WATER QUALITY

A total of 6 sampling points of 6 rivers, namely for Sg Kawag, Sg. Bole, Sg. Segama, Sg. Danum, Sg. Malua and Sg. Segama Ulu has been identified for the assessment process represents the Segama watershed area, and its sub-catchment areas which predominantly drain through the project site. These sampling points are labelled W1 to W6 (see Map, and Table 2), with W4 representing a sampling point outside of the project area that shall serve to observe gradual deterioration of water-quality attributed to other land-use activities downstream of the project site. Prevailing weather conditions in the last 24 hours prior to water sampling is provided in Table 1.

Table 2: Location of water quality sampling points within USM Project Area in 2018

Sample Point No.	Location	Date of Sampling		Surrounding Condition	GPS Location	
		1	2		North	East
W1	Sg. Kawag	April 2018	October 2018	Secondary forest	$05^0$03’06.2”	$117^0$59’12.7”
W 2	Sg. Bole			Secondary forest	$04^0$59’23.7”	$117^0$53’25.9”
W 3	Sg. Malua			Secondary forest	$05^0$05’44.4”	$117^0$37’21.5”
W 4	Sg. Segama Bawah			Secondary forest	$05^0$09’29.9”	$117^0$58’39.0”
W 5	Sg. Juak			Secondary forest	$04^0$55’26.7”	$117^0$56’44.4”

Sample Point No.	Location	Date of Sampling		Surrounding Condition	GPS Location	
		1	2		North	East
W 6	Sg. Segama Ulu			Secondary forest	$05^{0}01'12.5''$	$117^{0}47'23.8''$

