MJTD

Thilawa Special Economic Zone (Zone A) Development

Environmental Monitoring Report (Operation Phase)

Myanmar Japan Thilawa Development Limited.

October 2018

CONTENTS

Appendix

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

Report (No.6) 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 analysis the effect and impact	Refer to the attached report of water and wastewater quality report in appendix
2	Total Coliform	Exceed target value		

No.	Parameter	Type of Non-Compliance	Remedial Measures	Remarks
3	Mercury	Exceed target (June-2017 to August 2017)	- Consulting with environmental consultants and find out possible expected reason and consideration of proper investigation procedure for future.	Investigation of Mercury Detection in Industrial Zone of Thilawa Sepcial Economic Zone – A Report is attached in Appendix.

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

There were eighteen cases of minor accidents and one incident 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)

Category	Item	Location	Frequency	Remark
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
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.

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

Thilawa Special Economic Zone (Zone A)

Development Project (Operation Phase)

Environment Monitoring Form

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		3rd 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	5th January 2018	10th 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 – August 2018

NO_2, SO_2, 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	ppm	0.041	0.017 - 0.067	Refer to NEQG	< 0.06	Japan	1 week each in dry and wet season	HAZSCANNER, EPAS	
	SO_2	ppm	0.025	0.01 – 0.055		< 0.04	Japan		HAZSCANNER, EPAS	
	CO	ppm	0.017	0.000 – 0.281		< 10	Japan		HAZSCANNER, EPAS	
	TSP	mg/m^3	0.032	0.003 – 0.334		< 0.33	Thailand		HAZSCANNE1R, EPAS	
	PM10	mg/m^3	0.011	0.001 -0.121		< 0.12	Thailand		HAZSCANNER, EPAS	

***Remark: Referred to the Japan and Thailand Standard (EIA Report, Table 6.4-1) and Air Quality Monitoring Report (August 2018)**

Complains from Residents

- Are there any complaints 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 Complaints from Residents	Countermeasures
One of the villager complaints about the dust emission in front of his home due to the construction agitator when it was passed through the road.	MJTD take action as follow: - Inform to Locator's contractor about the complaints - Instruct the Locator's contractor to utilize the Thilawa SEZ Internal access road and only accept the Gate-2 for entrance and exit of Thilawa SEZ Zone-A. - Assign to security out-source to more inspection and monitor at that nearest complaints area and restrict the construction machineries utilization of it.

2)(a) Water Quality – April 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	Target value to be applied	*1Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
SW-1	pH	-	8.9	6-9	5.0-9.0	>=4	Once in two months	Instrument Analysis Method	
	SS	ppm	10	50	Max.50			APHA 2540D Method	
	DO	ppm	9.15	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	21	250	Max.70			APHA 5220D Method	
	BOD	ppm	5.36	50	Max.20			APHA-5210B Method	
	T-N	ppm	1.3	-	Max.80			HACH Method 10072	
	T-P	ppm	0.055	2	-			APHA 4500-PE	

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	24.82	-	-			APHA 2120C	
	Odor	Co.Pt	1	-	-			APHA 2150B	
	Total coliforms*3	MPN/100ml	1000	400	Max.400	7.5×10^3		APHA 9221B	
SW-5	pH	-	7.9	6-9	5.0-9.0			Instrument Analysis Method	
	SS	ppm	4	50	Max.50			APHA 2540D Method	
	DO	ppm	7.76	-	-	>=4		Instrument Analysis Method	
	COD(Cr)	ppm	19.4	250	Max.70			APHA 5220D Method	
	BOD	ppm	3.76	50	Max.20		Once in two months	APHA-5210B Method	
	T-N	ppm	0.6	-	Max.80			HACH Method 10072	
	T-P	ppm	< 0.05	2	-			APHA 4500-PE	
	Color	Co.Pt	28.89	-	-			APHA 2120C	
	Odor	Co.Pt	1	-	-			APHA 2150B	
	Total coliforms*3	MPN/100ml	> 160,000	400	Max.400	7.5×10^3		APHA 9221B	
SW-6	pH	-	6.4	6-9	5.0-9.0	>=4		Instrument Analysis Method	
	SS	ppm	4	50	Max.50			APHA 2540D Method	
	DO	ppm	10.04	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	8.3	250	Max.70			APHA 5220D Method	
	BOD	ppm	2.56	50	Max.20		Once in two months	APHA-5210B Method	
	T-N	ppm	12.9	-	Max.80			HACH Method 10072	
	T-P	ppm	0.317	2	-			APHA 4500-PE	
	Color	Co.Pt	7	-	-	7.5×10^3		APHA 2120C	

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)
	Odor	Co.Pt	1	-	-			APHA 2150B	
	Total coliforms	MPN/100ml	2	400	Max.400			APHA 9221B	
SW-2 (Reference Point)	pH	-	8.8	6-9	5.0-9.0	>=4	Once in two months	Instrument Analysis Method	
	SS	ppm	10	50	Max.50			APHA 2540D Method	
	DO	ppm	10.93	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	83	250	Max.70			APHA 5220D Method	
	BOD	ppm	9.48	50	Max.20			APHA-5210B Method	
	T-N	ppm	5.1	-	Max.80			HACH Method 10072	
	T-P	ppm	0.577	2	-			APHA 4500-PE	
	Color	Co.Pt	88.4	-	-			APHA 2120C	
	Odor	Co.Pt	8	-	-			APHA 2150B	
	Total coliforms*4	MPN/100ml	> 160,000	400	Max.400			APHA 9221B	
SW-3 (Reference Point)	pH	-	7.7	6-9	5.0-9.0	>=4	Once in two months	Instrument Analysis Method	
	SS*3	ppm	8	50	Max.50			APHA 2540D Method	
	DO	ppm	9.95	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	32.1	250	Max.70			APHA 5220D Method	
	BOD	ppm	2.32	50	Max.20			APHA-5210B Method	
	T-N	ppm	0.2	-	Max.80			HACH Method 10072	
	T-P	ppm	0.051	2	-			APHA 4500-PE	
	Color	Co.Pt	43.35	-	-			APHA 2120C	
	Odor	Co.Pt	1	-	-			APHA 2150B	

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 coliforms*4	MPN/100ml	2,600	400	Max.400			APHA 9221B	
SW-4 (Reference Point)	pH	-	7.8	6-9	5.0-9.0	>=4	Once in two months	Instrument Analysis Method	
	SS	ppm	8	50	Max.50			APHA 2540D Method	
	DO	ppm	9.95	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	32.1	250	Max.70			APHA 5220D Method	
	BOD	ppm	2.32	50	Max.20			APHA-5210B Method	
	T-N	ppm	0.0	-	Max.80			HACH Method 10072	
	T-P	ppm	< 0.05	2	-			APHA 4500-PE	
	Color	Co.Pt	42.46	-	-			APHA 2120C	
	Odor	Co.Pt	1	-	-			APHA 2150B	
	Total coliforms*4	MPN/100ml	< 1.8	400	Max.400			APHA 9221B	
GW-1 (Reference Point)	pH	-	8.4	None (Available Guideline value determined by MONREC)	None (Available Guideline Value determined by MOI)	5.5~9.0	Once in two months	Instrument Analysis Method	
	SS	ppm	2			50		APHA 2540D Method	
	DO	ppm	9.57			>=4		Instrument Analysis Method	
	COD(Cr)	ppm	4.8			60		APHA 5220D Method	
	BOD	ppm	0.68			15		APHA-5210B Method	
	T-N	ppm	0.9			0.1		HACH Method 10072	
	T-P	ppm	0.073			0.04		APHA 4500-PE	
	Color	Co.Pt	2.41					APHA 2120C	
	Odor	Co.Pt	1					APHA 2150B	
	Total coliforms	MPN/100ml	4.5			7.5×10^3		APHA 9221B	

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

*[2]Remarks: There is no current country standard but Ministry of Natural Recourses 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.

*[3]Remark: 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 was 4 for both SW1 & SW5 and they were under the reference under target value. It is considered that there is no significant impact to human health.

[4]*Remark: For reference monitoring points (SW-2 and SW-3), 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 SW2 was 6.1 and SW3 was 9.3 and they were under the reference under target value. It is considered that there is no significant impact to human health.

2)(b) Water Quality – June 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 Refereed 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			Instrument Analysis Method	
	pH	-	7.9	6-9	5.0-9.0			Instrument Analysis Method	
	SS*2	mg/l	222	50	Max 50			APHA 2540D Method	
	DO	mg/l	6.88	-	-	>=4		Instrument Analysis Method	
	BOD	mg/l	3.21	50	Max 20			APHA-5210B Method	
	COD(Cr)	mg/l	< 0.7	250	Max 70*4			APHA 5220D Method	
	Total Coliform*3	MPN/10	54,000	400	Max 400	7.5×10^3		APHA-9221B Method	
	T-N	0ml	1.7	-	Max 80		Twice in one	HACH Method 10072	
	T-P	mg/l	< 0.050	2	-		year	APHA 4500-P E Method	
	Color	mg/l	6.22	-	Max 150			APHA-2120C Method	
	Odor	Co.Pt	1	-	-			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	
	Formaldehyde	mg/l	0.316	-	Max 1			USEPA Method 420.1 Method	
	Phenols	mg/l	< 0.002	0.5	Max 1			APHA 3120B	
	Free Chlorine	mg/l	0.1	0.2	Max 1			HACH 8131	
	Zinc	mg/l	0.008	2	Max 5			APHA-3120B Method	
SW-1	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	

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)
	Cadmium	mg/l	≤ 0.001	0.1	Max 0.03		Twice in one	APHA-3120B Method	
	Barium	mg/l	0.040	-	Max 1		year	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	0.02	0.5	Max 0.2			HACH 8027 Method	
	Cyanide	mg/l	< 0.002	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	0.046	1	Max 1			HACH 8131 Method	
	Iron	mg/l	0.5	3.5	Max 3.5			APHA 3120 B ICP Method	
	Total Dissolved Solids	mg/l	98	-	Mas 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	0.082	10	Max 10			HACH 10205 Method	
	Fluoride	mg/l	0.240	20	Max 20			APHA 4110 B Method	
	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	-	9	6-9	5.0-9.0			Instrument Analysis Method	
	SS*2	mg/l	360	50	Mas 50			APHA 2540D Method	
	DO	mg/l	6.15	-	-	>=4		Instrument Analysis Method	
	BOD	mg/l	3.79	50	Max 20			APHA-5210B Method	
	COD(Cr)	mg/l	<0.7	250	Max 70*4		Twice in one	APHA 5220D Method	
	Total Coliform*3	MPN/10	92,000	400	Max 400	7.5×10^3	year	APHA-9221B 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	0ml	1.6	-	Max 80			HACH Method 10072	
	T-P	mg/l	0.119	2	-			APHA 4500-P E Method	
	Color	mg/l	9.34	-	Max 150			APHA-2120C Method	
	Odor	Co.Pt	1	-	-			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	0.13	-	Max 1			USEPA Method 420.1 Method	
	Phenols	mg/l	0.03	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		Twice in one	APHA-3120B Method	
	Copper	mg/l	≤0.002	0.5	Max 1		year	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	0.042	-	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	≤0.002	0.5	Max 0.2			HACH 8027 Method	
	Cyanide	mg/l	<0.002	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	0.059	1	Max 1			HACH 8131 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)
	Iron	mg/l	0.52	3.5	Max 3.5			APHA 3120B ICP Method	
	Total Dissolved Solids	mg/l	112	-	Mas 2000			APHA 2540C Method	
	Total Residual Chlorine	mg/l	<0.1	-	Max 0.2			APHA 4500-Cl G Method	
	Chromium (Hexavalent)	mg/l	< 0.5	0.1	Max 0.1			Spectrometric Method	
	Ammonia	mg/l	0.236	10	Max 10			HACH 10205 Method	
	Fluoride	mg/l	0.152	20	Max 20			APHA 4110 B Method	
	Silver	mg/l	≤ 0.002	0.5	Max 0.5			APHA 3120B ICP Method	
SW-6	Temperature	°C	30	< 3 (increase)	Max 40		Twice in one year	Instrument Analysis Method	
	pH	-	7.3	6-9	5.0-9.0			Instrument Analysis Method	
	SS	mg/l	4	50	Mas 30			APHA 2540D Method	
	DO	mg/l	10.19	-	-			Instrument Analysis Method	
	BOD	mg/l	2.93	50	Max 20	>=4		APHA-5210B Method	
	COD(Cr)	mg/l	3.3	250	Max 70[4]			APHA 5220D Method	
	Total Coliform	MPN/10	49	400	Max 400			APHA-9221B Method	
	T-N	0ml	5.8	-	Max 80	7.5×10^3		HACH Method 10072	
	T-P	mg/l	0.084	2	-			APHA 4500-P E Method	
	Color	mg/l	3.24	-	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	0.023	-	Max 1			USEPA Method 420.1 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)
	Phenols	mg/l	0.006	0.5	Max 1		Twice in one	APHA 3120B	
	Free Chlorine	mg/l	0.1	0.2	Max 1		year	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	0.006	-	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	
SW-6	Cyanide	mg/l	0.002	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	0.008	1	Max 1			HACH 8131 Method	
	Iron	mg/l	0.6	3.5	Max 3.5			APHA 3120B ICP Method	
	Total Dissolved Solids	mg/l	174	-	Max 2000			APHA 2540C Method	
	Total Residual Chlorine	mg/l	0.6	-	Max 0.2			APHA 4500-CI G Method	
	Chromium (Hexavalent)	mg/l	< 0.005	0.1	Max 0.5			Spectrometric Method	
	Ammonia	mg/l	<0.020	10	Max 10			HACH 10205 Method	
	Fluoride	mg/l	2.98	20	Max 20			APHA 4110 B Method	
	Silver		≤ 0.002	0.5	Max 0.5			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)
SW-2	Temperature	°C	28	< 3 (increase)	Max 40			Instrument Analysis Method	
(Reference	pH	-	8	6-9	5.0-9.0			Instrument Analysis Method	
Point)	SS*4	mg/l	98	50	Mas 30			APHA 2540D Method	
	DO	mg/l	4.92	-	-	>=4		Instrument Analysis Method	
	BOD	mg/l	4.54	50	Max 20			APHA-5210B Method	
	COD(Cr)	mg/l	15.7	250	Max 70*4			APHA 5220D Method	
	Total Coliform*5	MPN/10	92,000	400	Max 400	7.5×10^3		APHA-9221B Method	
	T-N	0ml	1.5	-	Max 80			HACH Method 10072	
	T-P	mg/l	0.073	2	-			APHA 4500-P E Method	
	Color	mg/l	47.8	-	Max 150		Twice in one	APHA-2120C Method	
	Odor	Co.Pt	1	-	-		year	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	0.116	-	Max 1			USEPA Method 420.1 Method	
	Phenols	mg/l	0.017	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	
SW-2	Mercury	mg/l	≤ 0.002	0.01	Max 0.005			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)
(Reference	Cadmium	mg/l	≤ 0.001	0.1	Max 0.03			APHA-3120B Method	
Point)	Barium	mg/l	0.05	-	Max 1		Twice in one	APHA-3120B Method	
	Selenium	mg/l	≤ 0.01	0.1	Max 0.02		year	APHA-3120B Method	
	Lead	mg/l	≤ 0.002	0.1	Max 0.2			APHA-3120B Method	
	Nickel	mg/l	0.012	0.5	Max 0.2			HACH 8027 Method	
	Cyanide	mg/l	< 0.002	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	0.076	1	Max 1			HACH 8131 Method	
	Iron	mg/l	1.6	3.5	Max 3.5			APHA 3120B ICP Method	
	Total Dissolved Solids	mg/l	106	-	Max 2000			APHA 2540C Method	
	Total Residual Chlorine	mg/l	0.2	-	Max 0.2			APHA 4500-CI G Method	
	Chromium (Hexavalent)	mg/l	< 0.05	0.1	Max 0.5			Spectrometric Method	
	Ammonia	mg/l	0.31	10	Max 10			HACH 10205 Method	
	Fluoride	mg/l	0.111	20	Max 20			APHA 4110 B Method	
	Silver		≤ 0.002	0.5	Max 0.5			APHA 3120B ICP Method	
SW-3	Temperature	°C	27	< 3 (increase)	Max 40			Instrument Analysis Method	
(Reference	pH	-	7.2	6-9	5.0-9.0	>=4		Instrument Analysis Method	
Point)	SS*4	mg/l	206	50	Mas 30			APHA 2540D Method	
	DO	mg/l	5.67	-	-			Instrument Analysis Method	
	BOD	mg/l	3.57	50	Max 20	7.5×10^3		APHA-5210B Method	
	COD(Cr)	mg/l	8.5	250	Max 70*4			APHA 5220D Method	
	Total Coliform*5	MPN/10	35,000	400	Max 400		Twice in one	APHA-9221B 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	0ml	1.3	-	Max 80		year	HACH Method 10072	
	T-P	mg/l	0.060	2	-			APHA 4500-P E Method	
	Color	mg/l	24.3	-	Max 150			APHA-2120C Method	
	Odor	Co.Pt	1	-	-	3		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	0.18	-	Max 1			USEPA Method 420.1 Method	
	Phenols	mg/l	0.006	0.5	Max 1			APHA 3120B	
	Free Chlorine	mg/l	< 0.1	0.2	Max 1			HACH 8131	
	Zinc	mg/l	0.026	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	
SW-3	Copper	mg/l	≤ 0.002	0.5	Max 1		Twice in one	APHA-3120B Method	
(Reference	Mercury	mg/l	≤ 0.002	0.01	Max 0.005		year	APHA-3120B Method	
Point)	Cadmium	mg/l	≤ 0.001	0.1	Max 0.03			APHA-3120B Method	
	Barium	mg/l	0.048	-	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	0.05	0.5	Max 0.2			HACH 8027 Method	
	Cyanide	mg/l	< 0.002	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	0.05	1	Max 1			HACH 8131 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)
	Iron	mg/l	1.54	3.5	Max 3.5			APHA 3120B ICP Method	
	Total Dissolved Solids	mg/l	72	-	Max 2000			APHA 2540C Method	
	Total Residual Chlorine	mg/l	0.2	-	Max 0.2			APHA 4500-CI G Method	
	Chromium (Hexavalent)	mg/l	< 0.05	0.1	Max 0.5			Spectrometric Method	
	Ammonia	mg/l	0.12	10	Max 10			HACH 10205 Method	
	Fluoride	mg/l	0.149	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	29	< 3 (increase)	Max 40			Instrument Analysis Method	
(Reference	pH	-	7.6	6-9	5.0-9.0			Instrument Analysis Method	
Point)	SS*4	mg/l	370	50	Mas 30		Twice in one	APHA 2540D Method	
	DO	mg/l	8.38	-	-		year	Instrument Analysis Method	
	BOD	mg/l	3.33	50	Max 20	>=4		APHA-5210B Method	
	COD(Cr)	mg/l	3.1	250	Max 70*4			APHA 5220D Method	
	Total Coliform*5	MPN/10	92,000	400	Max 400			APHA-9221B Method	
	T-N	0ml	4.9	-	Max 80	7.5×10^3		HACH Method 10072	
	T-P	mg/l	0.12	2	-			APHA 4500-P E Method	
	Color	mg/l	12.63	-	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	0.54	-	Max 1			USEPA Method 420.1 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-4	Phenols	mg/l	0.008	0.5	Max 1			APHA 3120B	
(Reference	Free Chlorine	mg/l	0.1	0.2	Max 1		Twice in one	HACH 8131	
Point)	Zinc	mg/l	0.018	2	Max 5		year	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	
	Barium	mg/l	0.044	-	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	0.036	0.5	Max 0.2			HACH 8027 Method	
	Cyanide	mg/l	0.003	1	Max 1			APHA 4500 CL G Method	
	Sulphide	mg/l	0.077	1	Max 1			HACH 8131 Method	
	Iron	mg/l	0.008	3.5	Max 3.5			APHA 3120B ICP Method	
	Total Dissolved Solids	mg/l	58	-	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	0.132	10	Max 10			HACH 10205 Method	
	Fluoride	mg/l	0.134	20	Max 20			APHA 4110 B Method	
	Silver		≤ 0.002	0.5	Max 0.5			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)
GW-1	Temperature	°C	34	None	Max 40			Instrument Analysis Method	
(Reference	pH	-	8.3	(Available	5.0-9.0			Instrument Analysis Method	
Point)	SS	mg/l	8	Guideline	Max 30			APHA 2540D Method	
	DO	mg/l	5.88	value	-	>=4	Twice in one	Instrument Analysis Method	
	BOD	mg/l	3.35	determined	Max 20		year	APHA-5210B Method	
	COD(Cr)	mg/l	6.9	by	Max 70*4			APHA 5220D Method	
	Total Coliform*6	MPN/10	2,500	MONREC)	Max 400	7.5×10^3		APHA-9221B Method	
	T-N	0ml	1.3		Max 80			HACH Method 10072	
	T-P	mg/l	0.052		-			APHA 4500-P E Method	
	Color	mg/l	1.26		Max 150			APHA-2120C Method	
	Odor	Co.Pt	1		-			APHA-2150B Method	
	HS	-	-		Max 1			HACH 8131 Method	
	Oil and Grease	mg/l	< 3.1		Max 5			APHA-5520B Method	
	Formaldehyde	mg/l	0.010		Max 1			USEPA Method 420.1 Method	
	Phenols	mg/l	< 0.002		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	

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)	Cadmium	mg/l	≤ 0.001		Max 0.03		Twice in one year	APHA-3120B Method	
	Barium	mg/l	0.070		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	0.008		Max 1			HACH 8131 Method	
	Iron	mg/l	1.76		Max 3.5			APHA 3120B ICP Method	
	Total Dissolved Solids	mg/l	1568		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		Max 0.5			Spectrometric Method	
	Ammonia	mg/l	2.050		Max 10			HACH 10205 Method	
	Fluoride	mg/l	≤ 0.014		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, June 2018.

*2Remark: In SW-1 and 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 and 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 kinds of vegetation and creature such as birds and small animals in and along the retention canals and retention pond and ii) the second suspect might be 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 1.8 & SW5 was <1.8 and they were under the reference under target value. It is

considered that there is no significant impact to human health.

*4Remark: For reference monitoring points (SW-2, 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.

*5Remark: 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 3.6, SW3 was 1.8 & SW4 was <1.8 and they were under the reference under target value. It is considered that there is no significant impact to human health.

*6Remark: 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 <1.8 and it was under the reference under target value. It is considered that there is no significant impact to human health.

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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 Refereed 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	-	7.2	6-9	5.0-9.0		Once in two months	Instrument Analysis Method	
	SS*2	ppm	116	50	Max.30			APHA 2540D Method	
	DO	ppm	6.79	-	-	>=4		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)
	COD(Cr)	ppm	4.1	250	Max.70			APHA 5220D Method	
	BOD	ppm	2.71	50	Max.20			APHA-5210B Method	
	T-N	ppm	0	-	Max.80			HACH Method 10072	
	T-P	ppm	0.62	2	-			APHA 4500-P E Method	
	Color	Co.Pt	6.73	-	-	7.5×10^3		APHA 2120C Method	
	Odor	Co.Pt	2	-	-			APHA 2150B Method	
	Total coliforms*3	MPN/100ml	24,000	400	Max.400			APHA 9221B Method	
SW-5	pH	-	8.6	6-9	5.0-9.0			Instrument Analysis Method	
	SS*2	ppm	208	50	Max.30			APHA 2540D Method	
	DO	ppm	8.8	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	< 0.7	250	Max.70			APHA 5220D Method	
	BOD	ppm	1.44	50	Max.20	>=4	Once in two months	APHA-5210B Method	
	T-N	ppm	0.4	-	Max.80			HACH Method 10072	
	T-P	ppm	0.07	2	-			APHA 4500-P E Method	
	Color	Co.Pt	1.45	-	-			APHA 2120C Method	
	Odor	Co.Pt	1.4	-	-			APHA 2150B Method	
	Total coliforms*3	MPN/100ml	> 16,000	400	Max.400	7.5×10^3		APHA 9221B Method	
SW-6	pH	-	6.7	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	7.3	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	2.8	250	Max.70			APHA 5220D 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)
	BOD	ppm	1.25	50	Max.20			APHA-5210B Method	
	T-N	ppm	4	-	Max.80			HACH Method 10072	
	T-P	ppm	0.1	2	-	7.5×10^3		APHA 4500-P E Method	
	Color	Co.Pt	1.26	-	-			APHA 2120C Method	
	Odor	Co.Pt	4	-	-			APHA 2150B Method	
	Total coliforms	MPN/100ml	< 1.8	400	Max.400			APHA 9221B Method	
SW-2 (Reference Point)	pH	-	6.9	6-9	5.0-9.0			Instrument Analysis Method	
	SS	ppm	30	50	Max.30			APHA 2540D Method	
	DO	ppm	6.15	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	10.6	250	Max.70			APHA 5220D Method	
	BOD	ppm	3.32	50	Max.20	>=4	Once in two months	APHA-5210B Method	
	T-N	ppm	1.1	-	Max.80			HACH Method 10072	
	T-P	ppm	0.13	2	-			APHA 4500-P E Method	
	Color	Co.Pt	5.03	-	-			APHA 2120C Method	
	Odor	Co.Pt	1	-	-			APHA 2150B Method	
	Total coliforms*5	MPN/100ml	92,000	400	Max.400			APHA 9221B Method	
SW-3 (Reference Point)	pH	-	6.7	6-9	5.0-9.0			Instrument Analysis Method	
	SS	ppm	50	50	Max.30	>=4	Once in two months	APHA 2540D Method	
	DO	ppm	7.46	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	9.8	250	Max.70			APHA 5220D Method	
	BOD	ppm	3.33	50	Max.20			APHA-5210B 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)
	T-N	ppm	2.5	-	Max.80			HACH Method 10072	
	T-P	ppm	0.13	2	-			APHA 4500-P E Method	
	Color	Co.Pt	3.02	-	-			APHA 2120C Method	
	Odor	Co.Pt	1.4	-	-			APHA 2150B Method	
	Total coliforms*5	MPN/100ml	92,000	400	Max.400			APHA 9221B Method	
SW-4 (Reference Point)	pH	-	6.6	6-9	5.0-9.0		Once in two months	Instrument Analysis Method	
	SS*4	ppm	98	50	Max.30			APHA 2540D Method	
	DO	ppm	9.17	-	-			Instrument Analysis Method	
	COD(Cr)	ppm	8.7	250	Max.70			APHA 5220D Method	
	BOD	ppm	3.01	50	Max.20	>=4		APHA-5210B Method	
	T-N	ppm	0	-	Max.80			HACH Method 10072	
	T-P	ppm	0.15	2	-			APHA 4500-P E Method	
	Color	Co.Pt	2.42	-	-			APHA 2120C Method	
	Odor	Co.Pt	1.0	-	-			APHA 2150B Method	
	Total coliforms*5	MPN/100ml	35,000	400	Max.400			APHA 9221B Method	
GW-1 (Reference Point)	pH	-	8.1	None (Available Guideline value determined by MONREC)	None (Available Guideline Value determined by MOI)	5.5~9.0	Once in two months	Instrument Analysis Method	
	SS	ppm	2			50		APHA 2540D Method	
	DO	ppm	8.18			>=4		Instrument Analysis Method	
	COD(Cr)	ppm	2.6			60		APHA 5220D Method	
	BOD	ppm	1.16			15		APHA-5210B Method	
	T-N	ppm	1.5			-		HACH Method 10072	

Location	Item	Unit	Measured Value	Country's Standard	Target value to be applied	*[1]Referred International Standard	Frequency	Method	Note (Reason of excess of the standard)
	T-P	ppm	0.06			-		APHA 4500-P E Method	
	Color	Co.Pt	0			-		APHA 2120C Method	
	Odor	Co.Pt	1			-		APHA 2150B Method	
	Total coliforms*[6]	MPN/100ml	1,700			7.5×10^3		APHA 9221B Method	

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

*[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 and SW-5, Total coliform are 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 1.8 & SW5 was 15 and they were under the reference under target value. It is considered that there is no significant impact to human health.

*[4]Remark: For reference monitoring points 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 14, SW3 was 26 & SW4 was 21 and they were under the reference under target value. It is considered that there is no significant impact to human health.

*[6]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 <1.8 and it was 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)	61	59-66	N/A	75		One time each in dry and wet season	Sound Level Meter	
	Leq(eve)	dB(A)	58	57-59		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)	63	60-66	N/A	70		One time each in dry and wet season	Sound Level Meter	
	Leq(eve)	dB(A)	60	58-62		65				
	Leq(night)	dB(A)	53	46-56		60				
NV-3	Leq(day)	dB(A)	52	48-59	N/A	70			Sound level Meter	
	Leq(eve)	dB(A)	44	51-52		65				
	Leq(night)	dB(A)	49	48-56		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.

No.	Date	Description	No. of Kgs	Remarks
1	April 2018	General Waste Disposal	1880	Golden Dowa Eco-system Myanmar Co.,Ltd
2	May 2018	General Waste Disposal	1940	Golden Dowa Eco-system Myanmar Co.,Ltd
3	June 2018	General Waste Disposal	3000	Golden Dowa Eco-system Myanmar Co.,Ltd
4	July 2018	General Waste Disposal	3420	Golden Dowa Eco-system Myanmar Co.,Ltd
5	August 2018	General Waste Disposal	1740	Golden Dowa Eco-system Myanmar Co.,Ltd
6	September 2018	General Waste Disposal	1800	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- April 2018

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
2-April-2018	-	m3/week	+7.13	m	Once a week	
9-April-2018	-	m3/week	+7.13	m		
23-April-2018	-	m3/week	+7.129	m		
30-April-2018	-	m3/week	+7.129	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 descript the water consumption quantity if using the tube well.**

(b) Ground Subsidence and Hydrology- May 2018

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
4-June-2018	-	m3/week	+7.129	m	Once a week	
11-June-2018	-	m3/week	+7.129	m		
18-June-2018	-	m3/week	+7.13	m		
25-June-2018	-	m3/week	+7.13	m		

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

(c) Ground Subsidence and Hydrology- June 2018

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
4-June-2018	-	m3/week	+7.130	m	Once a week	
11-June-2018	-	m3/week	+7.131	m		
18-June-2018	-	m3/week	+7.131	m		
25-June-2018	-	m3/week	+7.132	m		

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

(d) Ground Subsidence and Hydrology- July 2018

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
2-July-2018	-	m3/week	+7.134	m	Once a week	
9-July-2018	-	m3/week	+7.134	m		
16-July-2018	-	m3/week	+7.134	m		
24-July-2018	-	m3/week	+7.135	m		

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

(e) Ground Subsidence and Hydrology- August 2018

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
3-Aug-2018	-	m3/week	+7.135	m	Once a week	
13-Aug-2018	-	m3/week	+7.135	m		
20-Aug-2018	-	m3/week	+7.134	m		
27-Aug-2018	-	m3/week	+7.135	m		

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

(f) Ground Subsidence and Hydrology- September 2018

Duration (Week)	Water Consumption		Ground Level		Frequency	Note
	Quantity	Unit	Quantity	Unit		
3-Sep-2018	-	m3/week	+7.135	m	Once a week	
10-Sep-2018	-	m3/week	+7.136	m		
17-Sep-2018	-	m3/week	+7.136	m		
28-Sep-2018	-	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

Alwan Sok Village Complaints to DOWA	- Actual site checking about 3 times and continuously monitoring near the village by MJTD. - From the MJTD side, support to OSSC-Environment Section for investigation of bad smell/ odor. - Sharing information to OSSC-Environment Section how much area it suffered bad smell around village when we went site checking.

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 4th April 2018 in front of A-12 in Thilawa SEZ. Motorbike person (A-2) came from Gate-2 to A-2 and Bicycle person (A-12) stopped in front of A-12 site. TheMotorbike hit the bicycle in front of A-12. Bicycle was damaged and bicycle person got small abrasion on the right knee.	"MjTD take the action as per following: - Negotiate between two parties. - Motorbike person will pay compensation fees for that incident. "
An accident was occurred on 26th April 2018 in front of WPP junction in Thilawa SEZ.A truck and a motorbike came same direction from Gate-2 to that junction. The truck immediately turns left at the junction and hit the motorbike. The motorbike falls down but no one get injury and no damage.	"MjTD take the action as per following: - Remind to drive carefully in future and explained the traffic rule."
"An accident was occurred on 27th April 2018 around village gate in Thilawa SEZ.A motorbike came straight direction to D-9 site, another motorbike turned left from village gate street to inside SEZ C-1 site and accident happened. C-1 site worker's motorbike crashed to D-9 site worker's motorbike. No	"MjTD take the action as per following: - Negotiate between two parties. - Remind the bikers to reduce speed and explained the traffic rule.

Contents of Incidents	Countermeasures
one get injury but both motorbikes are damaged. "	- C-1 site worker's will repair the D-9 site worker's motorbike. "
"An accident was occurred on 29th April 2018 in front of Admin Building of Thilawa SEZ. A truck crashed the fence of admin building. At that time, the driver run away.The truck driver came back at 02:00AM. He contacted to his owner. This truck driver told that he came straight direction to MITT and he saw a motorbike in front of his truck on the road in front of admin building so he turned right immediately with the speed and crashed the fence of admin building without hitting motorbike."	"MjTD take the action as per following: - Kyauk Tan traffic police officer and his team arrived at accident place around (01:00AM) and they are investigation about accident."
An accident was occurred on 8th May 2018 in front of B - 8 site in Thilawa SEZ.The concrete mixer truck came from Gate- 2 to B-8 site and turns left to enter B-8 site and ALSOK staff goes straight in front of B-8 site so accident was happened.ALSOK staff got abrasion on the face and motorbike was 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 17th May 2018 in front of WPP junction in Thilawa SEZ.Both motorbikes came from Gate-2 and turned left direction together and crashed each other. No one got injury. The body of motorbikes was 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 17th May 2018 in front of WPP junction in Thilawa SEZ.Both car and motorbike came from Gate-2 and car is turned left to go A-1 site and motorbike went straight and crashed each other. No one got injury. The body of 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 21th May 2018 at Thilawa development road outside of Thilawa SEZ.Both light truck and motorbike come same direction to Zone - B, when car crashed to motorbike from behind.Motorbike person got heavy injury on right arm and leg.	"MjTD take the action as per following: -We called ambulance and Traffic Police. - Send the injured persons to hospital. - Remind the drivers to drive carefully."
An accident was occurred on 22th May 2018 in front of WPP junction in Thilawa SEZ.Both car and motorbike came from Gate-2 and car is turned left to go A-10 site and motorbike went straight and crashed each other. No one got injury. The body of car was 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 29th June 2018 at canal between C-3 and B-3 in Thilawa SEZ.The car from C1 Site drove to canal between C-3 and B-3.Nobody got injury.Platform and buffer zone had damaged.	"MjTD take the action as per following: - Responsible person from MJTD and C-1 site solved this case.

Contents of Incidents	Countermeasures
	- Remind to drive carefully in furture. - Accident car was carried out from canal with crane car by C-1 site."
An accident was occurred on 10th July 2018 in front of Gate - 2 outside road of Thilawa SEZ. The motorbike went straight direction from G&G store to Zone B and tri-cycle went same direction and turn right to Gate-2 and crashed the motorbike. One of the motorbike people got small injured and motorbike was 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 13th July 2018 near A-13 site junction outside road of Thilawa SEZ. Oil truck and tri-cycle were coming from opposite direction and crashed at near A-13 site junction outside road of Thilawa SEZ . Both vehicles were damaged and tri-cycle's two people got injured.	"MjTD take the action as per following: - We called ambulance and Traffic Police. - Send the injured persons to hospital. - Remind the drivers to drive carefully."
An accident was occurred on 17th July 2018 at front of B-1 site in Thilawa SEZ.A leaking engine oil container made the road dirty.	"MjTD take the action as per following: - Landscaping and zone maintenance team clean the road and remove it."
An accident was occurred on 21th July 2018 at front of A-1 site in Thilawa SEZ.Two workers from A-2(Myanmar Century Steel) site was happened accident in front of Suzuki site. They drove high speed from A-2 site. When they arrived in front of A-1 site, their motorbike was slipped and overturned. Motorbike driver was run away and left another person who come with him. That person has bad injury on head and abrasion were almost whole body.	"MjTD take the action as per following: - We called ambulance. - Send the injured persons to hospital . - Remind the drivers to reduce speed and explained the traffic rule"
An accident was occurred on 28th July 2018 at front of Gate-2 outside road of Thilawa SEZ.Two motorbikes were crashed face to face in front of Gate-2. One motorbike came from Myanmar Marine University to Zone-B, and the other came from Zone-B. One tried to enter to Thilawa SEZ - A at Gate-2, they crashed face to face.One motorbike person got a little injured and they talked each other about compensation fees. They went to a clinic for medication by themselves.	"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 07th August 2018 at admin back fence of admin complex building near car parking.The container truck from B-10 was hit the fence while parking in their factory area.	MjTD take the action as per following: - We inform to B-10 responsible person and solved this case.
An accident was occurred on 08th August 2018 at in front of Gate-2 outside road of Thilawa SEZ Zone-	"MjTD take the action as per following:

Contents of Incidents	Countermeasures
A.Two motorbikes came the same direction from the side of g&g store.One motorbike turned right in front of Gate-2 and crashed with the other bike.They got small injured and went to a clinic.	- Negotiate between two parties. - Remind to drive carefully in furture and explained the traffic rule. - They solved payment problem by themselves."
An accident was occurred on 6th September 2018 at front of C-2 site in Thilawa SEZ.Sand truck was from C-1 site and light truck was from C-2 site. Both cars drove the same direction but sand truck immediately turned right side to enter C-2 site and crashed light truck. No one got injury and both cars damaged.	MjTD take the action as per following: - We called the Traffic Police and solved this accident.

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

April, 2018

WATER QUALITY MONITORING REPORT

FOR DEVELOPMENT OF INDUSTRIAL AREA

IN THILAWA SEZ ZONE A

(OPERATION STAGE)

(Bi-Monthly Monitoring)

April 2018

Myanmar Koei International Ltd.

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED
MJTD

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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.

