2.5-5. The air quality monitoring from 6 February 2019 to 13 February 2019 suggested that the prevailing wind direction is from West-Southwest (WSW) to West (W).



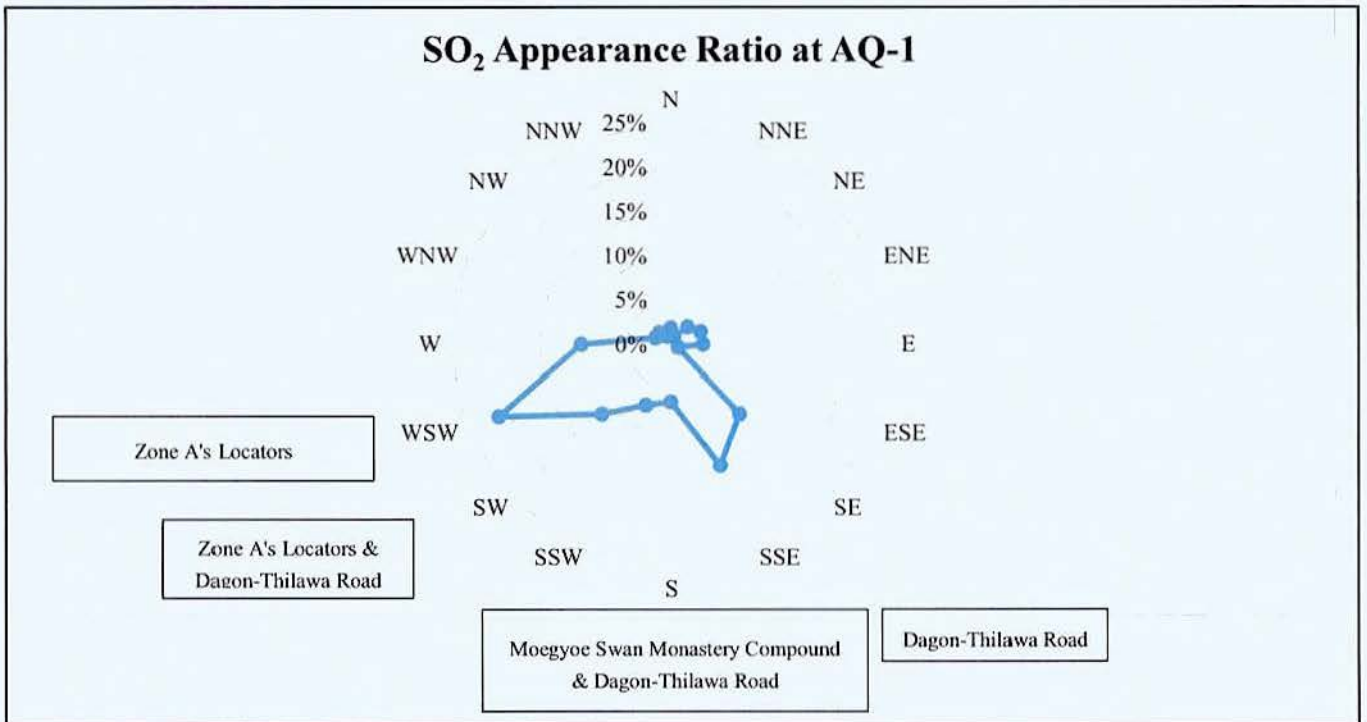


Figure 2.5-5 Wind Direction for SO₂ at AQ-1



CHAPTER 3: CONCLUSION AND ISSUES TO BE SOLVED

The result of air quality at AQ-1, concentration of CO during seven days monitoring was not exceeded the target value, thus there are no impacts on the surrounding environments. On the other hand, results of NO₂ level measured for three days, results of TSP and PM₁₀ level measured for five days and SO₂ level measured for seven days in this monitoring period are higher than the target value.

During the seven days monitoring period, 84 hours results were exceeded for NO₂, 64 hours were exceeded for TSP, 64 hours were exceeded for PM₁₀ and 109 hours were exceeded for SO₂.

After detailed analysis of the NO₂ exceeded time according to the wind direction, most exceeded hours are come from West-Southwest (WSW), West (W), Southwest (SW) and southeast (SE). Possible emission sources are affected from running vehicles on Dagon-Thilawa road and transportation in and around the monitoring area and the operation and construction activities from Zone A's locators.

After detailed analysis of the TSP and PM₁₀ exceeded time according to the wind direction, most exceeded hours are come from South-Southeast (SSE) and Southeast (SE). Possible emission sources are affected from the running vehicles on Dagon-Thilawa Road, natural origin such as dust from unpaved vacant area, and transportation in and around the monitoring area.

After detailed analysis of the SO₂ exceeded time according to the wind direction, most exceeded hours are come from West-Southwest (WSW), South-Southeast (SSE). Possible emission sources are affected from combustion of fuel for vehicles from Dagon-Thilawa Road and the operation and construction activities of Zone A's locators.

As for future subject for air quality monitoring in Zone A, the following action may be taken to achieve the target level:

- 1) To spray the water during construction period for Zone A's locators
- 2) To control the speed limit of all machinery and vehicle (25km/hr) on site to avoid excessive dust creation and to minimize air pollution by the exhaust fumes
- 3) To conduct the proper operation (stop idling while no operation)
- 4) To implement the regular maintenance of machine used for construction and operation activities
- 5) To give awareness training to workers on machinery
- 6) To check and maintain the generator regularly

The continuous monitoring will be necessary to grasp the environmental conditions in Thilawa SEZ Zone A. The mitigation measures for environmental management will be considered in collected periodical environmental data and has to be reviewed in future.



APPENDIX - HOURLY AIR RESULT





Date	Time	CO	NO ₂	TSP	PM ₁₀	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	mg/m ³	mg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
6 Feb 2019	12:00 ~ 13:00	0.000	0.002	0.028	0.010	0.000	4.56	244	WSW
6 Feb 2019	13:00 ~ 14:00	0.000	0.002	0.016	0.006	0.000	4.71	268	W
6 Feb 2019	14:00 ~ 15:00	0.000	0.002	0.042	0.015	0.000	6.15	294	WNW
6 Feb 2019	15:00 ~ 16:00	0.000	0.002	0.060	0.022	0.000	4.88	246	WSW
6 Feb 2019	16:00 ~ 17:00	0.000	0.002	0.124	0.045	0.000	5.33	261	W
6 Feb 2019	17:00 ~ 18:00	0.000	0.002	0.259	0.094	0.000	4.40	279	W
6 Feb 2019	18:00 ~ 19:00	0.131	0.002	0.413	0.150	0.000	0.63	242	WSW
6 Feb 2019	19:00 ~ 20:00	0.304	0.005	0.191	0.069	0.119	0.03	240	WSW
6 Feb 2019	20:00 ~ 21:00	0.289	0.061	0.341	0.124	0.100	0.05	240	WSW
6 Feb 2019	21:00 ~ 22:00	0.318	0.064	0.146	0.053	0.108	0.18	198	SSW
6 Feb 2019	22:00 ~ 23:00	0.222	0.055	0.096	0.035	0.099	0.60	228	SW
6 Feb 2019	23:00 ~ 0:00	0.278	0.082	0.153	0.056	0.093	0.83	243	WSW
7 Feb 2019	0:00 ~ 1:00	0.258	0.102	0.168	0.061	0.067	0.83	243	WSW
7 Feb 2019	1:00 ~ 2:00	0.243	0.101	0.190	0.069	0.058	0.03	237	WSW
7 Feb 2019	2:00 ~ 3:00	0.222	0.102	0.185	0.067	0.047	0.08	226	SW
7 Feb 2019	3:00 ~ 4:00	0.237	0.108	0.211	0.077	0.047	0.35	232	SW
7 Feb 2019	4:00 ~ 5:00	0.244	0.121	0.292	0.106	0.046	0.39	249	WSW
7 Feb 2019	5:00 ~ 6:00	0.316	0.114	0.347	0.126	0.053	0.65	274	W
7 Feb 2019	6:00 ~ 7:00	0.340	0.121	0.591	0.215	0.050	0.10	79	ENE
7 Feb 2019	7:00 ~ 8:00	0.494	0.147	0.401	0.146	0.053	0.42	23	NNE
7 Feb 2019	8:00 ~ 9:00	0.461	0.110	0.528	0.192	0.050	1.88	47	NE
7 Feb 2019	9:00 ~ 10:00	0.311	0.040	0.294	0.107	0.008	1.43	92	E
7 Feb 2019	10:00 ~ 11:00	0.186	0.002	0.133	0.048	0.000	2.53	154	SSE
7 Feb 2019	11:00 ~ 12:00	0.080	0.002	0.069	0.025	0.000	2.68	117	ESE

Max	0.494 (0.566 mg/m ³)	0.147 (0.277 mg/m ³)	0.591	0.215	0.119 (0.311 mg/m ³)
Avg	0.206 (0.235 mg/m ³)	0.056 (0.106 mg/m ³)	0.220	0.080	0.042 (0.109 mg/m ³)
Min	0.000 (0.000 mg/m ³)	0.002 (0.004 mg/m ³)	0.016	0.006	0.000 (0.000 mg/m ³)

Date	Time	CO	NO ₂	TSP	PM ₁₀	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	mg/m ³	mg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
7 Feb 2019	12:00 ~ 13:00	0.042	0.002	0.045	0.016	0.000	3.31	186	S
7 Feb 2019	13:00 ~ 14:00	0.000	0.002	0.052	0.019	0.000	3.21	122	ESE
7 Feb 2019	14:00 ~ 15:00	0.000	0.002	0.065	0.024	0.000	4.20	207	SSW
7 Feb 2019	15:00 ~ 16:00	0.000	0.002	0.094	0.034	0.000	4.53	175	S
7 Feb 2019	16:00 ~ 17:00	0.009	0.002	0.300	0.109	0.000	8.26	146	SE
7 Feb 2019	17:00 ~ 18:00	0.113	0.002	0.348	0.127	0.000	7.56	148	SSE
7 Feb 2019	18:00 ~ 19:00	0.273	0.023	0.357	0.130	0.040	2.23	143	SE
7 Feb 2019	19:00 ~ 20:00	0.514	0.105	0.394	0.143	0.115	0.00	147	SSE
7 Feb 2019	20:00 ~ 21:00	0.500	0.124	0.324	0.118	0.128	0.02	147	SSE
7 Feb 2019	21:00 ~ 22:00	0.488	0.129	0.347	0.126	0.132	0.04	151	SSE
7 Feb 2019	22:00 ~ 23:00	0.321	0.134	0.499	0.181	0.120	0.10	182	S
7 Feb 2019	23:00 ~ 0:00	0.183	0.127	0.231	0.084	0.086	0.23	203	SSW
8 Feb 2019	0:00 ~ 1:00	0.262	0.137	0.266	0.097	0.066	1.69	246	WSW
8 Feb 2019	1:00 ~ 2:00	0.242	0.143	0.253	0.092	0.072	0.99	255	WSW
8 Feb 2019	2:00 ~ 3:00	0.257	0.153	0.417	0.152	0.075	0.01	241	WSW
8 Feb 2019	3:00 ~ 4:00	0.255	0.144	0.385	0.140	0.071	1.09	277	W
8 Feb 2019	4:00 ~ 5:00	0.250	0.142	0.438	0.159	0.065	0.35	318	NW
8 Feb 2019	5:00 ~ 6:00	0.279	0.150	0.606	0.220	0.069	0.22	347	NNW
8 Feb 2019	6:00 ~ 7:00	0.465	0.151	1.057	0.384	0.108	0.03	350	N
8 Feb 2019	7:00 ~ 8:00	0.618	0.157	0.604	0.220	0.098	0.10	351	N
8 Feb 2019	8:00 ~ 9:00	0.428	0.120	0.626	0.228	0.085	2.60	89	E
8 Feb 2019	9:00 ~ 10:00	0.323	0.054	0.345	0.126	0.027	3.64	151	SSE
8 Feb 2019	10:00 ~ 11:00	0.282	0.009	0.218	0.079	0.003	3.35	309	NW
8 Feb 2019	11:00 ~ 12:00	0.093	0.002	0.100	0.036	0.000	3.43	255	WSW

Max	0.618 (0.708 mg/m ³)	0.157 (0.296 mg/m ³)	1.057	0.384	0.132 (0.345 mg/m ³)
Avg	0.258 (0.296 mg/m ³)	0.084 (0.158 mg/m ³)	0.349	0.127	0.057 (0.148 mg/m ³)
Min	0.000 (0.000 mg/m ³)	0.002 (0.004 mg/m ³)	0.045	0.016	0.000 (0.000 mg/m ³)





Date	Time	CO	NO ₂	TSP	PM ₁₀	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	mg/m ³	mg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
8 Feb 2019	12:00 ~ 13:00	0.098	0.002	0.038	0.014	0.000	3.23	169	S
8 Feb 2019	13:00 ~ 14:00	0.001	0.002	0.086	0.031	0.000	2.85	200	SSW
8 Feb 2019	14:00 ~ 15:00	0.012	0.002	0.122	0.044	0.000	2.84	240	WSW
8 Feb 2019	15:00 ~ 16:00	0.002	0.002	0.227	0.082	0.000	4.26	267	W
8 Feb 2019	16:00 ~ 17:00	0.001	0.002	0.283	0.103	0.000	3.15	173	S
8 Feb 2019	17:00 ~ 18:00	0.148	0.002	0.429	0.156	0.001	1.32	156	SSE
8 Feb 2019	18:00 ~ 19:00	0.508	0.003	0.816	0.297	0.047	0.38	146	SE
8 Feb 2019	19:00 ~ 20:00	0.529	0.053	0.600	0.218	0.124	0.45	164	SSE
8 Feb 2019	20:00 ~ 21:00	0.539	0.058	0.503	0.183	0.148	0.15	192	SSW
8 Feb 2019	21:00 ~ 22:00	0.318	0.061	0.337	0.123	0.127	0.59	218	SW
8 Feb 2019	22:00 ~ 23:00	0.256	0.073	0.187	0.068	0.091	0.71	222	SW
8 Feb 2019	23:00 ~ 0:00	0.245	0.090	0.206	0.075	0.078	1.04	216	SW
9 Feb 2019	0:00 ~ 1:00	0.243	0.105	0.172	0.063	0.069	2.69	246	WSW
9 Feb 2019	1:00 ~ 2:00	0.254	0.122	0.216	0.079	0.058	0.25	254	WSW
9 Feb 2019	2:00 ~ 3:00	0.238	0.111	0.212	0.077	0.061	1.28	249	WSW
9 Feb 2019	3:00 ~ 4:00	0.243	0.113	0.235	0.086	0.060	0.62	262	W
9 Feb 2019	4:00 ~ 5:00	0.241	0.113	0.269	0.098	0.058	0.08	286	WNW
9 Feb 2019	5:00 ~ 6:00	0.472	0.131	0.630	0.229	0.120	0.65	259	W
9 Feb 2019	6:00 ~ 7:00	0.663	0.133	0.986	0.359	0.329	0.38	143	SE
9 Feb 2019	7:00 ~ 8:00	0.445	0.138	0.377	0.137	0.090	0.33	85	E
9 Feb 2019	8:00 ~ 9:00	0.348	0.101	0.445	0.162	0.040	1.83	40	NE
9 Feb 2019	9:00 ~ 10:00	0.272	0.017	0.301	0.110	0.000	2.48	177	S
9 Feb 2019	10:00 ~ 11:00	0.208	0.002	0.196	0.071	0.000	1.84	270	W
9 Feb 2019	11:00 ~ 12:00	0.200	0.002	0.160	0.058	0.000	2.22	279	W