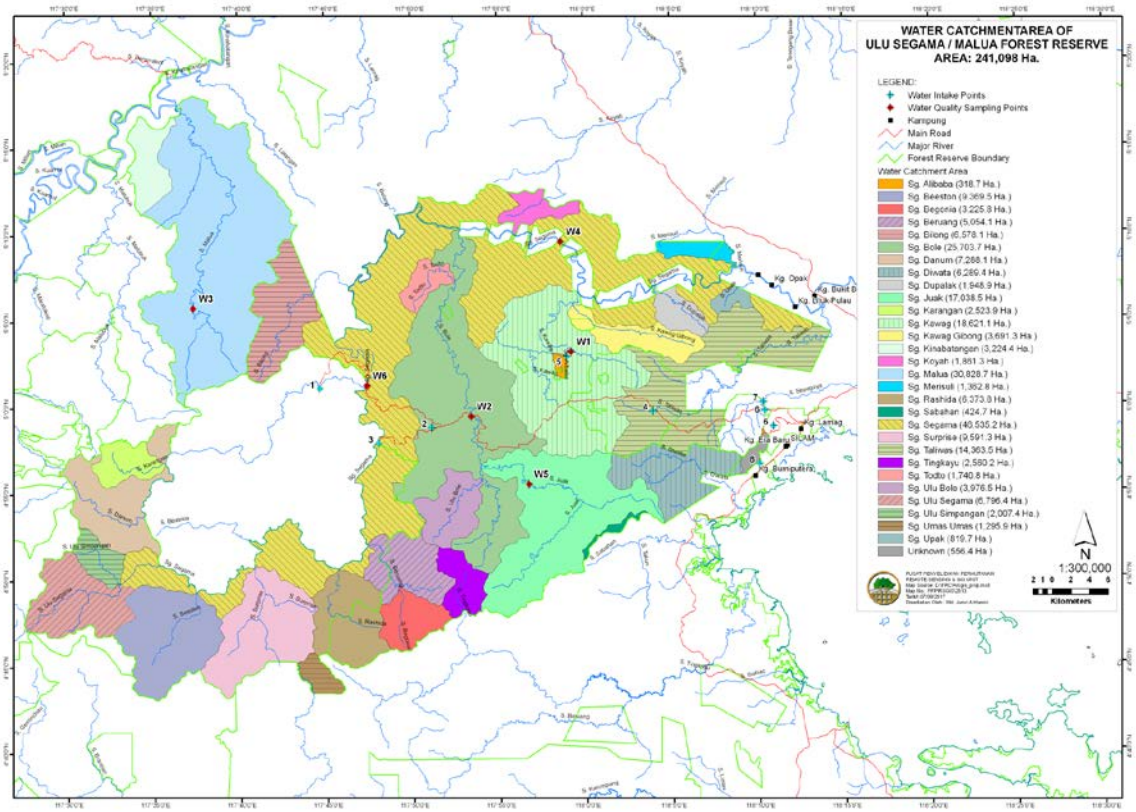


Figure 1: The location of water sampling points (W1-W6) and the distribution of catchments of USM FR, Sabah.

The chemical analyses and water quality classes for all parameters tested for six sampling points in the project area are listed in Table 3.

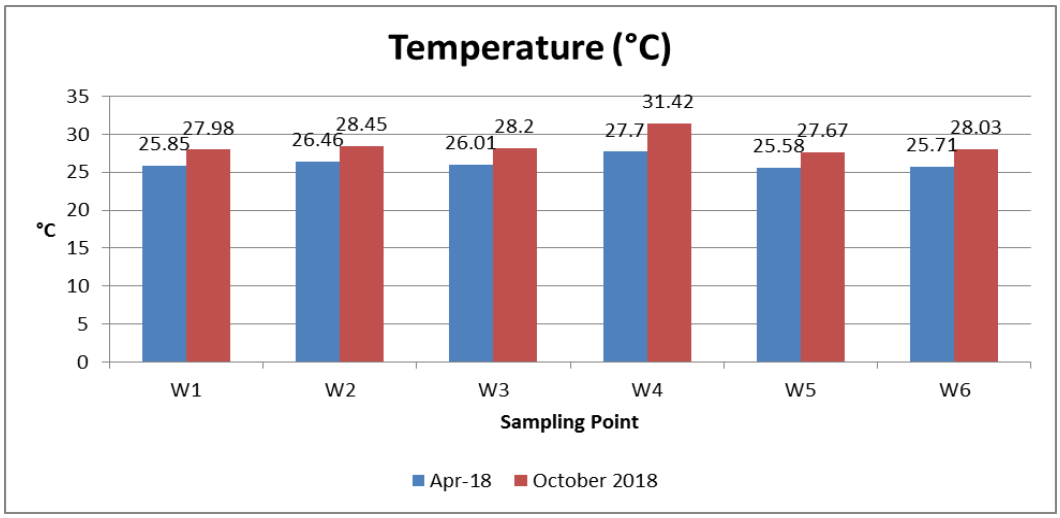
Table 3. The results of chemical analyses and water quality classes for all parameter tested for sampling location W1, W2, W3, W4, W5 and W6 in USM Project Area. Note: Dissolved Oxygen (DO in mg/l), Conductivity (µS/cm), Total Dissolved Solid (TDS in mg/l), and Temperature (°C).

Sampling Location	Location	Temperature (°C)		pH Value		Dissolved Oxygen, DO (mg/l)		Conductivity (µS/cm)		Total Dissolved Solid (mg/l)	
		Apr-18	October 2018	Apr-18	October 2018	Apr-18	October 2018	Apr-18	October 2018	Apr-18	October 2018
W_1	Sg. Kawag	25.85	27.98	7.63	7.7	3.05	6.39	138	327	69	163
W_2	Sg. Bole	26.46	28.45	7.82	7.39	2.01	7.39	163	396	81	198
W_3	Sg. Malua	26.01	28.2	7.75	8.05	3.11	6.97	144	385	72	193
W_4	Sg. Segama Bawah	27.7	31.42	7.36	7.72	2.12	5.93	121	259	61	130
W_5	Sg. Juak	25.58	27.67	7.96	8.22	3.17	5.55	188	473	94	236
W_6	Sg. Segama Ulu	25.71	28.03	7.45	7.77	1.96	7.02	113	325	56	163
Minimum		25.58	27.67	7.36	7.39	1.96	5.55	113	259	56	130
Maximum		27.7	31.42	7.96	8.22	3.17	7.39	188	473	94	236
Mean		26.22	28.63	7.67	7.81	2.57	6.54	144.50	360.83	72.17	180.50
NWQSM*		**Normal**		**Class I**		**Class III to Class V**	**Class I to Class V**	**Class I**		**Class I**	