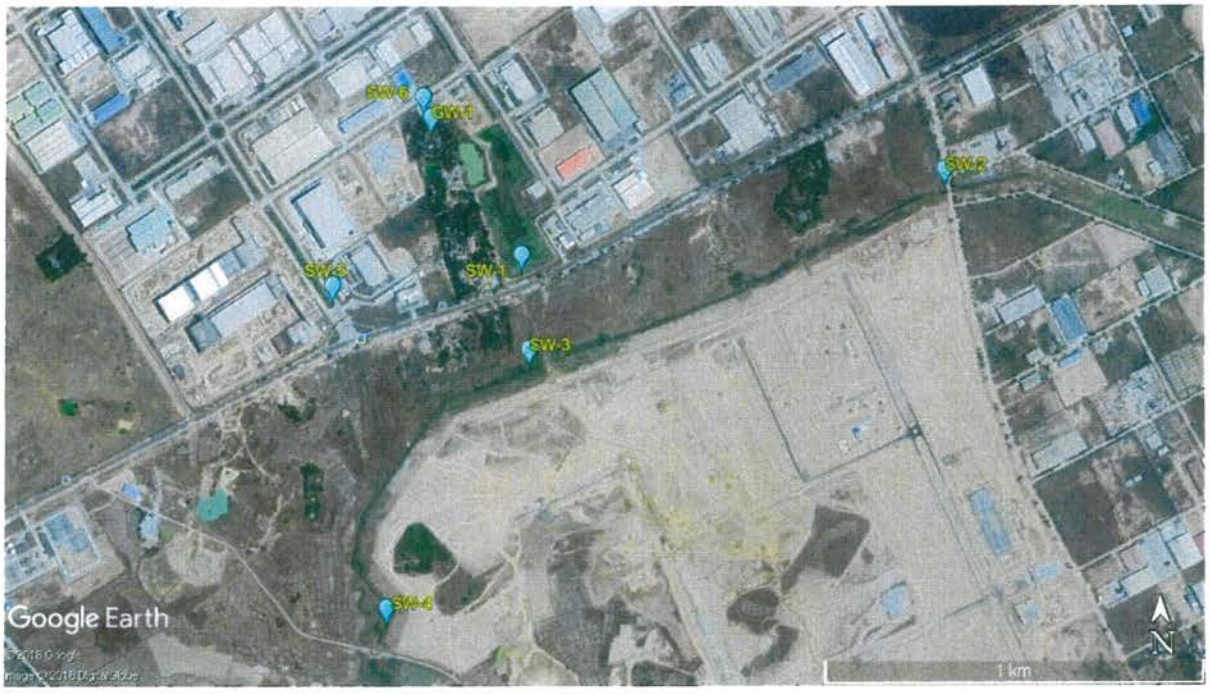

Figure 1.1-1 Location of Sampling Points of Water Quality Monitoring

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-2 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	Escherichia Coli (Self-monitoring)	O	O	O	O	O	O	O	Laboratory analysis
13	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 and water flow rate measurement.
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.
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 and paddy field in the west 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 and paddy field in the south and west 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 and paddy field in the south and west 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 25th April 2018 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon River, Myanmar on 25th April 2018 is shown in Table 2.4-2.

Table 2.4-1 Sampling Time of Each Station

No.	Station	Sampling Time
1	SW-1	25/04/2018 14:13
2	SW-2	25/04/2018 09:50
3	SW-3	25/04/2018 08:43
4	SW-4	25/04/2018 10:23
5	SW-5	25/04/2018 14:42
6	SW-6	25/04/2018 13:57
7	GW-1	25/04/2018 11:47

Source: Myanmar Koei International Ltd.

Table 2.4-2 Tide Record for Yangon River, Myanmar

Date	Time	Height	Tide Conditions
25/04/2018	00:20	4.6	High Tide
	07:10	1.5	Low Tide
	13:10	4.6	High Tide
	19:50	1.6	Low 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 total coliform were exceeded than the target value. 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 the monitoring points retention pond (SW-1) and retention canal (SW-5) exceeded the target value due to the expected reasons: 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 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)

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	29	27	26	≤ 35
2	pH	-	8.9	7.9	6.4	6.0~9.0
3	Suspended solid (SS)	mg/L	10	4	4	50
4	Dissolved oxygen (DO)	mg/L	9.15	7.76	10.04	-
5	BOD (5)	mg/L	5.36	3.76	2.56	30.00
6	COD (Cr)	mg/L	21	19.4	8.3	125.0
7	Total coliform	MPN/ 100ml	1,000	> 160,000	2	400
8	Total nitrogen (T-N)	mg/L	1.3	0.6	12.9	80.0
9	Total phosphorous (T-P)	mg/L	0.055	< 0.05	0.317	2
10	Color	TCU (True Color Unit)	24.82	28.89	7.00	150
11	Odor	TON (Threshold Odor Number)	1	1	1	-
12	Escherichia Coli	MPN/100ml	4.0	4.0	< 1.8	(1,000) * (CFU/100ml)
13	Flow Rate	m^3/s	-	-	0.009	-

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

As the comparison with the target value, the results of total coliform were exceeded than the target value. 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 for the result of total coliform of surface water, results at surface water monitoring points (SW-2 and SW-3) 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 was exceeded at monitoring point of SW-2 and SW-3, 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	22	24	25	28	≤ 35
2	pH	-	8.8	7.7	7.8	8.4	6.0~9.0
3	Suspended solid (SS)	mg/L	10	8	8	2	50
4	Dissolved oxygen (DO)	mg/L	10.93	9.95	3.86	9.57	-
5	BOD (5)	mg/L	9.48	2.32	2.43	0.68	30.00
6	COD (Cr)	mg/L	83	32.1	24.8	4.8	125.0
7	Total coliform	MPN/ 100ml	> 160,000	2,600	350	4.5	400
8	Total nitrogen (T-N)	mg/L	5.1	0.2	0.0	0.9	80.0
9	Total phosphorous (T-P)	mg/L	0.577	0.051	< 0.05	0.073	2
10	Color	TCU (True Color Unit)	88.40	43.35	42.46	2.41	150
11	Odor	TON (Threshold Odor Number)	8	1	1	1	-
12	Escherichia Coli	MPN/100 ml* (SW)	6.1	9.3	14.0		(1,000) * (CFU/100ml)
		MPN/100 ml** (GW)				< 1.8	(100) ** (MPN/100ml)
13	Flow Rate	m^3/s	0.013	-	-	-	-

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 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, results at the monitoring points retention pond (SW-1) and 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 retention canal (SW-5), results 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 total coliform in surface water were exceeded the target values at reference monitoring points. As mentioned in Section 2.5.2, the result of self-monitoring of E. coli at SW-2 and SW-3 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. The expected reasons for exceeding the target values of Total coliform are by natural origin (natural bacteria existed). 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 carry out the 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

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

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

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

FOR REFERENCE MONITORING POINTS FOR COMPARISON WITH DISCHARGING POINTS AND BASELINE OF DISCHARG ED 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

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1, ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel:01-2309051/ 09 796935149

Report No. : GEM-LAB-201805066
Revision No. : 1
Report Date : 10 May, 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 : -
Sample Description
Sample Name : MKI-SW-1-0425
Sample No. : W-1804140
Waste Profile No. : -
Sampling Date : 25 April, 2018
Sampling By : Customer
Sample Received Date : 25 April, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105'C Method)	mg/l	10.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	5.36	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	21	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.3	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.055	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	1000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	24.82	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	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 :
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Assistant supervisor

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GEM ECO-SYSTEM MYANMAR CO., LTD.
Lot No. E1, Thilawa SEZ Zone A, Yangon Region, the Union of Myanmar
Tel 01-230065, 09 796935119

Report No. : GEM-LAB-201805067
Revision No. : 1
Report Date : 10 May, 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 : -
Sample Description
Sample Name : MKI-SW-5-0425 Sampling Date : 25 April, 2018
Sample No. : W-1804141 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 25 April, 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	3.76	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	19.4	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	0.6	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	< 0.05	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	> 160000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	28.89	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	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

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Tel 01-2309051, 09 796635139

Report No. : GEM-LAB-201805068
Revision No. : 1
Report Date : 10 May, 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 : -
Sample Description
Sample Name : MKI-SW-6-0425 Sampling Date : 25 April, 2018
Sample No. : W-1804142 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 25 April, 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	2.56	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	8.3	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	12.9	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.317	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	2	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	7.00	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	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

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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, ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel 01-2309651, 09 796935119

Report No. : GEM-LAB-201805069
Revision No. : 1
Report Date : 10 May, 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 : -
Sample Description
Sample Name : MKI-SW-2-0425 Sampling Date : 25 April, 2018
Sample No. : W-1804143 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 25 April, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105'C Method)	mg/l	10.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	9.48	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	83	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	5.1	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.577	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	> 160000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	88.40	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	8	-
9	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	3.50	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

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Report No. : GEM-LAB-201805070
Revision No. : 1
Report Date : 10 May, 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 : -
Sample Description

Sample Name : MKI-SW-3-0425 — Sampling Date : 25 April, 2018
Sample No. : W-1804144 — Sampling By : Customer
Waste Profile No. : - — Sample Received Date : 25 April, 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	2.32	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	32.1	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	0.2	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.051	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	2600	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	43.35	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	-
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

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Tel 01-2309051 09 796935119

Report No. : GEM-LAB-201805071
Revision No. : 1
Report Date : 10 May, 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 : -
Sample Description
Sample Name : MKI-SW-4-0425 Sampling Date : 25 April, 2018
Sample No. : W-1804145 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 25 April, 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	2.43	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	24.8	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	0.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	< 0.05	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	350	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	42.46	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	-
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

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GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. E1 ,ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
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Report No. : GEM-LAB-201805072
Revision No. : 1
Report Date : 10 May, 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 : -
Sample Description
Sample Name : MKI-GW-1-0425
Sample No. : W-1804146
Waste Profile No. : -
Sampling Date : 25 April, 2018
Sampling By : Customer
Sample Received Date : 25 April, 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	0.68	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	4.8	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	0.9	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.073	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	4.5	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	2.41	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	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 :
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Approved By :
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Director

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED
MJTD

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

FOR DISCHARGING POINTS AND AFTER CENTRALIZED STP

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1 Thilawa SEZ Zone A, Yangon Region, the Union of Myanmar
Tel 01-2309051 09 796935149

Report No. : GEM-LAB-201804132
Revision No. : 1
Report Date : 30 April, 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-1-0425
Sample No. : W-1804149
Waste Profile No : -

Sampling Date : 25 April, 2018
Sampling By : Customer
Sample Received Date : 25 April, 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

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MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD

Report No. : GEM-LAB-201804133
Revision No. : 1
Report Date : 30 April, 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-S-0425 Sampling Date : 25 April, 2018
Sample No : W-1804150 Sampling By : Customer
Waste Profile No : - Sample Received Date : 25 April, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	4.9	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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Tomoya Suzuki
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DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1, ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel 01-2309051, 09-796035149

Report No. : GEM-LAB-201804134
Revision No. : 1
Report Date : 30 April, 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-6-0425 Sampling Date : 25 April, 2018
Sample No. : W-1804151 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 25 April, 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

LAB
GEM

Approved By :
Tomoya Suzuki
Director

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

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

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. C1 Thilawa SEZ Zone A, Yangon Region, the Union of Myanmar
Tel [illegible]

Report No. : GEM-LAB-201804135
Revision No. : 1
Report Date : 30 April, 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-2-0425 Sampling Date : 25 April, 2018
Sample No. : W-1804152 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 25 April, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	5.1	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
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Approved By :
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DOWA

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Report No. : GEM-LAB-201804136
Revision No. : 1
Report Date : 30 April, 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-3-0425
Sample No. : W-1804153
Waste Profile No. : -

Sampling Date : 25 April, 2018
Sampling By : Customer
Sample Received Date : 25 April, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	9.3	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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DOWA

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Report No : GEM-LAB-201804137
Revision No : 1
Report Date : 30 April, 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-4-0425
Sample No. : W-1804154
Waste Profile No : -
Sampling Date : 25 April, 2018
Sampling By : Customer
Sample Received Date : 25 April, 2018

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

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MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

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Report No. : GEM-LAB-201804138
Revision No. : 1
Report Date : 30 April, 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-1-0425 Sampling Date : 25 April, 2018
Sample No. : W-1804155 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 25 April, 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
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Approved By :
Tomoya Suzuki
Director

MJTD JAPAN THILAWA DEVELOPMENT LIMITED MYANMAR

Thilawa Special Economic Zone (Zone A)

Development Project (Operation Phase)

Appendix

Water and Waste Water Monitoring Report

June, 2018


MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED
MJTD

WATER QUALITY MONITORING REPORT

FOR DEVELOPMENT OF INDUSTRIAL AREA

IN THILAWA SEZ ZONE A

(OPERATION STAGE)

(Bi-Annually Monitoring)

June 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 five locations (SW-1, SW-2, 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	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	-	O	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 and water flow rate measurement.
2	SW-2	**Coordinate**- N-16° 40' 20.70", E- 96° 17' 18.70"
		Location - Upstream of Shwe Pyauk Creek
		Survey Item – Surface water sampling and water flow rate measurement.
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' 41.00", E- 96° 16' 26.50"
		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' 26.8", E- 96° 16' 30.7"
		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 and paddy field in the west 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 and paddy field in the south and west 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 800 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 and paddy field in the south and west 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	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	Phenol	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)
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))
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 11st June 2018 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon river, Myanmar on 11st June 2018 is shown in Table 2.4-2.

Table 2.4-1 Sampling Time of Each Station

No.	Station	Sampling Time
1	SW-1	11/06/2018 14:37
2	SW-2	11/06/2018 10:02
3	SW-3	11/06/2018 08:48
4	SW-4	11/06/2018 11:46
5	SW-5	11/06/2018 15:06
6	SW-6	11/06/2018 14:14
7	GW-1	11/06/2018 16:15

Source: Myanmar Koei International Ltd.

Table 2.4-2 Tide Record for Yangon River, Myanmar

Date	Time	Height	Tide Conditions
11/06/2018	02:10	4.8	High Tide
	08:50	1.1	Low Tide
	14:30	5.4	High Tide
	21:30	0.7	Low 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 value.

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 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 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.

In the first place, the monitoring points of retention pond (SW-1) should be changed to a little upstream where are possible to avoid flow back by tidal fluctuation in order to evaluate the impact on water quality from the industrial area of Zone A to public water body.

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	28	29	30	≤35
2	pH	-	7.9	9.0	7.3	6.0~9.0
3	Suspended solid (SS)	mg/L	222	360	4	50
4	Dissolved oxygen (DO)	mg/L	6.88	6.15	10.19	-
5	BOD (5)	mg/L	3.21	3.79	2.93	30
6	COD (Cr)	mg/L	< 0.7	< 0.7	3.3	125
7	Total coliform	MPN/ 100ml	54,000	92,000	49	400
8	Total nitrogen (T-N)	mg/L	1.7	1.6	5.8	80
9	Total phosphorous (T-P)	mg/L	< 0.050	0.119	0.084	2
10	Color	TCU (True Color Unit)	6.22	9.34	3.24	150
11	Odor	TON (Threshold Odor Number)	1	1	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	0.008	≤ 0.002	≤ 0.002	2
15	Arsenic	mg/L	≤ 0.01	≤ 0.01	≤ 0.01	0.1
16	Chromium	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	0.5
17	Cadmium	mg/L	≤ 0.001	≤ 0.001	≤ 0.001	0.03
18	Selenium	mg/L	≤ 0.01	≤ 0.01	≤ 0.01	0.02
19	Lead	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	0.1
20	Copper	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	0.5
21	Barium	mg/L	0.040	0.042	0.006	1
22	Nickel	mg/L	0.02	≤ 0.002	≤ 0.002	0.2
23	Cyanide	mg/L	< 0.002	< 0.002	0.002	0.1
24	Free Chlorine	mg/L	0.1	< 0.1	0.1	1
25	Sulphide	mg/L	0.046	0.059	0.008	1
26	Formaldehyde	mg/L	0.316	0.130	0.023	1
27	Phenol	mg/L	< 0.002	0.03	0.006	0.5
28	Iron	mg/L	0.50	0.52	0.60	3.50
29	Total Dissolved Solids	mg/L	98	112	174	2000
30	Total Residual Chlorine	mg/L	0.1	< 0.1	0.2	0.2
31	Chromium(Hexavalent)	mg/L	< 0.05	< 0.05	< 0.05	0.1
32	Ammonia	mg/L	0.082	0.236	< 0.020	10
33	Fluoride	mg/L	0.240	0.152	2.980	20
34	Silver	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	0.5
35	Escherichia Coli	MPN/100ml (SW)	1.8	< 1.8	< 1.8	(1000)* (CFU/100ml)
36	Flow Rate	m^3/s	0.91	0.47	0.03	-

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.
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 survey 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 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 the other surface water monitoring points (SW-2, SW-3, 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, 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.

As for the result of total coliform in ground water, result at GW-1 (ground water in Moegyoe Swan monastery) exceeded the target value. However, the result of E.Coli at GW-1 was under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of GW-1, but it is considered that there is no significant impact on human health.

Table 2.5-2 Result of Water Quality Survey 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	28	27	29	34	≤ 35
2	pH	-	8.0	7.2	7.6	8.3	6.0~9.0
3	Suspended solid (SS)	mg/L	98	206	370	8	50
4	Dissolved oxygen (DO)	mg/L	4.92	5.67	8.38	5.88	-
5	BOD (5)	mg/L	4.54	3.57	3.33	3.35	30
6	COD (Cr)	mg/L	15.7	8.5	3.1	6.9	125
7	Total coliform	MPN/ 100ml	92,000	35,000	92,000	2,500	400
8	Total nitrogen (T-N)	mg/L	1.5	1.3	4.9	1.3	80
9	Total phosphorous (T-P)	mg/L	0.073	0.060	0.120	0.052	2
10	Color	TCU (True Color Unit)	47.80	24.30	12.63	1.26	150
11	Odor	TON (Threshold Odor Number)	1	1	1	1	-
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	0.026	0.018	≤ 0.002	2
15	Arsenic	mg/L	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01	0.1
16	Chromium	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	≤ 0.002	0.5
17	Cadmium	mg/L	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001	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	0.050	0.048	0.044	0.070	1
22	Nickel	mg/L	0.012	0.05	0.036	≤ 0.002	0.2
23	Cyanide	mg/L	< 0.002	< 0.002	0.003	< 0.002	0.1
24	Free Chlorine	mg/L	< 0.1	< 0.1	0.1	< 0.1	1
25	Sulphide	mg/L	0.076	0.050	0.077	0.008	1
26	Formaldehyde	mg/L	0.116	0.180	0.540	0.010	1
27	Phenol	mg/L	0.017	0.006	0.008	< 0.002	0.5
28	Iron	mg/L	1.6	1.54	1.38	1.76	3.50
29	Total Dissolved Solids	mg/L	106	72	58	1658	2000
30	Total Residual Chlorine	mg/L	0.2	0.2	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	0.310	0.120	0.132	2.050	10
33	Fluoride	mg/L	0.111	0.149	0.134	≤ 0.014	20
34	Silver	mg/L	≤ 0.002	≤ 0.002	≤ 0.002	≤ 0.002	0.5
35	Escherichia Coli	MPN/100ml* (SW)	3.6	1.8	< 1.8		(1000)* CFU/100ml
		MPN/100ml** (GW)				< 1.8	(100)** (MPN/100ml)
36	Flow Rate	m^3/s	6.05	-	5.76	-	-

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 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 STP. On the other hand, parameters of SS and total coliform at retention pond (SW-1) and retention canal (SW-5) were exceeded the target values in this period for main discharging gates of Thilawa SEZ Zone A. However, as mentioned in Section 2.5.1, in the first place, the monitoring point of retention pond (SW-1) should be changed to a little upstream where are possible to avoid flow back by tidal fluctuation in order to evaluate the impact on water quality of SS and total coliform from the industrial area of Zone A to public water body. In addition, according to the result of self-monitoring of E. Coli at retention pond (SW-1) and retention canal (SW-5), results 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. As for the parameter of total coliform in ground water was exceeded the target value at reference tube well in monastery. 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. The expected reasons for exceeding the target values of total coliform 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. 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.

End of the Document

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

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

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

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

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

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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Report No. : GEM-LAB-201806198
Revision No. : 1
Report Date : 26 June, 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-1-0611
Sample No. : W-1806095
Waste Profile No. : -

Sampling Date : 11 June, 2018
Sampling By : Customer
Sample Received Date : 11 June, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	222.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.21	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	< 0.7	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.7	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	< 0.05	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	54000	1.8
7	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	6.22	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0
10	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
11	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.008	0.002
12	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
13	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
14	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.001	0.001
15	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
16	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
17	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.040	0.001
19	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.02	0.002
20	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
21	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.5	0.001
22	Cyanide	HACH 8027 (Pyridine -Pyrazalone Method	mg/l	< 0.002	0.002
23	Ammonia	HACH Method 10205 (Salicylate TNT Plus Method)	mg/l	0.082	0.020
24	Hexavalent Chromium (Cr6+)	ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5 diphenylcarbazide)	mg/l	< 0.05	0.05
25	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	0.240	0.014
26	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
27	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
28	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.046	0.005
29	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.316	0.003
30	TDS	APHA 2540C (Total Dissolved Solids Dried at 180°C)	mg/l	98.00	-
31	Phenol	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation))	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

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Report No. : GEM-LAB-201806199
Revision No. : 1
Report Date : 26 June, 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-S-0611 — Sampling Date : 11 June, 2018
Sample No. : W-1806096 — Sampling By : Customer
Waste Profile No. : - — Sample Received Date : 11 June, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105'C Method)	mg/l	360.00	-
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	< 0.7	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.6	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.119	0.05
6	Total Coliform	APHA 92218 (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
7	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	9.34	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0
10	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
11	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
13	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
14	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.001	0.001
15	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
16	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
17	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Banum	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.042	0.001
19	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
20	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
21	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.52	0.001
22	Cyanide	HACH 8027 (Pyridine -Pyrazalone Method	mg/l	< 0.002	0.002
23	Ammonia	HACH Method 10205 (Salicylate TNT Plus Method)	mg/l	0.236	0.020
24	Hexavalent Chromium (Cr6+)	ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide)	mg/l	< 0.05	0.05
25	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	0.152	0.014
26	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
27	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
28	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.059	0.005
29	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.130	0.003
30	TDS	APHA 2540C (Total Dissolved Solids Dried at 180'C)	mg/l	112.00	-
31	Phenol	USEPA Method 420.1 (Phenolics [Spectrophotometric, Manual 4AAP With Distillation])	mg/l	0.03	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

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Report No. : GEM-LAB-201806200
Revision No. : 1
Report Date : 26 June, 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-6-0611
Sample No. : W-1806097
Waste Profile No. : -

Sampling Date : 11 June, 2018
Sampling By : Customer
Sample Received Date : 11 June, 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	2.93	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	3.3	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	5.8	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.084	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	49	1.8
7	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	3.24	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0
10	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
11	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
13	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
14	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.001	0.001
15	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
16	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
17	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.006	0.001
19	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
20	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
21	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.6	0.001
22	Cyanide	HACH 8027 (Pyridine -Pyrazalone Method	mg/l	0.002	0.002
23	Ammonia	HACH Method 10205 (Salicylate TNT Plus Method)	mg/l	< 0.020	0.020
24	Hexavalent Chromium (Cr6+)	ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide)	mg/l	< 0.05	0.05
25	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	2.980	0.014
26	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.2	0.1
27	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
28	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.008	0.005
29	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.023	0.003
30	TDS	APHA 2540C (Total Dissolved Solids Dried at 180°C)	mg/l	174.00	-
31	Phenol	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation))	mg/l	0.006	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

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

DOWA

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Report No. : GEM-LAB-201806201
Revision No. : 1
Report Date : 26 June, 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-2-0611
Sample No. : W-1806098
Waste Profile No. : -

Sampling Date : 11 June, 2018
Sampling By : Customer
Sample Received Date : 11 June, 2018

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	4.54	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	15.7	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.5	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.073	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
7	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	47.80	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0
10	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
11	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
13	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
14	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.001	0.001
15	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
16	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
17	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.050	0.001
19	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.012	0.002
20	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
21	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	1.6	0.001
22	Cyanide	HACH 8027 (Pyridine -Pyrazalone Method	mg/l	< 0.002	0.002
23	Ammonia	HACH Method 10205 (Salicylate TNT Plus Method)	mg/l	0.31	0.020
24	Hexavalent Chromium (Cr6+)	ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide)	mg/l	< 0.05	0.05
25	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	0.111	0.014
26	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.2	0.1
27	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
28	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.076	0.005
29	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.116	0.003
30	TDS	APHA 2540C (Total Dissolved Solids Dried at 180°C)	mg/l	106.00	-
31	Phenol	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation))	mg/l	0.017	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

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MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED
MJTD

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. C1, ThilawaSEZ Zone A, Yangon Region, The Union of Myanmar
Tel: 01-2309051, 09 796955149

Report No. : GEM-LAB-201806202
Revision No. : 1
Report Date : 26 June, 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-3-0611
Sample No. : W-1806099
Waste Profile No. : -

Sampling Date : 11 June, 2018
Sampling By : Customer
Sample Received Date : 11 June, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	205.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.57	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	8.5	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.3	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.06	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	35000	1.8
7	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	24.30	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0
10	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
11	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.026	0.002
12	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
13	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
14	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.001	0.001
15	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
16	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
17	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.048	0.001
19	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.05	0.002
20	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
21	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	1.54	0.001
22	Cyanide	HACH 8027 (Pyridine -Pyrazalone Method	mg/l	< 0.002	0.002
23	Ammonia	HACH Method 10205 (Salicylate TNT Plus Method)	mg/l	0.12	0.020
24	Hexavalent Chromium (Cr6+)	ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5 diphenylcarbazide)	mg/l	< 0.05	0.05
25	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	0.149	0.014
26	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.2	0.1
27	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
28	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.050	0.005
29	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.180	0.003
30	TDS	APHA 2540C (Total Dissolved Solids Dried at 180°C)	mg/l	72.00	-
31	Phenol	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation))	mg/l	0.006	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

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MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED
MJTD

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD

Report No. : GEM-LAB-201806203
Revision No. : 1
Report Date : 26 June, 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-4-0611
Sample No. : W-1806100
Waste Profile No. : -

Sampling Date : 11 June, 2018
Sampling By : Customer
Sample Received Date : 11 June, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	370.00	
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.33	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	3.1	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	4.9	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.12	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
7	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	12.63	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0
10	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
11	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.018	0.002
12	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
13	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
14	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.001	0.001
15	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
16	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
17	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.044	0.001
19	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.036	0.002
20	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
21	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	1.38	0.001
22	Cyanide	HACH 8027 (Pyridine -Pyrazalone Method	mg/l	0.003	0.002
23	Ammonia	HACH Method 10205 (Silicylate TNT Plus Method)	mg/l	0.132	0.020
24	Hexavalent Chromium (Cr6+)	ISO 11083 1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide)	mg/l	< 0.05	0.05
25	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	0.134	0.014
26	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
27	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
28	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.077	0.005
29	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.540	0.003
30	TDS	APHA 2540C (Total Dissolved Solids Dried at 180°C)	mg/l	58.00	-
31	Phenol	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation))	mg/l	0.008	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

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DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1, Thilawa SEZ Zone A, Yangon Region, the Union of Myanmar
Tel 01-2309051/ 09 799035139

Report No. : GEM-LAB-201806207
Revision No. : 1
Report Date : 26 June, 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-1-0611
Sample No. : W-1806104
Waste Profile No. : -

Sampling Date : 11 June, 2018
Sampling By : Customer
Sample Received Date : 11 June, 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	3.35	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	6.9	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.3	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.052	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	2500	1.8
7	Oil and Grease	APHA 5520B (Partition-Gravimetric Method)	mg/l	< 3.1	3.1
8	Color	APHA 2120C (Spectrophotometric Method)	TCU	1.26	0.00
9	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	0
10	Mercury	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
11	Zinc	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
12	Arsenic	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
13	Chromium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
14	Cadmium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.001	0.001
15	Selenium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.01	0.01
16	Lead	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
17	Copper	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
18	Barium	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	0.070	0.001
19	Nickel	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
20	Silver	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	≤ 0.002	0.002
21	Iron	APHA 3120 B (Inductively Coupled Plasma (ICP) Method)	mg/l	1.76	0.001
22	Cyanide	HACH 8027 (Pyridine -Pyrazalone Method	mg/l	< 0.002	0.002
23	Ammonia	HACH Method 10205 (Silicylate TNT Plus Method)	mg/l	2.05	0.020
24	Hexavalent Chromium (Cr6+)	ISO 11083:1994 (Determination of chromium(VI) Spectrometric method using 1,5-diphenylcarbazide)	mg/l	< 0.05	0.05
25	Fluoride	APHA 4110 B (Ion Chromatography with Chemical Suppression of Eluent Conductivity)	mg/l	≤ 0.014	0.014
26	Total Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	0.1	0.1
27	Free Chlorine	APHA 4500 CL G (DPD Colorimetric Method)	mg/l	< 0.1	0.1
28	Sulphide	HACH 8131 (USEPA Methylene Blue Method)	mg/l	0.008	0.005
29	Formaldehyde	HACH 8110 (MBTH Method)	mg/l	0.010	0.003
30	TDS	APHA 2540C (Total Dissolved Solids Dried at 180'C)	mg/l	1658.00	-
31	Phenol	USEPA Method 420.1 (Phenolics (Spectrophotometric, Manual 4AAP With Distillation))	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

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Kei Nagata
Senior Manager

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

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

FOR DISCHARGING POINTS AND AFTER CENTRALIZED STP

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1 ,ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel.01-2309651/ 09 796935149

Report No. : GEM-LAB-201806187
Revision No. : 1
Report Date : 25 June, 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-1-0611 — Sampling Date : 11 June, 2018
Sample No. : W-1806084 — Sampling By : Customer
Waste Profile No. : - — Sample Received Date : 11 June, 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

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Tel 01-2309051/ 09 796935149

Report No. : GEM-LAB-201806188
Revision No. : 1
Report Date : 25 June, 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-5-0611 — Sampling Date : 11 June, 2018
Sample No. : W-1806085 — Sampling By : Customer
Waste Profile No. : - — Sample Received Date : 11 June, 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

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GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
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Tel.01-2309051/ 09 796935149

Report No. : GEM-LAB-201806189
Revision No. : 1
Report Date : 25 June, 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-6-0611 Sampling Date : 11 June, 2018
Sample No. : W-1806086 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 11 June, 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

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MJTD

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, ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel:01-2309051/ 09 796935149

Report No. : GEM-LAB-201806190
Revision No. : 1
Report Date : 25 June, 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-2-0611 — Sampling Date : 11 June, 2018
Sample No. : W-1806087 — Sampling By : Customer
Waste Profile No. : - — Sample Received Date : 11 June, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	3.6	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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DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1, ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel 01-2309051 / 09 796935149

Report No. : GEM-LAB-201806191
Revision No. : 1
Report Date : 25 June, 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-3-0611 — Sampling Date : 11 June, 2018
Sample No. : W-1806088 — Sampling By : Customer
Waste Profile No. : - — Sample Received Date : 11 June, 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

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GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. E1 ,ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel 01-2309051/ 09 796935149

Report No. : GEM-LAB-201806192
Revision No. : 1
Report Date : 25 June, 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-4-0611 — Sampling Date : 11 June, 2018
Sample No. : W-1806089 — Sampling By : Customer
Waste Profile No. : - — Sample Received Date : 11 June, 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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DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1 ,ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel:01-2309051/ 09 796935149

Report No. : GEM-LAB-201806196
Revision No. : 1
Report Date : 25 June, 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-1-0611
Sample No. : W-1806093
Waste Profile No. : -

Sampling Date : 11 June, 2018
Sampling By : Customer
Sample Received Date : 11 June, 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

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MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED
MJTD

Thilawa Special Economic Zone (Zone A)

Development Project (Operation Phase)

Appendix

Water and Waste Water Monitoring Report

August, 2018

WATER QUALITY MONITORING REPORT

FOR DEVELOPMENT OF INDUSTRIAL AREA

IN THILAWA SEZ ZONE A

(OPERATION STAGE)

(Bi-Monthly Monitoring)

August 2018

Myanmar Koei International Ltd.

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

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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 five locations (SW-1, SW-2, 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	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	Escherichia Coli (Self-monitoring)	O	O	O	O	O	O	O	Laboratory analysis
13	Flow Rate	O	O	-	O	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 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 and water flow rate measurement.
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 21st August 2018 and sampling time is shown in Table 2.4-1 to avoid tidal effect. The tide record for Yangon River, Myanmar on 21st 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	21/08/2018 14:38
2	SW-2	21/08/2018 09:13
3	SW-3	21/08/2018 16:26
4	SW-4	21/08/2018 09:53
5	SW-5	21/08/2018 14:14
6	SW-6	21/08/2018 15:12
7	GW-1	21/08/2018 12:49

Source: Myanmar Koei International Ltd.

Table 2.4-2 Tide Record for Yangon River, Myanmar

Date	Time	Height	Tide Conditions
21/08/2018	00:22	4.65	High Tide
	07:12	2.46	Low Tide
	12:54	4.95	High Tide
	20:23	1.97	Low 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 value.

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 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 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	30	30	31	≤ 35
2	pH	-	7.2	8.6	6.7	6.0~9.0
3	Suspended solid (SS)	mg/L	116.00	208.00	2.00	50
4	Dissolved oxygen (DO)	mg/L	6.79	8.80	7.30	-
5	BOD (5)	mg/L	2.71	1.44	1.25	30
6	COD (Cr)	mg/L	4.1	< 0.7	2.8	125
7	Total coliform	MPN/ 100ml	24,000	> 160,000	< 1.8	400
8	Total nitrogen (T-N)	mg/L	0.0	0.4	4.0	80
9	Total phosphorous (T-P)	mg/L	0.62	0.07	0.1	2
10	Color	TCU (True Color Unit)	6.73	1.45	1.26	150
11	Odor	TON (Threshold Odor Number)	2	1.4	4	-
12	Escherichia Coli	MPN/100ml	1.8	15.0	< 1.8	(1,000)* (CFU/100ml)
13	Flow Rate	m^3/s	0.58	0.51	0.03	-

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-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 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.

As for the result of total coliform in ground water, result at GW-1 (ground water in Moegyoe Swan monastery) 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. However, the result of E.Coli at GW-1 was under the reference value. Therefore, although the target value of total coliform was exceeded at monitoring point of GW-1, 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	29	29	30	35	≤ 35
2	pH	-	6.9	6.7	6.6	8.1	6.0~9.0
3	Suspended solid (SS)	mg/L	30.00	50.00	98.00	2.00	50
4	Dissolved oxygen (DO)	mg/L	6.15	7.46	9.17	8.18	-
5	BOD (5)	mg/L	3.32	3.33	3.01	1.16	30
6	COD (Cr)	mg/L	10.6	9.8	8.7	2.6	125
7	Total coliform	MPN/ 100ml	92,000	92,000	35,000	1,700	400
8	Total nitrogen (T-N)	mg/L	1.1	2.5	0.0	1.5	80
9	Total phosphorous (T-P)	mg/L	0.13	0.13	0.15	0.06	2
10	Color	TCU (True Color Unit)	5.03	3.02	2.42	0.00	150
11	Odor	TON (Threshold Odor Number)	1	1.4	1.0	1	-
12	Escherichia Coli	MPN/100 ml* (SW)	14.0	26.0	21.0	-	(1,000) * (CFU/100ml)
		MPN/100 ml** (GW)	-	-	-	< 1.8	(100) ** (MPN/100ml)
13	Flow Rate	m^3/s	1.67	-	2.95	-	-

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 STP. On the other hand, parameters of SS and total coliform at retention pond (SW-1) and retention canal (SW-5) were exceeded the target values in this period for main discharging gates of Thilawa SEZ Zone A. In addition, according to the result of self-monitoring of E. Coli at retention pond (SW-1) and retention canal (SW-5), results 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. As for the parameter of total coliform in ground water was exceeded the target value at reference tube well in monastery. 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. The expected reasons for exceeding the target values of total coliform 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. 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.

