

9

September 23, 2022

**MEMORANDUM**

**FOR :** The Regional Executive Director  
MIMAROPA Region

**THRU :** The Assistant Regional Director for Technical Services

**FROM :** The In-Charge, Office of the PENR Officer  
Oriental Mindoro

**SUBJECT :** **SUBMISSION OF THE 3<sup>RD</sup> QUARTER REPORT ON DATA  
GENERATED FROM THE SCIENCE-BASED REAL-TIME  
WATERSHED MONITORING INSTRUMENTS JULY-  
SEPTEMBER CY 2022**

This is to submit the monitored and analyzed data generated from the Automated Weather Stations (AWS), Automated Water Level Station (AWLS) and Conductivity Temperature and Depth (CTD) groundwater sensor established in the Province of Oriental Mindoro.

At present, the AWLS in Calapan City, the GWMS in (*MinSU Compound*) Victoria and the two (2) AWS instruments in Department of Agriculture compound and Macatoc Elementary School, Victoria, Oriental Mindoro are now functional and data are at present available.

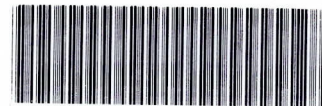
The one-unit Automated Weather Station (AWS) instrument in Hagan, Bongabong was already reinstalled on September 14, 2022. Moreover, its newly installed device data logger firmware was updated in a newer version. The validation period for this reinstalled instrument should be regularly done to check if certain errors will occur within the monitoring span.

Attached are the narrative report and photo-documents.

For information, record and reference.

  
ALMA E. GIBE

TSD-CDS/aem



DENRPENR02209000043



September 23, 2022

**MEMORANDUM**

**FOR** : The In-Charge, Office of the PENRO  
Oriental Mindoro

**THRU** : The Chief, CD Section  
PENRO Oriental Mindoro

**FROM** : The Database Manager IT Specialist  
PENRO Oriental Mindoro

**SUBJECT** : **SUBMISSION OF THE 3<sup>RD</sup> QUARTER REPORT ON DATA  
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WATERSHED MONITORING INSTRUMENTS JULY-  
SEPTEMBER CY 2022**

Submitting the monitored and analyzed data generated from the Automated Weather Stations (AWS), Automated Water Level Station (AWLS) and Conductivity Temperature and Depth (CTD) groundwater sensor established in the Province of Oriental Mindoro.

At present, the AWLS in Calapan City, the GWMS in (*MinSU Compound*) Victoria and the two (2) AWS instruments in Department of Agriculture compound and Macatoc Elementary School, Victoria, Oriental Mindoro are now functional and data are at present available.

The one (1) Automated Weather Station instrument in Barangay Hagan, Bongabong, Oriental Mindoro is at present functional and under validation period to observe further minimal error to the device data logger firmware.

As per memorandum, using the prescribed reporting format for the report from the Office of Forest Management Bureau was used to have a uniform reporting and in order to effectively and efficiently monitor and assess the data being generated from the installed instrumentation for watershed.

For information and record.

  
**ALISTER EARL M. MEMAN**



### **3<sup>RD</sup> QUARTER REPORT ON DATA GENERATED FROM THE SCIENCE-BASED REAL-TIME WATERSHED MONITORING INSTRUMENTS JULY-SEPTEMBER 2022**

## **I. INTRODUCTION**

### **Mag-Asawang Tubig Watershed (Victoria, Oriental Mindoro)**

The Mag-asawang Tubig Watershed (MTRW) is one of the major watersheds in Oriental Mindoro approximately 12,533 hectares of which is proposed for rehabilitation in the 2013-2019 Provincial Development and Physical Framework Plan (PDPFP). It is a critical watershed because of its role in food production, supplying irrigation to 40,000 hectares of rice fields in the flood plains of Mag-AsawangTubig and Bucayao Rivers. These two major rivers are connected viaPanggalaan River, which branches out from Mag-asawangTubig and joins Bucayao River flowing through Calapan City before it discharges to Calapan Bay.