Max	0.663 (0.760 mg/m ³)	0.138 (0.260 mg/m ³)	0.986	0.359	0.329 (0.862 mg/m ³)
Avg	0.270 (0.309 mg/m ³)	0.060 (0.113 mg/m ³)	0.335	0.122	0.062 (0.164 mg/m ³)
Min	0.001 (0.001 mg/m ³)	0.002 (0.004 mg/m ³)	0.038	0.014	0.000 (0.000 mg/m ³)

Date	Time	CO	NO ₂	TSP	PM ₁₀	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	mg/m ³	mg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
9 Feb 2019	12:00 ~ 13:00	0.084	0.002	0.096	0.035	0.000	2.49	282	WNW
9 Feb 2019	13:00 ~ 14:00	0.001	0.002	0.113	0.041	0.000	4.56	289	WNW
9 Feb 2019	14:00 ~ 15:00	0.000	0.002	0.167	0.061	0.000	5.23	296	WNW
9 Feb 2019	15:00 ~ 16:00	0.000	0.002	0.157	0.057	0.000	6.06	296	WNW
9 Feb 2019	16:00 ~ 17:00	0.000	0.002	0.213	0.078	0.000	6.63	263	W
9 Feb 2019	17:00 ~ 18:00	0.048	0.002	0.333	0.121	0.000	4.63	222	SW
9 Feb 2019	18:00 ~ 19:00	0.160	0.002	0.421	0.153	0.002	2.57	151	SSE
9 Feb 2019	19:00 ~ 20:00	0.338	0.026	0.316	0.115	0.096	1.73	150	SSE
9 Feb 2019	20:00 ~ 21:00	0.513	0.064	0.272	0.099	0.140	0.29	144	SE
9 Feb 2019	21:00 ~ 22:00	0.439	0.087	0.332	0.121	0.137	0.13	144	SE
9 Feb 2019	22:00 ~ 23:00	0.309	0.106	0.362	0.132	0.127	0.41	185	S
9 Feb 2019	23:00 ~ 0:00	0.278	0.120	0.250	0.091	0.092	2.62	235	SW
10 Feb 2019	0:00 ~ 1:00	0.242	0.109	0.198	0.072	0.070	3.85	251	WSW
10 Feb 2019	1:00 ~ 2:00	0.211	0.099	0.190	0.069	0.050	0.87	262	W
10 Feb 2019	2:00 ~ 3:00	0.190	0.084	0.179	0.065	0.035	0.58	279	W
10 Feb 2019	3:00 ~ 4:00	0.151	0.057	0.112	0.041	0.006	2.63	284	WNW
10 Feb 2019	4:00 ~ 5:00	0.128	0.045	0.124	0.045	0.008	0.83	278	W
10 Feb 2019	5:00 ~ 6:00	0.118	0.033	0.093	0.034	0.035	2.65	275	W
10 Feb 2019	6:00 ~ 7:00	0.145	0.031	0.106	0.038	0.088	1.99	267	W
10 Feb 2019	7:00 ~ 8:00	0.137	0.037	0.116	0.042	0.081	3.79	270	W
10 Feb 2019	8:00 ~ 9:00	0.141	0.007	0.120	0.044	0.000	3.07	268	W
10 Feb 2019	9:00 ~ 10:00	0.126	0.002	0.069	0.025	0.000	3.39	325	NW
10 Feb 2019	10:00 ~ 11:00	0.044	0.002	0.025	0.009	0.000	3.90	322	NW
10 Feb 2019	11:00 ~ 12:00	0.007	0.002	0.012	0.004	0.000	3.94	314	NW

Max	0.513 (0.588 mg/m ³)	0.120 (0.225 mg/m ³)	0.421	0.153	0.140 (0.366 mg/m ³)
Avg	0.159 (0.182 mg/m ³)	0.038 (0.072 mg/m ³)	0.182	0.066	0.040 (0.105 mg/m ³)
Min	0.000 (0.000 mg/m ³)	0.002 (0.004 mg/m ³)	0.012	0.004	0.000 (0.000 mg/m ³)





Date	Time	CO	NO ₂	TSP	PM ₁₀	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	mg/m ³	mg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
10 Feb 2019	12:00 ~ 13:00	0.000	0.002	0.008	0.003	0.000	5.35	278	W
10 Feb 2019	13:00 ~ 14:00	0.000	0.002	0.020	0.007	0.000	7.10	268	W
10 Feb 2019	14:00 ~ 15:00	0.000	0.002	0.044	0.016	0.000	8.42	267	W
10 Feb 2019	15:00 ~ 16:00	0.000	0.002	0.064	0.023	0.000	7.08	265	W
10 Feb 2019	16:00 ~ 17:00	0.000	0.002	0.094	0.034	0.000	6.90	206	SSW
10 Feb 2019	17:00 ~ 18:00	0.027	0.002	0.239	0.087	0.000	6.54	149	SSE
10 Feb 2019	18:00 ~ 19:00	0.183	0.002	0.239	0.087	0.042	3.33	151	SSE
10 Feb 2019	19:00 ~ 20:00	0.271	0.035	0.183	0.067	0.139	3.50	150	SSE
10 Feb 2019	20:00 ~ 21:00	0.371	0.087	0.300	0.109	0.161	1.56	160	SSE
10 Feb 2019	21:00 ~ 22:00	0.336	0.068	0.367	0.133	0.099	0.47	222	SW
10 Feb 2019	22:00 ~ 23:00	0.277	0.083	0.244	0.089	0.086	0.96	211	SSW
10 Feb 2019	23:00 ~ 0:00	0.228	0.082	0.228	0.083	0.059	0.10	256	WSW
11 Feb 2019	0:00 ~ 1:00	0.217	0.084	0.185	0.067	0.104	1.31	260	W
11 Feb 2019	1:00 ~ 2:00	0.221	0.091	0.228	0.083	0.405	1.76	264	W
11 Feb 2019	2:00 ~ 3:00	0.223	0.107	0.306	0.111	0.141	0.24	271	W
11 Feb 2019	3:00 ~ 4:00	0.220	0.124	0.366	0.133	0.074	0.41	239	WSW
11 Feb 2019	4:00 ~ 5:00	0.238	0.129	0.661	0.240	0.069	0.48	268	W
11 Feb 2019	5:00 ~ 6:00	0.217	0.134	1.398	0.508	0.063	1.73	288	WNW
11 Feb 2019	6:00 ~ 7:00	0.319	0.130	2.988	1.087	0.057	1.63	165	SSE
11 Feb 2019	7:00 ~ 8:00	0.330	0.142	1.333	0.485	0.058	1.68	128	SE
11 Feb 2019	8:00 ~ 9:00	0.383	0.133	0.508	0.185	0.077	1.89	184	S
11 Feb 2019	9:00 ~ 10:00	0.320	0.061	0.447	0.163	0.033	2.65	288	WNW
11 Feb 2019	10:00 ~ 11:00	0.341	0.012	0.353	0.128	0.003	3.89	319	NW
11 Feb 2019	11:00 ~ 12:00	0.373	0.002	0.300	0.109	0.001	3.44	308	NW

Max	0.383 (0.439 mg/m ³)	0.142 (0.266 mg/m ³)	2.988	1.087	0.405 (1.059 mg/m ³)
Avg	0.212 (0.243 mg/m ³)	0.063 (0.119 mg/m ³)	0.463	0.168	0.070 (0.182 mg/m ³)
Min	0.000 (0.000 mg/m ³)	0.002 (0.004 mg/m ³)	0.008	0.003	0.000 (0.000 mg/m ³)

Date	Time	CO	NO ₂	TSP	PM ₁₀	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	mg/m ³	mg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
11 Feb 2019	12:00 ~ 13:00	0.338	0.002	0.330	0.120	0.000	4.78	129	SE
11 Feb 2019	13:00 ~ 14:00	0.116	0.002	0.199	0.072	0.000	3.45	318	NW
11 Feb 2019	14:00 ~ 15:00	0.005	0.002	0.104	0.038	0.000	3.18	260	W
11 Feb 2019	15:00 ~ 16:00	0.000	0.002	0.120	0.044	0.005	3.13	272	W
11 Feb 2019	16:00 ~ 17:00	0.193	0.002	0.452	0.164	0.228	7.07	217	SW
11 Feb 2019	17:00 ~ 18:00	0.093	0.002	0.393	0.143	0.662	9.07	145	SE
11 Feb 2019	18:00 ~ 19:00	0.290	0.003	0.473	0.172	0.221	3.05	156	SSE
11 Feb 2019	19:00 ~ 20:00	0.398	0.045	0.439	0.160	0.177	0.23	141	SE
11 Feb 2019	20:00 ~ 21:00	0.554	0.086	0.639	0.232	0.163	0.70	155	SSE
11 Feb 2019	21:00 ~ 22:00	0.431	0.104	0.529	0.193	0.139	0.78	143	SE
11 Feb 2019	22:00 ~ 23:00	0.437	0.120	0.584	0.212	0.122	0.05	136	SE
11 Feb 2019	23:00 ~ 0:00	0.310	0.127	0.498	0.181	0.098	0.08	136	SE
12 Feb 2019	0:00 ~ 1:00	0.177	0.110	0.249	0.091	0.059	1.07	200	SSW
12 Feb 2019	1:00 ~ 2:00	0.280	0.118	0.306	0.111	0.058	1.48	239	WSW
12 Feb 2019	2:00 ~ 3:00	0.284	0.119	0.324	0.118	0.064	1.77	249	WSW
12 Feb 2019	3:00 ~ 4:00	0.281	0.126	0.437	0.159	0.069	0.88	238	WSW
12 Feb 2019	4:00 ~ 5:00	0.279	0.135	0.667	0.242	0.062	0.58	187	S
12 Feb 2019	5:00 ~ 6:00	0.371	0.139	0.843	0.307	0.072	0.09	141	SE
12 Feb 2019	6:00 ~ 7:00	0.308	0.139	0.961	0.350	0.064	0.18	61	ENE
12 Feb 2019	7:00 ~ 8:00	0.340	0.143	0.713	0.259	0.069	1.24	70	ENE
12 Feb 2019	8:00 ~ 9:00	0.370	0.127	0.566	0.206	0.073	2.58	47	NE
12 Feb 2019	9:00 ~ 10:00	0.301	0.072	0.443	0.161	0.051	3.48	49	NE
12 Feb 2019	10:00 ~ 11:00	0.191	0.007	0.231	0.084	0.024	3.49	71	ENE
12 Feb 2019	11:00 ~ 12:00	0.139	0.002	0.112	0.041	0.043	4.36	107	ESE

Max	0.554 (0.635 mg/m ³)	0.143 (0.268 mg/m ³)	0.961	0.350	0.662 (1.733 mg/m ³)
Avg	0.270 (0.309 mg/m ³)	0.072 (0.135 mg/m ³)	0.442	0.161	0.105 (0.275 mg/m ³)
Min	0.000 (0.000 mg/m ³)	0.002 (0.004 mg/m ³)	0.104	0.038	0.000 (0.000 mg/m ³)





Date	Time	CO	NO ₂	TSP	PM ₁₀	SO ₂	Wind Speed	Wind Direction	
		ppm	ppm	mg/m ³	mg/m ³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
12 Feb 2019	12:00 ~ 13:00	0.044	0.002	0.059	0.021	0.066	5.08	145	SE
12 Feb 2019	13:00 ~ 14:00	0.048	0.002	0.187	0.068	0.114	5.48	189	S
12 Feb 2019	14:00 ~ 15:00	0.029	0.002	0.144	0.052	0.119	8.92	151	SSE
12 Feb 2019	15:00 ~ 16:00	0.023	0.002	0.177	0.064	0.122	7.77	147	SSE
12 Feb 2019	16:00 ~ 17:00	0.086	0.002	0.274	0.100	0.123	5.42	151	SSE
12 Feb 2019	17:00 ~ 18:00	0.295	0.002	0.395	0.144	0.145	1.78	149	SSE
12 Feb 2019	18:00 ~ 19:00	0.289	0.002	0.462	0.168	0.166	0.37	198	SSW
12 Feb 2019	19:00 ~ 20:00	0.373	0.025	0.274	0.100	0.154	0.04	237	WSW
12 Feb 2019	20:00 ~ 21:00	0.252	0.026	0.282	0.103	0.102	0.04	222	SW
12 Feb 2019	21:00 ~ 22:00	0.363	0.055	0.429	0.156	0.114	0.20	197	SSW
12 Feb 2019	22:00 ~ 23:00	0.249	0.064	0.258	0.094	0.088	0.10	183	S
12 Feb 2019	23:00 ~ 0:00	0.248	0.069	0.258	0.094	0.068	0.03	176	S
13 Feb 2019	0:00 ~ 1:00	0.178	0.077	0.173	0.063	0.050	0.53	239	WSW
13 Feb 2019	1:00 ~ 2:00	0.219	0.078	0.181	0.066	0.061	0.53	241	WSW
13 Feb 2019	2:00 ~ 3:00	0.240	0.109	0.228	0.083	0.057	0.13	226	SW
13 Feb 2019	3:00 ~ 4:00	0.255	0.112	0.286	0.104	0.058	0.48	167	SSE
13 Feb 2019	4:00 ~ 5:00	0.253	0.119	0.298	0.108	0.054	0.35	258	WSW
13 Feb 2019	5:00 ~ 6:00	0.652	0.129	0.709	0.258	0.130	0.00	226	SW
13 Feb 2019	6:00 ~ 7:00	0.593	0.138	0.982	0.357	0.106	0.05	203	SSW
13 Feb 2019	7:00 ~ 8:00	0.544	0.140	0.446	0.162	0.096	0.52	92	E
13 Feb 2019	8:00 ~ 9:00	0.426	0.126	0.666	0.242	0.096	2.57	73	ENE
13 Feb 2019	9:00 ~ 10:00	0.316	0.050	0.408	0.148	0.064	1.43	86	E
13 Feb 2019	10:00 ~ 11:00	0.278	0.002	0.268	0.098	0.060	2.14	245	WSW
13 Feb 2019	11:00 ~ 12:00	0.163	0.002	0.178	0.065	0.068	2.91	322	NW

