REPORT ON DROUGHT CONDITION FOR PENINSULAR MALAYSIA
(BASED ON HYDROLOGIC ANALYSIS)

September 22, 2005

Hydrology and Water Resources Division
Department of Irrigation and Drainage
Malaysia

CONTENTS

Report on Drought Condition for Peninsular Malaysia
(Based on Hydrologic Analysis)
22 September 2005

Summary

1. Based on rainfall records collected from all 41 selected stations in Peninsular Malaysia for the purpose of drought monitoring, indicate that the average of total amount of those stations record less rainfall (i.e 139.14mm as compared to July 151.3 mm)

2. But on analyzing for three months total (June, July and August), most of the stations record comparatively less rainfall as to the long term average of the three months total. 18 stations record above average while 23 others are below average. Their percentage deviation ranging from -1 to -50%. This indicates that the drought conditions still persist.

3. By comparing the three month total (391.3 mm) to the long term three month average (447.6 mm), it can be deduced that the drought condition has worsen (–12.6 % of percentage deviation as compared to the previous month which is -7.8%).

4. Based on river flow analysed for the month of September, 2005, three out of ten rivers being monitored on-line still experiencing low flow condition as shown in table below.

No	Name of river	Low flow reading (cubic meter)	ARI (years)
1.	Sungai Muda @ Jambatan Syed Omar	5	10
2.	Sg. Kurau @ Pondok Tanjung	1.8	> 10
3.	Sg. Kerian @ Selama	7.7	5

5. From six dams being monitored on-line, as on September 22, three dams still need to be closely monitored as the storages are very near oreither decreasing as shown on table below:

No.	Name of dam being monitored	Present Storage (MCM) as on September 22	Percentage of **August** storage as compared to its full capacity	Percentage of **present** storage (22 September) as compared to its full capacity
1.	Klang Gate	18.22	60.12	63.85
2.	Machap	4.38	31.51	41.90
3.	Semberong	4.16	25.51	23.66

It shows that, two dams have increased in storage compared to the previous month but Semberong Dam on the other hand experiencing drawdown in storage.

1.0 Drought Monitoring by Rainfall Data

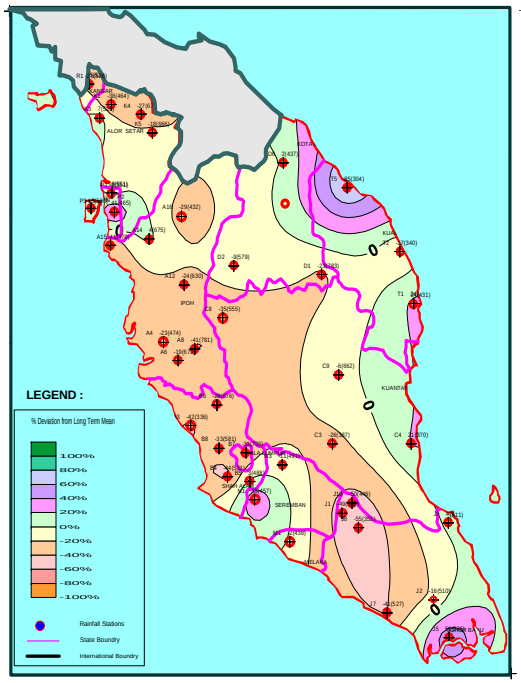
1.1 From the total of rainfall for the three consecutive months from July to September recorded at 100.9mm, 151.3mm and 139.14mm respectively, it can be deduced that the drought condition to some extent is not much improved. The rainfall data is then used to produce the isohytal map Figure 1.1 and 1.2 (also shown in the drought websites below)

i. http://infokemarau/DrIsohyet.html
ii. http://infokemarau/monthly_rainfall1.html
iii. http://infokemarau/dranalysis_2005.html

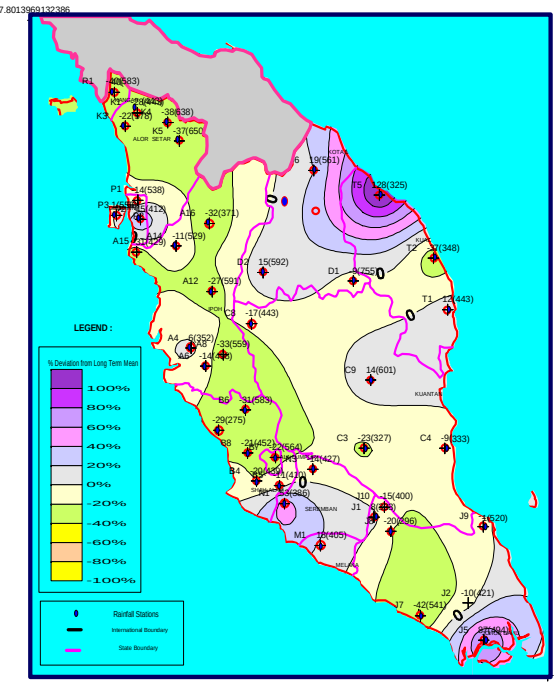
FIGURE A1 : ISOHYET OF RAINFALL DEVIATION FROM LTM

FOR THE MOVING 3 MONTHLY RAINFALL OF JUN– OGOS 2005

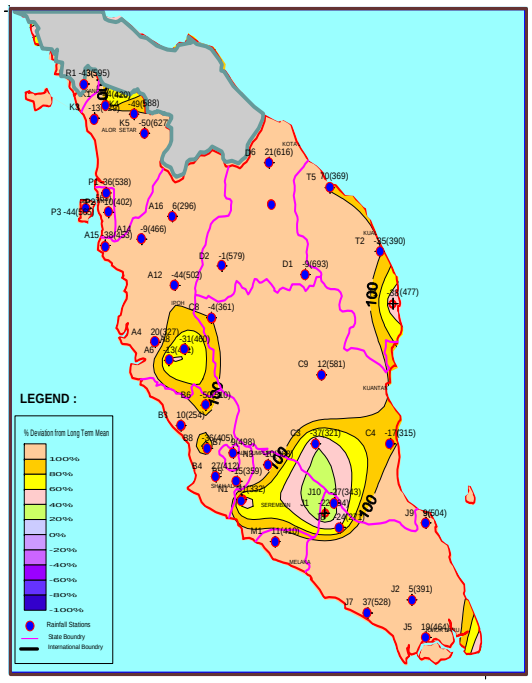
MONTH : JUNE 2005
PERIOD : APRIL - JUNE 2005



