



Republic of the Philippines
Department of Environment and Natural Resources
MIMAROPA Region
PROVINCIAL ENVIRONMENT AND NATURAL RESOURCES OFFICE

SEP 27 2022

MEMORANDUM

FOR : The Regional Executive Director
DENR MIMAROPA Region
1515 L&S Bldg, Roxas, Blvd.,
Ermita, Manila

THRU : The ARD for Technical Services

FROM : The OIC, PENR Officer

SUBJECT : **SUBMISSION OF THE WATER QUALITY
MONITORING REPORT OF APO REEF NATURAL
PARK FOR THE SECOND SEMESTER OF CY 2022**



Forwarded is the memorandum dated September 14, 2022 of CENRO Sablayan regarding Water Quality Monitoring Report of Apo Reef Natural Park- Protected Area Management Office (ARNP-PAMO) for the 2nd Semester of CY 2022. The report includes the results of the Laboratory analyses of samples collected and transported to Optimal Laboratories Inc. in Lipa, Batangas on August 20, 2022. The Class SA nad B Standard (for surface water and groundwater respectively) for most parameters were met. However, oil and grease levels in the monitoring stations (3-4mg/L) remain to be above the permissible threshold of 1mg/L.

Attached herewith is the narrative report with its corresponding appendices.

For information and record.


ERNESTO E. TAÑADA

TSD-CSD9/22/2022

Copy furnished:

1. Planning Section
2. File

So. Pag-asa, Brgy. Payompon, Mamburao, Occidental Mindoro
Email: penroccmin@denr.gov.ph



Republic of the Philippines
Department of Environment and Natural Resources
MIMAROPA Region
COMMUNITY ENVIRONMENT AND NATURAL RESOURCES OFFICE

September 16, 2022

MEMORANDUM

FOR : The Regional Executive Director
DENR MIMAROPA Region
Ermita, Manila

THRU : The PENR Officer
Mamburao, Occidental Mindoro

FROM : The CENR Officer

SUBJECT : **SUBMISSION OF THE WATER QUALITY MONITORING
REPORT OF APO REEF NATURAL PARK FOR THE SECOND
SEMESTER OF CY 2022**

RECORDED

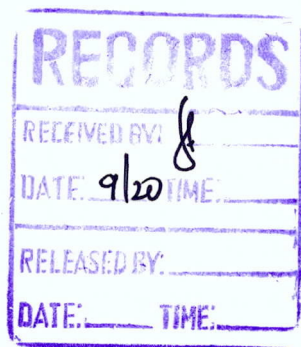
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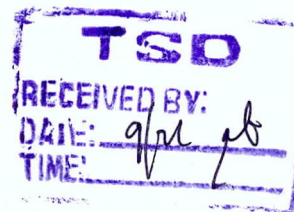
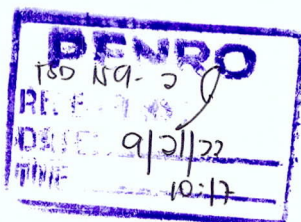
Respectfully forwarded is the Water Quality Monitoring Report of Apo Reef Natural Park – Protected Area Management Office (ARNP-PAMO) for the 2nd Semester of CY 2022. The report includes the results of the laboratory analyses of samples collected and transported to Optimal Laboratories Inc. in Lipa, Batangas on August 30, 2022. The Class SA and B standard (for surface water and groundwater respectively) for most parameters were met. However, oil and grease levels in the monitoring stations (3-4 mg/L) remain to be above the permissible threshold of 1 mg/L.

Attached herewith is the narrative report with its corresponding appendices.

For information and record



FOR. ANASTACIO A. SANTOS, MPA





Department of Environment and Natural Resources
MIMAROPA Region
APO REEF NATURAL PARK
Protected Area Management Office



September 16, 2022

MEMORANDUM

FOR : The Regional Executive Director
DENR-Region 4B – MIMAROPA
1515 L&S Bldg., Roxas Blvd., Ermita, Manila

THRU : The OIC, PENR Officer
Mamburao, Occidental Mindoro

The CENR Officer

FROM : The Protected Area Superintendent

SUBJECT : SUBMISSION OF THE WATER QUALITY MONITORING
REPORT OF APO REEF NATURAL PARK FOR THE
SECOND SEMESTER OF CY 2022

Respectfully submitted is the Water Quality Monitoring Report of Apo Reef Natural Park for the 2nd Semester of CY 2022. The results of the laboratory analyses and in-situ measurements made using the newly-acquired water quality checker are presented below.

Parameters	Measurements*						
	(Red-colored results failed Class SA/Class B Standard)						
	GW	LH	RK	PG	EW	SA1	SA2
Temperature (°C)	28.60	29.88	29.96	29.90	30.09	30.13	30.06
Color (TCU)	5	5	5	5	5	5	5
Total Suspended Solids (mg/L)	2	17	10	17	17	9	16
Fecal Coliform Count (MPN/100mL)	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8
Dissolved Oxygen (mg/L)	3	3.53	3.25	4.85	6.81	6.44	6.73
Nitrate (mg/L)	<0.05	0.23	<0.05	<0.05	<0.05	<0.05	<0.05
Oil and grease (mg/L)	3	2	3	3	3	3	3
pH (Range)	7.39	8.13	8.09	8.19	8.32	8.47	8.58
Phosphate (mg/L)	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Surfactants (mg/L)	0.12	0.14	0.21	0.16	0.15	0.17	0.15

*GW – Groundwater Well, LH – Lighthouse, RK – Ranger's Kiosk, PG – Picnic Ground, EW – Ego Wall, SA1 – San Antonio 1, SA 2 – San Antonio 2

Attached herewith are the narrative report and its corresponding appendices.

For your information and record.


KRYSTAL DAYNE T. VILLANADA

National Highway, Brgy.Sto. Niño, Sablayan, Occidental Mindoro
E-mail: aporeefnaturalpark@gmail.com



Water Quality Monitoring Report

2nd Semester of 2022

I. INTRODUCTION

Water quality is an important factor in coastal and marine ecosystems. It impacts the species richness or the number of species present in a community within an ecosystem (Johnston & Roberts, 2009). However, human activities have continuously caused a decrease in water quality, driving the degradation of coastal and marine ecosystems worldwide. For instance, harmful algal blooms (HABs), likely caused by anthropogenic nutrient enrichment, has led to large fish kills in Asia (Furuya et al., 2018). Outbreaks of Crown-of-Thorns Starfish (CoTS), which has resulted to large-scale coral declines, are also widely hypothesized to be linked to anthropogenic nutrient enrichment (Wooldridge & Brodie, 2015; Brodie et al., 2017). This is why the monitoring and improvement of water quality is critical to the management of coastal and marine resources.

Water quality monitoring is vital in developing policies and management decisions for water bodies, especially those that are delegated as Protected Areas (PAs) like Apo Reef Natural Park (ARNP). In the Philippines, the implementation of the Coastal and Marine Ecosystems Management Program (CMEMP) under the supervision of the DENR Biodiversity Management Bureau, includes Water Quality Monitoring within legislated NIPAS PAs as a subcomponent. This aims to quantify the pollution load and other water parameters that indicate pollution in PAs. Water quality monitoring in government-managed PAs has only commenced last 2020, but ARNP was only included last year. Thus, this is the second year of implementation of this subcomponent of CMEMP in ARNP.

The water quality in Apo Reef Natural Park is monitored twice yearly. The following are the specific objectives of the WQM in ARNP this year:

1. To collect data on water quality parameters in the seven monitoring stations; and,
2. To implement necessary management actions to ensure that ARNP meets standards set for marine protected waters.

II. METHODOLOGY

Monitoring stations

Five monitoring stations were established last year as per PAMB Resolution No. 2021-01. All sites were within the Multiple-Use Zone (MUZ) of Apo Reef Natural Park. This year, two additional sites were established by virtue of PAMB Resolution No. 2022-02. These two sites lie within the Strict Protection Zone (SPZ) of the PA, specifically at a stretch known as San Antonio. These were selected because they are a.) permanent coral reef monitoring stations, and b.) close to the navigational shipping route.

