Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
Regional Office No. VIII

ENVIRONMENTAL MANAGEMENT BUREAU
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MEMORANDUM

FOR	:	**ENGR. WILLIAM P. CUÑADO** Director Environmental Management Bureau DENR Compound, Visayas Avenue Diliman, Quezon City
ATTENTION	:	Chief, Environmental Quality Division Chief, Water Quality Management Section Chief, Policy, Planning, and Program Development Division
FROM	:	**THE OIC-REGIONAL DIRECTOR** Environmental Management Bureau Region 8 Tacloban City
SUBJECT	:	**2021 ANNUAL REPORT FOR THE OPERATIONALIZATION OF ORMOC BAY WQMA**
DATE	:	December 27, 2021

Submitting herewith the 2021 Annual Report for the operationalization of Ormoc Bay Water Quality Management (WQMA). It entails the status of the operationalization which includes the activities conducted from the 1st Quarter to 4th Quarter of 2021. It also presents the monthly and quarterly water quality monitoring results and the corresponding recommendations addressing the encountered issues for the year.

For his information.

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Date: 2022-02-04 08:41+08:00

ENGR. REYNALDO B. BARRA

OPERATIONALIZATION of ORMOC BAY WATER QUALITY MANAGEMENT AREA

CY 2021

Environmental Management
Bureau Region VIII

A. Executive Summary

Despite the limitations in movement, again brought by COVID 19 pandemic's threat for another year, Ormoc Bay Water Quality Management Area (WQMA) was able to continue its operation for CY 2021 by conducting water quality monitoring from the first quarter to the fourth quarter. In addition, organizing virtual meetings—eventually in the latter part of the year, physical ones, and conducting training activities with the GB members.

The first activity that was conducted is a training workshop on ambient water quality monitoring on January 11, 2021, which was participated by the Environmental Monitoring Officers (ENMOs) of the region. It was followed by a virtual meeting with the Governing Board members of the two WQMAs in the Region that was held on May 26, 2021. Moreover, on August 26 and 27, 2021, a capacity-building program on Pollution Load Assessment and updating of Water Quality Monitoring policies was conducted and participated by LGU representatives. In the third quarter, from October 5 to 7, the next governing board meeting conducted was held in a physical environment. To maximize the resources, it was conducted along with a training workshop on the preparation and updating of the LGU Compliance Scheme, basic GIS, and pollution load assessment on a three-day activity. Finally, for the last activity of the year, a year-end assessment was conducted on the last quarter—December 1 to 2, 2021, wherein the accomplishments and progress of the operationalization of the WQMA for the year were assessed as well as the issues encountered.

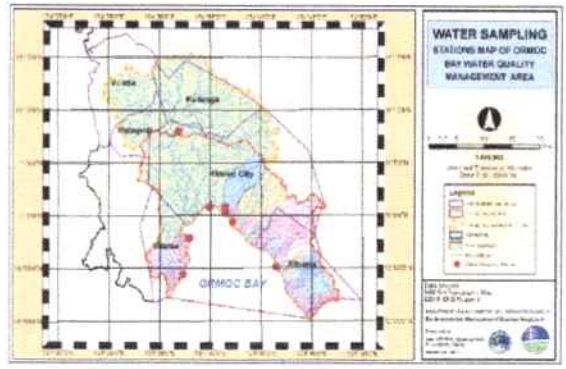
Water quality results show that temperature, pH, DO, color, and BOD in Ormoc Bay WQMA were generally within the standard. Since heavy metals samples are still analyzed in Cebu, no samples were collected due to unavoidable shipping delays brought by COVID 19 pandemic. The fecal coliform level, on the other hand, compared to the last year's result is still widely fluctuating. Observably, the high fecal coliform concentrations in all freshwater sampling stations have been due to a lack of septage treatment facilities, proper drainage systems, and domestic waste disposal. For TSS, most of the coastal stations sustained high TSS for March and April due to the strong wind action observed during the sampling period which may have caused the disturbance of the sediments. Panilahan river, as evidenced by its highly turbid state, had a consistently high TSS value. The Ormoc City LGU had intensified its actions on adopting appropriate measures in the regulation of sand and gravel operations in the area significantly affecting the water quality of nearby water bodies.

Due to the ongoing pandemic, most of the LGUs have temporarily ceased most activities concerning their respective compliance schemes. However, as the health protocol restrictions eventually loosen up in the latter months, they are starting to get their activities back to normal. Nevertheless, Baybay City had started with the development of its sewerage treatment facility. Continuous IEC on open defecation, solid waste management, health, and sanitation as well as provision of toilet facilities were some of the activities regularly conducted by the LGUs despite the pandemic.

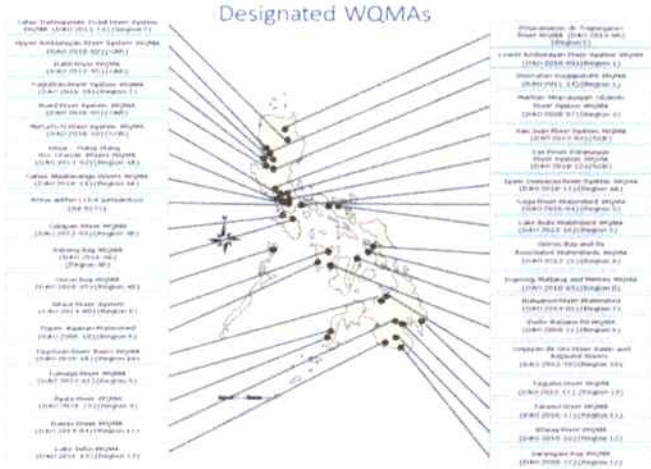
On a final note, continued strengthening of operationalization of the Ormoc Bay WQMA is highly recommended for the improvement of the WQMA's objectives. Although the results have yet to conform to the standard as provided in DAO 2016-08, still it can be discerned from the analysis of the results that there is a significant and noticeable improvement in the levels of the water quality parameters analyzed as reflected by the observed decreasing trend. Therefore, the implementation of the Ormoc Bay WQMA has to be intensified with the recommendations cited in this report.