The watershed is also expected to support the proposed hydroelectric power plant which is another vital support mechanism for the development and progress of the province and the whole island.

The Municipality of Victoria is 34 kilometers-about half an hour travel from Calapan City, the provincial capital of Oriental Mindoro, Victoria is bounded on the north by the Municipality of Naujan, on the southeast by the Municipality of Socorro, and on the southwest by the Municipality of Sablayan, one of the Municipalities of Occidental Mindoro. The town's geographical location is approximately 130° 11' latitude and 121° 17' longitude.

In 2019 a total of four (4) watershed instruments were installed within the watershed. This is to monitor the condition of the watershed thru the use of the said instruments.

However, only one (1) automated weather station was installed within the Bongabong River Watershed.

### **Status of Watershed Instruments Installed**

At present all the installed instruments along Mag-Asawang River Tubig Watershed (MARTW) are now functioning but still in validation period. The Automated Weather Stations (AWS) in Macatoc Elementary School and DA Compound, Victoria, Oriental Mindoro are now functioning after the three-month calibration by PAG-ASA. Starting August 25, 2022 to present, data are now available for analysis and future use.

The Ground Water Level Monitoring Station in Mindoro State University Compound is also now functioning since the malfunctioned data logger was already replaced last August 25, 2022 by the representative of PHILSINTRUMENTS.

The analysis of the generated data from this calibrated AWS instruments and newly purchased installed ZL6 data logger were started on August 25, 2022 to September 22, 2022. No data was generated during the period month of July and August 1-24, 2022 due to calibration and malfunctioned data logger for GWLMS in MinSU.

Only the AWLS in Calapan has a complete data to be generated since it is functional and the logger never breakdown.

Moreover, the status of the instrument in Bongabong River Watershed (BRW) at present is now functional, it was on September 14, 2022 when the instruments was place back to its location and data are now available.

Out of the five instruments installed, all of these instruments are now functional and data are at present available but still in validation period to fix any minimal error transmitted through the subscribed platforms.

## II. DATA ANALYSIS

### A. Mag-AsawangTubig River Watershed (MATRW)

Below is the Summary of the data from the watershed monitoring station in Mag-AsawangTubig River Watershed for 3<sup>rd</sup> Quarter of the Year 2022.

**Table 1. Summary of the data from the watershed monitoring station in Mag-AsawangTubig River Watershed for 3<sup>rd</sup> Quarter of the Year 2022.**

Summary of data from watershed monitoring instruments in Mag-AsawangTubig River Watershed from July-September 2022					
Watershed Monitoring Instruments Parameter	Number of Instruments	Period Covered	Average	Maximum *	Minimum *
Rainfall (mm)	2	July-September 2022	0.029	11.2	0
Air temperature (° C)	2	July-September 2022	27.40	34.7	23.8
Relative Humidity (%)	2	July-September 2022	89.81	111.10	56.60
Wind Velocity (m/s)	2	July-September 2022	0.071	2.9	0
Wind Direction (AWS DA Victoria)	1	August 25-September 2022	In average the wind moves towards North direction but maximum going East/North East from August 25-September 22, 2022		
Wind Direction (AWS Macatoc)	1	July-September 2022	In average the wind moves towards East/North direction but in maximum going North from August 25- September 22, 2022		
Solar Radiation (W/m <sup>2</sup> )	2	July-September 2022	90.32	1035.80	0
Stream Flow Level (m)	1 (Calapan)	July-September 2022	7.965	9.13	7.03
Streamflow (m <sup>3</sup> /s)	0	July-September 2022	No data available		
Streamflow Temperature (°C)	0	July-September 2022	27.861	37	23
Groundwater level (m)	1 (MinSU)	July-September 2022	3088.284	4393	1170
Groundwater Temperature (°C)	1 (MinSU)	July-September 2022	26.7	27.7	26.7
Soil Moisture (%) @ 10m	2	July-September 2022	4.75	79.6	-6.8
Conductivity (mS/cm)	1 (MinSU)	July-September 2022	0.268	0.273	0.263

- \* Base on raw data of the two AWS.