Six of the seven sites were sampled for surface water. Three of which were located along the bathing beach in Apo Island (Lighthouse, Picnic Ground, and Ranger's Kiosk). These sites were less than 1 m in depth and at least 300 meters away from each other (EMB, 2008). The depth in the remaining sites sampled for surface water were approximately 10 m (Ego Wall, San Antonio 1, and San Antonio 2). The three sites in wadable waters and Ego Wall were selected because of high tourist traffic. Thus, the safety of these sites for human recreation may be assessed. The water quality in these sites may also be compared with San Antonio 1 and San Antonio 2, which are within the SPZ where no recreational activities are allowed, to evaluate the possible impacts of tourism on water quality.

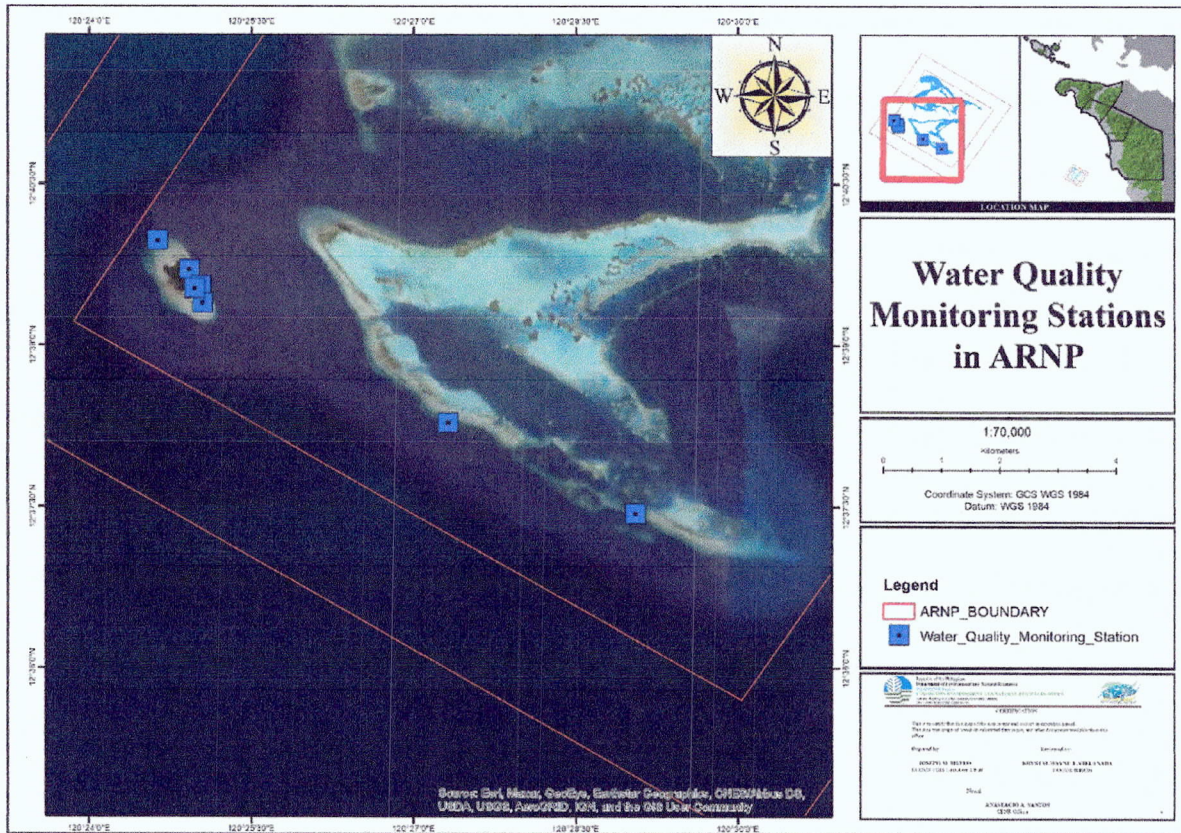


Figure 1. Map of the seven water quality monitoring stations sampled on 2022.

One station was sampled for groundwater: the groundwater well proximal to the Ranger's Station. Water from this groundwater well is accessed using a galvanized iron hand pump and an electric water pump. This station was included in the assessment because it was adjacent to a septic tank system on the island which can impact groundwater quality.

Field Collection and Laboratory Analysis

The water samples were collected on August 29, 2022 by personnel of ARNP-PAMO and MENRO Sablayan. The sampling was conducted early in the morning, between 4:00 AM to 6:30 AM, to ensure that enough time is allotted for the transportation of samples. Air temperature, percent cloud cover, weather condition, and visual color of water were noted prior to the collection of water samples in each site. Dissolved oxygen (DO), pH, and temperature were then measured in-situ using the recently acquired U-51 multiparameter water quality checker (HORIBA, Kyoto, Japan). This was done at three different depths in Ego Wall and San Antonio. The water quality checker was also used to measure DO and pH while purging out the stagnant water from the groundwater well.

Two grab sampling methods were employed during the activity: discrete and depth-integrated. Discrete grab sampling was used to sample water from the groundwater well and monitoring stations along the bathing beach (Picnic Ground, Ranger's Kiosk, and Lighthouse). Sampling was done directly using the sample containers which were as follows: 1L wide-mouthed glass, 1.5L plastic container, and sterile glass bottle. On the other hand, depth-integrated sampling was used in sites with depths greater than 5 meters (Ego Wall, San Antonio 1, and San Antonio 2). Water from surface (0.10-0.50 m), middle layer (~5 m), and near-bottom depth (9.5-10 m) was collected using an improvised PVC sampling device (Figure 2). Three

PVC sampling device were tied to a 10-m rope at varying depths. Unlike Van Dorn samplers which feature messengers, two divers manually closed the stoppers of each sampling device. The water samples from the three different depths were then distributed across the sampling containers and mixed.



Figure 2. PVC sampling device used in collecting samples from different depths (surface, middle-layer, and near-bottom) at Ego Wall.

All samples were immediately stored in four coolers double-lined with heavy-duty plastic bags and filled with ice to preserve the samples by maintaining the temperature at approximately 4 °C. The samples were then transported to the Optimal Laboratories Inc who performed the laboratory analyses for the water samples collected last year. Seven water quality parameters were measured in the laboratory (Table 1). Two of which, nitrate and surfactants, were not measured in the last sampling activity (May 23, 2022) due to the limited capacity of EMB Calapan Satellite Laboratory.

Table 1. Water quality parameters measured in the laboratory during the 1st and 2nd semester of 2022.

Water Quality Parameters	1 st Semester	2 nd Semester
Color	Visual Comparison	Visual Comparison
pH	Electrometric	-
Total Suspended Solids	Gravimetric Dried at 103-105	Gravimetric Dried at 103-105
Dissolved Oxygen	Azide Modification	-
Fecal Coliform Count	Multiple Tube Fermentation	Multiple Tube Fermentation
Nitrate	-	Brucine Colorimetric
Phosphate	Ascorbic Acid	Stannous Chloride
Surfactants	-	Anionic Surfactants as MBAS
Oil & Grease	LLP-Gravimetric (PET)	LLP-Gravimetric (PET)

**Laboratory analyses were performed by EMB Calapan Satellite Laboratory*

***Laboratory analyses were performed by Optimal Laboratories Inc.*

Data Analysis

The results were then compared to standards based on intended beneficial use.

To date, ARNP has not yet been classified based on the guidelines for classification of water bodies provided in the Water Quality Monitoring Manual published by DENR EMB. For this assessment, the results for the surface water were compared to the standards for Class SA (Protected Waters and Fishery Class I), which is the highest classification for marine waters. Meanwhile, the standards used for groundwater is for Class B (Bathing and Other Primary Contact Recreation). The DENR Department Administrative Order (DAO) No. 2016-08 as amended by DAO No. 2021-19 were primarily used as reference for the permissible thresholds per parameter.