Max	0.652 (0.746 mg/m ³)	0.140 (0.264 mg/m ³)	0.982	0.357	0.166 (0.435 mg/m ³)
Avg	0.267 (0.306 mg/m ³)	0.056 (0.105 mg/m ³)	0.334	0.122	0.095 (0.249 mg/m ³)
Min	0.023 (0.026 mg/m ³)	0.002 (0.004 mg/m ³)	0.059	0.021	0.050 (0.131 mg/m ³)

**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Appendix

Noise and Vibration Monitoring Report

February, 2019

**NOISE AND VIBRATION
MONITORING REPORT
FOR DEVELOPMENT OF INDUSTRIAL AREA
THILAWA SEZ ZONE A
(OPERATION STAGE)**

(BI-ANNUALLY MONITORING)

**February 2019
Myanmar Koei International Ltd.**



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CHAPTER 1: OUTLINES AND SUMMARY OF MONITORING PLAN

1.1 General

Thilawa Special Economic Zone (TSEZ) is located in southern district of Yangon region and about 23 km southeast of Yangon city. As the developer of Thilawa SEZ, Myanmar Japan Thilawa Development Ltd. (MJTD) has a responsibility to carry out regular environmental monitoring in the industrial area of Zone A in accordance with the approved Environmental Impact Assessment (EIA) report with Environmental Management Plan (EMP). MJTD has implemented monitoring various environmental items with the specified time frame to know the environmental conditions in and around the area.

1.2 Outlines of Monitoring Plan

To assess the environmental conditions under the operation of industrial area in and around Thilawa SEZ Zone A, noise and vibration levels had been monitored from 6 February 2019 – 9 February 2019 as follows;

Table 1.2-1 Outlines of Noise and Vibration Level Monitoring

Monitoring Date	Monitoring Item	Parameters	Number of Points	Duration	Monitoring Methodology
From 6 February – 7 February, 2019	Noise Level	$L_{Aeq}(dB)$	1 (NV-1)	24 hours	On-site measurement by “Rion NL-42 sound level meter”
From 7 February – 8 February, 2019	Noise Level	$L_{Aeq}(dB)$	1 (NV-2)	24 hours	On-site measurement by “Rion NL-42 sound level meter”
From 8 February – 9 February, 2019	Noise Level	$L_{Aeq}(dB)$	1 (NV-3)	24 hours	On-site measurement by “Rion NL-42 sound level meter”
From 6 February – 7 February, 2019	Vibration Level	$L_{v10}(dB)$	1 (NV-1)	24 hours	On-site measurement by “Vibration Level Meter- VM-53A”
From 7 February – 8 February, 2019	Vibration Level	$L_{v10}(dB)$	1 (NV-2)	24 hours	On-site measurement by “Vibration Level Meter- VM-53A”
From 8 February – 9 February, 2019	Vibration Level	$L_{v10}(dB)$	1 (NV-3)	24 hours	On-site measurement by “Vibration Level Meter- VM-53A”



CHAPTER 2: NOISE AND VIBRATION LEVEL MONITORING

2.1 Monitoring Item

The noise and vibration level monitoring items are shown in Table 2.1-1.

Table 2.1-1 Monitoring Parameters for Noise and Vibration Level

No.	Item	Parameter
1	Noise	A-weighted loudness equivalent (L_{Aeq})
2	Vibration	Vibration level, vertical, percentile (L_{V10})

2.2 Monitoring Location

The locations of noise and vibration level points are shown in Table 2.2-1. The detail of each sampling point is described below. The location of the noise and vibration monitoring points are shown in Figure 2.2-1.

Table 2.2-1 Location of Noise and Vibration Monitoring Station

Sampling Point	Coordinates	Description of Sampling Point
NV-1	N: 16°40'11.50", E: 96°16'32.00"	In front of administrative building, Thilawa SEZ Zone A
NV-2	N: 16°40'52.50", E: 96°16'55.50"	In the east of the Thilawa SEZ Zone A
NV-3	N: 16°40'46.20", E: 96°15'30.10"	In the west of the Thilawa SEZ Zone A, where is the nearest to the residential houses of Alwan sok village.



Figure 2.2-1 Location of Noise and Vibration Level Monitoring Points



NV-1

NV-1 is located in front of administrative building, Thilawa SEZ and next to Dagon-Thilawa road which is paved with moderate to highly traffic volume during the day and night by passing of loader vehicles and dump trucks. Possible sources of noise and vibration is generated from vehicle traffic during the day and nighttime.

NV-2

NV-2 is located in the east of the Thilawa SEZ Zone A, Thilawa dam in west and construction of factories in Thilawa SEZ Zone A in northwest. Possible sources of noise and vibration is generated from construction activities from Zone A's locators and road traffic. There is an access road situated east of NV-2.

NV-3

NV-3 is located in the west of the Thilawa SEZ Zone A, surrounded by the residential houses of Alwan sok village in north and northwest and garment factory in northeast, construction of factories in Thilawa SEZ Zone A in east respectively. Possible sources of noise and vibration is generated from operation and construction activities of surrounding Zone A's locators. In addition, daily human activities nearby Alwan sok village and road traffic might be noise and vibration sources. There is an access road situated in the northeast of NV-3.



2.3 Monitoring Method

Noise level was measured by “Rion NL-42 sound level meter” and automatically recorded every 10 minutes in a memory card. The vibration level meter was, VM-53A (Rion Co. Ltd., Japan), accompanied by a 3-axis accelerometer PV-83C (Rion Co., Ltd.) was placed on solid soil ground. Vertical vibration (Z axis), L_v , was measured every 10 minutes within the adaptable range of (10-70) dB at NV-1, (10-70) dB at NV-2, and (10-70) dB at NV-3 and recorded to a memory card.

The measurement period of noise and vibration was 24 hours for each monitoring point. The status of the noise and vibration level monitoring on NV-1, NV-2 and NV-3 are shown in Figure 2.3-1





Figure 2.3-1 Status of Noise and Vibration Level Monitoring at NV-1, NV-2 and NV-3

2.4 Monitoring Results

Noise Monitoring Results

Noise monitoring results are separated daytime (6:00 AM to 10:00 PM), night time (10:00 PM to 6:00 AM) time frames for NV-1, daytime (7:00 AM to 7:00 PM), evening time (7:00 PM to 10:00 PM), and night time (10:00 PM to 7:00 AM) time frames respectively for NV-2 and NV-3. Noise measurement was carried out for one location on a 24-hour basis. The monitoring results are summarized in Table 2.4-1, Table 2.4-2, and Table 2.4-3 respectively. Hourly noise level monitoring results for NV-1, NV-2 and NV-3 are shown in Table 2.4-4, Table 2.4-5 and Table 2.4-6. Comparing with the target value of noise level in operation stage prescribed in EIA report for Thilawa SEZ development project Zone A, all results were under the target values at NV-1, NV-2 and NV-3.

Table 2.4-1 Results of Noise Levels (L_{Aeq}) Monitoring at NV-1

Date	(Traffic Noise Level)	
	Equivalent Noise Level (L_{Aeq} , dB)	
	Day Time (6:00 AM – 10:00 PM)	Night Time (10:00 PM – 6:00 AM)
6 February – 7 February, 2019	58	54
Target Value	75	70

Note: Target value is applied to the noise standard along main road stipulated in the Noise Regulation Law (Japan) (Law No. 98 of 1968, Latest Amendment by Law No.91 of 2000).

Table 2.4-2 Results of Noise Levels (L_{Aeq}) Monitoring at NV-2

Date	(Commercial and Industrial Areas)		
	Equivalent Noise Level (L_{Aeq} , dB)		
	Day Time (7:00 AM – 7:00 PM)	Evening Time (7:00 PM – 10:00 PM)	Night Time (10:00 PM – 7:00 AM)
7 February – 8 February, 2019	62	57	53
Target Value	70	65	60

Note: Target value is applied to the noise level during the operation stage in the EIA Report for Thilawa SEZ Development Project (Industrial Area of Zone A).

Table 2.4-3 Results of Noise Levels (L_{Aeq}) Monitoring at NV-3

Date	(Commercial and Industrial Areas)		
	Equivalent Noise Level (L_{Aeq} , dB)		
	Day Time (7:00 AM – 7:00 PM)	Evening Time (7:00 PM – 10:00 PM)	Night Time (10:00 PM – 7:00 AM)
8 February – 9 February, 2019	47	50	45
Target Value	70	65	60

Note: Target value is applied to the noise level during the operation stage in the EIA Report for Thilawa SEZ Development Project (Industrial Area of Zone A).



Table 2.4-4 Hourly Noise Level (L_{Aeq}) Monitoring Results at NV-1

Date	Time	(L_{Aeq} , dB)	(L_{Aeq} , dB) Each Category	(L_{Aeq} , dB) Target Value
6 February – 7 February, 2019	6:00-7:00	58	58	75
	7:00-8:00	59		
	8:00-9:00	57		
	9:00-10:00	58		
	10:00-11:00	57		
	11:00-12:00	57		
	12:00-13:00	57		
	13:00-14:00	57		
	14:00-15:00	57		
	15:00-16:00	59		
	16:00-17:00	58		
	17:00-18:00	58		
	18:00-19:00	59		
	19:00-20:00	58		
	20:00-21:00	58		
	21:00-22:00	57		
	22:00-23:00	57	54	70
	23:00-24:00	56		
	24:00-1:00	55		
	1:00-2:00	55		
	2:00-3:00	53		
	3:00-4:00	53		
	4:00-5:00	52		
	5:00-6:00	53		

Table 2.4-5 Hourly Noise Level (L_{Aeq}) Monitoring Results at NV-2

Date	Time	(L_{Aeq} , dB)	(L_{Aeq} , dB) Each Category	(L_{Aeq} , dB) Target Value		
7 February – 8 February, 2019	7:00-8:00	64	62	70		
	8:00-9:00	63				
	9:00-10:00	61				
	10:00-11:00	61				
	11:00-12:00	61				
	12:00-13:00	60				
	13:00-14:00	60				
	14:00-15:00	61				
	15:00-16:00	62				
	16:00-17:00	62				
	17:00-18:00	66				
	18:00-19:00	62				
	19:00-20:00	59			57	65
	20:00-21:00	57				
	21:00-22:00	53				
	22:00-23:00	55				
	23:00-24:00	53	53	60		
	24:00-1:00	48				
	1:00-2:00	46				
	2:00-3:00	44				
	3:00-4:00	54				
	4:00-5:00	48				
	5:00-6:00	53				
	6:00-7:00	57				



Table 2.4-6 Hourly Noise Level (L_{Aeq}) Monitoring Results at NV-3

Date	Time	(L_{Aeq} , dB)	(L_{Aeq} , dB) Each Category	(L_{Aeq} , dB) Target Value
8 February – 9 February, 2019	7:00-8:00	52	47	70
	8:00-9:00	48		
	9:00-10:00	46		
	10:00-11:00	43		
	11:00-12:00	44		
	12:00-13:00	44		
	13:00-14:00	41		
	14:00-15:00	43		
	15:00-16:00	45		
	16:00-17:00	47		
	17:00-18:00	49		
	18:00-19:00	48		
	19:00-20:00	50	50	65
	20:00-21:00	51		
	21:00-22:00	48		
	22:00-23:00	45	45	60
	23:00-24:00	45		
	24:00-1:00	43		
	1:00-2:00	42		
	2:00-3:00	41		
	3:00-4:00	42		
	4:00-5:00	44		
	5:00-6:00	49		
	6:00-7:00	49		