- No data generated from the three (3) AWS during month of July, and also from August 1-24, 2022 does calibration of the Automated Weather Station is done for maintenance and was transported to DOST-PAGASA Manila,



### **A.1 Mag-Asawang Tubig River Watershed (MATRW) Rainfall**

Based on record of the two (2) AWS from period of August 25, 2022 to September 22, 2022 the average rainy day was recorded in the watershed at 0.029 mm, On the other hand, the average maximum of the two (2) AWS is recorded at 11.2 mm on August 26, 2022, 12:15 am.

### **A.2 Mag-Asawang Tubig River Watershed (MATRW) Air Temperature**

Regarding air temperature, it was on September 9, 2022 around 4:30 pm was the warmest day recorded in the watershed station (*DA compound, Victoria, Oriental Mindoro*) with 34.7 °C, while the coolest day was recorded on August 29, 2022 with 22.1°C. The average of the two AWS air temperature in the watershed was recorded at 27.40°C

### **A.3 Mag-AsawangTubig River Watershed (MATRW) Relative Humidity**

An average of 89.11 % relative humidity was recorded along MATRW. The most humid day was experienced in Macatoc with 111.1% on August 26, 2022 at around 3:35 am. The least humid day was experienced on September 17, 2022 with 52.5% at around 4:00 am.

The Relative humidity (RH) (expressed in percent) also measures water vapor, but RELATIVE to the temperature of the air. In other words, it is a measure of the actual amount of water vapor in the air compared to the total amount of vapor that can exist in the air at its current temperature. Warm air can possess more water vapor (moisture) than cold air, so with the same amount of absolute/specific humidity, air will have a HIGHER relative humidity if the air is cooler, and a LOWER relative humidity if the air is warmer. What we “feel” outside is the actual amount of moisture (absolute humidity) in the air.

### **A.4 Mag-Asawang Tubig River Watershed (MATRW) Wind Velocity**

The average wind speed in the watershed is 0.071 meters per second (m/s), the fastest wind speed was recorded on September 03, 2022 with an average of 2.9 m/s, while the slowest is 0 m/s or no wind at all.

### **A.5 Mag-AsawangTubig River Watershed (MATRW) Wind Direction**

In AWS DA compound in Barangay Alcate the wind heads to Northeast Direction from August 25- September 22, 2022 most of the time. Meanwhile, AWS Macatoc moves towards the North direction most of the time from August 25-September 22, 2022.

### **A.6 Mag-AsawangTubig River Watershed (MATRW) Solar Radiation**

The hottest or sunniest day is recorded in DA compound, Victoria, Oriental Mindoro - AWS with 1,035.8 W/m<sup>2</sup> on September 10, 2022 at around 12:15 pm. The least solar radiation was 0 W/m<sup>2</sup> or no radiation at all, these was recorded around August 25, 2022, 6:30 pm and August 26, 5:45am. The average of the two (2) AWS solar radiation is 90.32 W/m<sup>2</sup>.

### A.6 Mag-Asawang Tubig River Watershed (MATRW) Streamflow Level in Sitio Abaton, Barangay Parang, Calapan City, Oriental Mindoro

The stream flow level averages to 7.965 m for period of June 22- September 22, 2022. The water level rose to a maximum of 9.13 m on July 14 and 22 while the lowest was detected on July 4, 2022 with 7.03 m. This indicate that the level of water along MATRW is in low level, the amount of water is not either in moderate level. It means that within this period no flood occurrence made to this point, but the level of water is to low and it indicates minimal rainfall.