MONTH : JULY 2005
PERIOD : MAY – JULY 2005



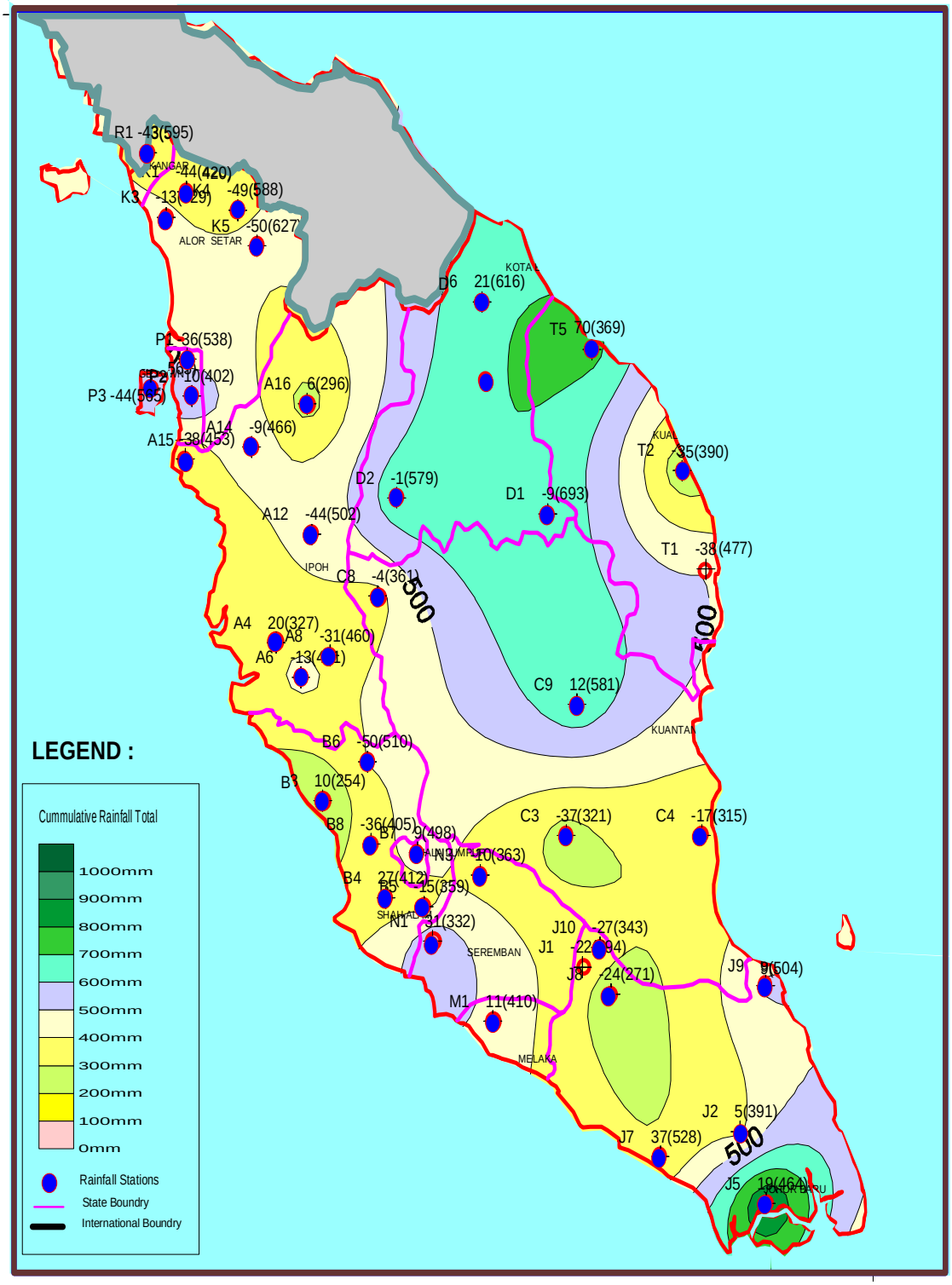
MONTH : OGOS 2005
PERIOD : JUN –OGOS 2005



