2019

Mailiao Industrial Harbor Environmental Report

Content

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Mailiao Industrial Harbor Environmental Report

This environmental report presents Mailiao Harbor 's achievements in environmental protection from 2015 to 2016 as well as the environmental policy, commitments and action plans of the Mailiao Harbor Administration Corporation.

If you have any inquiries regarding this report, please contact us.

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01/ Mailiao Harbor Environmental Policy

Mailiao Harbor Environmental Policies

Mailiao Harbor Administration Corporation firmly believes that environmental protection is as important as economic development of the harbor. As the administrative entity of the Mailiao Harbor, we take on the responsibility of protecting the environment and the safety of our employees. We strive to achieve our environmental goals by providing sufficient training and assuring the compliance of relevant regulations by all stakeholders.

The following principles are promoted to ensure the conformity of our environmental performance and government policies.

Comply with Environmental Regulations, Dedicate to Eco-Friendly Actions.

Proceed with Environmental Monitoring, Maintain Cleanness of the Harbor.

Environmental Education and Training, Heighten Environmental Awareness.

Safety and Environment Management, Achieve Sustainable Development.

The following objectives have been established to tackle the top 10 major harbor environmental issues. The environmental policies need to be reviewed annually to improve our actions and fulfill our commitment to environmental protection. In addition, all staffs working in the harbor, ship companies and local residents should be informed of these environmental policies. At the same time, the environmental policies are announced on our official website.

1. **Improve Air Quality in Harbor.**
   Setting up shore-side electricity. Only low-sulfur fuel is allowed in harbor. Enforcing boats to travel at a lower velocity. Promoting green transportation. Setting up gas recycling system. Reduction of Air pollutant emission.
2. **Maintaining Water Quality.**
   Develop ocean pollution prevention and emergency plan. Regular water quality monitoring. Improve marine pollution identification and reporting mechanism.
3. **Strict Management of Dangerous Cargo.**
   Introducing cargo loading/unloading protocols. Conducting inspection for the safety of eco-friendly equipment on ships and in the harbor. Strengthen access control. Reinforce dangerous cargo inspection and emergency drills.
4. **Cargo Leaking Prevention.**
   Installation of pollution prevention and recovery equipments. Deploying oil boom to prevent leaking oil from spreading. Setting up alarm and detection systems. Employing GasFindIR and professional decontamination vessels.
5. **Wastewater Discharge Prohibition.**
   Prohibit wastewater discharge from all vessels in port. Launching wastewater collection services. Integrate harbor inspection with law enforcement units.
6. **Strengthen Dredging and Dumping Management**:
   Make the dredging and dumping plan according to EIA promise. Monitoring the water quality during dredging and dumping process.
7. **Marine Habitat Protection:**
   Implement regular water quality monitoring and ecological survey in harbor vicinity. Banning fishing to maintain marine habitat.
8. **Reduce Energy and Resource Consumption**.
   Integrating water, electricity, and heat resources between the harbor and the industrial zone to reduce energy consumption.
9. **Waste Management**.
   Enforce recycling on docked ships and office buildings. Encourage waste reduction and recycling.
10. **Careful Attention to Ship Refueling Procedures.**
    Introduction of vessel refueling operation procedures to protect both the environment and workers' safety.

Chairman of Mailiao Harbor Administration Corporation CHEN BAO-LANG

Date: Dec 2, 2019

02/ Message from the Chairman

A Word from the Chairman of the Board

Amidst continual development of the global shipping industry, port operations will have a devastating effect on the environment if relevant protection measures are disregarded. In recent years, the concept of "EcoPorts" has received the attention of major international ports, including those in Europe and North America. The Mailiao Harbor in Taiwan has also focused on this concept since its opening, upholding equal emphasis on environment preservation and industrial development, to ensure sustainable development.

The Mailiao Harbor is Taiwan's largest industrial port and a pioneer in promoting environmental protection, where the harbor leads by example. The harbor possesses complete environment management policies, monitors all of its operations via strict management and control, and implements environmentally friendly and ecological protection-oriented measures, maintaining clean water surrounding the harbor and a wealth of terrain and marine ecological resources.

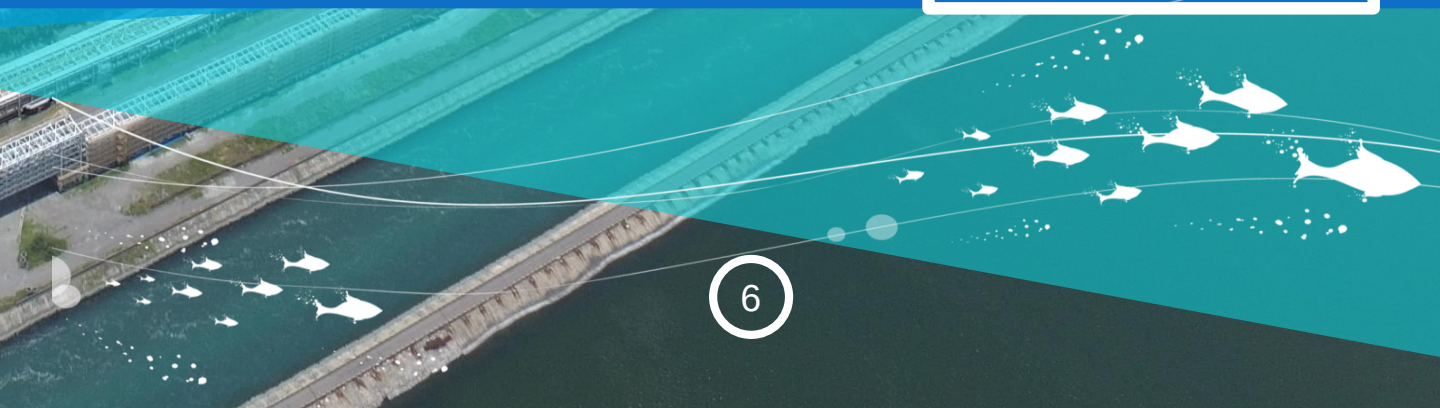
Regardless of various focuses on transportation development for port operations, green transportation has undoubtedly become the basic foundation in response to the development trend of global shipping industry. The Mailiao Harbor operates in a cautious and conscientious manner, complies with applicable environmental policies strictly, and engages in environmentally friendly endeavors. In addition, it implements relevant plans, performs reviews persistently, and refines and improves its plans to ensure the adequate execution of its policies and goals. In the future, the harbor will continue to elevate its operating performance and port service quality as well as apply for the European Union EcoPorts Certification to facilitate international exchanges and learning, transforming into a green port that saves energy, reduces carbon, emits minimal pollution, and practices environmental protection.

Chairman of Mailiao Harbor Administration Corporation

Date: Apr 1, 2018

Bao-Lang CHEN

03/ Mailiao Harbor Background and Introduction

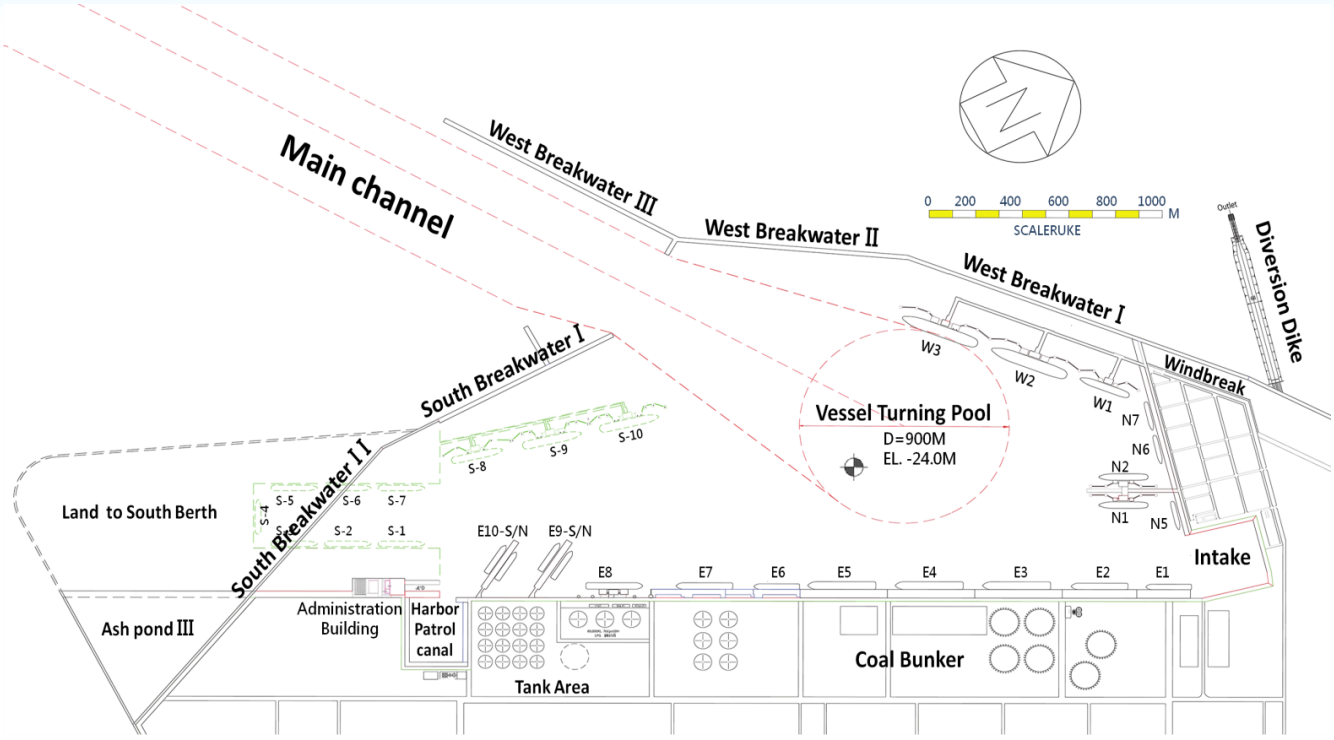


Introduction

Mailiao Industrial Harbor (hereinafter referred to as Mailiao Harbor) is located in the Mailiao area of the Yunlin Offshore Industrial Zone, Taiwan. The Yunlin Offshore Industrial Zone was developed by the Ministry of Economic Affairs to enhance basic industries in our country. Yunlin Offshore Industrial Zone is planned to provide the land needed for the expansion project of Mailiao Industrial Park; it is expected to meet current and future needs of the petrochemical industry for plant construction and relocation. The plan included extracting sand from the sea areas near Yunlin County for landfilling, to create land for the development of the Yunlin Offshore Industrial Zone. The industrial zone was divided into the Mailiao, Hsin Hsing, Taixi, and Sihu zones; the land area of the petrochemical industrial zone in the Mailiao zone was created by the Formosa Plastics Group by landfilling; and the appropriated berths in the Mailiao Harbor were built for the use of the Mailiao Industrial Zone. The Executive Yuan approved the construction of Mailiao Harbor on July 7, 1993. The harbor officially began operations on March 1, 2001.

Mailiao Harbor is located at the central point of Taiwan's west coast (120°08.9' E, 23 ° 46.9' N). Situated in the Yunlin Offshore Industrial Zone, Mailiao Harbor is the first international harbor in Taiwan funded and built by nongovernmental corporates. To the north lies the south bank of the Zhuoshui River Estuary; to the south lies the Hsinhuwei River Estuary; and to the west is the Penghu Channel. The Port of Taichung and the Port of Keelung is approximately 40 and 150 nautical miles north of the harbor, respectively; and the Port of Kaohsiung is about 80 nautical miles south of the harbor. The harbor entry faces west with a 34° angle to the south (between west-south-west and south-west), and the waterway at mid-tide is 24 m deep. It is the deepest harbor in Taiwan, capable to accommodate a 300,000-ton vessel.

Location of the Appropriated Berths in the Mailiao Harbor



Status of Mailiao Harbor

Item	Details
Harbor	Faces west with a 34° angle to the south; water depth EL-24 m; width 390 m
Entering/exiting channels	Channel length approximately 2,500 m; water depth 24 m at mid-tide
Vessel turning pool	Diameter 900 m
Berth	Comprising 20 appropriated and 10 public berths
Harbor patrol canal	For mooring, water refilling, and refueling of harbor craft boats
Factory and repairing slipway	For repair, inspection, and maintenance of harbor craft boats
Harbor area	A total area of 1,597.7 ha; interior harbor area 476 ha; terrestrial area 179.15 ha; exterior harbor water area 944 ha
Breakwater	West breakwater 3,243 m; south breakwater 2,227 m

Primary commercial activities

Item		2017 (a)	2018 (b)	Annual business comparison (b-a)	
				Actual number	%
Incoming and outgoing vessels	No. of incoming vessels (vessel)	2,664	2,680	16	0.60
	Gross tonnage of import (ton)	59,737,619	59,980,231	242,612	0.41
	No. of outgoing vessels (vessel)	2,663	2,682	19	0.71
	Gross tonnage of export (ton)	59,779,242	59,777,299	-1,943	-0.003
Cargo throughput	Tonnage of imports (metric ton)	49,080,571	50,394,210	1,313,639	2.68
	Tonnage of exports (metric ton)	22,307,103	23,853,577	1,546,474	6.93
	Tonnage of imports and exports (metric ton)	71,387,674	74,247,787	2,860,113	4.01
Loading/ unloading volume	Total (metric ton)	71,361,993	74,390,735	3,028,742	4.24

Operations statistics of Mailiao Harbor in 2017 and 2018

Main cargo

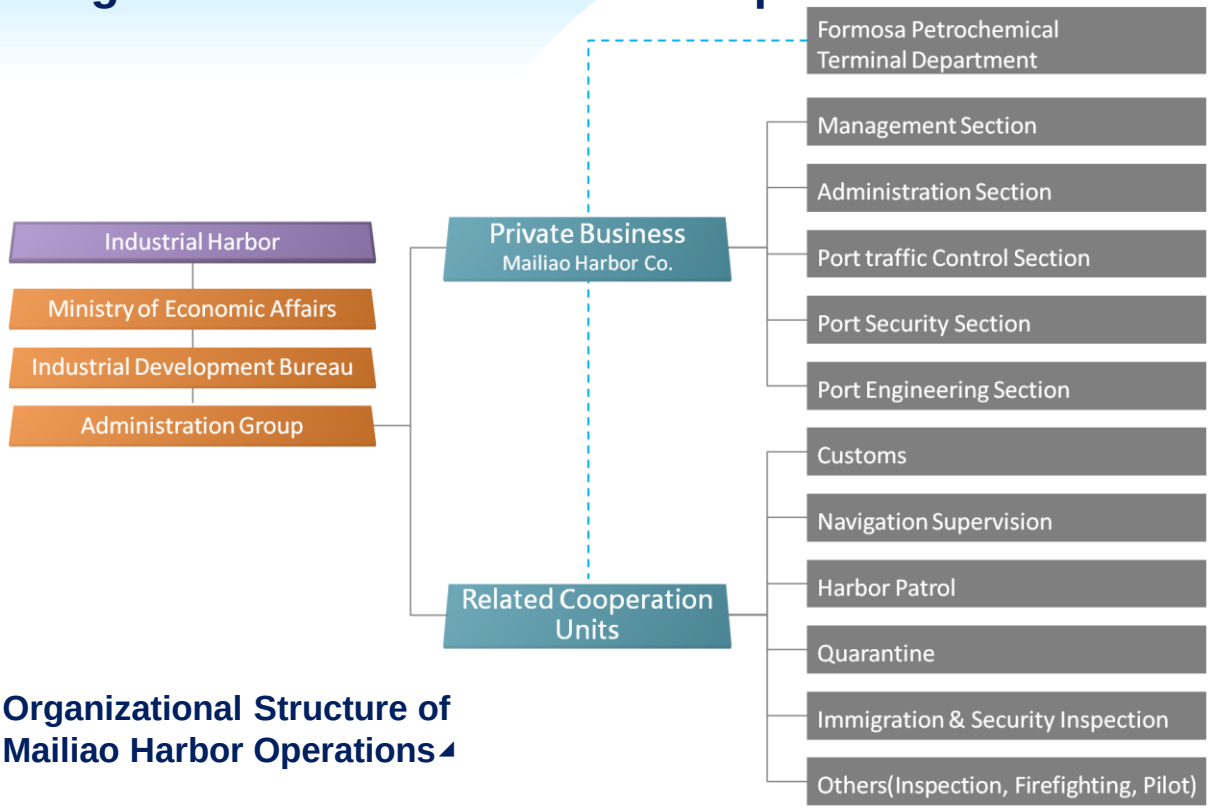
Incoming and outgoing goods at Mailiao Harbor are primarily oil-based products, followed by chemicals, ores, and dry bulk cargo of related industrial goods.

Petroleum
Crude oil LPG (Liquefied petroleum gas) Refined oil
Pyrites minerals/Ores
Coal Sulphur
Chemicals化學品
Sodium hydroxide Ethylene Glycol
Dry bulk
Coke Industrial salt

Primary goods in Mailiao Harbor

04/ Mailiao Harbor Environmental Management System

Organizational structure and explanations



Organizational Structure of Mailiao Harbor Operations

Stakeholders of the environmental concerns within the scope of Mailiao Harbor are: the Mailiao Harbor Administration Corporation (hereinafter referred to as Mailiao Harbor Co.), the Mailiao Terminal Department of the Formosa Petrochemical Corporation (hereinafter referred to as Formosa Petrochemical Terminal Department); the Administration Section of Mailiao Harbor's Industrial Development Bureau, Ministry of Economic Affairs (hereinafter referred to as Administration group); Mailiao Harbor Police from the Taichung Harbor Police Department, National Police Agency, Ministry of the Interior (hereinafter referred to as Harbor police); the Mailiao branch of the Taichung Customs Office (Clearance Division II), Customs Administration (hereinafter referred to as Customs); Quarantine center (Centers for Disease Control, South Region) at the Mailiao Harbor operations office (hereinafter referred to as Quarantine); Mailiao Harbor port security office of Coast Patrol Corps 4, Central Coastal Patrol Office, Coastal Patrol Directorate General, Coast Guard Administration (hereinafter referred to as Security inspection); Offshore Flotilla 13, Maritime Patrol Directorate General, Coast Guard Administration, Executive Yuan (hereinafter referred to as Harbor Patrol); Mailiao Harbor Brigade, Taichung Port Border Affairs Brigade, Border Affairs Corp, National Immigration Agency, Ministry of the Interior (hereinafter referred to as Immigration); and various harbor use units. In the Mailiao Harbor area, the Mailiao Harbor Co. handles actual harbor administrative work that does not involve public authorities. The Administration group of the harbor handles operations that involve government authorities. Additionally, navigation supervision, customs, harbor police, harbor patrol, quarantine, security inspection, and immigration cooperate with the Administration group in administrative and management operations.

The Mailiao Harbor Co. was jointly founded by industrialists within the industrial zone. On May 2, 1995, the Industrial Development Bureau of the Ministry of Economic Affairs approved the funding, construction, and operation of Mailiao Industrial Harbor by the Mailiao Harbor Co. The operational goal of the Mailiao Harbor Co. was to provide prompt and convenient port functions to reduce the freight and warehousing costs for businesses, enhance industrial competitiveness, and stimulate the economy. Thus, simplicity and efficiency are the foremost considerations of the organization. The internal organizations of the Mailiao Harbor Co. include the port engineering, port security, port traffic control, and administration sections. The stevedoring operations at the wharves are managed by the Formosa Petrochemical Terminal Department. The responsibilities of the various organizational units are as follows.

