



December 15, 2022

MEMORANDUM

FOR : The Regional Executive Director
MIMAROPA Region

THRU : The OIC-ARD for Technical Services
DENR MIMAROPA

FROM : The OIC, PENR Officer
Oriental Mindoro

SUBJECT : **SUBMISSION OF THE 4TH QUARTER REPORT ON DATA
GENERATED FROM THE SCIENCE-BASED REAL-TIME
WATERSHED MONITORING INSTRUMENTS OCTOBER-
DECEMBER CY 2022**

Submitted is the monitored and analyzed data generated from the installed watershed instruments within Mag-Asawang Tubig and Bongabong Watersheds. A total of five (5) instruments within the watersheds were installed to provide early warning to nearby communities.

Based on the data gathered, there is an increase in water level due to rainfall. Further, there is a minimal increase in the temperature of about less than 10% as compared in the previous quarter. The unpredictability of weather systems has a significant impact on these fluctuating water level readings during this period.

The data gathered from the installed instruments on the watersheds, showed that rainfall is moderate, enough rainfall was measured within the given period of reading. Further, the groundwater level is also in high level thus rainfall is frequent within the period of observation.

Attached are the narrative report and data generated for this quarter.

For information and record.


ALAN L. VALLE



DENRPENR02212000061

TSD-CDS/azm



December 15, 2022

MEMORANDUM

FOR : The Regional Executive Director
MIMAROPA Region

THRU : The OIC-PENR Officer
Oriental Mindoro

FROM : The Database Manager IT Specialist
PENRO Oriental Mindoro

SUBJECT : **SUBMISSION OF THE 4th QUARTER REPORT ON DATA
GENERATED FROM THE SCIENCE-BASED REAL-TIME
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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 is in need of battery replacement and a procurement was already done and at present waiting. 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 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 the software firmware is updated to the newest version.

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

4TH QUARTER REPORT ON DATA GENERATED FROM THE SCIENCE-BASED REAL-TIME WATERSHED MONITORING INSTRUMENTS OCTOBER- DECEMBER, 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, 12,533 hectares of which is proposed for rehabilitation in the 2013-2019 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-asawang Tubig and Bucayao Rivers. These two major rivers are connected via Panggalaan River, which branches out from Mag-asawang Tubig 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.

Status of Watershed Instruments Installed

At present, the downstream (Automated Weather Station: Department of Agriculture Compound, Victoria, Oriental Mindoro), midstream (Automated Weather Station: Macatoc Elementary School, Victoria, Oriental Mindoro), and upstream (Automated Weather Station: Bongabong, Oriental Mindoro) watershed instruments are all operational; data from the downstream and midstream are available including the upstream.

The Ground Water Level Monitoring Station in MinSU Compound is also now functioning; however, the Automated Water level Station in Calapan City need's replacement of battery and a purchase request is done and at present waiting.

The status of the instrument from Bongabong River Watershed (BRW) at present is now functional and data are now available at present.

II. DATA ANALYSIS

A. Mag-Asawang Tubig River Watershed (MATRW)

As stated earlier, Mag-Asawang Tubig River Watershed has two (2) AWS, one (1) GWMS, and one (1) AWLS. A total of 2,526.94 mm was collected in the 4th quarter of 2022, with an average annual rainfall of 2.826 mm and maximum rainfall of 486 mm.

Below is the Summary of the data from the watershed monitoring station in Mag-Asawang Tubig River Watershed for 4th Quarter of the Year 2022.

Table 1. Summary of the data from the watershed monitoring station in Mag-Asawang Tubig River Watershed for 4th Quarter of the Year 2022.

Watershed Monitoring Instruments Parameter	Number of Instruments	Period Covered	Average	Maximum	Minimum
Rainfall (mm)	2	October – December 2022	2.826	486	0
Air temperature (°C)	2	October – December 2022	26.70	35.1	20
Relative Humidity (%)	2	October – December 2022	95.45	108.5	57.4
Wind Velocity (m/s)	2	October – December 2022	0.107	4.2	0
Wind Direction (AWS DA Victoria)	1	October – December 2022	The wind moves towards the Northwest direction most during this quarter		
Wind Direction (AWS Macatoc)	1	October – December 2022	The wind moves towards the North direction most during this quarter		
Solar Radiation (W/m ²)	2	October – December 2022	118.05	945.2	0
Stream Flow Level (m)	1 (Calapan)	October – November 17, 2022	8.16	9.39	6.47
Streamflow (m ³ /s)**	0	There is no available data			
Streamflow Temperature (°C)		There is no available data			
Groundwater level (m)	1 (MinSU)	October – December 2022	6620.89	8650	820
Groundwater Temperature (°C)	1 (MinSU)	October – December 2022	26.69	26.8	26.6
Soil Moisture (%)	2	October – December 2022	-6.66	48.4	-43.1
Conductivity (mS/cm)	1 (MinSU)	October – December 2022	1.42	17.5	-35.5

A.1. MATRW Rainfall

The rainiest day recorded in the watershed is 25.4 mm in DA Compound, Victoria, Oriental Mindoro on October 08, 2022 at 12:15 am. The average quarterly rainfall data of the watershed is 0.175 mm. The average maximum of the two AWS is 22.4 mm. The Figure below shows that there is a heavy rainfall during the month of October and November.

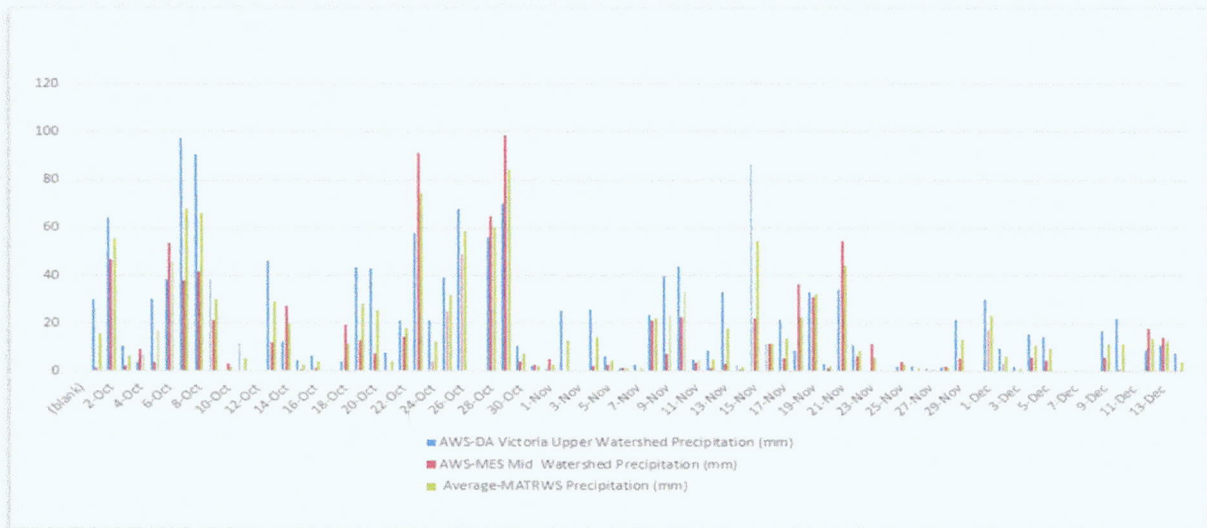


Figure 1. 4th Quarter Rainfall (mm) in Mag-Asawang Tubig River Watershed in 2022

A.2. MATRW Air Temperature

On air temperature, the warmest day in the watershed was recorded on October 11, 2022 with 35.1°C, while the coolest day is recorded on November 02, 2022 with 20°C around 5:45-6:15am at DA Compound Victoria, Oriental Mindoro. The quarterly average air temperature in the watershed 26.707 °C.