It is important to note that non-detects were substituted with the lowest detection limit in graphical representations. For phosphate concentration, a non-detect (<0.03) was considered to pass the standard for Class B water bodies (≤ 0.025 mg/L).

III. RESULTS AND DISCUSSION

Physical Parameters

All sites passed the water quality standards set by the DENR Environmental Management Bureau for the three physical parameters measured: Color, Temperature, and Total Suspended Solids (Table 2). The concentrations for suspended solids ranged from 2 to 17 mg/L which are below the permissible thresholds for Class SA (≤ 25 mg/L) and Class B (≤ 65 mg/L) water bodies. TSS is less likely to be high in offshore areas such as ARNP due to decreased proximity to human activities such as mining and dredging operations and agriculture. Similar findings were reported by Wei Bong & Weng Lee (2008) in Malaysia.

Table 2. Color, temperature, and total suspended solids measurements in the seven water quality monitoring stations.

Parameters	Measurements						
	GW	LH	RK	PG	EW	SA1	SA2
Temperature ($^{\circ}\text{C}$)	28.60	29.88	29.96	29.90	30.09	30.13	30.06
Color (TCU)	5	5	5	5	5	5	5
Total Suspended Solids (mg/L)	2	17	10	17	17	9	16

Biological Parameters

All stations also passed the lone biological parameter measured which is fecal coliform count (Table 3). The FCC were below the detection limit (<1.8 MPN/100mL) across the seven stations. Concentrations have been consistently low in the four stations proximal to the septic tank systems in Apo Island since last year (Figure 3a). This finding likely indicates that the existing systems used in managing the domestic wastewater produced within Apo Island are effective. In relation to this, the bathing beach and groundwater well remains safe for recreational and domestic use, respectively. Although the dive site Ego Wall may also be considered safe for recreational use given its current FCC (<1.8 MPN/100 mL), it should be closely monitored because fecal contamination was high in this area and along San Antonio last May (Figure 3b).

Table 3. Fecal coliform counts in the seven monitoring stations.

Parameters	Measurements						
	GW	LH	RK	PG	EW	SA1	SA2
Fecal Coliform Count (MPN/100mL)	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8

Values in red mark measurement that failed standards set by DENR-EMB.

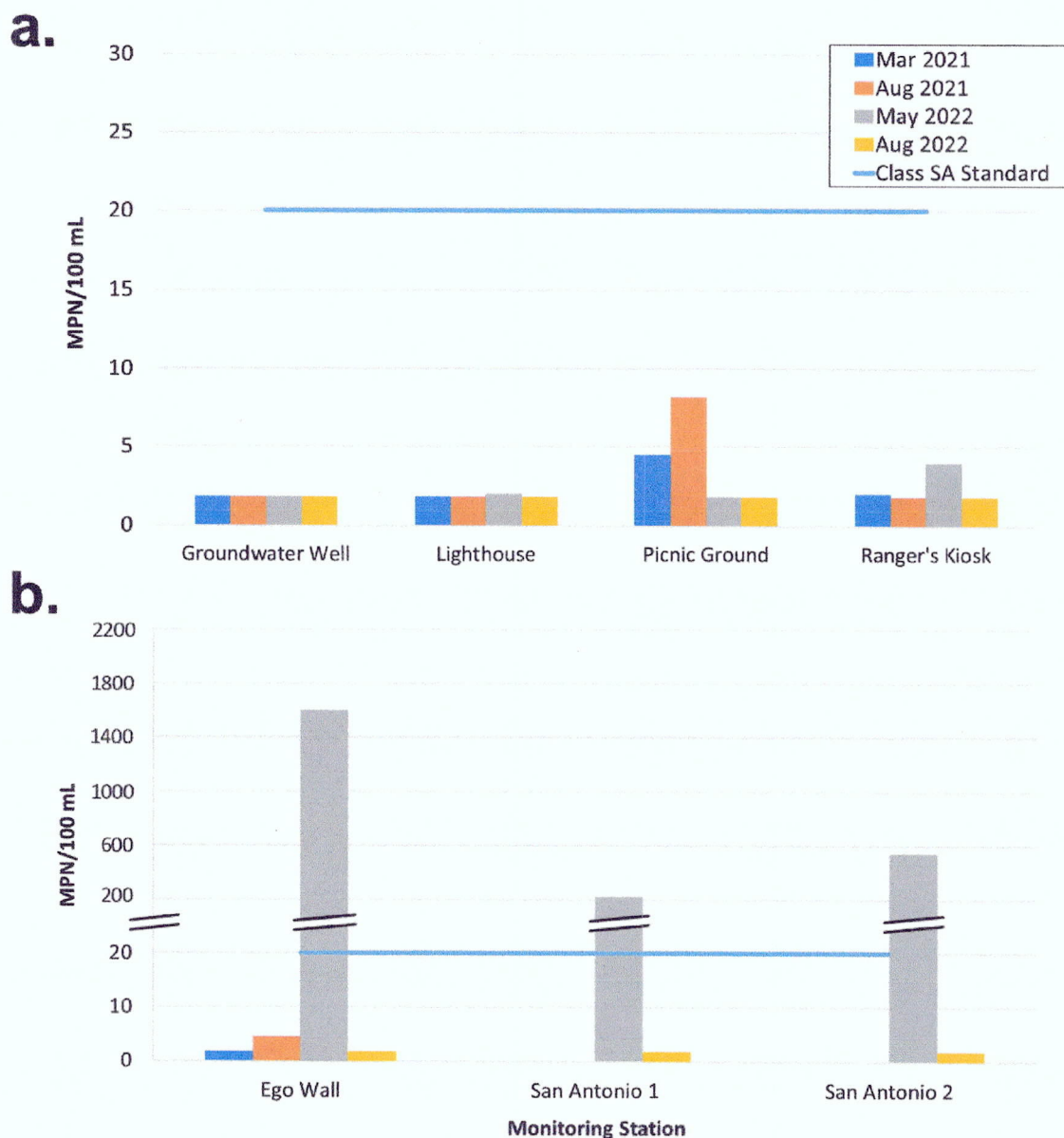


Figure 3. Fecal coliform count across the offshore (a) and island monitoring stations (b) from 2021 to 2022.

Chemical Parameters

At least three monitoring stations failed the set standards for DO and oil and grease (Table 3). The monitoring stations which did not reach the minimum DO concentration of 6 mg/L were those along the bathing beach. DO concentrations in these areas only ranged from 3 to 6.81 mg/L. However, the low concentrations acquired are likely due to the time of sampling

which was between 4:00 AM to 5:00 AM, at least 44 minutes before sunrise (5:44 AM). Photosynthetic production specifically by marine phytoplankton is low from dusk to dawn (Harding et al., 1981; Kana et al., 1985) hence, DO is significantly decreased by continuous respiration of marine organisms. DO concentrations in monitoring stations sampled closer to and after dawn (Ego Wall, San Antonio 1, and San Antonio 2) passed the set standard. All sites failed the set standards for oil and grease, with concentrations ranging from 2 to 3 mg/L (Figure 4). This may be attributed to marine transportation activities within and proximal to ARNP. The MPA is proximal to domestic shipping routes, particularly long-distance primary routes which connect major ports in the country (MARINA, 2018). Ropax vessels (RoRo passenger-cargo vessels) and cargo vessels including container and tanker ships are serving mainly for these routes (JICA, 2005). These vessels are known to release oil, mainly petroleum oil, into the sea in their routine operations, and as a result of major accidents like collisions and groundings. Other vessels such as commercial and small-scale fishing boats and recreational boats may also be contributing to oil pollution in ARNP.

Table 3. Dissolved oxygen, phosphate, pH, and oil and grease measurements in the seven water quality monitoring stations.

Parameters	Measurements						
	GW	LH	RK	PG	EW	SA1	SA2
Dissolved Oxygen (mg/L)	3	3.53	3.25	4.85	6.81	6.44	6.73
Nitrate (mg/L)	<0.05	0.23	<0.05	<0.05	<0.05	<0.05	<0.05
Oil and grease (mg/L)	3	2	3	3	3	3	3
pH (Range)	7.39	8.13	8.09	8.19	8.32	8.47	8.58
Phosphate (mg/L)	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Surfactants (mg/L)	0.12	0.14	0.21	0.16	0.15	0.17	0.15

Values in red mark measurement that failed standards set by DENR-EMB.