B. Background

Ormoc Bay and its Associated Watersheds was designated as Water Quality Management Area through DENR Administrative Order No. 21, Series of 2013 which was approved on August 27, 2013, and published on September 3, 2013The Ormoc Bay Water Quality Management Area (WQMA) is located in the western portion of Leyte Island in the Eastern Visayas Region. It consists of two main components: a bay area or marine component and a cluster of associated watersheds or drainage basins that make up the terrestrial component. The bay area covers approximately 24,930 hectares, with a coastline of around 57,097 meters and a marine boundary of around 25,381 meters. The terrestrial component which covers around 54,906 hectares has a topographic divide or ridge periphery of around 125,771 meters.



Under the government's classification scheme for the utilization of water bodies, Ormoc Bay is classified as Class SC per DENR Administrative



Order No. 05, Series of 1998 and therefore suitable for recreational uses and fishing. Its associated river systems are categorized as Class C for inland water bodies and are likewise

recommended for fishing and recreational uses. These include the numerous small basins that drain the municipalities of Albuera and Merida and portions of the very huge Ormoc-Kananga Basin which had been identified by the Mines and Geo-Sciences Bureau (MGB) as among the top twelve groundwater reservoirs in the country.

The Ormoc Bay WQMA covers the City of Ormoc and the municipalities of Albuera, BurauenMerida, Matag-ob, Baybay, Palompon, Isabel and Kananga.

C. Status of Operationalization

1. Joint WQMAs Governing Board Meeting

The **first GB meeting** was held last May 26, 2021, and led by DENR-EMB 8 using a virtual platform where all the WQMA members and representatives converged to discuss the agreed agendas. Due to the pandemic and for time efficiency, the first and second quarter concerns were talked about in one meeting. The endeavor was followed by the presentation and discussion of the CY 2021 water quality results of Ormoc Bay WQMA. The member LGUs were tasked to present their quarterly accomplishment in line with their 10-Year LGU Compliance Scheme submitted to the office. Unfortunately, only the LGUs Ormoc, Baybay, and Isabel had presented their quarterly accomplishments. The following accomplishments were presented by the LGUs:

LGU – Ormoc

The Ormoc City Septage Facility is expected to be fully utilized by the whole city before the end of 2021. As of now, only selected government offices wastewater was initially siphoned and treated at the water treatment facility. Other offices and establishments will soon benefit from the services of the wastewater treatment facility after the finalization of fees. It was also suggested that to prevent the direct discharge of wastewater of the city market, a collecting pond will be constructed wherein the wastewater produced will be stored and later collected for treatment, in which coincidentally, according to the LGU-Ormoc representative, they already have a plan to construct the suggested collecting pond.

The housing project has been completed and occupied by the identified beneficiaries previously living in coastal and other unsafe areas of some barangays in the city. Around 1,410 units were already awarded to the identified beneficiaries out of the 1,419 housing units.

LGU – Isabel

In response to the high fecal coliform levels of some stations in WQMA Isabel, the LGU said that there is already 82.24% of the total household that have access to sanitary toilets and only 17.76% do not have access which is contributory to the issue. There is already a total of 4 functional latrines for the Badjao Village. Informal settlers in Barangay Marvel, including the Badjao community living in the Mangrove Reserve, and Barangay Matlang is also proposed to be relocated to the NHA housing units. The relocation of the informal settlers is still an ongoing process.

LGU – Baybay

To address the wastewater treatment issues of the City, the LGU had come up with a proposed Constructed Wetland that has a capacity of 1000 cubic meters per day. The wastewater treatment facility is expected to be functional and ready for utilization before the year ends.

Regarding the complaint about the piggery in Brgy. Caridad, Ormoc City, a cease-and-desist order was already issued by the LGU-Baybay and was given three (3) months to comply with the regulations.

For the **third quarter GB meeting**, the activity was finally held in a physical environment. To maximize the time of the participants and technical staff organizing the event, a training workshop was also incorporated into the program. Along with the agendas related to the operationalization of WQMA, a training workshop was also conducted to strengthen the capacity of the LGU representatives. The training included the Preparation/Updating of the LGU Compliance Scheme based on the 10 Year WQMA Action Plan, Basic GIS, and Pollution Load Assessment. Furthermore, several issues and concerns were raised by some of the LGU representatives and other participants from the board:

a. Lack of proper turnover of WQMA-related documents, particularly the action plan from the previous MENRO designates to the present ones if changes are made due to change of administration in the LGU.

b. Lack of continuity in environment-related programs in LGUs as a result of some municipalities changing the MENRO as the mayoral administration changes.

b. Problem with retrieving the old action plan from the previous MENROs making it difficult to proceed with the next step of the workshop if their progress will be back to zero.

Lastly, for the **fourth quarter** GB meeting, a Year-end Assessment of the WQMAs in region 8—Ormoc Bay WQMA and Dupong, Matlang, and Merida WQMA was conducted and participated by LGU representatives and other members of the governing board. The activity was held on December 1 and 2. The activity included a presentation/discussion of the 3rd Quarter of Ormoc Bay WQMA, Dupont, Matlang, and Merida WQMA, and Adopt an Estero/ Waterbody inside WQMA, submission of the 4th Quarter CY 2021 Accomplishment Reports based on the members' LGU Compliance Scheme, and presentation by the member LGUs' respective implementation of their Compliance Schemes. Again, several issues and concerns were raised by the participants:

a. Adopters should conduct activities that enhance the quality of the water bodies and LGUs should be the one who initiates the activities since the industries are under their jurisdiction

b. Use the media to improve public participation through awareness and using the WQMA status and progress

c. Some LGUs requested more training activities with regards to the operationalization of WQMA

d. As raised by LGU Ormoc, the City Health Office should be included in WQMA meetings to solicit their inputs in addressing the fecal coliform concentration issues

e. Member LGUs shall conduct an investigation in regards to the causes of high Fecal Coliform concentration, come up with a graph of all the parameter results since the commencement of WQMA and present it in the next GB meeting

2. LGU Compliance Monitoring Validation

In the third quarter, the compliance schemes of member LGUs were validated. Some LGU representatives namely from LGUs Albuera and Kananga; however, were not present during the validation. LGUs Palompon and Merida requested a reorientation on the preparation of the schemes since they are new to the position as GB members. Listed in this compliance scheme are the activities and timetable for achieving the objectives of the 10 Year WQMA Action Plan in their territorial jurisdiction.