Administration section

- Manage and implement business operations, and collect harbor fees.

Port traffic control section

- Monitor vessels entering and exiting the harbor, allocate berths, and dispatch boats for harbor patrol.

Port security section

- Maintain security in the harbor area and maintain environmental cleanliness.

Port engineering section

- Manage harbor area constructions and maintain harbor facilities.

Mai-liao terminal department

- Perform stevedoring of incoming and outgoing cargo at the wharves.

Regulations governing environmental protection

The Mailiao Harbor Co. follows relevant international regulations and conventions, including the International Convention for the Prevention of Pollution From Ships (MARPOL 73/78), the London Convention (Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter), the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, the International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention), and the International Convention for the Control and Management of Ships' Ballast Water and Sediments.

The Mailiao Harbor Co. follows relevant national regulations and environmental management practices, which are as follows:

National environmental regulations governing Mailiao Harbor

Relevant regulations		Central authorities	Local authorities
Relevant laws for the construction of harbors	Industrial Innovation Act	Industrial Development Bureau, Ministry of Economic Affairs	
Laws related to the Ministry of Transportation and Communications	Ships Act	Maritime and Port Bureau, Ministry of Transportation and Communications (MOTC)	Office in Mailiao Harbor
Laws related to the Ministry of the Interior	Fire Services Act	National Fire Agency, Ministry of the Interior	Yunlin Fire-Fighting Department
Laws related to the Ministry of Ocean	Wildlife Conservation Act (Marine wildlife)	Ocean Affairs Council, Ocean Conservation Administration/EPA	Yunlin Agriculture Department
	Marine Pollution Control Act		
Laws related to the Environmental Protection Administration	Air Pollution Control Act	Environmental Protection Administration (EPA), Executive Yuan R.O.C. (Taiwan)	Yunlin County Government (Environmental Protection Bureau)
	Water Pollution Control Act		
	Waste Disposal Act		
	Environmental Impact Assessment Act		
	Environmental Education Act		
	Noise Control Act		
	Indoor Air Quality Management Act		
	Toxic Chemical Substances Control Act		
	Soil and Groundwater Pollution Remediation Act		
	Greenhouse Gas Reduction and Management Act		
	Public Nuisance Dispute Mediation Act		
Interdepartmental laws	Disaster Prevention and Response Act	The local authority concerned differs depending on the type of disaster	

05/ Environmental Status

Air quality

The primary function of Mailiao Harbor is to service the Yunlin Offshore Industrial Zone. It has spared no effort in protecting overall air quality. In the Formosa Plastics Group Sixth Naphtha Cracking Complex, the implementation of “Environmental Monitoring of Sixth Naphtha” was based on the environmental monitoring plans included in the “Environmental Impact Statement of the 6th Naphtha Expansion Project” and the “Environmental Impact Report of the 6th Naphtha Expansion Project.” The aforementioned Statement and Report were proposed by Formosa Plastics Group and approved by the Environmental Protection Administration (EPA). Each quarter, the monitoring results are sent to the 6th Naphtha Environmental Monitoring Committee for review; if the monitoring data are abnormal, the Formosa Plastics Group proposes response measures and keeps track of the situation. The monitoring and data analysis results of each quarter are compiled into a monitoring report and sent to the EPA; the complete report is published on the EPA website.

The air quality monitoring stations of Mailiao Harbor and Formosa Plastics Group are joint setups of Mailiao Industrial Zone. The air quality data monitored over the years from the three nearby air quality auto-monitoring stations at Taixi (Taixi Junior High School), Tuku (Honglun Elementary School), and Mailiao (Mailiao Junior High School) that were set up by the Formosa Plastics Group, along with the data from the three nearby air quality monitoring stations at Douliu, Lunbei, and Taixi in Yunlin County set up by the EPA, were also compiled. The locations of these air quality monitoring stations are illustrated in the following figure, and the air quality monitoring data are presented and explained in the following table:

Location of air quality monitoring stations near Mailiao Harbor

Air quality monitoring results over the years

Monitored item (unit)			SO_2	CO	O_3 Max-hr	O_3 8-hr	PM_{10}	NO_2	NMHC
Type	Name of station	Year	ppb	ppm	ppb	ppb	μg / m^3	ppb	ppm
FPG monitoring stations	Mailiao	2018	2.71	0.43	60.29	52.11	53.04	8.32	0.08
	Taixi	2018	2.68	0.40	54.39	47.15	47.36	7.56	0.06
	Tuku	2018	2.72	0.46	54.70	45.86	43.81	9.17	0.24
	Mailiao	2017	3.01	0.47	56.52	48.35	57.19	9.96	0.20
	Taixi	2017	3.12	0.44	56.73	48.71	41.80	9.52	0.22
	Tuku	2017	2.76	0.49	61.58	51.73	48.71	10.26	0.24
	Mailiao	2016	3.14	0.39	52.65	44.03	46.68	9.35	0.22
	Taixi	2016	3.48	0.40	55.05	46.48	36.86	8.91	0.19
	Tuku	2016	3.39	0.48	55.73	45.64	40.72	11.36	0.26
EPA monitoring stations	Lunbei	2018	2.61	0.28	56.90	48.20	52.60	9.49	-
	Taixi	2018	3.05	0.24	59.12	51.13	48.50	7.96	0.03
	Douliu	2018	2.69	0.34	66.06	53.39	49.90	12.23	-
	Lunbei	2017	2.83	0.28	57.30	47.98	57.40	9.95	-
	Taixi	2017	3.10	0.23	56.26	48.65	49.10	7.82	0.04
	Douliu	2017	2.80	0.34	65.88	52.38	50.90	12.97	-
	Lunbei	2016	2.81	0.30	54.61	44.87	50.30	10.06	-
	Taixi	2016	3.33	0.25	56.24	47.29	45.60	8.61	0.05
	Douliu	2016	3.05	0.38	61.09	48.02	48.50	14.16	-
Air quality standard			30	-	120	-	65	50	-

- Note: "—" means no monitoring data
- Data source: Environmental Impact Assessment supervision–Sixth Naphtha Environmental Monitoring data, EPA, Executive Yuan (Environmental Monitoring Report for the “Offshore Industrial Zone Petrochemicals Industry Comprehensive Area Development Project,” a subsidiary of Formosa Plastics Group) ttps://www.epa.gov.tw/

Sediment

The marine sediment monitoring points near Mailiao Harbor are situated in the sea area near the Mailiao Industrial Zone. A total of 17 monitoring points exist, and they are classified into far from shore (1A–5A), near shore (1B–5B), intertidal zone (2C–3C), ash pond area (1D), appropriated berths (1H), Hsinhuwei Stream Estuary (4M), and north bank of Zhuoshui River Estuary (1R–2R). The monitored items are the heavy metals Cd, Cr, Cu, Ni, Pb, Zn, As, and Hg.

The monitoring of heavy metals in the sediment of the Mailiao Industrial Harbor (hereafter referred to as Mailiao Harbor) revealed that, except for some gauging stations that exhibited Cr, Ni, and As contents exceeding the lower threshold of sediment quality and thus required more frequent inspections, all figures were less than the lower threshold. In the Q3 of 2017, the Cr, Ni, and As contents detected all exceeded the lower threshold as a result of two waves of torrential rain. The rain resulted in flooding in Yunlin and Nantou, during which contaminants in upstream rivers and cities were flushed by the Zhuoshui River and the Xinhuwei River into the river mouth and coastal ocean. In addition, the persistently high Ni content was contributed mainly by gauging station 4M, which was located at the mouth of Xinhuwei River, whose sediment according to statistics released by the Environmental Protection Administration (Executive Yuan) and Industrial Development Bureau (Ministry of Economic Affairs) exhibited an Ni content that constantly exceeded the lower sediment quality threshold. Therefore, we inferred that the excessively high Ni content in the sediment at the mouth and the south of Xinhuwei River are possibly attributable to Xinhuwei River itself. The As content ranged between 3.69 and 17.20 mg/kg and was seen to be slightly higher than the lower threshold of sediment quality (11 mg/kg) in gauging stations 1R, 2R, 2C, and 3C located at the mouth and intertidal zone of Zhuoshui River; at offshore stations 1A–5A; at inshore stations 2B¬–4B; at station 1H at the Mailiao Harbor; and at station 4M at the mouth of Xinhuwei River. In the official letter (document code: the amended order No. Tu 1020109478 issued by the EPA) issued on December 18, 2013, the Environmental Protection Administration, Executive Yuan corrected the description in the appendix (Procedure of Pollution Potential Area Establishment and Origin Evaluation of Groundwater Arsenic) of the Groundwater Pollution Control Standards attributing the relatively high As content in the inshore sediment in Yulin to the geological characteristics of the island of Taiwan.

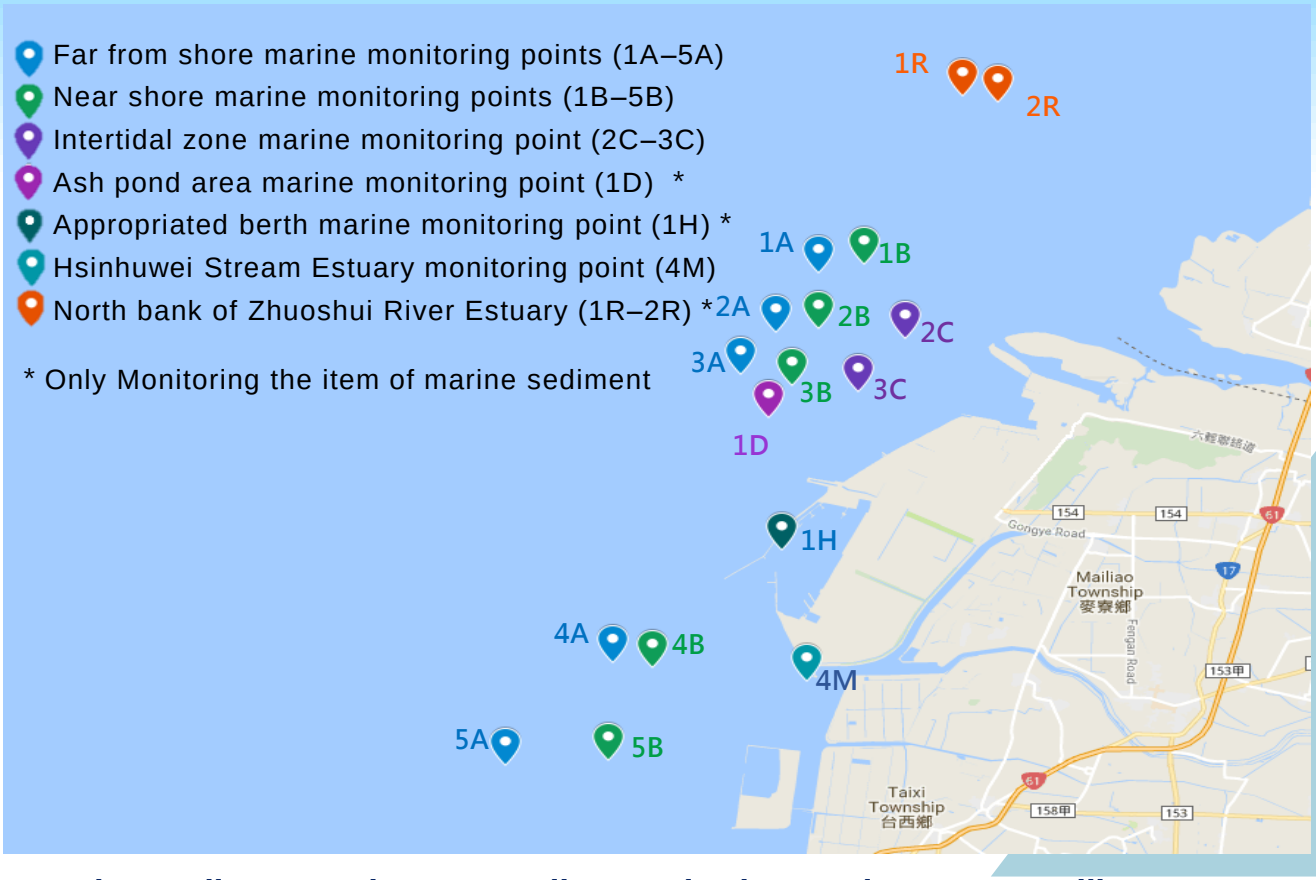
Sediment monitoring indices

Unit: mg/kg		Cd	Cr	Cu	Ni	Pb	Zn	As	Hg
Sediment Quality Guidelines	Lower limit	0.65	76	50	24	48	140	11	0.23
	Upper limit	2.49	233	157	80	161	384	33	0.87
Sediment Biohazard Guidelines (NOAA, U.S.)	Lower limit	1.2	81	34	20.9	46.7	150	8.2	0.15
	Upper limit	9.6	370	270	51.6	218	410	70	0.71

Sediment heavy metal concentration range of monitoring stations at the Mailiao sea area

	Cd (mg/kg)			Cr (mg/kg)			Cu (mg/kg)			Ni (mg/kg)		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
2017Q1	0.09	0.02	0.05	63.60	48.10	54.23	23.26	3.02	8.07	25.06	19.61	21.76
2017Q2	0.07	0.01	0.04	71.07	54.43	61.37	30.14	14.63	19.11	32.03	17.29	22.45
2017Q3	0.21	0.03	0.11	78.87	40.33	57.02	22.93	7.22	14.57	33.29	8.61	19.43
2017Q4	0.11	0.02	0.06	82.72	37.08	54.20	24.57	4.80	10.08	32.76	14.96	25.78
2018Q1	N.D.	N.D.	N.D.	38.42	10.21	22.24	27.94	4.36	9.07	34.52	13.18	19.81
2018Q2	0.06	0.02	0.04	41.20	12.20	18.90	25.10	4.50	7.70	27.10	13.30	16.50
2018Q3	0.05	0.00	0.02	47.20	14.60	24.60	28.96	4.88	9.15	36.40	13.80	20.50
2018Q4	0.06	0.02	0.03	50.10	21.90	27.10	24.30	5.57	8.05	35.90	18.10	22.40

	Pb (mg/kg)			Zn (mg/kg)			As (mg/kg)			Hg (μg/kg)		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
2017Q1	23.81	11.20	15.38	133.36	60.53	81.31	13.39	12.32	12.89	0.08	0.02	0.04
2017Q2	24.63	11.23	16.65	127.76	71.43	92.86	12.55	8.89	11.96	0.30	0.06	0.15
2017Q3	18.08	7.15	10.80	97.00	35.36	59.69	14.70	13.46	14.11	93.50	14.84	43.77
2017Q4	30.12	12.60	18.91	127.62	56.28	81.68	14.27	7.78	10.27	83.99	24.41	57.47
2018Q1	28.07	10.68	16.18	72.40	27.38	40.60	10.97	3.69	7.43	N.D.	N.D.	N.D.
2018Q2	20.30	8.80	11.40	91.80	38.00	51.30	17.20	7.30	11.00	162.00	34.00	64.00
2018Q3	27.70	10.50	13.80	110.00	40.60	58.70	15.55	7.88	12.23	67.00	2.00	26.00
2018Q4	25.50	11.30	14.70	114.00	46.60	59.70	14.10	6.75	10.80	0.09	0.01	0.03



Marine sediment and water quality monitoring stations near Mailiao

Marine water quality

Marine water quality is subject to the influence of natural factors such as upstream scour and rising and ebbing tides that are cannot be controlled by the harbor. The marine water quality monitoring points near Mailiao Harbor are situated in the sea area near the Mailiao Industrial Zone. A total of 13 monitoring points exist, and they are classified into far from shore (1A–5A), near shore (1B–5B), intertidal zone (2C–3C), and Hsinhuwei Stream Estuary (4M). The 29 monitored items such as temperature, salinity, dissolved oxygen, pH value, nitrate, E. coli, biochemical oxygen demand, chemical oxygen demand, ammonia nitrogen, total phosphorus, heavy metals, and volatile organics.

According to data sampled in each quarter of 2017 and 2018, the dissolved oxygen, pH, and ammoniacal nitrogen levels all conformed to the water quality standards for Category A marine environments according to the Marine Environment Categories and Marine Environment Quality Standards specified in Paragraph 1, Article 8 of the Marine Pollution control Act, and only the concentration of P approximated the specified threshold. The pass rate of the harbor water quality inspection was 100% in both 2017 and 2018 (refer to the inspection results in Appendix 2).