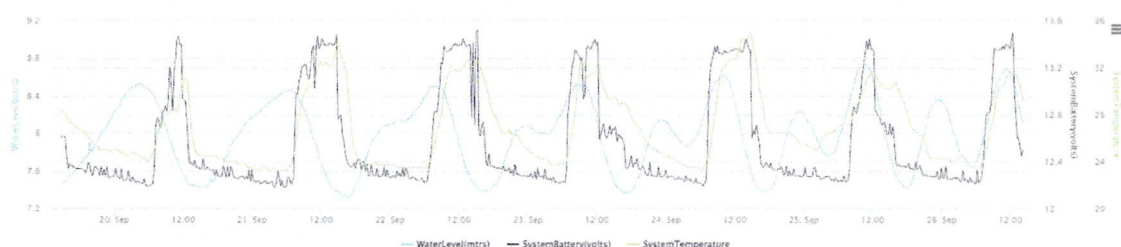


Figure 1. Streamflow Level, System Battery(volts) and System Temperature graph

### A.7 Mag-Asawang Tubig River Watershed (MATRW) Groundwater Level in Mindoro State University, Victoria, Oriental Mindoro.

For groundwater, the watershed has an average of level of 3.08m. The deepest groundwater level was recorded on August 29, 2022 around 5:30 am with 4.39 m while the shallowest is 1.17 m on September 21, 2022 around 3:00 pm. There is and decreasing trend of the groundwater level from August – September. The covering of the groundwater data started only in August 25, 2022 to September 22, 2022 due to data logger replacement.

**Table 2. Summary of Automated Weather Station at Department of Agriculture Compound, Victoria, Oriental Mindoro.**

Watershed Monitoring Instruments Parameter AWS-DA compound	Number of Instruments	Period Covered	Average	Maximum	Minimum	Remarks
Rainfall (mm)	1	Aug25-Sept 22, 2022	0.051	11.2	0	
Air temperature (° C)	1	Aug25-Sept 22, 2022	27.334	34.7	22.1	
Relative Humidity (%)	1	Aug25-Sept 22, 2022	87.423	104.1	52.5	
Wind Velocity (m/s)	1	Aug25-Sept 22, 2022	0	0	0	
Wind Direction	1	Aug25-Sept 22, 2022	0.022	59	0	
Solar Radiation (W/m <sup>2</sup> )	1	Aug25-Sept 22, 2022	166.573	1035.8	0	
Soil Moisture (%)@10m	1	Aug25-Sept 22, 2022	4.014	43.7	-43.1	negative value indicates that there is an error on reading of the sensor
Soil Moisture (%)@30m			0	0	0	



**Table 3. Summary of Automated Weather Station at Macatoc Elementary School Compound, Victoria, Oriental Mindoro.**

Watershed Monitoring Instruments Parameter AWS-Macatoc Elementary	Number of Instruments	Period Covered	Average	Maximum	Minimum	Remarks
Rainfall (mm)	1	Aug25-Sept 22, 2022	0.00796	8.8	0	
Air temperature (° C)	1	Aug25-Sept 22, 2022	27.46	34.5	22.8	
Relative Humidity (%)	1	Aug25-Sept 22, 2022	92.199	111.1	56.6	
Wind Velocity (m/s)	1	Aug25-Sept 22, 2022	0.142	2.9	0	
z	1	Aug25-Sept 22, 2022	50.581	359	0	
Solar Radiation (W/m <sup>2</sup> )	1	Aug25-Sept 22, 2022	14.076	874.1	0	
Soil Moisture (%)@10m	1	Aug25-Sept 22, 2022	0	0	0	negative value indicates that there is an error on reading of the sensor
Soil Moisture (%)@30m			9.149	79.6	-6.8	

**Table 4. Summary of Ground Water Level Monitoring Station at MinSU Compound, Victoria, Oriental Mindoro.**

Watershed Monitoring Instruments Parameter GWMS MINSU	Number of Instruments	Period Covered	Average	Maximum	Minimum	Remarks
Groundwater level (m)	1 (MinSU)	Aug25-Sept 22, 2022	3088.284	4393	1170	
Groundwater Temperature (°C)	1 (MinSU)	Aug25-Sept 22, 2022	26.7	27.7	26.7	
Conductivity (mS/cm)	1 (MinSU)	Aug25-Sept 22, 2022	0.268	0.273	0.263	