As a countermeasure against the waterbody pollution indicated by the fluctuating fecal coliform concentration, Baybay City had started with the development of its sewerage treatment facility. The proposed wastewater facility of the LGU is a joint project with DPWH Region 8. The LGU was able to secure a funding subsidy from DPWH's National Sewerage and Septage Management Program that targets local implementers to develop on-the-ground projects and programs on sewerage and septage management. The agency will shoulder 50% of the total project cost. As an additional requirement, LGU Baybay is advised to identify and secure a project site. With assistance from EMB 8, CENRO Baybay, and MGB 8, an assessment/ of a dried-up river bed as a site for their proposed wastewater treatment facility was conducted to meet the requirement set by DPWH.

3. Other Activities Conducted

Training Workshop On Ambient Water Quality Monitoring And Sampling For Environmental Management Officers (ENMOs)

To aid the Regional Office in attaining the target of monitoring the quality of our rivers and streams; lakes, ponds and similar water bodies; and marine waters (coastal and offshore waters), the Ambient Monitoring Section held a workshop on ambient water quality monitoring and sampling for the ENMOs assigned at the different PENROs and CENROs across Region 8. The event was held at EMB 8 Conference Hall last January 11, 2021. Overview on water

quality, the different purposes of monitoring including the primary and secondary water quality parameters i.e. physical, chemical, and biological properties of water, and its significance were discussed during the activity. Actual water quality sampling using a water quality checker was also demonstrated.

Capacity Building on Pollution Load Assessment and Updating of Water Quality Monitoring Policies

On August 26 to 27, 2021, a capacity-building program on Pollution Load Assessment and updating of Water Quality Monitoring policies was conducted and participated by LGU representatives. A resource speaker from the DILG was invited to discuss the Mandanas Ruling. Rudith A. Roca of the Department of the Interior and Local Government (DILG) Region 8 was invited over to walk the participants through the projected local government's internal revenue allotment (IRA) as LGUs assume more functions including environmental services starting 2022.

Training Workshop on the LGU Compliance Scheme based on the 10 Year WQMA Action Plan, Basic GIS Training, Pollution Load Assessment

As previously mentioned, another training on Pollution Load Assessment and updating of Water Quality Monitoring policies was conducted at the same program as the third GB meeting. The training was participated by LGU representatives. Moreover, Basic GIS training was also added to the activity considering its significance as a helpful environmental monitoring and management tool. The training also served as a preparation for the LGUs for when the Mandanas Ruling fully takes effect and most parts of the operationalization of the WQMA are devolved to the LGUs. Most of the LGU representatives who participated asked for more training activities and more in-depth GIS training. Although as brought up in the GB meeting, the lack of continuity in the MENRO position in some LGUs should be considered before investing in more capacity-building activities.

D. Water Quality Monitoring Results

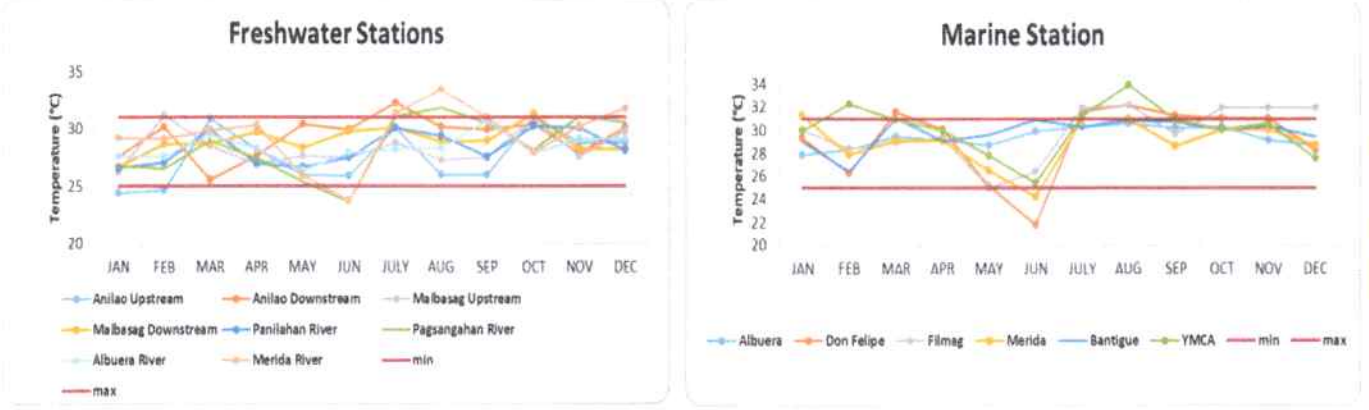
The laboratory results indicate that the water quality of Ormoc Bay in general, satisfies the requirements for Class SC, while its associated watersheds satisfy the requirements for Class C waters. The results, however, indicate that both marine and inland components of the proposed WQMA are under threat from pollution sources as reflected by the unstable water quality or widely fluctuating levels for the various parameters during different sampling periods. One important parameter which generated significant incidences of failure or non-attainment status for various sampling stations is fecal coliform. The detailed results of the water quality tests are presented below.

Temperature

Water temperature in the study area ranges from 24.4° C to 32.2 °C (*Graph 1).* Although a high temperature was occasionally observed throughout the sampling period, the increase of the difference between the actual concentration and the acceptable water quality values as provided in DAO 2016-08 is still within the 10% allowed maximum increase provided that the increase will not cause any risk to human health and the environment. Among river stations, all values obtained for CY 2021 passed the acceptable standard for temperature except for some minor incidents of exceedance (*Graph 1*).