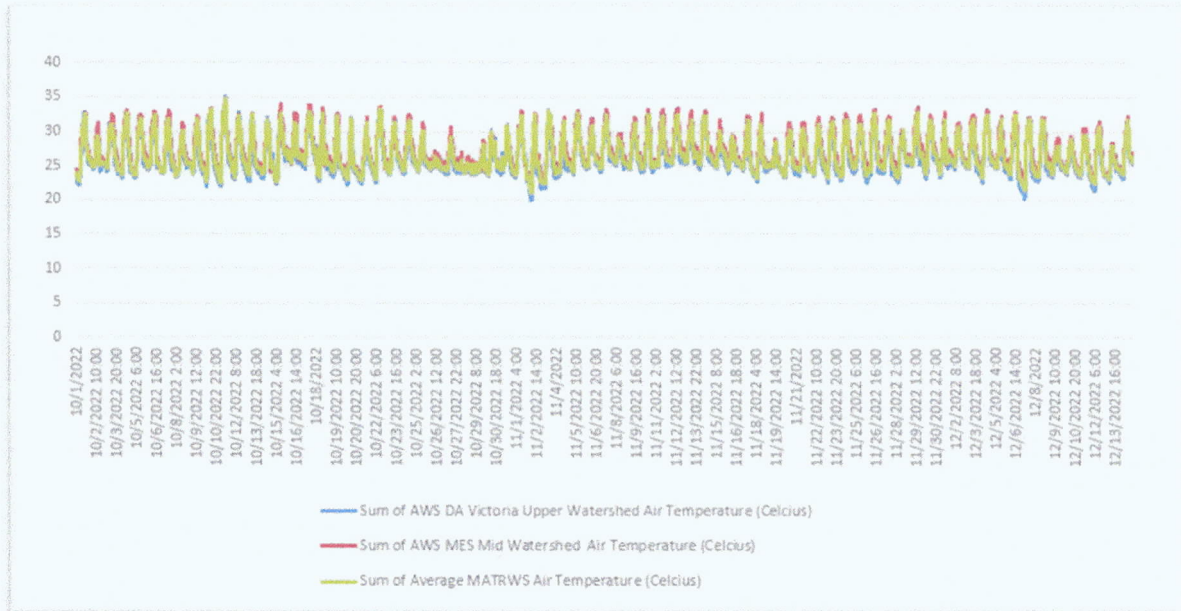


Figure 2. 4th Quarter Rainfall (mm) in Mag-Asawang Tubig River Watershed in 2022

A.3. MATRW Relative Humidity

In terms of relative humidity, an average of 95.44% was recorded. The most humid day was experienced in Macatoc, Victoria, Oriental Mindoro with 108.5% on November 22, 2022 around 7:00-7:45 pm. The least humid day was experienced on October 17, 2022 also in Macatoc Victoria, with 57.4%.



Figure 3. 4th Quarter Relative Humidity (%) in Mag-Asawang Tubig River Watershed in 2022

This means that relative humidity (RH) (expressed as a percent) also measures water vapor, but relative to the temperature of the air. In other words, it is 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. MATRW Wind Velocity

The quarterly average wind speed in the watershed is 0.1075 meters per second (m/s). The fastest wind speed was recorded on October 29, 2022 with 4.2 m/s, while the slowest is 0 m/s or no wind at all.

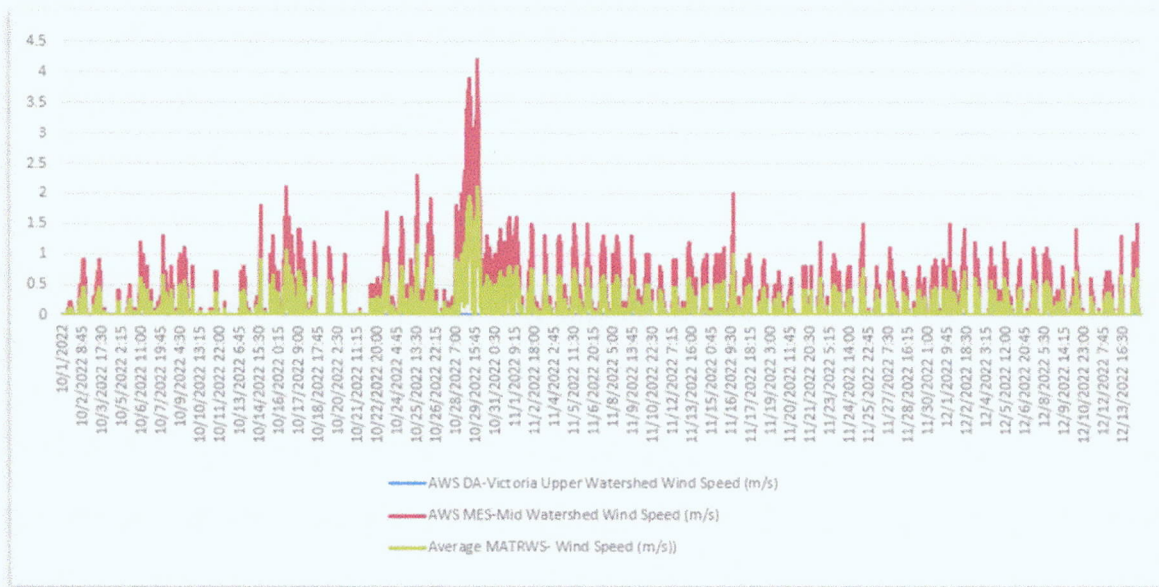


Figure 4. 4th Quarter Wind Velocity (m/s) in Mag-Asawang Tubig River Watershed in 2022

A.5. MATRW Wind Direction

Based on the Figure 5. The AWS Macatoc, Victoria, Oriental Mindoro, wind direction moves towards North-West direction mostly during this quarter with a maximum wind direction of 359⁰ and quarterly average of wind direction of 86.65⁰ NE from October to December 2022. Meanwhile, AWS DA, Victoria, moves towards the North direction most of the year.