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 DISCHARG ED 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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Tel:01-2309051/ 09 796935149

Report No. : GEM-LAB-201809053
Revision No. : 1
Report Date : 5 September, 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-1-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808205 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105°C Method)	mg/l	116.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	2.71	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	4.1	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	0.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.62	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	24000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	6.73	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

LAB GEM

Analysed By :
Ni Ni Aye Lwin
Assistant supervisor

Approved By :
Tomoya Suzuki
Director

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

DOWA

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Report No. : GEM-LAB-201809054
Revision No. : 1
Report Date : 5 September, 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-5-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808206 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105'C Method)	mg/l	208.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	1.44	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	< 0.7	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	0.4	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	> 160000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	1.45	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

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Report No. : GEM-LAB-201809055
Revision No. : 1
Report Date : 5 September, 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-6-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808207 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 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	1.25	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	2.8	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	0.1	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	1.26	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	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

LAB GEM

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Approved By :
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MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

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

DOWA

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Report No. : GEM-LAB-201809056
Revision No. : 1
Report Date : 5 September, 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-2-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808208 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105'C Method)	mg/l	30.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.32	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	10.6	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.1	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.13	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	5.03	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1	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

LAB GEM

Analysed By :
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Assistant supervisor

Approved By :
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Director

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. E1 ,ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel:01-2309051/ 09 796935149

Report No. : GEM-LAB-201809057
Revision No. : 1
Report Date : 5 September, 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-3-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808209 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	SS	APHA 2540D (Dry at 103-105'C Method)	mg/l	50.00	-
2	BOD (5)	APHA 5210 B (5 Days BOD Test)	mg/l	3.33	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	9.8	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	2.5	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.13	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	92000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	3.02	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	0.006	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

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Lot No. E1 ,ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel:01-2309051/ 09 796935149

Report No. : GEM-LAB-201809058
Revision No. : 1
Report Date : 5 September, 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-4-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808210 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 2018

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	3.01	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	8.7	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	0.0	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.15	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	35000	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	2.42	0.00
8	Odor	APHA 2150 B (Threshold Odor Test)	TON	1.0	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	0.012	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

LAB GEM

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Director

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GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. E1 ,ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel:01-2309051/ 09 796935149

Report No. : GEM-LAB-201809062
Revision No. : 1
Report Date : 5 September, 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-1-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808214 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 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	1.16	0.00
3	COD (Cr)	APHA 5220D (Close Reflux Colorimetric Method)	mg/l	2.6	0.7
4	Total Nitrogen	HACH Method 10072 (TNT Persulfate Digestion Method)	mg/l	1.5	0.0
5	Total Phosphorous	APHA 4500-P E (Ascorbic Acid Method)	mg/l	0.06	0.05
6	Total Coliform	APHA 9221B (Standard Total Coliform Fermentation Technique)	MPN/100ml	1700	1.8
7	Color	APHA 2120C (Spectrophotometric Method)	TCU	0.00	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

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

FOR DISCHARGING POINTS AND AFTER CENTRALIZED STP

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1, Thilawa SEZ Zone A, Yangon Region, the Union of Myanmar
Tel 01-7309051, 09 796935149

Report No. : GEM-LAB-201808245
Revision No. : 1
Report Date : 30 August, 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-1-0821 — Sampling Date : 21 August, 2018
Sample No. : W-1808194 — Sampling By : Customer
Waste Profile No. : - — Sample Received Date : 21 August, 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

LAB
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MJTD

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. C1, ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel.01-2209031/ 09 796935149

Report No. : GEM-LAB-201808246
Revision No. : 1
Report Date : 30 August, 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-5-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808195 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	15.0	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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DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1, ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel:01-2309051/ 09 796935149

Report No. : GEM-LAB-201808247
Revision No. : 1
Report Date : 30 August, 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-6-0821 — Sampling Date : 21 August, 2018
Sample No. : W-1808196 — Sampling By : Customer
Waste Profile No. : - — Sample Received Date : 21 August, 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

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

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.
Lot No. I1 , ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel.01-2309051/ 09 796935139

Report No. : GEM-LAB-201808248
Revision No. : 1
Report Date : 30 August, 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-2-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808197 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 2018

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

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GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1 ,ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel 01-2309051/ 09 796935149

Report No. : GEM-LAB-201808249
Revision No. : 1
Report Date : 30 August, 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-3-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808198 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 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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Tel:01-2309051; 09 796935149

Report No. : GEM-LAB-201808250
Revision No. : 1
Report Date : 30 August, 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-4-0821 — Sampling Date : 21 August, 2018
Sample No. : W-1808199 — Sampling By : Customer
Waste Profile No. : - — Sample Received Date : 21 August, 2018

No.	Parameter	Method	Unit	Result	LOQ
1	Escherichia Coli	APHA 9221 F Escherichia Coli Procedure Using Fluorogenic Substrate	MPN/100ml	21.0	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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MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED
MJTD

DOWA

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD
Lot No. E1, ThilawaSEZ Zone A, Yangon Region, the Union of Myanmar
Tel.01-2309051, 09 796935149

Report No. : GEM-LAB-201808254
Revision No. : 1
Report Date : 30 August, 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-1-0821 Sampling Date : 21 August, 2018
Sample No. : W-1808203 Sampling By : Customer
Waste Profile No. : - Sample Received Date : 21 August, 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

LAB GEM

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MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD


MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED
MJTD

Thilawa Special Economic Zone (Zone A)

Development Project (Operation Phase)

Appendix

Air Quality Monitoring Report

August, 2018


MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED
MJTD

AIR QUALITY MONITORING

REPORT

FOR DEVELOPMENT OF INDUSTRIAL AREA

THILAWA SEZ ZONE A

(OPERATION STAGE)

(BI-ANNUALLY MONITORING)

August 2018

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 condition under the operation of industrial area in and around Thilawa SEZ Zone A, Air quality had been monitored from 14th August 2018 – 21st August 2018 as follows;

Table 1.2-1 Outlines of Air Quality Monitoring Plan

Monitoring Date	Monitoring Item	Parameters	Number of Point	Duration	Monitoring Methodology
From 14th Aug–21st Aug, 2018	Air Quality	CO, NO_2, TSP, PM_{10}, and SO_2	1	7 Days *1	On site measurement by Haz-Scanner Environmental Perimeter Air Station (EPAS)

Note *1: Planned to monitor seven consecutive days but due to recording failure, six consecutive days were recorded.

CHAPTER 2: AIR QUALITY MONITORING

2.1 Monitoring Item

The parameters for air quality monitoring were CO, NO_2, TSP, PM_{10}, and SO_2.

2.2 Monitoring Location

The air quality measurement equipment, "Haz-Scanner Environmental Perimeter Air Station (EPAS) was set up inside the centralized Sewage Treatment Plant (STP) compound which is southeast of the Thilawa SEZ Zone A, N: 16°40'28.38", E: 96°16'34.71", surrounded by the factories of Thilawa SEZ Zone A, north of Dagon Thilawa road and northeast of Moegyoe Swan monastery respectively. Possible emission sources are dust emissions from construction activities and exhaust gas emissions from surrounded factories. The location of air quality monitoring is shown in the Figure 2.2-1.

Figure 2.2-1 Location of Air Quality Monitoring Point

2.3 Monitoring Period

Originally, seven-consecutive day measurement was planned and conducted. However, due to data recording failure for the seventh day measurement, data up to six consecutive days are utilized and presented hereunder. Furthermore, these six consecutive days covered in weekday and weekend.
Thus, Air quality monitoring was conducted six consecutive days from 14th August – 20th August, 2018.

2.4 Monitoring Method

Monitoring of CO, NO_2, TSP, PM_{10}, and SO_2 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 one minute and directly read and recorded onsite for CO, NO_2, TSP, PM_{10}, and SO_2. Due to the limitation of the analytical equipment in Myanmar, TSP results was calculated as predicted value which is based on the results of PM_{10}. 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, NO_2, TSP, PM_{10}, and SO_2 are described in Table 2.5-1. Comparing with the target value of CO, NO_2, TSP, PM_{10}, and SO_2 prescribed in EIA report for Thilawa SEZ development project Zone A, all results are under the target value.
Regarding the calculation of predicted TSP concentration, the correlation value between PM_{10} and TSP of ambient air quality guideline value in Thailand as below;

330 µg/m³ (TSP standard value in Thailand) / 120 µg/m³ (PM_{10} 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	ppm	mg/m^3	mg/m^3	ppm
14 ~15 August, 2018	0.038 (0.043 mg/m^3)	0.045 (0.084 mg/m^3)	0.038	0.014	0.015 (0.038 mg/m^3)
15 ~16 August, 2018	0.013 (0.015 mg/m^3)	0.043 (0.081 mg/m^3)	0.032	0.012	0.026 (0.067 mg/m^3)
16 ~17 August, 2018	0.001 (0.001 mg/m^3)	0.040 (0.075 mg/m^3)	0.028	0.010	0.026 (0.068 mg/m^3)
17 ~18 August, 2018	0.022 (0.026 mg/m^3)	0.040 (0.076 mg/m^3)	0.027	0.010	0.027 (0.071 mg/m^3)
18 ~19 August, 2018	0.003 (0.003 mg/m^3)	0.040 (0.076 mg/m^3)	0.024	0.009	0.020 (0.051 mg/m^3)
19 ~20 August, 2018	0.026 (0.03 mg/m^3)	0.041 (0.076 mg/m^3)	0.041	0.015	0.038 (0.10 mg/m^3)
6 Days Average Value	0.017 (0.02 mg/m^3)	0.041 (0.078 mg/m^3)	0.032	0.011	0.025 (0.066 mg/m^3)
Target Value	10.000 (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, NO_2 and SO_2 were converted to ppm units from mg/m^3.

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

APPENDIX - HOURLY AIR RESULT

CHAPTER 3: CONCLUSION AND ISSUES TO BE SOLVED

The result of air quality for CO, NO_2, TSP, PM_{10}, and SO_2 in each day were lower than the target value. (Referred to section 2.5).

In conclusion of this environmental monitoring, there are no specific air quality impacts to the surrounding area of industrial area of Thilawa SEZ Zone A during this monitoring period.

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

Date	Time	CO	NO2	TSP	PM10	SO2	Wind Speed	Wind Direction	
		ppm	ppm	mg/m³	mg/m³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
14 Aug, 2018	10:00 ~ 10:59	0.005	0.066	0.334	0.121	0.002	2.60	172.00	S
14 Aug, 2018	11:00 ~ 11:59	0.047	0.036	0.006	0.002	0.023	2.32	164.83	SSE
14 Aug, 2018	12:00 ~ 12:59	0.031	0.042	0.011	0.004	0.039	2.85	163.17	SSE
14 Aug, 2018	13:00 ~ 13:59	0.041	0.032	0.032	0.012	0.004	3.17	158.17	SSE
14 Aug, 2018	14:00 ~ 14:59	0.059	0.035	0.037	0.014	0.023	3.42	156.83	SSE
14 Aug, 2018	15:00 ~ 15:59	0.021	0.041	0.014	0.005	0.010	3.00	157.50	SSE
14 Aug, 2018	16:00 ~ 16:59	0.056	0.032	0.058	0.021	0.013	2.27	171.00	S
14 Aug, 2018	17:00 ~ 17:59	0.032	0.041	0.033	0.012	0.009	2.00	168.33	SSE
14 Aug, 2018	18:00 ~ 18:59	0.036	0.040	0.011	0.004	0.006	2.12	168.33	SSE
14 Aug, 2018	19:00 ~ 19:59	0.034	0.042	0.025	0.009	0.011	1.75	174.83	S
14 Aug, 2018	20:00 ~ 20:59	0.020	0.044	0.022	0.008	0.010	1.10	190.83	S
14 Aug, 2018	21:00 ~ 21:59	0.031	0.046	0.004	0.002	0.012	2.08	157.40	SSE
14 Aug, 2018	22:00 ~ 22:59	0.031	0.046	0.012	0.004	0.012	2.00	155.50	SSE
14 Aug, 2018	23:00 ~ 23:59	0.038	0.047	0.020	0.007	0.014	2.28	155.00	SSE
15 Aug, 2018	0:00 ~ 0:59	0.033	0.049	0.039	0.014	0.014	2.58	154.67	SSE
15 Aug, 2018	1:00 ~ 1:59	0.034	0.045	0.040	0.014	0.022	2.72	154.67	SSE
15 Aug, 2018	2:00 ~ 2:59	0.042	0.042	0.006	0.002	0.020	2.38	154.67	SSE
15 Aug, 2018	3:00 ~ 3:59	0.024	0.050	0.018	0.006	0.011	1.80	164.50	SSE
15 Aug, 2018	4:00 ~ 4:59	0.049	0.051	0.013	0.005	0.015	1.28	170.33	S
15 Aug, 2018	5:00 ~ 5:59	0.065	0.049	0.047	0.017	0.023	1.43	165.67	SSE
15 Aug, 2018	6:00 ~ 6:59	0.031	0.047	0.053	0.019	0.011	1.43	155.17	SSE
15 Aug, 2018	7:00 ~ 7:59	0.042	0.044	0.056	0.020	0.022	1.93	174.67	S
15 Aug, 2018	8:00 ~ 8:59	0.059	0.048	0.011	0.004	0.009	1.03	215.33	SW
15 Aug, 2018	9:00 ~ 9:59	0.046	0.057	0.003	0.001	0.018	1.48	158.17	SSE

Max	0.065 (0.074 mg/m³)	0.066 (0.124 mg/m³)	0.334	0.121	0.039 (0.103 mg/m³)
Avg	0.038 (0.043 mg/m³)	0.045 (0.084 mg/m³)	0.038	0.014	0.015 (0.038 mg/m³)
Min	0.005 (0.006 mg/m³)	0.032 (0.060 mg/m³)	0.003	0.001	0.002 (0.005 mg/m³)

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

Date	Time	CO	NO_2	TSP	PM_{10}	SO_2	Wind Speed	Wind Direction	
		ppm	ppm	mg/m³	mg/m³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
15 Aug, 2018	10:00 ~ 10:59	0.053	0.057	0.045	0.016	0.020	2.10	153.00	SSE
15 Aug, 2018	11:00 ~ 11:59	0.095	0.067	0.025	0.009	0.035	2.30	153.83	SSE
15 Aug, 2018	12:00 ~ 12:59	0.086	0.058	0.008	0.003	0.044	2.65	151.17	SSE
15 Aug, 2018	13:00 ~ 13:59	0.064	0.048	0.052	0.019	0.038	3.02	147.50	SSE
15 Aug, 2018	14:00 ~ 14:59	0.008	0.043	0.018	0.007	0.020	1.35	218.33	SW
15 Aug, 2018	15:00 ~ 15:59	0.000	0.036	0.012	0.004	0.018	0.98	196.83	SSW
15 Aug, 2018	16:00 ~ 16:59	0.000	0.037	0.036	0.013	0.021	1.08	239.17	WSW
15 Aug, 2018	17:00 ~ 17:59	0.000	0.043	0.038	0.014	0.022	0.97	168.50	SSE
15 Aug, 2018	18:00 ~ 18:59	0.000	0.043	0.036	0.013	0.019	1.02	131.33	SE
15 Aug, 2018	19:00 ~ 19:59	0.000	0.038	0.031	0.011	0.021	1.18	100.33	E
15 Aug, 2018	20:00 ~ 20:59	0.000	0.044	0.038	0.014	0.021	1.03	132.33	SE
15 Aug, 2018	21:00 ~ 21:59	0.000	0.041	0.048	0.017	0.023	0.63	125.00	SE
15 Aug, 2018	22:00 ~ 22:59	0.000	0.049	0.025	0.009	0.019	1.80	207.50	SSW
15 Aug, 2018	23:00 ~ 23:59	0.000	0.040	0.009	0.003	0.024	0.55	210.33	SSW
16 Aug, 2018	0:00 ~ 0:59	0.000	0.033	0.031	0.011	0.031	0.07	189.50	S
16 Aug, 2018	1:00 ~ 1:59	0.000	0.041	0.040	0.015	0.032	0.20	92.83	E
16 Aug, 2018	2:00 ~ 2:59	0.000	0.037	0.024	0.009	0.023	1.10	75.00	ENE
16 Aug, 2018	3:00 ~ 3:59	0.000	0.035	0.011	0.004	0.025	1.32	77.67	ENE
16 Aug, 2018	4:00 ~ 4:59	0.000	0.037	0.046	0.017	0.028	1.36	86.60	E
16 Aug, 2018	5:00 ~ 5:59	0.000	0.041	0.021	0.008	0.027	1.47	95.83	E
16 Aug, 2018	6:00 ~ 6:59	0.000	0.042	0.022	0.008	0.030	1.12	73.17	ENE
16 Aug, 2018	7:00 ~ 7:59	0.000	0.044	0.033	0.012	0.025	0.87	142.00	SE
16 Aug, 2018	8:00 ~ 8:59	0.000	0.044	0.079	0.029	0.019	0.53	168.17	SSE
16 Aug, 2018	9:00 ~ 9:59	0.000	0.038	0.039	0.014	0.027	1.03	233.67	SW

Max	0.095 (0.109 mg/m³)	0.067 (0.127 mg/m³)	0.079	0.029	0.044 (0.114 mg/m³)
Avg	0.013 (0.015 mg/m³)	0.043 (0.081 mg/m³)	0.032	0.012	0.026 (0.067 mg/m³)
Min	0.000 (0.000 mg/m³)	0.033 (0.063 mg/m³)	0.008	0.003	0.018 (0.047 mg/m³)

Date	Time			CO	NO2	TSP	PM10	SO2	Wind Speed	Wind Direction	
				ppm	ppm	mg/m³	mg/m³	ppm	kph	Deg.	Direction
				Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
16 Aug, 2018	10:00	~	10:59	0.000	0.036	0.022	0.008	0.029	0.95	204.67	SSW
16 Aug, 2018	11:00	~	11:59	0.016	0.040	0.041	0.015	0.036	1.45	216.00	SW
16 Aug, 2018	12:00	~	12:59	0.000	0.040	0.007	0.003	0.027	0.82	173.83	S
16 Aug, 2018	13:00	~	13:59	0.014	0.040	0.023	0.008	0.024	1.77	204.50	SSW
16 Aug, 2018	14:00	~	14:59	0.000	0.040	0.009	0.003	0.022	0.95	235.50	SW
16 Aug, 2018	15:00	~	15:59	0.000	0.038	0.011	0.004	0.018	0.52	217.17	SW
16 Aug, 2018	16:00	~	16:59	0.000	0.040	0.010	0.004	0.022	0.77	211.17	SSW
16 Aug, 2018	17:00	~	17:59	0.000	0.041	0.013	0.005	0.023	1.15	237.17	WSW
16 Aug, 2018	18:00	~	18:59	0.000	0.043	0.012	0.004	0.026	0.68	238.17	WSW
16 Aug, 2018	19:00	~	19:59	0.000	0.039	0.026	0.009	0.031	0.43	234.50	SW
16 Aug, 2018	20:00	~	20:59	0.000	0.044	0.030	0.011	0.025	0.22	188.40	S
16 Aug, 2018	21:00	~	21:59	0.000	0.037	0.021	0.008	0.024	0.27	177.83	S
16 Aug, 2018	22:00	~	22:59	0.000	0.036	0.043	0.016	0.025	0.38	199.83	SSW
16 Aug, 2018	23:00	~	23:59	0.000	0.037	0.023	0.008	0.025	0.73	239.17	WSW
17 Aug, 2018	0:00	~	0:59	0.000	0.040	0.032	0.012	0.029	0.80	248.00	WSW
17 Aug, 2018	1:00	~	1:59	0.000	0.039	0.034	0.012	0.026	0.50	225.83	SW
17 Aug, 2018	2:00	~	2:59	0.000	0.038	0.035	0.013	0.024	0.33	224.00	SW
17 Aug, 2018	3:00	~	3:59	0.000	0.042	0.030	0.011	0.030	0.25	219.83	SW
17 Aug, 2018	4:00	~	4:59	0.000	0.041	0.024	0.009	0.033	0.58	252.00	WSW
17 Aug, 2018	5:00	~	5:59	0.000	0.040	0.071	0.026	0.036	0.25	235.50	SW
17 Aug, 2018	6:00	~	6:59	0.000	0.041	0.051	0.018	0.018	0.48	235.67	SW
17 Aug, 2018	7:00	~	7:59	0.000	0.041	0.026	0.010	0.027	0.98	271.33	W
17 Aug, 2018	8:00	~	8:59	0.000	0.044	0.024	0.009	0.023	1.38	258.83	W
17 Aug, 2018	9:00	~	9:59	0.000	0.038	0.046	0.017	0.024	1.48	246.83	WSW

Max	0.016 (0.018 mg/m³)	0.044 (0.084 mg/m³)	0.071	0.026	0.036 (0.095 mg/m³)
Avg	0.001 (0.001 mg/m³)	0.040 (0.075 mg/m³)	0.028	0.010	0.026 (0.068 mg/m³)
Min	0.000 (0.000 mg/m³)	0.036 (0.067 mg/m³)	0.007	0.003	0.018 (0.047 mg/m³)

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

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
17 Aug, 2018	10:00 ~ 10:59	0.000	0.038	0.024	0.009	0.026	1.82	266.00	W
17 Aug, 2018	11:00 ~ 11:59	0.000	0.046	0.029	0.010	0.031	2.48	275.60	W
17 Aug, 2018	12:00 ~ 12:59	0.018	0.043	0.029	0.011	0.022	2.93	269.17	W
17 Aug, 2018	13:00 ~ 13:59	0.067	0.042	0.030	0.011	0.042	3.23	267.50	W
17 Aug, 2018	14:00 ~ 14:59	0.119	0.039	0.013	0.005	0.055	3.23	252.17	WSW
17 Aug, 2018	15:00 ~ 15:59	0.141	0.041	0.032	0.012	0.045	3.17	250.67	WSW
17 Aug, 2018	16:00 ~ 16:59	0.136	0.042	0.045	0.016	0.042	3.63	256.00	WSW
17 Aug, 2018	17:00 ~ 17:59	0.009	0.039	0.014	0.005	0.034	2.87	253.17	WSW
17 Aug, 2018	18:00 ~ 18:59	0.000	0.036	0.003	0.001	0.035	2.15	254.67	WSW
17 Aug, 2018	19:00 ~ 19:59	0.000	0.039	0.018	0.007	0.028	1.63	242.83	WSW
17 Aug, 2018	20:00 ~ 20:59	0.000	0.042	0.026	0.009	0.025	1.92	245.67	WSW
17 Aug, 2018	21:00 ~ 21:59	0.000	0.041	0.046	0.017	0.027	1.93	250.00	WSW
17 Aug, 2018	22:00 ~ 22:59	0.000	0.037	0.036	0.013	0.025	1.53	246.00	WSW
17 Aug, 2018	23:00 ~ 23:59	0.000	0.036	0.017	0.006	0.022	1.40	249.17	WSW
18 Aug, 2018	0:00 ~ 0:59	0.001	0.038	0.012	0.004	0.017	1.02	244.33	WSW
18 Aug, 2018	1:00 ~ 1:59	0.001	0.042	0.012	0.004	0.017	0.68	238.83	WSW
18 Aug, 2018	2:00 ~ 2:59	0.002	0.042	0.011	0.004	0.020	0.98	244.50	WSW
18 Aug, 2018	3:00 ~ 3:59	0.003	0.040	0.018	0.007	0.023	1.07	250.17	WSW
18 Aug, 2018	4:00 ~ 4:59	0.004	0.044	0.028	0.010	0.019	1.12	244.17	WSW
18 Aug, 2018	5:00 ~ 5:59	0.005	0.039	0.059	0.022	0.028	0.47	231.50	SW
18 Aug, 2018	6:00 ~ 6:59	0.008	0.041	0.047	0.017	0.014	0.52	214.00	SW
18 Aug, 2018	7:00 ~ 7:59	0.007	0.043	0.040	0.014	0.024	0.67	188.67	S
18 Aug, 2018	8:00 ~ 8:59	0.006	0.038	0.037	0.013	0.019	1.02	215.33	SW
18 Aug, 2018	9:00 ~ 9:59	0.008	0.039	0.015	0.005	0.014	1.63	241.50	WSW

Max	0.141 (0.162 mg/m^3)	0.046 (0.086 mg/m^3)	0.059	0.022	0.055 (0.143 mg/m^3)
Avg	0.022 (0.026 mg/m^3)	0.040 (0.076 mg/m^3)	0.027	0.010	0.027 (0.071 mg/m^3)
Min	0.000 (0.000 mg/m^3)	0.036 (0.067 mg/m^3)	0.003	0.001	0.014 (0.036 mg/m^3)

Date	Time	CO	NO_2	TSP	PM_{10}	SO_2	Wind Speed	Wind Direction	
		ppm	ppm	mg/m³	mg/m³	ppm	kph	Deg.	Direction
		Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
18 Aug, 2018	10:00 ~ 10:59	0.003	0.041	0.020	0.007	0.016	1.60	239.67	WSW
18 Aug, 2018	11:00 ~ 11:59	0.003	0.044	0.022	0.008	0.021	1.90	221.33	SW
18 Aug, 2018	12:00 ~ 12:59	0.000	0.042	0.007	0.003	0.012	1.15	185.83	S
18 Aug, 2018	13:00 ~ 13:59	0.005	0.041	0.009	0.003	0.023	1.07	209.67	SSW
18 Aug, 2018	14:00 ~ 14:59	0.009	0.038	0.044	0.016	0.018	2.45	248.50	WSW
18 Aug, 2018	15:00 ~ 15:59	0.001	0.039	0.003	0.001	0.018	2.20	244.83	WSW
18 Aug, 2018	16:00 ~ 16:59	0.003	0.042	0.017	0.006	0.018	1.27	230.33	SW
18 Aug, 2018	17:00 ~ 17:59	0.006	0.042	0.046	0.017	0.020	1.00	219.50	SW
18 Aug, 2018	18:00 ~ 18:59	0.004	0.044	0.044	0.016	0.017	0.78	169.67	S
18 Aug, 2018	19:00 ~ 19:59	0.002	0.041	0.035	0.013	0.015	1.30	166.67	SSE
18 Aug, 2018	20:00 ~ 20:59	0.001	0.037	0.016	0.006	0.016	1.35	168.33	SSE
18 Aug, 2018	21:00 ~ 21:59	0.003	0.040	0.025	0.009	0.023	1.25	161.00	SSE
18 Aug, 2018	22:00 ~ 22:59	0.002	0.038	0.024	0.009	0.022	1.47	157.83	SSE
18 Aug, 2018	23:00 ~ 23:59	0.003	0.037	0.015	0.005	0.019	2.25	158.67	SSE
19 Aug, 2018	0:00 ~ 0:59	0.000	0.042	0.033	0.012	0.019	2.07	186.00	S
19 Aug, 2018	1:00 ~ 1:59	0.003	0.039	0.011	0.004	0.023	0.98	166.50	SSE
19 Aug, 2018	2:00 ~ 2:59	0.007	0.042	0.016	0.006	0.021	1.00	145.00	SE
19 Aug, 2018	3:00 ~ 3:59	0.002	0.039	0.013	0.005	0.022	0.97	144.83	SE
19 Aug, 2018	4:00 ~ 4:59	0.001	0.038	0.061	0.022	0.030	0.73	149.83	SSE
19 Aug, 2018	5:00 ~ 5:59	0.002	0.043	0.020	0.007	0.017	0.88	124.17	SE
19 Aug, 2018	6:00 ~ 6:59	0.003	0.040	0.022	0.008	0.021	1.12	151.33	SSE
19 Aug, 2018	7:00 ~ 7:59	0.003	0.042	0.013	0.005	0.020	1.28	162.17	SSE
19 Aug, 2018	8:00 ~ 8:59	0.005	0.039	0.035	0.013	0.022	1.20	160.00	SSE
19 Aug, 2018	9:00 ~ 9:59	0.000	0.039	0.031	0.011	0.018	2.00	163.17	SSE

Max	0.009 (0.010 mg/m³)	0.044 (0.083 mg/m³)	0.061	0.022	0.030 (0.078 mg/m³)
Avg	0.003 (0.003 mg/m³)	0.040 (0.076 mg/m³)	0.024	0.009	0.020 (0.051 mg/m³)
Min	0.000 (0.000 mg/m³)	0.037 (0.069 mg/m³)	0.003	0.001	0.012 (0.031 mg/m³)

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

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
19 Aug, 2018	10:00 ~ 10:59	0.004	0.037	0.023	0.008	0.021	1.43	161.17	SSE
19 Aug, 2018	11:00 ~ 11:59	0.008	0.041	0.024	0.009	0.023	2.72	154.00	SSE
19 Aug, 2018	12:00 ~ 12:59	0.000	0.044	0.033	0.012	0.027	3.25	157.33	SSE
19 Aug, 2018	13:00 ~ 13:59	0.004	0.041	0.029	0.011	0.014	3.25	158.33	SSE
19 Aug, 2018	14:00 ~ 14:59	0.002	0.037	0.043	0.016	0.025	3.13	161.50	SSE
19 Aug, 2018	15:00 ~ 15:59	0.001	0.036	0.034	0.013	0.017	3.38	158.17	SSE
19 Aug, 2018	16:00 ~ 16:59	0.000	0.040	0.056	0.020	0.011	3.42	157.00	SSE
19 Aug, 2018	17:00 ~ 17:59	0.000	0.043	0.049	0.018	0.011	3.47	156.17	SSE
19 Aug, 2018	18:00 ~ 18:59	0.000	0.045	0.029	0.011	0.013	3.72	154.67	SSE
19 Aug, 2018	19:00 ~ 19:59	0.001	0.045	0.013	0.005	0.022	3.52	155.17	SSE
19 Aug, 2018	20:00 ~ 20:59	0.002	0.042	0.022	0.008	0.029	3.25	154.83	SSE
19 Aug, 2018	21:00 ~ 21:59	0.004	0.041	0.032	0.012	0.022	3.18	155.00	SSE
19 Aug, 2018	22:00 ~ 22:59	0.001	0.037	0.077	0.028	0.014	2.88	154.67	SSE
19 Aug, 2018	23:00 ~ 23:59	0.004	0.038	0.068	0.025	0.016	2.32	158.67	SSE
20 Aug, 2018	0:00 ~ 0:59	0.002	0.038	0.066	0.024	0.016	2.48	155.17	SSE
20 Aug, 2018	1:00 ~ 1:59	0.001	0.042	0.053	0.019	0.020	2.70	154.33	SSE
20 Aug, 2018	2:00 ~ 2:59	0.001	0.040	0.051	0.019	0.026	2.55	155.17	SSE
20 Aug, 2018	3:00 ~ 3:59	0.002	0.038	0.050	0.018	0.023	2.05	160.17	SSE
20 Aug, 2018	4:00 ~ 4:59	0.001	0.039	0.074	0.027	0.015	1.87	288.50	WNW
20 Aug, 2018	5:00 ~ 5:59	0.000	0.042	0.007	0.002	0.017	2.53	270.83	W
20 Aug, 2018	6:00 ~ 6:59	0.270	0.017	0.032	0.012	0.083	1.42	223.50	SW
20 Aug, 2018	7:00 ~ 7:59	0.043	0.066	0.039	0.014	0.010	1.10	153.00	SSE
20 Aug, 2018	8:00 ~ 8:59	0.281	0.020	0.039	0.014	0.263	1.12	150.33	SSE
20 Aug, 2018	9:00 ~ 9:59	0.000	0.064	0.042	0.015	0.179	1.53	154.50	SSE

Max	0.281 (0.321 mg/m^3)	0.066 (0.125 mg/m^3)	0.077	0.028	0.263 (0.689 mg/m^3)
Avg	0.026 (0.030 mg/m^3)	0.041 (0.076 mg/m^3)	0.041	0.015	0.038 (0.100 mg/m^3)
Min	0.000 (0.000 mg/m^3)	0.017 (0.031 mg/m^3)	0.007	0.002	0.010 (0.026 mg/m^3)

Thilawa Special Economic Zone (Zone A)

Development Project (Operation Phase)

Appendix

Noise and Vibration Monitoring Report

August, 2018

NOISE AND VIBRATION

MONITORING REPORT

FOR DEVELOPMENT OF INDUSTRIAL AREA

THILAWA SEZ ZONE A

(OPERATION STAGE)

(BI-ANNUALLY MONITORING)

August 2018

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 condition under the operation of industrial area in and around Thilawa SEZ Zone A, noise and vibration levels had been monitored from 14th August 2018 – 17th August 2018 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 14th August – 15th August, 2018	Noise Level	L_{Aeq}(dB)	1 (NV-1)	24 hours	On-site measurement by "Rion NL-42 sound level meter"
From 16th August – 17th August, 2018	Noise Level	L_{Aeq}(dB)	1 (NV-2)	24 hours	On-site measurement by "Rion NL-42 sound level meter"
From 15th August – 16th August, 2018	Noise Level	L_{Aeq}(dB)	1 (NV-3)	24 hours	On-site measurement by "Rion NL-42 sound level meter"
From 14th August – 15th August, 2018	Vibration Level	L_{v10} (dB)	1 (NV-1)	24 hours	On-site measurement by "Vibration Level Meter- VM-53A"
From 16th August – 17th August, 2018	Vibration Level	L_{v10} (dB)	1 (NV-2)	24 hours	On-site measurement by "Vibration Level Meter- VM-53A"
From 15th August – 16th August, 2018	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"	At the east of the Thilawa SEZ Zone A
NV-3	N: 16°40'46.20", E: 96°15'30.10"	At 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 at 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 at 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 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 2.3-2 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)
14th August – 15th August, 2018	61	58
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)
16th August – 17th August, 2018	63	60	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)
15th August – 16th August, 2018	52	44	49
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).

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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
14th August – 15th August, 2018	6:00-7:00	60	61	75
	7:00-8:00	61		
	8:00:9:00	61		
	9:00-10:00	61		
	10:00-11:00	60		
	11:00-12:00	61		
	12:00-13:00	60		
	13:00-14:00	61		
	14:00-15:00	66		
	15:00-16:00	61		
	16:00-17:00	62		
	17:00-18:00	62		
	18:00-19:00	59		
	19:00-20:00	60		
	20:00-21:00	60		
	21:00-22:00	60		
	22:00-23:00	59	58	70
	23:00-24:00	58		
	24:00-1:00	58		
	1:00-2:00	57		
	2:00-3:00	58		
	3:00-4:00	58		
	4:00-5:00	58		
	5:00-6:00	58		

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
16th August – 17th August, 2018	7:00-8:00	64	63	70
	8:00:9:00	63		
	9:00-10:00	63		
	10:00-11:00	62		
	11:00-12:00	63		
	12:00-13:00	60		
	13:00-14:00	62		
	14:00-15:00	66		
	15:00-16:00	62		
	16:00-17:00	63		
	17:00-18:00	65		
	18:00-19:00	62		
	19:00-20:00	59	60	65
	20:00-21:00	62		
	21:00-22:00	58		
	22:00-23:00	56	53	60
	23:00-24:00	56		
	24:00-1:00	51		
	1:00-2:00	49		
	2:00-3:00	46		
	3:00-4:00	51		
	4:00-5:00	55		
	5:00-6:00	52		
	6:00-7:00	55		

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
15th August – 16th August, 2018	7:00-8:00	54	52	70
	8:00:9:00	51		
	9:00-10:00	53		
	10:00-11:00	49		
	11:00-12:00	48		
	12:00-13:00	48		
	13:00-14:00	59		
	14:00-15:00	53		
	15:00-16:00	53		
	16:00-17:00	52		
	17:00-18:00	51		
	18:00-19:00	51		
	19:00-20:00	51	44	65
	20:00-21:00	52		
	21:00-22:00	52		
	22:00-23:00	56	49	60
	23:00-24:00	51		
	24:00-1:00	49		
	1:00-2:00	50		
	2:00-3:00	48		
	3:00-4:00	49		
	4:00-5:00	49		
	5:00-6:00	50		
	6:00-7:00	52		

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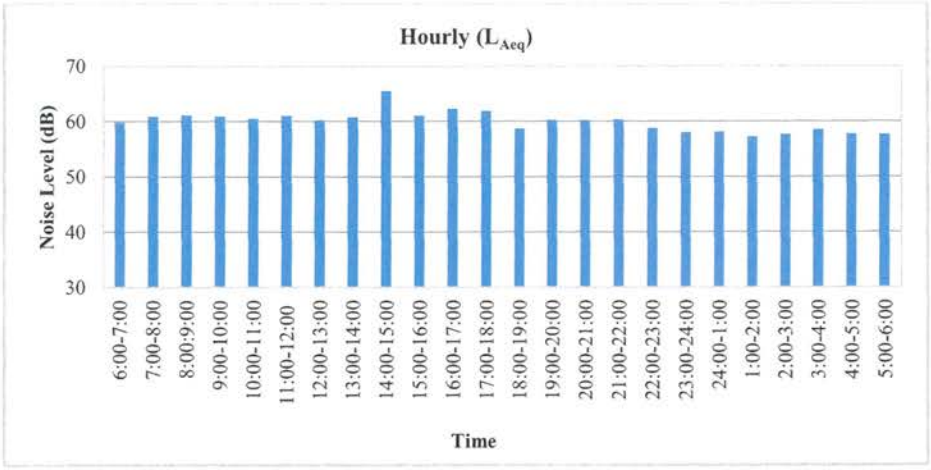

Figure 2.4-3 Results of Noise Levels (L_{Aeq}) Monitoring at NV-1

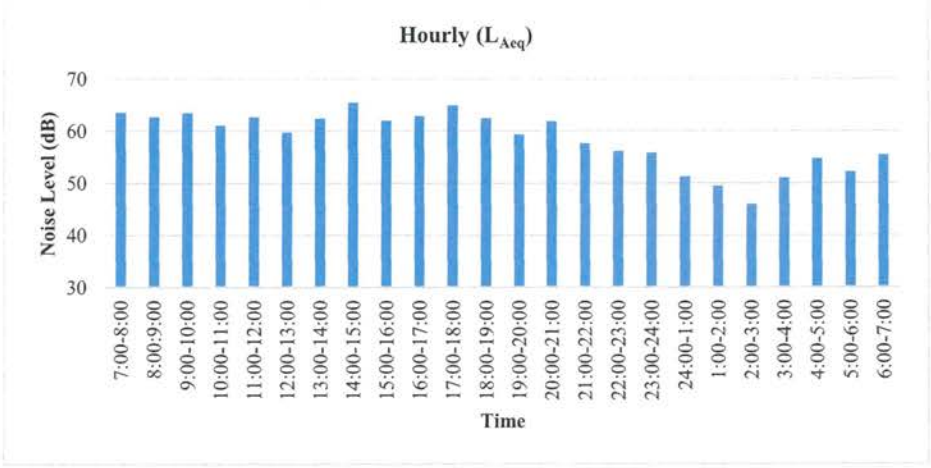

Figure 2.4-4 Results of Noise Levels (L_{Aeq}) Monitoring at NV-2

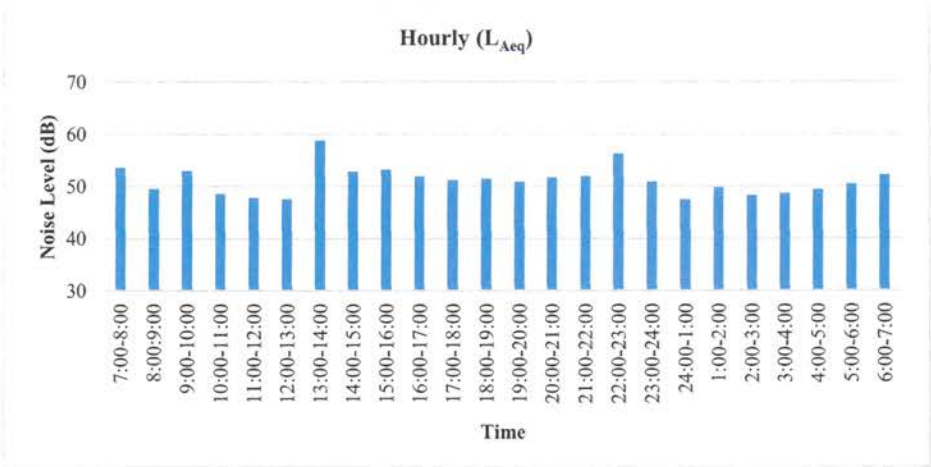

Figure 2.4-5 Results of Noise Levels (L_{Aeq}) Monitoring at NV-3

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)
14th August – 15th August, 2018	45	45	42
Target Value	70	65	65

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 2.4-8 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)
16th August – 17th August, 2018	37	33	26
Target Value	70	65	65

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 2.4-9 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)
15th August – 16th August, 2018	27	22	21
Target Value	70	65	65

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).