Marine water quality of Mailiao Harbor in 2017 and 2018

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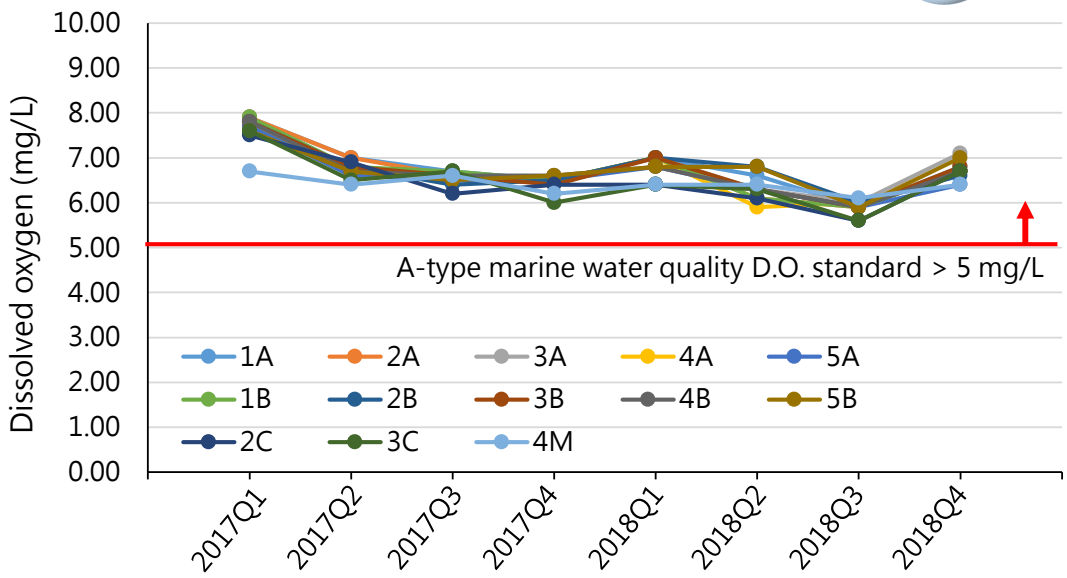
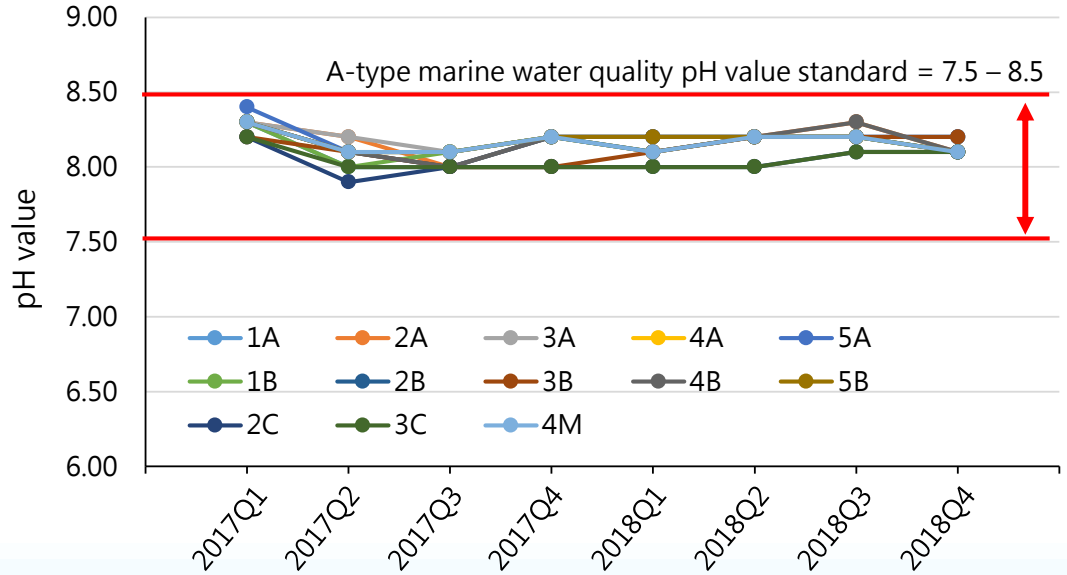


pH



Marine water quality of Mailiao Harbor in 2017 and 2018

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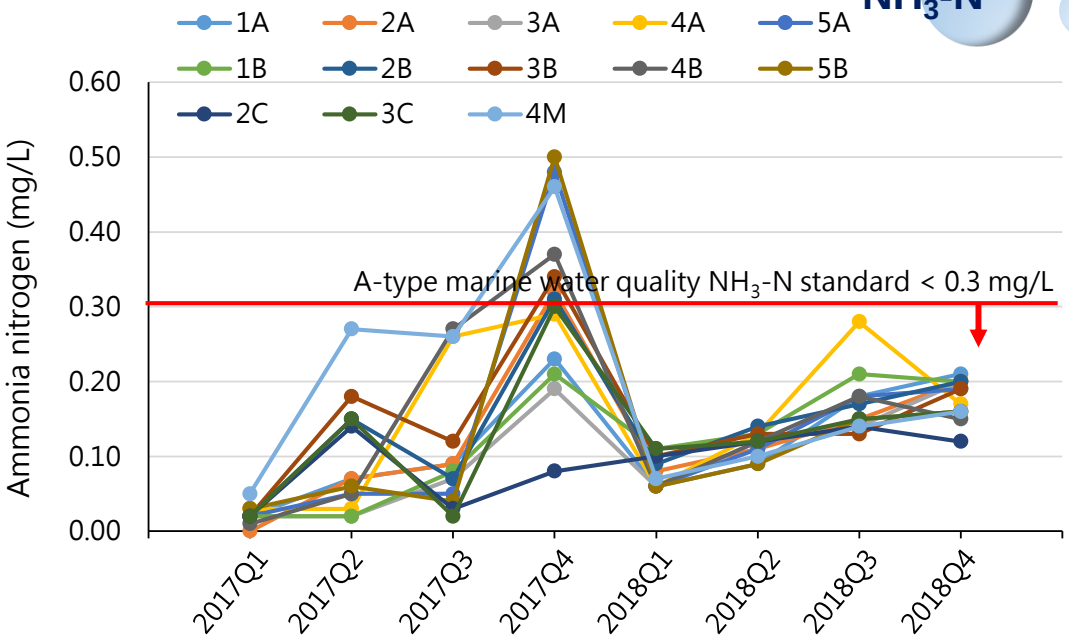
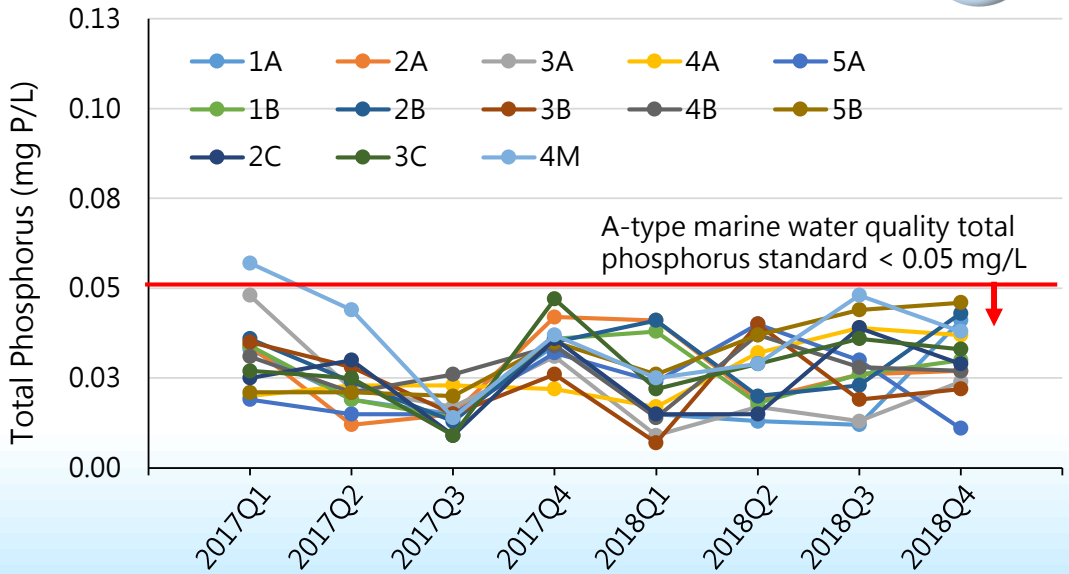


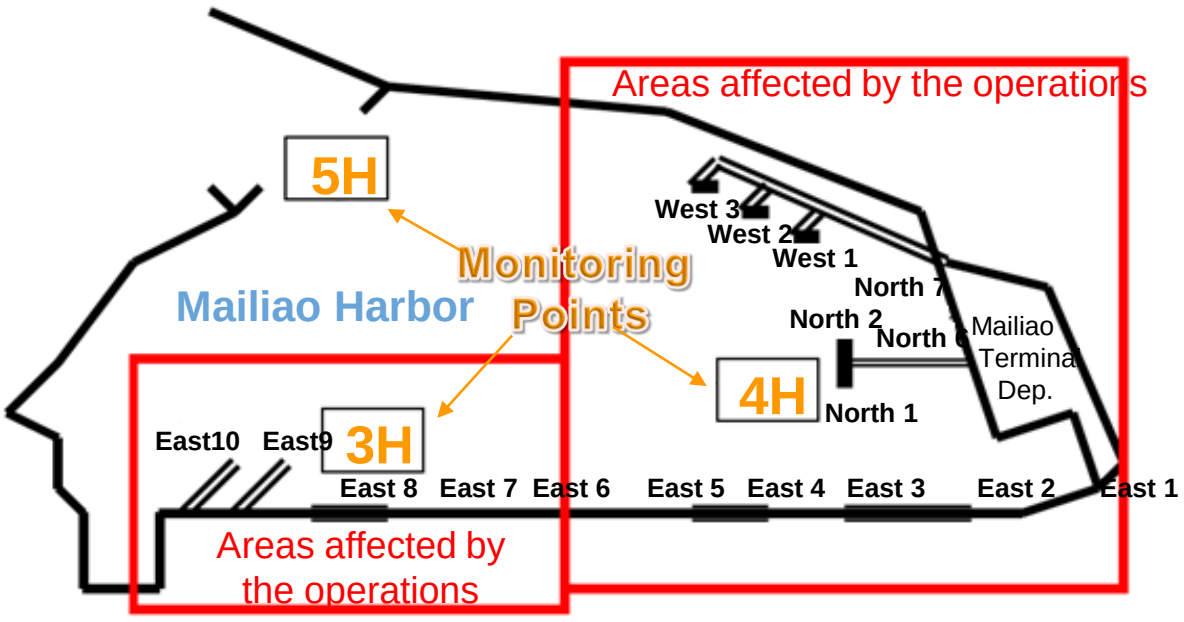
Phosphorus



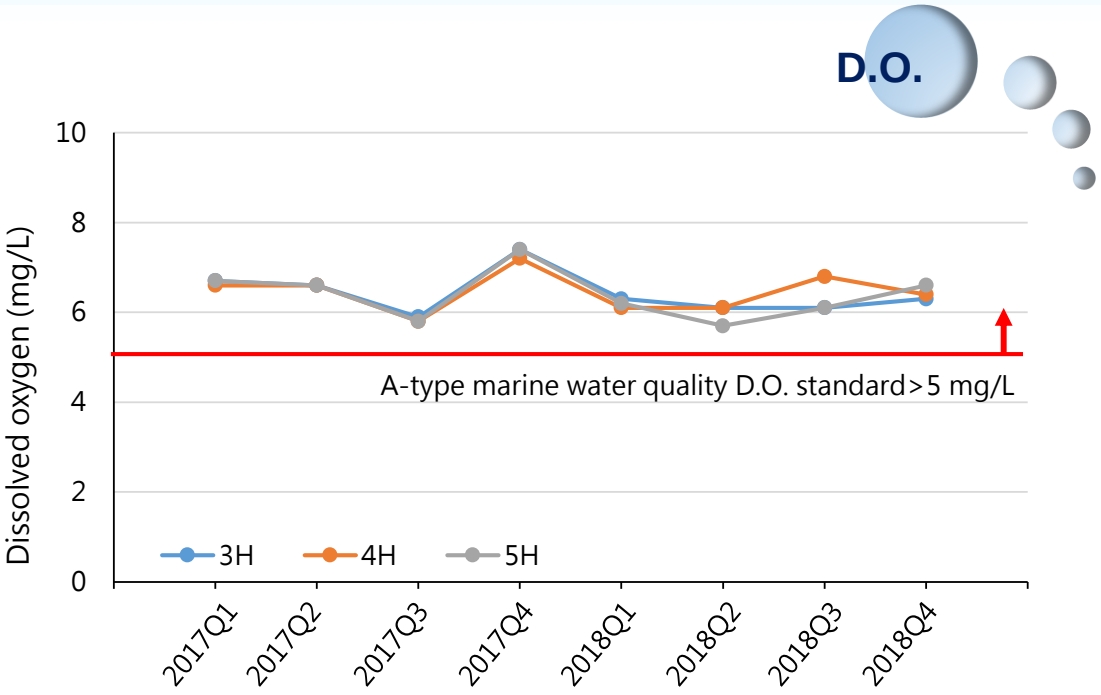
Harbor area water quality

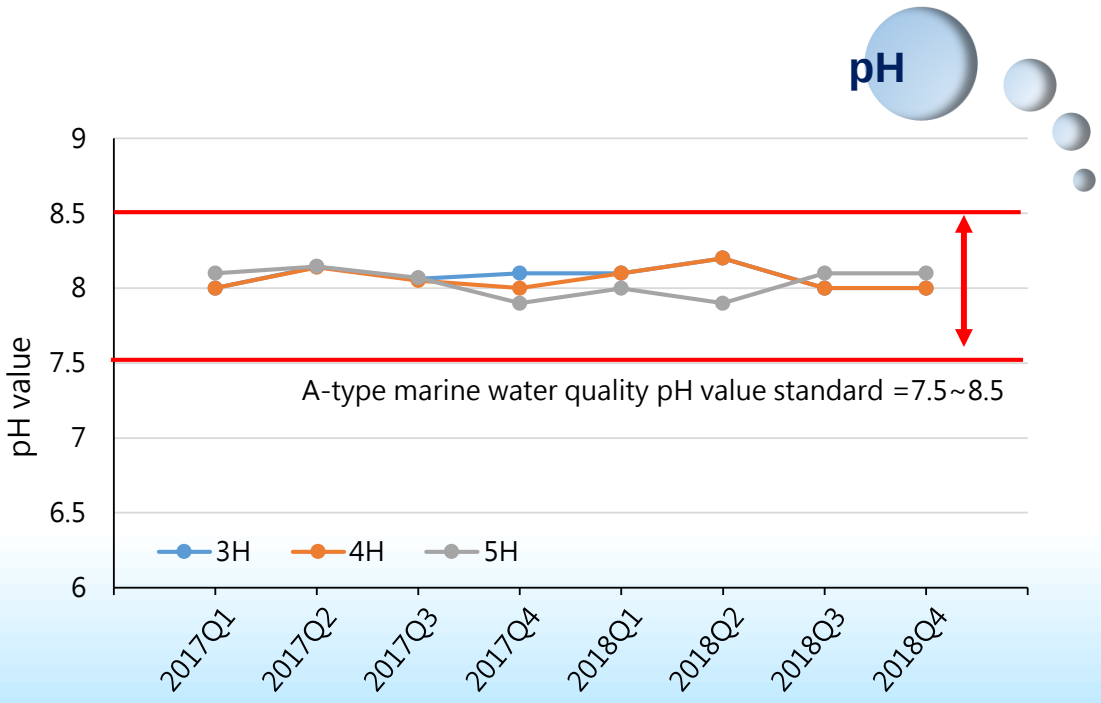
The incoming and outgoing cargoes at Mailiao Harbor are primarily industrial raw materials. To prevent chemical goods from polluting the sea when entering or exiting the harbor, a set of comprehensive guidelines has been formulated and implemented at Mailiao Harbor for water quality protection, including water quality assessment. Three monitoring points were set up within the harbor area, namely 3H–5H. A compilation of the quarter-based assessment results from 2015 to 2016 indicated compliance with the A-type marine water quality standards of the “marine environment categories and marine environment quality standards” stated in Article 8 Paragraph 1 of the “Marine Pollution Control Act.” The detailed monitoring results were attached as Appendix 2.

Location of sea water quality monitoring points at Mailiao Harbor



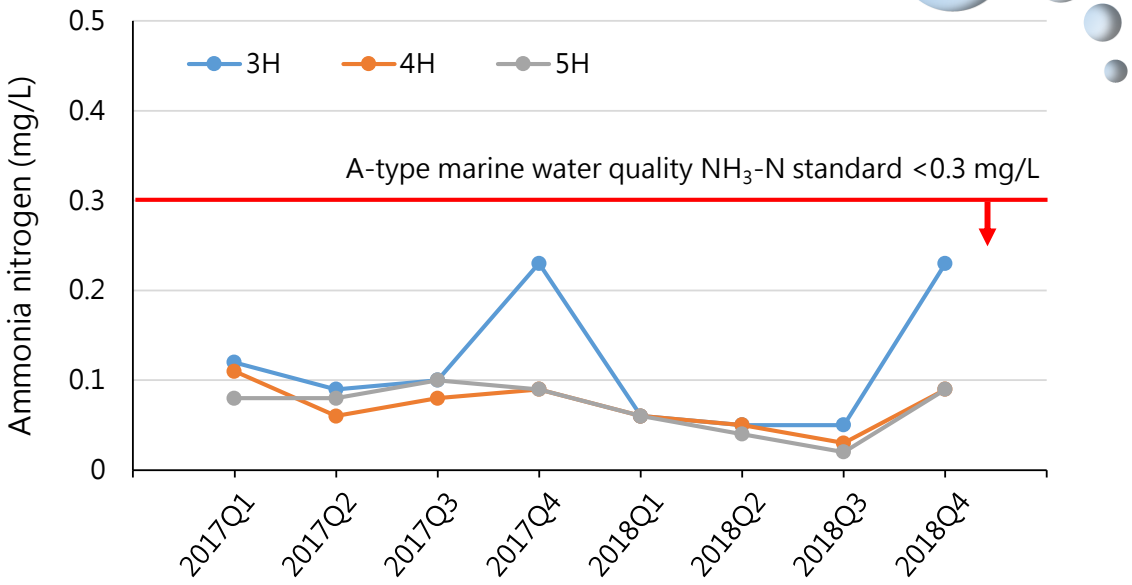
Harbor area water quality of Mailiao Harbor in 2017 and 2018



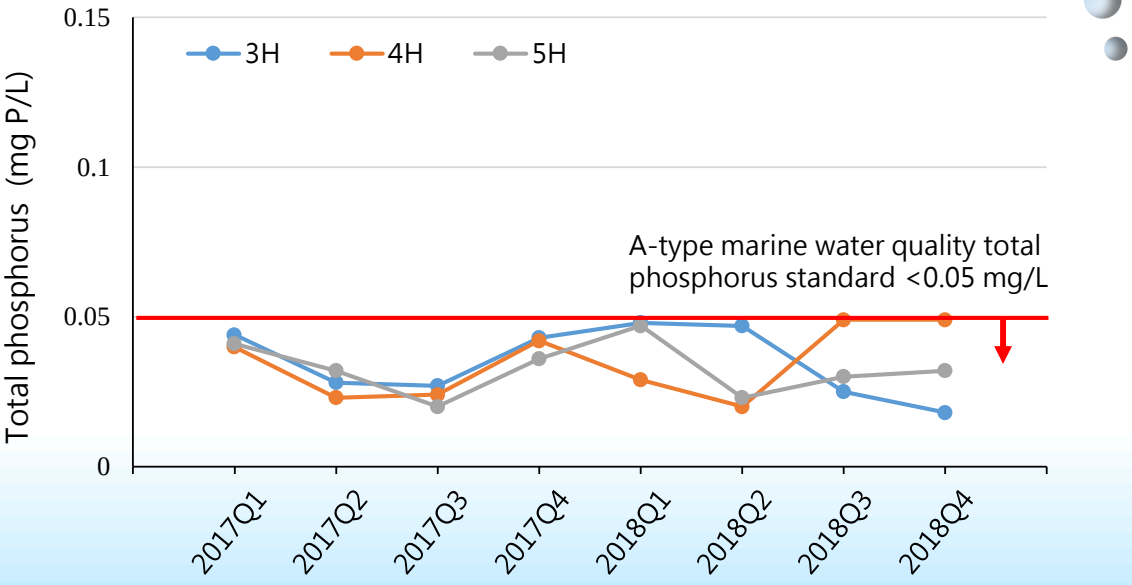


Harbor area water quality of Mailiao Harbor in 2017 and 2018

NH_3-N



Phosphorus



Additionally, Mailiao Harbor highly values the sea and implements several protection measures, such as requiring all cabin-washing water to be recycled as per the regulations; other requirements include leakage prevention measures and response measures in case of leakage, and they are explained as follows:

Regulations governing cabin prewashing operations

To fulfill the commitment included in the finalized Environmental Impact Statement of the 6th Naphtha Expansion Project and to meet the requirements of the Mailiao Harbor Marine Pollution Control Plan, the harbor has put in place controls for transportation of importing (incoming) chemical cargo vessels. To prevent randomly discharged toxic liquids from polluting the marine environment, the vessels must conduct cabin prewashing operations after unloading their cargo, and the water used must be treated and recycled as per the regulations. Hence, the harbor has clearly defined the scope and method for cabin prewashing. These control operations are clearly defined in the "computer-based tracking and control operations of cabin prewashing wastewater in Mailiao Harbor." If the control operations are not conducted because the shipped goods are in a different category, then the "Mailiao Harbor cabin prewashing wastewater tracking and control system" is adopted instead to track the vessel to the next port and replace the operating results of Mailiao Harbor with those of the next port, thereby fulfilling management responsibilities.