**National Water Quality Standards for Malaysia* **N A – Not Available*

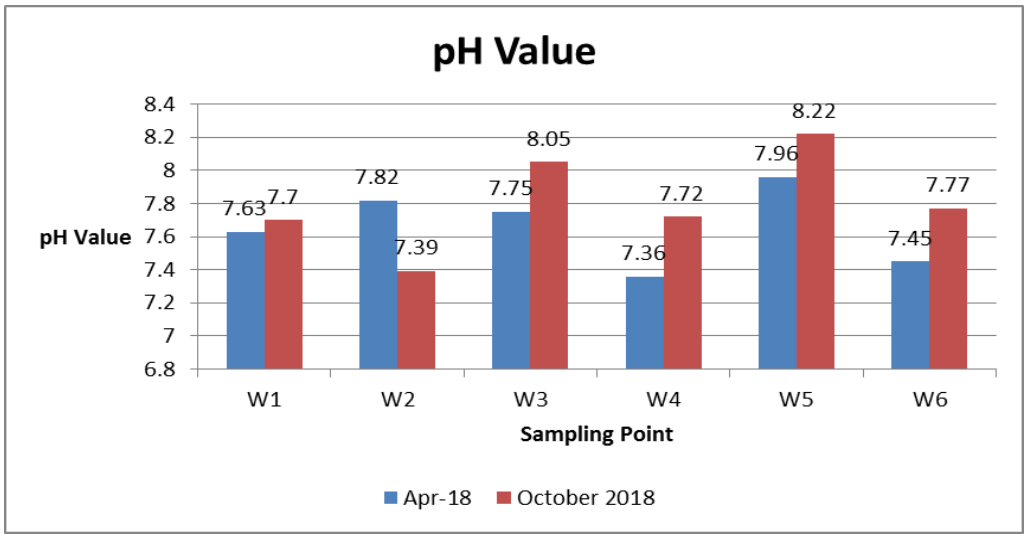
Temperature

The water temperature for all sampling points range from 25.58 to 27.7°C for the month of April 2018. For the month of October 2018, the temperature range from 27.67 to 31.42 °C. The registered temperature levels are within the normal value for river water. Water temperature will vary according to seasonal changes, altitudes and with the changes from day to night. Warm during the day and cool during the night. An alteration of the water body temperature will affect the biological activity and growth of aquatic community.