ISOHYET OF TREE MONTHLY RAINFALL DISTRIBUTION

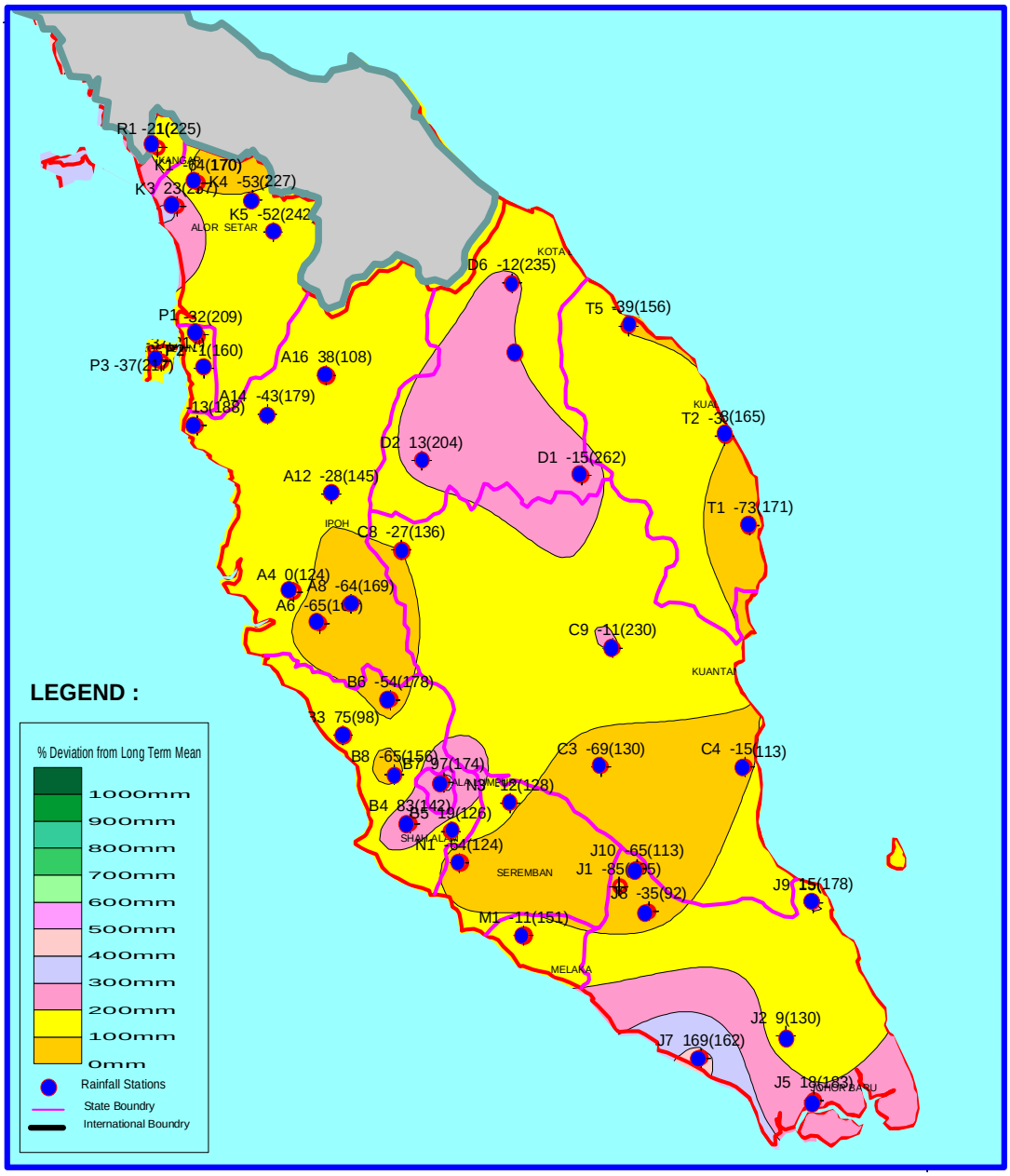
MONTH: OGOS 2005

PERIOD: JUN – OGOS 2005



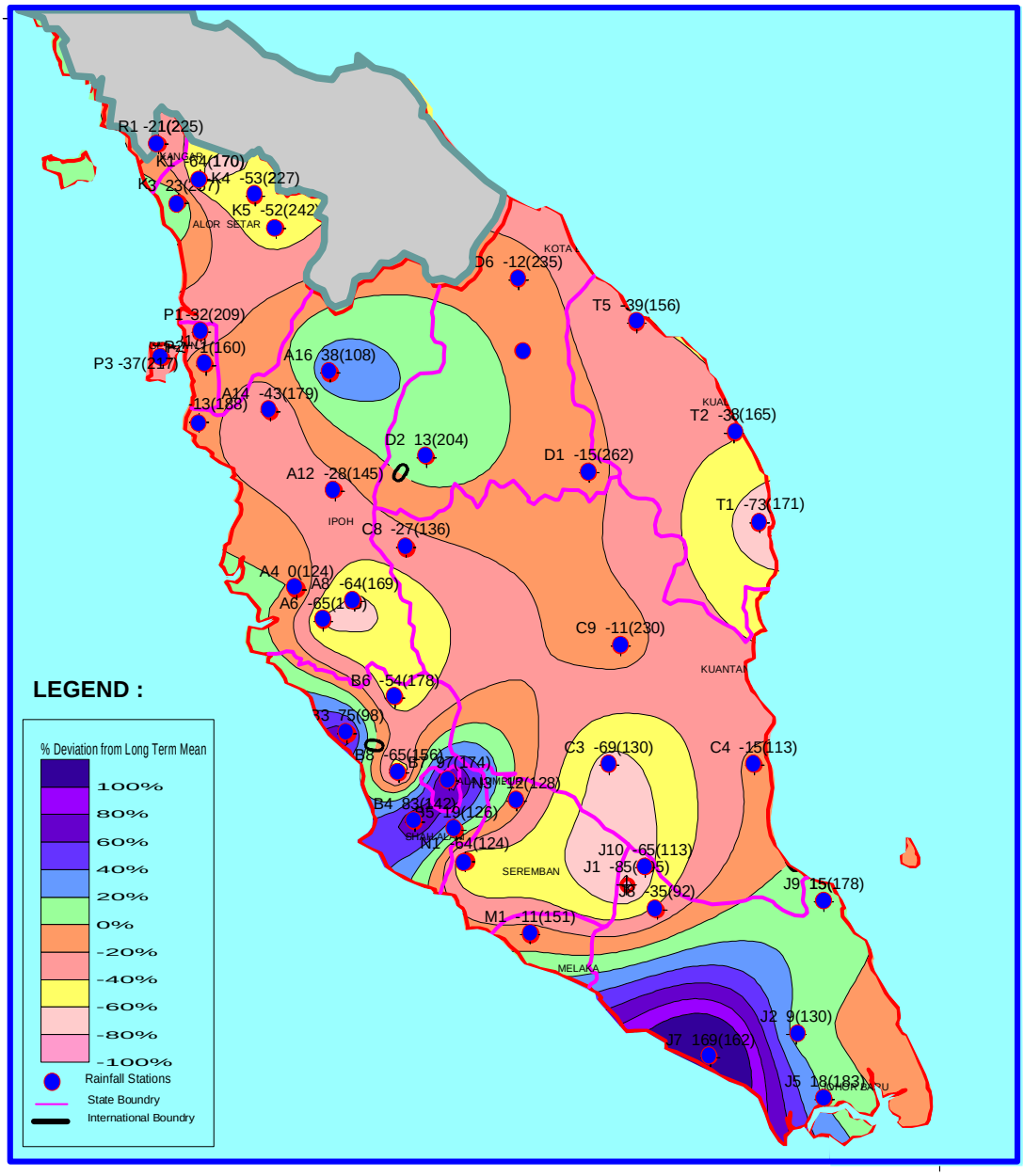
MONTHLY RAINFALL STATUS 2005

MONTH : OGOS 2005



MONTHLY RAINFALL STATUS 2005

MONTH : OGOS 2005



1.2 Based on Table 1.1, 3 out of 7 rainfall stations used for drought monitoring in Johor still recording deficiency ranging from -22% to -27% of their three monthly average rainfall. For Negeri Sembilan only one station (N3) records deficit of –6%. (N1). Detail drought analysis in Negeri Sembilan is described in para 1.5

1.3 For the state of Perlis, Kedah, Penang, Perak, Selangor and Pahang, the deficiency ranging from -1% to -50%. It shows that, the rainfall deficiency occurs to almost all the West Coast states and west of Pahang. For East Coast states, Terengganu records deficit in rainfall amount while Kelantan has overall, recorded more rainfall.