**Table 5. Summary of Automated Water Level Station at Sitio Abaton, Brgy. Parang, Calapan City, Oriental Mindoro.**

Watershed Monitoring Instruments Parameter - AWLS Calapan City	Number of Instruments	Period Covered	Average	Maximum	Minimum	Remarks
Stream Flow Level (m)	1 (Calapan)	June22 - Sept 22, 2022	7.965	9.13	7.03	
System Battery (Volts)		June22 - Sept 22, 2022	12.577	13.67	12.18	
Streamflow Temperature (° C)		June22 - Sept 22, 2022	27.861	37	23	

## A. Bongabong River Watershed (BRW)

**Table 6. Summary of Automated Water Level Station at Hagan, Bongabong, Oriental Mindoro**

Watershed Monitoring Instruments Parameter AWS-Bongabong	Number of Instruments	Period Covered	Average	Maximum	Minimum	Remarks
Rainfall (mm)	1	Sept14-Sept 22, 2022	0.0383	5.4	0	
Air temperature (° C)	1	Sept14-Sept 22, 2022	27.269	38.8	22.1	
Relative Humidity (%)	1	Sept14-Sept 22, 2022	79.675	92.5	47.1	
Wind Velocity (m/s)	1	Sept14-Sept 22, 2022	1.409	5.3	0	
Wind Direction (AWS Bongabong)	1	Sept14-Sept 22, 2022	204.625	359	0	
Solar Radiation (W/m <sup>2</sup> )	1	Sept14-Sept 22, 2022	173.35	1014	0	
Soil Moisture (%) @10m	1	Sept14-Sept 22, 2022	6.08	80.4	0	
Soil Moisture (%) @30m		Sept14-Sept 22, 2022	6.0889	79.9	0	

### B.1. BRW Rainfall

Based on one-unit Automated Water Station in Bongabong River Watershed, a total rainfall of 30.2 mm from September 14-September 22, 2022 was recorded only.

With an average rainfall of 0.0383 mm and maximum rainfall of 5.4 mm, this indicates that rainfall event is too low from September 14 – September 22, 2022, the amount of water along Bongabong River Watershed is at low level.

### B.2. BRW Air Temperature

The air temperature at Bongabong River Watershed averages with 27.269 °C, the warmest air temperature was experienced on September 17, 2022 at 11.30 am with 38.8 °C while the coolest temperature was recorded on September 22, 2022 around 5:15am to 5:30am with 22.1° C.

### B.3. BRW Relative Humidity

In terms of relative humidity which refers to amount of water vapor actually in the air, expressed as a percentage of the maximum amount of water vapor the air can hold at the same temperature. An average of 79.675 % relative humidity was recorded. The most humid day was experienced on September 17, 2022 around 12:45 am while the less humid day was experienced in same date with 47.1%.

### B.4. BRW Wind Velocity

The average wind speed in the watershed is 1.409 meters per second (m/s), the fastest wind speed was recorded with an average of 5.3 m/s, while the slowest is 0 m/s or no wind at all.



## B.5. BRW Wind Direction

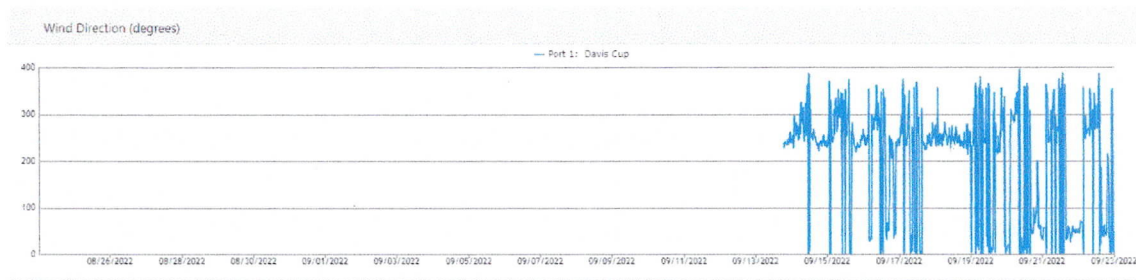


Figure 2. Wind Direction, AWS Bongabong, Oriental Mindoro

Based on the figure 2. above the flow of direction from September 14- 22, 2022 most frequently going North since the maximum wind direction is 359, while it was recorded that sometimes going to S/SW since the average wind direction is 204.625.

