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WATER QUALITY IMPROVEMENT OF SUNGAI KENAWAR SEGAMAT (PROTOTYPE TEST SITE) USING ECO BIO BLOCK (EBB)

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ABSTRACT

Water is one of the most important resources for all living things on earth. River is the main source of water supply. However, the aggressive economic growth in our country has spoilt the environments which then lead to river pollution. This study will focus on Sungai Kenawar's water quality analysis by using Eco Bio Block. This biotechnology water treatment solution does not require high maintenance cost as compared to other mechanical methods that had been used. The concept was based on using environmental-friendly microorganisms to treat raw water from the river source. The study will determine the trend and level of pollution. This study applies the Water Quality Index (WQI) as a fundamental water quality assessment for river classification. Basically, this study involves two tests namely test 1 which entail 12 weeks of sampling and analysis and test 2 which entails continues 24 hours monitoring. There are two main methods involved, which are field measurements and laboratory experiments. In field, the parameters measured consist of pH, conductivity, turbidity, temperature, dissolved oxygen (DO), and total dissolved solid (TDS). Meanwhile, the laboratory test parameters consist of dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), suspended solid (SS), ammonia nitrogen (NH3-N), and nitrite (NO2). Based on the preliminary results and data gained, EBB's usage showed improved water quality of Sungai Kenawar to about 29% for test 1 and 27.5 % for test 2. Besides that, it was found that the water quality class improved from class IV to class III.

Keywords: *River water pollution, Water Quality Index (WQI), Water quality improvement, Eco Bio Block (EBB).*

1.0 INTRODUCTION

Malaysia is fortunate to have ample amount of water with more than 9 billion meter cube of annual rainfall, however rapid population growth and industrial development will one day deplete the available resources. To ensure adequate water supply to meet the future demand requires coherent and systematic planning and development of its available resources. This paper highlights one of the efforts undertaken by our research group to improve, conserve and maintain the available surface water source of at least to the Interim Water Quality Standards of DOE, Malaysia (Department of Environmental). This project EBB was laid along a specific reach of the river of 10m length and 6m wide. Water flowed past the EBB. Samples were taken at the inlet and outlet for a specific period (every 24 hours intervals) for the laboratory determination of the parameters considered.

2.0 OBJECTIVES

i. To evaluate the removal efficiency of EBB
ii. To determine the water quality of the flowing water after the outlet of EBB compare with luterim Nation Water Quality Standards A or B.
iii. Compute Water Quality Index (WQI).

3.0 SCOPE OF WORKS

i. The study was carried out to evaluate the water quality improvement by comparing parameter value before and after EBB treatment.
ii. The study was carried out for a period of 12 weeks dated from 11/07/06 until 26/09/06. All data were taken every Monday and commencing at 9.00am.
iii. The 24-hour data were collected on 02/10/06 (on 13th week).
iv. Laboratory analysis include dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), suspended solid (SS), ammonical-nitrogen (NH3-N).
v. Physical parameters measured at site include pH, conductivity, turbidity, dissolved oxygen (DO), temperature, and total suspended solids (TSS).All the physical quality parameters were measured using Water Quality checker; model Horiba.

4.0 DATA ANALYSIS

Laboratory analysis of TSS, BOD, COD, NH3-N, NO2, NO3 were carried out. The basis of comparison of quality parameters was JAS standards A and B. Standard A was used for raw water abstraction intended for public water supply, meanwhile standard B was meant for consent of wastewater discharge with extensive treatment process if there were no other alternative source of water for water supply. The summary of the data collected for all the quality parameters considered were shown in appendixes overleaf.

Conclusion and recommendations results of data analysis of 12 week1 data collected showed an improve in water quality of Sungai Kenawar, Segamat. The application of EBB along certain river reach showed a reduction in level of the parameters measured such as BOD_5, COD, TSS, NH_3-N, SS, NO_2, NO_3, turbidity etc. This was shown from the influent and effluent quality. It can be concluded that EBB could improve water quality in small river such as Sungai Kenawar, EBB proved to be a cost effective method to lower the pollution level of a river receiving waste water discharge and storm water from a small catchment areas such as Kenawar catchment area of 2 square kilometer. Computation of WQI of Sg. Kenawar showed that the river was in class 2 according to JAS standard.