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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
14th August – 15th August, 2018	7:00-8:00	44	45	70
	8:00:9:00	43		
	9:00-10:00	43		
	10:00-11:00	46		
	11:00-12:00	45		
	12:00-13:00	45		
	13:00-14:00	44		
	14:00-15:00	46		
	15:00-16:00	46		
	16:00-17:00	46		
	17:00-18:00	45		
	18:00-19:00	45		
	19:00-20:00	43	45	65
	20:00-21:00	45		
	21:00-22:00	47		
	22:00-23:00	45	42	65
	23:00-24:00	42		
	24:00-1:00	42		
	1:00-2:00	42		
	2:00-3:00	42		
	3:00-4:00	43		
	4:00-5:00	42		
	5:00-6:00	40		
	6:00-7:00	40		

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
16th August – 17th August, 2018	7:00-8:00	39	37	70
	8:00:9:00	38		
	9:00-10:00	36		
	10:00-11:00	36		
	11:00-12:00	37		
	12:00-13:00	34		
	13:00-14:00	36		
	14:00-15:00	36		
	15:00-16:00	38		
	16:00-17:00	39		
	17:00-18:00	39		
	18:00-19:00	35		
	19:00-20:00	32	33	65
	20:00-21:00	36		
	21:00-22:00	29		
	22:00-23:00	32	26	65
	23:00-24:00	26		
	24:00-1:00	19		
	1:00-2:00	19		
	2:00-3:00	17		
	3:00-4:00	21		
	4:00-5:00	22		
	5:00-6:00	22		
	6:00-7:00	29		

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
15th August – 16th August, 2018	7:00-8:00	28	27	70
	8:00:9:00	23		
	9:00-10:00	26		
	10:00-11:00	26		
	11:00-12:00	26		
	12:00-13:00	25		
	13:00-14:00	28		
	14:00-15:00	24		
	15:00-16:00	27		
	16:00-17:00	29		
	17:00-18:00	28		
	18:00-19:00	29		
	19:00-20:00	24	22	65
	20:00-21:00	21		
	21:00-22:00	21		
	22:00-23:00	24	21	65
	23:00-24:00	19		
	24:00-1:00	19		
	1:00-2:00	18		
	2:00-3:00	17		
	3:00-4:00	17		
	4:00-5:00	18		
	5:00-6:00	18		
	6:00-7:00	25		

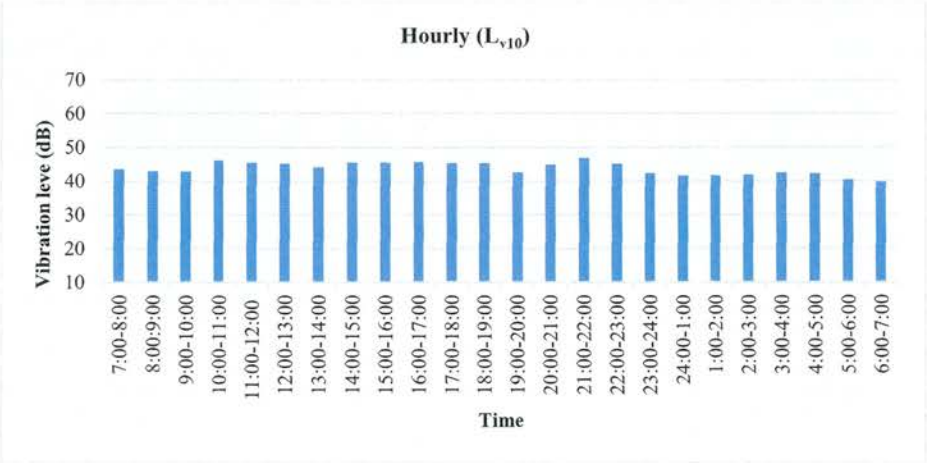

Figure 2.4-6 Results of Vibration Levels (L_{v10}) Monitoring at NV-1

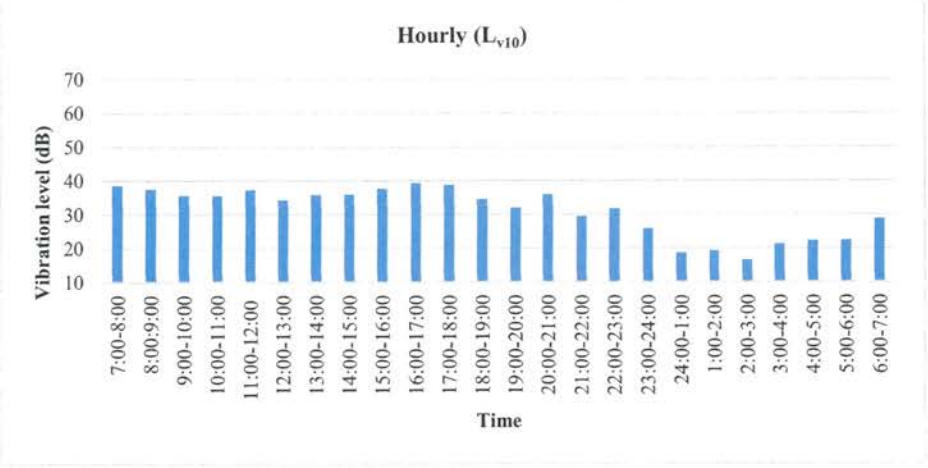

Figure 2.4-7 Results of Vibration Levels (L_{v10}) Monitoring at NV-2

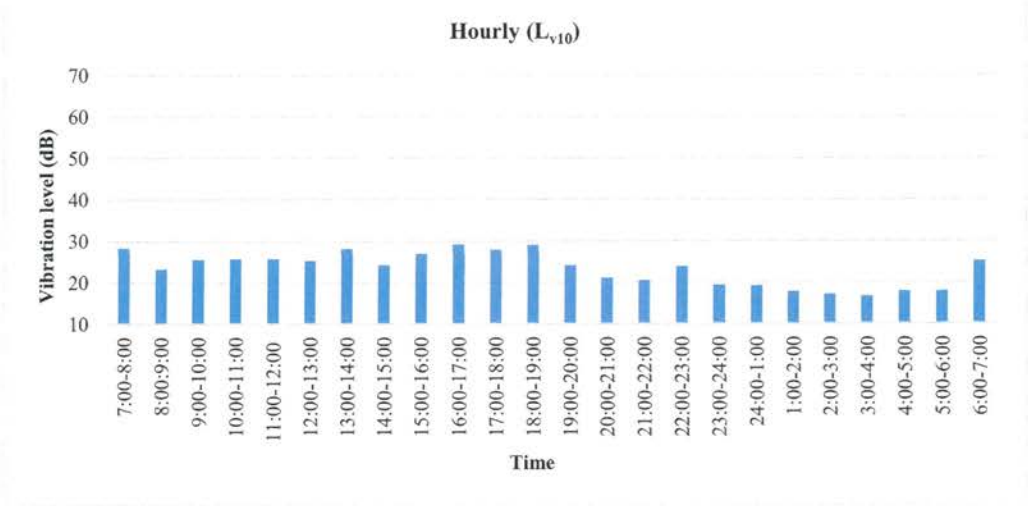

Figure 2.4-8 Results of Vibration Levels (L_{v10}) Monitoring at NV-3

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 to 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

May, 2018

MJTD MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED

SOIL CONTAMINATION SUREVEY IN THILAWA SEZ (ZONE A)

May 2018

Resource & Environment Myanmar

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

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

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MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

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

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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.

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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 8th and 9th May 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	5.1	7.0	5.1	7.2	-	-	-
2	Mercury	mg/kg	ND	0.0365	0.0454	0.0273	0.0329	15	610	-
3	Arsenic	mg/kg	2.28	1.28	1.36	1.67	1.12	150	27	12
4	Lead	mg/kg	26.5	16.7	17.1	17.9	14.9	150	750	300
5	Cadmium	mg/kg	1.79	0.519	0.794	0.597	0.396	150	810	10
6	Copper	mg/kg	31.7	20.7	25.6	21.9	18.0	-	-	100
7	Zinc	mg/kg	47.6	38.8	65.7	36.4	48.5	-	-	300
8	Chromium	mg/kg	163	119	115	121	92.1	250	640	-
9	Fluoride	mg/kg	0.12	0.08	0.14	0.06	0.15	-	-	-
10	Boron	mg/kg	48.6	38.0	33.9	34.5	28.6	-	-	-
11	Selenium	mg/kg	1.03	0.255	0.188	0.200	0.132	-	10,000	-

Appendix

Lab Result

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United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

ANALYSIS REPORT

PROJECT : SOIL QUALITY MONITORING FOR THILAWA SEZ
CUSTOMER NAME : REM-UAE LABORATORY AND CONSULTANT CO., LTD.
ADDRESS : B-702 DELTA PLAZA, SHWEGONDAING ROAD, BAHAN, YANGON, MYANMAR. TEL. 959 7301 3448 FAX 951 55 29 01
SAMPLING SOURCE : THILAWA
SAMPLE TYPE : SOIL
SAMPLING DATE : *
SAMPLING TIME : -
SAMPLING METHOD : -
SAMPLING BY : CUSTOMER
ANALYZED BY : MISS CHOMTHANAN APHIPATPAPHA

RECEIVED DATE : MAY 22, 2018
ANALYTICAL DATE : MAY 22-JUNE 7, 2018
ANALYSIS NO. : LAQ480-LAQ484/2018
WORK NO. : LAB3020/2018
REPORT NO. : L16940/2018

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT				
			S1 MAY 8, 2018* LAQ480/2018	S2 MAY 8, 2018* LAQ481/2018	S3 MAY 9, 2018* LAQ482/2018	S4 MAY 8, 2018* LAQ483/2018	S5 MAY 9, 2018* LAQ484/2018
pH (1:1)	-	ELECTROMETRIC METHOD (U.S. EPA 2004:9045 D)	5.5 (25°C)	5.1 (25°C)	7.0 (25°C)	5.1 (25°C)	7.2 (25°C)
FLUORIDE	mg/L F^-	ION-SELECTIVE ELECTRODE METHOD (SM 2012:4500-F^- C)	0.12	0.08	0.14	0.06	0.15
ARSENIC (As)	mg/kg	HYDROFLUORIC ACID DECOMPOSITION AND HYDRIDE GENERATION AAS METHOD	2.28	1.28	1.36	1.67	1.12
MERCURY (Hg)	mg/kg	THERMAL DECOMPOSITION AMALGAMATION AND ATOMIC ABSORPTION SPECTROMETRIC METHOD (U.S.EPA 2007:7473)	ND	0.0365	0.0454	0.0273	0.0329
SELENIUM (Se)	mg/kg	HYDROFLUORIC ACID DECOMPOSITION AND HYDRIDE GENERATION AAS METHOD	1.03	0.255	0.188	0.200	0.132
ZINC (Zn)	mg/kg	HYDROFLUORIC ACID DECOMPOSITION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	47.6	38.8	65.7	36.4	48.5
CADMIUM (Cd)	mg/kg	HYDROFLUORIC ACID DECOMPOSITION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	1.79	0.591	0.794	0.597	0.396
COPPER (Cu)	mg/kg	HYDROFLUORIC ACID DECOMPOSITION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	31.7	20.7	25.6	21.9	18.0
LEAD (Pb)	mg/kg	HYDROFLUORIC ACID DECOMPOSITION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	26.5	16.7	17.1	17.9	14.9

MYANMARSEZ THILAWA DEVELOPMENT LIMITED M.J.T.D

United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Tel. 0 2763 2828 Fax 0 2763 2800 www.uaeconsultant.com E-mail: uae@uaeconsultant.com

PARAMETER	UNIT	METHOD OF ANALYSIS	RESULT				
			S1 MAY 8, 2018* LAQ480/2018	S2 MAY 8, 2018* LAQ481/2018	S3 MAY 9, 2018* LAQ482/2018	S4 MAY 8, 2018* LAQ483/2018	S5 MAY 9, 2018* LAQ484/2018
BORON (B)	mg/kg	HYDROFLUORIC ACID DECOMPOSITION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	48.6	38.0	33.9	34.5	28.6
CHROMIUM (Cr)	mg/kg	HYDROFLUORIC ACID DECOMPOSITION AND INDUCTIVELY COUPLED PLASMA (ICP) METHOD	163	119	115	121	92.1
SAMPLE CONDITION			BROWN SOIL	BROWN SOIL	BROWN SOIL	BROWN SOIL	BROWN SOIL

ND : NON-DETECTABLE.

*United Analyst Engineering Consultant Co., Ltd is Sub-contractor of REM-UAE Laboratory and Consultant Co., Ltd

(MRS MANIDA YAMYAI)
TECHNICAL MANAGEMENT
JUNE 13, 2018

(MRS PIYAPAT SUTTAMANUTWONG)
LABORATORY SUPERVISOR
JUNE 13, 2018

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

Thilawa Special Economic Zone (Zone A)

Development Project (Operation Phase)

Appendix

Ground Subsidence Monitoring Status

(Location- Admin Complex Compound)

April 2018 to September 2018

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	
	30-Sep-16	+7.137	+7.136	-0.001	
Oct	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	
	28-Oct-16	+7.137	+7.136	-0.001	
Nov	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	
	25-Nov-16	+7.137	+7.138	+0.001	
Dec	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	
	23-Dec-16	+7.137	+7.133	-0.004	
	30-Dec-16	+7.137	+7.133	-0.004	
Jan	6-Jan-17	+7.137	+7.134	-0.003	
	13-Jan-17	+7.137	+7.134	-0.003	
	20-Jan-17	+7.137	+7.134	-0.003	
	27-Jan-17	+7.137	+7.134	-0.003	
Feb	3-Feb-17	+7.137	+7.134	-0.003	
	10-Feb-17	+7.137	+7.134	-0.003	
	17-Feb-17	+7.137	+7.134	-0.003	
	24-Feb-17	+7.137	+7.134	-0.003	
Mar	3-Mar-17	+7.137	+7.134	-0.003	
	10-Mar-17	+7.137	+7.134	-0.003	
	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	
Apr	7-Apr-17	+7.137	+7.128	-0.009	
	21-Apr-17	+7.137	+7.126	-0.011	
	28-Apr-17	+7.137	+7.126	-0.011	
May	5-May-17	+7.137	+7.126	-0.011	
	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	
Jun	9-Jun-17	+7.137	+7.135	-0.002	
	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	
July	7-Jul-17	+7.137	+7.136	-0.001	
	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	
Aug	3-Aug-17	+7.137	+7.136	-0.001	
	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	

Thilawa Special Economic Zone (Zone A)

Development Project (Operation Phase)

Appendix

General Waste Disposal Record

(Admin Complex Compound- April 2018 to September 2018)

MJTD

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	April	24-Apr-18	1	1080	1880
2	2018	April	24-Apr-18	1	800	
3	2018	May	16-May-18	1	1300	1940
4	2018	May	16-May-18	1	640	
5	2018	June	05-Jun-18	1	740	3000
6	2018	June	05-Jun-18	1	1000	
7	2018	June	29-Jun-18	1	1260	
8	2018	July	02-Jul-18	1	1300	3420
9	2018	July	25-Jul-18	1	2120	
10	2018	August	15-Aug-18	1	1740	1740
11	2018	September	10-Sep-18	1	1800	1800

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

Manifest — C-Slip

*Transportation company to Waste Generator

Date of issuance	(Day Month, Year) 24 Apr 2018	Issuer	(Name&Sign)
Number of issuance	9999 1804 0149		

Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development Ltd.	GEM	GEM
Tel			

Waste	Kind	Name	Style of packing
	☑Non-Hazardous	General Waste.	
	☐Hazardous	Quantity(Unit)	Remark
	☐Others	1080kg	

Customer code	0001	Waste Profile code	A001

Trace	PIC(Name&Sign)	Date of Completion
Transportation company	(Name&Sign) Min Oo 314-8876	(Day Month, Year)
Waste service company	(Name&Sign)	(Day Month, Year)

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

Manifest — C-Slip

*Transportation company to Waste Generator

Date of issuance	(Day Month, Year) 24-April 18	Issuer	(Name&Sign)
Number of issuance	9999 1804 0153		

Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development Ltd.	GEM	GEM
Tel			

Waste	Kind	Name	Style of packing
	☐Non-Hazardous	General Waste.	
	☐Hazardous	Quantity(Unit)	Remark
	☐Others	800kg	

Customer code		Waste Profile code	A001

Trace	PIC(Name&Sign)	Date of Completion
Transportation company	(Name&Sign) Min Oo 314-8876	(Day Month, Year)
Waste service company	(Name&Sign)	(Day Month, Year)

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

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

Manifest — C-Slip

*Transportation company to Waste Generator

Date of issuance	(Day Month, Year) 16 May 18	Issuer	(Name&Sign)
Number of issuance	9999 1805 0121		

Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development Ltd.	GEM	GEM
Tel			

Waste	Kind	Name	Style of packing
	☑Non-Hazardous	General Waste	
	☐Hazardous	Quantity(Unit)	Remark
	☐Others	1300kg	

Customer code	0001	Waste Profile code	A001

Trace	PIC(Name&Sign)	Date of Completion
Transportation company	(Name&Sign) Min Oo 3K-8896	(Day Month, Year)
Waste service company	(Name&Sign)	(Day Month, Year)

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

Manifest — C-Slip

*Transportation company to Waste Generator

Date of issuance	(Day Month, Year) 16 May 18	Issuer	(Name&Sign)
Number of issuance	9999 1805 0129		

Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development Ltd.	GEM	GEM
Tel			

Waste	Kind	Name	Style of packing
	☑Non-Hazardous	General Waste	
	☐Hazardous	Quantity(Unit)	Remark
	☐Others	640kg	

Customer code	0001	Waste Profile code	A001

Trace	PIC(Name&Sign)	Date of Completion
Transportation company	(Name&Sign) Min Oo 3K-8896	(Day Month, Year)
Waste service company	(Name&Sign)	(Day Month, Year)

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

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

Manifest — C-Slip

*Transportation company to Waste Generator

Date of issuance (Day Month, Year)	29 June 2018	Issuer (Name&Sign)	
Number of issuance	9999 1806 0236		

Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development limited.	GEM	GEM
Tel			

Waste	Kind	Name	Style of packing
	☐Non-Hazardous	General Waste.	
	☐Hazardous	Quantity(Unit)	Remark
	☐Others	1260kg	

Customer code	0001	Waste Profile code	A001

Trace	PIC(Name&Sign)	Date of Completion
Transportation company	(Name&Sign) Nyi Nyi Htwe-3k.8896	(Day Month, Year)
Waste service company	(Name&Sign)	(Day Month, Year)

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

Manifest — C-Slip

*Transportation company to Waste Generator

Date of issuance (Day Month, Year)	5 June. 2018	Issuer (Name&Sign)	
Number of issuance	9999 1806 0031		

Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development Ltd.	GEM	GEM
Tel			

Waste	Kind	Name	Style of packing
	☐Non-Hazardous	General Waste.	
	☐Hazardous	Quantity(Unit)	Remark
	☐Others	740kg	

Customer code	0001	Waste Profile code	A001

Trace	PIC(Name&Sign)	Date of Completion
Transportation company	(Name&Sign) Nyi Nyi Htwe 3k.6895	(Day Month, Year)
Waste service company	(Name&Sign)	(Day Month, Year)

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

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

Manifest	C-Slip	*Transportation company to Waste Generator	
Date of issuance	(Day Month, Year) 2 July 2018	Issuer	(Name&Sign)
Number of issuance	9999 1807 0005		
Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development Ltd.	GEM	GEM
Tel			

Waste	Kind	Name	Style of packing
	☑Non-Hazardous	General Waste	
	☐Hazardous	Quantity(Unit)	Remark
	☐Others	1300kg	

Customer code	0001	Waste Profile code	A001

Trace	PIC(Name&Sign)	Date of Completion
Transportation company	(Name&Sign) Min C 7K-7145	(Day Month, Year)
Waste service company	(Name&Sign)	(Day Month, Year)

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

Manifest	C-Slip	*Transportation company to Waste Generator	
Date of issuance	(Day Month, Year) 25 Jul 2018	Issuer	(Name&Sign)
Number of issuance	9999 1807 0184		
Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development Ltd.	GEM	GEM
Tel			

Waste	Kind	Name	Style of packing
	☑Non-Hazardous	General Waste	
	☐Hazardous	Quantity(Unit)	Remark
	☐Others	2120kg	

Customer code	0001	Waste Profile code	A001

Trace	PIC(Name&Sign)	Date of Completion
Transportation company	(Name&Sign) Soe min latt 2K/9896 25.7.18	(Day Month, Year)
Waste service company	(Name&Sign)	(Day Month, Year)

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

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

Manifest

C-Slip

*Transportation company to Waste Generator

Date of issuance	(Day Month, Year) 15 Aug 18	Issuer	(Name&Sign)
Number of issuance	9999 1808 0116		

Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development Ltd.	GEM	GEM
Tel			

	Kind	Name	Style of packing
Vaste	☐Non-Hazardous	General Waste.	
	☐Hazardous	Quantity(Unit)	Remark
	☐Others	1710 kg	

ustomer code	0001	Waste Profile code	A001

Trace	PIC(Name&Sign)	Date of Completion
ansportation company	(Name&Sign) Nyi Nyi Htwe 3K-8246	(Day Month, Year)
Vaste service company	(Name&Sign)	(Day Month, Year)

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

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

Manifest	C-Slip	*Transportation company to Waste Generator

Date of issuance	(Day Month, Year) 10 Sep 18	Issuer	(Name&Sign)
Number of issuance	7997 1809 0056		

Contractors	Waste generator	Transportation company	Waste service company
Company Name	Myanmar Japan Thilawa Development Ltd.	GEM	GEM
Tel			

	Kind	Name	Style of packing
Waste	☐Non-Hazardous	General Waste	
	☐Hazardous	Quantity(Unit)	Remark
	☐Others	1800 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 WOWA ECO-SYSTEM MYANMAR CO., LTD.

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

Thilawa Special Economic Zone (Zone A)

Development Project (Operation Phase)

Appendix

Sewage Treatment Plant Monitoring Record

April 2018 to September 2018

Monitoring Parameters Result for STP(Phase-1)

Month	Date	Inlet																																				
		pH	ORP	DO	EC	TDS	Turbidity	COD	Temp	BOD	T-Coli	T-N	T-P	O&G	SS	Cyanide	Chromium	Arsenic	Mercury	Cadmium	Selenium	Lead	Color	Odor	Zinc	Copper	Barium	Nickel	Sulphide	Free Chlorine	Formal-dehyde	Silver	Iron	Ammonia	Hexavalent Chromium (Cr6+)	Fluoride	Total Chlorine	Phenols
		Daily Parameters								Weekly Parameters						Monthly Parameters																								
Standard		6 – 9	–	–	–	Max 2,000	–	Max 400	Max 35 °C	Max 200	–	Max 80	Max8	Max 40	Max 200	Max 0.1	Max 0.5	Max 0.1	Max 0.005	Max 0.03	Max 0.02	Max 0.1	150	150	Max 2	Max 0.3	Max 1	Max 0.2	Max 1	Max 1	Max 1	Max 0.5	Max3.5	Max50	Max 0.1	Max20	Max0.2	Max 0.5
Unit		-	mv	mg/L	µs/cm	ppm	FNU	ppm	°C	ppm	MPN/100ml	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	Co-Pt	Co-Pt	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Apr	01-Apr-18	7.37	327.4	4.31	648	324	42.5		29.81																														
Apr	02-Apr-18	7.48	320.2	4.39	951	480	37.3	36.6	29.99																														
Apr	03-Apr-18	7.22	352.7	3.4	749	366	28.1	29.2	29.12																														
Apr	04-Apr-18	7.71	282.5	3.89	681	340	53.3	30.9	30.6	8.6	>160000	15	1.36	3.6	6																						0.1	
Apr	05-Apr-18	7.47	262.3	3.81	582	291	14.6	34	30.43																														
Apr	06-Apr-18	7.4	319.5	3.44	756	378	17.5	70	30.66																														
Apr	07-Apr-18	7.72	269.4	3.96	676	346	53.2		30.64																														
Apr	08-Apr-18	6.7	244.7	3.59	806	403	9.4		29.82																														
Apr	09-Apr-18	6.81	307.5	4.26	1541	770	7.5	52	29.85																														
Apr	10-Apr-18	6.96	312.5	4.21	943	472	11.2	30	30.17	4.9	>160000	11.5	1.14	4.4	10																						0.1	
Apr	11-Apr-18	6.94	326.9	3.57	502	251	11.1	41	30.62																														
Apr	12-Apr-18	7.14	226.2	3.24	536	267	12.1	55	30.73																														
Apr	13-Apr-18	6.83	243.6	3.94	856	430	8.2		30.15																														
Apr	14-Apr-18	7.08	314.7	3.5	526	263	17.2		29.86																														
Apr	15-Apr-18	7.15	226.2	3.24	582	276	11.2		30.73																														
Apr	16-Apr-18	7.07	340.7	2.9	461	231	4.9		29.7																														
Apr	17-Apr-18	7.05	357.2	3.86	493	247	34.9		29.84																														
Apr	18-Apr-18	7.09	343.6	3.5	541	271	29.8	20	29.74	14.8	>160000	7.5	0.828	3.4	12																						0.1	
Apr	19-Apr-18	7.08	315.6	3.5	536	263	18.2	33	29.76																														
Apr	20-Apr-18	7.16	336.7	3.23	521	271	11.3	52	29.86																														
Apr	21-Apr-18	7.11	279.4	3.89	700	350	7.2		30.63																														
Apr	22-Apr-18	7.38	299.6	3.35	880	440	25.7		30.61																														
Apr	23-Apr-18	7.08	316.6	3.58	560	248	11.3	19	30.62																														
Apr	24-Apr-18	5.76	291.4	3.54	1120	560	5.6	31	31.01																														
Apr	25-Apr-18	7.27	313	4.74	838	419	12.7	40	30.65	8.9	160000	11.2	9.05	<3.1	66																						0.1	
Apr	26-Apr-18	7.35	244.3	4.01	591	297	39.8	105	31.33																														
Apr	27-Apr-18	7.38	299.6	3.36	876	431	26.7	40	30.61																														
Apr	28-Apr-18	7.13	289.5	3.35	692	273	11.2		31.39																														
Apr	29-Apr-18	7.64	282.2	4.52	1028	514	31.7		30.93																														
Apr	30-Apr-18	7.29	320.4	3.65	967	484	20.6	59	30.76																														
May	01-May-18	7.26	326.6	3.11	590	296	24.2		30.28																														
May	02-May-18	7.28	317.5	3.63	621	311	20.7	37	30.09	8.9	>160000	7.6	1.18	3.89	18	0.014	≤0.002	≤0.01	≤0.002	≤0.001	≤0.01	≤0.002	18.58	1.4	≤0.002	≤0.002	0.024	0.014	0.07	<0.1	0.052	≤0.002	4.828	9.72	<0.05	0.927	0.1	<0.002
May	03-May-18	6.13	335	3.95	927	463	14.7	132	30.7																														
May	04-May-18	7.33	228.2	3.02	645	322	9.5	16	31.28																														
May	05-May-18	7.26	305.2	3.53	7.06	361	14.2		30.62																														
May	06-May-18	7.41	320	1.54	834	417	28		30.42																														
May	07-May-18	7.14	359.1	4.33	899	450	1.8	56	31.15	Stoped STP phase-1 soon after taking sample for tank cleaning.																													
May	08-May-18	6.44	253.2	2.67	646	324	10.2		31.23																														
May	09-May-18	7.2	327.6	3.1	580	297	24.3		30.31																														
May	10-May-18	7.32	319	3.58	652	318	14.6		30.28																														
May	11-May-18	6.84	221.7	2.35	619	310	19.7		31.1																														
May	12-May-18																																						
May	13-May-18	6.46	290.7	3.53	864	326	14.2		30.42																														
May	14-May-18	6.86	307.2	3.09	843	315	10.4		30.28																														
May	15-May-18	6.87	207.9	2.59	590	299	25.3		30.89																														
May	16-May-18	6.85	181.7	1.53	894	420	24.2		30.84																														
May	17-May-18	6.84	222.6	2.56	860	392	24.3		30.8																														
May	18-May-18	5.94	183.8	2.44	842	421	8.7		31.34																														
May	19-May-18	7.31	133.7	1.92	1004	502	8.5		31.4																														
May	20-May-18	7.16	173.3	2.16	848	425	11.4		31.14																														
May	21-May-18	7.26	186.3	2.51	856	420	10.4		31.34																														
May	22-May-18	7.11	196.7	3.06	932	442	14.6		31.5																														
May	23-May-18	7.33	148.4	2.81	644	322	41.1		31.19																														
May	24-May-18	7.2	139.5	1.47	618	409	0.1		31.24																														
May	25-May-18	7.26	176.3	2.17	928	428	10.4		31.35																														
May	26-May-18	7.23	169.6	2.08	910	447	11.7		31.37																														
May	27-May-18	8.05	208	2.22	684	342	71.4		30.8																														
May	28-May-18	8.25	257.9	3.5	926	450	75.6		31.85																														
May	29-May-18	7.03	226.1	2.78	381	191	72.3		30.25																														
May	30-May-18	7.28	207.1	2.95	953	428	26.3		31.3																														
May	31-May-18	7.33	206.8	27.6	852	529	26		30.32																														
Jun	01-Jun-18	7.12	183.4	2.89	482	241	87.6	289	30.54	STP (Phase -1) started operation in 1 June 2018.																													
Jun	02-Jun-18	7.3	268.1	2.12	766	360	14.5		30.45																														
Jun	03-Jun-18	7.14	202	2.39	776	388	21		30.13																														
Jun	04-Jun-18	7.2	290.3	2.53	710	355	18.5	44	30.17																														
Jun	05-Jun-18	7.3	342.3	2.62	650	326	31.8	79	30.65																														
Jun	06-Jun-18	7.3	268.1	2.36	768	336	19.2	76	30.46	16.5	>160000	12	0.95	< 3.1	2	0.003	≤0.002	≤0.01	≤0.002	≤0.001	≤0.01	≤0.002	16.6	1.4	≤0.002	≤0.002	0.026	0.02	0.025	0.1	0.061	≤0.002	2.84	10.7	< 0.05	0.519	0.2	0.032
Jun	07-Jun-18	7.28	287.5	2.67	792	362	14.6	32	30.38																														
Jun	08-Jun-18	71.14	84.3	3.64	918	9	1.5	37	29.9																														
Jun	09-Jun-18	7.4	291.5	2.39	569	282	18.8		30.46																														
Jun	10-Jun-18	7.3	293.3	2.63	658	326	19.2		30.49																														
Jun	11-Jun-18	7.28	290.1	2.38	719	320	22.2	58	30.18																														
Jun	12-Jun-18	7.43	293	3.06	647	324	12.4	13	29.7																														
Jun	13-Jun-18	7.24	306.7	2	844	421	22	23	30.23	4.53	54000	5.8	0.102	< 3.1	8																						0.1	
Jun	14-Jun-18	7.52	292.6	2.66	728	344	19.4	11	29.28																														
Jun	15-Jun-18	7.28	293.8	2.37	643	354	12.2	13	29.38																														
Jun	16-Jun-18	7.41	284.9	2.59	585	292	88.6		29.78																														
Jun	17-Jun-18	7.24	284.1	2.24	695	348	315		29.86																														
Jun	18-Jun-18	7.12	293.2	2.56	822	361	19.5	16	29.56																														
Jun	19-Jun-18	7.24	290.1	2.63	719	362	18.5	15	29.38																														
Jun	20-Jun-18							43		13.75	>160000	11.1	0.697	< 3.1	16																						0.1	
Jun	21-Jun-18	7.29	328.8	3.2	840	420	23.6	32	30.11																														
Jun	22-Jun-18	7.28	292.6	2.62	498	298	56.6	59	30.28																														
Jun	23-Jun-18	7.32	282.5	2.53	512	355	22.3		30.41																														
Jun	24-Jun-18	7.2	291.7	2.5	512	230	48.7		31.25																														
Jun	25-Jun-18	7.1	200.6	4.5	772	385	40.1	36	30.08																														
Jun	26-Jun-18	7.18	283.7	2.26	599	332	44.8	27	29.28																														
Jun	27-Jun-18	7.2	290.6	3.16	518	369	46.2	27	29.38	9.22	>160000	9.6	0.76	3.77	68																						<0.1	
Jun	28-Jun-18	7.25	293.2	4.39	532	266	26.3	18	29.24																														
Jun	29-Jun-18	6.96	194.3	5.1	617	308	21.5	24.9	29.77																														
Jun	30-Jun-18	7.24	231.2	4.12	524	338	42.7		29.66																														
July	01-Jul-18	7.26	280.9	3.24	703	351	14.8		29.78																														
July	02-Jul-18	5.25	340.7	4.63	873	437	19	16	29.79																														
July	03-Jul-18	3.13	471.4	5.34	2335	1174	32.6	73	29.87																														
July	04-Jul-18	4.24	397.6	3.42	979	427	26.4	13	28.22	6.2	160000	5.7	0.571	<3.1	24																						0.1	
July	05-Jul-18	5.17	351.2	4.18	891	458	22.3	39	29.38																														
July	06-Jul-18							30																														
July	07-Jul-18	7.37	263.7	3.92	766	382	12.2		29.6																														
July	08-Jul-18	7.26	298.6	3.48	768	408	14.2		29.36																														
July	09-Jul-18	7.19	310.2	3.36	769	439	22.5	26	29.76																														
July	10-Jul-18	7.2	512.1	3.5	821	618	19.4	12.5	29.1																														
July	11-Jul-18	7.41	314.6	4.5	463	232	53.1	26	28.9	9.3	>160000	5.6	0.571	<3.1	34	<0.002	≤0.01	≤0.01	≤0.00054	≤0.005	≤0.01	0.006	10.72	1	0.036	≤0.005	≤0.001	≤0.005	0.027	0.1	0.085	≤0.01	0.69	5.36	<0.05	0.562	0.1	0.002
July	12-Jul-18	7.59	266.4	5.4	492	246	24.3	74	29.17																														
July	13-Jul-18	7.93	296.5	5.06	603	287	14.6	132	29.78																														
July	14-Jul-18	7.71	275.2	5.47	541	270	17.7		29.17																														
July	15-Jul-18	7.25	359.7	1.96	534	266	18.8		29.07																														
July	16-Jul-18	7.12	326.2	4.1	507	252	26.9	16.4	29.04																														
July	17-Jul-18	7.36	361.5	3.6	620	271	24.8	19.5	29.13	7.8	>160000	4.9	0.448	<3.1	36																						0.1	
July	18-Jul-18	7.45	383.2	4.4	612	306	13	12.3	29.28																														
July	19-Jul-18	7.3	302.8	5.99	777	389	13.9		29.34																														
July	20-Jul-18	7.35	344.5	4.76	631	328	14.6	50	29.26																														
July	21-Jul-18	7.26	314.6	4.58	713	249	12.2		28.9																														
July	22-Jul-18	7.33	436.4	6.14	611	305	12.4		29.37																														
July	23-Jul-18	6.85	339.9	4.64	650	325	9.8	10.4	29.28																														
July	24-Jul-18	7.42	319.5	3.94	555	276	19.8	55	28.94	4.29	160000	8.6	0.883	<3.1	82																						0.2	
July	25-Jul-18	7.19	263.2	3.5	492	232	24.3	23	29.76																														
July	26-Jul-18	7.62	307.9	5.41	64.1	322	10.7	17	29.56																														
July	27-Jul-18	7.44	341	4.62	583	301	12.7		29.30																														
July	28-Jul-18	7.35	339	5.67	543	321	12.9		29.37																														
July	29-Jul-18	7.26	380.2	4.76	620	309	14.6		28.9																														