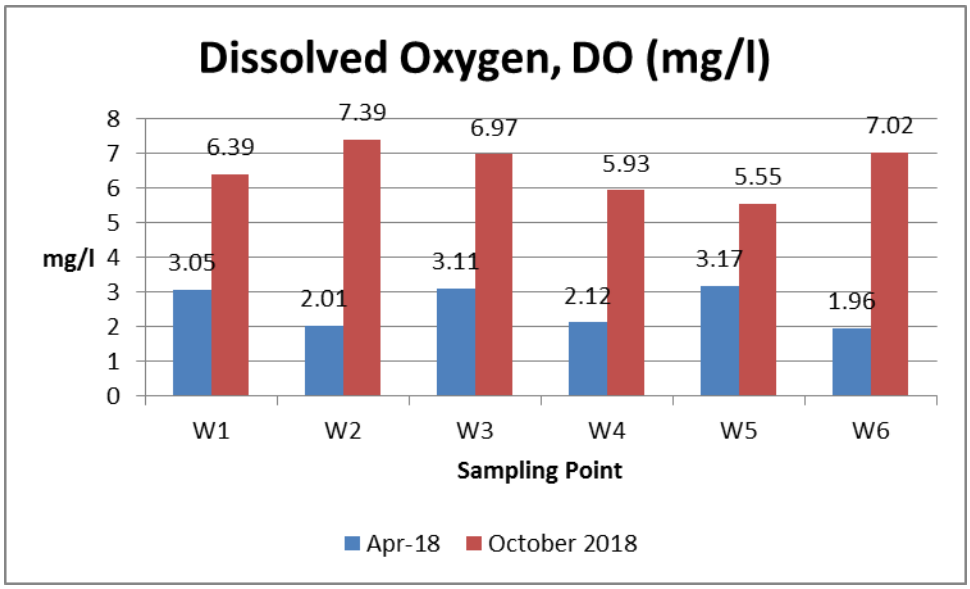
pH Value

The narrow concentration of hydrogen ions between pH 6 to 9 indicates the typical suitability range for the existence of most biological life. The pH for all sampling points ranged from 7.36 to 7.96 for the month of April 2018. As for the month of October 2018, all sampling point ranged from 7.39 to 8.22. pH below 5 is consider low and it can affect aquatic life especially fish in the river.



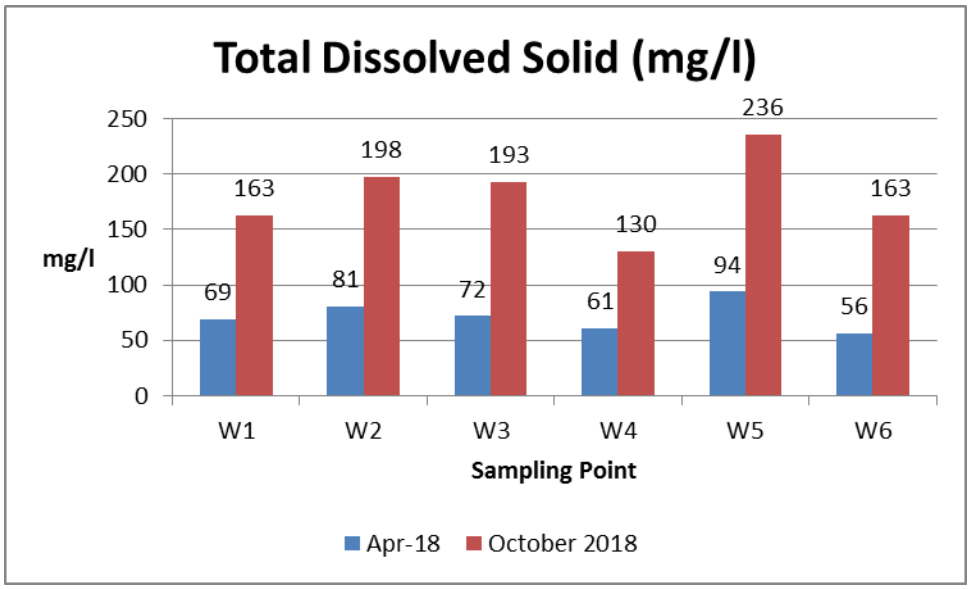
Dissolved Oxygen (DO)

DO is an essential indicator in supporting aquatic life. It measures the amount of oxygen (O2) that is dissolved in the water (Table 2). All sampling points ranged from 1.96 to 3.17 mg/L for the month of April 2018, while for the month of October 2018 ranged from 5.55 to 7.39 mg/L. Low DO level is consider a threat to aquatic organisms.