Table 1.1 : Rainfall Analysis for June – August 2005

WATER RESOURCES STATUS MONITORING PROGRAM IN PENINSULAR MALAYSIA
(Jun - Ogos 2005)

NO	NO STESEN	JUN-05	Jul-05	Aug-05	Total Rainfall	(3Mth Cum Rf)	Diff(mm)	% Dev
1	6501005 (R1)	98.00	64.00	176.50	338.50	595.4	-256.9	-43
2	6206035 (K1)	84.00	92.00	61.00	237.00	420.2	-183.2	-44
3	6103047 (K3)	117.90	111.00	316.70	545.60	629.1	-83.5	-13
4	061 (K4)	99.10	94.70	106.50	300.30	587.9	-287.6	-49
5	566 (K5)	123.50	74.00	116.50	314.00	627.2	-313.2	-50
6	5505033 (P1)	99.00	106.00	141.00	346.00	538.4	-192.4	-36
7	5304045 (P2)	64.00	219.50	158.00	441.50	401.7	39.8	10
8	5302003 (P3)	38.50	143.50	136.00	318.00	565.3	-247.3	-44
9	4109095 (A4)	70.00	200.00	124.00	394.00	327.3	66.7	20
10	4011139 (A6)	140.00	184.50	57.50	382.00	440.6	-58.6	-13
11	4011144 (A8)	144.00	112.00	60.50	316.50	460.0	-143.5	-31
12	4511111 (A12)	59.00	120.50	104.00	283.50	502.3	-218.8	-44
13	5006021 (A14)	56.00	265.50	101.50	423.00	466.1	-43.1	-9
14	5003028 (A15)	0.00	119.00	163.50	282.50	453.4	-170.9	-38
15	5210069 (A16)	85.00	80.50	149.50	315.00	296.3	18.7	6
16	3411017 (B3)	17.50	89.50	172.50	279.50	253.8	25.7	10
17	2917001 (B4)	47.50	217.00	260.50	525.00	412.5	112.5	27
18	2818110 (B5)	90.00	68.00	149.00	307.00	359.2	-52.2	-15
19	3516022 (B6)	85.00	87.50	81.50	254.00	510.1	-256.1	-50
20	3117070 (B7)	41.00	157.02	342.50	540.52	497.6	42.9	9
21	3115079 (B8)	66.00	141.00	54.00	261.00	404.7	-143.7	-36
22	2719001 (N1)	130.50	258.00	45.00	433.50	332.0	101.5	31
23	3023098 (N3)	89.00	125.50	113.00	327.50	363.1	-35.6	-10
24	2321006 (M1)	46.50	273.50	134.50	454.50	409.8	44.7	11
25	2526001 (J1)	40.00	173.00	16.00	229.00	293.7	-64.7	-22
26	2033001 (J2)	131.91	137.00	142.00	410.91	391.4	19.5	5
27	1437116 (J5)	77.00	259.00	216.00	552.00	464.3	87.7	19
28	1829001 (J7)	138.50	145.50	437.00	721.00	527.7	193.3	37
29	2528002 (J8)	29.00	118.00	60.00	207.00	271.5	-64.5	-24
30	2536168 (J9)	209.00	135.50	204.00	548.50	503.7	44.8	9
31	2527004 (J10)	66.50	143.00	39.50	249.00	343.1	-94.1	-27
32	3424081 (C3)	60.00	103.50	40.00	203.50	321.5	-118.0	-37
33	3533102 (C4)	59.50	104.50	96.50	260.50	314.8	-54.3	-17
34	4414036 (C8)	88.00	158.00	70.50	316.50	360.7	-44.2	-12
35	3930012 (C9)	221.50	224.00	206.00	651.50	581.4	70.1	12
36	4726001 (D1)	200.00	209.00	222.00	631.00	693.3	-62.3	-9
37	4819027 (D2)	159.00	185.00	231.00	575.00	579.4	-4.4	-1
38	5921009 (D6)	291.50	244.50	208.00	744.00	615.9	128.1	21
39	4234109 (T1)	137.00	112.00	42.50	291.50	477.5	-186.0	-39
40	4734079 (T2)	55.50	94.50	102.50	252.50	389.7	-137.2	-35
41	5331048 (T5)	281.00	253.00	46.00	580.00	369.0	211.0	57
	MEAN	100.9	151.3	139.14	391.3	447.6	-56.3	-12.6

Special focus on Johor's drought based on dam level and rainfall data

1.4 Figure 1.1 and 1.2, show that the rainfall stations which located near to the three dams being monitored i.e. Macap, Sembrong and Bekok still record a deficit in rainfall amount. Stor Baru JPS Kluang records a deficit of -13.0% until August 2005 and Macap Dam with a deficit of -31.0% until July 2005.

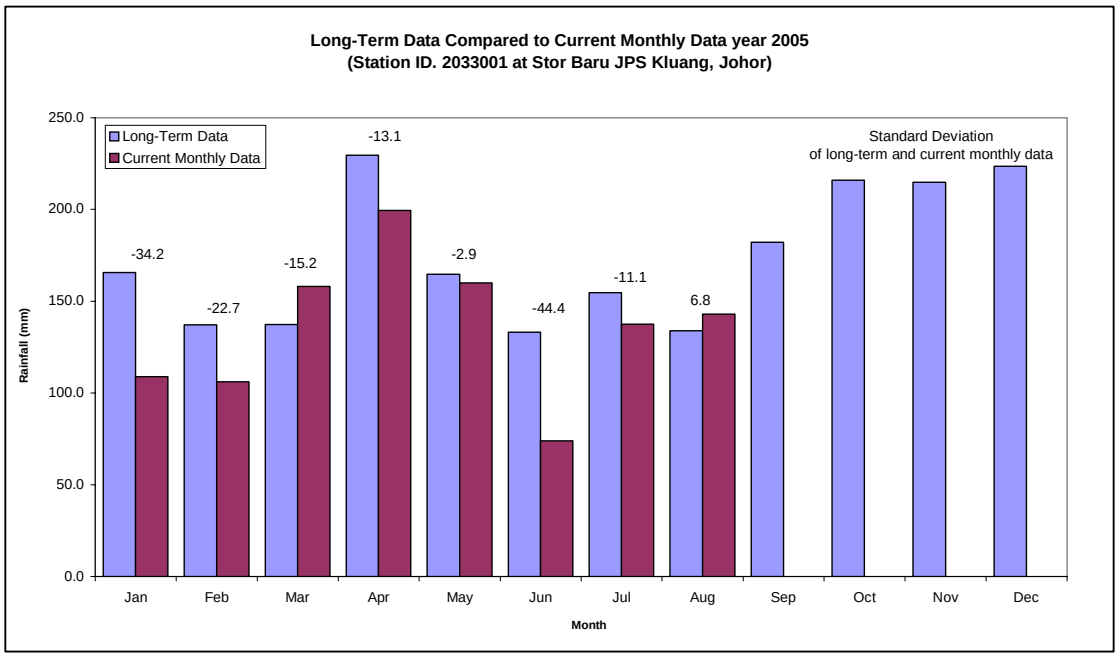


Figure 1.1: Long Term Data Compared to Current Monthly Data (year 2005) At Stor Baru JPS Kluang, Johor.