Month	Date	Inlet																																				
		pH	ORP	DO	EC	TDS	Turbidity	COD	Temp	BOD	T-Coli	T-N	T-P	O&G	SS	Cyanide	Chromium	Arsenic	Mercury	Cadmium	Selenium	Lead	Color	Odor	Zinc	Copper	Barium	Nickel	Sulphide	Free Chlorine	Formal-dehyde	Silver	Iron	Ammonia	Hexavalent Chromium (Cr6+)	Fluoride	Total Chlorine	Phenols
		Daily Parameters								Weekly Parameters						Monthly Parameters																								
Standard		6 ~ 9	-	-	-	Max 2,000	-	Max 400	Max 38 °C	Max 200	-	Max 80	Max8	Max 40	Max 200	Max 0.1	Max 0.5	Max 0.1	Max 0.005	Max 0.03	Max 0.02	Max 0.1	150	150	Max 2	Max 0.5	Max 1	Max 0.2	Max 1	Max 1	Max 1	Max0.5	Max3.5	Max80	Max0.1	Max20	Max0.2	Max 0.5
Unit		-	mv	mg/L	µs/cm	ppm	FNU	ppm	°C	ppm	MPN/100ml	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	Co-Pt	Co-Pt	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
July	30-Jul-18	7.51	301.9	10.27	562	281	77.6	23	28.52																														
July	31-Jul-18	7.4	268.8	5.4	467	232	12.8	9.4	29.21																														
Aug	01-Aug-18	7.33	259.1	7.08	514	257	0.9	15	28.19	1.99	>160000	8.1	0.681	<3.1	10	<0.002	≤0.01	≤0.01	≤0.002	≤0.005	≤0.01	0.006	3.99	1.4	0.06	≤0.005	0.056	0.066	0.01	0.1	0.014	≤0.01	3.378	8.41	<0.05	0.236	0.1	0.006
Aug	02-Aug-18	7.35	279.4	3.62	469	234	11	9.3	29.06																														
Aug	03-Aug-18	7.49	186.8	8.17	472	371	10.8	11.8	30.1																														
Aug	04-Aug-18	7.36	189.4	4.47	402	201	10.6		29.34																														
Aug	05-Aug-18	7.43	230.8	3.65	448	224	18.5		29.12																														
Aug	06-Aug-18	7.44	234	4.16	432	217	10.4	26.1	28.77																														
Aug	07-Aug-18	7.35	223	4.67	504	326	9.5	9.5	29.13																														
Aug	08-Aug-18	7.43	240.5	5.01	385	192	8.3	12.4	29.09	6.8	>160000	5	0.315	<3.1	18																								
Aug	09-Aug-18	7.4	244.6	5.8	364	176	19.1	17.6	29.36																														
Aug	10-Aug-18	7.4	255.1	3.1	428	214	13.3	16.2	28.97																														
Aug	11-Aug-18	7.19	234.8	5.59	467	234	8.5		29.34																														
Aug	12-Aug-18	7.27	274.9	4.86	454	227	16.5		28.9																														
Aug	13-Aug-18	7.25	200.9	4.43	405	201	17	15	28.86																														
Aug	14-Aug-18	7.53	236.1	6.56	621	202	17.1	43	29.2																														
Aug	15-Aug-18	7.42	279.4	4.43	492	246	6.7	21	29.43	4.37	>160000	9	0.13	<3.1	10																								
Aug	16-Aug-18	7.31	218.4	6.15	471	236	14.9	25	29.25																														
Aug	17-Aug-18	6.95	430.6	6.19	740	370	23.2	52	29.17																														
Aug	18-Aug-18	7.27	400.3	4.24	591	295	7.1		29.45																														
Aug	19-Aug-18	7.34	370.4	4.14	507	253	10.1		29.23																														
Aug	20-Aug-18	7.32	326.9	6.64	368	184	66.1	55	28.13																														
Aug	21-Aug-18	7.51	277.4	4.86	497	248	8.8	29	29.42	2.76	>160000	7	0.52	<3.1	24																								
Aug	22-Aug-18	7.34	284.3	4.33	516	257	18.9		29.18																														
Aug	23-Aug-18	7.43	308.3	5.94	576	288	11.1	22	29.1																														
Aug	24-Aug-18	7.47	307.4	6.87	622	311	22	26	29.06																														
Aug	25-Aug-18	7.42	306.2	4.89	489	321	23.2		29.13																														
Aug	26-Aug-18	7.23	446	3.59	479	238	12		28.99																														
Aug	27-Aug-18	7.25	314.6	5.5	404	202	21.4	4.9	28.7																														
Aug	28-Aug-18	6.98	310.1	6.56	505	253	14.6	9	29																														
Aug	29-Aug-18	7.34	326.9	6.54	398	185	12.1	27	28.76	10.99	>160000	12	3.27	<3.1	36																								
Aug	30-Aug-18	7.36	422.9	5.9	591	259	19.2	20.7	29.03																														
Aug	31-Aug-18	7.43	325.2	5.31	513	256	23.7	9.8	29.15																														
Sep	01-Sep-18	7.25	299.2	4.17	433	216	11.2	-	29.12																														
Sep	02-Sep-18	7.14	356.3	4.3	518	258	15	-	29.06																														
Sep	03-Sep-18	7.15	370.9	5.25	521	260	23.9	31	29.09																														
Sep	04-Sep-18	7.41	378.1	6.34	430	215	25.4	10.6	29.07																														
Sep	05-Sep-18	7.49	317.3	5.7	455	218	21.3	11.3	29.13	6.48	>160000	9	0.5	<3.1	14	<0.002	≤0.002	≤0.01	≤0.002	≤0.002	≤0.01	≤0.002	3.14	1.4	≤0.002	≤0.002	0.018	0.012	0.017	<0.1	0.036	≤0.002	2	5.11	<0.05	0.528	0.1	<0.002
Sep	06-Sep-18	7.2	389	6.55	373	186	27.2	11.4	28.76																														
Sep	07-Sep-18	7.42	395.1	5.9	501	250	24.4	16.2	29.05																														
Sep	08-Sep-18	7.45	298.3	5.12	497	248	21.2	-	29.09																														
Sep	09-Sep-18	7.49	266.6	4.99	486	243	14.3	-	29.16																														
Sep	10-Sep-18	7.45	449.3	5.22	499	251	18.1	21.8	28.93																														
Sep	11-Sep-18	7.23	301.6	3.61	625	313	49.2	23	29.38																														
Sep	12-Sep-18	7.45	204.9	4.8	525	263	13	16	29.55	6.91	>160000	11	0.85	<3.1	10																								
Sep	13-Sep-18	7.38	350	4.21	498	249	15.2	17.2	29.98																														
Sep	14-Sep-18	7.35	547.6	5.68	824	412	20.8	24.3	29.71																														
Sep	15-Sep-18	7.41	278	7.85	441	220	24	-	29.55																														
Sep	16-Sep-18	7.26	221.3	8.14	609	305	85.6	-	29.36																														
Sep	17-Sep-18	7.21	207	9.61	464	232	38.5	72	29.12																														
Sep	18-Sep-18	6.9	315.9	9.49	1288	644	7.6	38	29.47																														
Sep	19-Sep-18	7.42	227	9.83	501	251	22.9	41	29.19	14.6	>160000	11	0.84	<3.1	32																								
Sep	20-Sep-18	7.33	159.8	10.21	721	360	24.1	31	29.26																														
Sep	21-Sep-18	7.22	189.9	12.06	611	306	31.3	35	29.66																														
Sep	22-Sep-18	7.36	223.9	10.33	618	307	6.7	-	29.79																														
Sep	23-Sep-18	6.28	193.5	10.41	729	365	4.5	-	29.47																														
Sep	24-Sep-18	7.29	223.8	12.01	492	246	11.9	44	29.36																														
Sep	25-Sep-18	7.35	212.6	9.92	503	252	9.7	29	30.12																														
Sep	26-Sep-18	7.48	153.8	8.73	566	283	15.6	17	30.18	5.24	>160000	4	0.486	<3.1	10																								
Sep	27-Sep-18	7.55	220	10.75	596	297	13.5	49	30.22																														
Sep	28-Sep-18	7.45	211.5	9.03	575	288	11.8	38	30.21																														
Sep	29-Sep-18	7.4	194.3	13.07	718	358	7.4	-	30.18																														
Sep	30-Sep-18	7.23	247.4	9.12	672	336	8.7	-	30.17																														

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

Monitoring Parameters Result for STP(Phase-1)

Month	Date	Outlet																																							
		pH	ORP	DO	EC	TDS	Turbidity	COD	Temp	BOD	T-Coli	T-N	T-P	O&G	SS	Cyanide	Chromium	Arsenic	Mercury	Cadmium	Selenium	Lead	Color	Odor	Zinc	Copper	Barium	Nickel	Sulphide	Free Chlorine	Formal-dehyde	Silver	Iron	Ammonia	Hexavalent Chromium(Cr6+)	Fluoride	Total Chlorine	Phenols
		Daily Parameters								Weekly Parameters						Monthly Parameters																									
Standard		6 ~ 9	-	-	-	Max 2,000	-	Max 125	Max 38	Max 30	Max 400	Max 60	Max 4	Max 10	Max 50	Max 0.1	Max 0.5	Max 0.1	Max 0.005	Max 0.03	Max 0.02	Max 0.1	Max 150	Max 150	Max 2	Max 0.5	Max 1	Max 0.2	Max 1	Max 0.5	Max 1	Max 1	Max 0.5	Max 3.5	Max 10	Max 0.1	Max 35	Max 0.2	Max 0.5
Unit		-	mv	mg/L	µs/cm	ppm	FNU	ppm	°C	ppm	MNP/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
Apr	01-Apr-18	6.84	340.5	5.19	803	401	11.9		29.71																															
Apr	02-Apr-18	6.85	387.9	5.55	776	388	18.5	6.7	29.87																															
Apr	03-Apr-18	6.42	394.6	5.54	812	376	17.6	20.4	29.67																															
Apr	04-Apr-18	6.9	388.8	4.81	792	396	15.6	18.1	30.11	5.4	4.5	12.6	1.32	<3.1	14																							0.1	
Apr	05-Apr-18							17.2																															
Apr	06-Apr-18	6.89	388.5	4.93	791	396	16.6	19.4	30.17																															
Apr	07-Apr-18	6.42	396.6	5.56	816	381	17.6		29.69																															
Apr	08-Apr-18	6.98	224.7	4.02	743	371	42.9		29.97																															
Apr	09-Apr-18	6.99	352.1	5.17	741	371	22.5	7.8	29.6																															
Apr	10-Apr-18	6.66	361.7	4.8	866	433	42.6	11.4	29.75	0	70	12.4	0.685	<3.1	12																							0.1	
Apr	11-Apr-18	6.97	256.5	4.92	813	407	18	7.1	29.97																															
Apr	12-Apr-18	6.61	372.3	4.32	815	408	10	8.1	30.24																															
Apr	13-Apr-18	6.5	382.2	4.68	808	404	9.7		30.42																															
Apr	14-Apr-18	6.78	366.2	4.36	807	436	22.9		30.68																															
Apr	15-Apr-18	6.66	364.4	4.8	869	436	426		29.76																															
Apr	16-Apr-18	6.73	390.2	3.97	810	405	7.7		30.64																															
Apr	17-Apr-18	6.91	373.6	4.29	756	379	50.2		30.71																															
Apr	18-Apr-18	7	346.8	4.09	674	337	32.2	8.6	30.47	3.8	49	11.5	0.786	<3.1	14																							0.1	
Apr	19-Apr-18	6.66	365.2	4.37	806	4.38	42.6	9	30.64																															
Apr	20-Apr-18	6.79	366.3	4.7	809	435	42	11	30.69																															
Apr	21-Apr-18	7	343.4	4.06	777	388	35.5		30.29																															
Apr	22-Apr-18	6.95	338.7	4.58	789	394	64.9		30.74																															
Apr	23-Apr-18	6.66	369.1	4.38	809	438	42.6	6.7	30.72																															
Apr	24-Apr-18	6.91	363	3.94	818	410	32.1	7.5	30.83																															
Apr	25-Apr-18	6.94	246.9	4.44	880	440	18	6.8	30.89	3.3	>201	11.5	0.357	<3.1	2																							0.1	
Apr	26-Apr-18	7.23	334.2	4.51	883	442	16.4	12.5	30.91																															
Apr	27-Apr-18	6.66	364.4	4.8	853	426	42.6	11.4	29.64																															
Apr	28-Apr-18	6.72	348.9	4.99	761	458	32.7		29.98																															
Apr	29-Apr-18	6.28	352	4.92	922	461	63.3		30.73																															
Apr	30-Apr-18	7.12	352.4	4.49	964	482	8.1	5	30.92																															
May	01-May-18	7.06	208.3	3.25	908	496	4.5		30.26																															
May	02-May-18	6.98	360.6	4.48	940	470	23.3	8.2	30.57	3.57	>201	9.4	0.37	<3.1	4	<0.002	≤0.002	<0.01	≤0.002	≤0.001	≤0.01	≤0.002	7.56	2	≤0.002	≤0.002	0.026	0.012	0.015	<0.1	<0.003	≤0.002	0.494	0.03	<0.05	2.602	0.1	<0.002
May	03-May-18	6.99	366	4.37	845	423	7.4	5.4	30.12																															
May	04-May-18	7.12	367.1	4.41	861	431	3.9	5.3	30.24																															
May	05-May-18	6.66	360.5	4.52	996	462	12.3		30.59																															
May	06-May-18	7.08	359.2	3.47	880	440	2.3		30.34																															
May	07-May-18	7.44	335.4	2.95	1364	682	11.9	4.7	30.91	Stoped STP phase-1 soon after taking sample for tank cleaning.																															
May	08-May-18	7.14	265.2	3.76	879	439	11.6		31.25																															
May	09-May-18	7.06	289	1.85	976	490	15.4		30.29																															
May	10-May-18	6.97	327.3	2.86	937	471	11.5		30.49																															
May	11-May-18	6.83	279.6	3.43	845	424	4.5		31																															
May	12-May-18																																							
May	13-May-18	7.06	263.3	3.25	860	430	4.5		30.29																															
May	14-May-18	7.29	259.7	2.43	871	422	11.4		31.56																															
May	15-May-18	7.17	211	3.32	873	437	3.3		30.68																															
May	16-May-18	7.29	272.6	3.13	876	442	2.9		30.84																															
May	17-May-18	7.29	264.3	3.26	869	4.36	4.6		30.34																															
May	18-May-18	6.8	308.2	3.98	886	443	3.4		31.77																															
May	19-May-18	7.3	274.6	4.52	869	435	5.3		31.36																															
May	20-May-18	7.39	185.8	4.13	872	437	4.9		31.26																															
May	21-May-18	7.14	205.1	3.32	877	439	4.8		31.57																															
May	22-May-18	7.26	211.6	3.8	874	468	4.6		37.07																															
May	23-May-18	7.89	211.3	3.97	848	424	5.5		31.47																															
May	24-May-18	7.47	211.7	4.32	862	432	4.4		31.84																															
May	25-May-18	7.3	211.75	3.76	379	456	4.5		31.36																															
May	26-May-18	7.26	201.8	3.75	862	479	4.2		31.17																															
May	27-May-18	7.46	235	3.45	851	426	5.3		30.8																															
May	28-May-18	7.5	270.5	4.35	978	485	11.8		31.58																															
May	29-May-18	7.59	231.6	3.08	760	360	2.8		28.66																															
May	30-May-18	7.86	274.3	4.53	879	465	11.5		31.66																															
May	31-May-18	7.46	235	3.45	851	426	5.3		30.8																															
Jun	01-Jun-18	7.21	328.1	51.4	739	370	2.6	6.6	28.69	STP (Phase -1) started operation in 1 June 2018.																															
Jun	02-Jun-18	7.42	330.7	3.71	721	360	4.6		29.18																															
Jun	03-Jun-18	7.23	309.4	3.03	767	384	2.7		29.7																															
Jun	04-Jun-18	7.37	299.5	2.97	884	442	4.6	10.7	29.9																															
Jun	05-Jun-18	7.95	309	3.09	649	328	18.5	9.2	30.22																															
Jun	06-Jun-18	7.23	306.4	3.03	796	368	4.6	6.4	30.2	1.97	<1.8	10.4	0.19	<3.1	2	0.002	≤0.002	≤0.01	≤0.002	≤0.001	≤0.01	≤0.002	2.93	1.4	≤0.002	≤0.002	0.03	0.016	< 0.005	0.1	< 0.003	≤0.002	0.6	< 0.020	< 0.05	2.804	0.3	0.032
Jun	07-Jun-18	7.34	304.8	3.06	812	936	401	6.4	30.28																															
Jun	08-Jun-18	7.3	236.5	2.71	707	354	29.5	8.6	20.57																															
Jun	09-Jun-18	7.38	270.5	2.98	760	379	3.3		29.54																															
Jun	10-Jun-18	7.42	330.6	3.04	736	376	4.6		29.56																															
Jun	11-Jun-18	7.37	303.9	3.09	714	369	2.7	6.7	29.69																															
Jun	12-Jun-18	7.43	301.7	3.32	835	417	43.4	9.2	28.91																															
Jun	13-Jun-18	7.36	347.5	2.64	787	391	4.4	3.9	29.16	2.41	<1.8	9.7	0.154	<3.1	2																							0.1	
Jun	14-Jun-18	7.52	324.2	3.02	786	368	3.9	3.7	29.18																															
Jun	15-Jun-18	7.38	309.4	3.76	761	354	2.6	4	30.2																															
Jun	16-Jun-18	7.46	292.4	3.2	574	287	4.1		76.09																															
Jun	17-Jun-18	STP Phase - 1 outlet flow cleaning																																						
Jun	18-Jun-18	7.34	289.5	3.32	676	382	3.6	4.7	29.16																															
Jun	19-Jun-18	7.39	303.7	2.98	704	379	3.3	6.5	29.69																															
Jun	20-Jun-18							8.2		2.4	4800	6.9	0.146	<3.1	4																							0.1	
Jun	21-Jun-18	7.29	409.8	5.9	772	384	5.1	7	29.66																															
Jun	22-Jun-18	7.3	312.4	6.37	822	407	2.2	7.5	29.42																															
Jun	23-Jun-18	7.4	230.8	5.69	737	369	1.2		29.6																															
Jun	24-Jun-18	7.12	236.9	4.21	645	321	50.1		29.57																															
Jun	25-Jun-18	7.4	380.5	5.51	836	413	0.8	4.2	29.11																															
Jun	26-Jun-18	7.42	289.6	4.22	675	389	1.3	4.2	29.6																															
Jun	27-Jun-18	7.29	301.8	3.28	653	330	2.2	3.7	29.56	1.43	<1.8	7.9	0.099	<3.1	2																							0.2	
Jun	28-Jun-18	7.34	301.8	6.97	506	253	3.5	5.2	28.57																															
Jun	29-Jun-18	7.51	296.8	6.19	493	246	0.9	5	28.96																															
Jun	30-Jun-18	7.26	302.6	4.7	594	324	1.2		29.11																															
July	01-Jul-18	7.65	314.6	6.04	530	265	1.1		29.99																															
July	02-Jul-18	7.46	281.3	6.63	518	259	4.8	4.9	29.37																															
July	03-Jul-18	7.39	327.2	6.71	604	302	1.8	5.1	29.66																															
July	04-Jul-18	7.46	324.2	6.65	612	295	2.6	5.4	30.12	0.94	<1.8	8.1	0.088	<3.1	2																							0.5	
July	05-Jul-18	7.58	301.4	6.52	611	284	2.4	4.3	29.68																															
July	06-Jul-18							12.4																															
July	07-Jul-18	7.34	313.2	6.25	698	358	4.3		29																															
July	08-Jul-18	7.46	286.3	6.36	656	298	2.6		29.86																															
July	09-Jul-18	7.62	271.4	6.29	601	283	2.4	6.5	29.68																															
July	10-Jul-18	6.59	321.2	7.37	507	412	3.1	4.3	29.79																															
July	11-Jul-18	7.6	330.8	6.1	665	327	2.4	6.5	28.57	0.83	22000	7.2	0.115	<3.1	2	<0.002	≤0.01	≤0.01	≤0.00054	≤0.005	≤0.01	0.01	7.1	1	≤0.005	≤0.005	≤0.001	≤0.005	0.002	0.1	0.015	≤0.01	≤0.005	<0.020	<0.05	1.442	0.1	<0.002
July	12-Jul-18	7.95	266.5	6.31	626	312	11.7	6.5	28.67																															
July	13-Jul-18	7.72	273.4	6.23	654	349	2.4	5.1	29.28																															
July	14-Jul-18	8.16	277.4	7.48	696	348	14.1		28.75																															
July	15-Jul-18	7.29	530.8	6.27	820	407	2.2		28.69																															
July	16-Jul-18	7.1	303.2	5.31	736	362	3.9	4.5	28.57																															
July	17-Jul-18	7.18	324.4	6.56	596	367	2.4	5.3	28.68	0.83	<1.8	4.7	0.117	<3.1	2																							0.2	
July	18-Jul-18	7.51	412.1	5.48	638	319	1.9	4	28.75																															
July	19-Jul-18	7.54	363.6	6.53	542	272	1.1		28.24																															
July	20-Jul-18	7.56	398.5	5.96	548	324	1.5	3.8	28.26																															
July	21-Jul-18	7.39	277.3	6.31	625	327	2.4		29.79																															
July	22-Jul-18	7.59	518.8	6.59	685	343	1.8		28.45																															
July	23-Jul-18	7.68	370.9	6.95	694	345	3.6	5.1	28.73																															
July	24-Jul-18	7.41	331.2	5.37	587	291	2.8	4.4	28.62	0	<1.8	4.7	<0.050	<3.1	4																							0.8	
July	25-Jul-18	7.34	339.8	6.31	624	307	2.4	3	28.57																															
July	26-Jul-18	7.52	328.1	7.42	634	317	1.1	3.9	28.65																															
July	27-Jul-18	7.45	410.1	5.66	605	301	1.6		28.57																															
July	28-Jul-18	7.58	340.7	5.92	601	329	1.9		29.71																															
July	29-Jul-18	7.29	324.6	5.96	638	310	2.4		29.79																															
July	30-Jul-18	7.51	336.2	7	582	291	1.3	4	28.12																															

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

Standard		6 ~ 9	-	-	-	Max 2,000	-	Max 125	Max 35	Max 30	Max 400	Max 60	Max 2	Max 10	Max 50	Max 0.1	Max 0.5	Max 0.1	Max 0.005	Max 0.03	Max 0.02	Max 0.1	Max 150	Max 150	Max 2	Max 0.5	Max 1	Max 0.2	Max 1	Max 1	Max 1	Max0.5	Max3.5	Max10	Max0.1	Max20	Max0.2	Max 0.5
	Unit	-	mv	mg/L	µs/cm	ppm	FNU	ppm	°C	ppm	MNP/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
July	31-Jul-18	7.72	270.7	5.76	509	285	1	1.4	28.19																													
Aug	01-Aug-18	7.58	261.3	7.18	613	289	2.4	2.3	28.25	1.07	<1.8	5.8	0.168	<3.1	2	< 0.002	≤0.01	≤0.01	≤0.002	≤0.005	≤0.01	≤0.005	0	1	≤0.005	≤0.005	0.04	≤0.005	<0.005	0.4	0.003	≤0.01	0.18	< 0.020	< 0.05	0.954	0.5	0.005
Aug	02-Aug-18	7.52	273.3	7.32	502	251	1.1	3.4	28.1																													
Aug	03-Aug-18	7.73	221.1	7.36	536	265	6.2	5.7	28																													
Aug	04-Aug-18	7.65	224.1	6.75	560	279	31.5		28.55																													
Aug	05-Aug-18	7.5	256.2	6.38	524	262	1.8		28.49																													
Aug	06-Aug-18	7.59	232.9	6.06	504	252	12.2	11	28.4																													
Aug	07-Aug-18	7.48	244	7.36	494	247	2.1	4.9	28.84																													
Aug	08-Aug-18	7.53	245.7	7.18	453	227	5.3	6.1	28.66	3.2	<1.8	8	0.067	<3.1	2																							
Aug	09-Aug-18	7.56	286.2	6.36	596	262	31.5	6.1	28.46																													
Aug	10-Aug-18	7.5	258	6.44	443	222	38	4.5	28.39																													
Aug	11-Aug-18	7.44	247.8	7.13	460	230	42.9		28.23																													
Aug	12-Aug-18	7.49	245.6	5.96	492	246	76.9		28.82																													
Aug	13-Aug-18	7.5	240	6.82	487	244	51.3	3.4	28.63																													
Aug	14-Aug-18	7.64	238.1	6.49	416	205	10.8	5	29.28																													
Aug	15-Aug-18	7.42	276.8	6.17	553	276	3.9	2	28.67	1.6	<1.8	7	0.09	<3.1	2																							
Aug	16-Aug-18	7.53	237.3	7.06	586	293	54.6	10.4	28.66																													
Aug	17-Aug-18	7.4	360.5	6.15	489	244	97.3	4.5	28.79																													
Aug	18-Aug-18	7.23	430.1	5.68	516	256	13		28.94																													
Aug	19-Aug-18	7.4	377.9	6.01	568	284	5.5		28.73																													
Aug	20-Aug-18	7.34	322.8	5.81	565	283	1.9	3.7	28.72																													
Aug	21-Aug-18	7.64	274.3	5.86	594	275	13.9	3.3	28.88	1.6	<1.8	6	0.17	<3.1	2																							
Aug	22-Aug-18	7.42	286.4	6.53	612	269	12.8		28.46																													
Aug	23-Aug-18	7.25	319.1	6.76	577	289	20.1	2.3	29.02																													
Aug	24-Aug-18	7.26	297	5.69	507	254	34.2	5.1	29.37																													
Aug	25-Aug-18	7.4	369.5	6.16	598	268	30.1		29.49																													
Aug	26-Aug-18	7.55	418.4	5.28	583	291	32.5		28.64																													
Aug	27-Aug-18	7.57	307.8	6.87	565	283	3.9	5.6	28.21																													
Aug	28-Aug-18	7.2	324.3	6.93	539	268	6.5	6.2	28.29																													
Aug	29-Aug-18	7.34	322.8	5.84	598	227	5.3	4.1	28.84	0.17	<1.8	8	0.13	<3.1	2																							
Aug	30-Aug-18	7.34	470.6	6.07	627	315	23.6	6.8	28.71																													
Aug	31-Aug-18	7.52	335.4	6.18	608	304	86	3.5	28.88																													
Sep	01-Sep-18	7.51	304.9	6.84	538	269	84.4	-	28.84																													
Sep	02-Sep-18	7.41	318.7	5.99	581	290	32	-	28.69																													
Sep	03-Sep-18	7.49	338	6.72	533	266	6.4	3.8	28.76																													
Sep	04-Sep-18	7.62	361.4	7.49	495	247	27.6	4.3	28.71																													
Sep	05-Sep-18	7.38	332.4	6.62	480	240	52.4	5.4	28.33	0.15	<1.8	11	0.289	<3.1	6	0.002	≤0.002	≤0.01	≤0.002	≤0.002	≤0.01	≤0.002	1.26	1	≤0.002	≤0.002	0.008	0.008	0.005	0.8	0.02	≤0.002	0.508	0.24	<0.05	1.472	1.2	<0.002
Sep	06-Sep-18	7.51	349.5	6.6	476	238	23	4.3	28.51																													
Sep	07-Sep-18	7.46	367.7	6.25	456	228	25.2	5.4	28.56																													
Sep	08-Sep-18	7.49	323.2	6.29	451	231	28.3	-	29.13																													
Sep	09-Sep-18	7.57	271.9	6.82	490	245	92.3	-	29.19																													
Sep	10-Sep-18	7.59	456.1	7.26	522	261	18.1	2.9	29.15																													
Sep	11-Sep-18	7.59	448.2	3.97	531	266	26.9	9.5	29.24																													
Sep	12-Sep-18	7.89	208.7	2.68	527	280	16.4	4.5	29.68	4.53	>5000	7	0.172	<3.1	2																							
Sep	13-Sep-18	7.42	365.2	5.44	507	254	87.5	2.7	29.43																													
Sep	14-Sep-18	7.62	413	7.3	556	278	11.4	4.9	29.58																													
Sep	15-Sep-18	7.55	298.8	9.49	598	298	15.2	-	29.44																													
Sep	16-Sep-18	7.24	217.7	6.77	461	230	13.6	-	29.72																													
Sep	17-Sep-18	7.34	242.3	10.99	562	281	16.8	2.4	29.16																													
Sep	18-Sep-18	7.52	337.1	13.14	578	289	70.6	4.3	29.46																													
Sep	19-Sep-18	7.45	247	15.12	678	314	1.9	2.6	29.02	3	<1.8	10	0.158	<3.1	2																							
Sep	20-Sep-18	7.49	245.1	14.45	686	343	32.5	3.8	28.77																													
Sep	21-Sep-18	7.44	238.3	13.82	620	310	0.6	4.1	28.98																													
Sep	22-Sep-18	7.62	171.4	15.04	704	352	0.4	-	29.85																													
Sep	23-Sep-18	7.23	239	16.18	695	348	0.5	-	29.49																													
Sep	24-Sep-18	7.45	226.8	14.02	721	361	0.8	3.5	29.75																													
Sep	25-Sep-18	7.46	239.7	14.47	738	369	1.5	4.3	29.9																													
Sep	26-Sep-18	7.44	209.8	14.53	735	368	0.5	3.3	29.95	3.05	<1.8	7	0.147	<3.1	2																							
Sep	27-Sep-18	7.57	231.5	13.05	752	376	9.3	1.5	30.27																													
Sep	28-Sep-18	7.55	219.8	14.09	775	388	9.4	6.4	30.39																													
Sep	29-Sep-18	7.65	203.8	14.38	749	374	3.6	-	30.61																													
Sep	30-Sep-18	7.21	279.6	13.69	738	369	6.1	-	30.31																													

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

GTUM

Monitoring Parameters Result for STP(Phase-2)

Month	Date	Inlet																																				
		pH	ORP	DO	EC	TDS	Turbidity	COD	Temp	BOD	T-Coli	T-N	T-P	O&G	SS	Cyanide	Chromium	Arsenic	Mercury	Cadmium	Selenium	Lead	Color	Odor	Zinc	Copper	Barium	Nickel	Sulphide	Free Chlorine	Formal-dehyde	Silver	Iron	Ammonia	Hexavalent Chromium (Cr6+)	Fluoride	Total Chlorine	Phenols
		Daily Parameters								Weekly Parameters						Monthly Parameters																								
Standard		6 ~ 9	-	-	-	Max 2,000	-	Max 400	Max 35 °C	Max 200	-	Max 80	Max8	Max 40	Max 200	Max 0.1	Max 0.5	Max 0.1	Max 0.005	Max 0.03	Max 0.02	Max 0.1	150	150	Max 2	Max 0.5	Max 1	Max 0.2	Max 1	Max 1	Max 1	Max0.5	Max3.5	Max50	Max0.1	Max20	Max0.2	Max 0.5
Unit		-	mv	mg/L	µs/cm	ppm	FNU	ppm	°C	ppm	MPN/100ml	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	Co-Pt	Co-Pt	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Apr	01-Apr-18	7.16	360.8	2.89	699	349	12.9		28.89																													
Apr	02-Apr-18	7.14	364.4	3.27	773	331	15.4		29.07																													
Apr	03-Apr-18	7.22	351.3	2.29	685	411	16.1		29.12																													
Apr	04-Apr-18	7.4	312.6	1.66	594	297	30		29.54																													
Apr	05-Apr-18	7.47	262.3	3.61	582	291	14.6		29.74																													
Apr	06-Apr-18	7.13	363.6	2.39	891	446	24		29.57																													
Apr	07-Apr-18	7.4	312.8	1.69	658	299	32		29.54																													
Apr	08-Apr-18	6.89	249.5	2.11	743	371	13.4		29.16																													
Apr	09-Apr-18	7.12	325.4	2.74	727	363	12.2		28.57																													
Apr	10-Apr-18	6.95	343.2	2.34	773	387	54.2		29.16																													
Apr	11-Apr-18	6.95	223.5	2.94	567	283	8.4		29.41																													
Apr	12-Apr-18	7.32	294.2	1.95	583	319	7.2		29.31																													
Apr	13-Apr-18	7.07	289.4	1.39	806	403	8.3		29.23																													
Apr	14-Apr-18	6.96	342.5	2.24	736	368	5.3		29.19																													
Apr	15-Apr-18	7.32	286.2	1.69	700	396	7.3		29.31																													
Apr	16-Apr-18	6.97	358.6	1.98	552	276	17.7		29.07																													
Apr	17-Apr-18	6.99	352.9	2.89	504	252	28		29.13																													
Apr	18-Apr-18	7.01	346.8	2.35	475	237	13.4		29.15																													
Apr	19-Apr-18	7.3	282.2	1.64	786	376	6.3		29.31																													
Apr	20-Apr-18	7.41	326.5	2.25	619	281	7.2		29.24																													
Apr	21-Apr-18	7.09	316.2	2.66	647	323	6.1		29.65																													
Apr	22-Apr-18	7.06	327.5	2.42	819	410	9.3		29.64																													
Apr	23-Apr-18	7.69	326.6	2.42	786	323	6.3		29.31																													
Apr	24-Apr-18	6.48	225.8	1.8	741	370	4.5		29.83																													
Apr	25-Apr-18	7.25	282.5	4.18	700	350	4.1		30.56																													
Apr	26-Apr-18	7.3	297.2	3.67	796	400	36.8		31.25	STP (Phase -2) started operation in 26 Apr 2018.																													
Apr	27-Apr-18	7.32	286.6	2.25	756	369	5.3	30	29.2																													
Apr	28-Apr-18	6.93	326.1	2.42	614	340	6.1		29.48																													
Apr	29-Apr-18	7.14	320.3	3.13	1353	677	17		30.44																													
Apr	30-Apr-18	7.08	338.4	2.06	1170	585	14.8	57	30.18																													
May	01-May-18	7.33	289	3.79	996	586	31.6		30.79																													
May	02-May-18	7.03	345.6	1.97	813	407	10	33	29.75	12.4	>160000	7.9	1.08	3.2	32	0.017	≤0.002	≤0.01	≤0.002	≤0.001	≤0.01	≤0.002	16.29	1	≤0.002	≤0.002	0.018	0.01	0.088	<0.1	0.065	≤0.002	4.214	9.89	<0.05	0.774	0.1	<0.002
May	03-May-18	6.75	353	4.19	978	489	10.8	67	30.83																													
May	04-May-18	7.2	334.7	3.44	579	289	10	29	31.5																													
May	05-May-18	7.06	352.5	2.38	6.89	464	10.5		30.78																													
May	06-May-18	7.58	326.6	2.24	1172	586	24.7		30.76																													
May	07-May-18	7.19	366.4	4.61	882	441	2.3	53	30.92																													
May	08-May-18	6.91	269	2.87	692	346	10.3	66	31.21																													
May	09-May-18	7.33	269	3.9	991	500	31.6	46	30.8	11.3	24000	14.1	0.165	3.6	12																						0.1	
May	10-May-18	6.99	339.1	2.34	816	455	10.5	53	30.74																													
May	11-May-18	6.69	262.3	2.79	515	258	18	33	31.4																													
May	12-May-18																																					
May	13-May-18	6.59	268	2.34	905	382	10.8		31.23																													
May	14-May-18	6.67	275.2	2.24	853	411	10.3	50	31.82																													
May	15-May-18	6.68	272.8	2.84	464	232	33.2	54	31.41																													
May	16-May-18	6.88	263.7	2.74	1359	675	54.1	148	31.21	48.9	>160000	17.2	1.45	8.33	32																						0.1	
May	17-May-18	6.89	276.2	2.36	996	568	32.1	75	31.8																													
May	18-May-18	6.55	177.6	2.69	788	354	11	112	31.51																													
May	19-May-18	7.16	191.3	3.32	622	311	24		31.52																													
May	20-May-18	7.00	216.3	2.56	706	352	31.5		31.66																													
May	21-May-18	7.33	168.3	3.41	706	352	33.3	56	31.62																													
May	22-May-18	7.03	231.6	3.72	914	386	35.1	37	31.05																													
May	23-May-18	7.53	218.2	3.05	578	289	46.3	83	31.24	26.1	>160000	27	2.26	7.44	10																						0.1	
May	24-May-18	7.24	241.2	2.79	847	368	55.1	95	31.68																													
May	25-May-18	7.32	253.7	2.82	468	246	32.1	43	31.21																													
May	26-May-18	7.16	265.2	3.61	908	316	11		31.8																													
May	27-May-18	8.2	215.9	2.63	1015	508	63.5		31.1																													
May	28-May-18	8.25	276.8	3.75	1116	685	65.5	20.7	31.7																													
May	29-May-18	7.39	196.2	2.83	393	197	66.1	12.9	30.46																													
May	30-May-18	7.52	235.1	3.72	914	366	35.9	25	31.25	1.57	54000	6.6	0.51	3.41	22																						0.1	
May	31-May-18	7.47	248.8	2.88	903	456	30.2	110	31.88																													
Jun	01-Jun-18	7.06	242.3	3.06	591	295	131	125	30.47																													
Jun	02-Jun-18	7.28	266.2	2.19	796	398	136		30.48																													
Jun	03-Jun-18	7.12	282.4	2.71	739	370	19.4		30.3																													
Jun	04-Jun-18	7.23	300.6	2.78	650	325	25.5	77	30.36																													
Jun	05-Jun-18	7.5	382.1	2.75	944	466	30.3	46	30.74																													
Jun	06-Jun-18	7.26	296.2	2.69	986	365	26.3	87	30.58	13.74	>160000	13.9	1.12	< 3.1	20	0.003	≤0.002	≤0.01	≤0.002	≤0.001	≤0.01	≤0.002	22.01	1.4	≤0.002	≤0.002	0.02	0.008	0.036	0.1	0.08	≤0.002	3	16.2	< 0.05	1.137	0.2	0.041
Jun	07-Jun-18	7.32	306.5	2.7	1007	330	19.2	60	30.48																													
Jun	08-Jun-18	7.33	308.2	2.72	660	320	25.5	67	30.42																													
Jun	09-Jun-18	7.41	308.1	2.45	790	365	25.7		30.69																													
Jun	10-Jun-18	7.36	305.1	2.52	860	396	28.3		30.69																													
Jun	11-Jun-18	7.28	309.6	2.71	948	407	25.8	62	30.48																													
Jun	12-Jun-18	7.51	294.7	3.23	539	270	13.3	15	29.73																													
Jun	13-Jun-18	7.42	331.3	2.13	842	424	42.9	30	30.12	4.05	35000	5	0.089	< 3.1	10																						0.1	
Jun	14-Jun-18	7.44	284.5	2.52	789	379	25.4	10	30.29																													
Jun	15-Jun-18	7.73	295	2.69	636	350	25.7	12	30.48																													
Jun	16-Jun-18	7.38	298	2.68	668	334	53.8		29.77																													
Jun	17-Jun-18	7.27	350	2.71	606	302	31.8		29.84																													
Jun	18-Jun-18	7.4	293.4	2.61	633	324	25.3	27	29.44																													
Jun	19-Jun-18	7.28	309.8	2.53	539	371	25.8	44	29.48																													
Jun	20-Jun-18							40		14.43	>160000	7.7	0.454	< 3.1	14																						0.1	
Jun	21-Jun-18	7.52	357.7	4.17	839	470	16.6	36	30.08																													
Jun	22-Jun-18	7.28	290.1	2.6	896	472	28.34	64	30.46																													
Jun	23-Jun-18	7.18	248.3	6.16	699	350	78.6		29.84																													
Jun	24-Jun-18	7.56	231.5	4.12	478	470	67.5		28.3																													
Jun	25-Jun-18	7.23	319.5	6.06	463	305	47.4	32	29.79																													
Jun	26-Jun-18	7.22	294.6	4.12	448	352	47.8	25	29.28																													
Jun	27-Jun-18	7.28	309	2.5	516	309	29.6	26.5	29.48	7.27	>160000	9.4	0.487	< 3.1	120																						0.1	
Jun	28-Jun-18	7.26	29.84	5.22	525	262	38.8	15.8	29.53																													
Jun	29-Jun-18	7.24	200.1	4.47	586	293	26.5	23.4	29.76																													
Jun	30-Jun-18	7.44	224.6	3.42	544	321	34.8		29.28																													
Jul	01-Jul-18	7.39	292.2	5.71	698	349	23.4		29.85																													
Jul	02-Jul-18	5.75	354.9	6.31	895	468	23.1	23	28.81																													
Jul	03-Jul-18	4.05	516.1	5.7	1813	974	28	58	29.77																													
Jul	04-Jul-18	7.26	383.9	5.79	668	334	0.7	49	29.32	16.6	160000	17.2	1.01	< 3.1	30																						0.2	
Jul	05-Jul-18	7.18	382.8	6.23	791	419	22.1	18	29.38																													
Jul	06-Jul-18							54																													
Jul	07-Jul-18	7.33	306.2	4.24	788	399	27.8		29.68																													
Jul	08-Jul-18	7.28	386.6	5.31	798	348	28		29.32																													
Jul	09-Jul-18	7.33	364.7	5.73	780	325	23.6	36	29.38																													
Jul	10-Jul-18	8.2	512.9	7.76	990	306	27.8	39	29.9																													
Jul	11-Jul-18	7.45	331.5	3.88	491	244	55	21	28.84	10.5	>160000	6.6	0.667	< 3.1	38	<0.002	≤0.01	≤0.01	≤0.00054	≤0.005	≤0.01	0.008	11.44	1	0.012	≤0.005	≤0.001	0.014	0.038	0.1	0.061	≤0.01	1.118	8.66	<0.05	0.296	0.1	0.008
Jul	12-Jul-18	7.42	258.3	3.14	586	295	20.4	48	29.09																													
Jul	13-Jul-18	7.26	291.9	6.23	660	308	23.6	62	29.32																													
Jul	14-Jul-18	8.07	274.9	6.73	754	377	68.8		28.94																													
Jul	15-Jul-18	7.21	420.9	6.54	549	271	20.4		29.28																													
Jul	16-Jul-18	7.14	303.7	6.77	461	230	35.4	15.7	29.1																													
Jul	17-Jul-18	7.55	361.6	7.64	530	264	18.3	15.1	29.01	7.2	>160000	5.5	0.499	< 3.1	18																						0.1	
Jul	18-Jul-18	7.49	388	5.07	550	275	11.8	18.2	29.38																													
Jul	19-Jul-18	7.30	335.6	5.98	619	308	17.1		29.41																													
Jul	20-Jul-18	7.44	343.4	5.69	554	324	11.7	31	29.66																													
Jul	21-Jul-18	7.3	306.2	7.76	586	295	20.4		29.32																													
Jul	22-Jul-18	7.58	503.9	7.56	761	390	10.1		29.09																													
Jul	23-Jul-18	7.25	351.9	6.32	639	317	31.2	17	29.27																													
Jul	24-Jul-18	7.69	291	6.09	663	329	37.6	29	29.13	4.39	160000	7.3	0.062	< 3.1	50																						0.1	
Jul	25-Jul-18	7.33	296.1	6.54	668	370	20.4	21	29.26																													
Jul	26-Jul-18	7.51	329.9	6.99	687	343	11.8	11.9	29.13																													
Jul	27-Jul-18	7.54	353.3	5.63	574	284	11.6		29.42																													
Jul	28-Jul-18	7.32	368.5	5.53	564	271	11.9		28.82																													
Jul	29-Jul-18	7.49	345	7.07	569	275	11.7		29.32																													
Jul	30-Jul-18	7.49	338.3	7.86	514	257	24.3	15	28.77																													
Jul	31-Jul-18	7.54	279.7	5.55	430	214	16.5	11.6	28.31																													
Aug	01-Aug-18	7.53	261.5	9.55	506	246	10.2	3.3	29.28	6.66	>160000	9.6	1.63	<3.1	26	<0.002	≤0.01	≤0.01	≤0.002	≤0.005	≤0.01	≤0.005	4.43	1.4	0.06	≤0.005	0.062	0.075	0.011	0.1	0.045	≤0.01	4.728	9.43	<0.05	≤0.014	0.1	0.009
Aug	02-Aug-18	7.32	239	8.57	518	257	10.5	10.3	29.12																													
Aug	03-Aug-18	7.65	225.5	7.86	427	212	12.1	10.5	30.21																													
Aug	04-Aug-18	7.56	229.6	6.84	469	412	15.7		31.18																													
Aug	05-Aug-18	7.38	189.2	5.77	480	240	12.2		29.32																													
Aug	06-Aug-18	7.5	256.2	5.4	483	240	15.6	19	29.11																													
Aug	07-Aug-18	7.39	237.5	5.83	467	233	10.1	10	26.21																													
Aug	08-Aug-18	7.34	233.4	5.71	436	218	8.2	19.2	29.27	9.97	>160000	7	0.467	<3.1	20																							
Aug	09-Aug-18	7.38	186.2	5.78	464	236	12.1	8.1	29.27																													
Aug	10-Aug-18	7.49	231.4	5.21	449	225	10.2	15.8	29.16																													
Aug	11-Aug-18	7.28	248.1	5.6	374	187	7.9		29.15																													
Aug	12-Aug-18	7.29	262.2	5.65	456	228	13.5		29																													