Table 1. Monthly temperature values from the sampling stations for CY 2021

STATION	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
Anilao Upstream	24.4	24.6	30.9	28.2	26	25.9	30	26	26	31	28.8	28.8
Anilao Downstream	27.6	30.2	25.56	27.7	30.4	30	32.3	30.2	30	30.4	27.9	30.1
Malbasag Upstream	26.2	31.2	28.52	26.9	27.7	27.5	28.8	27.3	27.5	31	27.6	29.8
Malbasag Downstream	26.7	28.7	28.76	29.7	28.4	29.8	30.1	28.9	29	31.3	28.3	28.2
Panilahan River	26.6	27.1	30	27	26.7	27.5	30.10	29.4	27.6	30.3	30.1	28.1
Pagsangahan River	26.8	26.5	29	27.44	25.4	23.6	31.1	31.9	30.5	28.2	31.1	30.6
Albuera River	27.6	27.6	29.5	28.3	26.4	28	28.2	28.4	30.7	27.9	29.1	29.1
Merida River	29.2	29.1	29.9	30.34	25.9	23.7	31.4	33.5	31	28	30.3	31.8
Albuera	27.9	28.3	29.5	29.2	28.70	29.90	30.3	30.6	30.2	30.3	29.2	28.7
Don Felipe	29.3	26.3	31.64	30.11	25.10	21.80	31.7	32.2	31.3	31.04	31.04	28.3
Filmag	30	28.4	28.9	29.43	25.00	26.40	32	32.2	29.7	32	32	32
Merida	31.3	27.9	29.1	29.12	26.50	24.20	31	31	28.6	30.1	30.1	28.7
Bantigue	29	26.4	31.06	29.1	29.60	30.90	30.3	30.9	30.8	30.1	30.4	29.5
YMCA	29.9	32.3	30.9	29.97	27.80	25.40	31.3	34	30.9	30.06	30.6	27.6
min	*25*	*25*	*25*	*25*	*25*	*25*	*25*	*25*	*25*	*25*	*25*	*25*
max	*31*	*31*	*31*	*31*	*31*	*31*	*31*	*31*	*31*	*31*	*31*	*31*



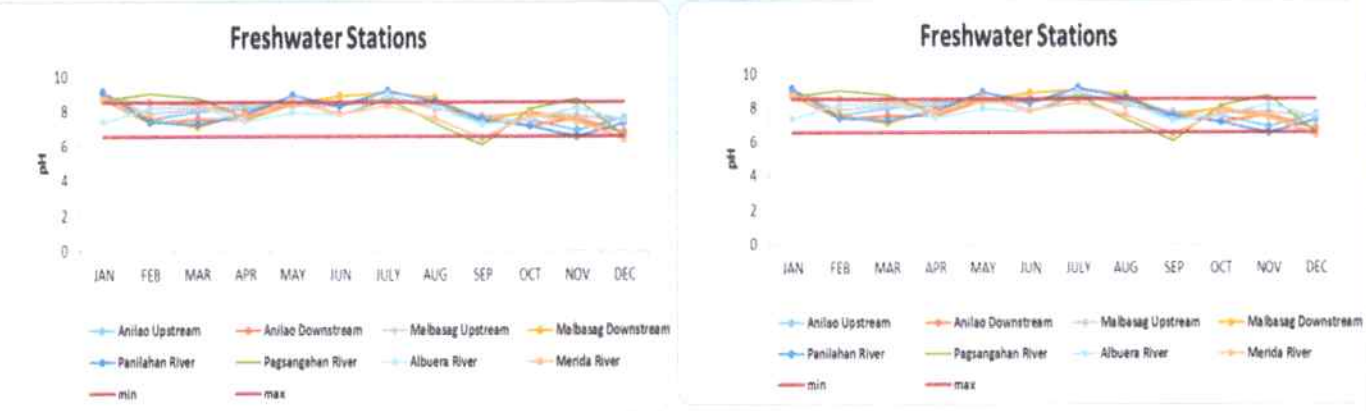
Graph 1. Temperature results for freshwater and marine stations for 2021

pH

The pH level for CY 2021 revealed that pH results in most stations remained within the optimal range (pH 6.5 – 8.5) are generally within the DENR Water Quality Guidelines (DAO 2016-08). However, a noticeable decrease on pH level was observed on Merida River during September. A drastic change in pH can greatly affect aquatic organisms as most of them are adapted to the water of a specific pH. These pH anomalies range from as low as -2.0 to as high as 1.2. Changes in pH between 0.2 and 0.3 are already stressful to some species and may even result in mass mortality and migration.

Table 2. Monthly pH values from the sampling stations for CY 2021

STATION	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
Anilao Upstream	9.13	7.54	7.97	8.15	8.28	8.43	8.75	8.2	7.41	7.49	6.9	7.6
Anilao Downstream	8.7	7.33	7.53	7.52	8.38	8.29	8.82	8.15	7.72	7.12	7.56	6.72
Malbasag Upstream	8.9	7.86	8.11	8.36	8.28	8.32	8.67	8.37	7.71	7.87	7.71	7.48
Malbasag Downstream	9	7.55	7.09	7.91	8.44	8.86	9.07	8.74	7.46	7.97	7.46	6.37
Panilahan River	9.14	7.38	7.25	7.82	8.92	8.3	9.17	8.55	7.49	7.16	6.52	7.3
Pagsangahan River	8.64	8.99	8.77	7.68	8.6	7.75	8.72	7.29	6.07	8.13	8.72	6.5
Albuera River	7.34	8.19	8.31	7.4	7.95	7.75	8.89	8.26	7.23	7.56	8.2	7.45
Merida River	8.63	8.48	8.37	7.72	8.62	7.8	8.3	7.56	6.44	7.79	7.4	6.35
Albuera	7.64	8.4	8.08	7.62	7.51	7.48	8.47	8.26	7.51	7.5	6.2	7.6
Don Felipe	8.22	8.08	8.02	7.45	8.08	7.93	8.25	7.58	7.13	7.46	7.64	6.89
Filmag	8.38	8.23	7.92	7.36	7.92	7.75	8.12	9.66	6.85	8.2	7.45	7.2
Merida	8.34	8.29	7.71	7.72	7.93	7.7	7.67	7.79	7.06	7.64	8.13	6.35
Bantigue	8.57	7.99	7.85	7.85	8.1	7.85	8.4	8.22	7.47	7.45	6.94	7.27
YMCA	8.3	8.07	8.02	7.71	7.69	7.74	8.03	7.29	6.59	8.13	7.7	7.09
min	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
max	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5