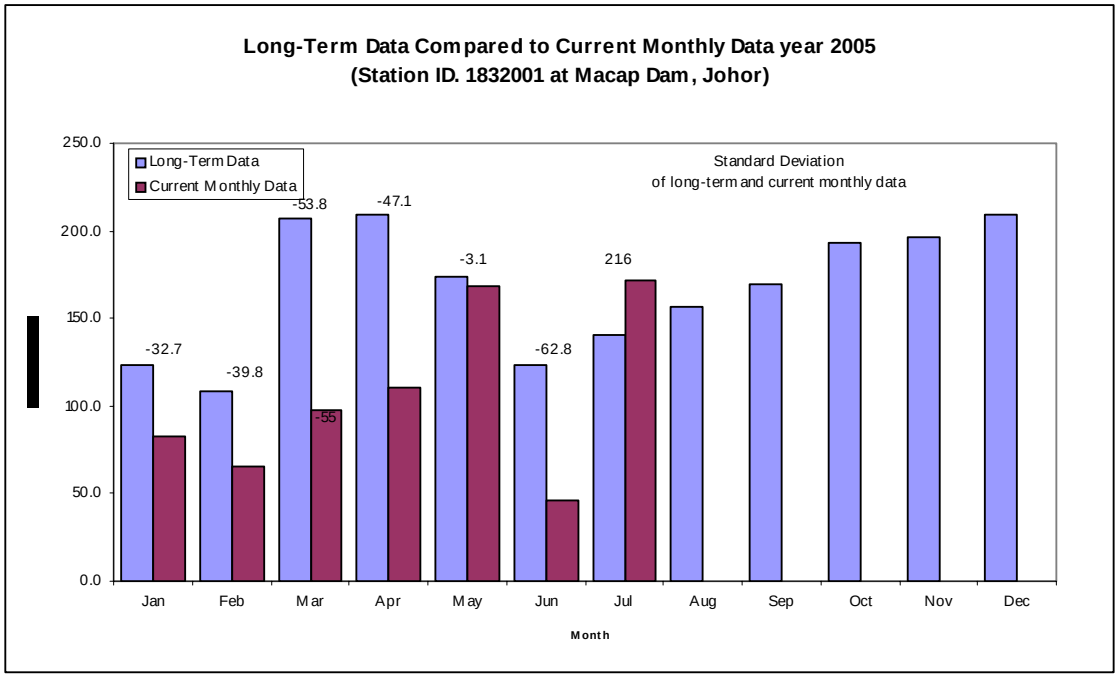


Figure 1.2 : Long Term Data Compared to Current Monthly Data (year 2005) For Macap Dam, Johor.

Special focus to Negeri Sembilan's drought based on rainfall data

1.5 Seremban has experience shortage of water supply since June 2005. Water rationing has been exercised throughout Seremban to ensure its fair distribution. On analysing the water shortage, DID has focused on Sg. Terip catchment located at the upstream of Seremban town. Based on three rainfall stations being analysed, two stations (refer to Fig. 1.3) record increase rainfall (+5.7% and +10.8% compared to its long term average) and one station located within the Sg. Terip catchment record deficit of -25%. This would probably suggest the cause of water shortage experienced in Seremban as there was not much rainfall being recorded over the Sg. Terip cathment which is the source of water supply for large part of Seremban town.

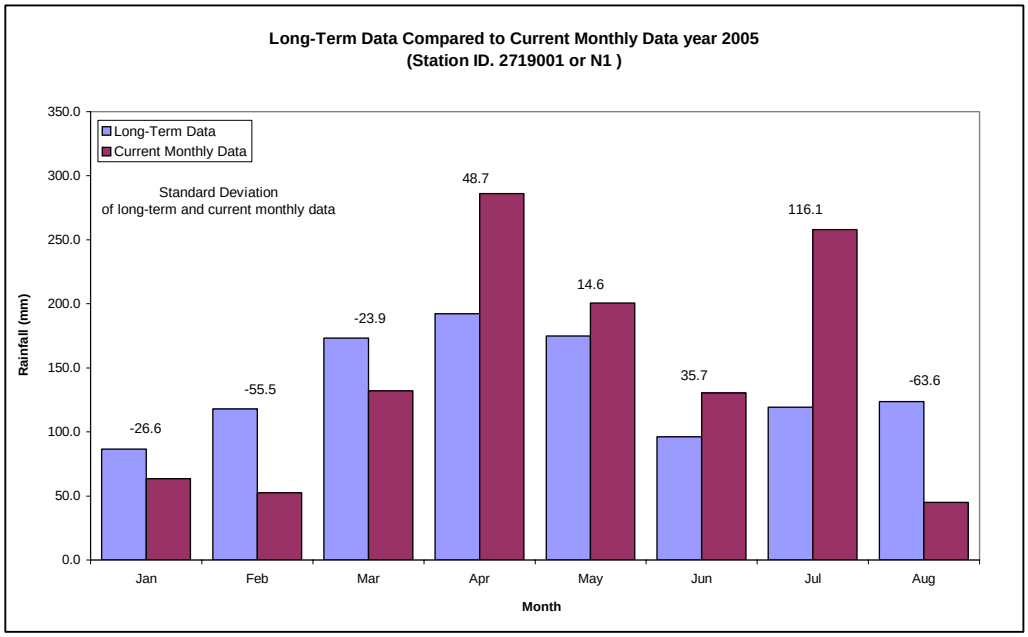


Figure 1.3 : Long-Term Data Compared to Current Monthly Data (year 2005) in Negeri Sembilan.