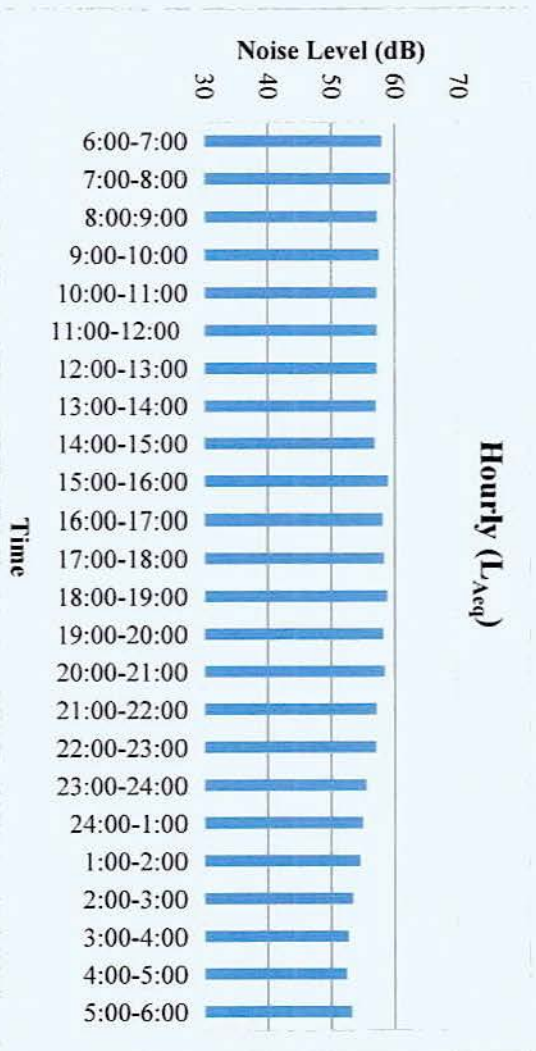


Figure 2.4-1 Results of Noise Levels (L_{Aeq}) Monitoring at NV-1

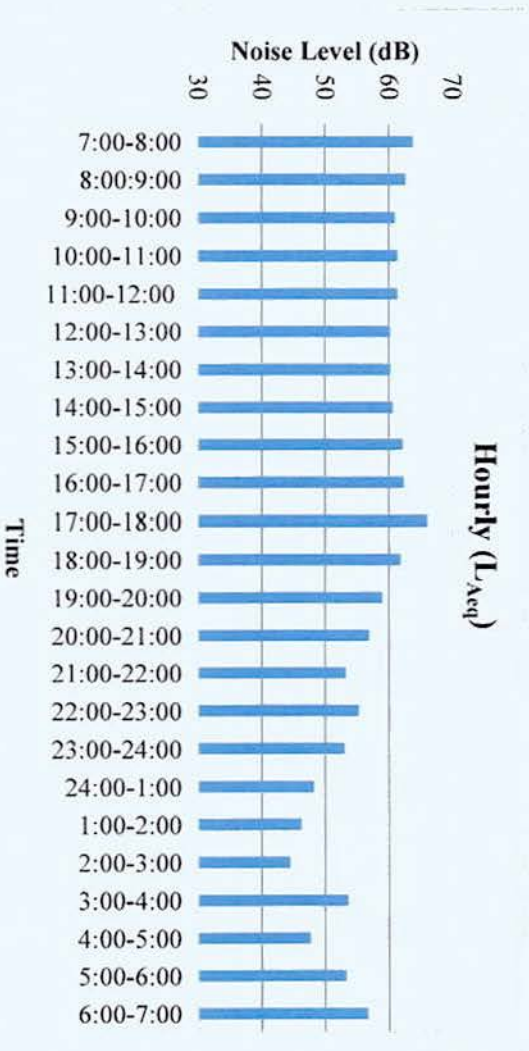


Figure 2.4-2 Results of Noise Levels (L_{Aeq}) Monitoring at NV-2



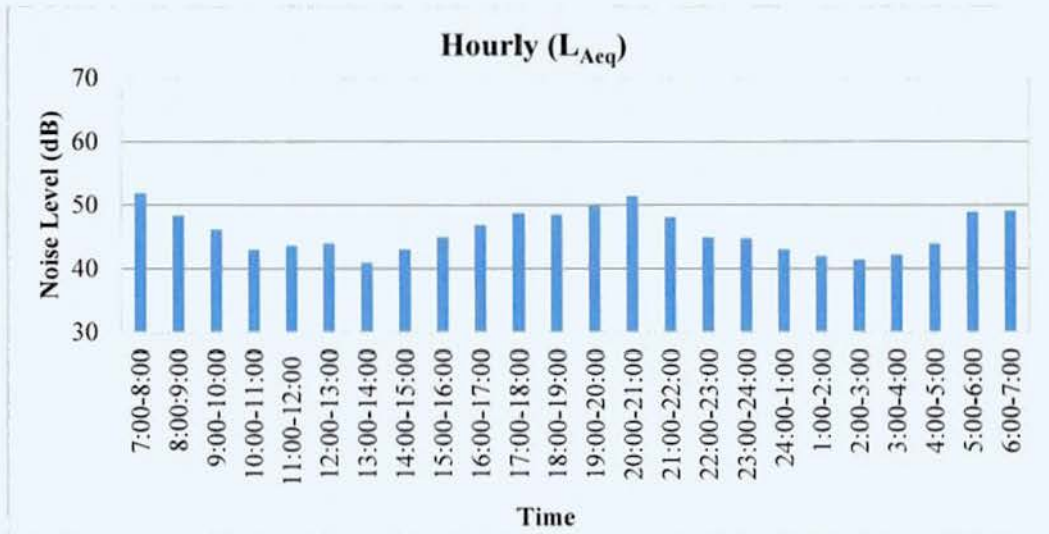


Figure 2.4-3 Results of Noise Levels (L_{Aeq}) Monitoring at NV-3

Vibration Monitoring Results

The results of vibration level are shown in Table 2.4-7, Table 2.4-8, and Table 2.4-9 respectively. Results of hourly vibration level monitoring for NV-1, NV-2 and NV-3 are summarized in Table 2.4-10, Table 2.4-11 and Table 2.4-12. By comparing with the target vibration level in operation stage in EIA report for Thilawa SEZ development project Zone A, all of results were under the target values.

Table 2.4-7 Results of Vibration Levels (L_{v10}) Monitoring at NV-1

Date	(Office, commercial facilities, and factories) Equivalent Vibration Level (L _{v10} , dB)		
	Day Time (7:00 AM – 7:00 PM)	Evening Time (7:00 PM – 10:00 PM)	Night Time (10:00 PM – 7:00 AM)
6 February – 7 February, 2019	47	44	40
Target Value	70	65	65

Note: Target value is applied to the vibration level during the operation stage in the EIA Report for Thilawa SEZ Development Project (Industrial Area of Zone A).

Table 2.4-8 Results of Vibration Levels (L_{v10}) Monitoring at NV-2

Date	(Office, commercial facilities, and factories) Equivalent Vibration Level (L _{v10} , dB)		
	Day Time (7:00 AM – 7:00 PM)	Evening Time (7:00 PM – 10:00 PM)	Night Time (10:00 PM – 7:00 AM)
7 February – 8 February, 2019	36	33	27
Target Value	70	65	65

Note: Target value is applied to the vibration level during the operation stage in the EIA Report for Thilawa SEZ Development Project (Industrial Area of Zone A).

Table 2.4-9 Results of Vibration Levels (L_{v10}) Monitoring at NV-3

Date	(Office, commercial facilities, and factories) Equivalent Vibration Level (L _{v10} , dB)		
	Day Time (7:00 AM – 7:00 PM)	Evening Time (7:00 PM – 10:00 PM)	Night Time (10:00 PM – 7:00 AM)
8 February – 9 February, 2019	29	27	22
Target Value	70	65	65

Note: Target value is applied to the vibration level during the operation stage in the EIA Report for Thilawa SEZ Development Project (Industrial Area of Zone A).



Table 2.4-10 Results of Hourly Vibration Levels (L_{v10}) Monitoring at NV-1

Date	Time	(L_{v10} , dB)	(L_{v10} , dB) Each Category	(L_{v10} , dB) Target Value
6 February – 7 February, 2019	7:00-8:00	44	47	70
	8:00-9:00	43		
	9:00-10:00	46		
	10:00-11:00	47		
	11:00-12:00	48		
	12:00-13:00	47		
	13:00-14:00	46		
	14:00-15:00	46		
	15:00-16:00	48		
	16:00-17:00	47		
	17:00-18:00	48		
	18:00-19:00	47	44	65
	19:00-20:00	45		
	20:00-21:00	44		
	21:00-22:00	41	40	65
	22:00-23:00	41		
	23:00-24:00	42		
	24:00-1:00	42		
	1:00-2:00	38		
	2:00-3:00	40		
	3:00-4:00	36		
4:00-5:00	38			
5:00-6:00	37			
6:00-7:00	41			

Table 2.4-11 Results of Hourly Vibration Levels (L_{v10}) Monitoring at NV-2

Date	Time	(L_{v10} , dB)	(L_{v10} , dB) Each Category	(L_{v10} , dB) Target Value
7 February – 8 February, 2019	7:00-8:00	37	36	70
	8:00-9:00	36		
	9:00-10:00	36		
	10:00-11:00	36		
	11:00-12:00	36		
	12:00-13:00	36		
	13:00-14:00	35		
	14:00-15:00	36		
	15:00-16:00	37		
	16:00-17:00	36		
	17:00-18:00	38		
	18:00-19:00	34		
	19:00-20:00	33		
	20:00-21:00	34	27	65
	21:00-22:00	31		
	22:00-23:00	28		
	23:00-24:00	30		
	24:00-1:00	28		
	1:00-2:00	22		
	2:00-3:00	19		
	3:00-4:00	24		
4:00-5:00	19			
5:00-6:00	25			
6:00-7:00	31			



Table 2.4-12 Results of Hourly Vibration Levels (L_{v10}) Monitoring at NV-3

Date	Time	(L_{v10} , dB)	(L_{v10} , dB) Each Category	(L_{v10} , dB) Target Value
8 February – 9 February, 2019	7:00-8:00	30	29	70
	8:00-9:00	27		
	9:00-10:00	30		
	10:00-11:00	27		
	11:00-12:00	26		
	12:00-13:00	27		
	13:00-14:00	27		
	14:00-15:00	29		
	15:00-16:00	28		
	16:00-17:00	30		
	17:00-18:00	30		
	18:00-19:00	30	27	65
	19:00-20:00	27		
	20:00-21:00	28		
	21:00-22:00	23		
	22:00-23:00	25	22	65
	23:00-24:00	25		
	24:00-1:00	19		
	1:00-2:00	21		
	2:00-3:00	19		
3:00-4:00	18			
4:00-5:00	20			
5:00-6:00	18			
6:00-7:00	24			

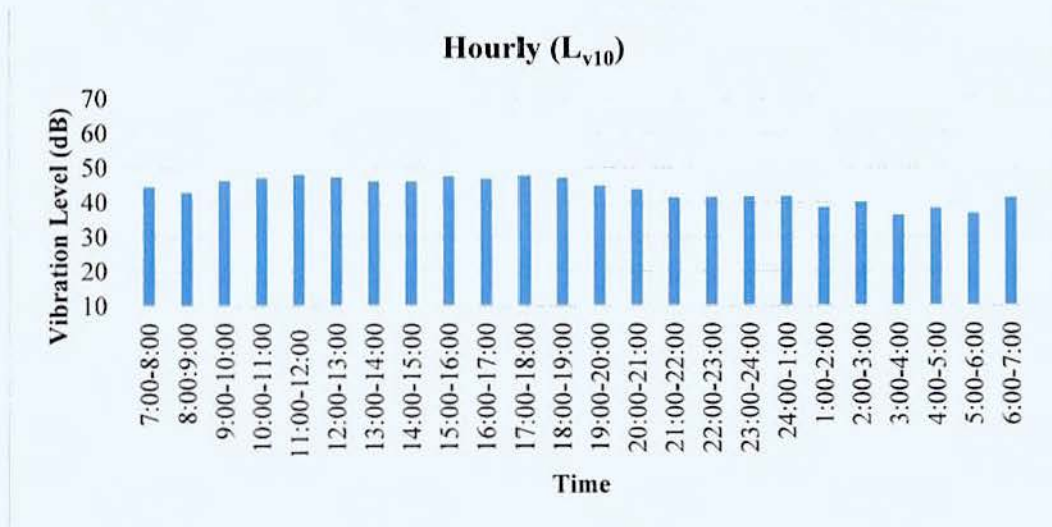


Figure 2.4-4 Results of Vibration Levels (L_{v10}) Monitoring at NV-1



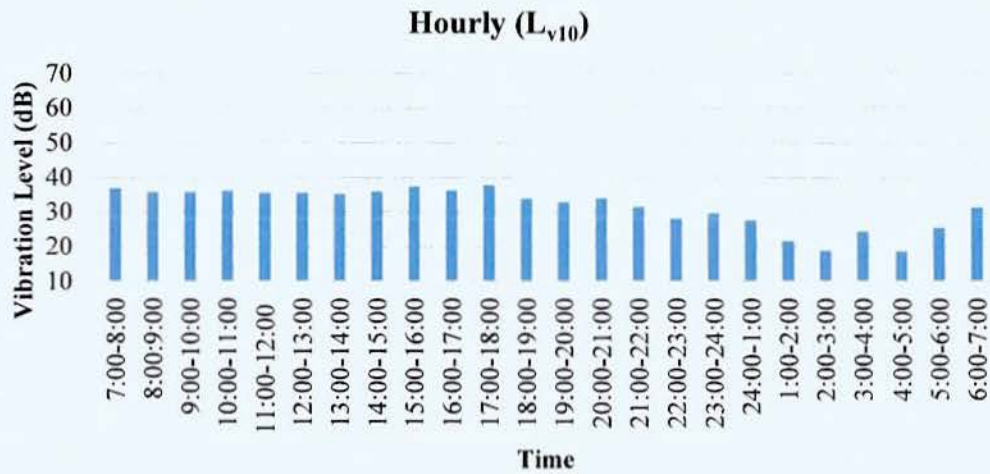


Figure 2.4-5 Results of Vibration Levels (L_{v10}) Monitoring at NV-2

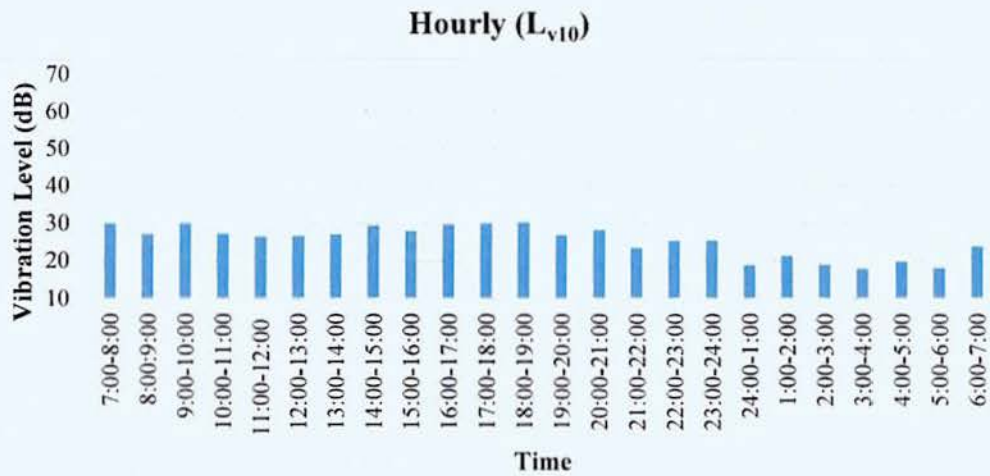


Figure 2.4-6 Results of Vibration Levels (L_{v10}) Monitoring at NV-3



CHAPTER 3: CONCLUSION AND RECOMMENDATION

By comparing with the target noise and vibration level in operation stage in EIA report for Thilawa SEZ development project Zone A, all results were under the target values at NV-1, NV-2, and NV-3. (Referred to section 2.4).

In conclusion of this environmental monitoring, there are no specific noise and vibration impacts on the surrounding area of industrial area of Thilawa SEZ Zone A during this monitoring period.