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED ★ MJTD

Monitoring Parameters Result for STP(Phase-2)

Month	Date	Inlet																																							
		pH	ORP	DO	EC	TDS	Turbidity	COD	Temp	BOD	T-Coli	T-N	T-P	O&G	SS	Cyanide	Chromium	Arsenic	Mercury	Cadmium	Selenium	Lead	Color	Odor	Zinc	Copper	Barium	Nickel	Sulphide	Free Chlorine	Formal-dehyde	Silver	Iron	Ammonia	Hexavalent Chromium (Cr6+)	Fluoride	Total Chlorine	Phenols
		Daily Parameters								Weekly Parameters						Monthly Parameters																										
Standard		6 – 9	-	-	-	Max 2,000		Max 400	Max 35 °C	Max 200	-	Max 80	Max8	Max 40	Max 200	Max 0.1	Max 0.5	Max 0.1	Max 0.005	Max 0.03	Max 0.02	Max 0.1	150	150	Max 2	Max 0.5	Max 1	Max 0.2	Max 1	Max 1	Max 1	Max 0.5	Max3.5	Max50	Max0.1	Max20	Max 0.2	Max 0.5
Unit		-	mv	mg/L	µs/cm	ppm	FNU	ppm	°C	ppm	MPN/100ml	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	Co-Pt	Co-Pt	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Aug	13-Aug-18	7.3	233.2	5.12	429	213	11	17	29.03																															
Aug	14-Aug-18	7.46	183.7	7.66	429	243	4.4	52	28.45																															
Aug	15-Aug-18	7.33	277.7	5.79	587	283	9.4	38	29.39	6.72	>160000	8	0.09	<3.1	28																									
Aug	16-Aug-18	7.39	235.7	6.11	453	227	14	28	29.14																															
Aug	17-Aug-18	6.74	395.9	5.56	680	340	14.8	76	29.26																															
Aug	18-Aug-18	7.22	424.8	4.93	606	301	8.1		29.34																															
Aug	19-Aug-18	7.35	326.9	5.82	491	245	12.2		29.34																															
Aug	20-Aug-18	7.42	317.4	6.12	357	179	62.8	43	28.17																															
Aug	21-Aug-18	7.32	279.8	5.5	459	229	8.1	16	29.32	3.04	>160000	8	0.56	<3.1	16																									
Aug	22-Aug-18	7.35	312.7	6.52	554	184	12.8		29.22																															
Aug	23-Aug-18	7.35	315.5	5.77	650	325	11.3	-	29.08																															
Aug	24-Aug-18	7.4	309.7	7.29	552	276	1.3	38	29.1																															
Aug	25-Aug-18	7.36	316.4	6.11	368	189	8.2		29.11																															
Aug	26-Aug-18	7.38	414.5	7.27	554	564	14		29.05																															
Aug	27-Aug-18	7.33	315.7	5.26	436	218	14.2	12	28.21																															
Aug	28-Aug-18	7.21	327.4	6.45	521	260	25.5	9	29.02																															
Aug	29-Aug-18	7.39	236.7	6.11	456	226	14	15.9	29.39	9.24	>160000	10	4.98	<3.1	16																									
Aug	30-Aug-18	7.33	416.1	5.22	585	291	17.2	16.9	29.15																															
Aug	31-Aug-18	7.44	333.3	5.71	518	259	19.6	17.5	29.16																															
Sep	01-Sep-18	7.34	307.1	5.76	475	237	11.3	-	29.01																															
Sep	02-Sep-18	7.2	342.4	4.63	516	258	14.4	-	29.11																															
Sep	03-Sep-18	7.12	345.8	5.56	510	255	35.3	34.9	29.07																															
Sep	04-Sep-18	7.21	366.2	5.76	419	209	24.9	16.5	29.04																															
Sep	05-Sep-18	7.53	318.9	5.72	485	242	39.8	11.9	28.84	8.61	>160000	10	0.58	<3.1	10	<0.002	≤0.002	<0.01	≤0.002	≤0.002	≤0.01	≤0.002	1.98	1.4	≤0.002	≤0.002	0.018	0.036	0.024	0.1	0.033	≤0.002	3.4	6.98	<0.05	0.7	0.1	0.023
Sep	06-Sep-18	7.3	372.6	5.9	384	191	29.5	9.2	29.9																															
Sep	07-Sep-18	7.42	397.2	5.51	439	217	12.2	9.3	29.1																															
Sep	08-Sep-18	7.53	321.3	5.62	493	235	16.9	-	29.18																															
Sep	09-Sep-18	7.51	270.4	5.78	543	271	16.2	-	29.17																															
Sep	10-Sep-18	7.42	426.5	5.3	530	267	20.6	14.1	28.91																															
Sep	11-Sep-18	7.35	400.7	3.53	528	264	13.9	13	29.47																															
Sep	12-Sep-18	8.1	204.9	4.79	587	283	3.8	31	29.65	6.79	>160000	14	0.87	<3.1	14																									
Sep	13-Sep-18	7.35	330	4.02	443	222	12	13.3	29.87																															
Sep	14-Sep-18	7.4	454.4	6.58	548	325	19.2	37.4	29.49																															
Sep	15-Sep-18	7.31	297.6	8.14	483	242	12.6	-	29.6																															
Sep	16-Sep-18	7.45	209.8	7.87	550	275	2.9	-	29.7																															
Sep	17-Sep-18	7.27	239.1	9.73	517	258	31	13.2	29.19																															
Sep	18-Sep-18	7.29	347	10.18	466	247	12.3	39	29.58																															
Sep	19-Sep-18	7.44	250.7	9.02	436	218	24	17	29.2	10.34	>160000	8	0.84	<3.1	22																									
Sep	20-Sep-18	7.27	221.1	8.75	642	321	14.3	29	29.21																															
Sep	21-Sep-18	7.37	235.9	10.46	711	355	14.9	32	29.57																															
Sep	22-Sep-18	7.38	203.3	12.05	602	300	7.1	-	29.85																															
Sep	23-Sep-18	9.95	214.7	13.04	711	355	10.5	-	29.44																															
Sep	24-Sep-18	7.3	236.9	12.95	475	238	12.2	11.8	29.4																															
Sep	25-Sep-18	7.36	233.9	12.32	544	272	10.1	27	30.06																															
Sep	26-Sep-18	7.48	189.1	10.98	563	282	17.5	21	30.18	8.93	>160000	8	0.582	<3.1	14																									
Sep	27-Sep-18	7.45	233.2	11.75	514	257	9.6	10.3	30.18																															
Sep	28-Sep-18	7.51	219	11.08	601	300	13.4	40	30.16																															
Sep	29-Sep-18	7.47	211.2	14.09	708	354	6	-	30.35																															
Sep	30-Sep-18	7.27	268.4	11.64	617	308	10.5	-	30.15																															

Monitoring Parameters Result for STP(Phase-2)

Outlet

Daily Parameters

Month	Date	pH	ORP	DO	EC	TDS	Turbidity	COD	Temp
Standard		6 - 9	-	-	-	Max 2,000	-	Max 125	Max 35
Unit		-	mV	mg/L	µs/cm	ppm	FNU	ppm	°C
Apr	01-Apr-18	6.83	369	5.57	1103	551	2.8		28.76
Apr	02-Apr-18	6.6	341	4.97	842	432	16.3		28.16
Apr	03-Apr-18	6.76	372	5.68	925	520	9.6		28.29
Apr	04-Apr-18	6.81	383.1	4.9	1120	560	2.6		29.32
Apr	05-Apr-18	6.93	382.4	4.59	1123	562	6.2		29.46
Apr	06-Apr-18	6.89	384	5.23	1129	565	5.9		29.57
Apr	07-Apr-18	6.8	389.2	4.86	1128	546	2.6		29.32
Apr	08-Apr-18	6.9	256.9	3.87	1118	559	6.6		29.19
Apr	09-Apr-18	6.96	347.4	4.48	1117	559	5.4		29.11
Apr	10-Apr-18	6.73	361.9	4.76	1114	558	2.7		29.08
Apr	11-Apr-18	7.03	212.9	3.6	1121	561	5.4		29.39
Apr	12-Apr-18	6.73	367.4	3.46	1118	559	4.7		29.68
Apr	13-Apr-18	6.63	367.4	3.86	1124	563	4.4		29.64
Apr	14-Apr-18	6.68	363.5	3.92	1118	559	5.5		30.2
Apr	15-Apr-18	6.73	361.9	4.72	1116	568	2.7		29.06
Apr	16-Apr-18	6.72	377.5	4.16	1116	558	10.1		30.27
Apr	17-Apr-18	6.66	374.9	4.65	1110	555	12.8		30.5
Apr	18-Apr-18	6.89	351.4	3.59	1118	559	12.4		30.25
Apr	19-Apr-18	6.86	378.4	4.16	1118	558	16.1		30.26
Apr	20-Apr-18	6.87	376.5	4.71	1116	556	13.2		30.28
Apr	21-Apr-18	6.97	342.9	3.84	1100	550	7		30.17
Apr	22-Apr-18	6.87	343.2	3.86	1111	555	6.2		30.27
Apr	23-Apr-18	6.87	376.5	4.71	1116	558	13.2		30.26
Apr	24-Apr-18	6.91	231.2	3.73	1117	559	5		30.69
Apr	25-Apr-18	7.34	305.3	4	1079	539	10		30.7
Apr	26-Apr-18	7.19	324.6	3.93	1114	557	5.6		30.56
Apr	27-Apr-18	7.03	212.9	3.6	1121	561	5.4		29.39
Apr	28-Apr-18	6.61	337.8	4.25	1118	552	12.6		29.32
Apr	29-Apr-18	7.02	343.4	3.8	1022	511	6.5		30.17
Apr	30-Apr-18	7.03	351.1	3.71	1028	514	7.4	6.8	30.29
May	01-May-18	7.11	289.6	2.83	1036	516	6.8		30.3
May	02-May-18	6.89	359.4	3.65	1028	514	5.9	17.6	30
May	03-May-18	7.07	356.3	5.06	904	452	39.9	9.8	30.07
May	04-May-18	7.04	363.3	4.55	886	443	2.3	14.7	30.27
May	05-May-18	7.06	348.2	5.02	936	461	3.2		30.26
May	06-May-18	7.13	356.8	3.52	855	428	1.7		31.01
May	07-May-18	7.52	322.5	3.17	1105	553	12.9	7.7	30.68
May	08-May-18	7.11	282	3.55	984	492	84	18	31.14
May	09-May-18	7.11	290.7	2.83	1033	516	6.8	9.2	30.32
May	10-May-18	7.9	293.6	4.11	1019	482	4.6	7.4	30.28
May	11-May-18	6.73	287.4	3.3	829	415	2.4	8.9	30.73
May	12-May-18								
May	13-May-18	7.29	230.7	3.26	860	430	2.3		30.51
May	14-May-18	6.76	284.6	3.86	899	445	4.1	7.3	30.26
May	15-May-18	6.75	269	3	850	425	2	7.9	30.86
May	16-May-18	6.99	294.8	2.94	788	395	2.1	9.4	31.07
May	17-May-18	6.76	289.7	3.26	861	448	2.3	12.5	30.86
May	18-May-18	7	301.9	3.05	855	428	5	14	31.5
May	19-May-18	7.24	274.9	3.55	948	474	15.5		31.33
May	20-May-18	7.27	221.1	2.98	1014	508	5.2		31.06
May	21-May-18	7.1	249.5	2.14	1058	529	3.4	7.7	31.44
May	22-May-18	7.34	285.6	3.7	937	468	35.6	12.7	31.05
May	23-May-18	7.73	224.1	3.55	801	401	47.4	10.7	31.09
May	24-May-18	7.38	240.9	3.15	779	390	34.2	10	31.38
May	25-May-18	7.29	236.1	3.26	868	395	3.5	10.8	31.26
May	26-May-18	7.26	283.4	3.7	918	402	2.6		31.87
May	27-May-18	7.47	248.4	2.88	761	380	1.1		30.86
May	28-May-18	7.75	275.8	5.28	961	405	35.6	33.1	31.91
May	29-May-18	7.44	202.3	3.77	566	283	52.6	10.6	29.46
May	30-May-18	7.52	269.8	4.11	971	478	35.3	18.8	31.28
May	31-May-18	7.65	205.7	3.87	951	436	36.3	11.6	31.18
Jun	01-Jun-18	7.12	328.3	4.25	639	319	19.2	8.7	30.27
Jun	02-Jun-18	7.17	343.8	4.28	670	335	42.7		30.25
Jun	03-Jun-18	7.26	307.5	3.51	738	813	9.7		30.34
Jun	04-Jun-18	7.29	302.2	42.7	3.22	453	5.1	8.5	30.28
Jun	05-Jun-18	7.63	393.2	3.58	626	298	5.5	7.4	30.51
Jun	06-Jun-18	7.26	310.6	3.56	768	336	5.6	8.6	30.35
Jun	07-Jun-18	7.19	301.5	3.53	772	351	5.8	8.3	30.29
Jun	08-Jun-18	7.28	260.3	3.28	633	363	5.7	9.2	29.34
Jun	09-Jun-18	7.6	270.8	3.13	783	390	16.9		29.99
Jun	10-Jun-18	7.28	302.2	3.23	798	339	6.6		30.39
Jun	11-Jun-18	7.16	310.3	3.22	812	416	5.2	3.7	30.29
Jun	12-Jun-18	7.52	297	3.71	731	365	73.4	4.5	29.32
Jun	13-Jun-18	7.42	337.7	2.99	641	317	9.6	3.5	29.61
Jun	14-Jun-18	7.32	274.5	3.44	655	384	6.7	4.8	29.48
Jun	15-Jun-18	7.29	320.8	3.58	670	406	5.5	7.5	29.28
Jun	16-Jun-18	7.32	301	3.4	727	364	94		761.1
Jun	17-Jun-18	7.22	440.5	2.97	707	354	77.1		29.61
Jun	18-Jun-18	7.26	348.5	3.42	672	342	69.6	6.2	29.21
Jun	19-Jun-18	7.29	332.5	3.58	670	390	70.7	7.6	29.29
Jun	20-Jun-18	Meter Maintenance						5.4	
Jun	21-Jun-18	7.38	391	5.26	754	375	7.7	5.8	29.84
Jun	22-Jun-18	7.38	306.7	7.28	799	398	6.2	5.6	29.65
Jun	23-Jun-18	7.27	268.6	6.54	635	317	17.3		29.63
Jun	24-Jun-18	7.35	461.7	5.82	784	510	17.5		30.31
Jun	25-Jun-18	7.3	371	7.13	643	319	17.2	5.7	29.40
Jun	26-Jun-18	7.27	344.5	6.47	694	319	17.2	4.5	29.68
Jun	27-Jun-18	7.38	397.2	6.38	630	342	19.8	3.9	29.39
Jun	28-Jun-18	7.36	300.9	7.01	567	284	962	5.6	29.06
Jun	29-Jun-18	7.48	337.9	6.96	553	277	21	6.1	29.38
Jun	30-Jun-18	7.24	348.7	6.62	578	293	18		29.26
Jul	01-Jul-18	7.48	317.2	7.4	679	339	23.8		30.34
Jul	02-Jul-18	7.43	289.2	6.63	713	357	35.2	4.9	29.73
Jul	03-Jul-18	7.4	342.3	7.29	697	348	3.4	4.6	29.85
Jul	04-Jul-18	7.42	279.1	7.26	715	344	32.4	4.4	29.28
Jul	05-Jul-18	7.26	263.8	7.13	682	329	31.2	4.3	29.28
Jul	06-Jul-18							4.8	
Jul	07-Jul-18	7.3	325.4	6.9	905	451	11.6		29.35
Jul	08-Jul-18	7.42	289.1	7.16	868	365	26.8		29.32
Jul	09-Jul-18	7.28	291.3	7.32	837	348	19.6	6.8	29.28
Jul	10-Jul-18	8.2	287.2	8.2	785	368	18.7	3.8	30.56
Jul	11-Jul-18	7.56	338.3	7.1	650	325	25.2	5.9	28.93
Jul	12-Jul-18	7.53	268.7	6.23	599	299	75.6	8.5	28.75
Jul	13-Jul-18	7.26	279.8	7.36	610	318	32.4	8.3	28.85
Jul	14-Jul-18	7.8	276.2	6.37	562	281	27.3		29.22
Jul	15-Jul-18	7.4	475.4	7.47	680	339	21		28.97
Jul	16-Jul-18	7.25	314.3	7.32	513	256	53.3	5.6	28.7
Jul	17-Jul-18	7.43	291.4	7.16	685	309	32.6	5.4	29.28
Jul	18-Jul-18	7.53	395.9	6.99	648	324	13.2	3.6	28.97
Jul	19-Jul-18	7.56	356.7	7.59	780	389	11.1		28.91
Jul	20-Jul-18	7.47	354.6	7.62	694	338	14.2	3.5	28.84
Jul	21-Jul-18	7.25	319.2	7.13	715	325	11.6		29.28
Jul	22-Jul-18	7.49	475.5	5.68	590	295	9.8		29.26
Jul	23-Jul-18	7.61	371.6	7.23	735	365	1.2	4.1	29.23
Jul	24-Jul-18	7.81	279.5	6.88	556	276	11.1	3.6	28.74
Jul	25-Jul-18	7.56	291.3	6.37	650	281	18.7	6.2	29.32
Jul	26-Jul-18	7.6	317.3	5.33	652	326	10.9	4.6	20.48
Jul	27-Jul-18	7.45	391.7	6.97	660	329	16.9		29.2
Jul	28-Jul-18	7.51	377.9	6.12	596	326	26.7		28.73
Jul	29-Jul-18	7.67	354.6	7.18	583	335	11.6		29.28
Jul	30-Jul-18	7.39	325	7.15	497	249	16.6	2.5	28.98
Jul	31-Jul-18	7.6	277.6	7.26	504	251	1.9	2.8	28.83
Aug	01-Aug-18	7.44	256.9	7.59	510	255	1.9	2.8	28.85
Aug	02-Aug-18	7.34	213.9	7.85	550	274	9.8	3.6	28.78
Aug	03-Aug-18	7.71	220.7	6.96	533	266	16.7	6	28.54
Aug	04-Aug-18	7.41	199.5	7.14	513	257	1.2		28.72
Aug	05-Aug-18	7.59	258	7.4	454	227	3.8		28.96

STP (Phase -2) started operation in 26 Apr 2018.

Weekly Parameters

Month	Date	BOD	T-Coli	T-N	T-P	O&G	SS
Standard		Max 30	Max 400	Max 80	Max 2	Max 10	Max 50
Unit		ppm	MNP/100ml	ppm	ppm	ppm	ppm
May	03-May-18	4.85	33	12.8	0.207	<3.1	6
May	10-May-18	2.2	7.8	12	0.085	<3.1	2
May	17-May-18	0	<1.8	22	0.09	<3.1	2
May	24-May-18	0.1	33	13.1	0.21	<3.1	2
May	31-May-18	1	23	9.8	0.89	3.33	46
Jun	07-Jun-18	4.13	<1.8	9.9	0.11	<3.1	4
Jun	14-Jun-18	2.37	23	6.5	0.108	<3.1	2
Jun	21-Jun-18	0.43	<1.8	8.7	0.136	<3.1	2
Jun	28-Jun-18	1.18	<1.8	7.7	0.139	<3.1	4
Jul	05-Jul-18	1.11	<1.8	9.4	0.062	<3.1	2
Jul	12-Jul-18	1	23	7.7	0.273	<3.1	4
Jul	18-Jul-18	1	<1.8	5	0.162	<3.1	6
Jul	24-Jul-18	1.62	<1.8	4.7	0.05	<3.1	2
Aug	02-Aug-18	1.7	<1.8	6.5	0.107	<3.1	2

Monthly Parameters

Month	Date	Cyanide	Chromium	Arsenic	Mercury	Cadmium	Selenium	Lead	Color	Odor	Zinc	Copper	Barium	Nickel	Sulphide	Free Chlorine	Formal-dehyde	Silver	Iron	Ammonia	Hexavalent Chromium (Cr6+)	Fluoride	Total Chlorine	Phenols
Standard		Max 0.1	Max 0.5	Max 0.1	Max 0.005	Max 0.03	Max 0.02	Max 0.1	Max 150	Max 150	Max 2	Max 0.5	Max 1	Max 0.2	Max 1	Max 1	Max 1	Max0.5	Max3.5	Max10	Max0.1	Max20	Max0.2	Max 0.5
Unit		ppm	ppm	ppm	ppm	ppm	ppm	ppm	-	-	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
May	03-May-18	<0.002	≤0.002	≤0.01	≤0.002	≤0.001	≤0.01	≤0.002	8.02	1.4	≤0.002	≤0.002	0.014	0.008	0.007	<0.1	0.021	≤0.002	0.868	0.435	<0.05	2.154	0.1	<0.002
May	10-May-18																						0.1	
May	17-May-18																						0.1	
May	24-May-18																						0.7	
May	31-May-18																						0.2	
Jun	07-Jun-18	<0.002	≤0.002	≤0.01	≤0.002	≤0.001	≤0.01	≤0.002	5.75	1	≤0.002	≤0.002	0.01	0.008	0.007	0.1	< 0.003	≤0.002	0.84	0.069	< 0.05	2.764	0.2	0.049
Jun	14-Jun-18																						0.1	
Jun	21-Jun-18																						0.2	
Jun	28-Jun-18																						0.2	
Jul	05-Jul-18																						0.5	
Jul	12-Jul-18	<0.002	≤0.01	≤0.01	≤0.00054	≤0.005	≤0.01	≤0.005	4.3	1.4	≤0.005	≤0.005	≤0.001	≤0.005	0.023	0.1	0.04	≤0.01	0.328	<0.020	<0.05	1.088	0.1	0.007
Jul	18-Jul-18																						0.1	
Jul	24-Jul-18																						0.3	
Aug	02-Aug-18	0.002	≤0.01	≤0.01	≤0.002	≤0.005	≤0.01	≤0.005	1.04	1	≤0.005	≤0.005	0.03	≤0.005	<0.005	0.1	0.018	≤0.01	0.4	<0.02	<0.05	0.47	0.1	0.004

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

Standard		6 ~ 9	-	-	-	Max 2,000	-	Max 126	Max 35	Max 30	Max 400	Max 80	Max 2	Max 10	Max 50	Max 0.1	Max 0.5	Max 0.1	Max 0.005	Max 0.03	Max 0.02	Max 0.1	Max 150	Max 150	Max 2	Max 0.5	Max 1	Max 0.2	Max 1	Max 1	Max 1	Max 0.5	Max3.5	Max10	Max0.1	Max20	Max0.2	Max 0.5
Unit		-	mv	mg/L	µs/cm	ppm	FNU	ppm	°C	ppm	MNP/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
Aug	06-Aug-18	7.36	226.5	7.77	390	195	2.5	1	28.73																														
Aug	07-Aug-18	7.5	242.5	7.46	442	221	3.6	2.6	29.06																														
Aug	08-Aug-18	7.45	219	7.84	408	204	2.5	4.8	28.74	3.49	<1.8	6	0.065	<3.1	2																								
Aug	09-Aug-18	7.44	256	7.06	468	226	3.8	3.9	28.76																														
Aug	10-Aug-18	7.51	200.6	6.95	564	282	10.5	3.8	28.7																														
Aug	11-Aug-18	7.37	247.4	7.25	512	256	2.2	-	28.55																														
Aug	12-Aug-18	7.39	262	7.73	580	290	2.1	-	28.84																														
Aug	13-Aug-18	7.44	242.1	7.32	552	276	2.1	4.1	28.89																														
Aug	14-Aug-18	7.66	241.4	8.25	530	264	2.3	4.7	28.66																														
Aug	15-Aug-18	7.4	269.5	6.93	564	282	12.2	1.9	28.9	2.12	<1.8	7	0.08	<3.1	2																								
Aug	16-Aug-18	7.52	238.5	7.45	565	282	2.2	1.2	28.78																														
Aug	17-Aug-18	7.29	365.8	6.68	518	259	2.1	4.4	29.15																														
Aug	18-Aug-18	7.27	427.5	5.88	453	226	2.9	-	28.93																														
Aug	19-Aug-18	7.41	378.3	6.82	555	278	3.7	-	28.8																														
Aug	20-Aug-18	7.43	316.1	6.83	528	264	1.8	3.9	29.99																														
Aug	21-Aug-18	7.58	278.3	7.5	486	243	2.4	3.4	28.85	1.59	<1.8	5	0.09	<3.1	2																								
Aug	22-Aug-18	7.39	314.5	6.27	534	253	2.3	-	29.44																														
Aug	23-Aug-18	7.32	318.4	6.64	532	266	3.8	-	29.17																														
Aug	24-Aug-18	7.26	312.1	5.07	561	280	16.6	3.7	29.57																														
Aug	25-Aug-18	7.37	246.4	7.26	526	258	2.2	-	29.59																														
Aug	26-Aug-18	7.53	388.9	6.73	538	267	12.1	-	28.78																														
Aug	27-Aug-18	7.52	308.9	7.39	564	282	31.4	5.8	28.36																														
Aug	28-Aug-18	7.44	322.4	7.68	502	251	2.7	4.5	28.47																														
Aug	29-Aug-18	7.39	316.6	6.26	546	256	2.3	1.6	28.76	2.84	<1.8	8	0.09	<3.1	2																								
Aug	30-Aug-18	7.45	427.6	6.35	602	279	1.8	2.4	28.54																														
Aug	31-Aug-18	7.53	335.3	7.43	585	562	5.4	2.8	28.41																														
Sep	01-Sep-18	7.51	303.4	7.83	570	285	1.3	-	28.61																														
Sep	02-Sep-18	7.37	318.6	7.24	544	270	4.1	-	28.7																														
Sep	03-Sep-18	7.36	345.8	6.56	491	249	3.2	4.4	29																														
Sep	04-Sep-18	7.54	381	7.4	475	237	2.6	3.4	28.75																														
Sep	05-Sep-18	7.59	319.7	6.61	477	239	2.9	7.2	28.29	1.67	<1.8	12	0.145	<3.1	2	<0.002	≤0.002	≤0.01	≤0.002	≤0.002	≤0.01	≤0.002	2.24	1.4	≤0.002	≤0.002	0.004	0.014	<0.005	0.2	0.014	≤0.002	0.048	2.65	<0.05	0.814	0.2	<0.002
Sep	06-Sep-18	7.57	344.6	7.3	468	234	30.2	5.6	28.35																														
Sep	07-Sep-18	7.06	398.5	6.42	451	225	4.6	6.3	28.53																														
Sep	08-Sep-18	7.91	342.6	6.38	468	231	4.9	-	28.59																														
Sep	09-Sep-18	7.63	269.3	6.24	468	234	5.4	-	28.92																														
Sep	10-Sep-18	7.52	487	6.23	455	229	2.2	4.6	29.12																														
Sep	11-Sep-18	7.59	439.7	3.92	500	250	2.5	4.6	29.14																														
Sep	12-Sep-18	7.39	208.3	2.67	520	260	19.5	4.5	29.66	4.29	<1.8	9	0.133	<3.1	2																								
Sep	13-Sep-18	7.47	366.3	5.78	500	250	1.2	5	29.52																														
Sep	14-Sep-18	7.55	410.9	7.77	522	261	5.8	5.9	29.6																														
Sep	15-Sep-18	7.63	299.2	9.44	549	274	1.2	-	29.26																														
Sep	16-Sep-18	7.21	225.3	6.43	459	229	11.5	-	29.76																														
Sep	17-Sep-18	7.39	253.7	14.06	461	230	3.3	3.2	29.56																														
Sep	18-Sep-18	7.47	354.2	13.53	453	226	0.6	3.3	29.36																														
Sep	19-Sep-18	7.46	250.9	13.25	585	293	0.4	4	29.01	0	<1.8	10	0.134	<3.1	2																								
Sep	20-Sep-18	7.48	248.5	13.13	587	294	0.4	2.8	28.87																														
Sep	21-Sep-18	7.42	242.8	14.55	616	308	0.4	2.3	28.96																														
Sep	22-Sep-18	7.61	172.6	14.25	707	353	0.5	-	29.8																														
Sep	23-Sep-18	7.24	233	14.45	659	329	0.4	-	29.67																														
Sep	24-Sep-18	7.41	230	14.3	638	319	0.5	3.4	29.93																														
Sep	25-Sep-18	7.45	240.8	14.07	627	313	0.4	3.4	29.87																														
Sep	26-Sep-18	7.41	217.2	14.36	643	322	1.9	3.8	30.09	1.81	<1.8	5	0.137	<3.1	2																								
Sep	27-Sep-18	7.68	226.5	14.48	707	354	2.2	5.6	30.3																														
Sep	28-Sep-18	7.7	214.8	14.04	704	352	0.9	3.2	30.31																														
Sep	29-Sep-18	7.62	208.1	14.43	671	336	1	-	30.52																														
Sep	30-Sep-18	7.27	274.2	13.43	679	340	0.7	-	30.13																														

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MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED

Thilawa Special Economic Zone (Zone A)

Development Project (Operation Phase)

Appendix

Investigation of Mercury Detection in Industrial Zone of Thilawa Special Economic Zone-A Report

July, 2018

SERVICE COMPLETION REPORT

FOR

INVESTIGATION OF MERCURY DETECTION

IN

INDUSTRIAL AREA

OF

THILAWA SPECIAL ECONOMIC ZONE-A

July 2018

Myanmar Koei International Ltd.

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED
MJTD

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CHAPTER 1: INTRODUCTION

1.1 Introduction of Mercury Detection by Regular Environmental Monitoring for Zone-A Industrial Area

In order to monitor the water quality in Thilawa Special Economic Zone (SEZ) Zone-A industrial area, Myanmar Japan Thilawa Development (MJTD) have carried out regular water quality monitoring periodically. It was occurred that two out of the seven water sampling points contained mercury on June 2017 in excess amount than the target value in Thilawa SEZ Zone-A which is stipulated in MJTD's Environmental Impact Assessment (EIA).

In addition, the figures of the mercury outside of Thilawa SEZ Zone-A were and are under the value of National Environmental Quality (Emission) Guidelines (NEQG) which is guidelines of the Republic of the Union of Myanmar enacted in 29th December 2015.

MJTD reported to Thilawa SEZ Management Committee (TSMC) immediately once MJTD found the excess of the target value on 14th July 2017. And also, MJTD reported to tenant company in Thilawa SEZ Zone-A that the mercury was detect in water on 31st July 2017. Moreover, MJTD increased to 23 sampling points for additional monitoring (2 points are outside of SEZ Zone-A and 21 points are inside of SEZ Zone-A) and monitoring frequency were around once per two weeks. The monitoring results of mercury in August and September 2017 were not excess of MJTD EIA target value and much lower than the results of first-time monitoring in June 2017 when mercury level was exceeded.

Site inspections were carried out at the site of tenant companies which are along retention canal and check construction activities, operation status, waste management, chemical and material storage, pest control activities to find the possibility sources for mercury detection.

TSMC has instructed 4 tenant companies who exceed the MJTD EIA target value of mercury to analyze their drainage water 23rd August 2017. MJTD had tested the soil analysis inside Thilawa SEZ on 29th, 30th August 2017 and all samples were below the standards in ASEAN countries (Thailand and Vietnam) and Japan. Water analysis results of mercury is shown in Table 1.1-1.

Table 1.1-1 Water Analysis Results of Mercury

Sampling Date: 27th June 2017, Result Received Date: 14th July 2017				
Location		**Result (mg/l)**	**NEQG Guideline Value (0.01mg/l)**	**MJTD EIA Zone-A Target value (0.005mg/l)**
Inside Thilawa SEZ Zone-A	Retention Pond	0.006	Not Excess	Excess
	Retention Canal	0.008	Not Excess	Excess
Outside Thilawa SEZ Zone-A	Downstream of Creek	≤ 0.002	Not Excess	Not Excess

Sampling Date: 21st July 2017, Result Received Date: 28th July 2017				
Location		**Result (mg/l)**	**NEQG Guideline Value (0.01mg/l)**	**MJTD EIA Zone-A Target value (0.005mg/l)**
Inside Thilawa SEZ Zone-A	Retention Pond	0.004	Not Excess	Not Excess
	Retention Canal	0.03	Excess	Excess
Outside Thilawa SEZ Zone-A	Downstream of Creek	≤ 0.002	Not Excess	Not Excess

Sampling Date: 31st July 2017, Result Received Date: 7th August 2017				
Location		**Result (mg/l)**	**NEQG Guideline Value (0.01mg/l)**	**MJTD EIA Zone-A Target value (0.005mg/l)**
Inside Thilawa SEZ Zone-A	Retention Pond	-	-	-
	Retention Canal	0.068	Excess	Excess
Outside Thilawa SEZ Zone-A	Downstream of Creek	-	-	-

Sampling Date: 1st August 2017, Result Received Date: 11th August 2017				
Location		**Result (mg/l)**	**NEQG Guideline Value (0.01mg/l)**	**MJTD EIA Zone-A Target value (0.005mg/l)**
Inside Thilawa SEZ Zone-A	Retention Pond	≤ 0.002	Not Excess	Not Excess
	Retention Canal	0.034	Excess	Excess
	Locator Drainage	0.026	Excess	Excess
Outside Thilawa SEZ Zone-A	Downstream of Creek	0.008	Not Excess	Excess

Sampling Date: 25th August 2017, Result Received Date: 8th September 2017				
Location		**Result (mg/l)**	**NEQG Guideline Value (0.01mg/l)**	**MJTD EIA Zone-A Target value (0.005mg/l)**
Inside Thilawa SEZ Zone-A	Retention Pond	≤ 0.002	Not Excess	Not Excess
	Retention Canal	≤ 0.002	Not Excess	Not Excess
	Locator Drainage	≤ 0.002	Not Excess	Not Excess
Outside Thilawa SEZ Zone-A	Downstream of Creek	≤ 0.002	Not Excess	Not Excess

Sampling Date: 8th September 2017, Result Received Date: 22nd September 2017				
Location		**Result (mg/l)**	**NEQG Guideline Value (0.01mg/l)**	**MJTD EIA Zone-A Target value (0.005mg/l)**
Inside Thilawa SEZ Zone-A	Retention Pond	≤ 0.002	Not Excess	Not Excess
	Retention Canal	≤ 0.002	Not Excess	Not Excess
	Locator Drainage	≤ 0.002	Not Excess	Not Excess
Outside Thilawa SEZ Zone-A	Downstream of Creek	≤ 0.002	Not Excess	Not Excess

Sampling Date: 22nd September 2017, Result Received Date: 12th October 2017				
Location		**Result (mg/l)**	**NEQG Guideline Value (0.01mg/l)**	**MJTD EIA Zone-A Target value (0.005mg/l)**
Inside Thilawa SEZ Zone-A	Retention Pond	≤ 0.002	Not Excess	Not Excess
	Retention Canal	≤ 0.002	Not Excess	Not Excess
	Locator Drainage	≤ 0.002	Not Excess	Not Excess
Outside Thilawa SEZ Zone-A	Downstream of Creek	≤ 0.002	Not Excess	Not Excess

Note: Red color mentions the exceeded value for Mercury

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While the figure of the mercury in the water is currently under target value of EIA and the guideline value of NEQG in SEZ Zone-A. Mercury is an accumulation related substance, thus this above event is not causing neighboring environment and health and is also not affecting adverse impact because this event was transient and the water quality level is below NEQG guideline value outside of SEZ (downstream of creek).

1.2 Purpose of Investigation for Mercury Detection

The purpose of this investigation for mercury detection is finding out the reason of mercury detection and the source of the mercury. In addition, candidate plan for preventative control and proposed future counter measures are considered in this investigation.