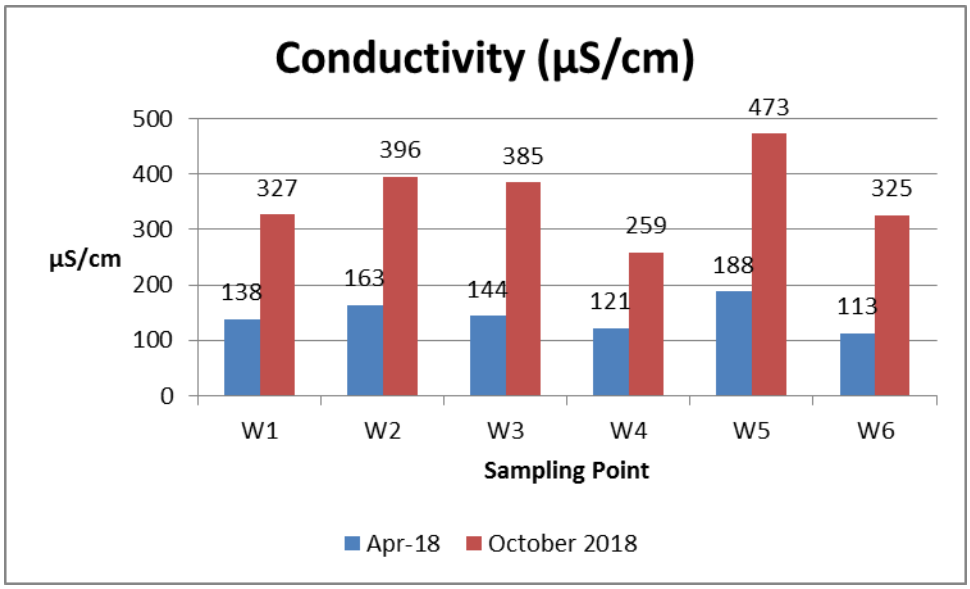
Total Dissolved Solid

TDS is consists of the combined total of organic and inorganic substances in water. This refers to any minerals, salts, metals, cations or anions dissolved in water. All sampling point ranged from 56 to 94 mg/L for the month of April 2018. For the month of October 2018 all sampling point ranged from 130 to 236 mg/L. Based on the NWQSM, the TDS level for all sampling point is classified within the Class I waters quality range.



Conductivity

Conductivity is the indicator of the presence of ions within the water, due to leaching from the ground or saline water intrusion. It is also the indicator of industrial discharges. The conductivity ranges from 113 to 188 µS/cm for the month of April 2018. For the month of October 2018, the conductivity ranges from 259 to 473 µS/cm. All sampling points registered conductivity levels under Class I water for the Interim National Water Quality Standards for Malaysia.



Synthesis of Assessment

According to the National Water Quality Standard (NWQS) the water quality of the rivers based on the physicochemical parameters (except for dissolved oxygen in certain sampling point) fall into Class 1. The pH for all rivers generally complied with the standards set for water under Class I of the NWQSM. The acceptable limit for river water pH is 6 to 9, thus the pH for all sampling points are in an acceptable limit.

For DO it is essential for the aquatic life within the river water. A low DO level would threaten the aquatic community whereas only DO level below 2 mg/l is considered harmful for aquatic life. The DO for the sampling point on the month of April 2018 was very low that is under 2 mg/l. comparing the result from earlier sampling, this might be because of error from the water quality checker. However, further investigation is needed to clarify this issue. The temperatures for all sampling points vary as the sampling was done from early morning until in the afternoon and it is still in normal value of NWQSM.

The concentration of TDS (mg/L) and conductivity were low indicating that there is no leaching of organic or inorganic substances from the ground. Both parameter shows Class I of NWQSM.

It is recommended that the management team to always carry out periodic inspection and monitoring at all the sampling points to prevent deterioration of the water quality. The management team should install signage at all the sampling point to prevent visitors or passer by traversing the road from dumping waste into the watercourse. Nevertheless, the river water would require conventional treatment such as boiling before it can be used for domestic consumption.