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Appendix 1

LAMPIRAN A

Jadual Ketiga

Akta Kualiti Alam Sekeliling 1974

Peraturan-peraturan Kualiti Alam Sekeliling (kumbahan dan Effluen-effluen Perindustrian) 1978

[Peraturan 8 (1), 8 (2), 8 (3)]

Parameter	Unit	Piawai A	Piawai B
i. Suhu	°C	40	40
ii. Nilai pH	-	6.0-9.0	5.5-9.0
iii. BOD_5 pada 20°C	mg/l	20	50
iv. COD	mg/l	50	100
v. Pepejal Terampai	mg/l	50	100
vi. Raksa	mg/l	0.005	0.05
vii. Kadmium	mg/l	0.01	0.02
viii. Kromium Heksavalensi	mg/l	0.05	0.05
ix. Arsenium	mg/l	0.05	0.10
x. Sianid	mg/l	0.05	0.10
xi. Pelambum	mg/l	0.10	0.5
xii. Kromium, Trivalensi	mg/l	0.20	1.0
xiii. Tembaga	mg/l	0.20	1.0
xiv. Mangganam	mg/l	0.20	1.0
xv. Nikel	mg/l	0.20	1.0
xvi. Timah	mg/l	0.20	1.0
xvii. Zing	mg/l	1.0	1.0
viii. Boron	mg/l	1.0	4.0
xix. Besi (Fe)	mg/l	1.0	5.0
xx. Fenol	mg/l	0.001	1.0
xxi. Klorin bebas	mg/l	1.0	2.0
xxii. Sulfid	mg/l	0.50	0.50
xiii. Minyak dan Gris	mg/l	Tak boleh dikesan	10.0

Nilai Standard efluen air sisa mengikut akta yang tercatat.

Appendix 2

LAMPIRAN B

Piawai bagi Semua Kelas Dalam INWQS (*Interim Water Quality Criteria and Standard for Malaysia*) dengan Parameter Kualiti Air yang berkaitan

Parameter	Unit	Kelas				
		I	II	III	IV	V
DO	mg/l	7	5	3	1	Tahap yang Lebih Tinggi Dariapada Kelas IV
COD	mg/l	10	25	50	100	
BOD	mg/l	1	3	6	12	
SS	mg/l	25	50	150	300	
NH_3-N	mg/l	0.1	0.3	0.9	2.7	
PH	-	6.5-8.5	6-9	5-9	5-9	
Kekonduksian	Umhos/cm	1000	1000	-	6000	
Saliniti	Ppt	0.5	1	-	2	
Minyak & Gris	mg/l	-	7	-	-	
Koliform jumlah	Koloni/100 ml	100	5000	50000	50000	
E. Coli	Koloni/100 ml	10	100/400	5000	5000	
Kadmium	mg/l	-	0.001	0.01	0.01	
Arsenik	mg/l	-	0.05	0.05	0.1	
Raksa	mg/l	-	0.0001	0.001	0.002	
Kromium	mg/l	-	0.05	0.05	0.1	
Plumbum	mg/l	-	0.01	0.02	5	
Kuprum	mg/l	-	0.012	0.012	0.2	
Nikel	mg/l	-	0.05	0.9	1.2	
Zink	mg/l	-	5	0.4	2	
Nitrat	mg/l	-	7	-	5	
Fosfat	mg/l	-	0.2	0.1	-	
Fenol	mg/l	-	0.01	-	-	
Klorida	mg/l	-	200	-	80	
Sulfat	mg/l	-	-	-	-	
Sianida	mg/l	-	0.02	0.06	-	

Appendix 3

LAMPIRAN C

WQI = (0.22*SIDO) + (0.19*SIBOD) + (0.16*SICOD) + (0.15*SIAN) + (0.16*SISS) + (0.12*SIpH)

Sub-Indeks Untuk DO

SIDO = 0	Untuk X sama dengan atau kurang dari 8
SIDO = 100	Untuk X sama dengan atau lebih dari 9
$SIDO = -0.395 + 0.03\ X^2 - 0.0002\ X^2$	Untuk X sama dengan 8 tapi kurang dari 9

Sub-Indeks Untuk BOD

SIBOD = 100.4 – 4.23 X	Untuk X sama dengan atau kurang dari 5
$SIBOD = 108\ e^{-0.055\ X} - 0.1\ X$	Untuk X sama dengan atau lebih dari 5