Leakage prevention and response measures

To prevent marine pollution, two levels of regulations have been established. Level 1 regulations are to formulate appropriate regulations to prevent any possibility of leakage, which include regulations on refueling, standards in the stevedoring of dangerous goods, and unloading guidelines. Level 2 regulations are to formulate response measures to be taken during a leakage event, including immediate treatment and preventing leaks from spreading. Relevant guidelines include the mandatory use of an oil boom to surround the vessel during the stevedoring of oil-based products and chemicals, the installation of pollution prevention facilities and cleaning equipment at all connecting points of the refueling pipeline in the refueling ship during refueling, and the immediate termination of operations in case of oil leakage and any abnormalities. The aforementioned measures are clearly defined in the "Regulations Governing Vessel Refueling at Mailiao Industrial Harbor Administration" and the "Regulations Governing Dangerous Goods Loading and Unloading at Mailiao Industrial Harbor Administration."

Pollution prevention measures for the storage tank area

Because Mailiao Harbor is located near the Mailiao Industrial Zone, the possibility of harbor area soil being polluted cannot be ruled out. To prevent pollution of soil and groundwater, the company has implemented pollution prevention measures in the storage tank area. These measures are complemented by the oil and terminal departments, and are explained as follows:

To prevent leakage of oil or oil-based products and to reduce the environmental impact incurred by such incidents, the bottom of the storage tanks in the factory area and the surrounding areas are reinforced with barrier constructions, including waterproof material and spill dikes. Leakage test tubes and oil leakage monitors are installed parallel to the bottom and side of the storage tanks. Regular inspection or real-time monitoring is conducted to assess the potential of oil leakage on or near the storage tanks. Oil leakages are managed at various levels based on the leakage potential to achieve the ultimate goal of pollution prevention.

1. Leakage prevention measures

(1)Before laying the floorboard of the storage tanks, check that the base has at least 95% compaction.
Purpose: Floor compaction reduces soil permeability and prevents uneven sinking or tilting of storage tanks.

(2)Remove rust and paint the tank floor, as well as apply an anti-corrosion layer and fiber-reinforced plastic (FRP) coating to the joint connecting the floor and exterior wall.
Purpose: To prevent leakage caused by the corrosion of storage tank steel plates.

2. Barrier measures

(1)Before laying the floorboard of the storage tanks, lay high density polyethylene (HDPE) waterproof material.
Purpose: Prevent leaks from directly permeating the ground and causing groundwater and soil pollution.

(2)Construct an interceptor ditch with a reinforced concrete (RC) base on the exterior of the storage tank base.
Purpose: An RC interceptor ditch can stop leaked oil from flowing into the soil.

(3)Construct a spill dike near the storage tank.
Purpose: To prevent leaks from directly permeating the ground and causing groundwater and soil pollution.

3. Leak test measures

(1)Bury horizontal tilt detection tubes at the base of the storage tank.

Purpose: If leakages flow into the RC interceptor ditch through the tilt detection tubes, then the leak sensor inside the PIT sends an alert signal to staff.

(2)Install fuel gas detector (for the oil-based product storage tank).

Purpose: To send an alert signal to staff immediately when the storage tank leaks.

(3)Install a groundwater monitoring well for long-term monitoring of water quality.

Purpose: To determine whether the storage tank is leaking by understanding the water level and water quality changes in groundwater.

(4)Monitor sinking of the storage tank.

Purpose: To determine changes in elevation of the storage tank, and prevent uneven sinking and tilting of the storage tank.

(5)Monitor sinking of the RC interceptor ditch of the storage tank (for storage tanks with an RC base).

Purpose: To determine the base elevation and prevents the base from uneven sinking and tilting.

Oil tank leakage prevention and detection measures

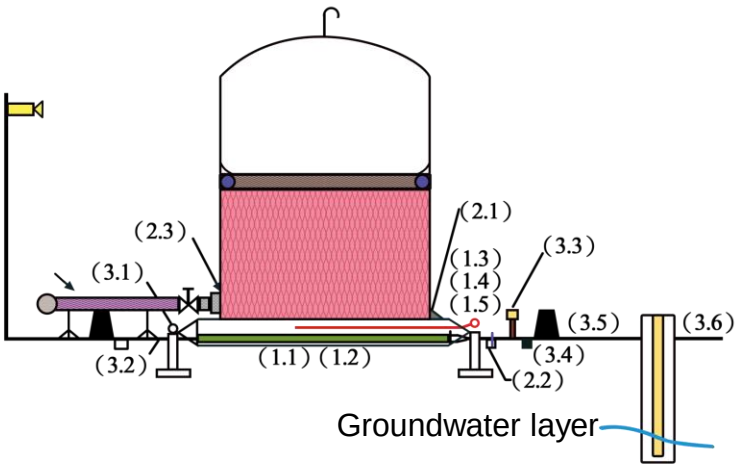


Diagram of leakage prevention measures for a 130,000 kiloliter crude oil storage tank

1. Leakage prevention measures for storage tank floor
- 1.1 Compaction of storage tank base
- 1.2 Leak prevention layer on storage tank base
- 1.3 Drainage tube
- 1.4 Fuel gases detector tube
- 1.5 Horizontal inclinometer tube

2. Leakage prevention measures for the body floor
- 2.1 Anti-corrosion engineering for the floor
- 2.2 Oil leak detector
- 2.3 Monitors for body sinking

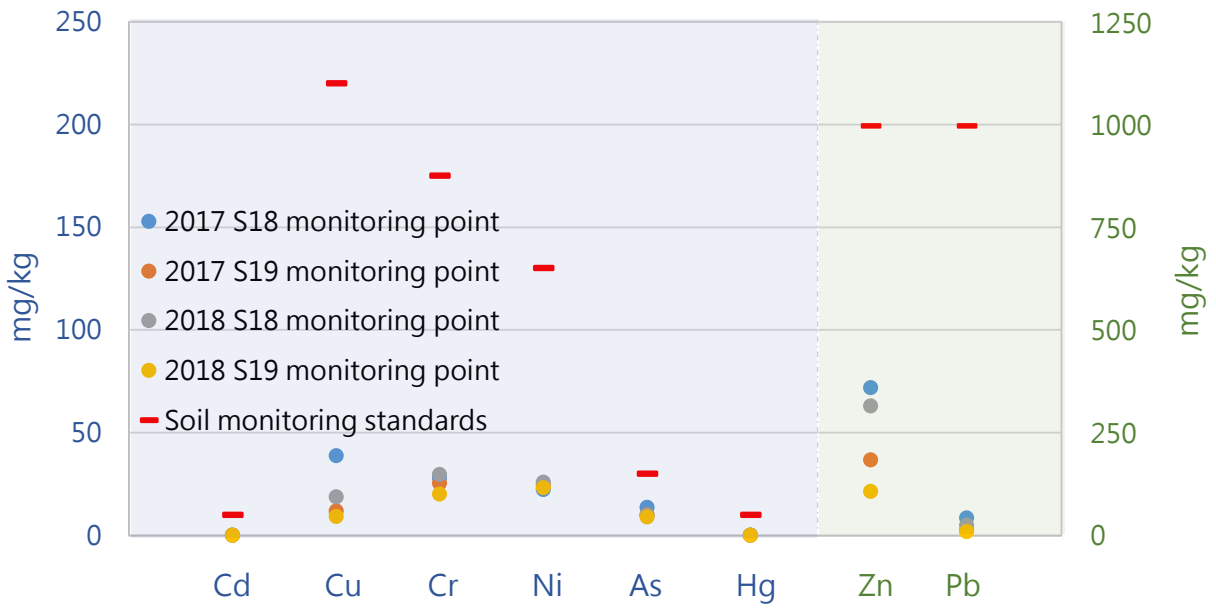
3. Breakage and leakage prevention measures for the tank body
- 3.1 RC base sinking monitor
- 3.2 Floor compaction
- 3.3 Gas detector
- 3.4 Rain and wastewater drainage
- 3.5 Spill dike
- 3.6 Groundwater monitoring well

Four soil monitoring points exist near the harbor. Points S18 and S19 monitor soil pH value, eight types of heavy metal element (i.e., cadmium [Cd], chromium [Cr], copper [Cu], nickel [Ni], lead [Pb], zinc [Zn], arsenic [As], and mercury [Hg]), 20 types of volatile organic substances (benzene, toluene, ethylbenzene, xylene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, carbon tetrachloride, chloroform, 1,2-dichloroethane, cis-1,2-dichlorobenzene ethylene, trans-1,2-dichloroethylene, 1,2-dichloropropane, tetrachloroethylene, trichloroethylene, vinyl chloride, hexachlorobenzene, 3,3-dichlorobenzidine, 2,4,6- Trichlorophenol, 2,4,5-trichlorophenol, and pentachlorophenol), and total petroleum hydrocarbons. Points S31 and S32 monitor acrylonitrile.

Mailiao Harbor soil sampling locations map

According to the 2017 and 2018 soil monitoring data, the eight types of heavy metal monitored at stations S18 and S19 were within the limits of soil pollution monitoring standards. None of the 20 types of volatile organic substances were detected. The highest value for total petroleum hydrocarbons was 29.0 mg/kg, which was far lower than the regulatory standard of 1,000 mg/kg. Acrylonitrile, monitored at S31 and S32, was below the detection limit, showing that the soil near the harbor did not suffer any significant pollution.

Heavy metals concentration in soil at monitoring points near the harbor

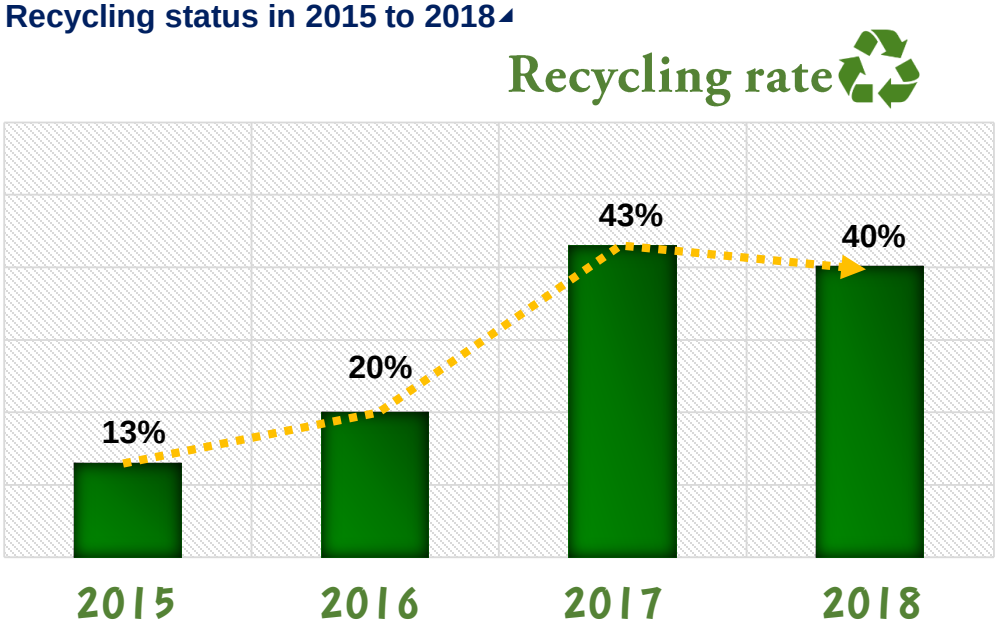


Harbor waste

Mailiao Harbor greatly emphasizes a clean harbor environment. To maintain cleanliness at the harbor and ensure appropriate treatment of waste, the harbor commissioned qualified operators for waste disposal according to the Waste Disposal Act, and clearly defined waste disposal timings to be followed by relevant harbor personnel. Vessels moored at the harbor must comply with the “Notification Form of Garbage Removal from the Vessels Berthing at Mailiao Industrial Harbor” when sorting waste. The Mailiao Harbor Co. actively promotes the importance of sorting waste and has installed waste sorting bins at all offices to enhance the recycling rate of waste at the harbor.

According to the waste management in 2015 and 2016, the recycling rate was increased from 13.16% in 2015 to 20.47% in 2016 and to 40%–43% in 2017 and 2018. The total quantity of refuse collection was reduced from 4,528.21 tons in 2015 to 1,784.83 tons in 2018, indicating the Mailiao Harbor Administration Corporation’s increasing emphasis on and effective promotion of recycling and the source reduction of waste; the corporation will continue to promote and implement proper waste management.

Recycling status in 2015 to 2018



The various operations are explained as follows.

1. Waste reduction at source

(1) Garbage produced by vessels berthing at the harbor

- After a vessel berths at the wharf, the “Notification Form of Garbage Removal from the Vessels Berthing at Mailiao Industrial Harbor” is sent to the shipper, requesting the shipper to sort garbage according to the regulations.
- Garbage removal time is 13:00–15:00 daily.

(2) Garbage produced by vessels offshore

- Promote garbage sorting to related workers and contractors during meetings.
- Set up waste sorting bins at offices.

2. Waste sorting

(1) Garbage produced by vessels berthing at the harbor

- Collect the garbage produced by vessels berthing at the harbor every day, and ask the cleaning personnel to sort the garbage according to company regulations.

(2) Garbage produced by vessels offshore

- Dispose and transport the garbage in the garbage sorting bins every day to the waste collection yard, and ask the cleaning personnel to re-sort the garbage according to company regulations.

3. Recycling

After sorting, the garbage at the harbor area (harbor vessel and offshore vessel garbage), are temporarily kept at the waste collection yard.

- According to the type of garbage, recycling firms collect the recyclable wastes (such as plastics, waste glass containers, waste aluminum foil packaging, scrap iron containers, scrap aluminum containers, waste paper, stainless steel, scrap copper, scrap iron), and transport them to various recycling plants for recycling and reuse.
- Garbage that cannot be recycled is transported to a subsidiary of the Formosa Petrochemical Corporation, the Nan Ya recycling plant, for incineration or landfill.

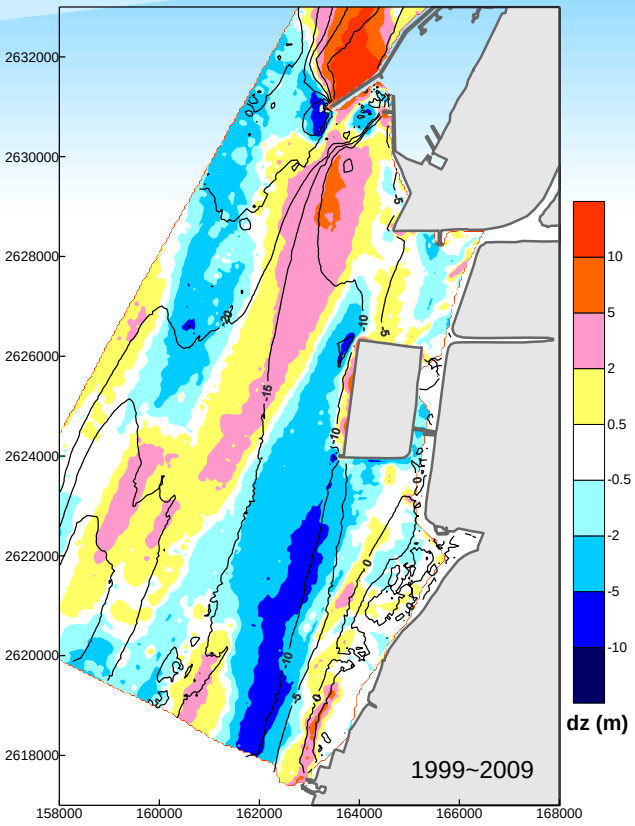
Dredging management

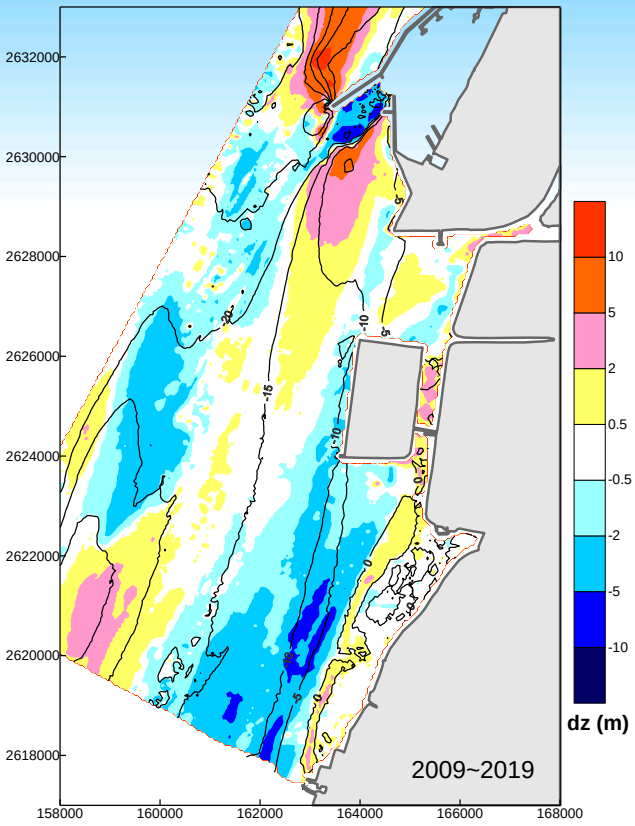
To maintain the course and depth of the harbor, dredging and silting are mandatory. According to the review conclusions of the “Environmental Impact Statement of the Mailiao Harbor Transformation Plan in Yunlin Offshore Industrial Zone,” Mailiao Harbor uses sediments of sound quality from external channel dredging excavation to cover erosion at the south bank caused by development of Mailiao Industrial Park. This landfill operation, which began in 2009, is ongoing.

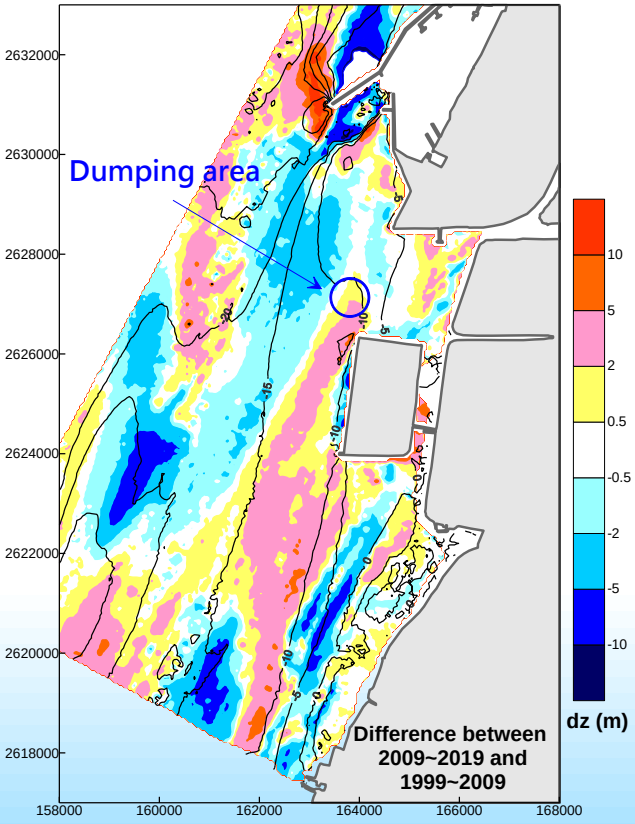
The landfill volume is based on the numerical simulation results obtained by professional research institutes. Research has estimated that 1 million m^3 of sand is required to reach a balance. However, considering the landfill site is near an oyster farming area, the recommended volume was reduced to 600,000 m^3.