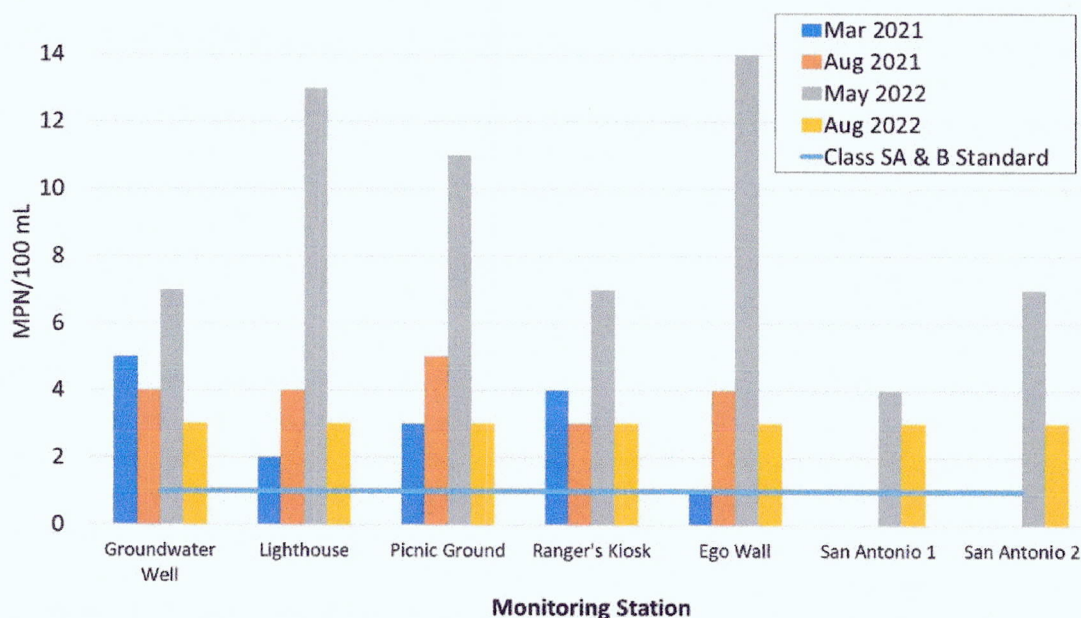


Figure 4. Oil and grease concentration across the monitoring stations from 2021 to 2022.

Most stations passed the set standards for pH. The lone station that did not pass was San Antonio 2 with an average pH of 8.58. Meanwhile, the concentration of surfactants, nitrate, and phosphate in all sites passed the set standards. Nitrate and phosphate levels were notably

well below the maximum concentration acceptable for Class SA and B water bodies. Six of the seven stations had concentrations less than the limit of detection for both parameters. Lighthouse also had a phosphate concentration of <0.03 mg/L but the nitrate concentration in the area was slightly higher than the other sites (0.23 mg/L). The nutrient levels from 2021 to 2022 (Figure 5) further suggest that domestic wastewater from Apo Island, which can be a source of dissolved inorganic nutrients, is being effectively managed. Minimizing nutrient input into the marine environment is important because these may cause HABs (Furuya et al., 2018) and facilitate or exacerbate CoTS Outbreaks (Wooldridge & Brodie, 2015; Brodie et al., 2017).

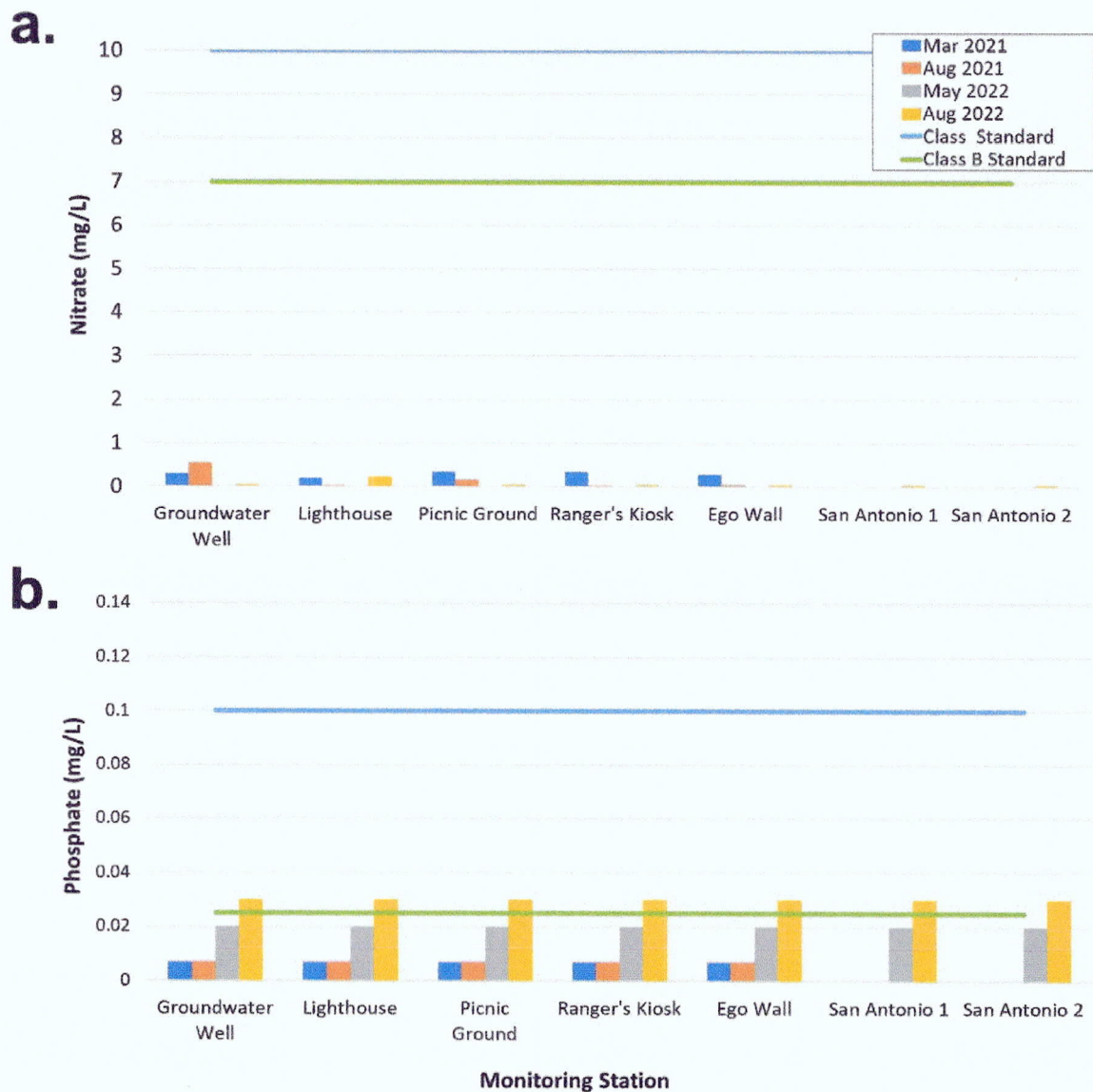


Figure 5. Nitrate (a) and phosphate (b) levels in the monitoring stations from 2021 to 2022. The phosphate concentration in the groundwater well was <0.03 mg/L and thus, considered to be within the permissible threshold for Class B water bodies (≤ 0.025 mg/L).

IV. CONCLUSIONS AND RECOMMENDATIONS

Seven monitoring stations were sampled for surface water and groundwater on August 30, 2022. The stations passed the set standard (Class SA and B) for most of the water quality parameters measured. Results suggest that the domestic wastewater coming from Apo Island is effectively controlled or treated given the consistently low levels of nutrients (nitrate and phosphate) and fecal coliform in monitoring stations proximal to the existing septic tank systems. Hence, the bathing beach and groundwater remains safe for bathing and domestic use, respectively.