Sub-Indeks Untuk COD

SICOD = -1.33 X + 99.1	Untuk X sama dengan atau kurang dari 20
$SICOD = 103\ e^{-0.0157\ X} - 0.04\ X$	Untuk X sama dengan atau lebih dari 20

Sub-Indeks Untuk Ammonia Nitrogen (AN)

SIAN = 100.5 – 105 X	Untuk X sama dengan atau kurang dari 0.3
$SIAN = 94\ e^{-0.573\ X} - 5\ (X-2)$	Untuk X lebih dari 0.3 tapi kurang dari 4
SIAN = 0	Untuk X sama dengan atau lebih dari 4

Sub-Indeks Untuk SS

$SISS = 97.5\ e^{-0.00676\ X} - 0.05\ X$	Untuk X sama dengan atau kurang dari 100
$SISS = 71\ e^{-0.0016\ X} - 0.015\ X$	Untuk X lebih 100 tapi kurang dari 1000
SISS = 0	Untuk X sama dengan atau lebih dari 1000

Appendix 4

LAMPIRAN C (SAMBUNGAN)

Klasifikasi Kualiti air

Kelas	Kegunaan
I	Keadaan air yang terpelihara bagai persekitaran semulajadi. Untuk kegunaan bekalan air dan ia tidak memerlukan rawatan melainkan pembasmian. Untuk kehidupan air yang sangat sensitif terutamanya ikan.
II	Untuk kegunaan bekalan air memerlukan rawatan secara konvesional dan perlukan air yang berkualiti tinggi. Untuk perikanan sesuai bagi hidupan air yang sensitif. Boleh digunakan untuk tujuan rekreasi dan mandi-manda.
III	Untuk kegunaan bekalan air memerlukan rawatan rapi dan merupakan sumber simpanan bekalan air. Perikanan sesuai untuk spesies yang mempunyai nilai ekonomi yang boleh bertoleransi terhadap kualiti air.
IV	Sesuai untuk pengairan pertanian.
V	Untuk kegunaan selain daripada di atas.

(Sumber: Jabatan Alam Sekitar Malaysia)

Appendix 5

LAMPIRAN D (CONTINUE)