The landfill method used a sand dredger to dredge channel silt, and then the suspended sand in the upper layer of the cabin was eliminated using the overflow method; finally, superior-quality sand with larger particles that settled at the bottom of the cabin was transported and dumped at the landfill site. Landfilling is paused during oyster spawning, and water quality monitoring is conducted during landfilling to prevent the activity from affecting the marine ecology.

The survey results of water depth topography over the years have indicated that landfill and beach nourishment could make up for a part of the sand source of the eroded area, and help to reduce regional changes in plane siltation. For example, the south side of the Hsin Hsing Zone, which has a depth of 10–15 m, continues to show erosion. The water depth and topography will continue to be monitored, and the effectiveness of landfill and beach nourishment shall be reviewed periodically.







- **Comparison of Mailiao Harbor 10 years before beach nourishment and 10 years after beach nourishment**

Data source:
Industrial Development Bureau, 2019

Ecological conservation

In response to rapid changes to the environment, in addition to avoiding the pollution that could be caused by various types of human activities, Mailiao Harbor considers ecological conservation and regeneration urgent and critical. The harbor places great emphasis on the marine environment and the symbiotic system of the marine ecosystem, and actively participates in marine regeneration work, including conservation measures for the protection of the critically endangered white dolphin and regeneration of fishery resources. Thus, the Mailiao Harbor Company not only shows a responsible spirit for pollution prevention, but also is active in ecological conservation and regeneration. The white dolphin conservation measures and release of fry are detailed in the following paragraphs.

White dolphin conservation measures

The International Union for Conservation of Nature declared the Chinese white dolphin critically endangered (CR) in August 2008. However, since March 2008, Formosa Plastics Group has continually run a survey project, and the results obtained so far indicate that the Chinese white dolphin is mainly found in long and narrow sea area within 3 km offshore, in water less than 15 m in depth, and primarily moving in a north–south direction. The number of white dolphins along the Yunlin coast constitutes more than half of the species' number along Taiwan's west coast; this is also a vital nursery area. The white dolphin conservation measures implemented by Mailiao Harbor are explained as follows.

1. Regulation of incoming and outgoing vessel speed

Cargo carriers entering and exiting the harbor should be alert for white dolphins. If white dolphins are sighted ahead, then the vessel must reduce its speed to less than 6 knots provided it does not affect navigational safety; however, because of weather and sea conditions, some large vessels must maintain a speed of more than 7 knots. For instance, if the sea condition is a flat tide with no flow (within 0.5 hr before and after a high or low tide), and the visibility is more than 2,100 m with a wind speed of less than 3, then the signal station would inform the pilot, who would first consider the navigational safety before deciding whether to enter the harbor at under 6 knots.

2. Regulation of sand dredging and landfill vessels

Before dredging the channel for sand, the work boats should ensure that no white dolphins are in the harbor before performing sand extraction and landfill operations. The monitoring and regulation of sand extraction vessels are conducted by the Mailiao Harbor signal station, which is explained as follows:

(1) Sand extraction vessels use radar and a global positioning system for vessel positioning and navigation.

(2) The signal station uses radar and an automatic identification system on vessels to monitor their position, which it continues to record. Upon receiving a report of a white dolphin sighting, the signal station immediately informs the sand extraction vessel and nearby merchant vessels to reduce vessel speed and implement appropriate collision avoidance measures.

(3) Originally, a plan existed to install monitoring recorder systems on sand extraction vessels to record operations. However, considering the low efficiency of the original sand extraction vessels, sand extraction operations were commissioned to foreign professional sand extraction vessels, enabling a reduction in the number of sailings as well as reducing the probability of affecting white dolphin activities.

3. The pH value of marine water quality near Yunlin

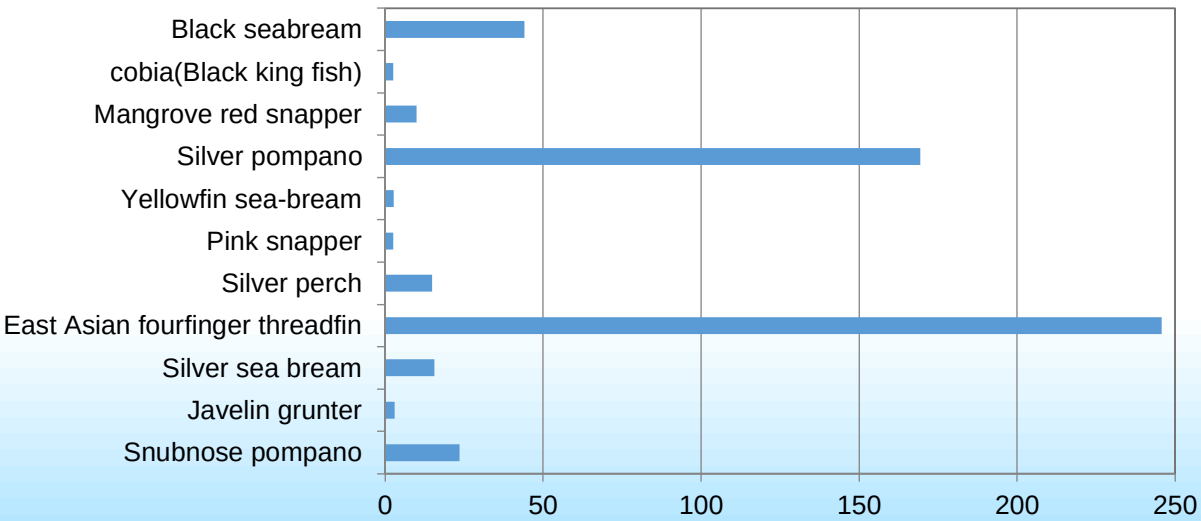
According to the monitoring results of water quality in nearby sea areas, the pH can be maintained between 7.5–8.5, and the pH value of discharged water by various factories can conform to the legal requirements of the EPA. The pH value of seawater near Yunlin will be continuously monitored.

Measures of fry releasing

Because of the depletion of coastal resources in Taiwan, and in order to exhibit friendliness to local environment, Formosa Plastics Group has promoted the proliferation and release of fry for conservation purposes in the Yunlin Mailiao marine area for many years.

This was in response to the regeneration of fishery resources promoted by the local government, and it has enriched local fishery resources and enhanced the catches of fishermen in the area. Since the initial release of fry in 2008, the operation has been implemented for 10 years, releasing close to 5 million fry. Additionally, to enhance the ecology conservation concept of the masses, conservation activities have actively been promoted; lecturers with a background in marine ecology conservation as well as knowledge of fisheries were hired to teach conservation lessons with the expectation that this regeneration strategy would be used to stimulate sustainable development of local fisheries. In 2014, Formosa Plastics Group was awarded the “Marine Oscar,” an award set by the Council of Agriculture, as the model for marine resources proliferation and fry release.

Additionally, Formosa Plastics Group and the Yunlin Fishery Association released fry at Boziliao Fish Harbor. In addition to inviting children to share the experience, they invited government authorities to witness the event. The fish species released included the East Asian fourfinger threadfin, silver pompano, and black seabream. The Yunlin Fishery Association said that after the long-term participation of Formosa Plastics Group in marine regeneration, the local fishermen reported significant increases in their catches, and hoped that the group would continue these operations. In addition, because of this releasing of fry, fish species of high economic value that had become scarce from overfishing have reappeared.



Statistical diagram of the total amount of fry released during 2008–2019

Marine ecology and environmental photography project

Mailiao Harbor on the western coast of Yunlin County is situated on reclaimed land for the development of the Yunlin Offshore Industrial Park. To record the underwater ecology inside and outside the harbor and the green ecological environment in the port and adjacent areas, Mailiao Harbor commissioned the Coastal Waters and Environment Center of National Marine Technology University of Kaohsiung to conduct a survey on the marine ecology of Mailiao Harbor and undertake marine environment photography.

From April 2016 to September 2017, the underwater marine ecology in six main areas inside and outside Mailiao Harbor were photographed: (A) the power plant discharge point; (B) water intake point; (C) East wharf; (D) Northwest wharf; (E) West breakwater; and (F) harbor craft basin and South breakwater. Also photographed were the marine environment monitoring operation process inside and outside the harbor, and harbor operations such as vessels entering and exiting the harbor, stevedoring operations at the wharves, and harbor health, safety, and environmental protection management operations. The green ecological environment in adjacent areas, such as the green and environmental construction of the Mailiao Industrial Zone, was also recorded.

A survey on the underwater ecology indicated ecological diversity in the harbor. The following six phyla were recorded: annelids, cnidarians, mollusks, arthropods, echinoderms, and chordates. To date, six phyla, 72 families, and 148 species have been identified. As the frequency of the survey increased, the total number of living species also increased. A total of 69 bird species were photographed in the green ecological environment of the harbor and adjacent areas.

The six main underwater ecological areas of Mailiao Harbor

Harbor ecology

Chaetodon vagabundus

Ellosella robusta

Panulirus versicolor

Diadema setosum

Pterois volitans

Thais clavigera

Tubastraea aurea

Canthigaster compressa

Portunidae sp.

Labroides dimidiatus

Terrestrial ecology

-**Birds:** Photographing migratory bird activity near Mailiao Harbor is a major part of the Mailiao Harbor Marine Ecology and Environmental Photography Project. The record of bird distribution over the years has indicated a relatively rich variety of species (69 in total).

-**Casuarina windbreak forest:** Mailiao Harbor has the largest casuarina forest in Taiwan because of forestation.

-**Intertidal zone:** Because of its proximity to the sea, Mailiao Township has an intertidal zone of 47 km^2. It has a flat coast and rich marine ecology. Marine creatures such as fiddler and monk crabs can be seen everywhere, and numerous resident and migratory birds stay in this area. This indicates that the marine ecological environment near Mailiao Harbor is excellent.

Larus ridibundus

Copsychus saularis

Alcedo atthis

Charadrius hiaticula

Ardea cinerea

Threskiornis aethiopicu

Acrocephalus bistrigiceps

Chlidonias hybrida

Himantopus himantopus

Circus spilonotus

Streptopelia tranquebarica

Prinia inornata

Environmental performance indices

Issues	Index item	Calculation method	Index target	Index results	
				2017	2018
1. Air quality	Ratio of harbor craft boats using low-emission fuel and the usage volume	•Number of harbor craft boats using low-emission fuel (super diesel) ÷ Total number of harbor craft boats × 100% •Volume of low-emission fuel used by harbor craft boats	•Ratio of harbor craft boats using low-emission fuel (super diesel; sulfur content <10 ppm): 100%	• Harbor craft boats: 13; harbor craft boats using low-emission fuel: 13; ratio: 100% • •Low-emission fuel used by harbor craft boats: 1,781.789 kL	• Harbor craft boats: 13; harbor craft boats using low-emission fuel: 13; ratio: 100% • Low-emission fuel used by harbor craft boats: 1,801.578 kL
	Ratio of harbor craft boats using shore power	Number of harbor craft boats using shore power (vessel) ÷ Total number of harbor craft boats (vessel) × 100%	•Ratio of harbor craft boats using shore power: 100%	•Harbor craft boats: 16; boats using shore power: 16; ratio:100%	•Harbor craft boats: 15; boats using shore power: 15; ratio:100%
	Emission standards for air pollution control equipment	Conduct flue detection for air pollutants (i.e., TSP, SO_2, NOx, and VOCs) in waste gas at the rear of the incinerator.	•Rate of emitting lower levels of TSP, SO_2, NOx, and VOCs than the legal requirements: 100%	•TSP target achieving rate: 100% •SO_2 target achieving rate: 100% •NOx target achieving rate: 100% •VOCs target achieving rate: 100%	•TSP target achieving rate: 100% •SO_2 target achieving rate: 100% •NOx target achieving rate: 100% •VOCs target achieving rate: 100%
	Rate of appropriate volatile organic compound (VOC) leakage handling	Periodically use GasFind IR; once leakage is discovered, immediately repair or change the component.	•Rate of appropriate VOC leakage handling: 100%	•Number of leaking components: 0; number of appropriately handled components (including repaired or changed): 0	•Number of leaking component: 0; number of appropriately handled components (including repaired or changed): 0

Environmental performance indices

Issues	Index item	Calculation method	Index target	Index results	
				2017	2018
2. Water quality	Qualification rate of marine water quality	Ratio of the monitoring results from the marine water quality monitoring stations outside Mailiao Harbor conforming to the marine environment classification and ocean environment quality standard .	•Marine water quality test qualification rate: 90% (Marine water quality qualification rate is not set to 100% because it is subject to the influence of natural factors such as upstream scour and rising and ebbing tides that are cannot be controlled by the harbor)	•Marine water quality test qualification rate: 100%	•Marine water quality test qualification rate: 93.89%
	Harbor water quality qualification rate	Ratio of the monitoring results from the marine water quality monitoring stations inside Mailiao Harbor conforming to the marine environment classification and ocean environment quality standard.	•Harbor water quality test qualification rate: 100%	•Harbor water quality test qualification rate: 100%	•Harbor water quality test qualification rate: 100%
3. Hazardous goods (handling/ storage)	Total number of disasters	Total number of disasters	•0 disaster	•Number of disasters: 0	•Number of disasters: 0

Port authority

Environmental performance indices

Issues	Index item	Calculation method	Index target	Index results	
				2017	2018
4. Cargo spillage (handling)	Number of harbor inspection, cargo spillage emergency response drill, and joint supervision of harbor safety	Number of harbor inspection, cargo spillage emergency response drill, and joint supervision of harbor safety.	• Number of spill incidents: 0 • Frequency of harbor inspection: ≥ 5 times/day • Frequency of cargo spillage emergency response drill: ≥ 3 times/year (harbor area: 2; harbor marine area: 1) • Frequency of joint supervision of harbor safety: ≥ 5 times/year	• Number of spill incidents: 0 • Frequency of harbor inspection: 5 times/day • Frequency of cargo spillage emergency response drill: 3 times/year (harbor area: 2; harbor marine area: 1) • Frequency of joint supervision of harbor safety: 5 times/year	• Number of spill incidents: 0 • Frequency of harbor inspection: 5 times/day • Frequency of cargo spillage emergency response drill: 3 times/year (harbor area: 2; harbor marine area: 1) • Frequency of joint supervision of harbor safety: 5 times/year
5. Vessel discharge (sewage)	Execution results of commissioning oily bilge water cleanup service to qualified operators	Number of vessels receiving oily bilge water cleanup service from qualified operators÷ number of vessels receiving oily bilge water cleanup service × 100%	•Ratio of vessels receiving oily bilge water cleanup service from qualified operators: 100%	•Ratio of vessels receiving oily bilge water cleanup service from qualified operators: 100%	•Ratio of vessels receiving oily bilge water cleanup service from qualified operators: 100%

Environmental performance indices

Issues	Index item	Calculation method	Index target	Index results	
				2017	2018
5. Vessel discharge (sewage)	Locking of vessel sewage valve	When conducting vessel safety and sanitation inspections, the port security section personnel check whether the external sewage valve has been closed and locked.	•Sampling rate: 15%; locking of vessel sewage valve: 100%	•Sampling rate: 19.95%; locking of vessel sewage valve: 100%	•Sampling rate: 19.42%; locking of vessel sewage valve: 100%
	Water quality test in trough area before and after sewage processing	Raw qualification rate of sewage collection = Raw number of qualification in sewage collection test/number of sampling tests Qualification rate of sewage discharge = Number of qualification in sewage discharge test/number of sampling tests	•Raw qualification rate of sewage collection: 100%; •Qualification rate of sewage discharge: 100%	•Number of raw sewage sampling tests: 467; qualification rate: 100% •Number of sewage discharge sampling tests: 365; qualification rate: 100%	•Number of raw sewage sampling tests: 467; qualification rate: 100% •Number of sewage discharge sampling tests: 365; qualification rate: 100%

Environmental performance indices

Issues	Index item	Calculation method	Index target	Index results	
				2017	2018
6. Management of dredging	Qualification rate of water quality after beach nourishment	Test for water turbidity 1 hour after landfill and beach nourishment operations to determine whether the turbidity level falls below the level of Class A marine environment (i.e., 50 NTU), a level that does not affect the survival of oysters .	•Qualification rate of water turbidity test: 100%	•Qualification rate of water turbidity test: 100%	•Qualification rate of water turbidity test: 100%
	Qualification rate of sediment quality (Ar, Cd, Cr, Cu, Hg, Ni, Pb, and Zn)	Sediment quality satisfying the upper limit of sediment quality indices in the “Regulations Governing the Classified Management of Sediment Quality and Usage Restrictions.”	•Sediment quality qualification rate: 100%	•Sediment quality qualification rate: 100%	•Sediment quality qualification rate: 100%
7. Habitat/ (marine) ecosystem	White dolphin conservation measures (in accordance with the commitment made in the environmental impact assessment, under weather and sea conditions that are safe for navigation, vessels should reduce speed to below 6 knots; calculate the implementation rate of vessels complying with speed restriction guidelines)	Number of times sea conditions were confirmed ÷ number of flat tides × 100%	•Implementation rate: 100%	•Number of sea-state assessments= 1,411 times; assessment completion rate = 100%	•Number of sea-state assessments = 1,410 times; assessment completion rate = 100%

Environmental performance indices

Issues	Index item	Calculation method	Index target	Index results	
				2017	2018
8. Energy and resource consumption	Rainwater harvesting	According to the rainwater harvesting project, the annual volume of rainwater harvested and usage rate at the harbor administration building and trough area are calculated. Water conservation measures: The harbor company installed three water harvesting troughs (20 tons ×3) for rainwater harvesting and reuse in the harbor operations administration area.	•Rainwater harvesting and reuse rate: 100%	•Trough area rainwater harvesting volume: 208,598 tons; reuse rate: 100% •Harbor administration building rainwater harvesting volume: 107 tons; reuse rate: 100%	•Trough area rainwater harvesting volume: 345,615 tons; reuse rate: 100% •Harbor administration building rainwater harvesting volume: 8 tons; reuse rate: 100%
	Exchange rate of lighting equipment	Number of harbor administration area street lamps changed to power-saving LED lamps. Total number of lamps changed ÷ Total number of lamps = Lamp exchange rate	•Total number of lamps changed: 100%	• Mailiao Harbor Administration Corporation: Replacement of 76 lamps; replacement rate = 100%. • Formosa Petrochemical Corporation MAI-LIAO Terminal Department : Replacement of 826 lamps; replacement rate = 100%.	