Dissolved oxygen and oil and grease are the two water quality parameters wherein at least three monitoring stations failed the set standards. However, it is likely that the low dissolved oxygen levels recorded were only due to the early time of sampling. With our current capacity, water samples have to be collected as early as 0400h to ensure that the samples are received by the laboratory within the recommended holding time. Sampling time may be adjusted accordingly as more equipment and faster watercraft becomes available. For oil and grease, all stations exceed the permissible threshold of ≤ 1 mg/L. Marine transport activities remain to be the most likely source of the increased oil and grease recorded which ranged from 2 to 3 mg/L. Being proximal to navigational shipping lanes, the Protected Area is mainly exposed to oil discharge from Ropax and cargo vessels. Commercial and small-scale fishing boats and recreational boats operating inside or outside the Protected Area may also be contributing to oil pollution in the area but to a lesser extent.

It is recommended that other quality assurance and control measures, like the collection of field blank, equipment blank, and field duplicates, be taken when more funding becomes available. Sampling sites within the Protected Area may be increased afterwards to improve the generality of the findings. Aside from these, the Maritime Industry Authority (MARINA) should be consulted for feasible actions addressing the increased oil and grease levels within the MPA and response plans for major accidents which may lead to oil spills should be developed.

Prepared by:


HUGO IGNACIO G. SALVADOR
CMEMP Extension Officer

Reviewed and submitted by:


KRYSTAL DAYNE T. VILLANADA
Protected Area Superintendent

V. REFERENCES

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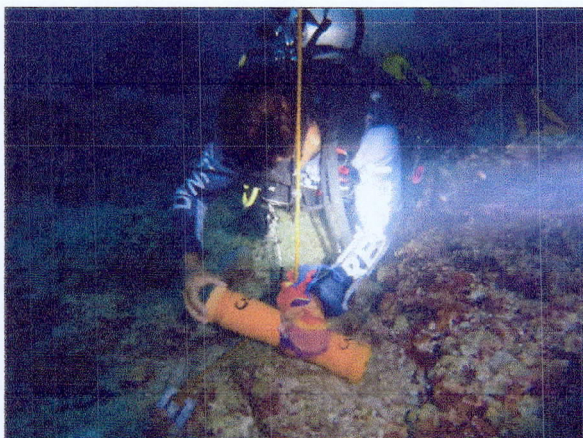
VI. APPENDICES

Appendix A. Participants of the water sampling in Apo Reef Natural Park on August 30, 2022.

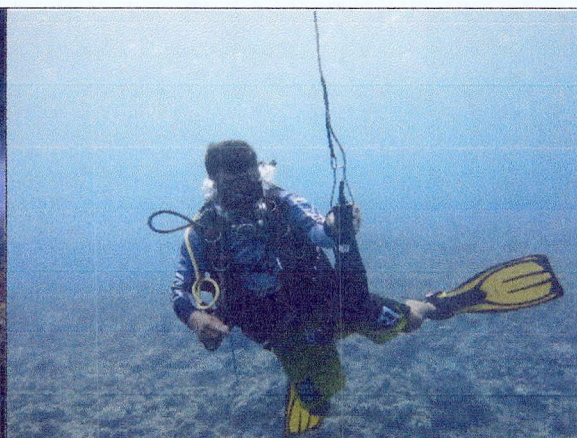
Name	Position	Office
Krystal Dayne T. Villanada	Protected Area Superintendent	ARNP-PAMO
Hugo Ignacio G. Salvador	CMEMP Extension Officer	ARNP-PAMO
Anna Ritchelle D. Nicanor	Administrative Aide IV	ARNP-PAMO
Roberto P. Beringuela	Park Maintenance Foreman	ARNP-PAMO
Efraim Z. Pagador	Forest Ranger	ARNP-PAMO
Romel M. Pacaul	Boat Captain	ARNP-PAMO
Mark Dennis M. Barretto	Boat Captain	ARNP-PAMO
Salvador M. Ciasico	Support Staff	ARNP-PAMO
Temart E. Rebito	Park Ranger	ARNP-PAMO
Kelvin U. Zubiri	Park Ranger	ARNP-PAMO
Federico A. de Jesus	Park Ranger	ARNP-PAMO
Melvin Cariño	Park Ranger	MENRO Sablayan
Jerry Noval	Park Ranger	MENRO Sablayan
Cliford Leyto	Boat Captain	MENRO Sablayan

Appendix B. Photodocumentation of the water sampling in the seven monitoring stations in Apo Reef Natural Park on August 30, 2022.

	
<p>PAMO Staff purging stagnant water out of the groundwater well</p>	<p>CMEMP Extension Officer Hugo G. Salvador preparing to sample water from the groundwater well</p>
	
<p>Water sampling along the bathing beach of Apo Island</p>	<p>Park Rangers Temart E. Rebato organizing samples collected in front of the lighthouse</p>
	
<p>PASu Krystal Dayne T. Villanada measuring several parameters <i>in-situ</i> with a Horiba U-50 Multiparameter Water Quality Checker</p>	<p>Park Maintenance Foreman Roberto P. Beringuela preparing to collect samples at different depths in Ego Wall</p>



PMF Beringuela closing the improvised PVC sampler in Ego Wall at a depth of approximately 10-m



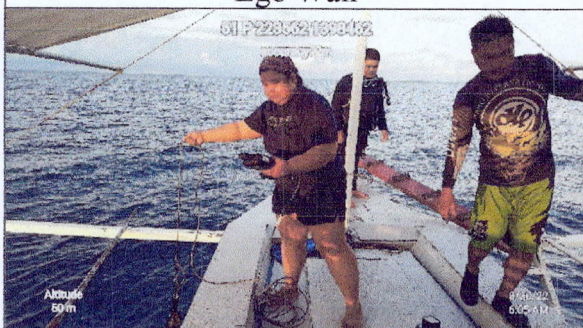
PMF Beringuela assisting the probe of the Horiba U-50 Multiparameter Water Quality Checker



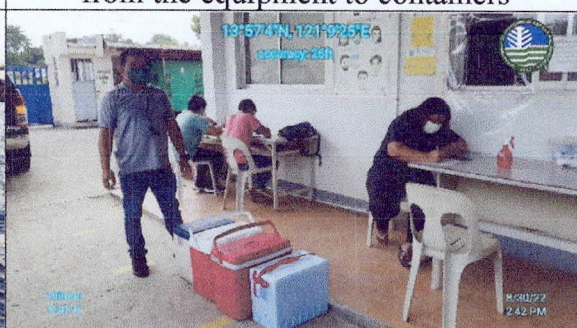
CMEMP Extension Officer Hugo Salvador collecting water sample from the surface at Ego Wall



Boat Captain Romel M. Pacaul assisting the CMEMP-EO in transferring the samples from the equipment to containers