Graph 2. pH results for freshwater and marine stations for 2021

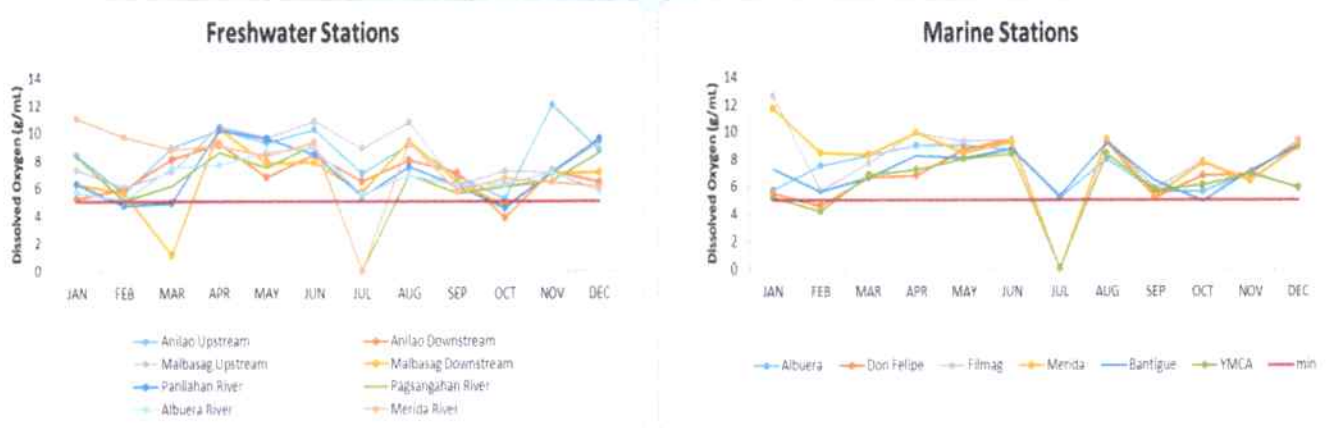
Monthly data range from 6.07 to 9.66 (Table 2). At pH 6.0, the microorganisms which decompose organic matter begin to die. Further decrease (i.e. acidification), plankton and other microorganisms which form the base of the food chain begin to decline drastically. Furthermore, all aquatic organisms are likely to suffer from impacts on critical habitat loss and limited food sources for other organisms.

Dissolved Oxygen

Overall DO data for 2021 showed relatively high levels which are above the DO minimum threshold limit (Graph 3). A higher dissolved oxygen level usually indicates better water quality. If dissolved oxygen levels are too low, some fish and other organisms may not be able to survive. Most DO levels of the freshwater sampling stations were above the threshold limit of 5 mg L^{-1}. Overall, the concept of oxygen tolerance of aquatic organisms will be continuously influenced by climate change and variability of the aquatic ecosystems thus affecting food web structure, recruitment success, and fish production.

Table 3. Monthly DO values from the sampling stations for CY 2021

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Anilao Upstream	8.36	5.63	8.93	10.2	9.24	10.25	7.04	9.15	6.88	5.21	12.01	8.74
Anilao Downstream	5.2	5.9	8.06	9.19	6.76	8.43	6.47	8.02	7.12	3.84	7.21	6.37
Malbasag Upstream	7.3	6.03	7.18	10.44	9.64	10.8	8.87	10.74	6.24	7.22	7.08	9.3
Malbasag Downstream	6.28	5.63	1.15	10.21	7.76	7.83	5.7	9.39	6.48	4.66	7.06	7.1
Panilahan River	6.28	4.73	4.9	10.2	9.58	8.43	5.35	7.55	6.17	4.56	7.15	9.58
Pagsangahan River	8.24	5.08	6.13	8.54	7.49	9.15		6.9	5.63	6.11	6.53	8.53
Albuera River	5.65	5.08	7.48	7.67	8.63	8.89	5.51	6.9	6.15	6.25	7.1	5.82
Merida River	11.01	9.68	8.76	9.00	8.29	9.32		9.32	5.75	6.67	6.37	6.12
Albuera	5.73	7.53	8.22	8.99	8.96	8.66	5.15	8.03	5.6	5.63	7.01	5.85
Don Felipe	5.5	4.57	6.65	6.8	8.68	9.44		9.2	5.2	6.76	6.89	9.26
Filmag	12.62	5.67	7.72	9.91	9.31	9.44		9.44	5.88	7.8	6.4	9.03
Merida	11.7	8.44	8.33	9.91	8.44	9.2		9.44	5.32	7.68	6.41	8.87
Bantigue	7.25	5.59	6.65	8.26	8.07	8.75	5.3	9.2	6.38	4.95	7.15	8.97
YMCA	5.15	4.19	6.83	7.21	8.00	8.36		8.36	5.72	6.12	6.89	5.91
min	5	5	5	5	5	5	5	5	5	5	5	5