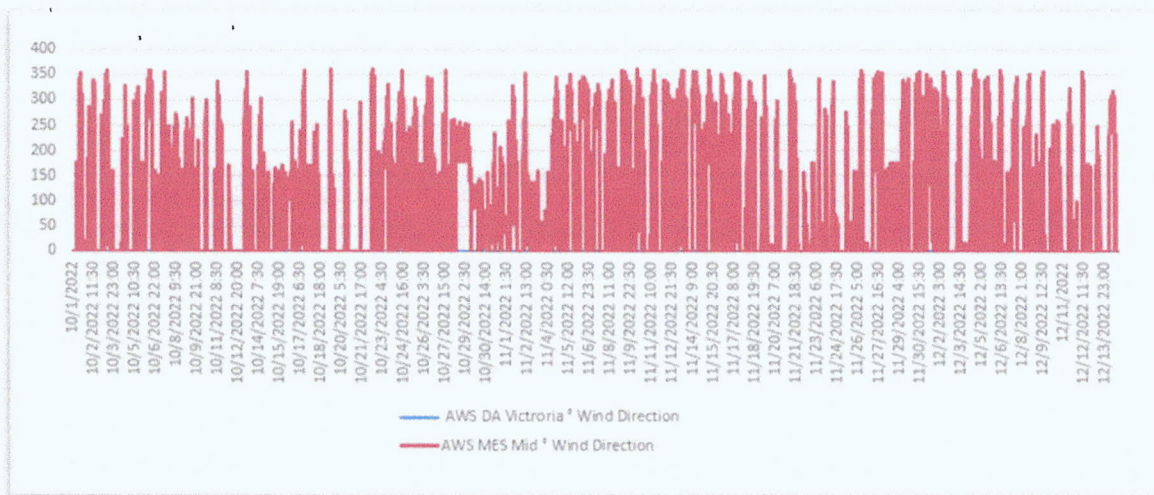


Figure 5. 4th Quarter Wind Direction in Mag-Asawang Tubig River Watershed in 2022

A.6. MATRW Solar Radiation

The sunniest day is 945.2(W/m²) in DA Victoria, Oriental Mindoro on October 1, 2022 at 12:15 pm. The least solar radiation was 0 (W/m²) or no radiation at all. The quarterly average is 118.34 (W/m²).

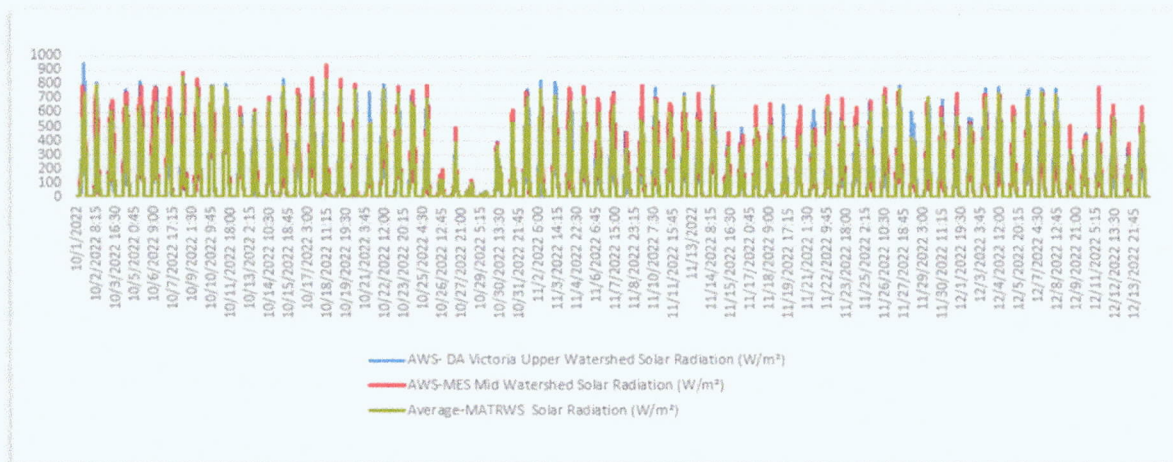


Figure 6. 4th Quarter Solar Radiation (W/m²) in Mag-Asawang Tubig River Watershed in 2022

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	October – December 2022	0.212	25.4	0	
Air temperature (°C)	1	October – December 2022	26.13	35.1	20	
Relative Humidity (%)	1	October – December 2022	94.82	101.7	58.1	
Wind Velocity (m/s)	1	October – December 2022	0	0	0	
Wind Direction (AWS DA Victoria)	1	October – December 2022	0	0	0	
Solar Radiation (W/m ²)	1	October – December 2022	112.29	945.2	0	
Soil Moisture (%)@10m	1	October – December 2022	-13.32	48.4	-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	October – December 2022	0.137	19.4	0	
Air temperature (°C)	1	October – December 2022	27.27	34.8	22.3	
Relative Humidity (%)	1	October – December 2022	96.09	108.5	57.4	
Wind Velocity (m/s)	1	October – December 2022	0.215	4.2	0	
Wind Direction (AWS Macatoc)	1	October – December 2022	86.54	359	0	
Solar Radiation (W/m ²)	1	October – December 2022	123..74	936.4	0	
Soil Moisture (%)@10m	1	October – December 2022	0	0	0	negative value indicates that there is an error on reading of the sensor
Soil Moisture (%)@30m			2.84	17.5	-35.5	

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)	October – December 2022	6620.89	8650	820	
Groundwater Temperature (°C)	1 (MinSU)	October – December 2022	26.69	26.8	26.7	
Conductivity (mS/cm)	1 (MinSU)	October – December 2022	0.291	0.36	0.26	

A.6. MATRW GWLS Ground Level (mm)

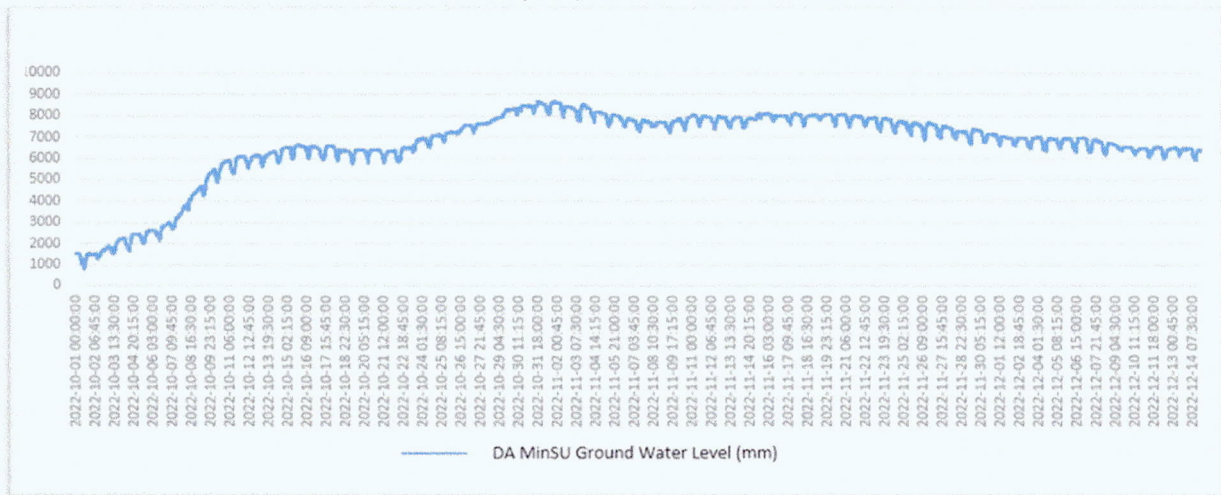


Figure 7. 4th Quarter Ground Water Level (mm) in Mag-Asawang Tubig River Watershed in 2022