**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Appendix

Soil contamination survey in Thilawa SEZ

December, 2018

SOIL CONTAMINATION SUREVEY IN THILAWA SEZ (ZONE A)

December 2018



Resource & Environment Myanmar Ltd. B-702/401 Delta Plaza Building,
Shwegondaing Rd., Bahan, Yangon. MYANMAR

Tel: (959) 7301 3448; Fax: (951) 552901

www.enviromyanmar.net



Soil Contamination Survey in Thilawa SEZ (Zone-A)

Survey Item

Parameter for soil contamination survey are determined by referring to the parameter of soil content observation of Japan and other countries as shown in Table 1.

Table 1 Survey parameter for soil quality

No.	Parameter	Unit	Standard		
			Japan	Thailand	Vietnam
1	pH	-	-	-	-
2	Mercury	mg/kg	15	610	-
3	Arsenic	mg/kg	150	27	12
4	Lead	mg/kg	150	750	300
5	Cadmium	mg/kg	150	810	10
6	Copper	mg/kg	-	-	100
7	Zinc	mg/kg	-	-	300
8	Chromium	mg/kg	250	640	-
9	Fluoride	mg/kg	-	-	-
10	Boron	mg/kg	-	-	-
11	Selenium	mg/kg	-	10,000	-

Source: Japan: Ministry of Environment, Government of Japan (2002), "Regulation for Implementing the Law on Soil Contamination Countermeasures"

Thailand: Notification of National Environmental Board No.25, B.E. Thailand (2004), "other purpose" class"

Vietnam: QCVN 03:2008/BTNMT, Applied "industrial land", Vietnam.

Summary of survey points

The survey location is situated in Thilawa Special Economic Zone (Zone-A) areas, Thanlyin Township, Yangon. There are five samples collected for soil quality survey.



Figure 1 Location map of the soil sampling points



The locations of survey points are shown in following table. The detail of each survey point is described below.

Table 2 Summary of survey points

Sampling Point	Coordinates	Description of Sampling Point
S-1	16° 40' 13.49" N 96° 16' 29.89" E	About 40 m northeast of administration building.
S-2	16° 40' 10.74" N 96° 16' 22.01" E	At the embankment area of the drain, near main gate of Thilawa SEZ.
S-3	16° 40' 30.25" N 96° 16' 34.86" E	At the drain from sewage treatment plant.
S-4	16° 40' 24.29" N 96° 15' 49.55" E	At damping area near retention pond.
S-5	16° 40' 32.36" N 96° 15' 49.81" E	At the drain from the retention pond.

S-1

S-1 is situated in the southern part of the Thilawa SEZ Zone (A) area, and distanced about 40 m from administration building. It was collected beside of the Trash Storage Building. Sometimes, wastewater after cleaning that domestic waste is leaked and may sink into the ground. The soil condition is fine to medium grained, reddish brown colored silty clay.



Figure 2 Soil quality sampling at S-1

S-2

S-2 was collected at the slope area of the retention canal, which is situated near the main gate of Thilawa SEZ (Zone-A). It is beside of the Thilawa SEZ car road and intended to plant the trees along the slop. The soil condition is fine to medium grained, reddish brown colored silty caly.





Figure 3 Soil quality sampling at S-2

S-3

S-3 is collected in the retention canal where wastewater from the centralized sewage treatment plant is flowing into the retention canal. It is distanced about 5 m away from the junction of wastewater discharge drainage and main rain water drainage. The soil condition is fine to medium grained, yellowish brown colored silty clay.



Figure 4 Soil quality sampling at S-3

S-4

S-4 is collected from the soil disposing site which is located near Plot No.E-1 of TSEZ Zone-A retention pond, about 40 m in distance. This dumping site is about 16,500 square meters where soil from Thilawa SEZ Zone-A (Phase-2). The soil condition is fine to medium grained, reddish brown colored silty caly.



Figure 5 Soil quality sampling at S-4

S-5

It is collected at the retention canal where wastewater is discharged from the retention pond of Plot No.E-1 of Thilawa SEZ Zone-A. S-5 is distanced about 100 m from this retention pond. The soil condition is fine grained, yellowish brown colored silty clay.



Figure 6 Soil quality monitoring at S-5

Survey Period

Soil sampling was carried out on 20th December 2018.

Survey Method

For soil sampling, the standard environmental sampler (soil auger) was applied. The sampler is a stainless-steel tube that is sharpened on one end and fitted with a long, T-shaped handle. This tube is approximately three inches inside diameter. In order to refrain from contamination, about 20-30 cm of top soil was removed by the sampler before sampling. Then sample was taken and collected in cleaned plastic bag. Chemical preservation of soil is not generally recommended. Samples were cooled in an ice box which temperature was under 4°C. Samples were protected from sunlight to minimize any potential reaction.



Field equipment used on site are also shown in the table.

Table 3 Field Equipment for Sediment and Soil Quality Survey

No.	Equipment	Originate Country	Model
1	Soil Auger (for soil sampling)	U.S.A	AMS

The analysis method for each parameter is also shown in the following table.

Table 4 Analysis methods of soil quality

No.	Parameter	Analysis Method
1	pH	Atomic Absorption Spectrophotometer, Aqua-regia
2	Mercury (Hg)	Atomic Absorption Spectrophotometer, Aqua-regia
3	Arsenic (As)	Atomic Absorption Spectrophotometer, Aqua-regia
4	Lead (Pb)	Atomic Absorption Spectrophotometer, Aqua-regia
5	Cadmium (Cd)	Atomic Absorption Spectrophotometer, Aqua-regia
6	Copper (Cu)	Atomic Absorption Spectrophotometer, Aqua-regia
7	Zinc (Zn)	Atomic Absorption Spectrophotometer, Aqua-regia
8	Chromium (VI)	Atomic Absorption Spectrophotometer, Aqua-regia
9	Fluoride (F)	Atomic Absorption Spectrophotometer, Aqua-regia
10	Boron (B)	Atomic Absorption Spectrophotometer, Aqua-regia
11	Selenium (Se)	Atomic Absorption Spectrophotometer, Aqua-regia

Survey Result

Chemical properties for soil was analyzed in the laboratory of United Analyst and Engineering Consultant Co., Ltd. in Thailand.

The result of soil quality analysis is presented as follow. The results are complied with the proposed standard value of contamination.

Table 4 Soil quality result

No.	Parameter	Unit	S-1	S-2	S-3	S-4	S-5	Japan	Thailand	Vietnam
1	pH	-	5.5	5.4	7.8	7.0	7.3	-	-	-
2	Mercury	mg/kg	ND	ND	ND	0.342	ND	15	610	-
3	Arsenic	mg/kg	12.8	9.8	3.91	14.5	5.35	150	27	12
4	Lead	mg/kg	16.7	13.6	13.0	16.1	11.8	150	750	300
5	Cadmium	mg/kg	3.37	2.67	1.48	3.12	1.59	150	810	10
6	Copper	mg/kg	26.4	19.8	22.2	17.8	17.8	-	-	100
7	Zinc	mg/kg	34.6	29.0	51.3	31.4	40.2	-	-	300
8	Chromium	mg/kg	80.5	45.4	35.7	82.8	32.9	250	640	-
9	Fluoride	mg/kg	ND	ND	ND	ND	ND	-	-	-
10	Boron	mg/kg	25.3	20.9	11.6	21.9	12.5	-	-	-
11	Selenium	mg/kg	0.764	0.231	ND	0.311	0.152	-	10,000	-



ANALYSIS REPORT

PROJECT NAME : SOIL CONTAMINATION SURVEY IN THILAWA SEZ (ZONE A)
CUSTOMER NAME : REM-UAE LABORATORY AND CONSULTANT CO.,LTD.
ADDRESS : B-702 DELTA PLAZA, SHWEGONDAING ROAD BAHAN YANGON MYANMAR
CONTACT INFORMATION : TEL : +959799855808 e-mail : toetoehting@rem-uaeconsultant.com
SAMPLING SOURCE : THILAWA
SAMPLE TYPE : SOIL **RECEIVED DATE** : DECEMBER 21, 2018
SAMPLING DATE : DEMCEMBER 20, 2018 **ANALYTICAL DATE** : DECEMBER 21, 2018-JANUARY 7, 2019
SAMPLING TIME : - **REPORT NO.** : 2019-U01697
SAMPLING METHOD : - **WORK NO.** : 2018-008851
SAMPLING BY : CUSTOMER **ANALYSIS NO.** : T18AJ004-0001
ANALYZED BY : MISS CHOMTHANAN APHIPATPAPHA

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			S1 T18AJ004-0001	
pH (1:1)	-	ELECTROMETRIC METHOD (U.S. EPA 2004:9045 D)	5.5 (25°C)	-
FLUORIDE	mg/kg	ION SELECTIVE ELECTRODE METHOD (U.S. EPA METHOD : 9214:1996)	ND	0.80
METALS				
MERCURY (Hg)	mg/kg	ACID DIGESTION AND COLD VAPOUR AAS METHOD (U.S.EPA 2007:7471 B)	ND	0.100
BORON (B)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	25.3	0.250
CADMIUM (Cd)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	3.37	0.050
CHROMIUM (Cr)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	80.5	0.150
COPPER (Cu)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	26.4	0.050


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• REPORTED ANALYSIS REFERS TO SUBMITTED SAMPLE ONLY.




PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			S1 T18AJ004-0001	
LEAD (Pb)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018.6010 D)	16.7	0.150
ZINC (Zn)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018.6010 D)	34.6	0.150
ARSENIC (As)	mg/kg	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050 B AND 1992:7061 A)	12.8	0.100
SELENIUM (Se)	mg/kg	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050 B AND 1992:7061 A)	0.764	0.100
SAMPLE CONDITION			BROWN SOIL	

ND : NON-DETECTABLE.


.....
(MR BHUCHONK PANICHLERTUMPI)
TECHNICAL MANAGEMENT

JANUARY 8, 2019


.....
(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR

JANUARY 8, 2019



DO NOT COPY PARTIAL OF THIS ANALYSIS REPORT WITHOUT OFFICIAL APPROVAL .
REPORTED ANALYSIS REFERS TO SUBMITTED SAMPLE ONLY.

ANALYSIS REPORT

PROJECT NAME : SOIL CONTAMINATION SURVEY IN THILAWA SEZ (ZONE A)
CUSTOMER NAME : REM-UAE LABORATORY AND CONSULTANT CO.,LTD.
ADDRESS : B-702 DELTA PLAZA, SHWEGONDAING ROAD BAHAN YANGON MYANMAR
CONTACT INFORMATION : TEL : +959799855808 e-mail : toetoehtlaing@rem-uaeconsultant.com
SAMPLING SOURCE : THILAWA
SAMPLE TYPE : SOIL **RECEIVED DATE** : DECEMBER 21, 2018
SAMPLING DATE : DEMCEMBER 20, 2018 **ANALYTICAL DATE** : DECEMBER 21, 2018-JANUARY 7, 2019
SAMPLING TIME : - **REPORT NO.** : 2019-U01699
SAMPLING METHOD : - **WORK NO.** : 2018-008851
SAMPLING BY : CUSTOMER **ANALYSIS NO.** : T18AJ004-0002
ANALYZED BY : MISS CHOMTHANAN APHIPATPAPHA

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			S2 T18AJ004-0002	
pH (1:1)	-	ELECTROMETRIC METHOD (U.S. EPA 2004.9045 D)	5.4 (25°C)	-
FLUORIDE	mg/kg	ION SELECTIVE ELECTRODE METHOD (U.S. EPA METHOD : 9214.1996)	ND	0.80
METALS				
MERCURY (Hg)	mg/kg	ACID DIGESTION AND COLD VAPOUR AAS METHOD (U.S.EPA 2007:7471 B)	ND	0.100
BORON (B)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	20.9	0.250
CADMIUM (Cd)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	2.67	0.050
CHROMIUM (Cr)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	45.4	0.150
COPPER (Cu)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	19.8	0.050

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PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			S2 T18AJ004-0002	
LEAD (Pb)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018.6010 D)	13.6	0.150
ZINC (Zn)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018.6010 D)	29.0	0.150
ARSENIC (As)	mg/kg	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050 B AND 1992:7061 A)	9.81	0.100
SELENIUM (Se)	mg/kg	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050 B AND 1992:7061 A)	0.231	0.100
SAMPLE CONDITION			BROWN SOIL	

ND : NON-DETECTABLE.



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(MR BHUCHONK PANICHLERTUMPI)
TECHNICAL MANAGEMENT

JANUARY 8, 2019

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ANALYSIS REPORT

PROJECT NAME : SOIL CONTAMINATION SURVEY IN THILAWA SEZ (ZONE A)
CUSTOMER NAME : REM-UAE LABORATORY AND CONSULTANT CO.,LTD.
ADDRESS : B-702 DELTA PLAZA, SHWEGONDAING ROAD BAHAN YANGON MYANMAR
CONTACT INFORMATION : TEL : +959799855808 e-mail : toetoehtaing@rem-uaeconsultant.com
SAMPLING SOURCE : THILAWA
SAMPLE TYPE : SOIL **RECEIVED DATE** : DECEMBER 21, 2018
SAMPLING DATE : DECEMBER 20, 2018 **ANALYTICAL DATE** : DECEMBER 21, 2018-JANUARY 7, 2019
SAMPLING TIME : - **REPORT NO.** : 2019-U01700
SAMPLING METHOD : - **WORK NO.** : 2018-008851
SAMPLING BY : CUSTOMER **ANALYSIS NO.** : T18AJ004-0003
ANALYZED BY : MISS CHOMTHANAN APHIPATPAPHA

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			S3 T18AJ004-0003	
pH (1:1)	-	ELECTROMETRIC METHOD (U.S. EPA 2004.9045 D)	7.8 (25°C)	-
FLUORIDE	mg/kg	ION SELECTIVE ELECTRODE METHOD (U.S. EPA METHOD : 9214:1996)	ND	0.80
METALS				
MERCURY (Hg)	mg/kg	ACID DIGESTION AND COLD VAPOUR AAS METHOD (U.S.EPA 2007:7471 B)	ND	0.100
BORON (B)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	11.6	0.250
CADMIUM (Cd)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	1.48	0.050
CHROMIUM (Cr)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	35.7	0.150
COPPER (Cu)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	22.2	0.050

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PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			S3 T18AJ004-0003	
LEAD (Pb)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	13.0	0.150
ZINC (Zn)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	51.3	0.150
ARSENIC (As)	mg/kg	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050 B AND 1992:7061 A)	3.91	0.100
SELENIUM (Se)	mg/kg	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050 B AND 1992:7061 A)	ND	0.100
SAMPLE CONDITION			GREY SOIL	

ND : NON-DETECTABLE.