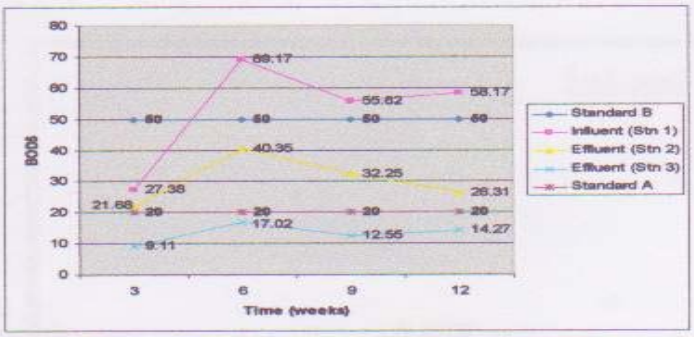


Figure 10: The value of BOD_5 compare with Standard A, JAS

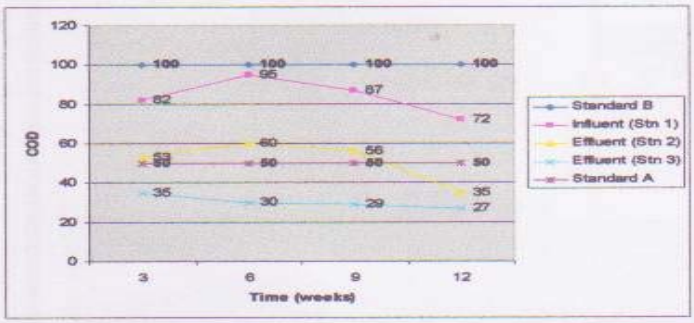


Figure 11: The value of COD compare with Standard A&B, JAS

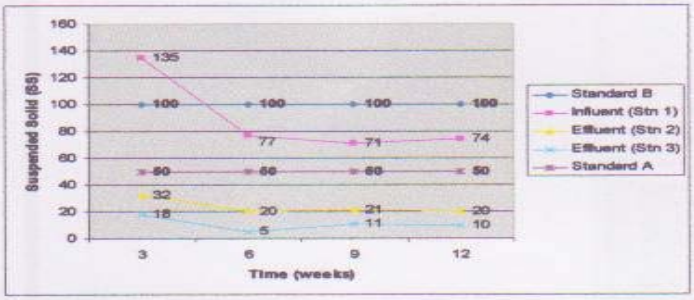
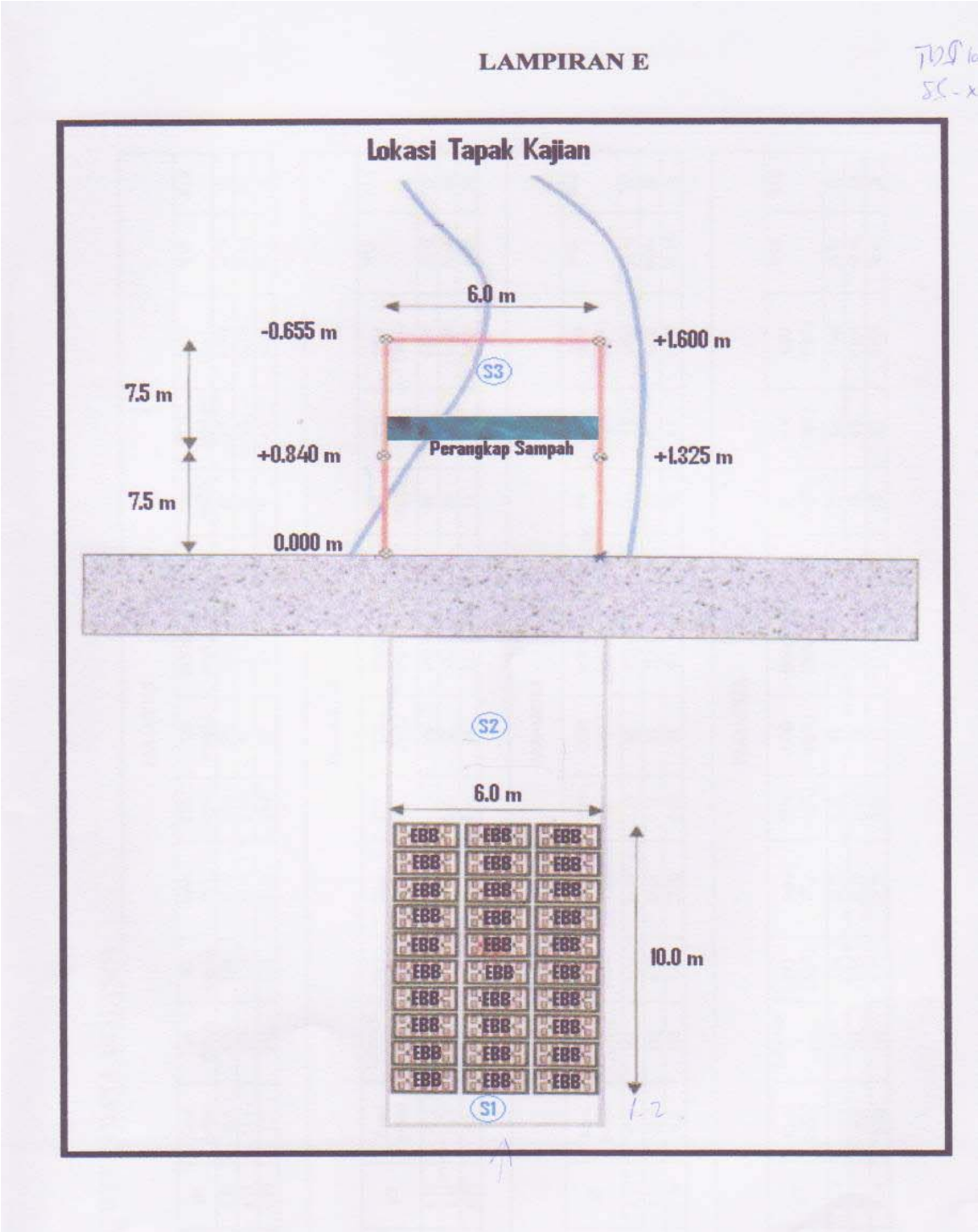


Figure 12: The value of SS compare with Standard A&B, JAS

Appendix 6


LAMPIRAN E
Lokasi Tapak Kajian
6.0 m
-0.655 m
+1.600 m
S3
7.5 m
+0.840 m
Perangkap Sampah
+1.325 m
7.5 m
0.000 m
S2
6.0 m
EBB
10.0 m
S1