PASu Villanada measuring DO, pH, and temperature in San Antonio



Four ice coolers containing the water samples collected from ARNP

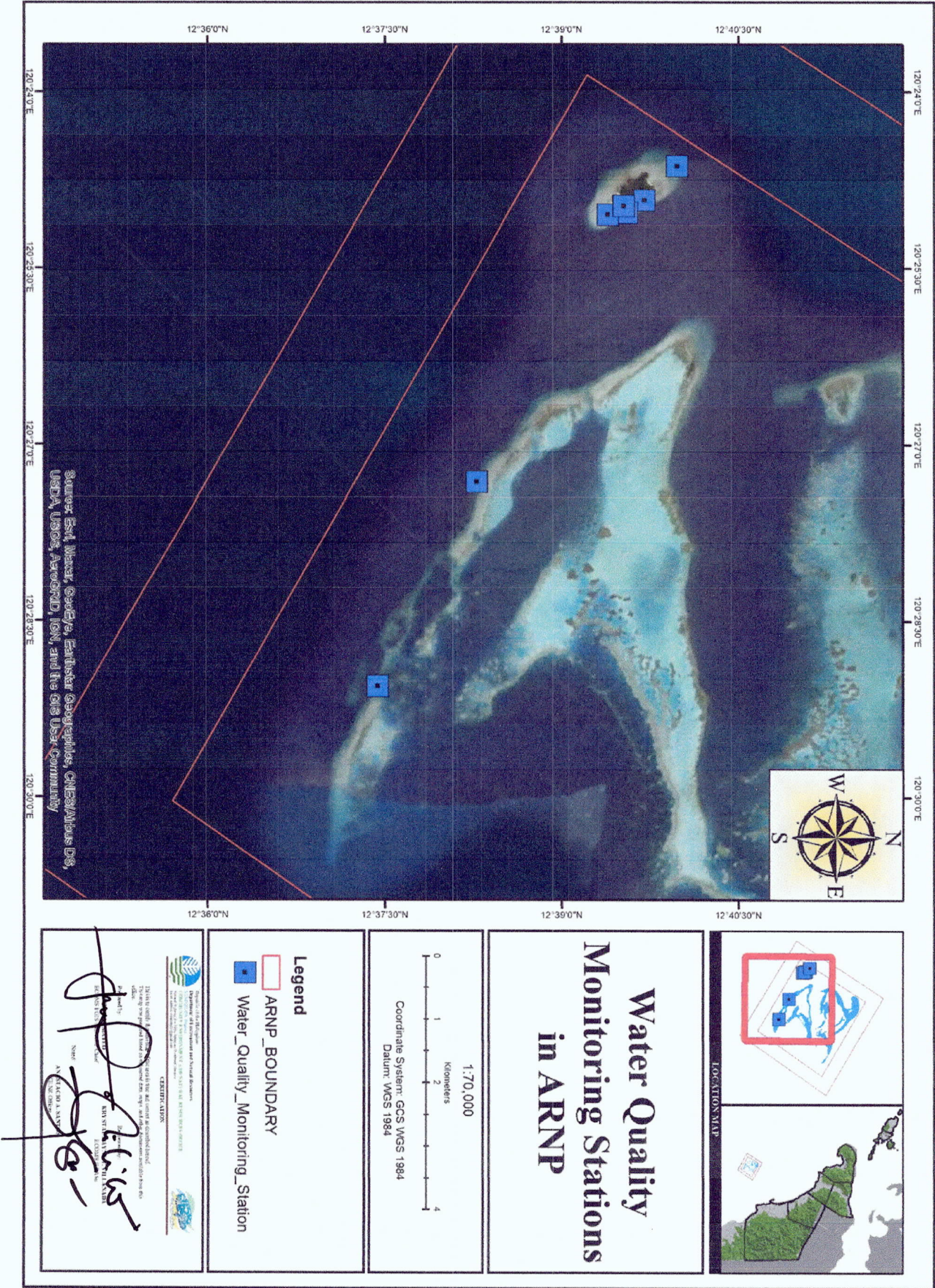


PASu Villanada filling out the Chain of Custody Form of Optimal Laboratories, Inc.



SCDO Anna Ritchelle D. Nicanor managing the payment for the laboratory analyses of the samples

Appendix C. Map showing the seven water quality monitoring stations in Apo Reef Natural Park



Appendix D. Results of the laboratory analyses of samples collected on August 30, 2022.

**Recognition:**

Department of Environment and Natural Resources
DA - Bureau of Animal Industry
Department of Health
Food and Drug Administration

F-RR-07-08/01

Iss.03 Rev. 02

Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : **APO REEF NATURAL PARK**
Address : **Sablayan, Occidental Mindoro**

Work Order : **22-07222**
Date Collected : **August 30, 2022**
Date Received : **August 30, 2022**
Date Analyzed : **August 30, 2022 - September 06, 2022**
Date Reported : **September 07, 2022**
Time Collected: **4:00 AM**
Submitted By : **Customer**

RESULTS OF ANALYSIS:

Customer Sample ID : Water - GW		Lab Sample ID: 22-07222-001
PARAMETER	METHOD	RESULT
Thermotolerant (Fecal) Coliform Count	Multiple Tube Fermentation Technique ^a	<1.8 MPN/100 mL

Sample Description/Condition: The sample is clear and received in plastic container transported with ice.

References: ^a Standard Methods for the Examination of Water and Wastewater 23rd ed. 2017

Certified True and Correct by:

Shyla May L. Quizon, RMT
Laboratory Analyst II
PRC Lic. #0075710

Jonahdimary R. Alilio
Laboratory Analyst III

Approved by:

Jennifer R. Maralit, RCh
General Manager
PRC Lic. # 0007374

Results of analysis refer only to the sample of material submitted by the customer. This report/certificate cannot be reproduced without written authorization from Optimal Laboratories, Inc. and Not Valid without official Company dry seal. This will be file for 5 years from date of issue.

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Appendix D. (Continuation)

**Recognition:**

Department of Environment and Natural Resources
DA - Bureau of Animal Industry
Department of Health
Food and Drug Administration

F-RR-07-08/01

Iss.03 Rev. 02

Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : **APO REEF NATURAL PARK**
Address : **Sablayan, Occidental Mindoro**

Work Order : **22-07222**
Date Collected : **August 30, 2022**
Date Received : **August 30, 2022**
Date Analyzed : **August 30, 2022 - September 06, 2022**
Date Reported : **September 07, 2022**
Time Collected: **4:45 AM**
Submitted By : **Customer**

RESULTS OF ANALYSIS:

Customer Sample ID : Water - PG		Lab Sample ID: 22-07222-002
PARAMETER	METHOD	RESULT
Thermotolerant (Fecal) Coliform Count	Multiple Tube Fermentation Technique ^a	<1.8 MPN/100 mL

Sample Description/Condition: The sample is clear and received in sterile bottle transported with ice.

References: ^a Standard Methods for the Examination of Water and Wastewater 23rd ed. 2017

Certified True and Correct by:

Shyla May L. Quizon, RMT
Laboratory Analyst II
PRC Lic. #0075710

Jonahdimary R. Aliilo
Laboratory Analyst III

Approved by:

Jennifer R. Maralit, RCh
General Manager
PRC Lic. # 0007374

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Appendix D. (Continuation)

**Recognition:**

Department of Environment and Natural Resources
DA - Bureau of Animal Industry
Department of Health
Food and Drug Administration

F-RR-07-08/01

Iss.03 Rev. 02

Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : APO REEF NATURAL PARK
Address : Sablayan, Occidental Mindoro

Work Order : 22-07222
Date Collected : August 30, 2022
Date Received : August 30, 2022
Date Analyzed : August 30, 2022 - September 06, 2022
Date Reported : September 07, 2022
Time Collected: 4:30 AM
Submitted By : Customer

RESULTS OF ANALYSIS:

Customer Sample ID : Water - RK		Lab Sample ID: 22-07222-003
PARAMETER	METHOD	RESULT
Thermotolerant (Fecal) Coliform Count	Multiple Tube Fermentation Technique ^a	<1.8 MPN/100 mL

Sample Description/Condition: The sample is clear and received in sterile bottle transported with ice.

References: ^a Standard Methods for the Examination of Water and Wastewater 23rd ed. 2017

Certified True and Correct by:

Shyla May L. Quizon, RMT
Laboratory Analyst II
PRC Lic. #0075710

Jonahdimary R. Alilio
Laboratory Analyst III

Approved by:

Jennifer R. Maralit, RCh
General Manager
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Appendix D. (Continuation)

**Recognition:**

Department of Environment and Natural Resources
DA - Bureau of Animal Industry
Department of Health
Food and Drug Administration

F-RR-07-08/01

Iss.03 Rev. 02

Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : **APO REEF NATURAL PARK**
Address : **Sabluyan, Occidental Mindoro**

Work Order : **22-07222**
Date Collected : **August 30, 2022**
Date Received : **August 30, 2022**
Date Analyzed : **August 30, 2022 - September 06, 2022**
Date Reported : **September 07, 2022**
Time Collected: **4:15 AM**
Submitted By : **Customer**

RESULTS OF ANALYSIS:

Customer Sample ID : Water - LH		Lab Sample ID: 22-07222-004
PARAMETER	METHOD	RESULT
Thermotolerant (Fecal) Coliform Count	Multiple Tube Fermentation Technique ^a	<1.8 MPN/100 mL

Sample Description/Condition: The sample is clear and received in plastic container transported with ice.