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JANUARY 8, 2019



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ANALYSIS REPORT

PROJECT NAME : SOIL CONTAMINATION SURVEY IN THILAWA SEZ (ZONE A)
CUSTOMER NAME : REM-UAE LABORATORY AND CONSULTANT CO.,LTD.
ADDRESS : B-702 DELTA PLAZA, SHWEGONDAING ROAD BAHAN YANGON MYANMAR
CONTACT INFORMATION : TEL : +959799855808 e-mail : toetoehtaing@rem-uaeconsultant.com
SAMPLING SOURCE : THILAWA
SAMPLE TYPE : SOIL **RECEIVED DATE** : DECEMBER 21, 2018
SAMPLING DATE : DEMCEMBER 20, 2018 **ANALYTICAL DATE** : DECEMBER 21, 2018-JANUARY 7, 2019
SAMPLING TIME : - **REPORT NO.** : 2019-U01701
SAMPLING METHOD : - **WORK NO.** : 2018-008851
SAMPLING BY : CUSTOMER **ANALYSIS NO.** : T18AJ004-0004
ANALYZED BY : MISS CHOMTHANAN APHIPATPAPHA

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			S4 T18AJ004-0004	
pH (1:1)	-	ELECTROMETRIC METHOD (U.S. EPA 2004.9045 D)	7.0 (25°C)	-
FLUORIDE	mg/kg	ION SELECTIVE ELECTRODE METHOD (U.S. EPA METHOD : 9214.1996)	ND	0.80
METALS				
MERCURY (Hg)	mg/kg	ACID DIGESTION AND COLD VAPOUR AAS METHOD (U.S.EPA 2007.7471 B)	0.342	0.100
BORON (B)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996.3050 B AND 2018.6010 D)	219	0.250
CADMIUM (Cd)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996.3050 B AND 2018.6010 D)	3.12	0.050
CHROMIUM (Cr)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996.3050 B AND 2018.6010 D)	82.8	0.150
COPPER (Cu)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996.3050 B AND 2018.6010 D)	17.8	0.050

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PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	
			S4 T18AJ004-0004	DETECTION LIMIT
LEAD (Pb)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	16.1	0.150
ZINC (Zn)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018:6010 D)	31.4	0.150
ARSENIC (As)	mg/kg	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050 B AND 1992:7061A)	14.5	0.100
SELENIUM (Se)	mg/kg	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050 B AND 1992:7061A)	0.311	0.100
SAMPLE CONDITION			BROWN SOIL	

ND : NON-DETECTABLE.



[Signature]
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JANUARY 8, 2019

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ANALYSIS REPORT

PROJECT NAME	: SOIL CONTAMINATION SURVEY IN THILAWA SEZ (ZONE A)	RECEIVED DATE	: DECEMBER 21, 2018
CUSTOMER NAME	: REM-UAE LABORATORY AND CONSULTANT CO.,LTD.	ANALYTICAL DATE	: DECEMBER 21, 2018-JANUARY 7, 2019
ADDRESS	: B-702 DELTA PLAZA, SHWEGONDAING ROAD BAHAN YANGON MYANMAR	REPORT NO.	: 2019-U01702
CONTACT INFORMATION	: TEL : +959799855808 e-mail : toetoehtaing@rem-uaeconsultant.com	WORK NO.	: 2018-008851
SAMPLING SOURCE	: THILAWA	ANALYSIS NO.	: T18AJ004-0005
SAMPLE TYPE	: SOIL		
SAMPLING DATE	: DECEMBER 20, 2018		
SAMPLING TIME	: -		
SAMPLING METHOD	: -		
SAMPLING BY	: CUSTOMER		
ANALYZED BY	: MISS CHOMTHANAN APHIPATPAPHA		


PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	
			S5 T18AJ004-0005	DETECTION LIMIT
pH (1:1)	-	ELECTROMETRIC METHOD (U.S. EPA 2004.9045 D)	7.3 (25°C)	-
FLUORIDE	mg/kg	ION SELECTIVE ELECTRODE METHOD (U.S. EPA METHOD : 9214.1996)	ND	0.80
METALS				
MERCURY (Hg)	mg/kg	ACID DIGESTION AND COLD VAPOUR AAS METHOD (U.S.EPA 2007.7471 B)	ND	0.100
BORON (B)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996.3050 B AND 2018.6010 D)	12.5	0.250
CADMIUM (Cd)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996.3050 B AND 2018.6010 D)	1.59	0.050
CHROMIUM (Cr)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996.3050 B AND 2018.6010 D)	32.9	0.150
COPPER (Cu)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996.3050 B AND 2018.6010 D)	17.8	0.050

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PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT	DETECTION LIMIT
			S5 T18AJ004-0005	
LEAD (Pb)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018.6010 D)	11.8	0.150
ZINC (Zn)	mg/kg	ACID DIGESTION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD (U.S.EPA 1996:3050 B AND 2018.6010 D)	40.2	0.150
ARSENIC (As)	mg/kg	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050 B AND 1992:7061 A)	5.35	0.100
SELENIUM (Se)	mg/kg	ACID DIGESTION AND HYDRIDE GENERATION AAS METHOD (U.S.EPA 1996:3050 B AND 1992:7061 A)	0.152	0.100
SAMPLE CONDITION			BROWN SOIL	

ND : NON-DETECTABLE.


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**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Appendix

Finding Reason of Dead Fish

January, 2019

**FINDING REASON OF DEAD FISH
IN
INDUSTRIAL AREA
OF
THILAWA SPECIAL ECONOMIC ZONE-A**

January 2019

Myanmar Japan Thilawa Development Ltd



1. Time and Place Occurred Dead Fish Case

First time dead fish case occurred in retention canal on 23th June 2018.

Second time dead fish case occurred in retention pond on 29th September 2018.

2. Kind of Dead Fish

All of dead fishes were Ngabae Than in local name.

3. Action Taken

1. MJTD reported immediately once to Thilawa SEZ Management Committee (TSMC) on 25th June 2018 for first time and 1st October 2018 for second time.
2. MJTD checked along the canal where dead fish occurred on 23th June 2018 for first time and 29th September 2018. During at that time, villagers near the Thilawa Special Economic Zone fishing by electric shock was also heard.
3. Take off all of dead fish and analyzed the species of fish. All of dead fish are all the kind of Ngabae Than.
4. For detection of dead fish case, collect sample water where dead fish occurred and analyzed it. The parameters analyzed were pH, Oil and Grease, Mercury, Hexavalent Chromium, Ammonia, Cyanide, Free Chlorine and Phenol.
5. Then reporting the results to TSMC after receiving the analyzed results on 4th July 2018 and 16th October 2018.
6. After reporting to TSMC, MJTD continuous monitor and check around canal retention pond till now.



4. Water Analysis Results

First time dead fish case, water analysis results are as follow:

Sampling Date: 25 th June 2018, Analysis Result Received Date: 4 th July 2018										
No	Parameter	unit	Env-1	Env-2	Env-3	Env-4	Env-5	Env-6	Standard NEQG	Target Value of EIA
1	pH		6.68	7.22	7.25	7.22	7.42	7.03	6-9	6-9
2	Dissolved Oxygen	mg/L	3.73	4.11	4.16	4.19	4.63	4.11	-	-
3	Oil and Grease	mg/L	<3.1	<3.1	<3.1	<3.1	3.2	< 3.1	10	10
4	Mercury	mg/L	≤0.00054	≤0.00054	≤0.00054	≤0.00054	≤0.00054	≤0.00054	0.01	0.005
5	Ammonia	mg/L	0.204	0.221	0.181	0.163	0.174	0.112	10	10
6	Hexavalent Chromium	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	0.1	0.1
7	Cyanide	mg/L	0.003	0.007	0.002	0.005	0.004	< 0.002	1	0.2
8	Free Chlorine	mg/L	< 0.1	<0.1	<0.1	<0.1	<0.1	< 0.1	-	0.2
	Phenols	mg/L	<0.002	<0.002	<0.002	<0.002	0.003	< 0.002	0.5	1



Second time dead fish case, water analysis results are as follow:

Sampling Date: 1 st October 2018, Analysis Result Received Date: 16 th October 2018									
No	Parameter	unit	Env-1	Env-2	Env-3	Env-4	Env-5	Standard NEQG	Target Value of EIA
1	pH		6.98	7.23	7.95	8.35	7.27	6-9	6-9
2	Oil and Grease	mg/L	<3.1	<3.1	<3.1	<3.1	<3.1	10	10
3	Mercury	mg/L	≤0.002	≤0.002	≤0.002	≤0.002	≤0.002	0.01	0.005
4	Hexavalent Chromium	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	0.1
5	Cyanide	mg/L	<0.002	<0.002	0.003	0.004	0.014	1	0.2
6	Free Chlorine	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	-	0.2
7	Phenols	mg/L	<0.002	<0.002	<0.002	< 0.002	<0.002	0.5	1

Expected Reasons

Reason for dead fish cause by high water temperature cause by climate, oxygen depletion, under water explosion, toxin, oil or hazardous waste, drought and overstocking and fishing. During dead fish case happen water temperature is between 24-29.8 °C and there is little hot. For depletion of oxygen, DO is in the range of 3.73-4.63 mg/L and it is enough for alive of fish. For detection of oily water, water is analyzed oil and grease and most of results are <3.1 and it could not be affected to fish. For detection of toxin and hazardous waste, we analyzed water mercury, hexavalent chromium, cyanide, phenol and free chlorine. All of these parameters are under target value and standard of NEQG. From the above results, it could be said water in retention canal and retention ponds are not toxin and hazardous. The time we investigate of dead fish we observed that fishing was done by electric shock and temperature is little hot. From analysis results and weather conditions, dead fish was happened by fishing and temperature changes.

**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Appendix

**Ground Subsidence Monitoring Status
(Location- Admin Complex Compound)
October 2018 to March 2019**

Ground Subsidence Monitoring Status (Operation Phase)

Location Admin Complex Compound
 Coordinate Points E=209545.508 N=1844669.443

Month	Date	Predefined Level (m)-ASL	Weekly Reading Level (m)-ASL	Subsidence (m)	Remark
Jul	15-Jul-16	+7.137	+7.137	0.000	
	22-Jul-16	+7.137	+7.136	-0.001	
	29-Jul-16	+7.137	+7.136	-0.001	
Aug	5-Aug-16	+7.137	+7.136	-0.001	
	12-Aug-16	+7.137	+7.136	-0.001	
	19-Aug-16	+7.137	+7.136	-0.001	
	26-Aug-16	+7.137	+7.136	-0.001	
Sept	2-Sep-16	+7.137	+7.136	-0.001	
	9-Sep-16	+7.137	+7.136	-0.001	
	16-Sep-16	+7.137	+7.136	-0.001	
	23-Sep-16	+7.137	+7.136	-0.001	
Oct	30-Sep-16	+7.137	+7.136	-0.001	
	7-Oct-16	+7.137	+7.136	-0.001	
	14-Oct-16	+7.137	+7.136	-0.001	
	21-Oct-16	+7.137	+7.136	-0.001	
Nov	28-Oct-16	+7.137	+7.136	-0.001	
	4-Nov-16	+7.137	+7.136	-0.001	
	11-Nov-16	+7.137	+7.136	-0.001	
	18-Nov-16	+7.137	+7.136	-0.001	
Dec	25-Nov-16	+7.137	+7.138	+0.001	
	2-Dec-16	+7.137	+7.136	-0.001	
	9-Dec-16	+7.137	+7.136	-0.001	
	16-Dec-16	+7.137	+7.135	-0.002	
Jan	23-Dec-16	+7.137	+7.133	-0.004	
	30-Dec-16	+7.137	+7.133	-0.004	
	6-Jan-17	+7.137	+7.134	-0.003	
	13-Jan-17	+7.137	+7.134	-0.003	
Feb	20-Jan-17	+7.137	+7.134	-0.003	
	27-Jan-17	+7.137	+7.134	-0.003	
	3-Feb-17	+7.137	+7.134	-0.003	
	10-Feb-17	+7.137	+7.134	-0.003	
Mar	17-Feb-17	+7.137	+7.134	-0.003	
	24-Feb-17	+7.137	+7.134	-0.003	
	3-Mar-17	+7.137	+7.134	-0.003	
	10-Mar-17	+7.137	+7.134	-0.003	
Apr	17-Mar-17	+7.137	+7.128	-0.009	After earthquake
	24-Mar-17	+7.137	+7.128	-0.009	
	31-Mar-17	+7.137	+7.128	-0.009	
	7-Apr-17	+7.137	+7.128	-0.009	
May	21-Apr-17	+7.137	+7.126	-0.011	
	28-Apr-17	+7.137	+7.126	-0.011	
	5-May-17	+7.137	+7.126	-0.011	
Jun	12-May-17	+7.137	+7.129	-0.008	
	19-May-17	+7.137	+7.131	-0.006	
	26-May-17	+7.137	+7.135	-0.002	
	9-Jun-17	+7.137	+7.135	-0.002	
July	16-Jun-17	+7.137	+7.134	-0.003	
	23-Jun-17	+7.137	+7.134	-0.003	
	30-Jun-17	+7.137	+7.136	-0.001	
	7-Jul-17	+7.137	+7.136	-0.001	
Aug	14-Jul-17	+7.137	+7.136	-0.001	
	21-Jul-17	+7.137	+7.138	+0.001	
	28-Jul-17	+7.137	+7.136	-0.001	
	3-Aug-17	+7.137	+7.136	-0.001	
Aug	10-Aug-17	+7.137	+7.137	+0.000	
	17-Aug-17	+7.137	+7.136	-0.001	
	24-Aug-17	+7.137	+7.137	+0.000	