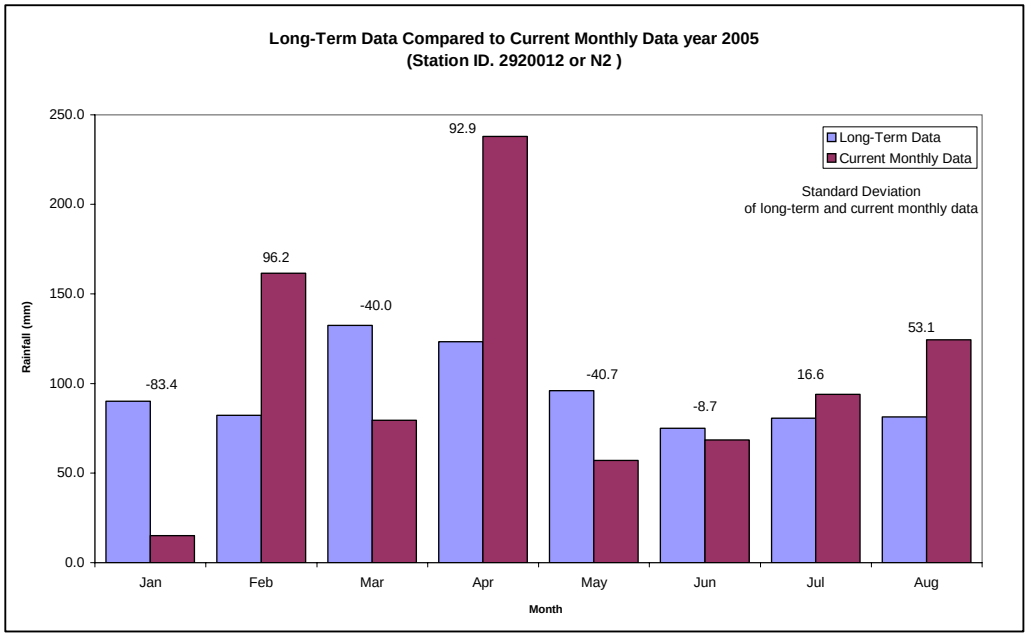


Figure 1.4 : Long-Term Data Compared to Current Monthly Data (year 2005) in Negeri Sembilan.

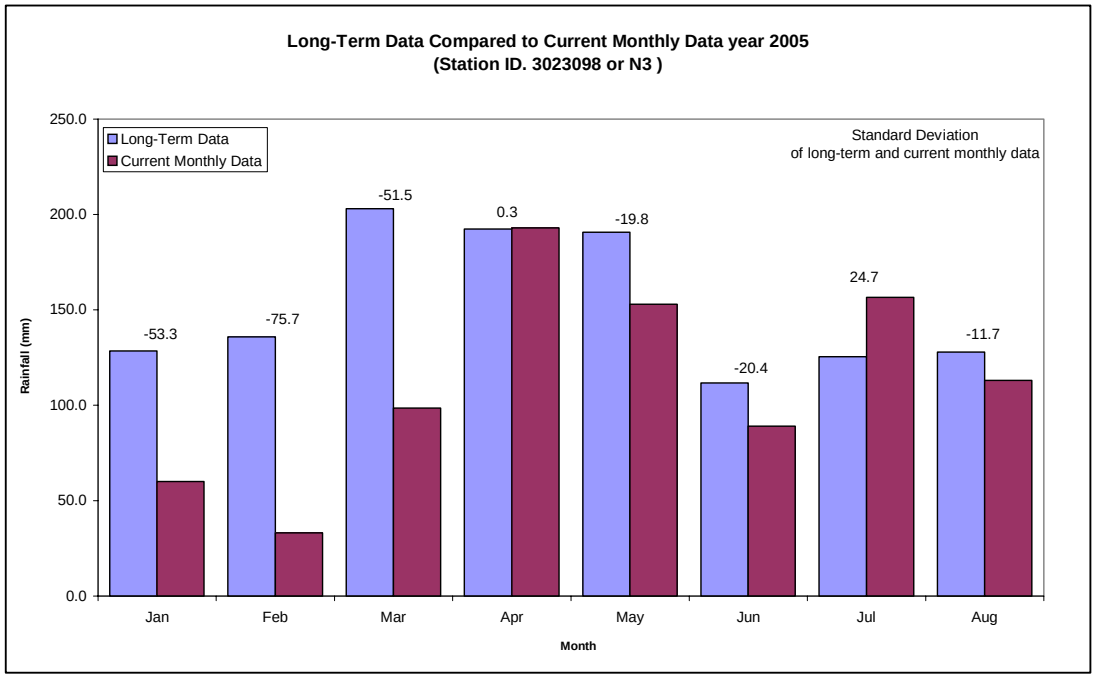


Figure 1.5: Long-Term Data Compared to Current Monthly Data (year 2005) for Negeri Sembilan

2.0 Drought Monitoring by River Flow

2.1 Based on Table 2.1 and 2.2, as on September 22, 2005, the flow of Sg. Muda at Jambatan Syed Omar, Kedah increased to 5 cumecs (ARI 10 years) compared to its August reading of 3 cumecs (ARI 20 years).

2.2 Three other rivers, namely Sg. Kelantan at Jambatan Guillemard, Sg. Bernam at Jambatan SKC, Sg. Kurau at Pondok Tanjung and Sg. Kerian at Selama have a low flow ranging from 2 to 10 years ARI.

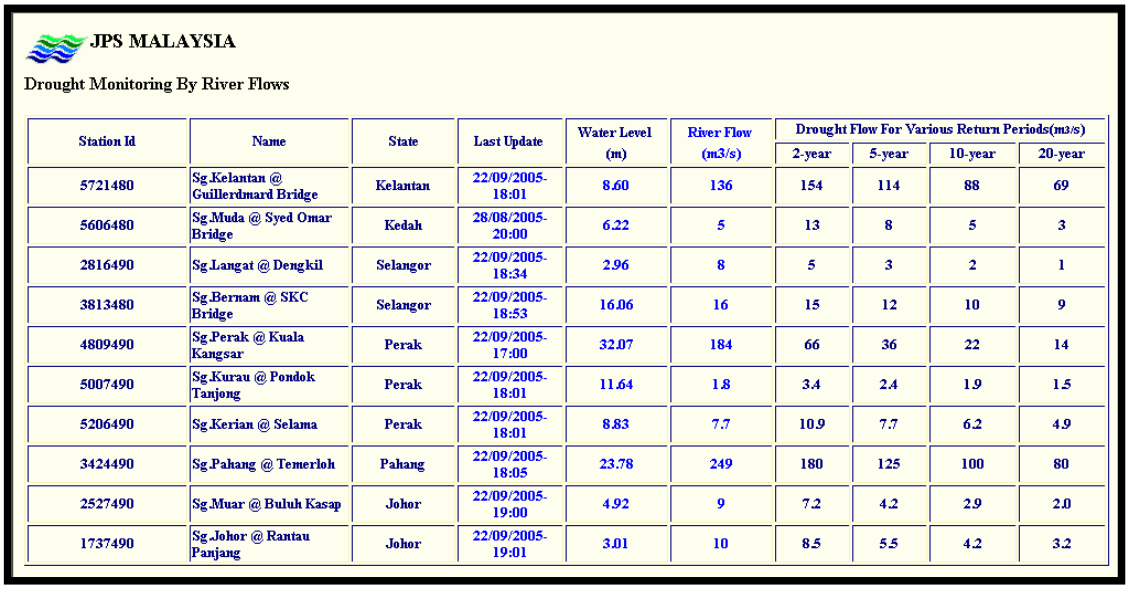
2.3 Table 2.2 shows the on-line reading of 10 water level stations extracted from the Drought Information Website as on September 22, 2005.