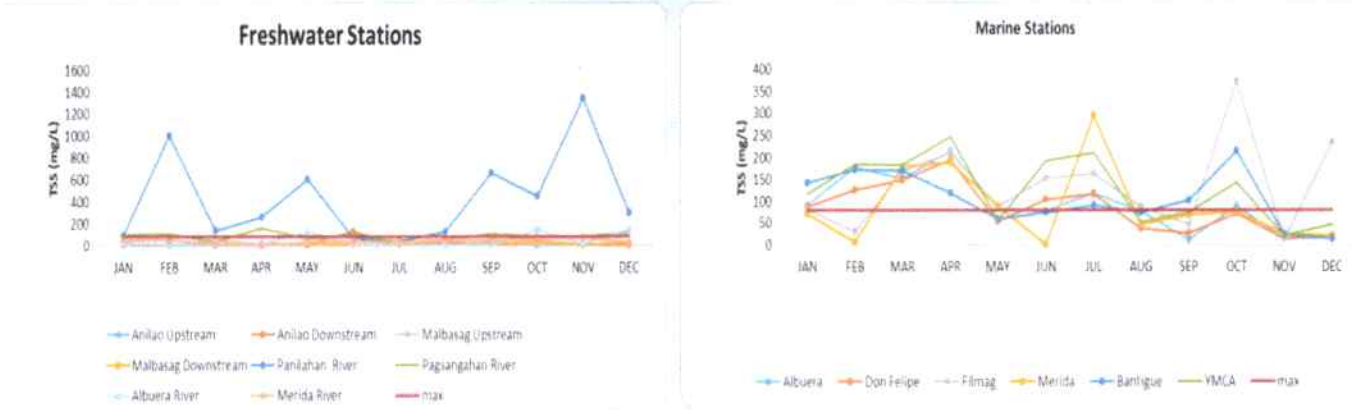


Graph 3. DO results for freshwater and marine stations for 2021

The total suspended solids (TSS) parameter measures the amount of particulate solid particles in water such as level of siltation, decaying plant and animal matter, and domestic and industrial wastes. It is indicative of the extent of sedimentation resulting from land-based and/or anthropogenic activities. Suspended solids can result from erosion from urban runoff and agricultural land, industrial wastes, bank erosion, bottom feeders, algae growth, or wastewater discharge. For 2021, the average TSS level of the freshwater stations is 82.21 mg/L and 105.96 for the marine stations which are both above the 80 mg/L standard maximum value. Moreover, there had been an observable consistently high TSS level at Panilahan River and some fluctuations in the coastal stations. These high TSS levels may have been accompanied by heavy rainfall and river run-off that brought particulate materials to coastal areas (Graph 4). In the case of the Panilahan River, TSS has been consistently above the standard. This indicates the degradation of water quality through increased TSS resulting from particulate-derived pollution. It is commonly known that sand and gravel activities are operating upstream.

Table 5. Monthly TSS values from the sampling stations for CY 2021

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Anilao Upstream	2	4	8	6	6	9	13	3	34	nd	7.21	12
Anilao Downstream	6	10	6	9	14	125	8	31	6	8	7.15	13
Malbasag Upstream	2	14	4	3	5	9	5	3	27	7	0	nd
Malbasag Downstream	21	4	49	16	13	10	9	11	8	36.00	6	4
Panilahan River	91	1005	136	259	607	71	36	124	664	448	1340	297
Pagsangahan River	94	105	40	160	59	105	29	53	106	79	81	110
Albuera River	22	6	30	19	117	17	3	6	4	144	18	145
Merida River	47	55	19	1.8	33	42	25	50	47	66	72	27
Albuera	91	178	152	215	84	79	119	77	11	89	14	17
Don Felipe	87	126	148	194	55	104	116	37	26	72	13	21
Filmag	81	31	168	211	90	152	163	87	47	373	13	234
Merida	70	6	180	189	90	0	296	46	69	76	24	21
Bantigue	143	172	170	118	59	75	91	75	102	214	23	13
YMCA	117	185	184	248	56	193	211	53	74	143	21	47
max	*80*	*80*	*80*	*80*	*80*	*80*	*80*	*80*	*80*	*80*	*80*	*80*



Graph 4. TSS results for freshwater and marine stations for 2021

Color

The color of the water is attributed to the suspended particles and organic matter present. True color with DENR standard of 75 HU for Class C and SC waters was analyzed. Color results are related to the total suspended solids of the water. Results range from 5 to 20 HU. Generally, all stations garnered values within the standard.

Table 5. Monthly color values from the sampling stations for CY 2021

STATION	JUL	AUG	SEP	OCT	NOV	DEC
Anilao Upstream	5	5	5	5	5	5
Anilao Downstream	5	5	5	5	5	5
Malbasag Upstream	5	5	5	5	5	5
Malbasag Downstream	5	5	5	5.00	5	5
Panilahan River	5	5	5	5	5	10
Pagsangahan River	10	5	5	10	5	5
Albuera River	5	5	5	5	5	20
Merida River	5	5	5	10	5	5
Albuera	5	5	5	5	5	5
Don Felipe	5	5	5	5	5	5
Filmag	5	5	5	5	5	5
Merida	5	5	5	5	5	5
Bantigue	5	5	5	5	5	15
YMCA	10	5	5	5	5	5
max	*75*	*75*	*75*	*75*	*75*	*75*

Graph 5. Color results for freshwater and marine stations for 2021

Fecal Coliform

The average data result for the freshwater station is 7715.428 MPN/100mL and 1790.073 MPN/100mL for the marine station which showed exceedance than that of the maximum standard fecal coliform standard of 200 MPN/100mL. Moreover, the maximum observed fecal concentration for 2021 is 240,000 MPN/100mL in Bantigue for the month of May. Generally, all stations showed significantly high levels of Fecal Coliform exceeding the maximum standard value throughout the year. However, in February and March Filmag showed a very low level of concentration. Fecal coliform bacteria may occur in ambient water as a result of the overflow of domestic sewage or nonpoint sources of human and animal waste, as have been pointed out multiple times in GB meetings. For some stations, especially the downstream portion of Anilao and Malbasag rivers and Albuera River, they are under threat from pollution as reflected by the unstable water quality or widely fluctuating levels of high fecal coliform concentrations from the stations.

Table 6. Monthly fecal coliform values from the sampling stations for CY 2021

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Anilao Upstream	230	920	2,400	3,300	33,000	4,900	1400		3500	460	1300	5400
Anilao Downstream	54,000	2,400	790	11,000	92,000	54,000	16000		16000		16001	16000
Malbasag Upstream	2,300	920	2,200	1,400	49,000	160000	4300		2200		1300	5400
Malbasag Downstream	160,000	920	35,000	160,001	160,000	4,900	16000		16000		9200	16000
Panilahan River	2,300	5,400	1,100	780	13,000	3,300	16000		490	5400	9200	2400
Pagsangahan River	-	7,900	1,600	4,900	7,900		16000		16000	9200	16001	16000
Albuera River	-	14,000	1,600	35,000	240,000	35,000	16000		16000	16000	16001	16000
Merida River	-	54,000	1,600	35,000	200	54,000	16000		16000	9200	5400	16001
Albuera	-	11,000	130	230	240,000	1,300	16000		2400	790	1700	790
Don Felipe	49	2,400	2,400	7,900	17,000		16000		16000	16000	16001	5400
Filmag	-	17	33	6,800	35,000	3,200	78		1300	1100	5400	2300
Merida	-	330	11	200	2,000	200	16000		9200	330	790	2200
Bantigue	110	70	2,400	780	240,000	13,000	16000		330		3500	230
YMCA	430	920	1,300	1,700	780		1700		16000	3500	9200	16001
max	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*	*200*