Month	Date	Predefined Level (m)-ASL	Weekly Reading Level (m)-ASL	Subsidence (m)	Remark
Sept	1-Sep-17	+7.137	+7.136	-0.001	
	8-Sep-17	+7.137	+7.136	-0.001	
	15-Sep-17	+7.137	+7.136	-0.001	
	22-Sep-17	+7.137	+7.136	-0.001	
	29-Sep-17	+7.137	+7.136	-0.001	
Oct	2-Oct-17	+7.137	+7.136	-0.001	
	9-Oct-17	+7.137	+7.136	-0.001	
	16-Oct-17	+7.137	+7.136	-0.001	
	23-Oct-17	+7.137	+7.136	-0.001	
	30-Oct-17	+7.137	+7.136	-0.001	
Nov	6-Nov-17	+7.137	+7.136	-0.001	
	13-Nov-17	+7.137	+7.136	-0.001	
	20-Nov-17	+7.137	+7.135	-0.002	
	27-Nov-17	+7.137	+7.135	-0.002	
Dec	4-Dec-17	+7.137	+7.135	-0.002	
	11-Dec-17	+7.137	+7.135	-0.002	
	18-Dec-17	+7.137	+7.134	-0.003	
	26-Dec-17	+7.137	+7.134	-0.003	
Jan	2-Jan-18	+7.137	+7.134	-0.003	
	8-Jan-18	+7.137	+7.133	-0.004	
	15-Jan-18	+7.137	+7.133	-0.004	
	22-Jan-18	+7.137	+7.132	-0.005	
	29-Jan-18	+7.137	+7.132	-0.005	
Feb	5-Feb-18	+7.137	+7.132	-0.005	
	13-Feb-18	+7.137	+7.132	-0.005	
	19-Feb-18	+7.137	+7.132	-0.005	
	26-Feb-18	+7.137	+7.132	-0.005	
Mar	5-Mar-18	+7.137	+7.132	-0.005	
	12-Mar-18	+7.137	+7.132	-0.005	
	19-Mar-18	+7.137	+7.132	-0.005	
	26-Mar-18	+7.137	+7.130	-0.007	
Apr	2-Apr-18	+7.137	+7.130	-0.007	
	9-Apr-18	+7.137	+7.130	-0.007	
	23-Apr-18	+7.137	+7.129	-0.008	
	30-Apr-18	+7.137	+7.129	-0.008	
May	7-May-18	+7.137	+7.129	-0.008	
	14-May-18	+7.137	+7.129	-0.008	
	21-May-18	+7.137	+7.13	-0.007	
	28-May-18	+7.137	+7.13	-0.007	
June	4-Jun-18	+7.137	+7.13	-0.007	
	11-Jun-18	+7.137	+7.131	-0.006	
	18-Jun-18	+7.137	+7.131	-0.006	
	25-Jun-18	+7.137	+7.132	-0.005	
July	2-Jul-18	+7.137	+7.134	-0.003	
	9-Jul-18	+7.137	+7.134	-0.003	
	16-Jul-18	+7.137	+7.134	-0.003	
	24-Jul-18	+7.137	+7.135	-0.002	
August	3-Aug-18	+7.137	+7.135	-0.002	
	13-Aug-18	+7.137	+7.135	-0.002	
	20-Aug-18	+7.137	+7.134	-0.003	
	27-Aug-18	+7.137	+7.135	-0.002	
September	3-Sep-18	+7.137	+7.135	-0.002	
	10-Sep-18	+7.137	+7.136	-0.001	
	17-Sep-18	+7.137	+7.136	-0.001	
	28-Sep-18	+7.137	+7.136	-0.001	
October	8-Oct-18	+7.137	+7.136	-0.001	
	15-Oct-18	+7.137	+7.136	-0.001	
	20-Oct-18	+7.137	+7.136	-0.001	
	31-Oct-18	+7.137	+7.136	-0.001	
November	9-Nov-18	+7.137	+7.136	-0.001	
	16-Nov-18	+7.137	+7.136	-0.001	
	23-Nov-18	+7.137	+7.135	-0.002	



Month	Date	Predefined Level (m)-ASL	Weekly Reading Level (m)-ASL	Subsidence (m)	Remark
December	3-Dec-18	+7.137	+7.135	-0.002	
	13-Dec-18	+7.137	+7.135	-0.002	
	20-Dec-18	+7.137	+7.135	-0.002	
	27-Dec-18	+7.137	+7.135	-0.002	
January	8-Jan-19	+7.137	+7.135	-0.002	
	19-Jan-19	+7.137	+7.135	-0.002	
	26-Jan-19	+7.137	+7.135	-0.002	
February	1-Feb-19	+7.137	+7.135	-0.002	
	8-Feb-19	+7.137	+7.134	-0.003	
	15-Feb-19	+7.137	+7.134	-0.003	
	23-Feb-19	+7.137	+7.135	-0.002	
March	4-Mar-19	+7.137	+7.135	-0.002	
	16-Mar-19	+7.137	+7.136	-0.001	
	23-Mar-19	+7.137	+7.136	-0.001	
	30-Mar-19	+7.137	+7.136	-0.001	



**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Appendix

General Waste Disposal Record

(Admin Complex Compound- October 2018 to March 2019)



Waste Disposal Record

Location : Admin Complex Compound (Trash Room)

Disposal Site : Golden DOWA Eco-system Myanmar Co.,Ltd

Type of Waste : Waste from common area of Thilawa SEZ and Admin complex compound

No	Year	Month	Date	Waste Disposal Time	Weight(Kg)	Total Weight/month
1	2018	October	05-Oct-18	1	1100	2120
2	2018	October	10-Oct-18	1	1020	
3	2018	November	13-Nov-18	1	1220	2100
4	2018	November	14-Nov-18	1	880	
5	2018	December	19-Dec-18	1	1320	1320
6	2019	January	16-Jan-19	1	1100	2300
7	2019	January	28-Jan-19	1	1200	
8	2019	February	20-Feb-19	1	1200	2820
9	2019	February	21-Feb-19	1	440	
10	2019	February	21-Feb-19	1	1180	
11	2019	March	22-Mar-19	1	1060	2260
12	2019	March	22-Mar-19	1	1200	




Manifest		C-Slip		*Transportation company to Waste Generator
Date of issuance	(Day Month, Year) 5 Oct 2018	Issuer	(Name&Sign) Tan Yan Onn	
Number of issuance	9999 1810 0052			
Contractors	Waste generator	Transportation company	Waste service company	
Company Name	Myanmar Japan Thilawa Development	GEM	GEM	
Tel	Hd.			
Waste	Kind	Name	Style of packing	
	<input checked="" type="checkbox"/> Non-Hazardous	General Waste		
	<input type="checkbox"/> Hazardous	Quantity(Unit)	Remark	
	<input type="checkbox"/> Others	1100kg		
Customer code	0001	Waste Profile code	A001	
Trace	PIC(Name&Sign)		Date of Completion	
Transportation company	(Name&Sign) 3K1889G Kyinw Naing oo	(Day Month, Year)		
Waste service company	(Name&Sign) 	(Day Month, Year)		

Designed by GOLDEN WOVA ECO-SYSTEM MYANMAR CO., LTD.

Manifest		C-Slip		*Transportation company to Waste Generator
Date of issuance	(Day Month, Year) 10 Oct 18	Issuer	(Name&Sign) S	
Number of issuance	9999 1810 0097			
Contractors	Waste generator	Transportation company	Waste service company	
Company Name	Myanmar Japan Thilawa Development Hd.	GEM	GEM	
Tel				
Waste	Kind	Name	Style of packing	
	<input checked="" type="checkbox"/> Non-Hazardous	General Waste		
	<input type="checkbox"/> Hazardous	Quantity(Unit)	Remark	
	<input type="checkbox"/> Others	1020kg		
Customer code	0001	Waste Profile code	A001	
Trace	PIC(Name&Sign)		Date of Completion	
Transportation company	(Name&Sign) A3 16 km 3K 7115	(Day Month, Year)		
Waste service company	(Name&Sign) Khaing	(Day Month, Year)		

Designed by GOLDEN WOVA ECO-SYSTEM MYANMAR CO., LTD.



Manifest		C-Slip		*Transportation company to Waste Generator	
Date of issuance	(Day Month, Year) 13 NOV 2018	Issuer	(Name&Sign)		
Number of issuance	9999 1811 0114				
Contractors	Waste generator	Transportation company	Waste service company		
Company Name	Myanmar Japan Thilawa Development	GEM	GEM		
Tel	LTD				
Waste	Kind	Name	Style of packing		
	<input checked="" type="checkbox"/> Non-Hazardous	General Waste			
	<input type="checkbox"/> Hazardous	Quantity(Unit)	Remark		
	<input type="checkbox"/> Others	1220kg	Being line border		
Customer code	001	Waste Profile code	A001		
Trace	PIC(Name&Sign)		Date of Completion		
Transportation company	(Name&Sign) 3K14145 Saw... [Signature]		(Day Month, Year)		
Waste service company	(Name&Sign) [Signature]		(Day Month, Year)		
Designed by GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.					

Manifest		C-Slip		*Transportation company to Waste Generator	
Date of issuance	(Day Month, Year) 14 NOV 2018	Issuer	(Name&Sign)		
Number of issuance	9999 1811 0127				
Contractors	Waste generator	Transportation company	Waste service company		
Company Name	Myanmar Japan Thilawa Development	GEM	GEM		
Tel					
Waste	Kind	Name	Style of packing		
	<input checked="" type="checkbox"/> Non-Hazardous	General Waste			
	<input type="checkbox"/> Hazardous	Quantity(Unit)	Remark		
	<input type="checkbox"/> Others	880kg			
Customer code	001	Waste Profile code	A001		
Trace	PIC(Name&Sign)		Date of Completion		
Transportation company	(Name&Sign) 3K19145 Kyaw Naing Co [Signature]		(Day Month, Year)		
Waste service company	(Name&Sign) [Signature]		(Day Month, Year)		

Manifest

C-Slip

*Transportation company to Waste Generator
GEM - SL - R 010E /00

Date of issuance	(Day Month, Year) 19 Dec 2018	Issuer	(Name&Sign) S
Number of issuance	9999 1812 0168		
Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development Ltd	GEM	GEM
Tel			
Waste	Kind	Name	Style of packing
	<input checked="" type="checkbox"/> Non-Hazardous	General waste	
	<input type="checkbox"/> Hazardous	Quantity(Unit)	Remark
	<input type="checkbox"/> Others	1320kg	
Customer code	0001	Waste Profile code	A001
Trace	PIC(Name&Sign)	Date of Completion	
Transportation company	(Name&Sign) Mu Myin Win 09-35-8896	(Day Month, Year)	
Waste service company	(Name&Sign) Ain Pa So Hlaing	(Day Month, Year)	

Designed by GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.




Manifest		C-Slip		*Transportation company to Waste Generator GEM - SL - R 010E /00	
Date of issuance	(Day Month, Year) 16 Jan 2019	Issuer	(Name&Sign) 		
Number of issuance	9999 1901 0117				
Contractors	Waste generator	Transportation company	Waste service company		
Company Name	Myanmar Japan Thilawa Development Ltd	GEM	GEM.		
Tel					
Waste	Kind	Name		Style of packing	
	<input checked="" type="checkbox"/> Non-Hazardous	General waste			
	<input type="checkbox"/> Hazardous	Quantity(Unit)		Remark	
	<input type="checkbox"/> Others	1100kg			
Customer code	0001	Waste Profile code	A001		
Trace	PIC(Name&Sign)		Date of Completion		
Transportation company	(Name&Sign) 	Myi Myi Hkwp. 315888 10		(Day Month, Year)	
Waste service company	(Name&Sign) 			(Day Month, Year)	

Designed by GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.

Manifest		C-Slip		*Transportation company to Waste Generator GEM - SL - R 010E /00	
Date of issuance	(Day Month, Year) 28 Jan 2019	Issuer	(Name&Sign) 		
Number of issuance	9999 1901 0227				
Contractors	Waste generator	Transportation company	Waste service company		
Company Name	Myanmar Japan Thilawa Development Ltd	GEM	GEM		
Tel					
Waste	Kind	Name		Style of packing	
	<input checked="" type="checkbox"/> Non-Hazardous	General waste			
	<input type="checkbox"/> Hazardous	Quantity(Unit)		Remark	
	<input type="checkbox"/> Others	1200kg			
Customer code	0001	Waste Profile code	A001		
Trace	PIC(Name&Sign)		Date of Completion		
Transportation company	(Name&Sign) 	Swimin Latl 215 3896		(Day Month, Year)	
Waste service company	(Name&Sign) 			(Day Month, Year)	

Designed by GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.




Manifest		C-Slip		*Transportation company to Waste Generator GEM - SL - R 010E /00	
Date of issuance	(Day Month, Year) 21 Feb 2019	Issuer	(Name&Sign)		
Number of issuance	9999 1902 0206				
Contractors		Waste generator	Transportation company	Waste service company	
Company Name		Myanmar Japan Thilawa Development Ltd	GEM	GEM	
Tel					
Waste	Kind	Name		Style of packing	
	<input checked="" type="checkbox"/> Non-Hazardous	General waste			
	<input type="checkbox"/> Hazardous	Quantity(Unit)		Remark	
	<input type="checkbox"/> Others	440 kg			
Customer code		0001	Waste Profile code	A001	
Trace		PIC(Name&Sign)		Date of Completion	
Transportation company		(Name&Sign) Zaw Nang Lin 3K13896		(Day Month, Year)	
Waste service company		(Name&Sign) Phyu Phyu Aye		(Day Month, Year)	

Designed by GOLDEN WOVA ECO-SYSTEM MYANMAR CO., LTD.

Manifest		C-Slip		*Transportation company to Waste Generator GEM - SL - R 010E /00	
Date of issuance	(Day Month, Year) 21 Feb 2019	Issuer	(Name&Sign)		
Number of issuance	9999 1902 0200				
Contractors		Waste generator	Transportation company	Waste service company	
Company Name		Myanmar Japan Thilawa Development Ltd	GEM	GEM	
Tel					
Waste	Kind	Name		Style of packing	
	<input checked="" type="checkbox"/> Non-Hazardous	General waste			
	<input type="checkbox"/> Hazardous	Quantity(Unit)		Remark	
	<input type="checkbox"/> Others	1180 kg			
Customer code		0001	Waste Profile code	A001	
Trace		PIC(Name&Sign)		Date of Completion	
Transportation company		(Name&Sign) 3K13896 Kyau Nang 00		(Day Month, Year)	
Waste service company		(Name&Sign) Phyu Phyu Aye		(Day Month, Year)	

Designed by GOLDEN WOVA ECO-SYSTEM MYANMAR CO., LTD.