Table 2.1 : Drought Monitoring by River Flow

Station Id	Name	State	River Flow (m^3/s)					
			April 30	May 30	June 6	July 18	Aug. 15	Sept. 22
5721480	Sg.Kelantan @ Guillerdmard Bridge	Kelantan	83	254	245	128	102	136
5606480	Sg.Muda @ Syed Omar Bridge	Kedah	19	21	21	11	3	5
2816490	Sg.Langat @ Dengkil	Selangor	10	7	7	25	27	8
3813480	Sg.Bernam @ SKC Bridge	Selangor	19	16	16	13	11	16
4809490	Sg.Perak @ Kuala Kangsar	Perak	191	184	184	183	150	184
5007490	Sg.Kurau @ Pondok Tanjong	Perak	3.4	4.1	4.1	3.8	1.2	1.8
5206490	Sg.Kerian @ Selama	Perak	5.3	6.3	6.3	6.9	5.5	7.7
3424490	Sg.Pahang @ Temerloh	Pahang	258	277	277	330	187	249
2527490	Sg Muar @ Buluh Kasap	Johor	No data					9
1737490	Sg.Johor @ Rantau Panjang	Johor	5.3	3	3	18	2	10

Table 2.2 : Drought Monitoring by River Flow

(on-line Infokemarau)



JPS MALAYSIA

Drought Monitoring By River Flows

Station Id	Name	State	Last Update	Water Level (m)	River Flow (m3/s)	Drought Flow For Various Return Periods(m3/s)			
						2-year	5-year	10-year	20-year
5721480	Sg.Kelantan @ Guillerdmard Bridge	Kelantan	22/09/2005-18:01	8.60	136	154	114	88	69
5606480	Sg.Muda @ Syed Omar Bridge	Kedah	28/08/2005-20:00	6.22	5	13	8	5	3
2816490	Sg.Langat @ Dengkil	Selangor	22/09/2005-18:34	2.96	8	5	3	2	1
3813480	Sg.Bernam @ SKC Bridge	Selangor	22/09/2005-18:53	16.06	16	15	12	10	9
4809490	Sg.Perak @ Kuala Kangsar	Perak	22/09/2005-17:00	32.07	184	66	36	22	14
5007490	Sg.Kurau @ Pondok Tanjong	Perak	22/09/2005-18:01	11.64	1.8	3.4	2.4	1.9	1.5
5206490	Sg.Kerian @ Selama	Perak	22/09/2005-18:01	8.83	7.7	10.9	7.7	6.2	4.9
3424490	Sg.Pahang @ Temerloh	Pahang	22/09/2005-18:05	23.78	249	180	125	100	80
2527490	Sg.Muar @ Buluh Kasap	Johor	22/09/2005-19:00	4.92	9	7.2	4.2	2.9	2.0
1737490	Sg.Johor @ Rantau Panjang	Johor	22/09/2005-19:01	3.01	10	8.5	5.5	4.2	3.2

3. Drought Monitoring by Dam Storage

3.1 From the six dams being monitored by this Division as shown in Table 3.1 and 3.2, two dams i.e. Macap and Sembrong, their water level are still below the alert level with reading of 14.55 m and 6.22 m respectively. Based on rainfall analysis for this particular area shows that the standard deviation ranging from –13.3% and –31.0%.

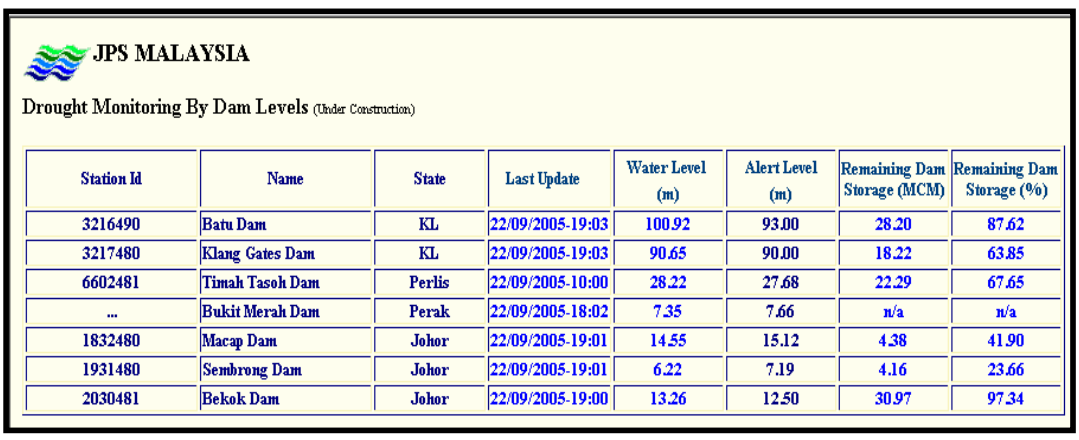
3.2 The different between the current level with the alert level for both dams i.e. Machap and Sembrong dam are 0.57m and 0.97m respectively. Their remaining storages are 41.9 % (higher than August 2005 reading) and 23.66% (lower than August 2005 reading).

3.3 The Batu, Klang Gate, Timah Tasoh and Bekok dam show an increase in water level by 7.92m, 0.65m, 0.54m and 0.76m above the alert level. Table 3.2 shows the on-line dam monitoring in Drought Information Website on September 22, 2005.