Environmental performance indices

Issues	Index item	Calculation method	Index target	Index results	
				2017	2018
9. Harbor waste	General waste volume removed and recycling rate	General waste recycling volume ÷ general waste volume removed × 100%	•Recycling rate: 10%	•General waste volume removed from the harbor company: 347.51 tons •General waste recycled in the harbor company85.22 tons •General waste removed from the Formosa Petrochemical Terminal Department: 2,633.04 tons •General waste recycled in the Formosa Petrochemical Terminal Department: 1,196.76 tons •Recycling rate: (85.22+1,196.76)÷(374.51+2,633.04)×100%=43.01%	•General waste volume removed from the harbor company: 341.83 tons •General waste recycled in the harbor company: 63.46 tons •General waste removed from the Formosa Petrochemical Terminal Department: 1,443 tons •General waste recycled in the Formosa Petrochemical Terminal Department: 653.52 tons •Recycling rate: (63.46+653.52)÷(341.83+1,443)×100%=40.17%

Environmental performance indices

Issues	Index item	Calculation method	Index target	Index results	
				2017	2018
10. Vessel refueling	Implementation rate of onshore pipeline, oil barge, and vehicle refueling	Ratio of refueling operations performed according to the “Regulations Governing Refueling Operations at Mailiao Harbor.”	•Ratio of onshore pipeline refueling operations conforming to the Regulations: 100% •Ratio of oil barge refueling operations conforming to the Regulations: 100% •Ratio of vehicle refueling operations conforming to the Regulations: 100%	• Ratio of onshore pipeline refueling operations conforming to the Regulations: 100%, fuel refueling volume:52,126 kL; diesel refueling volume: 4,126 kL • Ratio of oil barge refueling operations conforming to the Regulations: 100%; fuel refueling volume: 81,250 kL; diesel refueling volume: 9,111 kL	• Ratio of onshore pipeline refueling operations conforming to the Regulations: 100%; fuel refueling volume: 88,220 kL; diesel refueling volume: 12,742 kL • Ratio of oil barge refueling operations conforming to the Regulations: 100%; fuel refueling volume: 75,605 kL; diesel refueling volume: 1,240 kL
	Implementation rate of refueling operations using an oil boom	Before a refueling vessel is connected to the pipeline during onshore refueling operations, the ratio of harbor staff performing the loading and unloading of oil-based products in accordance with related regulations in the “Regulations Governing the Loading and Unloading of Dangerous Goods at Mailiao Industrial Harbor.”	•Implementation rate: 100%	•Implementation rate of using an oil boom when refueling: 100%	•Implementation rate of using an oil boom when refueling: 100%

Environmental performance indices

Issues	Index item	Calculation method	Index target	Index results	
				2017	2018
1. Air quality	Qualification rate of air quality (217 items, including acetaldehyde, acetic acid, acetonitrile, and acetone in the air)	Two monitoring vehicles are used to strictly control the values of various common air pollution indices. They periodically move to appropriate areas for sampling, and the sampled data are checked according to the following regulations governing harbor air pollutant concentrations. 1. The appendix table of the standards for the emissions at peripheral boundaries, which is attached to the fixed pollution source air pollutants emission standards. 2. Permissible concentration of hazardous substances in the air in a working environment with workers. 3. “Odor threshold of odorous substances at offshore industrial zone,” (CTCI, 1990). 4. Maximum incremental reactivity scale.	•Monitoring frequency: ≥ 1 time/year •Qualification rate: 100%	•Monitoring frequency: 1 time/year •Qualification rate: 100%	•Monitoring frequency: 1 time/year •Qualification rate: 100%

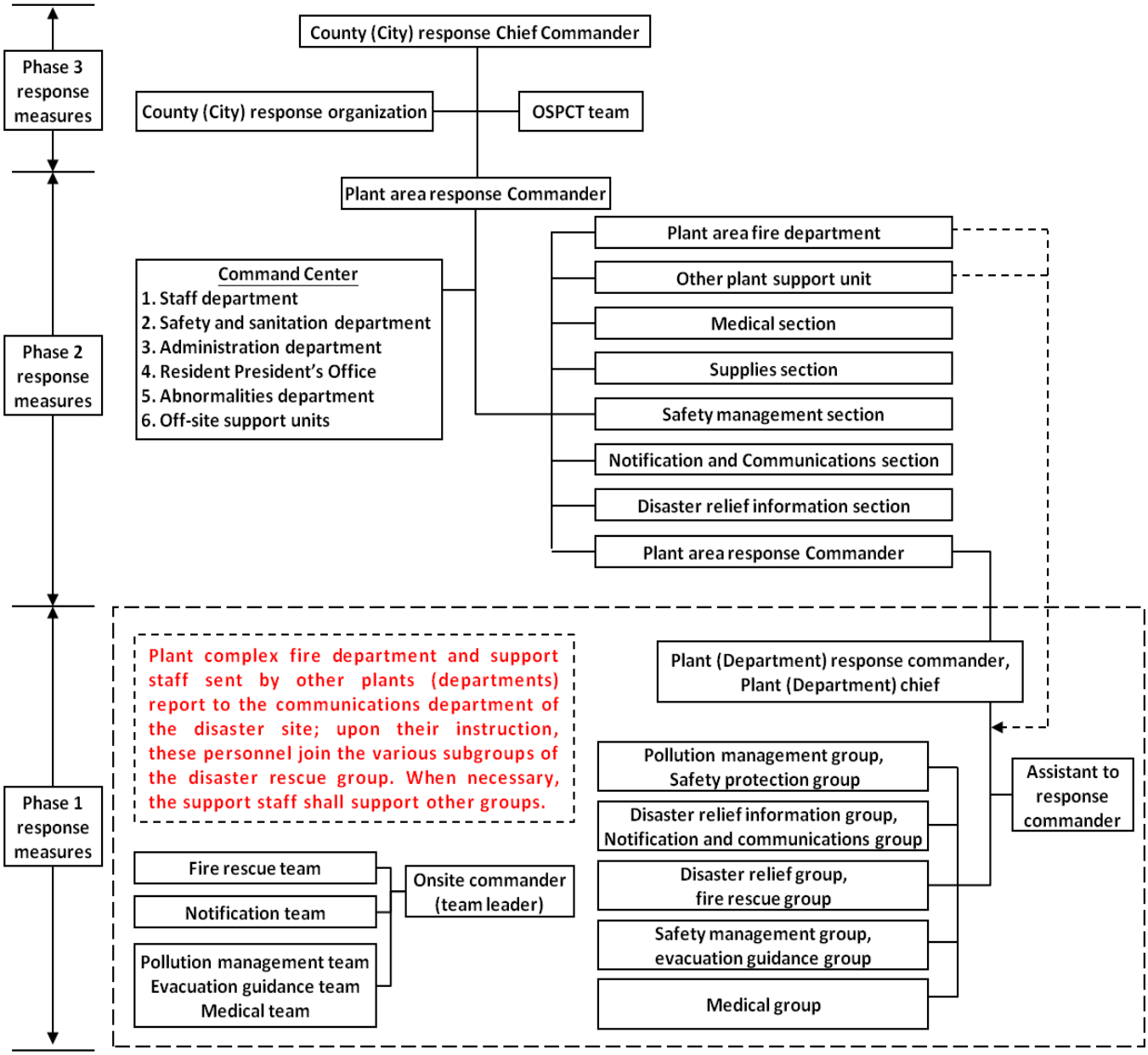
Stakeholder

Environmental performance indices

Issues	Index item	Calculation method	Index target	Index results	
				2017	2018
1. Air quality	Proportion of inbound ships using low-sulfur fuel Proportion of large diesel-powered vehicles conforming to emission standards	Pursuant to the Air Pollution Control Act, executives at all levels are authorized to delineate air quality maintenance zones according to the local conditions. Accordingly, the Environmental Protection Bureau, Yunlin County included Mailiao Harbor in the designated air quality maintenance zone. To maintain the air quality in the harbor, Mailiao Harbor initiated a green transport plan. •Number of inbound ships operating on low-sulfur fuel ÷ total number of inbound ships × 100% •Number of inbound large diesel-powered vehicles conforming to the emission standard ÷ total number of inbound large diesel-powered vehicles × 100%	• Proportion of private ships operating on low-pollution fuel (sulfur ≤0.5) = 100% • Proportion of large diesel-powered vehicles conforming to the emission standards in Q1–Q3 = 100%	(Implemented since 2018)	• Proportion of inbound ships operating on low-pollution fuel (sulfur ≤ 0.5) = 100% • Proportion of large diesel-powered vehicles conforming to the emission standards in Q1–Q3 = 100%
7. Habitat/ (marine) ecosystem	Regeneration of fishery resources (release of fry into adjacent sea areas)	Times of fry releasing	•Release of fry : ≥ 1 time/year	•Release of fry : 1 time/year •573,000 fry in total	•Release of fry : 1 time/year •602,000 fry in total

06/ Emergency Response

Mailiao Harbor emergency response organization structure



To prevent and avoid accidents, as well as to reduce the damage caused in the event of an accident, Mailiao Harbor regularly implements emergency response drills for all possible accidents and formulates emergency responses for marine pollution events. Additionally, the harbor planned a comprehensive early warning system to check various situations at any time.

Emergency response drill

To familiarize all staff members with emergency response operations during an accident, the harbor regularly implements simulation drills (every 6 months) according to the “Emergency Response Plan.” The emergency response drill plan includes the drill process and drill manual; explanations for the complete emergency response organization structure, operations flowchart, and notification process; and recovery operations and accident investigations after an accident. During the drill, all participating personnel must wear protective gear; thus, they learn how to use the various types of protective gear, and determine any problems for review. The drills are practiced in the hope of controlling a disaster in the shortest time possible after its occurrence, to prevent the disaster from spreading, and to minimize damage and threats. The drills are also hoped to instill disaster awareness in all staff, achieve process safety management, ensure process safety, and prevent disasters. Moreover, the identified areas of problem will be continually reviewed and improved to prevent similar abnormal events from reoccurring.

Emergency response for marine pollution

To prevent, eliminate, or reduce the impact of marine oil pollution emergency incidents on the ecological environment at Mailiao Harbor and the health and property of nearby residents, whenever an emergency incident of marine oil pollution is anticipated or has occurred, notification should be conducted immediately to implement response measures. The resources of government authorities, businesses, and co-operating businesses are integrated promptly and effectively to obtain pollution handling equipment, materials, and expert technicians, to achieve safe, immediate, effective, and coordinated response operations.

Therefore, to enhance the accident response ability of harbor staff, Mailiao Harbor co-ordinates with various authorities each year, holding various drills that include marine oil pollution and chemical disaster prevention to familiarize harbor staff with the marine pollution emergency notification system and to continually improve the system. Moreover, the harbor integrates and coordinates the resources and response operations of government authorities, businesses, and cooperating businesses, and establishes a joint defense system. Other measures implemented by the harbor include enhancing emergency response and handling capabilities for marine pollution incidents, and effectively preventing marine accidents or minimizing damage caused by marine accidents, thereby enhancing the accident response capability of the harbor area.

The marine pollution emergency response operations

Through these marine pollution emergency response operations, the harbor has enhanced the familiarity of harbor staff with the notification process and clarified the division of responsibility during marine pollution emergencies for the most rapid response, and established better communications and mutual supporting channels between authorities, businesses, and cooperating businesses during marine pollution emergencies. Disaster rescue resources, labor, and equipment are used to enhance the overall disaster rescue capability and reduce impacts on humans, ecology, environment, and property. Moreover, the operations have enhanced the awareness of relevant operational personnel and the public regarding disaster management, specifically through workshops, training, drills, and concept promotion. A coordinated marine accident emergency response system was established, and the related procedures were formulated.

The marine pollution emergency response operations

An inflatable offshore oil boom was towed to the oil spill site to contain the oil within the boom

A skimmer was brought to the site of the oil spill to collect the oil

The vessel that deployed skimmers docked and transported the collected oil to the vacuum truck

Mailiao Harbor

Furthermore, to enhance the emergency response capacity of the harbor, Mailiao Harbor purchased Taiwan's first offshore pollution cleanup vessel, named "Mailiao Marine." It was manufactured by Ecoceane (France), and delivered to Taiwan in November 2015. The entire vessel is made of aluminum alloy, and it is lighter than a steel vessel. It features spark-free performance in collision accidents, providing superior safety. In the place of traditional oil skimmers, the vessel uses patented water tunnel system technology to suck oil floating on the ocean surface into the vessel, and then uses a physical method to separate the oil from water directly. The vessel can be moved to any other sea areas in Taiwan on the demand of the EPA to assist in treating marine pollution in such areas.

Passage planning in the pilot cabin

Control room in the Mailiao Marine.

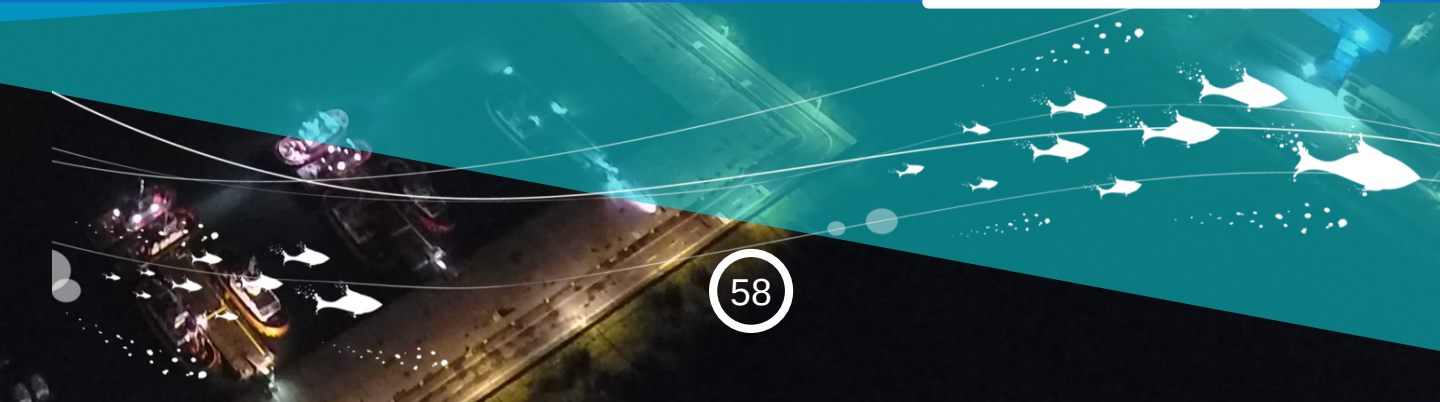
Marine communication system

Control room in the Mailiao Marine.

Screen for monitoring of the oil collection operation

Drill of oil spill collection by the vacuum drainage system of the Mailiao Marine

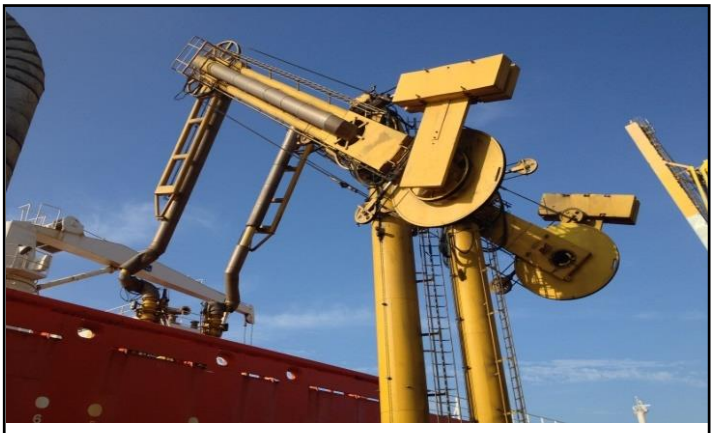
07/ Examples of Environmental Practices



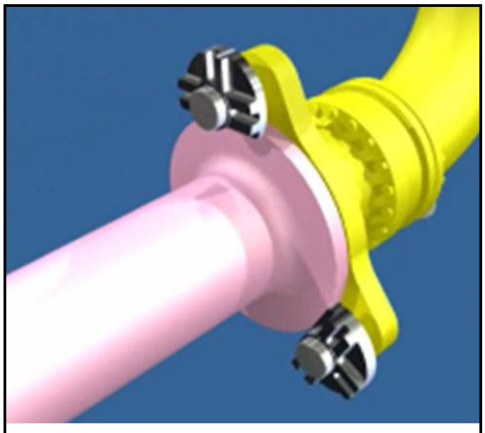
Safe, environmental, and efficient transportation and storage facilities

The Mailiao Harbor uses a marine loading arm, enclosed ducts that run separately, and oil booms. The loading arm was purged with nitrogen and thus would result in no residuals; quick connect/disconnect couplers, vapor recovery units, emergency release couplers, and an emergency power supply were used in the loading arm to protect the environment and workers at the harbor from harm caused by ruptured or cracked oil loading hoses. Enclosed independently running ducts were employed to prevent contamination from one another in the process of loading various materials. Oil booms were used to prevent pollution from spreading, to safeguard protected areas, and to collect pollutants.

The loading and unloading of oil products at the Mailiao Harbor are conducted using the loading arm to connect ships and the shore and using the enclosed ducts for transportation and storage. Enclosed stevedoring of chemical products are conducted by connecting the loading arm to ships' manifolds and enabling the transport of products through ducts from the loading dock to storage tanks at the shore. The installment of a vapor recovery hose can prevent the emission of volatile organic compounds harmful to the human body into the air. Safety, workers' health, and environmental protection are all ensured in the loading and unloading operations at Mailiao Harbor. The operations are efficient: A 280,000-ton crude tanker can be unloaded within 36 hours, achieving an average rate of 7,500 tons/hour.



Marine loading arm



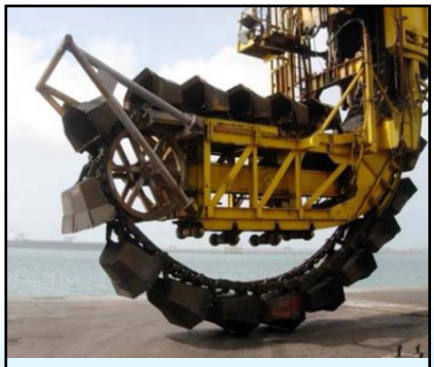
Picture of a loading arm connected to ducts

Airtight transportation and storage facilities

Break bulk cargoes are the main goods loaded and unloaded in a general commercial harbor. The dust generated during the loading and unloading operations can be detrimental to the air quality at the harbor if no preventive measures are employed. Mailiao Harbor is an industrial harbor and is used specifically for the import and export of raw materials and finished goods of firms at the Yunlin Offshore Industrial Park. Because of the noise and waste gases produced by fuel loading machines at the harbor, Mailiao Harbor uses effective loading devices powered by electricity and equipped with artificial intelligence technology to reduce energy consumption and carbon emissions. The software and hardware facilities at Mailiao Harbor are all highly effective and produce little pollution. The harbor's two chain bucket ship unloaders and six screw ship unloaders are all powered by electricity.

Subject to the southwest monsoon in the summer and the northeast monsoon in the winter, Mailiao Harbor is affected by dust transported by winds. To avoid dust pollution in Mailiao due to the winds, transportation and storage in the port for solid bulk cargoes employs a coal unloader for transportation and storage operations from a loading dock to the shore through an airtight conveyor. These operations achieve a low level of pollution, are highly efficient (1,000 tons/hour per unloader), and produce no fugitive dust. When the electricity supply is interrupted, the power generator of the coal unloader serves as the back-up power supplier for the transportation of coal from the loading dock.