Manifest		C-Slip		*Transportation company to Waste Generator GEM - SL - R 010E 700	
Date of issuance	(Day Month, Year) 20 Feb 2019	Issuer	(Name&Sign) 		
Number of issuance	9999, 1999, 0123				
Contractors	Waste generator	Transportation company	Waste service company		
Company Name	Myanmar Japan Therapy Development Ltd	GEM	GEM		
Tel					
Waste	Kind	Name		Style of packing	
	<input checked="" type="checkbox"/> Non-Hazardous	General waste			
	<input type="checkbox"/> Hazardous	Quantity(Unit)		Remark	
	<input type="checkbox"/> Others	1200 kg			
Customer code	0001	Waste Profile code	A001		
Trace	PIC(Name&Sign)		Date of Completion		
Transportation company	(Name&Sign) Zaw Shwe Lin 1/1/2019		(Day Month, Year)		
Waste service company	(Name&Sign) 		(Day Month, Year)		

Designed by GOLDEN WOVA ECO-SYSTEM MYANMAR CO., LTD.

Date: 20/02/2019 Time: 10:30

Ref: 2019

Ref: 01-0001

Waste generator: Myanmar Japan Therapy Development Ltd

Waste service: GEM

Waste type: General waste
Quantity: 1200 kg
Waste code: A001



Manifest		C-Slip		*Transportation company to Waste Generator GEM - SL - R 010E /00	
Date of issuance	(Day Month, Year) 22 Mar 2019	Issuer	(Name&Sign)		
Number of issuance	9999 1703 0227				
Contractors	Waste generator	Transportation company	Waste service company		
Company Name	Myanmar Japan Thilawa Development	GEM	GEM		
Tel					
Waste	Kind	Name	Style of packing		
	<input checked="" type="checkbox"/> Non-Hazardous	General Waste			
	<input type="checkbox"/> Hazardous	Quantity(Unit)	Remark		
	<input type="checkbox"/> Others	1060 kg			
Customer code	0001	Waste Profile code	A001		
Trace	PIC(Name&Sign)		Date of Completion		
Transportation company	(Name&Sign)		(Day Month, Year)		
Waste service company	(Name&Sign)		(Day Month, Year)		
Designed by GOLDEN WOVA ECO-SYSTEM MYANMAR CO., LTD.					

Manifest		C-Slip		*Transportation company to Waste Generator GEM - SL - R 010E /00	
Date of issuance	(Day Month, Year) 22 Mar 2019	Issuer	(Name&Sign)		
Number of issuance	9999 1703 0230				
Contractors	Waste generator	Transportation company	Waste service company		
Company Name	Myanmar Japan Thilawa Development	GEM	GEM		
Tel					
Waste	Kind	Name	Style of packing		
	<input checked="" type="checkbox"/> Non-Hazardous	General Waste			
	<input type="checkbox"/> Hazardous	Quantity(Unit)	Remark		
	<input type="checkbox"/> Others	1200 kg			
Customer code	0001	Waste Profile code	A001		
Trace	PIC(Name&Sign)		Date of Completion		
Transportation company	(Name&Sign)		(Day Month, Year)		
Waste service company	(Name&Sign)		(Day Month, Year)		
Designed by GOLDEN WOVA ECO-SYSTEM MYANMAR CO., LTD.					



**Thilawa Special Economic Zone (Zone A)
Development Project (Operation Phase)**

Appendix

**Sewage Treatment Plant Monitoring Record
October 2018 to March 2019**

Monitoring Parameters Result for STP(Phase-1)

Month	Date	Inlet																																										
		pH	ORP	DO	EC	TDS	Turbidity	COD	Temp	BOD	T-Coll	T-N	T-P	O&G	SS	Cyanide	Chromium	Arsenic	Mercury	Cadmium	Selenium	Lead	Color	Odor	Zinc	Copper	Barium	Nickel	Sulphide	Free Chlorine	Formaldehyde	Silver	Iron	Ammonia	Hexavalent Chromium (Cr6+)	Fluoride	Total Chlorine	Total Cyanide	Phenols					
		Daily Parameters								Weekly Parameters								Monthly Parameters																										
Standard	Unit	Max 200	Max 400	Max 35°C	Max 200	MPN/100ml	Max 80	Max 40	Max 40	Max 200	Max 0.1	Max 0.4	Max 0.1	Max 0.005	Max 0.03	Max 0.02	Max 0.1	150	150	Max 2	Max 0.9	Max 1	Max 0.2	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1	Max 1				
Oct	01-Oct-18	7.36	204.6	10.58	510	260	10.1	20	20.67																																			
Oct	02-Oct-18	7.68	172.0	6.71	742	371	10.5	35	30.39																																			
Oct	03-Oct-18	7.22	228.1	0.37	584	292	9.7	-	30.3																																			
Oct	04-Oct-18	7.53	162.1	9.25	595	297	12.2	25	30.22																																			
Oct	05-Oct-18	7.82	165.8	8.83	762	381	8.6	30	30.21																																			
Oct	06-Oct-18	7.6	401.6	7.76	723	361	16.8		30.29																																			
Oct	07-Oct-18	7.4	151.3	6.43	694	342	10.7		30.45																																			
Oct	08-Oct-18	7.53	217	6.37	793	397	25.2	30	29.87																																			
Oct	09-Oct-18	7.59	187.5	8.57	584	292	7.7	16.3	30.3																																			
Oct	10-Oct-18	7.66	160.5	6.74	715	354	12.2	19	30.54	7.17	>160000	6	0.95	<3.1	12																													
Oct	11-Oct-18	7.7	166.1	7.86	595	298	14.2	31	30.34																																			
Oct	12-Oct-18	7.63	222.3	7.05	614	307	10.1	42	30.58																																			
Oct	13-Oct-18	7.77	203.5	10.46	529	265	8.7		30.45																																			
Oct	14-Oct-18	7.61	289.3	8.1	776	388	5.6		30.41																																			
Oct	15-Oct-18	7.47	212.2	13.13	1053	527	12.7	47	30.56																																			
Oct	16-Oct-18	7.64	256.8	12.28	655	342	9	48	30.55																																			
Oct	17-Oct-18	7.24	227.1	12.88	595	297	7.5	18	30.85	18.30	>160000	14	0.7	<3.1	12																													
Oct	18-Oct-18	7.46	193.1	13.3	611	306	15.3	26	30.68																																			
Oct	19-Oct-18	7.48	242.8	10.65	606	303	8.6	19	30.41																																			
Oct	20-Oct-18	7.59	201.1	13.13	783	391	9.3		30.5																																			
Oct	21-Oct-18	7.26	197.1	11.21	604	302	4.8		29.95																																			
Oct	22-Oct-18	7.53	198.5	13.12	674	323	4.9	13	29.93	8.6	>160000	9	0.667	<3.1	16	<0.002	0.02	<0.01	<0.002	<0.002	<0.01	0.01	2.76	1.4	0.032	<0.002	0.034	0.018	0.005	<0.1	0.152	<0.002	2.812	7.2	<0.05	0.921					<0.002			
Oct	23-Oct-18	7.58	212.5	11.12	428	214	14.7		29.55																																			
Oct	24-Oct-18	7.91	162.4	13.94	459	235	13.1		29.47																																			
Oct	25-Oct-18	7.49	202.3	12.68	654	317	13.7		29.41																																			
Oct	26-Oct-18	6.60	273.6	13.65	724	362	33.9	24	29.78																																			
Oct	27-Oct-18	7.35	225.9	12.68	495	248	10.1		29.91																																			
Oct	28-Oct-18	7.62	160.9	12.78	709	354	6.7		30.22																																			
Oct	29-Oct-18	7.57	201.8	12.29	767	383	13.8	28	29.81																																			
Oct	30-Oct-18	7.75	180.1	12.75	650	325	10.4	14	30.22																																			
Oct	31-Oct-18	7.54	205.9	11.61	614	307	10.9	33	30.37	9.48	>160000	6	0.607	<3.1	28																													
Nov	01-Nov-18	7.81	177.6	13.62	730	365	36.5	49	29.98																																			
Nov	02-Nov-18	7.52	165.8	12.87	688	349	14.7	27	29.67																																			
Nov	03-Nov-18	7.39	163.9	11.64	508	253	9.6		30.52																																			
Nov	04-Nov-18	7.69	164.3	11.78	514	267	15.2		30.13																																			
Nov	05-Nov-18	7.85	166.6	10.17	563	282	10.3	67	30.04																																			
Nov	06-Nov-18	7.81	184.2	12.58	675	338	22.6	57	30.28	12.28	>160000	13	0.511	<3.1	36	0.002	<0.002	<0.01	<0.002	<0.002	<0.01	<0.002	3.85	1.4	<0.002	<0.002	0.02	0.022	0.011	0.3	0.124	<0.002	2.16	10.9	<0.05	3.209					<0.002			
Nov	07-Nov-18	7.43	221.8	11.3	478	238	17.6		30.2																																			
Nov	08-Nov-18	6.02	159.5	12.93	710	355	1.8	37	29.76																																			
Nov	09-Nov-18	7.78	159.6	10.77	576	288	12.1	26.5	30.45																																			
Nov	10-Nov-18	7.61	173	11.72	643	322	14.7																																					

Monitoring Parameters Result for STP(Phase-2)

Month	Date	Inlet																																						
		Daily Parameters											Weekly Parameters					Monthly Parameters																						
		pH	ORP	DO	EC	TDS	Turbidity	COD	Temp	BOD	T-Coll	T-N	T-P	OAG	SS	Cyanide	Total Cyanide	Chromium	Arsenic	Mercury	Cadmium	Selenium	Lead	Color	Odor	Zinc	Copper	Barium	Nickel	Sulphide	Free Chlorine	Formaldehyde	Silver	Iron	Ammonia	Hexavalent Chromium (Cr6+)	Fluoride	Total Chlorine	Phenols	
		Unit	Unit	mg/L	µmhos/cm	mg/L	NTU	ppm	°C	ppm	MPN/100ml	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Oct	01-Oct-18	7.4	220.5	10.23	553	778	13.7	29	29.88																															
Oct	02-Oct-18	7.68	176.3	10.99	704	352	26.4	39	30.15																															
Oct	03-Oct-18	7.45	250.7	12.98	563	281	14.3	32	30.27	13.81	>160000	21	1.34	<-3.1	18	0.002	<0.002	<0.01	<0.002	<0.002	<0.01	<0.002	8.40	1	0.05	<0.002	0.026	0.044	0.028	0.1	0.11	<0.002	4.24	28.5	<0.05	0.674	0.027			
Oct	04-Oct-18	7.5	215.8	13.11	608	324	32.1	30	29.99																															
Oct	05-Oct-18	7.60	182	10.18	693	347	19.1	47	30.20																															
Oct	06-Oct-18	7.94	273.3	17.73	607	434	10.7	30	29.28																															
Oct	07-Oct-18	7.93	158.9	3.68	271	380	45.5	34	30.21																															
Oct	08-Oct-18	7.64	212.8	11.18	1128	663	45.9	34	30.21																															
Oct	09-Oct-18	7.23	192.1	8.47	651	327	11.9	15.4	30.14																															
Oct	10-Oct-18	7.66	182.3	10.19	573	376	13.7	24	30.6	7.81	>160000	11	0.95	<-3.1	16																									
Oct	11-Oct-18	7.7	194.7	10.18	620	310	16.1	34	30.43																															
Oct	12-Oct-18	7.96	234.1	10.54	569	294	9.8	21	30.35																															
Oct	13-Oct-18	7.77	204.1	11.75	701	351	12.1	30	30.43																															
Oct	14-Oct-18	7.81	202.1	8.5	595	328	10.8	30	30.12																															
Oct	15-Oct-18	7.81	201.3	11.33	703	352	18.2	64	29.94																															
Oct	16-Oct-18	7.68	258	12.04	651	325	10.8	24	30.52																															
Oct	17-Oct-18	7.47	220	13.82	742	371	7.5	43	30.48	16.71	>160000	10	1.38	<-3.1	10																									
Oct	18-Oct-18	7.87	196.8	13.43	675	338	11.1	15	30.76																															
Oct	19-Oct-18	7.55	238.1	10.11	640	320	12	34	30.43																															
Oct	20-Oct-18	7.85	151	13.94	623	412	16	30	30.50																															
Oct	21-Oct-18	7.11	203	12.26	628	313	8.5	28	29.81																															
Oct	22-Oct-18	7.14	201.2	13.21	694	378	11.3	15	29.84	7.9		8	0.544	<-3.1	14																									
Oct	23-Oct-18	7.59	212.8	10.18	607	249	12.5	29	29.30																															
Oct	24-Oct-18	7.79	180.5	12.16	456	328	13	29	29.22																															
Oct	25-Oct-18	7.92	154.8	13.11	566	298	11.6	29	29.57																															
Oct	26-Oct-18	6.85	281.7	12.90	1022	511	14.9	29	29.83																															
Oct	27-Oct-18	7.30	225.2	12.7	485	247	6.7	29	29.92																															
Oct	28-Oct-18	7.78	181.2	13.81	648	474	7.1	26	29.26																															
Oct	29-Oct-18	7.54	208.8	13.35	642	321	12.2	66	29.75																															
Oct	30-Oct-18	7.73	182.6	12.59	578	280	10.2	40	30.16																															
Oct	31-Oct-18	7.5	203.6	10.52	648	324	15.2	46	30.23	14.78	>160000	24	1.69	<-3.1	112																									
Nov	01-Nov-18	7.89	170.5	13.35	662	331	35.3	42	29.96																															
Nov	02-Nov-18	7.72	168.5	11.7	661	328	11	32	29.77																															
Nov	03-Nov-18	7.88	166.9	11.48	952	251	10.7	30	30.71																															
Nov	04-Nov-18	7.75	165.9	13.45	572	258	9.4	30	30.1																															
Nov	05-Nov-18	7.78	167.2	9.3	619	310	7.7	75	30.13																															
Nov	06-Nov-18	7.73	195.9	12.39	603	252	14	62	30.25	9.78	>160000	18	0.685	<-3.1	34	0.002	<0.002	<0.01	<0.002	<0.002	<0.01	0.008	7.3	1	<0.002	<0.002	0.02	0.008	0.01	0.4	0.062	<0.002	1.22	16.8	<0.05	2.423	<0.002			
Nov	07-Nov-18	7.48	202	11.38	825	328	11.8	33	30.33																															
Nov	08-Nov-18	7.69	169.6	11.45	472	238	9.5	17	29.61																															
Nov	09-Nov-18	7.71	163	10.73	681	291	8.6	25.7	29.78																															
Nov	10-Nov-18	7.64	172.7	11.46	504	262	7.3	30	30.85																															
Nov	11-Nov-18	7.67	194.4	8.16	719	300	15.2	30	30.4																															
Nov	12-Nov-18	7.67	161.4	12.05	612	311	11.1	41	29.81																															
Nov	13-Nov-18	7.69	160.5																																					

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