Station Id	Name	State	Alert Level (m)	Water Level (m)			Remaining Dam Storage (MCM)			Remaining Dam Storage (%)		
				July 18	Aug. 15	Sept 22	July 18	Aug. 15	Sept 22	July 18	Aug. 15	Sept 22
3216490	Batu Dam	KL	93.00	101.66	101.42	100.92	29.74	29.24	28.2	90.39	90.83	87.62
3217480	Klang Gates Dam	KL	90.00	90.62	90.11	90.65	18.16	17.16	18.22	63.64	60.12	63.85
6602481	Timah Tasoh Dam	Perlis	27.68	28.00	28.02	28.22	19.91	20.12	22.29	60.42	61.06	67.65
1832480	Macap Dam	Johor	15.12	14.59	14.26	14.55	4.54	3.30	4.38	43.42	31.51	41.9
1931480	Sembrong Dam	Johor	7.19	6.50	6.30	6.22	5.35	4.49	4.16	30.42	25.51	23.66
2030481	Bekok Dam	Johor	12.50	13.26	13.26	13.26	30.97	30.97	30.97	97.34	97.34	97.34

Table 3.1 : Water Level of the Dams being monitored
(confine to those dams regulated by DID)
Comparison of data between July 18, Aug. 15 and Sept. 22, 2005)

Table 3.2 : Drought Monitoring by Dam Level
(on-line Infokemarau)



JPS MALAYSIA

Drought Monitoring By Dam Levels (Under Construction)

Station Id	Name	State	Last Update	Water Level (m)	Alert Level (m)	Remaining Dam Storage (MCM)	Remaining Dam Storage (%)
3216490	Batu Dam	KL	22/09/2005-19:03	100.92	93.00	28.20	87.62
3217480	Klang Gates Dam	KL	22/09/2005-19:03	90.65	90.00	18.22	63.85
6602481	Timah Tasoh Dam	Perlis	22/09/2005-10:00	28.22	27.68	22.29	67.65
...	Bukit Merah Dam	Perak	22/09/2005-18:02	7.35	7.66	n/a	n/a
1832480	Macap Dam	Johor	22/09/2005-19:01	14.55	15.12	4.38	41.90
1931480	Sembrong Dam	Johor	22/09/2005-19:01	6.22	7.19	4.16	23.66
2030481	Bekok Dam	Johor	22/09/2005-19:00	13.26	12.50	30.97	97.34

3.4 Figure 3.1 shows that, the Macap Dam level has fall below the alert level since March 25, 2005. The monthly rainfall during this period starting March until August is 97.5 mm (March), 134.5 mm (April), 163 mm (May), 46 mm (June), 171.5 mm (July) and 218.5 mm (August) respectively.

By observing the hydrograph of the Macap dam as in Fig. 3.1 below, the worst case of drought is expected to occur if there is no or little rain in the coming months thus affecting further drawdown of the water level. But historically, during the intermonsoon period from middle of September until middle of October, the case of no or less rain can be considered as very unsual. On the other hand, we would say that more rain will be received during this period of time. The lowest water level reading for Machap Dam is recorded on March 8 & 9, 1997 i.e 13.59m caused by the small rainfall amount of only 39mm for the two previous months i.e January and February 1997.

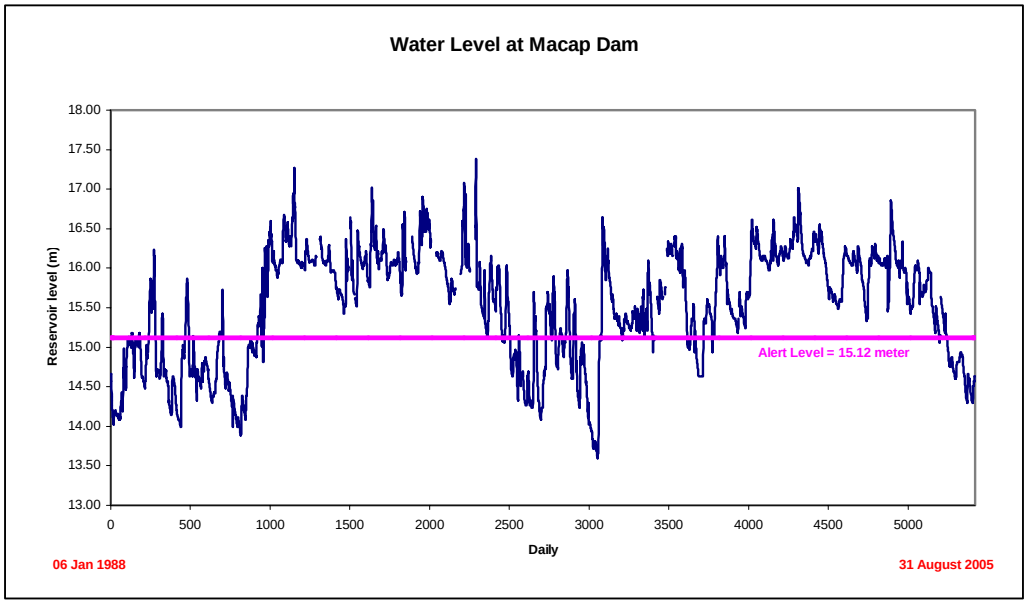


Figure 3.1 : Water Level at Macap Dam, Johor

3.4 Figure 3.2 shows the hydrograph for the water level of Sembrong Dam, Johor. From this figure, we can clearly observe that there are many cases of the drawdown of water level, but the recent one is quite critical as the water level has fell below the alert level. This drawdown of water level is due to less rainfall recorded during the previous months starting April.

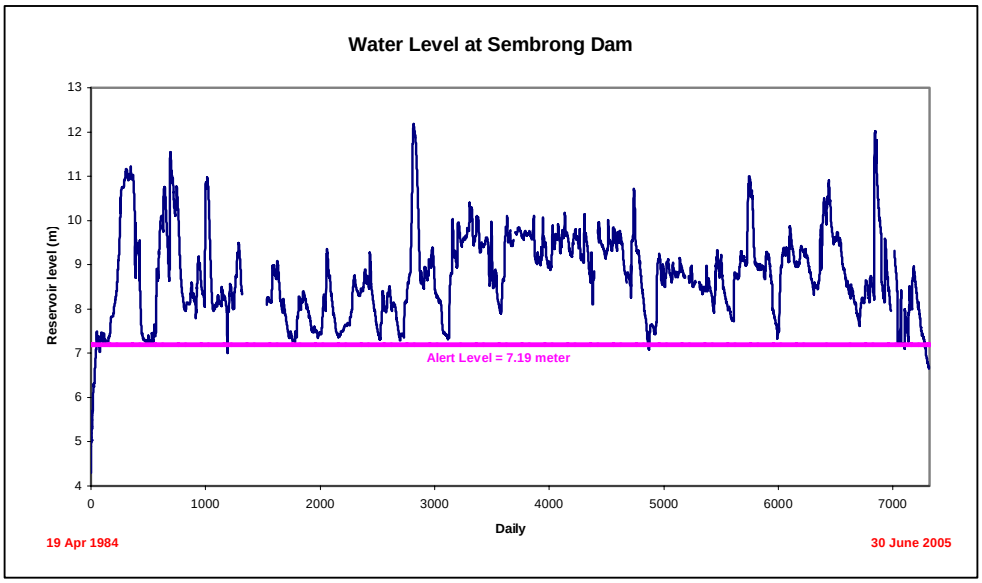


Figure 3.2 : Water Level at Sembrong Dam, Johor