The groundwater level (mm) averages 6635 mm for the period of 4th quarter, the maximum level is 8650 mm and was recorded on October 31, 2022 and minimum groundwater level is 820 mm on October 01, 2022.

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)	October – December 2022	7.965	9.13	7.03	
System Battery (Volts)		October – December 2022	12.577	13.67	12.18	
Streamflow Temperature (°C)		October – December 2022	27.861	37	23	

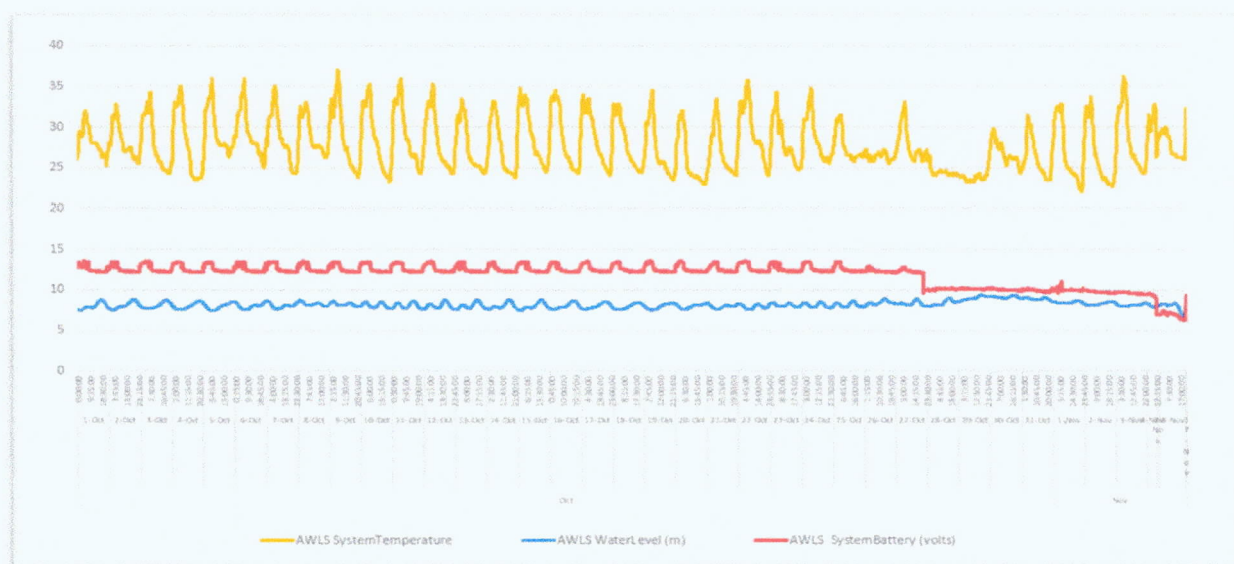


Figure 8. 4th Quarter AWLS- Water Level (m), System Temperature (°C) and System Battery (volts), Abaton Maidlang, Calapan City in Mag-Asawang Tubig River Watershed in 2022

The stream flow level averages to 8.16 m for the 4th quarter. The water level rose to maximum level is 9.39 m while the lowest was detected 6.47 m. it was noted that the maximum level of water was observed on October 29, 2022 at 5:00 pm while the lowest level was observed on November 08, 2022 at 8:45 pm.

Based on the Figure 8. The flow of data shows that the water level increase from October to November, 2022. If we look at the graph the voltages begin to drops on November 4, 2022 and later record data on November 7-8, 2022 and continuous voltages drop. This means that the battery was on drain mode, an inspection was done and found out that the battery is for replacement. Purchase order was done proceeded by request for quotation, and at present still waiting for its replacement.

The trend of water increases due to weather phenomena's, most likely the LPA, monsoon and shearlines.

B. Bongabong River Watershed (BRW)

The difference between MATRW and BRW is Bongabong River Watershed has only AWS compared to MATRW that has two (2) AWS, one (1) AWLS and one GWMS. The available parameters are summarized on the Table below.

Table 7. Summary of the data from the watershed monitoring station in Bongabong River Watershed for 4th Quarter of the Year 2022.

Watershed Monitoring Instruments Parameter AWS-Bongabong	Number of Instruments	Period Covered	Average	Maximum	Minimum	Remarks
Rainfall (mm)	1	October – December 2022	0.0999	22.2	0	
Air temperature (° C)	1	October – December 2022	26.92	38.4	22.3	
Relative Humidity (%)	1	October – December 2022	83.107	94.1	53.8	
Wind Velocity (m/s)	1	October – December 2022	1.682	12.4	0	
Wind Direction (AWS Bongabong)	1	October – December 2022	136.69	359	0	
Solar Radiation (W/m ²)	1	October – December 2022	159.06	1070.1	0	
Soil Moisture (%) @10m	1	October – December 2022	-19.753	5.6	-43.1	
Soil Moisture (%) @30m		October – December 2022	-10.565	9.2	0	

B.1. BRW Rainfall

Based on one AWS, Bongabong River Watershed received a total quarterly rainfall of 687.2 mm from October 1- December 14, 2022, with an average quarterly rainfall of 0.0999 mm and maximum rainfall of 22.2 mm, this indicate that rainfall event is too moderate from October 1– December 14, 2022, the amount of water along Bongabong River Watershed is at minimum level. Figure 7. shows that there was high rainfall recorded in November 11, 2022, it says that high rainfall events occur in the month of November, minimal in month of October and month of December.