References: ^a Standard Methods for the Examination of Water and Wastewater 23rd ed. 2017

Certified True and Correct by:

Shyla May L. Quizon, RMT
Laboratory Analyst II
PRC Lic. #0075710

Jonahdimary R. Alilio
Laboratory Analyst III

Approved by:

Jennifer R. Maralit, RCh
General Manager
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Appendix D. (Continuation)

**Recognition:**

Department of Environment and Natural Resources
DA - Bureau of Animal Industry
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Food and Drug Administration

F-RR-07-08/01

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Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : **APO REEF NATURAL PARK**
Address : **Sablayan, Occidental Mindoro**

Work Order : **22-07222**
Date Collected : **August 30, 2022**
Date Received : **August 30, 2022**
Date Analyzed : **August 30, 2022 - September 06, 2022**
Date Reported : **September 07, 2022**
Time Collected: **5:15 AM**
Submitted By : **Customer**

RESULTS OF ANALYSIS:

Customer Sample ID : Water - EW		Lab Sample ID: 22-07222-005
PARAMETER	METHOD	RESULT
Thermotolerant (Fecal) Coliform Count	Multiple Tube Fermentation Technique ^a	<1.8 MPN/100 mL

Sample Description/Condition: The sample is clear and received in sterile bottle transported with ice.

References: ^a Standard Methods for the Examination of Water and Wastewater 23rd ed. 2017

Certified True and Correct by:

Shyla May L. Quizon, RMT
Laboratory Analyst II
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Jonahdimary R. Alilio
Laboratory Analyst III

Approved by:

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F-RR-07-08/01
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Effectivity: July 11, 2022

Recognition:
Department of Environment and Natural Resources
DA - Bureau of Animal Industry
Department of Health
Food and Drug Administration

CERTIFICATE OF ANALYSIS

Customer : **APO REEF NATURAL PARK**
Address : **Sabluyan, Occidental Mindoro**

Work Order : **22-07222**
Date Collected : **August 30, 2022**
Date Received : **August 30, 2022**
Date Analyzed : **August 30, 2022 - September 06, 2022**
Date Reported : **September 07, 2022**
Time Collected: **5:45 AM**
Submitted By : **Customer**

RESULTS OF ANALYSIS:

Customer Sample ID : Water - SA1		Lab Sample ID: 22-07222-006
PARAMETER	METHOD	RESULT
Thermotolerant (Fecal) Coliform Count	Multiple Tube Fermentation Technique ^a	<1.8 MPN/100 mL

Sample Description/Condition: The sample is clear and received in sterile bottle transported with ice.

References: ^a Standard Methods for the Examination of Water and Wastewater 23rd ed. 2017

Certified True and Correct by:

Shyla May L. Quizon, RMT
Laboratory Analyst II
PRC Lic. #0075710

Jonahdimary R. Alilio
Laboratory Analyst III

Approved by:

Jennifer R. Maralit, RCh
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**Recognition:**

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Food and Drug Administration

F-RR-07-08/01

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Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : **APO REEF NATURAL PARK**
Address : **Sabluyan, Occidental Mindoro**

Work Order : **22-07222**
Date Collected : **August 30, 2022**
Date Received : **August 30, 2022**
Date Analyzed : **August 30, 2022 - September 06, 2022**
Date Reported : **September 07, 2022**
Time Collected: **6:15 AM**
Submitted By : **Customer**

RESULTS OF ANALYSIS:

Customer Sample ID : Water - SA2		Lab Sample ID: 22-07222-007
PARAMETER	METHOD	RESULT
Thermotolerant (Fecal) Coliform Count	Multiple Tube Fermentation Technique ^a	<1.8 MPN/100 mL

Sample Description/Condition: The sample is clear and received in sterile bottle transported with ice.

References: ^a Standard Methods for the Examination of Water and Wastewater 23rd ed. 2017

Certified True and Correct by:

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Jonahdimary R. Alilio
Laboratory Analyst III

Approved by:

Jennifer R. Maralit, RCh
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Appendix D. (Continuation)

**Recognition:**

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F-RR-07-08/01

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Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : APO REEF NATURAL PARK
Address : Sablayan, Occidental Mindoro

Work Order : 22-07222
Date Collected : August 30, 2022
Date Received : August 30, 2022
Date Analyzed : August 31, 2022 - September 06, 2022
Date Reported : September 07, 2022
Time Collected: 4:00 AM
Submitted By : Customer

RESULTS OF ANALYSIS:

Customer Sample ID : Water - GW		Lab Sample ID: 22-07222-001
PARAMETER	METHOD	RESULT
Color (True Color)	2120 B. Visual Comparison ^a	5 TCU
Nitrate as NO ₃ -N	352.1 Colorimetric, Brucine ^b	0.23 mg/L
Oil and Grease	5520 B. Liquid-Liquid, Partition-Gravimetric ^a	3 mg/L
Phosphate as Phosphorus	4500 -P D. Stannous Chloride ^a	<0.03 mg/L
Surfactants (MBAS)	5540 C. Anionic Surfactants as MBAS ^a	0.14 mg/L
Total Suspended Solids	2540 D. Gravimetric, Dried at 103-105°C ^a	2 mg/L

Sample Description/Condition: The sample is clear and received in glass and plastic containers transported with ice.

References:

- ^a Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017
^b US EPA 352.1. Standard Methods for the Examination of Water and Wastewater, 13th Edition.

Certified True and Correct by:

Ranmar Marco A. Marco, RCh
Laboratory Analyst II
PRC Lic. #0014151

Approved by:

Jennifer R. Maralit, RCh
General Manager
PRC Lic. # 0007374

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Appendix D. (Continuation)



Recognition:

Department of Environment and Natural Resources
DA - Bureau of Animal Industry
Department of Health
Food and Drug Administration

F-RR-07-08/01

Iss.03 Rev. 02

Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : **APO REEF NATURAL PARK**
Address : **Sablayan, Occidental Mindoro**

Work Order : **22-07222**
Date Collected : **August 30, 2022**
Date Received : **August 30, 2022**
Date Analyzed : **August 31, 2022 - September 06, 2022**
Date Reported : **September 07, 2022**
Time Collected: **4:45 AM**
Submitted By : **Customer**

RESULTS OF ANALYSIS:

Customer Sample ID : Water - PG		Lab Sample ID: 22-07222-002
PARAMETER	METHOD	RESULT
Color (True Color)	2120 B. Visual Comparison ^a	5 TCU
Nitrate as NO ₃ -N	352.1 Colorimetric, Brucine ^b	<0.05 mg/L
Oil and Grease	5520 B. Liquid-Liquid, Partition-Gravimetric ^a	3 mg/L
Phosphate as Phosphorus	4500 -P D. Stannous Chloride ^a	<0.03 mg/L
Surfactants (MBAS)	5540 C. Anionic Surfactants as MBAS ^a	0.16 mg/L
Total Suspended Solids	2540 D. Gravimetric, Dried at 103-105°C ^a	17 mg/L

Sample Description/Condition: The sample is clear and received in glass and plastic containers transported with ice.

References:

- ^a Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017
^b US EPA 352.1. Standard Methods for the Examination of Water and Wastewater, 13th Edition.