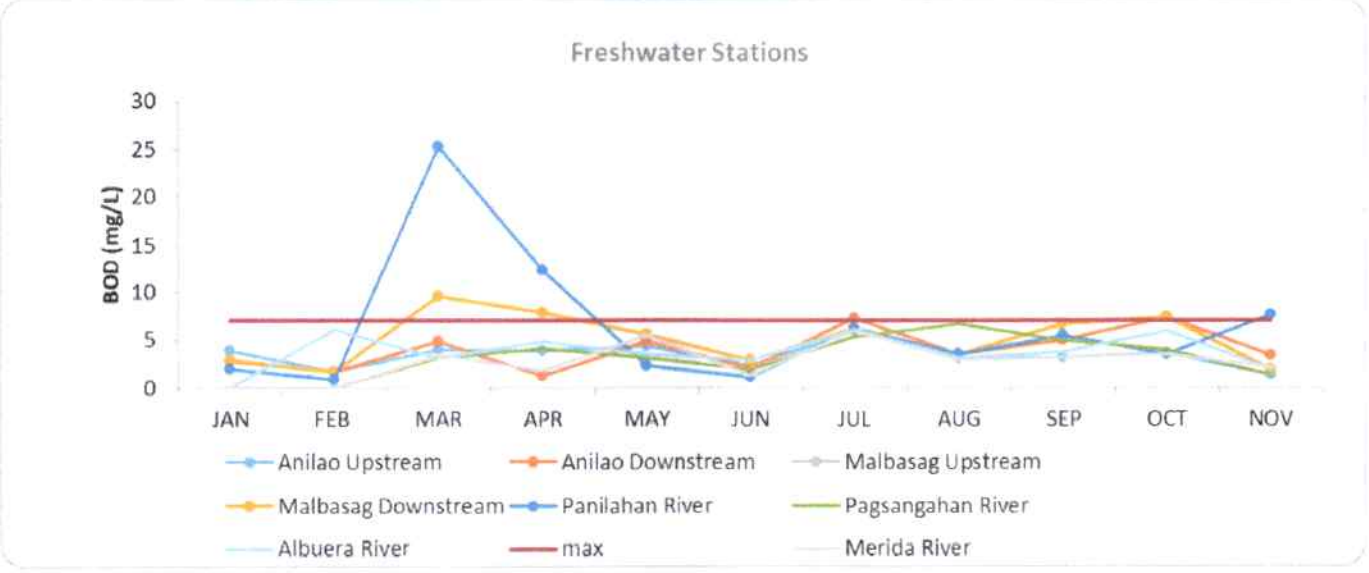
Graph 6. Fecal coliform results for freshwater and marine stations for 2021

Biochemical Oxygen Demand

Biochemical oxygen demand, or BOD, measures the amount of oxygen consumed by microorganisms in decomposing organic matter in stream water. BOD parameter measures the organic strength of wastes in the water, the greater the BOD, the greater the degree of organic pollution. As shown in the data presented, the BOD of the freshwater stations is generally within the Water Quality Guidelines, except for an exceedance showed by Malbasag River (downstream) and Panilahan River in March and April but manifested a decrease in result in the succeeding months. Moreover, Anilao River (downstream) also showed a slight exceedance to the maximum value in July and October. Other stations consistently showed a normal BOD level throughout the year.

Table 7. Monthly BOD values from the freshwater sampling stations for CY 2021

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
Anilao Upstream	3.9	1.7	4	3.9	4.3	2.3	5.9	3.2	3.2	3.6	1.3
Anilao Downstream	2.8	1.7	4.9	1.2	4.9	2.1	7.3	3.5	5	7.4	3.4
Malbasag Upstream	2.5	2.3	3	0	2.5	1.9	5.4	3.5	3.5	4	1.5
Malbasag Downstream	2.9	1.7	9.6	7.9	5.6	2.9	6.2	3.5	6.6	7.4	1.9
Panilahan River	1.9	0.9	25.3	12.3	2.3	1.1	6.2	3.50	5.40	3.5	7.6
Pagsangahan River	-	-	3.2	4.1	3.2	1.9	5.3	6.70	5	4	1.3
Albuera River	-	6	3.1	4.9	3.5	2.9	6.1	3.10	3.8	5.9	2
Merida River	-	-	3.4	1.8	5.5	1.3	5.9	2.90	3.1	3.5	2.2
max	7	7	7	7	7	7	7	7	7	7	7



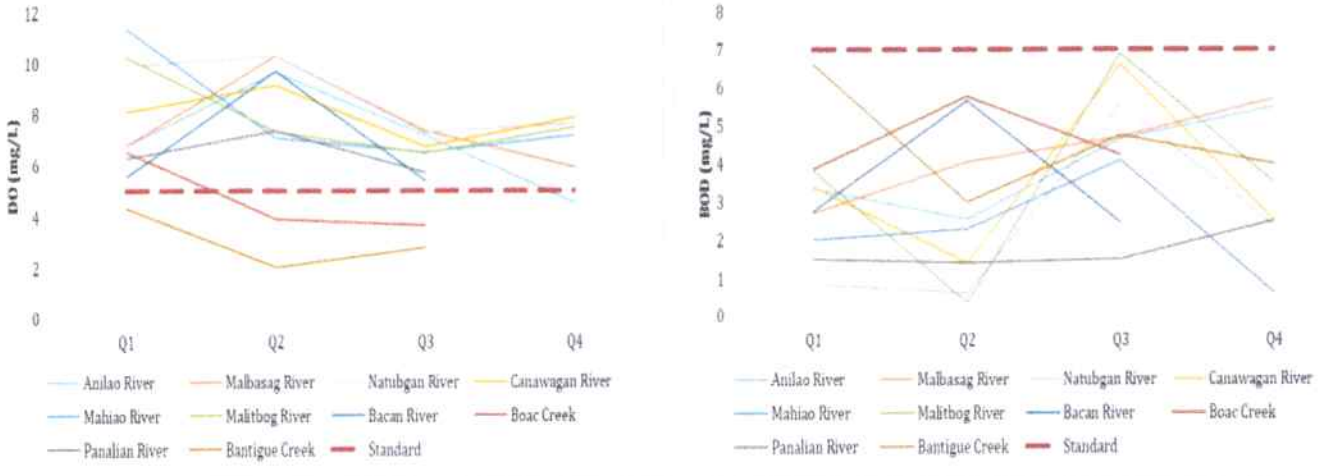
Graph 7. BOD results for freshwater stations for 2021

E. Adopted Estero/Waterbody within Ormoc Bay WQMA

Table 8 shows the adopted Estero and water bodies inside Ormoc Bay WQMA. DO and BOD are the primary parameters tested to determine the water quality status of the water bodies. All DO values at the stations were within the standard minimum level except for Boac and Bantigue creek. Likewise with BOD except for the downstream portion of Anilao and Malbasag Rivers during the third quarter of CY 2021.