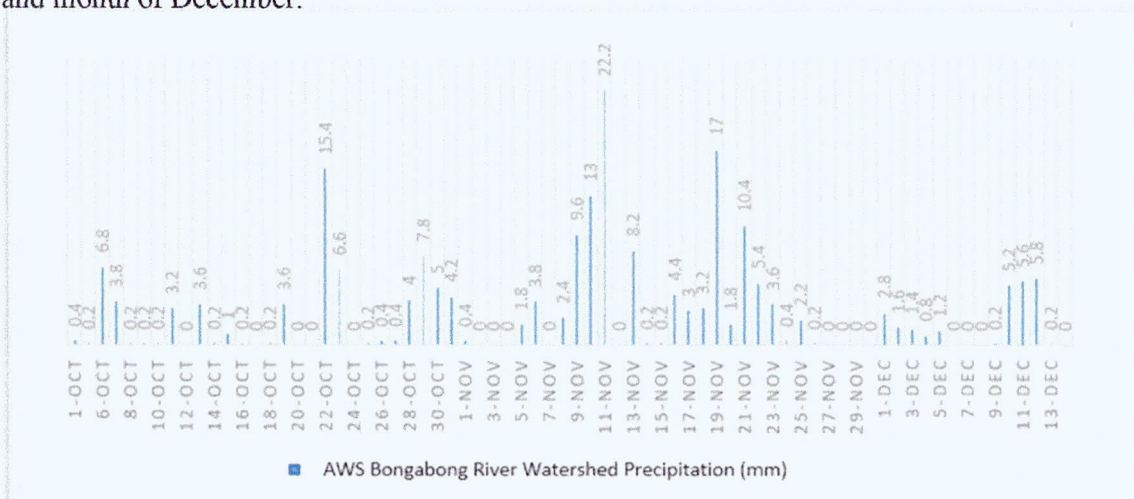


Figure 9. 4th Quarter Rainfall (mm) in Bongabong River Watershed in 2022

B.2. BRW Air Temperature

The quarterly air temperature at Bongabong River Watershed averages with 26.92 °C. the warmest air temperature was experienced on October 02, 2022 at 10:00 am with 38.4 °C while the coolest temperature was recorded on November 09, 2022 around 9:00 pm to 9:30 pm with 21.3° C.

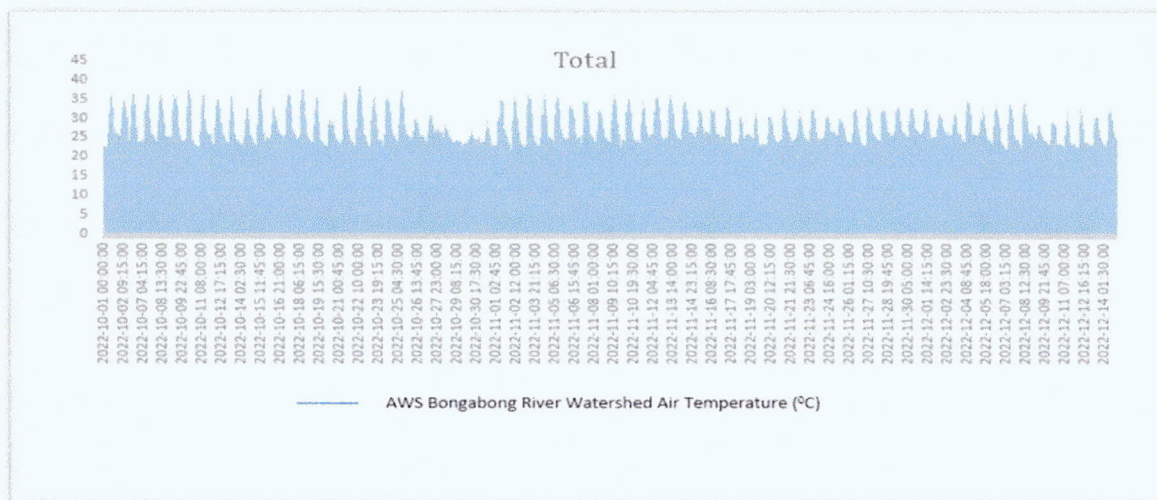


Figure 10. 4th Quarter Air Temperature (°C) in Bongabong River Watershed in 2022

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 83.11% was recorded. The most humid day was experienced November 11, 2022 with 94.1%. The least humid day was experienced on December 08, 2022 with 53.8%

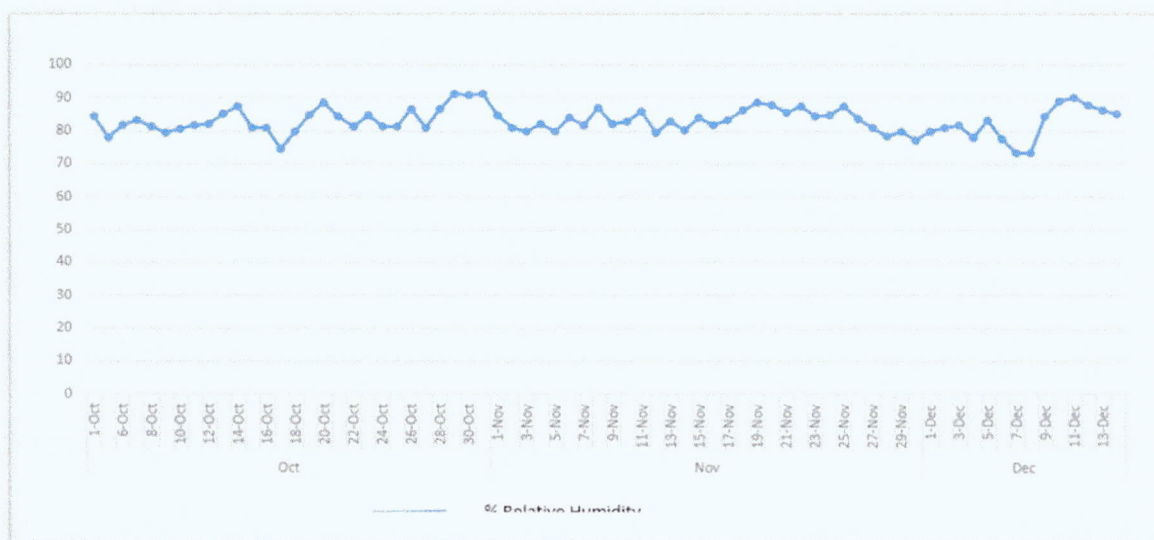


Figure 11. 4th Quarter Relative Humidity (%) in Bongabong River Watershed in 2022

B.4. BRW Wind Velocity

Wind velocity, an average of 1.68 m/s was recorded with maximum wind speed of 12.4 m/s was recorded on November 11, 2022 around 6:00pm.