CHAPTER 2: SCOPE AND METHODOLOGY OF STUDY

2.1 Scope of Investigation

The scope of this investigation includes;

- To consider mercury detection by construction and operation activities of tenant company
- To consider mercury detection by natural origin
- To confirm the reliability of laboratory analysis
- To prepare a service completion report for this investigation

2.1.1 To Consider Mercury Detection by Construction and Operation Activities of Tenant Company

This investigation includes reviewing of the list of chemicals usage in tenant company to grasp the possibilities of usage for mercurial item, reviewing the tenant company inspection report, and consideration about possibilities of mercury pollution by mercurial items usage by tenant company / construction company.

In addition, confirmation of current situation of mercurial insecticide / herbicide usage in Myanmar will be carried out. This survey includes the type of insecticide / herbicide which might be utilized in industrial area of Zone-A SEZ, and consideration about possibilities of mercury detection by mercurial insecticide / herbicide usage.

This survey will be conducted three construction companies and nine tenant companies in Thilawa Zone-A SEZ to get information for pest control treatment.

Hearing survey will be conducted to get information from Plant Protection Division (Yangon Region), Department of Agriculture (Kyauktan Township), to obtain information at the Environment Section of One Stop Service for Thilawa Special Economic Zone Management Committee (TSMC), to get information from construction and tenant companies in Thilawa SEZ and suppliers and users in order to find the possible sources of mercury pollution in the area. Verbal discussion will be conducted to these stakeholders.

Data and information will be collected through hearing survey as follows:

- Information relating to the sources and toxicity of heavy metals
- Pesticide residue in water
- Urban pest control and the common pesticides
- Organic and inorganic mercury compounds
- The use of mercury containing fungicides
- Regulations regarding mercury compound in Myanmar
- The sales of pesticides from Thanlyin and Kyauktan township markets

2.1.2 Consideration of Mercury Pollution by Natural Origin

Existing monitoring results of water and soil quality will be reviewed together with data of water levels at retention pond and will be considered about possibilities of mercury pollution by natural origin.

The following items will be reviewed;

- Existing Soil survey report
- Comparison of existing soil data and mercury contamination survey data
- Regular water quality monitoring results (from September 2016 to December 2017)
- Additional water quality monitoring results (from July 2017 to September 2017)
- Weather and water level monitoring data

2.1.3 Confirmation of Reliability of Laboratory Analysis

Existing monitoring results of water quality (which implemented in laboratory of Myanmar) will be reviewed. The same sample results in Thailand and Japanese laboratory will be compared.

2.1.4 Preparation of Service Completion Report

A service completion report shall be prepared based on the scope of "2.1.1" to "2.1.3".

CHAPTER 3: CONSIDERATION OF MERCURY DETECTION BY ACTIVITIES OF TENANT COMPANY

A study was made to identify the possible relevant sources of mercury which could have affected the mercury level of the water that passes through the drainage canal of the Thilawa SEZ Zone-A. The use of pesticides has been identified as a possible source of mercury for the following reasons:

1) Previous land use of the area occupied by the Thilawa SEZ Zone-A is agricultural.
2) Current land use of some of the areas within the vicinity of the Thilawa SEZ Zone-A is agricultural.
3) Backfill materials used for elevating the land occupied by the Thilawa SEZ Zone-A may have come from lands used for agricultural purposes.
4) Landscaping and greening activities of the locators within Thilawa SEZ Zone-A uses pesticides.
5) Construction contractors uses pest control chemicals to limit infestation within their construction area
6) Pesticides in the past had mercury content and mercury is one of the chemicals known to be persistent in soils.

A team was developed to identify the current activities within Thilawa SEZ Zone-A related to the use of pesticides. The team was also tasked to study the current uses of pesticides and its availability outside the facility.

The key informants identified included the following:

- Thilawa SEZ Zone-A Locators
- Thilawa SEZ Zone-A Contractors
- Pest control companies operating in the area
- Plant Protection Division, Department of Agriculture, Ministry of Agriculture, Livestock and Irrigation
- Department of Agriculture, Kyauktan Township
- Suppliers of chemicals that are being used or maybe used within Thilawa SEZ Zone-A

This section highlights the results of the key informant interviews done with the above representatives and the information that was provided either directly or as a result of the interviews.

3.1 Key Informant Survey of Thilawa Locators and Contractors

3.1.1 Locators and Contractors

A survey of three (3) construction companies and nine (9) locators (tenant) currently operating within Thilawa SEZ Zone was undertaken between January and March. The list of the locators and contractors is provided in Table 3.1-1 List of the Locators and Contractors.

Table 3.1-1 List of the Locators and Contractors

Tenant Companies	Construction Companies
• Lot No. (A11-1)	• Penta Ocean Construction Co.
• Lot No. (B20)	• Mindama Construction Co.
• Lot No. (B3)	• Dagon Construction Company
• Lot No. (B17)	
• Lot No. (B23)	
• Lot No. (A8)	
• Lot No. (C17)	
• Lot No. (B2)	
• Lot No. (D18)	

Based on the interviews done, it was learnt that the pest control service companies were hired to carry out pest control treatment within their respective areas. During the construction and operation stage, chemical treatment methods are carried out to control termites, rodents, mosquitoes, ants, cockroaches and other flying insects.

The pest control companies use chemicals that are imported into Myanmar. Most of the pest control service companies use chemical treatments manufactured by Ensystex Inc (USA) and Sumitomo Chemical Co. Ltd. (Japan). Other chemical treatment products being used are manufactured by VAPCO Veterinary and Agricultural Products Manufacturing Co. Ltd. (Jordan), Sherwood Chemical Public Co. Ltd (Thailand), Asiatic Agricultural Industries Pte Ltd (Singapore), Bell laboratories, Inc., Ladda Co., Ltd (Thailand), Nisus Corporation (USA), Agropharm Co. Ltd (UK), Arysta Life Science (India) and Syngenta Asia Pacific Pte. Ltd. (Singapore).

Table 3.1-2 Details of Pesticides used in Thilawa SEZ Zone-A

No.	Construction Company	Tenant Company	Trade Name	Active Ingredients	Chemical Structure	Product Company	Pest Control Service
1	Penta Ocean		Delete-2.5% EC	Deltame-thrin	$C_{22}H_{19}Br_2No_3$	VAPCO Veterinary and Agricultural Products Manufacturing Co. Ltd (Jordan)	**Environmental Essentials Co. Ltd (Myanmar)** 53, 32nd St., Lower Block, Ward (9), Panbedan Tsp, Yangon 0949249370
			Nofar-1	Brodifacoum	$C_{31}H_{23}BrO_3$	VAPCO Veterinary and Agricultural Products Manufacturing Co. Ltd (Jordan)	Environmental Essentials Co. Ltd (Myanmar)
			Sherwacide D	Deltametarin + Piperonyl Butoxide +S-bioallerthrin	$C_{22}H_{19}Br_2No_3$ + $C_{19}H_{30}O_9$ + $C_{19}H_{26}O_3$	Sherwood Chemical Public Co., Ltd (Thailand)	Environmental Essentials Co. Ltd (Myanmar)
2	Mindama		Able	Cypermethrin	$C_{22}H_{19}Cl_2NO_3$	Asiatic Agricultural Industries Pte Ltd (Singapore)	**Titan Pest Management Co., Ltd** Level 6, Suite 606, 611 Hledan Centre, Pyay Road & Hledan Road, Kamayut Tsp, Yangon 09 44445 6212
			Outri-gger	Deltamethrin	$C_{10}H_{10}N_4O$	Thai Company	Titan Pest Management Co., Ltd
			Pesgu-ard FG 161	D-Tetramethrin + Cyphenothrin	$C_{19}H_{25}O_4N$ + $C_{23}H_{25}O_3CN$	Agricultural Chemicals (M) Sdn. Bhd. (Malaysia)	Titan Pest Management Co., Ltd
3	Dagon	Lot No. (D6 + D7)	Termidor 25 EC Fipronil Bayer - German	Fipronil	$C_{12}H_4Cl_2F_6N_4OS$		**DDNA** 3, Aung Yadanar St., Aung Yadanar Housing, Thingangyun Tsp, Yangon

No.	Construction Company	Tenant Company	Trade Name	Active Ingredients	Chemical Structure	Product Company	Pest Control Service
							09-250175856, 09-797537513
4		Lot No. (A11-1)	Maxx-thor (100 Water-Based)	Bifenthrin 10% w/v	$C_{23}H_{22}ClF_3O_2$	Ensystex II Inc (USA)	**Number One Pest Management** Mudita Condo-2, West Ywar Ma, Insein Tsp, Yangon 09 964 993493
			Prothor	Imidaclopri d 20% w/v WP	$C_9H_{10}ClN_5O_2$	Ensystex II Inc (USA)	Number One Pest Management
			Bithor	Bifenthrin 4.5% w/v Imidaclopri d 5.5% w/v	$C_{23}H_{22}ClF_3O_2$ $C_9H_{10}ClN_5O_2$	Ensystex II Inc (USA)	Number One Pest Management
			Roden-thor	Brodifacou m 0.005% w/w RB	$C_{31}H_{23}BrO_3$	Ensystex II Inc (USA)	Number One Pest Management
			Ensystex Requiem Termite Bait	Chlorfluazu ron 0.1% w/w	$C_{20}H_9Cl_3F_5N_3O_3$	Ensystex II Inc (USA)	Number One Pest Management
			Hymen-opthor	Fipronil 0.01% w/w	$C_{12}H_4Cl_2F_6N_4OS$	Ensystex II Inc (USA)	Number One Pest Management
			Ultra-thor	Fipronil 10% w/v SC	$C_{12}H_4Cl_2F_6N_4OS$	Ensystex II Inc (USA)	Number One Pest Management
			Esbio-thrin Techni-cal 93% TG	Esbiothrin 93% TG	$C_{19}H_{26}O_3$	Sumitomo Chemical Co. Ltd (Japan)	Number One Pest Management
			Gokilaht TG	Cyphenothr in 93% TG	$C_{24}H_{25}NO_3$	Sumitomo Chemical Co. Ltd (Japan)	Number One Pest Management
			Gokilaht-S TG	Cyphenothr in 93% TG	$C_{24}H_{25}NO_3$	Sumitomo Chemical Co. Ltd (Japan)	Number One Pest Management
			Pynamin Forte 90 EC	D-allethrin 81% EC (min)	$C_{19}H_{26}O_3$	Sumitomo Chemical Co. Ltd (Japan)	Number One Pest Management
			Pesgu-ard FG 161 EC	D-tetramethrin 4% + Cyphenothrin 12% EC	$C_{19}H_{25}NO_4$ $C_{24}H_{25}NO_3$	Sumitomo Chemical Co. Ltd (Japan)	Number One Pest Management
5		Lot No. (B20)	Contrac All-Weather Blox	Bromadiolon e	$C_{30}H_{23}BrO_4$	Bell Laboratories, Inc.	**Javelin Service Limited** Level 4, West Entrance, 99 Condo, 99 Dhamazedi Road, Yangon

No.	Construction Company	Tenant Company	Trade Name	Active Ingredients	Chemical Structure	Product Company	Pest Control Service
							09450622263/64
			Maxx-thor	Bifenthrin 10% w/v	$C_{23}H_{22}ClF_3O_2$	Ensystex II Inc (USA)	Javelin Service Limited
6		Lot No. (B3)	Pesgu-ard FG 161	D-tetramethrin Cyphenothrin	$C_{19}H_{25}NO_4$ $C_{24}H_{25}NO_3$	Sumitomo Chemical Co. Ltd (Japan)	**Friend Termites & Pest Solutions** 99, Nan Da Wun St, Bahan Tsp, Yangon 09-970100551, 09-970100552
			Bithor Dual Action Insect-icide	Bifenthrin Imidaclopri d	$C_{23}H_{22}ClF_3O_2$ $C_9H_{10}ClN_5O_2$	Ensystex Australasia Pty Ltd	Friend Termites & Pest Solutions
			Teme-guard 1% SG	Temephos	$C_{16}H_{20}O_6P_2S_3$	Ladda Co., Ltd (Thailand)	Friend Termites & Pest Solutions
			TERRO – PCO Liquid Ant Bait	Sodium Tertaborate Decahydrat e (Borax)	$Na_2[B_4O_5(OH)_4]\cdot 8H_2O$	Nisus Corporation (USA)	Friend Termites & Pest Solutions
			Termi-dor SC	Fipronil	$C_{12}H_4Cl_2F_6N_4OS$	BASF Corporation (Germany)	Friend Termites & Pest Solutions
7		Lot No. (B17)	Bentacide 250 EC	Pyrethroid formulation Cypermethrin	$C_{22}H_{19}Cl_2NO_3$	Agropharm Ltd Co., (UK)	
			Bithor Dual Action	Bifenthrin (45 g/L) Imidaclopri d (55 g/L)	$C_{23}H_{22}ClF_3O_2$ $C_9H_{10}ClN_5O_2$	Ensystex, Inc (USA)	
			Hymenopt hor Ultra	Fipronil	$C_{12}H_4Cl_2F_6N_4OS$	Ennsystex, Inc (USA)	
			Pesguard FG-161	Neo-Pynamin Forte (d-tetramethrin) (4.3% w/w) Golilaht (cyphenothrin) (13.3% w/w)	$C_{19}H_{25}NO_4$ $C_{24}H_{25}NO_3$	Sumitomo Chemical Company, Limited (Japan)	
			Rodenthor	Brodifacou m (0.005%)	$C_{31}H_{23}BrO_3$	Ensystex, Inc (USA)	
			Sumi Pro	SumiOne (0.1% w/w) Golilaht - 5 (6.0% w/w) Piperonyl Butoxide (10.0% w/w)	$C_{19}H_{30}O_5$	Sumitomo Chemical Company, Limited (Japan)	
8		Lot No. (B23)	Pyno-sect 10 Cis	Piperonyl Butoxide	$C_{19}H_{30}O_5$	Arysta LifeScience	

No.	Construction Company	Tenant Company	Trade Name	Active Ingredients	Chemical Structure	Product Company	Pest Control Service
			trans 40 60	Hydrocarbons		(India)	
				Permethrin	$C_{21}H_{20}Cl_2O_3$		
				Tetramethrin	$C_{19}H_{25}NO_4$		
				Naphthalene	$C_{10}H_8$		
				Benzenesul-fonic acid	$C_6H_6O_3S$		
				Aromatics			
			Quest MC	Lambda-Cyhalothrin (2.5%)	$C_{23}H_{19}ClF_3NO_3$	Asiatic Agricultural Industries Pte Ltd (Singapore)	
			Talon Pellet	4-hydroxy-3-(3-4'- bromo-4-biphenylyl)-1,2,3,4-tetrahydro-1-naphthyl) coumarin, kaolin		Syngenta Asia Pacific Pte. Ltd. (Singapore)	
9		Lot No. (A8)	Pesguard FG 161 EC	D-tetramethrin 4% + Cyphenothrin 12% EC	$C_{19}H_{25}NO_4$ $C_{24}H_{25}NO_3$	Sumitomo Chemical Co. Ltd (Japan)	Number One Pest Management Co., Ltd
			Maxxt-hor (100 Water-Based)	Bifenthrin 10% w/w	$C_{23}H_{22}ClF_3O_2$	Ensystex Australasia Pty Ltd	Number One Pest Management Co., Ltd
			Sumithion 20 CS	Fenitrothion 20.0%	$C_9H_{12}NO_5PS$	Sumitomo Chemical Co. Ltd (Japan)	Number One Pest Management Co., Ltd
			Rodenthor	Brodifacoum 0.005% w/w RB	$C_{31}H_{23}BrO_3$	Ensystex Australasia Pty Ltd	Number One Pest Management Co., Ltd
			Hymenopthor	Fipronil 0.01% w/w	$C_{12}H_4Cl_2F_6N_4OS$	Ensystex, Inc (USA)	Number One Pest Management Co., Ltd
			Catchmaster	Polybuthylene Polyisobutylenes	$(C_4H_8)_n$		Number One Pest Management Co., Ltd
			VIC 80 SC	Bifenthrin 7.8%	$C_{23}H_{22}ClF_3O_2$	Asiatic Agricultural Industries Pte. Ltd (Singapore)	Number One Pest Management Co., Ltd
10		Lot No. (B2)	Permethrin 50Ec	Permethrin	$C_{21}H_{20}Cl_2O_3$	-	Page Pest Control Co.
11		Lot No. (C17)	PESGUARD FG 161	D-tetramethrin 4% + Cyphenothrin 12% EC	$C_{19}H_{25}NO_4$ + $C_{24}H_{25}NO_3$	Sumitomo Chemical Co. Ltd (Japan)	Clean & Green Pest Control Co., Ltd
			SUMITHRIN 10SEC	D- Phenothrin	$C_{23}H_{26}O_3$	Sumitomo Chemical Co. Ltd (Japan)	Clean & Green Pest Control Co., Ltd

MYANMAR JAPAN THILAWA DEVELOPMENT LIMITED MJTD

No.	Construction Company	Tenant Company	Trade Name	Active Ingredients	Chemical Structure	Product Company	Pest Control Service
12		Lot No. (D18)	Contrac Blox	Bromadiolone	$C_{30}H_{23}BrO_4$	Bell Laboratories, Inc.	Javelin Service Limited
13		Lot No. (A18)					Javelin Service Limited

Secondary information indicated that material safety data sheets (MSDS) for the chemicals being used by the above pesticide companies are available online. Lot No. (B2) was the only company operating within Thilawa SEZ Zone-A which did not identify the manufacturer of the chemicals that they are using. The staff from Lot No. (B2) said that the pesticide they used was bought from a local company which did not provide MSDS. From the list of pest control services company, Javelin Service Ltd. and Number One Pest Management Co. Ltd. are more hired than the others.
Brodifacoum, d-tetramethrin, fipronil, bifenthrin and Cyphenothrin are the highly used chemical and deltamethrin, imidacloprid and piperonyl butoxide are moderately used. The pesticides are mainly used for mosquitoes, termite and ant. Liquid type is mostly found in the survey.

3.1.2 Pest Control Service Companies

Interviews with pest control service companies were made to provide further information on the chemicals being used as pesticides. Companies operating within Thilawa and outside Thilawa were included in the interview. These companies include Green Pest Management Co. Ltd.; OMIC Myanmar Inspection and Surveying Co. Ltd; Myanmar Pest Control Service Co., Ltd.; and Mandalar Pest Control Enterprise.
Out of the four companies surveyed, the Green Pest Management Company is the only company that carried out pest control service to a large extent. Green Pest Management provided pest control service at Thilawa SEZ. It was learnt that the company used MSDS and the used insecticides had no mercury content. The other companies provide mostly fumigation service.

3.1.2.1 Green Pest Management Co. Ltd

The pesticides being used by Green Pest Management is listed in Table 3.1-1 List of the Locators and Contractors. The company provides service for controlling termite and general pests (mosquito, cockroach, ant, rodent, fly and bird). These insecticides are manufactured by Ensystex (USA). They are chosen based on quality of the formulation. As for the control of termite, construction stage treatment is usually done in summer and operation stage treatment is carried out in the early rainy season. The guarantee period of termite control is from three (3) to ten (10) years depending on the dosage of the insecticide. The main termite control technique is spraying. The insecticides get dried within one hour and after that even if it rains, the residue will not drain into the water.
Rodent control treatment is conducted fortnightly and bait and repellent technique is used. Cockroach and fly are controlled with blattathor cockroach trap, blattathor insect monitor and vinegar fly trap.
Most of the insecticides are odorless water-based suspension type and there cause allergic reaction or dizziness. Used containers or packages are buried in the ground and covered with limestone. Operators are given trainings from Plant Protection Division and also from Ensystex (USA) on how to handle chemicals. Green Pest Management has Hazard Analysis Critical Control Point (HACCP) certificate.

Table 3.1-3 Pesticides used by Green Pest Management Co. Ltd

No.	Control	Trade Name	Active Ingredients	Manufacturer	Technique	Remark
1	Termite	Maxxthor	Bifenthrin	Ensystex	Spray	Pre-construction
2		Prothor	Imidacloprid	Ensystex	Spray	Post-construction
3		Ultrathor	Fipronil	Ensystex	Spray	Pre-& Post
4		Labyrinth	Chlorfluazuron	Ensystex	Bait	Termite colony elimination
5	General Pest	Bithor Dual Action	Bifenthrin, Imidacloprid	Ensystex	Spray	
6		Maxxthor Turbo	Bifenthrin, Imiprothrin, Piperonyl Butoxide	Ensystex	Spray	
7		Attrathor	Fipronil	Ensystex	Spray	Residual effect & attractant
8	Ant, cockroach	Hymenopthor Ultra	Fipronil	Ensystex	Granular Bait	
9	Cockroach	Blattathor Ultra	Fipronil	Ensystex	Gel Bait	
10	Rodent	Rodenthor Block	Brodifacoum	Ensystex	Bait	With a central hole
11	Rodent	Rodenthor Soft	Brodifacoum	Ensystex	Bait	
12	Rodent	Rodenthor Rat Out	Garlic Oil, White Pepper	Ensystex	Repellent	
13	Bird	Avithor Bird Away	Peppermint Oil, White Pepper	Ensystex	Repellent	
14	Cockroach, insects	Blattathor Cockroach Trap		Ensystex	Trap	Food lure coated on glue board
15	Cockroach, insects	Blattathor Insect Monitor		Ensystex	Trap	Food lure coated on glue board
16	Fly	Vectothor Vinegar Fly Trap		Ensystex	Trap	

(i) OMIC Myanmar Inspection and Surveying Co., Ltd

OMIC provides fumigation services for export cargo containers. Phosphine (PH3) tablets and methyl bromide are used as fumigants. These fumigants are chosen based on their effectiveness. Pesticide Registration Board of Myanmar allows methyl bromide to be used as restricted chemical for storage pest control. After the methyl bromide in the cylinder is completely used up, it does not leave any residue and the empty cylinders are sold to be used as LPG gas containers in homes. Phosphine tablet residue could be left inside the container and it would be disposed by the imported countries.

(ii) Myanmar Pest Control Service Company

Myanmar Pest Control Service performs fumigation service for stored agricultural products. They no longer provide service for pest control.

(iii) Mandalar Pest Control Enterprise

At present, Mandalar Pest Control Enterprise conducts fumigation services for peas and beans, maize and sesame. The company provides less service for termite and general pest control. Insecticides from Sumitomo Corporation are mainly used for pest control. Termite control at construction stage is guaranteed for five years. General pest control is served once per 45 days. All the operators have certificates and training from Plant Protection Division.

3.2 Key Informant Surveys with Department of Agriculture

3.2.1 Plant Protection Division, Department of Agriculture, Ministry of Agriculture, Livestock and Irrigation

A representative from the Plant Protection Division, Yangon Region, Department of Agriculture, Ministry of Agriculture, Livestock and Irrigation was interviewed as part of the study. The salient points obtained during the interview are provided below:

- Information relating to the sources and toxicity of heavy metals
- Pesticide residue in water
- Urban pest control and the common pesticides
- Organic and inorganic mercury compounds
- The use of mercury containing fungicides
- Regulations regarding mercury compound in Myanmar
- The sales of pesticides from Thanlyin and Kyauktan township markets

3.2.1.1 Sources and toxicity of heavy metals

The information includes:

(i) Information on toxicity of Lead (Pb), Chromium (Cr), Cadmium (Cd), Arsenic (As), Nickel (Ni) and Mercury (Hg).

(ii) Information on sources of contamination of mercury such as barometers, thermometers, hydrometers, lamps producing ultra violet rays, in mercury boilers, manufactured from all mercury salts, mirrors, as catalysts in oxidation of organic compounds, extraction of gold and silver from ores are the sources of contamination of mercury. Sources and toxicity of heavy metals are attached in Appendix I.

3.2.1.2 Pesticide Residue in Water

With regard to the information on pesticide residue in water, pesticides are applied to crops and soils in various formulations and with various application methods. In some circumstances, pesticides can reach surface water the most likely routes being spray drift and run off from the surface of treated fields. The properties of pesticides are water solubility, mobility in a variety of soil types, persistence in soils and rate of hydrolysis. It is likely to reach surface or ground water based on their properties of the chemical and its use pattern. When the pesticides are improperly used or where spillage or improper disposal occurs, there is the likelihood that pesticides will reach surface or ground water and this could be clearly detected.

3.2.1.3 Urban Pest Control and the Common Pesticides

It was informed that high population density, congested living conditions and lack of proper sanitary facilities serve as an excellent breeding ground for many urban pests such as mosquitoes, cockroaches, house flies, rodents and ants. Termite build nests in the soil and are very dependent on soil for moisture.

Among household insecticides, mosquitoes are common insects that bring many diseases such as malaria and dengue fever. One of the mosquito control approaches is chemical control.
Insecticidal larvicides include temephos (ABATE) for clean water breeders and fenthion (BAYTEX) and chlorpyrifos (DURSBAN) for polluted water breeders. Newer insecticidal larvicides including lpha-cypermethrin (FENDONA), fenitrothion, permethrin and cyfluthrin can be used in both clean and polluted water.
Insecticidal adulticides spray include malathion (both fogging and ultralow volume formulations), fenitrothion (fogging) and synergized pyrethrins (fogging/ ULV).
Another household insecticide is termite that is considered to be amongst the most destructive insects in the world. Pre and post construction chemical treatment methods are carried out to control. The best time and least expensive method to protect structures against the termite attack is during the planning and construction of the building.
Pre-construction treatment involves the drenching of the building sites with a water-based termiticide. Pest control companies will invalidate any warranty provided against termite attack. The warranty period provided by pest control companies for pre-construction is from 5 years for non-organochlorine termiticides. Retreatment is necessary every 5 years with the current pyrethroid or organophosphate compounds to ensure continuous protection.
Post construction treatment method is achieved by drilling holes into the flooring and injecting the liquid chemicals into the ground. Foam methods of application are used to complement the treatment in voids underneath concrete slab.
Cockroaches are primitive insects that require warmth, food and shelter to survive and breed. Hydramethylnon, sulfluramid, abamectin, imidacloprid and fipronil are effective for cockroach control. Cockroach baits are usually formulated in bait stations or as gel. Beside insecticides, insect growth regulators (IGR) have also been used for cockroach control.
Ants are nuisance pests and potential mechanical vectors of diseases. Insecticides play a major role in the control of various household ants. Some active ingredients used in residual spraying are bendiocarb, carbaryl, chlorpyrifos, diazinon, propoxur and cypermethrin. Deltamethrin is the common active ingredient in insecticidal dust.
Rodents cause major problems all over the world by exploiting the environment created by man. They damage property by gnawing at woodwork and other parts of the structure of buildings. As agricultural pests, rodents eat standing crops of rice, maize and many others. Where livestock animals are reared or food is stored, rodents spread diseases and contaminate the food with urine, droppings and hairs.
Flies breed on a wide variety of human and animal wastes in the urban environment. The common house fly breeds in decaying food and garbage throughout the year and is a serious nuisance to householders and food preparation industries.

3.2.1.4 Organic and Inorganic Mercury Compounds

The organic and inorganic mercury compounds are persistent in the soil and on the surface of plants and seeds. Organomercury compounds are more often used and generally more toxic to fungi than inorganic mercury salts. They have a disinfecting and protective action and often considerable volatility. The organomercury fungicides are ethyl mercury chloride, 2-methoxyethyl mercury chloride, 2-methoxyethyl mercury silicate, phenylmercury acetate and phenylmercury chloride.
Inorganic mercuric chloride and the almost insoluble mercurous chloride are used for seed dressing and soil application. Mercuric oxide has a similar effect.

3.2.1.5 The Use of Mercury Containing Fungicides

Before 1990, mercury containing fungicides were used in agriculture as seed treatment in Myanmar. These fungicides are either paste or powder type. After 1990, local companies did not import mercury containing

fungicides anymore while other alternatives are being used and the stocks were used up completely. The trade names of the mercury containing fungicides are shown in the following table.

Table 3.2-1 Trade Names of the Mercury Containing Fungicides

No.	Active Ingredients	Trade Names
1	Ethyl Mercury Chloride	EMC, Encon, Hexasan
2	Mercuric Chloride	Fungchex, Mersil
3	Mercuric oxide	Aacuram-Tex, Kankerdood, Kankerex, Kankertox, Santar
4	Mercurous Chloride	Calo-Gran, Calomel, Cyclosan, MC Turf Fungicide, Vita Calomel
5	Methoxyethyl Mercury Silicate	Ceresan Universal thicken-beize
6	Phenylmercury Acetate	Cekusil, Cresan Universal, Ceresol, Dyanacide, Falisan-HB- Saatgut-Nassbe, HongNien, Kwiksan, Leytosan, Liquaphere, Maysan, Meran, Mersolite, Mist-o-Matic, Nylmerate, Phenmad, Phix, PMAS Turf Fungicide, Purasan-SC-10, Quicksan, Riogen, SC 110, SC 200, Scutl, Shinmerex, Shinmex

3.2.1.6 Regulations regarding Mercury Compound in Myanmar

In 1996, Pesticide Registration Board banned organic mercury compound and inorganic mercury compound in accordance with the Prior Informed Consent (PIC) Procedure. In 2013, Pesticide Registration Board updated the banned lists of pesticides including organic and inorganic mercury compound as described in Table 3.2-2. The Pesticide Registration Board has the authority to issue notification about the official banned pesticides. All the Persistent Organic Pollutants (POPs) included the list are strictly banned, as Myanmar is a party to the Stockholm Convention on POPs. However, some of the pesticides from PIC list can be imported with the permission of designated national authority (DNA) for agriculture, as Myanmar is not yet a party to the Rotterdam Convention.

Table 3.2-2 List of Banned Pesticides in Myanmar

No.	Active Ingredient	Reason
1	Aldicarb	PIC List
2	Alchlor	PIC List
3	Alpha Hexachlorocyclohexane	POP List
4	Arsenic Compound	Carcinogenicity
5	Binapacryl	PIC List
6	Chlordecone	POP List
7	Chlorobenzilate	PIC List
8	DNOC	PIC List
9	Ethylene Dichloride	PIC List
10	Endosulfan	POP List
11	Ethylene Oxide	PIC List
12	Fluoroacetamide	PIC List
13	Heptachlor	POP List
14	Lindane (Gama Hexachlorocyclohexane)	POP List
15	Methomyl	Cholinesterase inhibitor, Acute Toxicity in Human
16	Methamideophos	PIC List
17	Methyl Parathion	PIC List
18	Monocrotophos	PIC List
19	Mirex	POP List

No.	Active Ingredient	Reason
20	Pentachlorophenol (PCP)	PIC List
21	Phosphamidon	PIC List
22	Tributylin Compound	PIC List
23	Aldrin	PIC List
24	Beta-Hexachlorocyclohexane (BHC)	PIC List
25	Captafol	PIC List
26	Chlordimeform	PIC List
27	Chlordane	PIC List
28	Cyhexatine	PIC List
29	Dieldrin	PIC List
30	Dinoseb	PIC List
31	Ethylene Dibromide (EDB)	PIC List
32	Endrin	Oncogenicity
33	EPN	Neurotoxicity
34	Inorganic Mercury Compounds	PIC List
35	Organic Mercury Compounds	PIC List
36	Parathion Ethyl	PIC List
37	Strobane	Oncogenicity
38	2,4,5 – T and 2,4,5 – TP	PIC List
39	Toxaphene	Oncogenicity

3.2.1.7 Use of Dichlorodiphenyltrichloroethane (DDT)

In 2013, Pesticide Registration Board announced the restricted lists of pesticides including dichlorodiphenyltrichloroethane (DDT). This substance was previously used as pesticide but has been found to be poisonous to humans and animals. The use of DDT currently is restricted to vector control for malaria. The restricted pesticides are described in Table 3.2-3. DDT from India and Indonesia, the pesticide from Academy Pine Company and unknown pesticide are found in the market (28th street, Pabetan Township, Yangon, Myanmar).

Table 3.2-3 List of Restricted Pesticides

No.	Active Ingredient	Group	Remark
1	Methyl Bromide	Fumigant	For storage pest control
2	Phosphine	Fumigant	For storage pest control
3	Bromadiolone	Coumarin	For rodent control
4	Zinc Phosphide	Inorganic	For rodent control
5	Brodifacoum	Coumarin	For rodent control
6	Fenthion	Organo Phosphorus	For malarial control
7	D.D.T	Organo Chloride	For malarial control

3.2.1.8 Findings

According to the survey it was found that mercury containing fungicides are no longer being used in Myanmar and there is no stock of mercury fungicide. Mercury was found only as fungicide and it was not used for pest control treatment.

3.2.2 Department of Agriculture, Kyauktan Township

The following information was received from the Department of Agriculture, Kyauktan township;

- Over 150,000 acres have been cultivated in Kyauktan Township and, currently, one third carries out Good Agricultural Practices (GAP). Paddy and green gram are planted in summer, paddy in rainy season and green gram from winter. Most of the pesticides are used in winter crops. The common herbicides are Primer, Galaxy and Pawn Killer. The common termiticides are Diadrin, Cypermethrin and Furadan.
- The main companies selling pesticides in Kyauktan township are Awba, Wisara, Zebra, Mega grow, Ywet Sane, Annawrathar, Golden Lion, Minmahwar and Golden Dragon.
- Pesticide residue in surface water is one of the possible sources of water pollution. The source of pesticide pollution from soil is less likely reason however it is possible when the pesticide container is leaking.
- Thilawa SEZ includes both Thanlyin and Kyauktan township and soil for landfill in the SEZ was dug from fallow land and high land which could not contain any pesticides.
- Approximate five trainings are conducted on the use of pesticide every year in the township.

3.2.2.1 Findings

According to the interview with the officials from Kyauktan Township, the possibility of pesticide as a source of mercury from soil in Thilawa SEZ is less likely to be the reason because soil for land fill was dug from fallow land and small hillsides. Fallow lands and small hillsides are not typically used for agricultural purposes. Further, in Kyauktan township, trainings were conducted on the use of pesticides every year although some farmers have little awareness because of the lack of education.

3.3 Available Pesticides in Yangon Area

3.3.1 List of Available Pesticides as Per Plant Protection Division

The Plant Protection Division (PPD) provided a list containing ten pesticides that are sold in Thanlyin market and all of these are insecticides. The list of the insecticides from Thanlyin township markets are shown in Table 3.3-1. Pesticides include cypermethrin 10%chlorpyrifos 50% EC + cypermethrin 5%, cypermethrin 10%, chlorpyrifos 50% EC + cypermethrin 5%, profenofos 40% + cypermethrin 5%, chlorpyrifos 48% EC, cypermethrin 10%, chlorpyrifos 50% W/V + cypermethrin 5%, cypermethrin 25% EC and carbofuran 3%.

Table 3.3-1 List of Pesticides from Thanlyin Township as per PPD (2018)

No.	Trade Name	Active Ingredient	Chemical Structure	Manufacturer (Company)	Retail Company Name/ Address
1	Whitegold 10 EC	Cypermethrin 10%	$C_{22}H_{19}Cl_2NO_3$	Arysta lifeScience India Ltd. (India)	Myanmar Arysta Life Science Co., Ltd No.95, Padonmar St, Dagon Tsp, Yangon 01-256192
2	Tenchant 55 EC	Chlorpyrifos 50% EC + Cypermethrin 5%	$C_9H_{11}Cl_3NO_3PS$ $C_{22}H_{19}Cl_2NO_3$	Parijat Industries (India) PVT.,Ltd. (India)	Aventine Ltd No.126 (A), Kabaraye Pagoda Road, Bahan Tsp

No.	Trade Name	Active Ingredient	Chemical Structure	Manufacturer (Company)	Retail Company Name/ Address
3	MLM Cyper 10% EC	Cypermethrin 10%	$C_{22}H_{19}Cl_2NO_3$	Myanmar Pesticides Industry Co. Ltd. (MPI)	Marlarmyaing Co., Ltd No.531 - B, Marlar Myaing Ave, Pyay Rd, Kamayut Tsp. 01-501352, 503235
4	Number One	Chlorpyrifos 50% EC + Cypermethrin 5%	$C_9H_{11}Cl_3NO_3PS$ $C_{22}H_{19}Cl_2NO_3$	Jiangxi Zhengbang Bio Chemical Co.Ltd. (China)	Myanmar Shwe Thein No.8A, Yuzana Road, AyeYeikMon Housing, Hlaing Tsp
5	Profex Super44% EC	Profenofos 40% + Cypermethrin 5%	$C_{22}H_{19}Cl_2NO_3$	Nagarjuna Agrichem Ltd. (India)	Marlarmyaing Co., Ltd No.531 - B, Marlar Myaing Ave, Pyay Rd, Kamayut Tsp. 01-501352, 503235
6	Foss 48 EC	Chlorpyrifos 48% EC	$C_9H_{11}Cl_3NO_3PS$	Kingtai Chemical Ltd. (Hong Kong)	Kingtai Myanmar Co. Ltd No.7A 47 Block Shwe Kan Thar Yar Housing, Yangon Pathein Road, Hlaing Tharyar Tsp, Yangon
7	Nagarjuna Cyper-10	Cypermethrin 10% EC	$C_{22}H_{19}Cl_2NO_3$	Nagarjuna Agrichem Ltd. (India)	Marlarmyaing Co., Ltd No.531 - B, Marlar Myaing Ave, Pyay Rd, Kamayut Tsp. 01-501352, 503235
8	Vita Tsunami	Chlorpyrifos 50% W/V + Cypermethrin 5% W/V	$C_9H_{11}Cl_3NO_3PS$ $C_{22}H_{19}Cl_2NO_3$	Anhui Byter Agricultural Technological Co., Ltd. (China)	Myanmar Vita Co.,Ltd. No.940, Zatila (2) St, No, 16/1 Ward, Thingangyun Tsp, Yangon
9	Thunder 250 EC	Cypermethrin 25% EC	$C_{22}H_{19}Cl_2NO_3$	AgriGate Crop Science, Pte Ltd. (Singapore)	Myanmar Awba No.95 - A, Kyaik Wine Pagoda St,, 8-mile, Mayangone Tsp, Yangon
10	Furan 3G	Carbofuran 3%	$C_{12}H_{15}NO_3$	ACI Formulation Ltd. (Bangladesh)	Network Marketing Ltd Building No.16 Bomoe Road San Chaung Tsp, Yangon, Myanmar

In Kyauktan township, ten pesticides are sold in the market and most of them are insecticides according to PPT. List of pesticides from Kyauktan township markets are described in Table 3.3-2. They are cypermethrin 10%, phosdrin 40% EC, chlorpyrifos, dimethoate, zeta cypermethrin, imidacloprid 10% WP, dichlorvos 80% EC, chlorpyrifos 45.90 w/w + cypermethrin 4.59% w/w, thiomethoxal 35%, pyriproxyfem.