Chain bucket ship unloader



Screw ship unloader

Yellow: coal unloader
White: conveyor belt

08/ Green Statistics

Environmental investment and costs

The costs of investment for Mailiao Harbor in environmental issues could be classified into employees, environmental maintenance and management, environmental monitoring, emergency response, and communication and publications. The goal was to enhance the environmental awareness of employees, maintain harbor area environment and enhance quality, increase emergency response ability, and enhance public understanding of the harbor. The various costs are explained as follows:

- **Employees:** The staff costs for hiring employees handling environmental affairs and the expenses of environmental education and training
- **Environmental maintenance and management:** Harbor area landscaping, waste removal, and harbor dredging
- **Environmental monitoring and planning:** Environmental monitoring such as air, noise, water quality, sediment, dredging, and environmental patrol; planning focused on the harbor's environmental protection objectives or measures
- **Emergency response:** Accident handling expenses, and verification expenses for materials and dangerous substances polluting the harbor area
- **Communications and publications:** Website maintenance, promotional activities, and environmental publications

The total costs of investment for Mailiao Harbor in 2017 and 2018 were NT$ 2,003,943,880 and NT$ 2,163,696,472, respectively, equaling approximately 57.26 million Euros and 61.82 million Euros. The following table presents the detailed cost breakdown.

Expenses	2017	2018
Employees	441,516,000	419,918,000
Environmental maintenance and management	1,513,793,136	1,684,610,850
Environmental monitoring and planning	40,995,004	50,319,819
Emergency response	3,036,973	4,123,442
Communications and publications	4,602,767	4,724,361
Total	2,003,943,880	2,163,696,472

The cost of investment of Mailiao Harbor toward environmental issues in 2017 and 2018 (Unit: NT$)

Environmental assets

To develop the harbor into an environmentally friendly green port, Mailiao Harbor invested considerable fixed assets toward tackling environmental issues to promote harbor development and renewal. The total amount of fixed assets invested by Mailiao Harbor toward environmental issues in 2017 and 2018 was NT$ 12,817,762 and NT$ 25,378,261, respectively, equaling approximately 366,222 Euros and 725,093 Euros.

Assets invested by Mailiao Harbor toward environmental issues in 2017 and 2018 (Unit: NT$)

Year	Type of asset	Item	Amount	Total
2017	Machine and equipment	Unmanned aerial vehicle camera	104,762	12,817,762
		CCTV system for the south embankment	9,980,000	
		Engine-powered hot-water high-pressure cleaner	283,000	
		Meeting presentation system	2,450,000	
2018	Transportation and communication equipment	Official vehicle (AZF-3137)	980,952	25,378,261
	Housing and construction	Reconstruction of Mailiao Harbor's fencing: reinforced concrete fencing construction	13,521,809	
		Rainwater collection tanks	465,000	
	Machine and equipment	Hardware facilities for real-time monitoring of currents in Mailiao Harbor	3,200,000	
		Access control system in Mailiao Harbor	2,720,000	
		Night vision surveillance cameras in Mailiao Harbor	2,750,000	
		Video call system	1,140,500	
		Fiber-reinforced plastic square cooling tower	600,000	
Total				38,196,023

09/ Innovation and Cooperation

Participating and collaborating organizations

Academic institutions

Kaohsiung University of Science and Technology

National Kaohsiung University of Science and Technology was commissioned in 2017 to conduct the Wave Monitoring Plan in Mailiao Harbor. The university analyzed the measured wave data and devised rules for ships to dock at the harbor during a swell, aiming to ensure the safety of ships and harbor facilities. The university provided measured wave data at the Formosa Petrochemical Corporation MAI-LIAO Terminal Department as a reference to determine when to issue warnings, to stop loading and unloading operations, or to disconnect hoses; this prevents the loading arm from breaking during operations due to the waves, which can result in spills.

Taiwan Hydraulics Laboratory, National Cheng Kung University

This is a specialized research institution established by collaboration between the Water Resources Agency, Ministry of Economic Affairs and National Cheng Kung University. The laboratory has been commissioned by the Industrial Development Bureau, Ministry of Economic Affairs to conduct the Environmental Monitoring Plan in the Coastal Areas in Yunlin for a period of more than 20 years.

Therefore, it has extensive knowledge of the trends in environmental change for Yunlin's coastal areas and has assisted the Mailiao Harbor Administration Corporation in applying for certification as a green, ecofriendly port from the European Sea Ports Organisation.

National Taiwan Ocean University

Professor Chien Lien-kwei from the Department of Harbor and River Engineering at the National Taiwan Ocean University was invited in 2017 to deliver a speech on Evaluation of Coastal Damage Potential and the Classification of Coastal Protection Zones in Taiwan.

Academic institutions

National Yunlin University of Science and Technology

National Yunlin University of Science and Technology was commissioned to critical infrastructure protection affairs. The Office of Homeland Security, Executive Yuan decided to conduct the 2018 drill in Mailiao Harbor. The drill was conducted in the form of a tabletop exercise—required by the Office of Homeland Security—in conjunction with prerecorded contents. Moreover, the drill required the participation of members from various departments and local governments to evaluate the responses of supervisors and executives at all levels, namely their leadership, ability to issue orders, responses to emergencies, and response procedures. Such participation was hoped to improve all units' capacity in critical infrastructure protection.

Government authorities

Environmental Protection Bureau, Yunlin County

Participated in the 2017 emergency drill for marine pollution held in Mailiao Harbor.

Coordinated the 2018 Yunlin emergency drill for marine pollution with organizations including the Formosa Petrochemical Corporation.

Cooperated with the Environmental Protection Bureau, Yunlin County in its inspection of the Mailiao Harbor and ships in the harbor.

Maritime and Port Bureau, Ministry of Transportation and Communications
Central Taiwan Maritime Affairs Center

Cooperated with the Central Taiwan Maritime Affairs Center in its on-board inspections for port state control and flag state control in Mailiao Harbor.

Government authorities

Yunlin County Police Bureau

Yunlin County Police Bureau, Mailiao Harbor Administration Corporation, Formosa Petrochemical Corporation, and several other organizations jointly organized a task-based speech on harbor security and the International Ship and Port Facility Security in the Taixi police station in 2017. The speech topics included the following: Harbor Epidemic Prevention; Dengue Fever, Chikungunya Fever, and Zika Fever; Implementation and Verification of Harbor Facility Security; and Guidelines for Practice of Harbor Security

Yunlin County Fire Department

Participated in the 2017 emergency drill for marine pollution held in Mailiao Harbor.

Participated in the 2018 emergency drill for marine pollution held in Mailiao Harbor.

Foundations and consulting companies

National Yunlin University of Science and Technology

Sinotech Engineering Services, Ltd. was commissioned by Mailiao Harbor Administration Corporation in 2019 to conduct the Green Port/EcoPort Certification Plan for Mailiao Harbor, helping Mailiao Harbor Administration Corporation apply for certification as a green, ecofriendly port from the European Sea Ports Organisation.

Foundations and consulting companies

CECI Engineering Consultants, Inc., Taiwan

The harbor craft basin has been in use since 2000. According to recent elevation measurements and on-site observation of the southwest and northwest pier platforms, the basin was flooded during spring tides due to land subsidence, which resulted in hazards to on-site workers and passing cars. Therefore, Mailiao Harbor Administration Corporation commissioned the CECI Engineering Consultants in 2017 to conduct the Evaluation Plan for the Improvement and Elevation of Pier Platforms at the Harbor Craft Basin. The collected data were compared with the initial design conditions to understand the degree of wear in the structure and to design a method of pier platform elevation and improvement, in the hope of enhancing the structural security of the elevated pier platforms and their lifespans. In 2018, CECI Engineering Consultants was commissioned by Mailiao Harbor Administration Corporation to conduct the real-time maneuvering simulation of Mailiao Harbor's 300,000-deadweight-tonnage very large crude carrier. The purpose of this plan was to simulate the docking of a 300,000-deadweight-tonnage very large crude carrier with a draft from 20.3 to 20.6 m when it enters the harbor; the feasibility of the deadweight-tonnage very large crude carrier when its draft is 20.6 m was examined with the following conditions defined: At the inbound channel, the height of the tide was set at 23 m, the width of the channel at 565 m, and the tide height in the outer and entrance channels at 24 m.

China Marine Institute

The Taipei University of Marine Technology was commissioned in 2018 to conduct the training of vessel traffic service operators at the harbor's signal station to improve the operators' competencies and self-training skills as well as to familiarize them with the operational procedures of vessel traffic management and appropriate emergency responses, thereby increasing the overall quality of the vessel traffic services.

CR Classification Society

The CR Classification Society was commissioned in 2019 to conduct the Evaluation and Plan of Harbor Facility Security at Mailiao Harbor as well as to apply to the Ministry of Economic Affairs for the renewal of the harbor's Statement of Compliance of a Port Facility

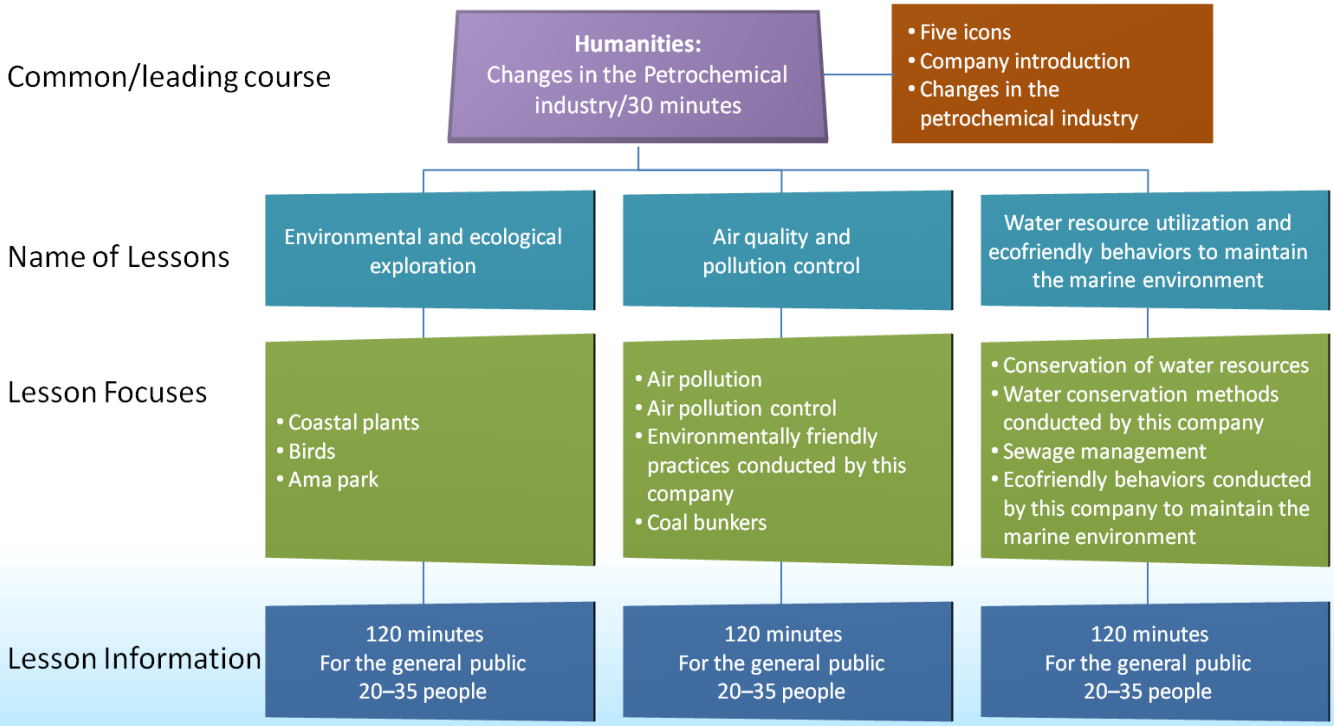
10/ Training

Increasing environmental awareness in recent years has prompted Mailiao Harbor's parent company, Formosa Plastics Group, to recognize environmental protection as a public concern. Today, environmental education is an emerging public movement. However, the public generally considers factories or businesses to be the main sources of environmental pollution. Therefore, this company constantly improves and enhances its measures of pollution prevention, and believes that its duty is to educate the public. Thus, implementing comprehensive corporate environmental education provides the company and its workers with a joint target, namely to enhance the environmental literacy of its employees and the people's sense of identification with this place, thereby enabling everyone to learn more about this company.

The design concept of the Mailiao park environmental education class has a set of common lessons and two main core lessons. The leading course is "The developmental history of the petrochemicals industry," followed by the two core theme lesson plans, "Air quality, water quality, and marine environment." The lesson plans include "Humanities education: History of industrial development in Taiwan and the importance of Taiwan's petrochemical industry," "Air quality and pollution control," and "Water resource utilization and ecofriendly behaviors to maintain the marine environment." In the future, the company will continue to development short-, medium-, and long-term courses; for short-term development, an "Environmental and ecological exploration lesson" has been planned for future environmental education classes.

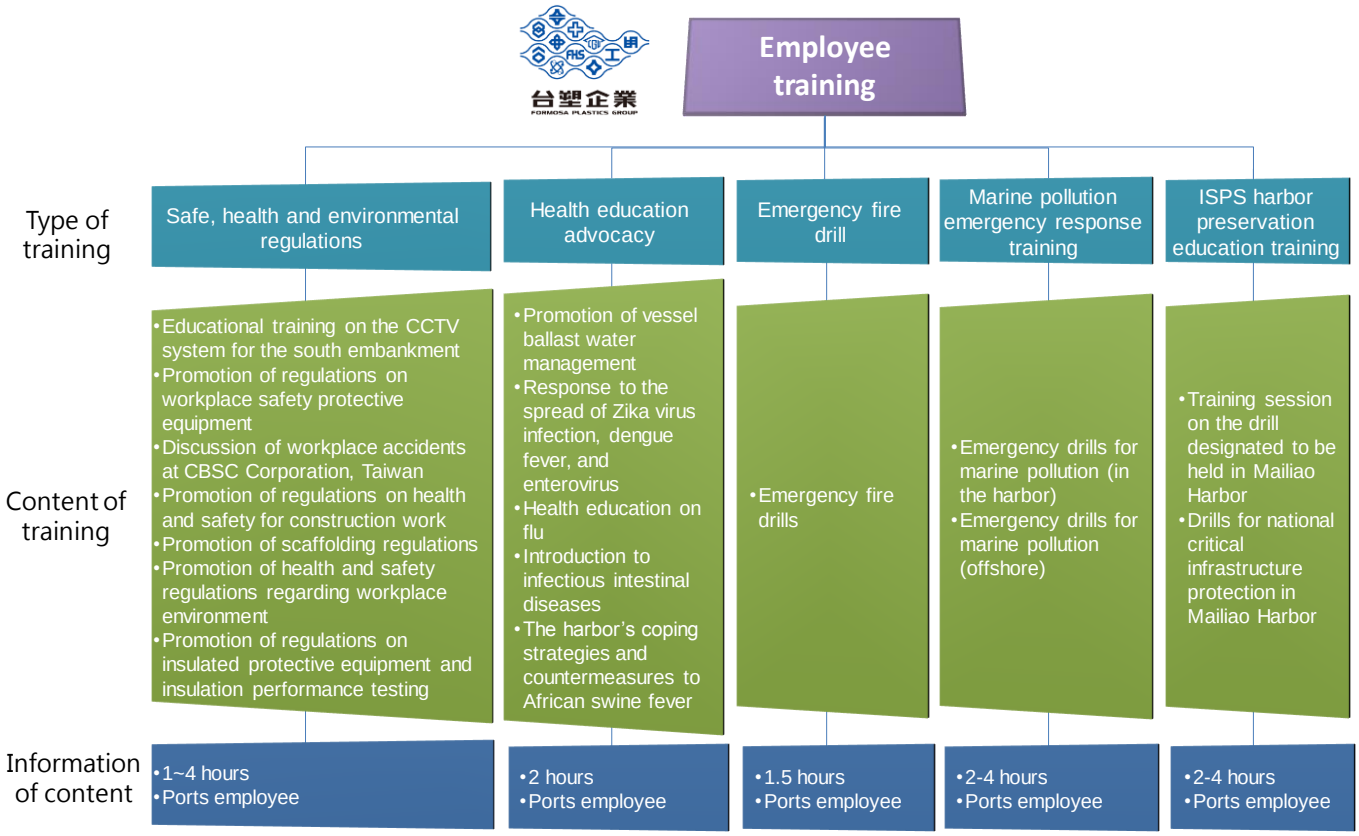
Mailiao park environmental education facility plan

台塑企業
FORMOSA PLASTICS GROUP



Employee training and education in Mailiao harbor can be divided into five parts: “Safe, health and environmental regulations” “Health education advocacy” “Emergency fire drill” “Marine pollution emergency response training” “ISPS harbor preservation education training”. The total training hours is 9,252 man-hour in 2017 and 6,597 man-hour in 2018.

Mailiao harbor employee training contents



Mailiao harbor employee training situation from 2017 to 2018

Unit: man-hour

Curriculum Field	Harbor		Terminal Department	
	2017	2018	2017	2018
Safe, health and environmental regulations	1,758	1,674	3,065	2462
Health education advocacy	220	320	173	302
Emergency fire drill	180	180	173	302
Marine pollution emergency response training	1,120	1,160	60	60
ISPS harbor preservation education training	880	1,760	-	-
Total	**4,158**	**5,094**	**3,471**	**3,126**

11/ Communications and Publications

Activity

In addition to maintaining a sound environment, the Formosa Plastics Group endeavors to communicate with the local communities, support local communities, and contribute to the society, fulfilling its corporate responsibility as a good neighbor.

Widespread participation in environmental protection

Mailiao Industrial Park held the first Companies and Communities as a Family event in 2013. In 2017, the park collaborated with Mailiao Township Office's cleaning team, engaged nearly 500 people, comprising students and staff members from companies and contractors, and provided large machines and cleaning tools to clean the streets and windbreaks in Mailiao Township, creating a cleaner hometown with the participation of local businesses and communities.

Fostering arts and cultural literacy of local members

To cultivate arts and cultural literacy among local members, cultural troupes, including the If Kids Theater, Apple Theater, and the Ming Hwa Yuan Arts and Culture Group are invited each year to perform in the township. Through performances, these troupes have brought artistic and cultural elements into the remote coastal township. From 2017 to 2018, five public performances were held in Mailiao, Taixi, Beigang, and Douliu, with a combined audience of 9,200 people.

Donations to schools and local infrastructures

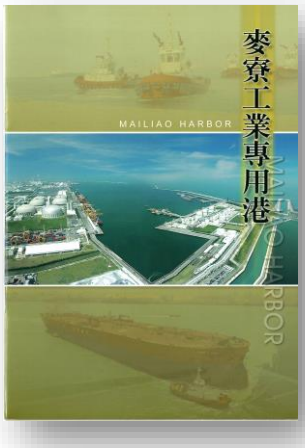
From 2017 to 2018, Mailiao Harbor Administration Corporation donated NT$ 9.3 million to students in low-income families, students in middle-to-low-income families, and students experiencing sudden changes in their family circumstances at 34 local high schools and elementary schools. These donations were used to provide balanced and healthy breakfasts to these students for improving their learning performance. In 2018, the corporation donated 470 million to create the Mailiao Social Education Park, which was aimed at creating a lifestyle unique to Mailiao, cultivating an aesthetic and cultural atmosphere in the local area, improving the quality of life of local residents, and dedicating itself to Yunlin's sustainable development.