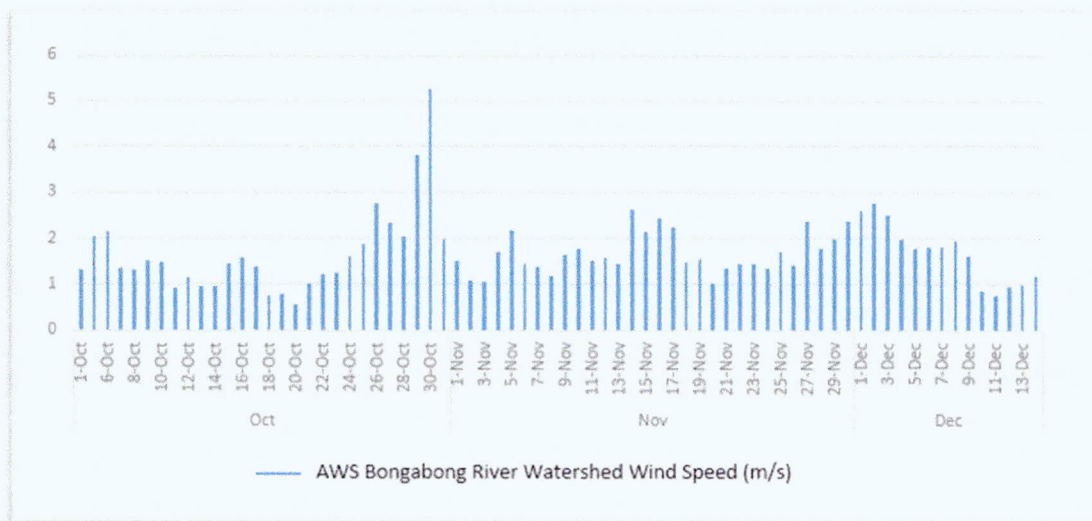


Figure 12. 4th Quarter Wind Speed (m/s) in Bongabong River Watershed in 2022

B.5. BRW Wind Direction

The most frequent wind direction is 359.0, this indicate that most of the time the wind heads to North West direction most of the time.

B.6. BRW Solar Radiation

In Hagan, Bongabong, the average solar radiation is 159.063W/m². It was on October 08, 2022 with 1070.10 W/m² recorded the sunniest day on Hagan, Bongabong, Oriental Mindoro. The least solar was zero which means that no radiation occurrence at that day.

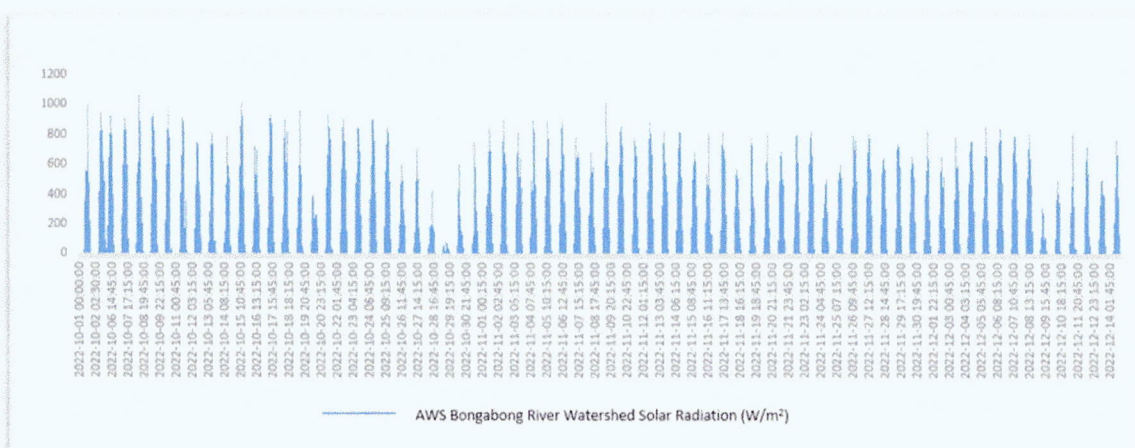


Figure 13. 4th Quarter AWS Bongabong River Watershed Solar Radiation (W/m²) in 2022

Observation

A total of 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 were installed in the Watershed of Oriental Mindoro.

Based on the data gathered, there is an increase in water level due to rainfall. Further, there is a minimal increase in the temperature of about less than 10% as compared in the previous quarter. The unpredictability of weather systems has a significant impact on these fluctuating water level readings during this period.

Also, a problem was encountered on the Automated Water Level Station in Abaton Maidlang Bridge, Parang, Calapan City a procurement of new battery was requested for replacement of the drained battery. While the remaining installed watershed instruments within the province has a complete raw data provided.


The watersheds showed that rainfall is moderate, enough rainfall was measured within the given period of reading. Further, the groundwater level is also in high level thus rainfall is frequent within the period of observation.

Recommendations

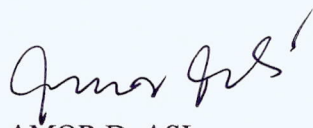
Since the stationary watershed monitoring instruments has already been developed, still unpredictable event may come anytime, a religiously monitoring is to be considered to eliminate future error during this period. The data to be gathered is vital for the success and meaningful purpose of the program. The installed instruments from upper to lower area of the watershed in particular gives a localized interpretation to the different parameter, which able locality understand and have enough time for decision making such as early evacuation, to prevent casualties brought by any natural disasters such as flooding and soil erosions.

Also, the data gathered from this instrument can contribute to the projects of different agencies/programs such as upland development, flood mitigation, disaster management and mitigation (landslide and erosion control) and coastal management.

Prepared by:


Alister Earl M. Meman
Database Manager IT Specialist

Noted by:

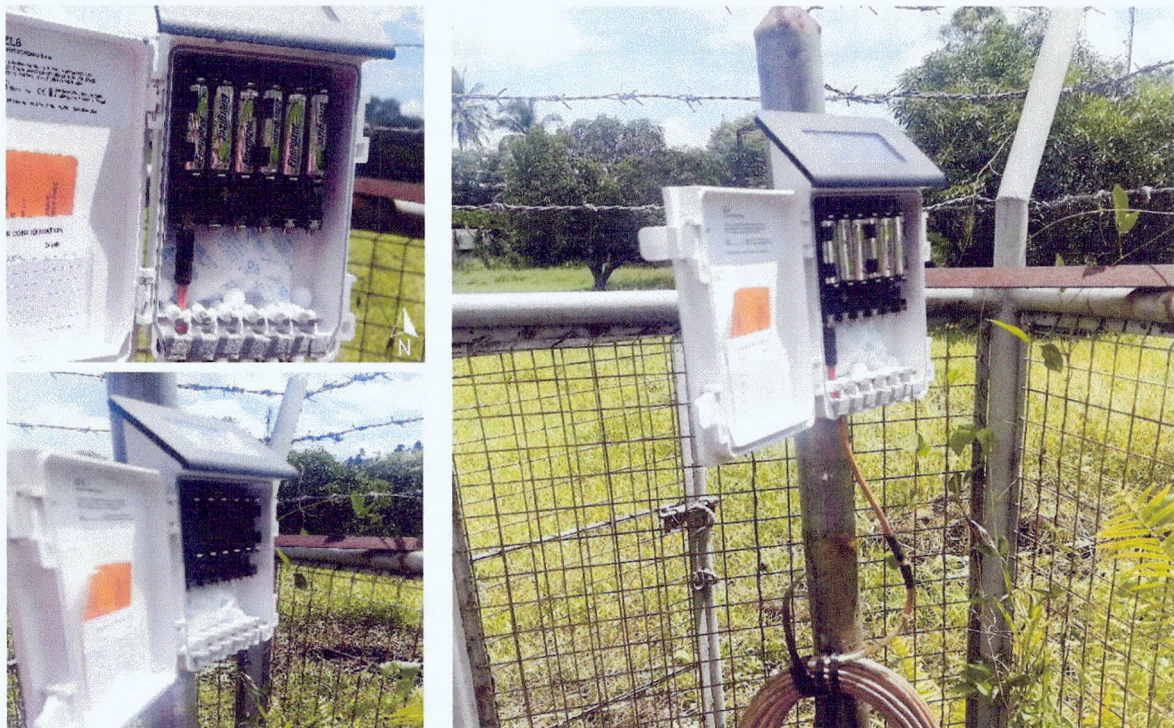

AMOR D. ASI
Chief, Conservation and Development Section

MOV for the month of October, 2022 – Report on Data Generated from the Science-Based Real-Time Watershed Monitoring Instruments

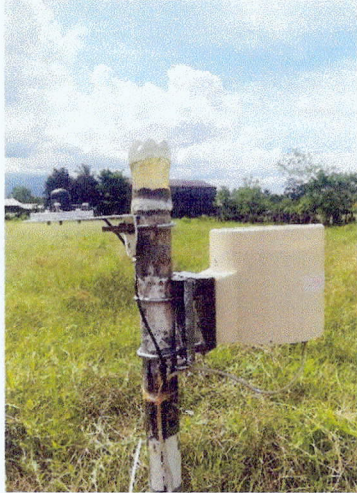
Automated Weather Station (AWS) at Macatoc Elementary School, Victoria, Oriental Mindoro.



Automated Weather Station (AWS) at Macatoc Elementary School, Victoria, Oriental Mindoro.



Ground Water Level Monitoring Station at MinSU Compound, Victoria, Oriental Mindoro



Automated Weather Station (AWS) at Department of Agriculture Compound, Barangay Alcate, Victoria, Oriental Mindoro

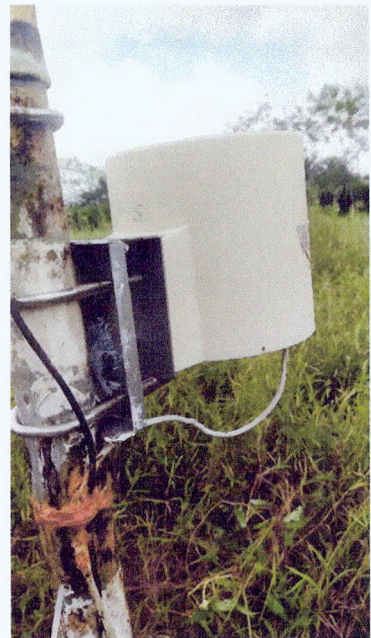


Ground Water Level Station (GWLS) at So. Abaton, Barangay Parang, Calapan City, Oriental Mindoro

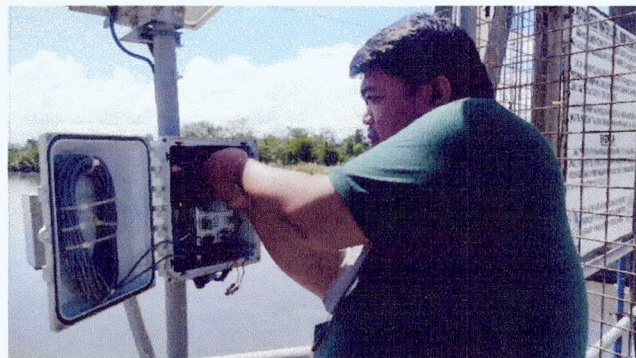
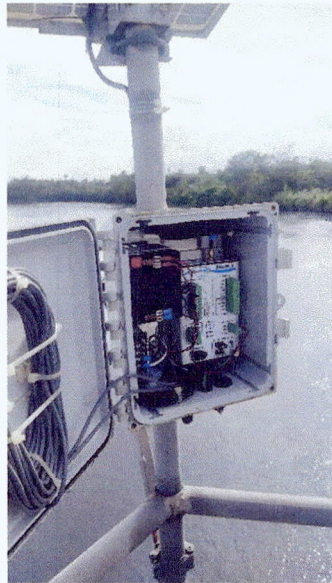
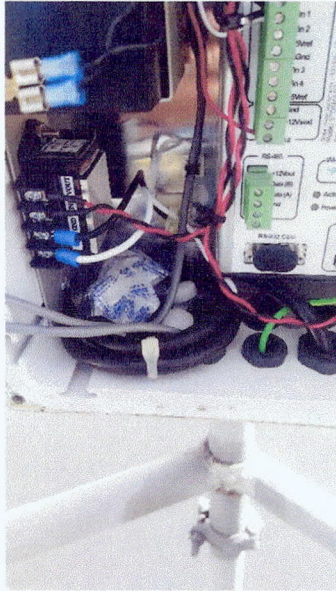
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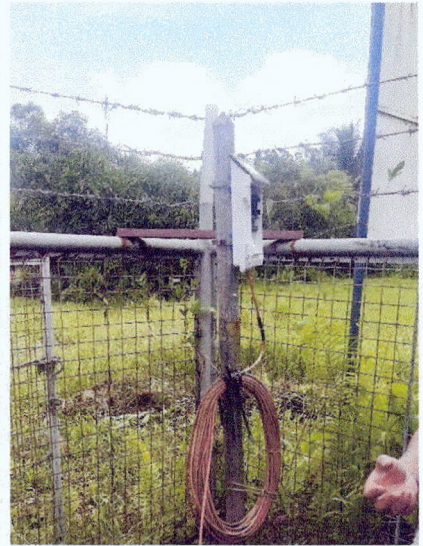
Automated Weather Station (AWS) at Macatoc Elementary School, Victoria, Oriental Mindoro.