## B.6. BRW Solar Radiation

In Hagan, Bongabong, it was recorded that the average solar radiation is 173.35 W/m<sup>2</sup>. The sunniest day reaches 1,014 W/m<sup>2</sup> in September 17, 2022 around 11:30 am. The least Solar radiation was 0 or no radiation recorded.

## B.7. BRW Soil Moisture

The average soil moisture in Bongabong River Watershed is 6.0889%. The highest soil moisture is recorded in September 21, 2022 around 12:45am with 79.9% while the lowest soil moisture is zero (0 %).

## B.8. BRW Correlational Analysis

The correlational analysis of the Bongabong River Watershed cannot be applied since only one AWS was installed. However, the rainfall and air temperature can be correlated since the AWS collects both data.

Parameters	Pearson Correlation Coefficient	Interpolation	Period Covered
Rainfall & Air Temperature	-0.11888	Very Weak correlation Negative relationship	September 14- September 22, 2022
Rainfall & Stream Water Level	No available data on the parameters		
Rainfall & Groundwater Level	No available data on the parameters		
Air Temperature & Ground Temperature	No Installed GWMS in Bongabong River Watershed		
Stream Flow and Water Level	No Installed AWLS in Bongabong River Watershed		

**Correlation Coefficient:** 0.00 – 0.19 = Very Weak; 0.20-0.39= Weak; 0.40-0.59 = Moderate; 0.60-0.79 = Strong; 0.80-1.00 = Very strong

### *B.8.1 BRW Rainfall & Air Temperature*

Rainfall and Air Temperature is at negative inverse with weak correlation. This means that the rainfall(mm) increases with decreasing temperature (°C). The inverse correlation was about -0.11888,

#### **Observation**

There are four (4) watershed monitoring instruments (1 AWSLS, 1 GWMS, and 2 AWS) in Mag-Asawang Tubig River Watershed, and only one (1) Automated Weather Station in Bongabong River Watershed.

Since the three (3) AWS are newly calibrated, data generated started only on August 25, 2022 – September 22, 2022 to AWS in DA Victoria and Macatoc Elementary School, Victoria, Oriental Mindoro. However, the AWS located in Hagan, Bongabong was reinstalled only on September 14, 2022 due to unfavorable weather condition during the early days.

Further, since all instruments are now completely calibrated and reinstalled to its stations, the succeeding months will have a complete data to be generated from the instruments.

Both watersheds showed that rainfall is not at its peak season, less rainfall were measured within the given period of reading. Further, the groundwater level is in a low level thus rainfall is not prevalent within the period of observation rainfall is too low.



## Recommendations

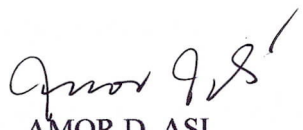
All data of the watershed monitoring instruments can be used in future updating of research related to watershed programs (CRVA and IWMP). The data gathered will be useful with implementation of any Greening Programs and all parameters from the instruments will allow the users or community to be aware on the climatic condition of the surroundings.

Now that all the instruments are functional, analysis of the data in a longer period shall be observed and noted. Likewise. Whatever observation and analysis will become useful in the management and conservation of any activities within the target watershed. Sharing of these data to partner agencies are useful in the identification of whatever possible actions in the future that will contribute to the betterment of our environment and natural resources.