Certified True and Correct by:

Ranmar Marco A. Marco, RCh
Laboratory Analyst II
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Approved by:

Jennifer R. Maralit, RCh
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Appendix D. (Continuation)



Recognition:

Department of Environment and Natural Resources
DA - Bureau of Animal Industry
Department of Health
Food and Drug Administration

F-RR-07-08/01

Iss.03 Rev. 02

Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : APO REEF NATURAL PARK
Address : Sablayan, Occidental Mindoro

Work Order : 22-07222
Date Collected : August 30, 2022
Date Received : August 30, 2022
Date Analyzed : August 31, 2022 - September 06, 2022
Date Reported : September 07, 2022
Time Collected: 4:30 AM
Submitted By : Customer

RESULTS OF ANALYSIS:

Customer Sample ID : Water - RK		Lab Sample ID: 22-07222-003
PARAMETER	METHOD	RESULT
Color (True Color)	2120 B. Visual Comparison ^a	5 TCU
Nitrate as NO ₃ -N	352.1 Colorimetric, Brucine ^b	<0.05 mg/L
Oil and Grease	5520 B. Liquid-Liquid, Partition-Gravimetric ^a	3 mg/L
Phosphate as Phosphorus	4500 -P D. Stannous Chloride ^a	<0.03 mg/L
Surfactants (MBAS)	5540 C. Anionic Surfactants as MBAS ^a	0.15 mg/L
Total Suspended Solids	2540 D. Gravimetric, Dried at 103-105°C ^a	10 mg/L

Sample Description/Condition: The sample is clear and received in glass and plastic containers transported with ice.

References:

- ^a Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017
- ^b US EPA 352.1. Standard Methods for the Examination of Water and Wastewater, 13th Edition.

Certified True and Correct by:

Ranmar Marco A. Marco, RCh
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Appendix D. (Continuation)



F-RR-07-08/01
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Effectivity: July 11, 2022

Recognition:
Department of Environment and Natural Resources
DA - Bureau of Animal Industry
Department of Health
Food and Drug Administration

CERTIFICATE OF ANALYSIS

Customer : APO REEF NATURAL PARK
Address : Sablayan, Occidental Mindoro

Work Order : 22-07222
Date Collected : August 30, 2022
Date Received : August 30, 2022
Date Analyzed : August 31, 2022 - September 06, 2022
Date Reported : September 07, 2022
Time Collected: 4:15 AM
Submitted By : Customer

RESULTS OF ANALYSIS:

Customer Sample ID : Water - LH		Lab Sample ID: 22-07222-004
PARAMETER	METHOD	RESULT
Color (True Color)	2120 B. Visual Comparison ^a	5 TCU
Nitrate as NO ₃ -N	352.1 Colorimetric, Brucine ^b	<0.05 mg/L
Oil and Grease	5520 B. Liquid-Liquid, Partition-Gravimetric ^a	2 mg/L
Phosphate as Phosphorus	4500 -P D. Stannous Chloride ^a	<0.03 mg/L
Surfactants (MBAS)	5540 C. Anionic Surfactants as MBAS ^a	0.21 mg/L
Total Suspended Solids	2540 D. Gravimetric, Dried at 103-105°C ^a	17 mg/L

Sample Description/Condition: The sample is clear and received in glass and plastic containers transported with ice.

References:

- ^a Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017
^b US EPA 352.1. Standard Methods for the Examination of Water and Wastewater, 13th Edition.

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Recognition:

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F-RR-07-08/01

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CERTIFICATE OF ANALYSIS

Customer : APO REEF NATURAL PARK
Address : Sablayan, Occidental Mindoro

Work Order : 22-07222
Date Collected : August 30, 2022
Date Received : August 30, 2022
Date Analyzed : August 31, 2022 - September 06, 2022
Date Reported : September 07, 2022
Time Collected: 5:15 AM
Submitted By : Customer

RESULTS OF ANALYSIS:

Customer Sample ID : Water - EW		Lab Sample ID: 22-07222-005
PARAMETER	METHOD	RESULT
Color (True Color)	2120 B. Visual Comparison ^a	5 TCU
Nitrate as NO ₃ -N	352.1 Colorimetric, Brucine ^b	<0.05 mg/L
Oil and Grease	5520 B. Liquid-Liquid, Partition-Gravimetric ^a	3 mg/L
Phosphate as Phosphorus	4500 -P D. Stannous Chloride ^a	<0.03 mg/L
Surfactants (MBAS)	5540 C. Anionic Surfactants as MBAS ^a	0.12 mg/L
Total Suspended Solids	2540 D. Gravimetric, Dried at 103-105°C ^a	17 mg/L

Sample Description/Condition: The sample is clear and received in glass and plastic containers transported with ice.

References:

- ^a Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017
^b US EPA 352.1. Standard Methods for the Examination of Water and Wastewater, 13th Edition.

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Recognition: Department of Environment and Natural Resources
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F-RR-07-08/01
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Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : APO REEF NATURAL PARK
Address : Sablayan, Occidental Mindoro

Work Order : 22-07222
Date Collected : August 30, 2022
Date Received : August 30, 2022
Date Analyzed : August 31, 2022 - September 06, 2022
Date Reported : September 07, 2022
Time Collected: 5:45 AM
Submitted By : Customer

RESULTS OF ANALYSIS:

Customer Sample ID : Water - SA1		Lab Sample ID: 22-07222-006
PARAMETER	METHOD	RESULT
Color (True Color)	2120 B. Visual Comparison ^a	5 TCU
Nitrate as NO ₃ -N	352.1 Colorimetric, Brucine ^b	<0.05 mg/L
Oil and Grease	5520 B. Liquid-Liquid, Partition-Gravimetric ^a	3 mg/L
Phosphate as Phosphorus	4500 -P D. Stannous Chloride ^a	<0.03 mg/L
Surfactants (MBAS)	5540 C. Anionic Surfactants as MBAS ^a	0.17 mg/L
Total Suspended Solids	2540 D. Gravimetric, Dried at 103-105°C ^a	9 mg/L

Sample Description/Condition: The sample is clear and received in glass and plastic containers transported with ice.

References:

- ^a Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017
- ^b US EPA 352.1. Standard Methods for the Examination of Water and Wastewater, 13th Edition.

Certified True and Correct by:

Ranmar Marco A. Marco, RCh
Laboratory Analyst II
PRC Lic. #0014151

Approved by:

Jennifer R. Maralit, RCh
General Manager
PRC Lic. # 0007374

Results of analysis refer only to the sample of material submitted by the customer. This report/certificate cannot be reproduced without written authorization from Optimal Laboratories, Inc. and Not Valid without official Company dry seal. This will be file for 5 years from date of issue.

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Physico - Chemical Analysis for Foods, Feeds & Pharmaceutical Products
Microbiological Testing / Stability Testing
Water and Wastewater Analysis & Monitoring
Ambient Air / Stationary Source Emission Sampling & Analysis

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Appendix D. (Continuation)



Recognition:

Department of Environment and Natural Resources
DA - Bureau of Animal Industry
Department of Health
Food and Drug Administration

F-RR-07-08/01

Iss.03 Rev. 02

Effectivity: July 11, 2022

CERTIFICATE OF ANALYSIS

Customer : APO REEF NATURAL PARK
Address : Sablayan, Occidental Mindoro

Work Order : 22-07222
Date Collected : August 30, 2022
Date Received : August 30, 2022
Date Analyzed : August 31, 2022 - September 06, 2022
Date Reported : September 07, 2022
Time Collected: 6:15 AM
Submitted By : Customer

RESULTS OF ANALYSIS:

Customer Sample ID : Water - SA2		Lab Sample ID: 22-07222-007
PARAMETER	METHOD	RESULT
Color (True Color)	2120 B. Visual Comparison ^a	5 TCU
Nitrate as NO3-N	352.1 Colorimetric, Brucine ^b	<0.05 mg/L
Oil and Grease	5520 B. Liquid-Liquid, Partition-Gravimetric ^a	3 mg/L
Phosphate as Phosphorus	4500 -P D. Stannous Chloride ^a	<0.03 mg/L
Surfactants (MBAS)	5540 C. Anionic Surfactants as MBAS ^a	0.15 mg/L
Total Suspended Solids	2540 D. Gravimetric, Dried at 103-105°C ^a	16 mg/L

Sample Description/Condition: The sample is clear and received in glass and plastic containers transported with ice.

References:

- ^a Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017
- ^b US EPA 352.1. Standard Methods for the Examination of Water and Wastewater, 13th Edition.

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