Table 3.3-2 List of Pesticides from Kyauktan Township as Per PPD (2018)

No.	Trade Name	Active Ingredient	Chemical Structure	Manufacturer (Company)	Retail Company Name/ Address
1	Cymkill 10 %	Cypermethrin 10%	$C_{22}H_{19}Cl_2NO_3$	Forward International Co. Ltd (Taiwan) and Forward (BEIHAI) HEPU Pesticide Co., Ltd (Taiwan)	FORWARD MYANMAR No.34, Parami Road, Yankin Township, Yangon, Myanmar 01-661002

No.	Trade Name	Active Ingredient	Chemical Structure	Manufacturer (Company)	Retail Company Name/ Address
2	Phosdrin 40% EC	Phosdrin 40% EC	$C_7H_{13}O_6P$	AgriGate Crop Science, Pte Ltd. (Singapore)	Myanmar Awba No.95 - A, Kyaik Wine Pagoda St, 8-mile, Mayangone Tsp, Yangon
3	MLM-Pyriphos 48% EC	Chlorpyrifos 40% EC	$C_9H_{11}Cl_3NO_3PS$	Myanmar Peak Trading Pte. Ltd. (Singapore)	Marlarmyaing Co., Ltd No.531 - B, Marlar Myaing Ave, Pyay Rd, Kamayut Tsp. 01-501352, 503235
4	Loko 40 EC	Dimethoate 40% EC	$C_5H_{12}NO_3PS_2$	Agrinoon Enterprise Ltd. (China)	Myanmar Arysta Life Science Co., Ltd No.95, Padonmar St, Dagon Tsp, Yangon 01-256192
5	Fury 10 EC	Zeta-Cypermethrin	$C_{22}H_{19}Cl_2NO_3$	FMC Corporation Agricultural Products Group (USA)	Myanmar Arysta Life Science Co., Ltd No.95, Padonmar St, Dagon Tsp, Yangon 01-256192
6	Ya Shi Jing 10 WP	Imidacloprid 10% WP	$C_9H_{10}ClN_5O_2$	Jiangsu Kesheng Group Share Co., Ltd. (China)	Myanmar Diamond Light International Co., Ltd. No.114, Khayae St, 21x22 Lane, Aungmyaythazan Tsp, Mandalay
7	Charge 80 EC	Dichlorvos 80% EC	$C_4H_7Cl_2O_4P$	Hubei sanoda Co., Ltd. (China)	Myanmar Diamond Light International Co., Ltd. No.114, Khayae St, 21x22 Lane, Aungmyaythazan Tsp, Mandalay
8	Cyclone 505 EC	Chlorpyrifos 45.90 w/w Cypermethrin 4.59% w/w	$C_9H_{11}Cl_3NO_3PS$ $C_{22}H_{19}Cl_2NO_3$	AgriGate Crop Science, Pte Ltd. (Singapore)	Myanmar Awba No.95 - A, Kyaik Wine Pagoda St, 8-mile, Mayangone Tsp, Yangon
9	Shwe Thimee 35%	Thiomethoxal 35%	$C_8H_{10}ClN_5O_3S$	Makro Chemical (Thailand)	Zebra No.258/262 Strand Road, 11th Floor, Classic Strand Condo, Pabedan
10	Shwe Pyri 10% WV	Pyriproxyfem	$C_{20}H_{19}NO_3$	Makro Chemical (Thailand)	Zebra No.258/262 Strand Road, 11th Floor, Classic Strand Condo, Pabedan

3.3.2 Available Pesticides from Retail Shops in Kyauktan Township

There are 36 pesticide retail shops in Kyauktan township. Pesticides from retail shops are shown in Table 3.3-3. The pesticides sold from retail shops are Armo Vital 75% SP, Primer, Pawn Killer, Azphate 75% SP, Dupont Prevathon, Furadan, Thein Cephate 75 SP, Galaxy 48SL, Sunup 48 SL, Harvest Tablet, Beno Cop 50 WP, Dozer 20 WP, Litosen 2 SL, Happy Rat Killer and Happy Pest Killer.

Table 3.3-3 List of Pesticides from Retail Shops in Kyauktan Township (2018)

No.	Trade Name	Name of Chemicals	Chemical Structure	Manufacturer	Retail Company	Purpose of Use
1	Armo Vital 75% SP	Acephate	$C_4H_{10}NO_3PS$	Rallis India Limited (India)	Aventine Limited	Pesticide Agri-culture
2	Primer	Paraquat Dichloride (27.6% w/v)	$C_{12}H_{14}Cl_2N_2$	AgriGate CropSciences Pte., Ltd (Singapore)	Myanmar Awba	Herbicide
3	Pawn Killer	Glyphosate (41.2% w/w)	$C_3H_8NO_5P$		Myanmar Awba	Agri-culture
4	Azphate 75% SP	Acephate (75% w/w)	$C_4H_{10}NO_3PS$	AgriGate CropScience Pte. Ltd. (Singapore)	Myanma Awba Group Co.,Ltd.	Pesticide Agri-culture
5	Dupont Prevathon	Chlorantranili-prole (51.5 5/L SC)	$C_{18}H_{14}BrCl_2N_5O_2$	Arysta LifeScience (India)	DuPont Company (Singapore) Pte Ltd	Pesticide Agri-culture
6	Furadan	Furadan	$C_{12}H_{15}NO_3$	Arysta LifeScience (India)	FMC Corporation	Agri-culture
7	Thein Cephate 75 SP	Acephate	$C_4H_{10}NO_3PS$	Jiangxi Zhengbang Biochemical Co.,Ltd. (China)	Myanmar Shwe Thein Trading Co., Ltd	Agri-culture
8	Galaxy 48 SL	Glyphosate (48%)	$C_3H_8NO_5P$	Syntech Interna-tional Co., Ltd (China)	Shwe	Herbicide
9	Sunup 48 SL	Glyphosate (48%)	$C_3H_8NO_5P$	Sundat (S) Pte Ltd, (Singapore)	Golden Key Co., Ltd	Herbicide
10	Happy Pest Killer					Pesticide
11	Happy Rat Killer	Brodifacoum (0.005%)	$C_{31}H_{23}BrO_3$			Rat
12	Harvest Tablet	Aluminium Phosphide (56%)		Shenyang Harvest Agrochemical Co., Ltd (China)	Diamond Light International Trading Co.,Ltd.	Agri-culture
13	Beno Cop 50 WP	Copper Oxychloride (25%) + Benomyl (25%)	$Cu_2(OH)_3Cl$ + $C_{14}H_{18}N_4O_3$	Syntech International Co., Ltd (China)	AGT Agro Tech Co., Ltd	Fungicide
14	Dozer 20 WP	Imidacloprid 20% WP	$C_9H_{10}ClN_5O_2$	AgriGate Crop Science Pte. Ltd. (Singapore)	Myanma Awba Group Co.,Ltd.	
15	Litosen 2 SL	Nitrophenols 2% w/v	$C_6H_5NO_3$	Forward (Myanmar) Co.,Ltd	Forward International Co.,Ltd	Plant Growth Regulator

3.3.3 Available Pesticides Along 28th Street, Pabedan Township, Yangon

Insecticide survey was made in 28th Street, Pabedan Township, Yangon. Four (4) insecticides were bought from retail shops in 28th Street, Pabedan township. These include Dichlorodiphenyl trichloroethane (DDT 75% WDP) which is manufactured in Indonesia and Dichlorodiphenyl trichloroethane (DDT 750 WP) which is from India. Pesticide, namely Academy is sold by Academy Pine Co., in liquid form. The other one is unknown pesticide which is also liquid type. List of insecticides from retail shops in 28th street, Pabetan Township, Yangon is shown in Table 3.3-4.

Table 3.3-4 List of Insecticides from Retail Shops in 28th Street

No.	Trade Name	Name of Chemicals	Chemical Structure	Product Company	Purpose of Use	Photo
1	DDT 75% WDP	DDT	$C_{14}H_9Cl_5$	from Indonesia	Insecticide for Adult Mosquitoes	
2	DDT 750 WP	DDT	$C_{14}H_9Cl_5$	Hindustan Insecticides Ltd. (India)	Insecticide for Adult Mosquitoes	
3	Academy	Unknown	Unknown	Academy Pine Con:	Disinfectant & Germicide	
4	Unknown	Unknown	Unknown	from Thailand	Termite insecticide	

3.3.4 Findings

The Plant Protection Division (PPD) has a short list of available pesticides in the Thanlyin and Kyauktan Townships. Retail shops are, however, selling other chemicals which are not in the list of PPD. Pesticides containing DDT are still being sold along 28th Street in Pabedan Township despite the ban on the use of this product.

3.4 Assessment of Key Findings

The locators and construction contractors operating in Thilawa SEZ Zone-A hires pesticide services company to address the infestation of pests within their area of responsibility. Most of the pesticide services company imports their pesticides from other countries, and from companies that has the necessary documentation on the content and safety of their pesticides, including the materials safety data sheet (MSDS). Only one pesticide services company, Lot No. (B2) could not produce the MSDS of the chemicals they use as the local supplier that provides them pesticides do not have this information. The content and

composition of the pesticides they use are not known. Further investigation may be required to confirm if the company is not using chemicals containing mercury.

According to the survey made at the Plant Protection Division, Yangon Region and Department of Agriculture, it was found that the likelihood of mercury contamination from insecticide in Thilawa SEZ Zone-A could be minimal as the import and use of mercury containing compounds were banned in Myanmar since 1996. Moreover, mercury containing fungicides are also no longer used in any country. However, it should be noted that the farmers in Kyauktan may still be using pesticides that have mercury due to their lack of awareness despite the trainings given by PPD.

According to the PPD, the pesticides being sold in Thanlyin and Kyauktan Townships are mostly imported to Myanmar from countries like China, India, Singapore and Bangladesh. Myanmar Pesticides Industry Co. Ltd. is the only local company listed by PPD that produces pesticides.

Among pesticides that are sold in the market in Yangon, Academy Pine is selling pesticides with no declared content and composition. Another local brand of pesticide is being sold in the market with no label on its content and composition. Further investigation may be required to confirm the composition of these two products, especially on its mercury-content.

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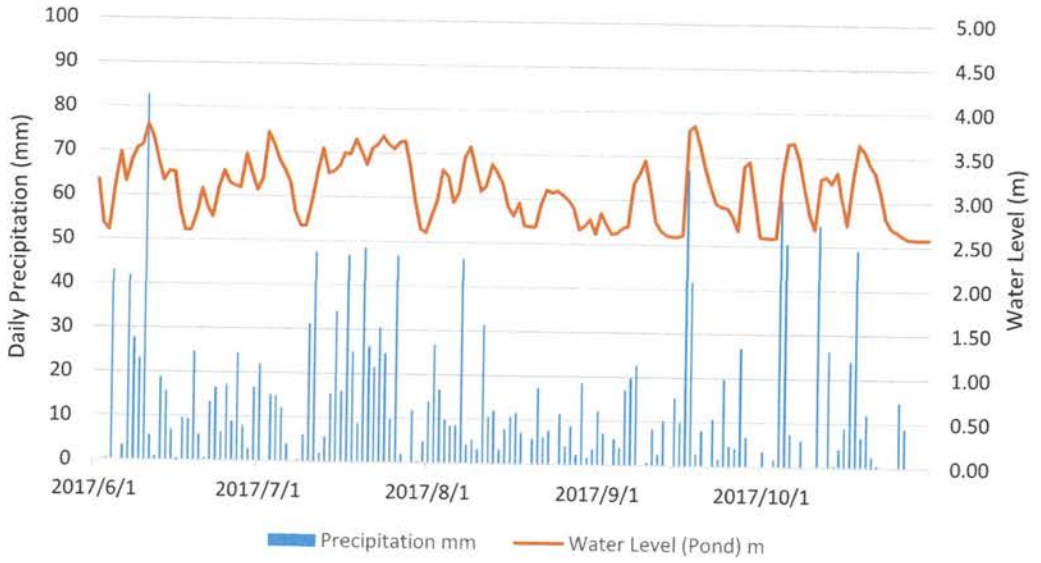
CHAPTER 4: CONSIDERATION OF MERCURY DETECTION FROM NATURAL ORIGIN

4.1 Weather and Water Level Monitoring

Weather monitoring system and water level sensor were installed at Thilawa SEZ in June 2017 and each parameter (including precipitation and water level of retention pond/canal) were monitored every 10 minutes. Considering the relativity between the water analysis result and weather, daily data of precipitation and water level of retention pond are collected as follows.



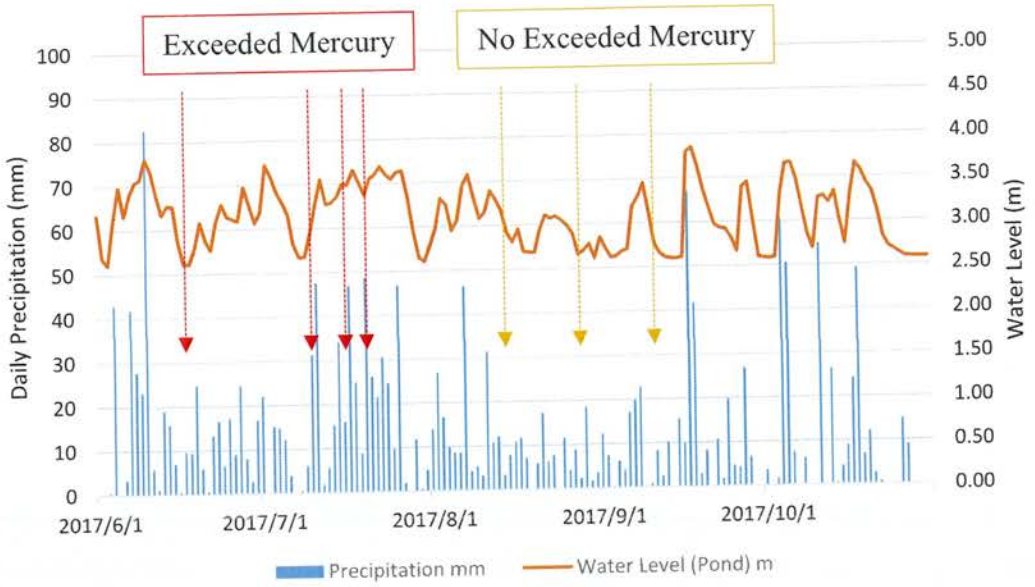
*Above water level shows the daily average of retention pond.
Source: Weather Monitoring System in Thilawa SEZ 2017, MJTD

Figure 4.1-1 Result of Weather/Water Level Monitoring from June 2017

4.2 Comparison Result of Water Analysis and Weather/Water Level Monitoring

Below graph shows the comparison result of water analysis and weather/water level monitoring. Red arrows show the sampling date when mercury exceeded the target value, while yellow ones show the date when mercury did not.

This graph shows that the samples after long rainy days like the end of July have higher mercury than those in the end of August and early September when there were no long rainy days.



Source: Weather Monitoring System in Thilawa SEZ 2017, MJTD

Figure 4.2-1 Result of Water Analysis and Weather/Water Level Monitoring

Below Table 4.2-1 shows the total volume of rainfall for three days right before each sampling date. It seems that there is no strong relationship between them.

Table 4.2-1 Analysis Result and Precipitation for Three Days

Sampling Date	Day	Target	Monitoring Type	Number of Exceeded Sample (for Target Value)	Total Precipitation mm (for 3 days[1)])
2017/6/27	Tue	Water	Regular Analysis	2 out of 3 (Pond & Canal)	32.7
2017/7/21	Fri	Water	Regular Analysis	1 out of 3 (Canal)	82.5
2017/7/28	Fri	Water	-	1 out of 6 (Canal)	58.7
2017/7/31	Mon	Water	Regular Analysis	1 out of 1 (Canal)	12.4
2017/8/1	Tue	Water	Regular Analysis	3 out of 4 (Pond & Canal & outside)	17.3
2017/8/1	Tue	Water	Self	9 out of 23 (Canal & Inside Factories	17.3
2017/8/25	Fri	Water	Regular Analysis	0 out of 4	14.3
2017/8/29 - 8/30	Tue -	Soil	-	0	15.6
2017/9/8	Fri	Water	Regular Analysis	0 out of 4	41.0
2017/9/22	Fri	Water	Regular Analysis	0 out of 4	11.1

*Orange highlight shows that some samples have exceeded Mercury.
1) Total rainfall for 3 days right before the sampling date (e.g. total precipitation of 6/24-26 for 6/27)
Source: Announcement Letter (MJTD), Analysis Report (DOWA), etc.

4.3 Confirmation of Mercury Detection by Natural Soil

The comparison results of mercury contamination in soil for EIA Report of Thilawa SEZ Zone-A and Zone B and MJTD Self-Monitoring are shown in Table 4.3-4. The mercury parameter showed significantly lower levels than the examined standards in Japan and Thailand.

Survey Method for In and Around Thilawa SEZ

(1) Methodology

1) Standard Method

In the course of survey, sampling procedure, sample preservation and sample analysis recommended in standard operating procedure of U.S. EPA (SOP-2012, SOP2016, and SOP 2003) were referred.

2) Sampling and preservation method

For soil sampling, the standard agricultural 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 20~30cm of top soil was removed by the sampler before sampling. Then sample was taken and collected in cleaned plastic bag. Same as sediment sample preservation, 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.

3) Analysis method

The analysis methods for each parameter are shown in Table 4.3-1.

Table 4.3-1 Analysis Method for Sediment and Soil Samples

No.	Parameter	Analysis Method
1	Mercury (Hg)	Atomic Absorption Spectrophotometer, Aqua-regia

(2) Laboratory

Chemical properties for soil were analyzed in the laboratory as shown in Table 4.3-2.

Table 4.3-2 List of Laboratory for Analyzed Soil

No.	Date	Survey Point	Laboratory / Country	Reference
1	29th July 2013	ST1, ST2	Applied Geology Department, Myanmar	EIA Report of Thilawa SEZ Zone-A
2	29th April 2013	ST1		EIA Report of Thilawa SEZ Zone-A
3	14th December 2015	SO-1, SO-2, SO-3, SO-4		EIA Report of Thilawa SEZ Zone B
4	29th-30th August 2017	S-1, S-2, S-3, S-4	UAE in Bangkok, Thailand	MJTD Self-Monitoring
	29th-30th August 2017	S-5, B12-Org, B12-DP1, B12-DP2		
	29th-30th August 2017	B23-Org, C1-Org, C1-D1, C1-D2		
	29th-30th August 2017	C2-Org, C2-D1, C2-D2, C16-Org		

(3) Instrumentation

Field equipment used on site are shown in Table 4.3-3.

Table 4.3-3 Field Equipment for Soil Quality Survey

No.	Equipment
1	Soil Auger (for soil sampling)

(4) Survey Result

(1) Soil quality

Below Table 4.3-4 shows the result of soil analysis for mercury in and around Thilawa SEZ. According to the results, there is no mercury contaminated soils. Therefore, the possibility of mercury detection by elution from soil is considered to be extremely low.

Table 4.3-4 Result of Soil Analysis for Mercury in and around Thilawa SEZ

No.	Date	Unit	Result (1)	Result (2)	Result (3)	Result (4)	Environmental Standard		Reference
							Japan	Thailand	
1	29th July 2013	mg/kg	(ST1) 0.002	(ST2) 0.004	-		15	610	EIA Report of Thilawa SEZ Zone-A
2	29th April 2013	mg/kg	ST1 ND	-	-				EIA Report of Thilawa SEZ Zone-A
3	14th December 2015	mg/kg	SO-1 ND	SO-2 ND	SO-3 ND	SO-4 ND			EIA Report of Thilawa SEZ Zone B
4	29th-30th August 2017	mg/kg	S-1 ND	S-2 ND	S-3 ND	S-4 ND			MJTD Self-Monitoring
	29th-30th August 2017	mg/kg	S-5 ND	B12-Org ND	B12-DP1 ND	B12-DP2 ND			
	29th-30th August 2017	mg/kg	B23-Org ND	C1-Org ND	C1-D1 ND	C1-D2 ND			
	29th-30th August 2017	mg/kg	C2-Org ND	C2-D1 ND	C2-D2 ND	C16-Org ND			

ND: Not Detected
Source: MJTD

CHAPTER 5: RELIABILITY OF ANALYSIS RESULT

5.1 Comparison of Mercury Analysis Result in Three Countries Laboratory

In order to verify the veracity of laboratory analysis for mercury, triplicate samples were collected for water quality sampling points SW-1 and SW-5. The samples were brought to Golden DOWA Ecosystem laboratory in Myanmar, OSUMI Co., Ltd laboratory in Japan and SGS laboratory in Thailand for analysis. The samples were collected on 25th August 2017. Samples were cooled in an ice box which temperature was under 4° C and was immediately sent to the laboratory for analysis.

The laboratory analysis showed that the mercury levels of the samples submitted were below the detection limit of the laboratory although the three laboratories have different detection limits. Myanmar laboratory measured <0.002 mg/L, the Japan laboratory measured <0.005 mg/L and the laboratory in Thailand showed levels <0.0005 mg/L. Although the detection limit of the three laboratories differ, it can be deduced that the analysis by the three laboratories are accurate and repeatable.

Table 5.1-1 Comparison of Mercury Test Results in Three Country (Myanmar, Japan and Thailand)

No.	Country	Date	Unit	SW-1	SW-5	Target Value (MJTD EIA)	Remark
1	**Myanmar**	25-Aug-17	mg/L	≤ 0.002	≤ 0.002	Max. 0.005	MJTD Self-Monitoring
2	**Japan**	25-Aug-17	mg/L	< 0.005	< 0.005	Max. 0.005	MJTD Self-Monitoring
3	**Thailand**	25-Aug-17	mg/L	< 0.0005	< 0.0005	Max. 0.005	MJTD Self-Monitoring

Source: Japan: Ministry of Environment, Government of Japan (2002)
Thailand: Notification of National Environmental Board No 25, B.E. (2004)," other purpose" class

5.2 Confirmation on Existing Results of Semi-annual Monitoring in Thilawa SEZ Zone-A

A comparison of the semi-annual monitoring results for SW-1 and SW-5 from on Oct 2016, June 2017 and Dec 2017 showed that the total suspended solids, total coliform and color parameters continuously exceed the allowable level. Although mercury can be bounded to silt and soil resulting to a higher mercury concentration during sampling, the results appear to have no correlation on mercury levels and suspended solid levels. Further, the suspended solids levels also appear to have no direct correlation to rainfall, except the potential for run-offs to have diluted the water in the drainage canal which led to lower suspended solids. The drainage canal is a concrete canal and receives run-offs from areas that are cemented, and as such, are expected to have limited silted water contribution. The high total coliform level indicates the contamination from domestic wastewater. The consistent high total coliform level for the drainage canal indicate possible continuous discharge of domestic wastewater into the drainage. As such, the source should be identified. Color is a function of total and dissolved suspended solids (Canadian EQG, 2001). In the case of SW-1 and SW-5, the limited data precludes a statistically acceptable correlation. This can, however, be statistically tested once more sampling data are made available.

Table 5.2-1 Comparison of MKI Semi-Annual Monitoring Results (Oct 2016 to Dec 2017)

Sampling Date			18-Oct-16	27-Jun-17	5-Dec-17	18-Oct-16	27-Jun-17	5-Dec-17	Target Value
No.	Parameters	Regular Monitoring SW-1	Regular Monitoring SW-1	Regular Monitoring SW-1	Regular Monitoring SW-1	Regular Monitoring SW-5	Regular Monitoring SW-5	Regular Monitoring SW-5	
1.	Temperature	˚C	35	28.6	33.6	33	30.0	32.1	Max. 40
2.	pH	-	7	7.2	8.2	7.5	7.9	8.0	5.0~9.0
3.	Suspended solid (SS)	mg/L	982	90	226	120	120	26	Max. 30
4.	Dissolved oxygen (DO)	mg/L	4.76	7.38	6.17	6.71	6.59	4.37	-
5.	BOD (5)	mg/L	9.35	0.00	8.76	4.48	0.00	7.58	Max. 20
6.	COD (Cr)	mg/L	2380.0	9.0	9.0	4.6	9.0	11.6	Max. 70
7.	Total coliform	MPN/ 100ml	90,000	160,000	92,000	160,000	>160,000	> 160,000	Max. 400
8.	Total nitrogen (T-N)	mg/L	3.1	2.4	4.9	1.2	3.8	1.1	80
9.	Total phosphorous (T-P)	mg/L	0.606	< 0.05	< 0.05	0.27	< 0.05	0.073	-
10.	Sulphide	mg/L	1.188	0.363	0.248	0.508	0.488	0.046	Max. 1
11.	Free chlorine	mg/L	8.0	1.9	0.1	2.8	2.4	< 0.1	Max. 1
12.	Color	TCU (True Color Unit)	8.75	3.50	10.74	5.62	7.64	13.62	-
13.	Cyanide	mg/L	7.00	0.018	0.030	0.147	0.027	0.002	Max. 0.2
14.	Oil and grease	mg/L	320.25	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1	Max. 5
15.	Formaldehyde	mg/L	0.490	0.120	0.050	0.202	0.163	0.017	Max. 1
16.	Phenols	mg/L	0.032	< 0.002	< 0.002	0.028	< 0.002	< 0.002	Max. 1
17.	Mercury	mg/L	≤ 0.00054	0.006	≤ 0.002	≤ 0.00054	0.008	≤ 0.002	Max. 0.005
18.	Zinc	mg/L	0.054	0.060	0.01	0.042	0.048	≤ 0.002	Max. 5
19.	Arsenic	mg/L	0.022	0.016	0.014	0.012	0.02	0.012	Max. 0.25
20.	Chromium	mg/L	≤ 0.002	≤ 0.002	0.018	≤ 0.002	≤ 0.002	≤ 0.002	Max. 0.5
21.	Cadmium	mg/L	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001	Max. 0.03
22.	Selenium	mg/L	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01	≤ 0.01	Max. 0.02
23.	Lead	mg/L	≤ 0.002	0.012	≤ 0.002	≤ 0.002	0.018	0.018	Max. 0.2
24.	Copper	mg/L	0.004	0.006	≤ 0.002	≤ 0.002	0.104	≤ 0.002	Max. 1
25.	Barium	mg/L	0.048	0.038	0.052	0.036	0.050	0.032	Max. 1
26.	Nickel	mg/L	0.052	0.036	0.03	0.028	0.046	0.004	Max. 0.2
27.	Odor	TON (Threshold Odor Number)	200	1	1	1	1	1	-
28.	Flow Rate	m^3/s	0.44	0.245	0.097	0.093	0.266	0.006	-

Source: Myanmar Koei International Ltd.
Note: Red color means the exceeded value than target value.

CHAPTER 6: CONCLUSION AND FUTURE COUNTER MEASURE

6.1 Conclusion

Table 6.1-1 below shows the findings of the study undertaken on possible sources of mercury levels within the development area of the Thilawa SEZ Zone-A.

Table 6.1-1 Potential Sources of Mercury According to the Results of the Study

	Source	Findings
Anthropogenic sources	Use of pesticides, chemical pest controls, herbicides and fungicides	• Past and present uses of pesticides may have affected the soil in the area within and in the vicinity of Thilawa SEZ Zone-A. The residues from these pesticides may have entered the drainage system through run-offs. • Lot No. (B2) is using pesticides without a Materials Safety and Data Sheet (MSDS). The content of the pesticides they use are not known. • Academy Pine Company are selling pesticides with unknown chemical content. • An unbranded pesticide with an undeclared chemical content is being sold in the market.
Natural causes	Presence of mercury during heavy rainfall or runoffs	• The mercury concentration results were not observed to be high after days of heavy rainfall
Natural causes	Presence of mercury on soil samples	• Mercury concentration of soil samples were way below the nominated target value of Japan and Thailand, with most of the results showing concentrations below the detection limit of the laboratory.
Natural causes	Water quality sampling results of semi-annual monitoring	• Semi-annual water quality sampling results consistently show suspended solid levels above the allowable target value of maximum 30 mg/L increase, while color also showed results above the target value. However before and after mercury exceeded events, mercury levels were lower than the limit of detection.
Laboratory Analysis	Comparison of laboratory results done by three laboratories in three different countries	• The three laboratories who undertook the analysis of triplicate water samples collected in two sampling stations all returned with comparable results despite having different detection limits. All samples were below the NEQG.

The results of the study indicate that the past and present use of pesticides that may contain mercury within and outside Thilawa SEZ Zone-A. And may have left soil residues that contributed to the mercury levels in drainage waters during the rainy season sampling in 2017. It should be noted though that laboratory results on soil sampling done during the EIA stage and the subsequent monitoring resulted to non-detected.

It is recommended that continuous frequent monitoring of the mercury levels in water samples be undertaken until the results continuously show levels within the NEQG. A review of the sampling points may need to be undertaken to identify potential contributors to the increase in mercury levels in drainage water. A summary of countermeasures has been formulated in Section 6.2Future Countermeasures.

TSMC should also require all the landscaping and greening contractors, as well as pesticides control service contractors to provide them information on all chemicals being used in Thilawa SEZ Zone-A to be certain that no mercury-containing chemicals are being used and that the chemicals are registered with the Pesticide Registration Board.

6.2 Future Countermeasures

Figure 6.1-1 shows the procedure that can be implemented should a similar event as to the increased mercury level occur within Thilawa SEZ Zone-A. The proposed a countermeasure and not preventative measure. It was prepared to provide assistance in addressing any potential contamination identified or if there are contaminants that have been accidentally released in the environment or in drainage canals.

Action 1 Emergency measures provide the immediate measures to counter any potential release of contaminants, or when contamination has been confirmed through laboratory analysis. The first level of action is to limit the spread of contaminant/s through shutting off the source or stopping the operation of the source of contaminants, and setting up physical barriers to limit the spread of the contaminant/s.
Action 2 Report and communications provide the step by step process in preparing the incident report and providing a copy of the incident report to proper authorities and to stakeholder representatives, especially the local government unit which has jurisdiction of the area that may be affected.
Action 3 Investigation of environmental damage provides for the process in identifying the magnitude and extent of the impact of contamination on physical and biological environmental aspects and disseminating the information to concerned stakeholders.
Action 4 Actions after water pollution incident is on the development of control measures to and to formulate monitoring schemes to assess if the impact has already been addressed. If impact persists, monitoring should continue and other control measures may need to be implemented.
Figure 6.1-2 shows the proposed reportorial protocol if there will be any exceedances to the adopted water quality standards. The water quality monitoring results will be compared with the MJTD adopted water quality standards and if exceeded, the results will be compared with the National Environmental Quality (Emission) Guidelines (NEQG).
If the result returns within the limits of NEQG, the results will be communicated immediately with OSSC Environmental Section, TSMC, JICA and any other concerned agencies. Should the result be beyond the allowable levels of NEQG, the results will immediately be communicated with the OSSC Environmental Section, TSMC, JICA, and will be announced to the Public to prevent any potential adverse impact to the community. In any which case, continuous monitoring will be undertaken until the exceeded parameter/s has obtain levels within the MJTD standards.

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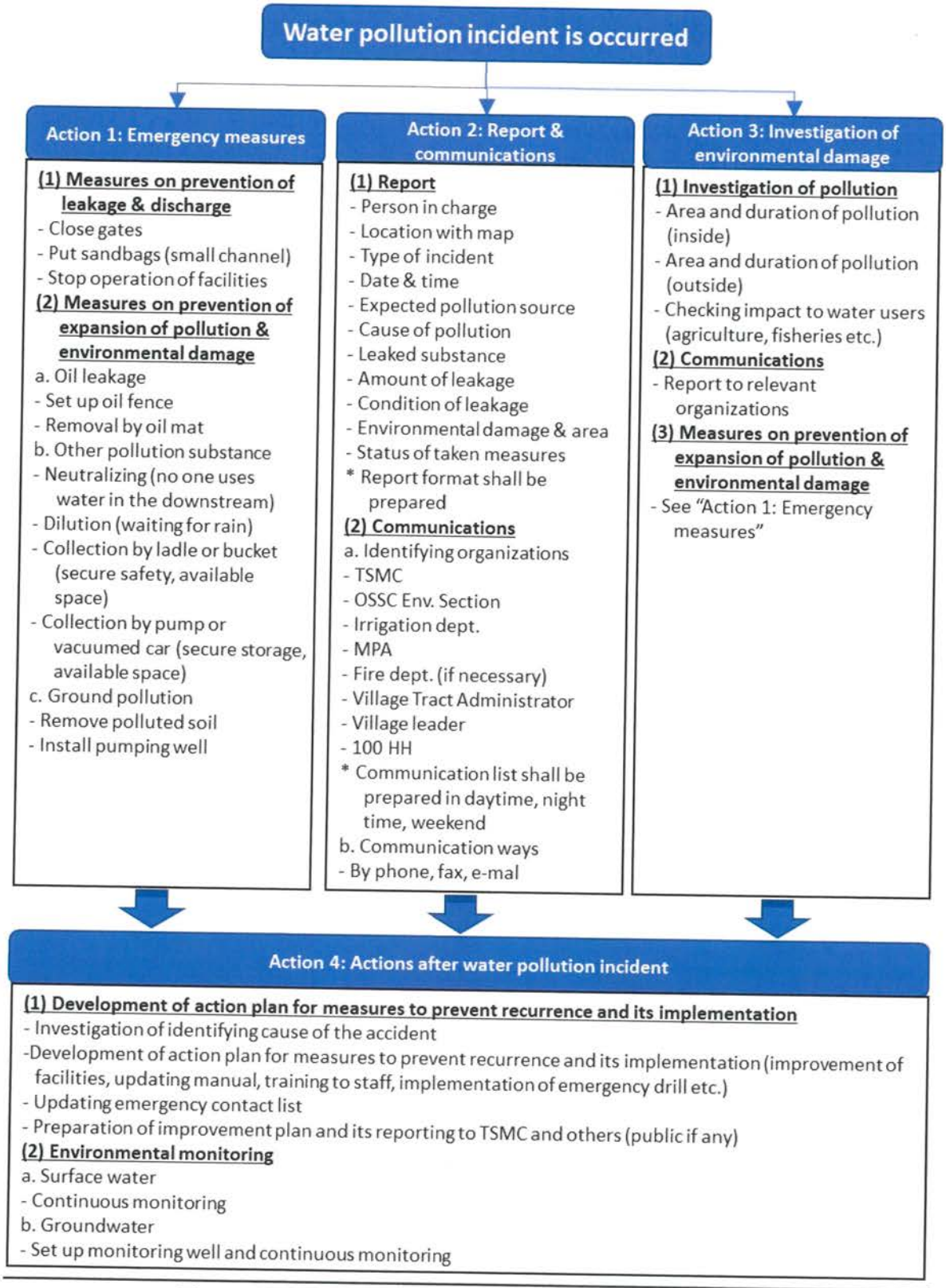

Figure 6.1-1 Water Pollution Incident Response Procedures

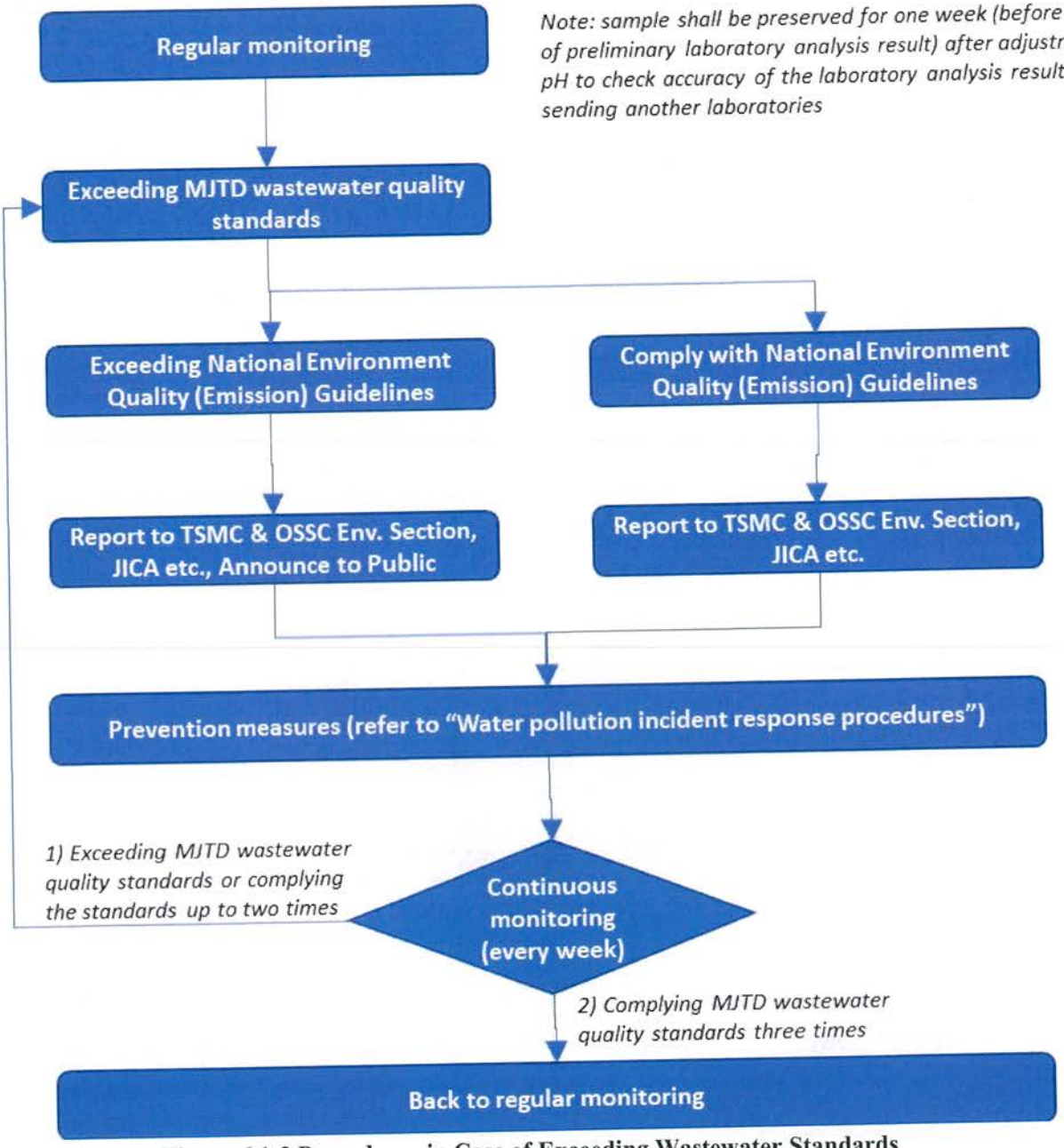

Figure 6.1-2 Procedures in Case of Exceeding Wastewater Standards

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