Automated Weather Station (AWS) at Department of Agriculture Compound, Barangay Alcate, Victoria, Oriental Mindoro



Automated Water Level Station (AWLS) at So. Abaton, Barangay Parang, Calapan City, Oriental Mindoro

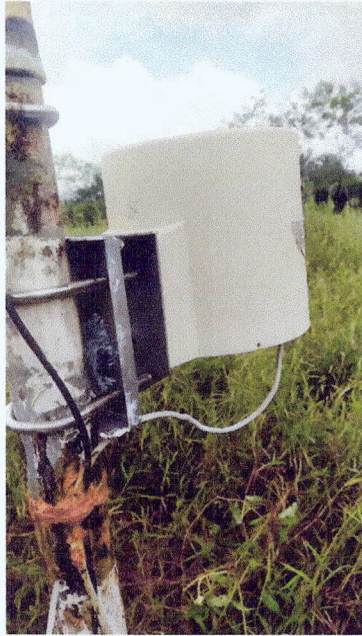


Ground Water Level Station (GWLS) at Mindoro State University, Barangay Alcate, Victoria, Oriental Mindoro

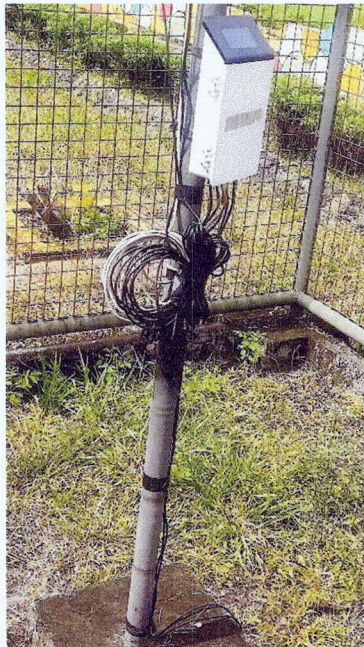
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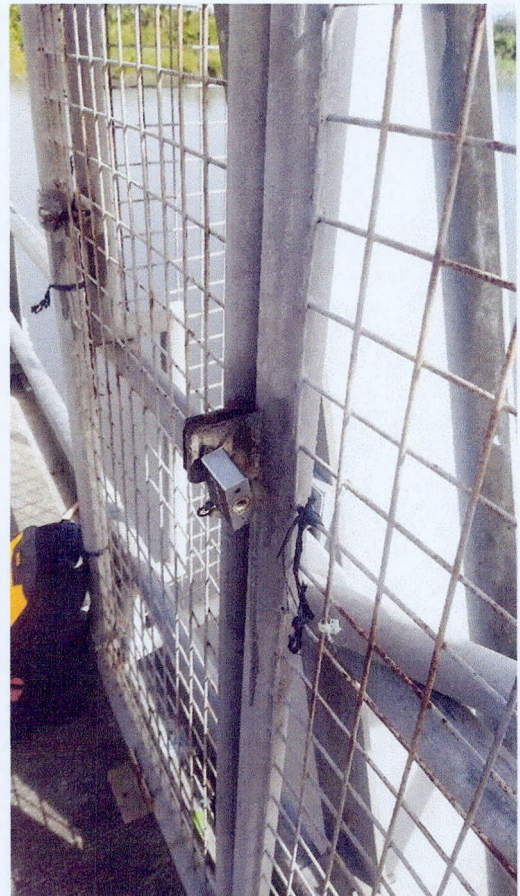
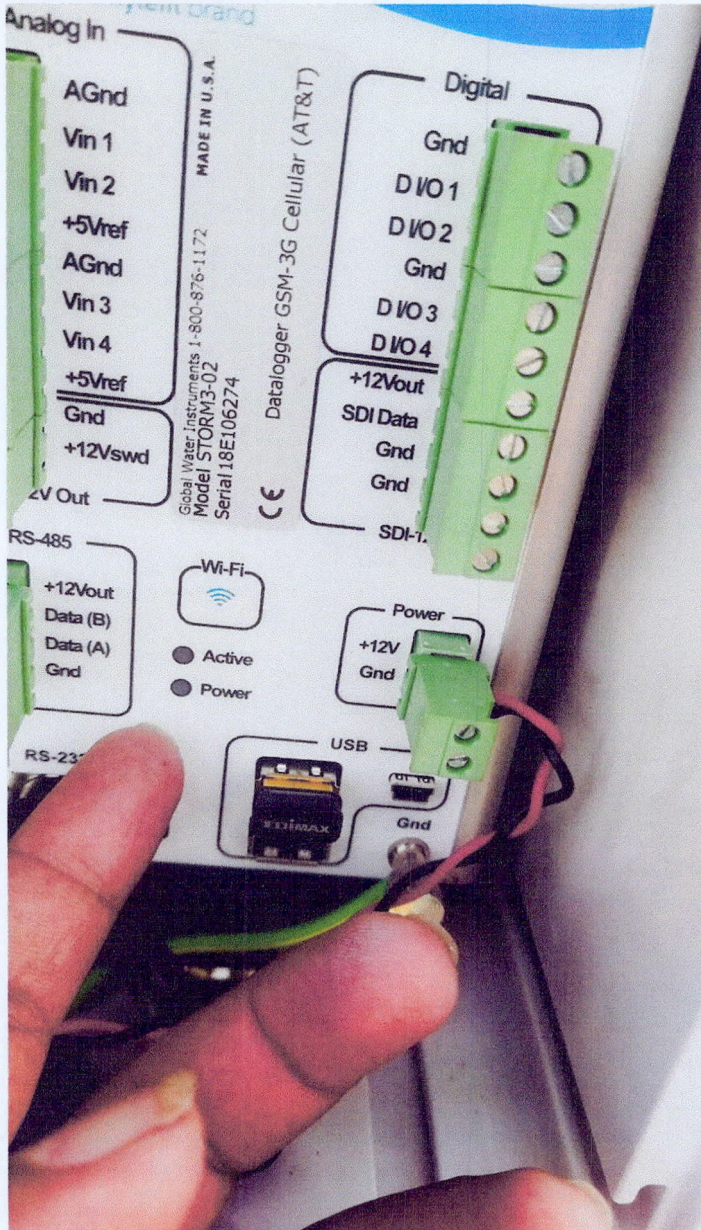
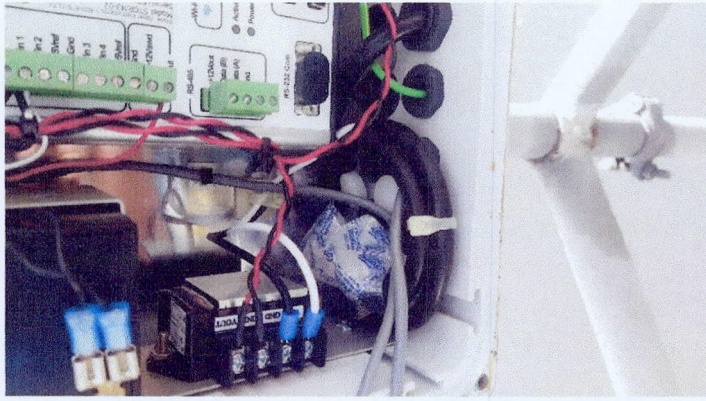
Automated Weather Station (AWS) at Macatoc Elementary School, Victoria, Oriental Mindoro.



Automated Weather Station (AWS) at Department of Agriculture Compound, Barangay Alcate, Victoria, Oriental Mindoro



Automated Weather Station (AWS) at Macatoc Elementary School, Victoria, Oriental Mindoro.



Automated Water Level Station (AWLS) at So. Abaton, Barangay Parang, Calapan City, Oriental Mindoro