Prepared by:

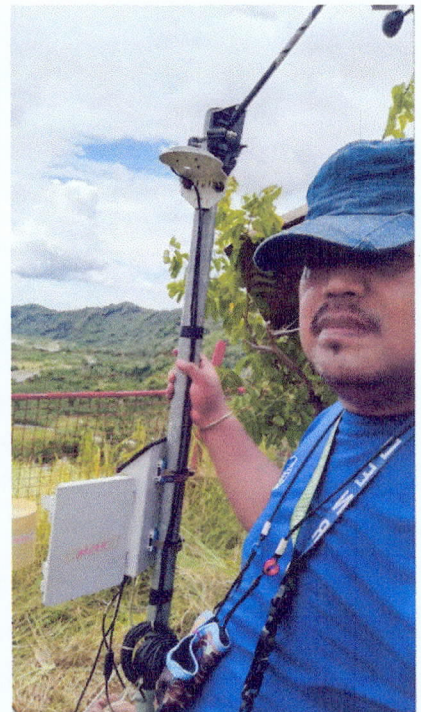
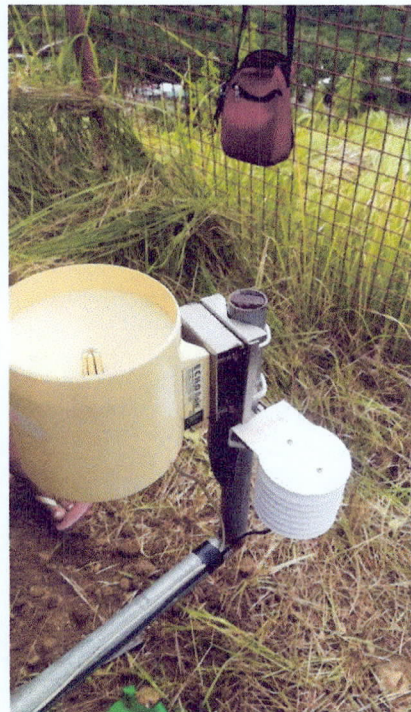
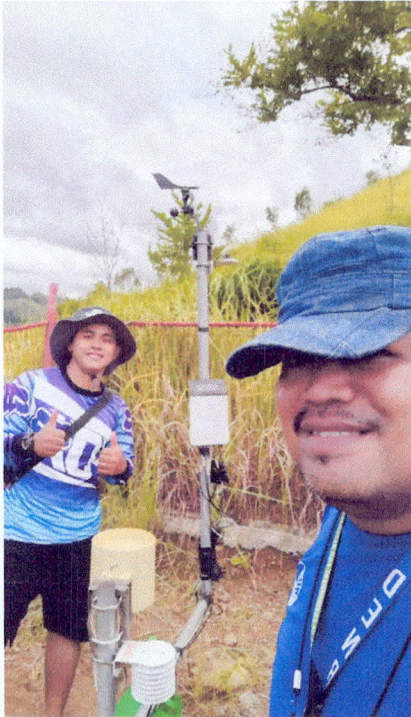
  
Alister Earl M. Meman  
Database Manager IT Specialist

Noted by:

  
AMOR D. ASI  
Chief, Conservation and Development Section



**3<sup>RD</sup> QUARTER REPORT ON DATA GENERATED FROM THE SCIENCE-BASED REAL-TIME  
WATERSHED MONITORING INSTRUMENTS JULY-SEPTEMBER 2022**



***Reinstallation of the Automated Weather Station (AWS) on September 14, 2022 at Barangay Hagan, Bongabong, Oriental Mindoro***





**Maintenance and Monitoring of the Automated Water Level Monitoring Station instrument at Sitio Abaton, Barangay Parang, Calapan City, Oriental Mindoro last September 15, 2022.**





**Maintenance and Monitoring of the Automated Weather Station instrument at Department of Agriculture Compound, Barangay Alcate, Victoria, Oriental Mindoro last September 15, 2022.**





**Maintenance and Monitoring of Ground Water Level Monitoring Station instrument at Mindoro State University Compound, Victoria, Oriental Mindoro last September 15, 2022.**





**Maintenance and Monitoring of the Automated Weather Station instrument at Macatoc Elementary School Compound, Victoria, Oriental Mindoro last September 15, 2022.**