Table 8. Quarterly DO and BOD values from the Estero/ waterbodies for CY 2021

No.	Site/Station Description	Location	Station no.	Q1		Q2		Q3		Q4	
				DO (mg/L)	BOD (mg/L	DO (mg/L)	BOD (mg/L	DO (mg/L)	BOD (mg/L	DO (mg/L)	BOD (mg/L
1	Anilao River	Ormoc City	Station #1	8.36	3.9	9.19	1.2	7	4.4	3.84	7.4
			Station #2	5.2	2.8	10.2	3.9	7.4	4.9	5.21	3.6
2	Malbasag River	Ormoc City	Station #1	7.3	2.5	10.21	8.1	7.26	4	4.66	7.4
			Station #2	6.28	2.9	10.44	0	7.5	5.4	7.22	4
3	Natubgan River	Kananga, Leyte	Station #1	9.97	0.4	10.07	0.7	5.7	5.7	7.56	2.3
			Station #2	9.9	1.3	10.55	0.5	8.87	5.4	7.73	2.4
4	Canawagan River	Kananga, Leyte	Station #1	8.15		9.88	1.7	6.47	7.3	7.87	2.7
			Station #2	8.06	3	8.4	1.1	7.04	5.9	7.9	2.3
5	Mahiao River	Kananga, Leyte	Station #1	12.52	0.8	6.9	2.4	6.31	3.9	7.2	0.6
			Station #2	10.3	3.2	7.3	2.2	6.72	4.3	-	-
6	Malitbog River	Kananga, Leyte	Station #1	10.21	6.2	7.25	0.3	6.31	6.7	7.5	3.5
			Station #2	10.33	1.4	7.43	0.4	6.71	7.1	-	-
7	Bacan River	Kananga, Leyte	Station #1	5.27	3.6	9.54	6.1	5.45	2.7	6.75	-
			Station #2	5.84	1.9	9.86	5.2	5.36	2.2	7.02	-
8	Boac Creek	Ormoc City	Station #1	8.2	6.5	3.85	7.91	4.97	2.8	5.67	-
			Station #2	6.03	3.4	4.42	8.02	3.57	4.6	4.67	-
			Station #3	5.69	2.9	3.8	4.88	4.84	2.4	4.78	-
			Station #4	5.61	3.4	3.39	4.74	3.51	6.5	4.17	-
			Station #5	7.08	3.1	4	3.28	1.34	4.9	4.14	-
9	Panalian River	Ormoc City	Station #1	5.45	1.7	7.37	0.9	6.37	1.8	8.51	1.9
			Station #2	7.12	1.3	7.38	1.9	5.11	1.2	8.63	3.1
10	Bantigue Creek	Ormoc City	Station #1	4.6	6.9	2.02	2.2	2.76	4.9	7.54	4.3
			Station #2	4.07	6.3	2.02	3.8	2.81	4.6	7.6	3.7
11	Bilwang Creek		Station #1	5.63	-	-	-	6.7	0.8		3.2
			Station #2	5.55	-	-	-	-	-		-
12	Cabangcoy River		Station #1	6.01	3.8	-	-	6.51	2.2		3.5
			Station #2	6.15	1.5	-	-	-	-		-
13	Matlang River		Station #1	6.23	1.1	-	-	6.87	0.9		2.2
			Station #2	6.35	0	-	-	5.69	ND		-
DENR STANDARD for CLASS C RIVER				5mg/L	7mg/L	5mg/L	7mg/L	5mg/L	7mg/L	5mg/L	7mg/L



Graph 8. BOD and DO results Adopted Estero/Waterbody within Ormoc Bay WQMA stations for 2021

F. Recommendations

For better implementation of the Ormoc Bay WQMA, the following are the recommendations to wit:

- For the member LGUs to implement the resolutions passed for CY 2021 and for EMB 8 to monitor the status of such implementation next year.

- To continue the regular submission of the Compliance Schemes by another member LGUs;

- To continue intensified Information, Education, and Communication Campaigns by the member LGUs and government agencies.

- To continue strengthening the No Open Defecation Policy and strict implementation of RA 9003 by the member LGUs.

- For the member LGUs to continue the environmental programs included in their respective compliance schemes consistent with the goals of the WQMA Action Plan especially in the abatement of direct discharge of untreated wastewater into the water bodies.

- To continue activities in regulating the operation of backyard piggeries that discharge wastewater directly into the waterbody

- To continue relocation of informal settlers residing along the rivers

- To continue the survey of identified industries in Ormoc Bay WQMA with regards to discharge permit application

- For the member LGUs to continue the environmental programs included in their respective compliance schemes consistent with the goals of the WQMA Action Plan.

- Members LGUs are advised to amend or modify existing ordinances and refer to the provisions of the Philippine Sanitation Code, the Philippine Clean Water Act, and Housing Land Use Regulatory Board Resolution No. R-74, Series of 2000 with regards to backyard piggeries.

- Ormoc City LGU to continue to improve the operation of their STP to have a wider area of coverage or cater to other sectors and municipalities.

- Adopters should conduct activities that enhances the quality of the water bodies and LGUs should be the one who initiates the activities since the industries are under their jurisdiction

Prepared by:

KAREN PATRICIA A. FABILE
Senior EMS

Reviewed by:

ARNEL L. IFE
OIC-Chief, Ambient Monitoring Section

Approved by:

MANUEL J. SACEDA, JR.
OIC-Chief, EMED

Noted:

ENGR. REYNALDO B. BARRA
OIC, Regional Director