Conferences

To promote satisfactory functioning as a green, ecofriendly port, Mailiao Harbor has actively undergone and shared its experience of gaining certification as a green, ecofriendly port in conferences. It has also submitted a paper describing its experience of obtaining the EcoPorts certification to the Proceedings of the 40th Ocean Engineering Conference in Taiwan, Republic of China. The paper details the certification process and demonstrates the harbor's environmental achievements using extracts from its environmental reports. The harbor hoped to promote its achievements in becoming an ecofriendly port through the aforementioned publication. In addition, Mailiao Harbor participated in the Ocean Engineering Conference in Taiwan on November 20, 2018. In this conference, Mailiao Harbor's evolution to an ecofriendly port was orally presented, and it promoted its achievements to the audience and facilitated exchanges with experts in the same field.

Publications/Promotional material

Mailiao Harbor introduction



The Mailiao Harbor introduction introduces the background information of the harbor, including the harbor's location, an aerial view of the harbor, the harbor's history, operations characteristics, administration organization structure, and berths on operation.

Key statistics of Mailiao Harbor

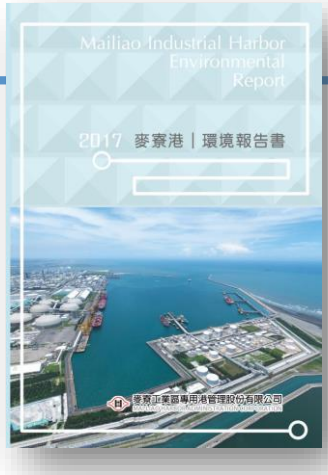
The key statistics of Mailiao Harbor includes the information of the number of vessels and the amount of cargo entering and exiting the port every year, and facts about stevedoring, financial affairs, organizational staff, and port facilities.

Yunlin Offshore Industrial Zone development process

The Yunlin Offshore Industrial Zone development process records the development process of the "Yunlin Offshore Industrial Zone Development Plan"; its contents include an overview of the development plan, status, construction site tour, sustainable environment, and future prospects.

Mailiao Harbor marine ecology survey and environmental photography project

The Mailiao Harbor marine ecology survey and environmental photography project mainly focused on photographing the underwater ecology inside and outside of Mailiao Harbor and the green ecological environment in adjacent areas. Between April 2016 and September 2017, the underwater ecology inside and outside Mailiao harbor such as the power plant discharge point, water intake point, east wharf, northwest wharf, west breakwater, harbor craft basin, and south breakwater (F), were photographed. In addition, the marine environment monitoring process inside and outside the harbor, harbor operations such as vessels entering and exiting the harbor, stevedoring operations at the wharves, harbor safety, sanitation, and environmental protection management operations were photographed. The green ecological environment at adjacent areas, such as the green constructions in the 6th Naphtha Cracker Complex and green ecology in adjacent areas, was also recorded.



Environmental report

The report described Mailiao Harbor's ecological efforts from 2015 to 2016 and the Mailiao Harbor Administration Corporation's environmental policy, objectives, pledges, and action plans for green port development.

Environmental protection map

The map presents the Formosa Petrochemical Corporation persistence in care for the Earth, advertisement of ecological and conservation concepts, and dedication to comprehensive and advanced facilities for environmental protection.

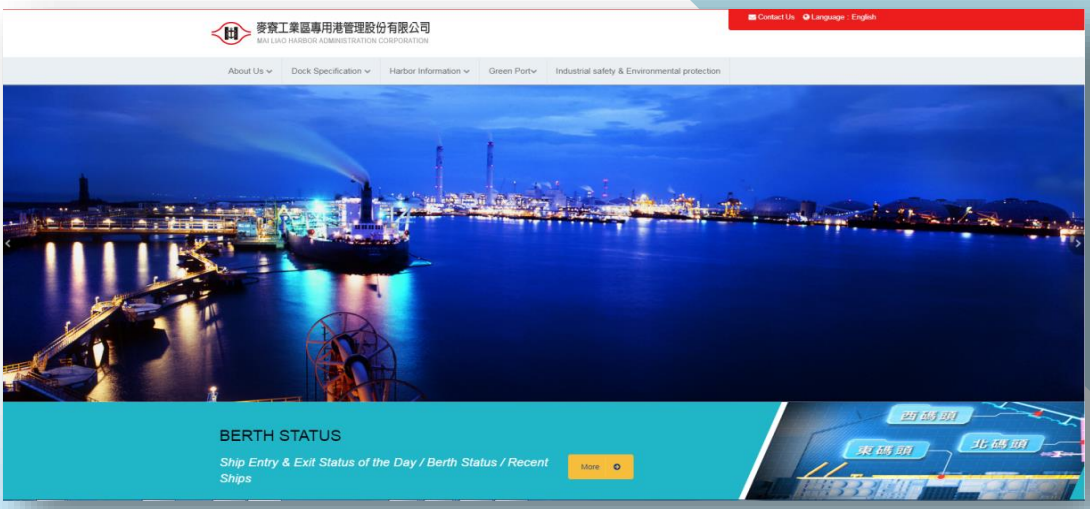
The Formosa Petrochemical Corporation has implemented environmental monitoring comprehensively, providing satisfactory environmental protection results, and has used the map to exhibit for the public its environmental protection practices and features of ecological beauty.

Websites

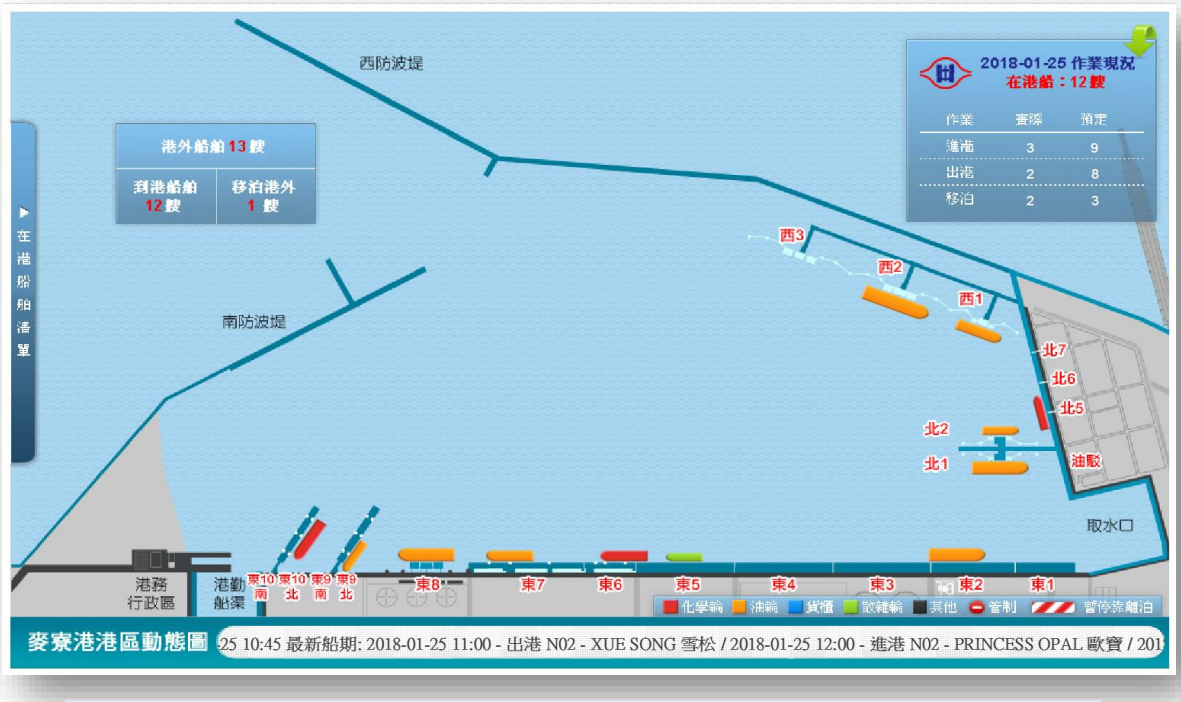
Comprehensive information on Mailiao Harbor can be found on the Mailiao Harbor Co. website: (http://www.mlharbor.com.tw/j2mlh/enus/index.do). The information found there includes the purpose of establishing the harbor, harbor operations, services, harbor status, and harbor news. The website is available to the public.

Mailiao Harbor website (Chinese version)

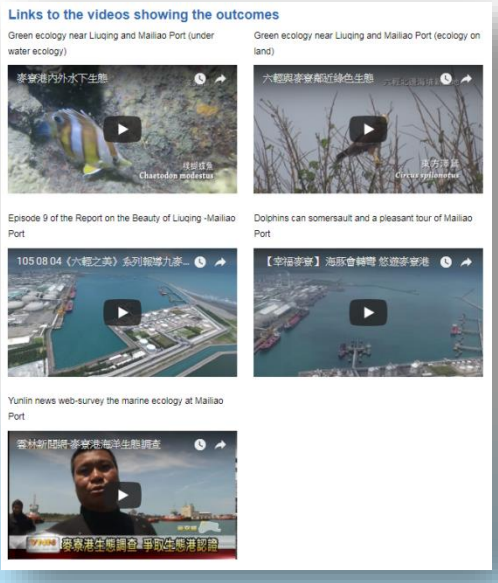
Mailiao Harbor website (English version)



Mailiao Harbor real-time movement of vessels



Results of the Mailiao Harbor marine ecology survey and environmental photography project



Workshop on green port certification

Mailiao Harbor has actively promoted various control measures for green, ecofriendly ports, aiming to improve sustainable operation and management methods for harbors. In September 2018, Mailiao Harbor received international certification as a green, ecofriendly port, which testified to Mailiao Harbor's dedication to environmental and ecological protection.

Furthermore, Mailiao Harbor listed air quality as the environmental focus of improvement and prioritized the development of onshore power supply systems. Accordingly, Mailiao Harbor held a ceremony for the launch of the onshore power supply system and for the green, ecofriendly port certification on October 5, 2018. Executives, including the county executive of Yunlin and the director-general of the Industrial Development Bureau, were invited to the groundbreaking session; the general manager of the Lloyd's Register Taiwan was invited to bestow the EcoPorts certification at the ceremony.

12/ Future Prospects

Mailiao Harbor is the first industrial harbor in Taiwan funded and managed by enterprises. It officially began operations in 2001, and since then, has become the largest industrial harbor in the country.

Even though Mailiao Harbor already used low impact sand extraction and landfilling measures during the harbor construction stage to minimize potential impacts on marine and coastal ecology, pollution discharge during operations such as vessels entering and exiting the harbor, mooring, stevedoring warehousing, and refueling, remain unavoidable. Other operations that could generate pollution include moving heavy machinery on harbor land at the terminal and warehousing areas, which may deteriorate the environmental quality of the harbor.

To reverse environmental deterioration and maintain the international trend of green, ecofriendly ports, the Mailiao Harbor Administration Corporation has actively implemented measures for green port implementation, namely reducing pollution in the harbor, maintaining the ecosystem, improving the operational effectiveness of the harbor, and increasing benefits to local communities. Certified as a green, ecofriendly port for the first time in September 2018, it will continue its efforts to implement environmental policy for harbors and to promote green, ecofriendly certification with the aim of green, ecofriendly, and sustainable port development.

Appendix

Appendix 1 - monitoring results of marine water quality near Mailiao

2017 Q1 monitoring results of marine water quality near Mailiao (1/3)

Station	Units	A type marine water quality standard	1A	1A	1A	2A	2A	2A	3A	3A	3A	4A	4A	4A
Depth	meter		1	11	21	1	11	22	1	11	21	1	12	23
Temp.	ºC		21.18	20.81	20.80	20.84	20.80	20.79	20.83	20.83	20.85	21.18	21.10	21.07
Salinity	PSU		33.541	33.487	33.485	33.494	33.506	33.502	33.502	33.546	33.567	33.643	33.733	33.714
pH	–	7.5~8.5	8.14	8.27	8.26	8.30	8.31	8.31	8.33	8.33	8.33	8.26	8.28	8.30
D.O.	mg/L	more than 5	7.77	7.89	7.72	7.80	7.86	7.75	7.83	7.69	7.81	7.74	7.65	7.62
B.O.D.	mg/L	2	1.71	1.59	1.48	1.54	1.70	1.73	1.44	1.35	1.59	1.45	1.30	1.48
E. coli	CFU/100 mL	1000	4	4	8	< 1	1	6	22	17	15	29	4	7
S.S.	mg/L		21.48	21.18	25.38	10.84	16.22	20.02	15.22	12.84	20.24	18.82	18.08	20.88
Cyanide	μg/L	10	< 5.7	8.41	6.95	9.14	8.04	9.14	8.78	5.85	8.41	9.87	8.04	8.78
Total phenols	μg/L	10	6.67	7.28	5.89	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5
Mineral oil	mg/L	2	1.12	0.56	1.84	0.68	1.20	0.68	0.92	0.72	0.76	1.60	1.48	1.56
Chlorophyll a	μg/L		0.80	0.76	0.44	0.50	0.41	0.64	0.66	0.65	0.72	0.41	0.29	0.31
Total phosphorus	mg/L	0.05	0.030	0.033	0.022	0.032	0.031	0.034	0.032	0.048	0.033	0.018	0.019	0.020
NH_3-N	mg/L	0.3	0.02	0.01	0.01	< 0.01	< 0.01	< 0.01	0.01	0.02	< 0.01	0.03	0.01	0.02
Nitrite	μg/L		26.85	25.68	25.39	21.30	18.68	16.92	18.97	18.97	16.34	16.34	16.34	16.05
Nitrate	mg/L		146.33	141.86	138.75	148.63	144.52	142.92	135.14	134.00	134.43	178.72	179.86	161.99
Cd	μg/L	10	0.089	0.069	0.079	0.073	0.071	0.077	0.047	0.045	0.055	0.038	0.038	0.040
Cr (VI)	μg/L	50	0.21	0.23	0.22	0.28	0.34	0.33	0.39	0.40	0.42	0.43	0.40	0.43
Co	μg/L		0.068	0.066	0.061	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cu	μg/L	30	0.40	0.36	0.32	0.41	0.47	0.49	0.40	0.49	0.49	0.67	0.62	0.65
Ni	μg/L		0.31	0.27	0.28	0.28	0.30	0.31	0.30	0.28	0.31	0.39	0.36	0.32
Pb	μg/L	100	0.108	0.070	0.055	0.042	0.030	< 0.03	< 0.03	< 0.03	0.052	0.030	0.040	0.033
Zn	μg/L	500	0.31	0.27	0.29	0.29	0.31	0.31	0.31	0.29	0.29	0.34	0.33	0.32
Fe	μg/L		1.58	1.48	1.38	0.75	0.78	0.72	0.74	0.69	0.79	0.64	0.70	0.68
As	μg/L	50	1.38	1.34	1.32	1.29	1.25	1.31	1.23	1.29	1.54	1.48	1.55	1.46
Hg	μg/L	2	1.26	1.46	1.56	1.13	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Turbidty	NTU		7.58	16.17	18.28	12.28	16.67	22.40	15.46	16.31	20.72	9.28	5.13	9.03
Transparency	meter		1.5	–	–	1.5	–	–	1	–	–	1.4	–	–
Silicate	μg/L		233.11	214.85	231.71	207.83	205.02	188.17	220.47	154.47	200.81	182.56	209.24	136.21
Total oil	mg/L		20.28	8.76	31.80	27.40	7.88	22.08	21.44	33.20	21.56	30.16	5.40	13.40

2017 Q1 monitoring results of marine water quality near Mailiao (2/3)

Station	Units	A type marine water quality standard	5A	5A	5A	1B	1B	1B	2B	2B	2B	3B	3B	3B
Depth	meter		1	11	22	1	7	13	1	8	15	1	8	15
Temp.	°C		21.33	21.35	21.33	21.05	20.89	20.88	21.44	20.84	20.83	21.06	20.82	20.82
Salinity	PSU		33.850	33.865	33.858	33.546	33.492	33.483	33.658	33.500	33.497	33.531	33.496	33.500
pH	—	7.5~8.5	8.31	8.33	8.35	8.10	8.27	8.27	8.03	8.29	8.28	8.15	8.22	8.23
D.O.	mg/L	more than 5	7.72	7.56	7.44	7.88	7.66	7.66	7.75	7.72	7.25	7.78	7.71	7.68
B.O.D.	mg/L	2	1.50	1.54	1.61	1.70	1.33	1.44	1.59	1.59	1.36	1.38	1.39	1.47
E. coli	CFU/100 mL	1000	—	—	—	23	5	4	12	< 1	6	12	3	2
S.S.	mg/L		—	—	—	21.56	76.94	36.62	14.04	40.16	56.50	13.86	16.94	34.32
Cyanide	μg/L	10	6.62	11.38	31.01	9.87	9.14	< 5.7	8.41	8.78	9.87	< 5.7	< 5.7	< 5.7
Total phenols	μg/L	10	1.3	—	—	7.17	6.44	7.94	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5
Mineral oil	mg/L	2	3	3	5	1.80	1.68	1.48	1.72	1.64	1.74	1.32	0.96	1.48
Chlorophyll a	μg/L		17.24	19.26	54.14	0.56	0.43	0.63	0.63	0.12	0.34	1.25	0.94	0.75
Total phosphorus	mg/L	0.05	0.017	0.015	0.019	0.034	0.029	0.021	0.031	0.024	0.036	0.035	0.012	0.008
NH_3-N	mg/L	0.3	0.02	< 0.01	< 0.01	0.02	0.01	< 0.01	0.02	0.01	< 0.01	< 0.01	0.02	0.02
Nitrite	μg/L		7.32	8.12	18.00	25.97	23.93	23.05	25.39	21.01	23.64	21.89	21.89	19.55
Nitrate	mg/L		1.40	1.56	1.64	149.51	147.07	141.15	170.55	158.02	204.15	193.46	211.62	185.64
Cd	μg/L	10	0.26	0.23	0.31	0.075	0.082	0.079	0.042	0.039	0.038	0.073	0.067	0.071
Cr (VI)	μg/L	50	16.65	14.66	18.65	0.33	0.29	0.27	0.32	0.33	0.31	0.60	0.62	0.65
Co	μg/L		161.49	174.13	179.75	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.060	0.064	0.059
Cu	μg/L	30	15.76	< 10	< 10	0.44	0.41	0.43	0.37	0.34	0.41	1.08	1.04	0.97
Ni	μg/L		7.59	6.71	5.54	0.26	0.28	0.24	0.27	0.24	0.22	0.55	0.53	0.49
Pb	μg/L	100	147.98	114.82	112.61	0.033	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.070	0.077	0.084
Zn	μg/L	500	0.021	0.018	0.019	0.32	0.30	0.33	0.29	0.29	0.29	0.37	0.39	0.37
Fe	μg/L		0.031	0.032	0.035	1.24	1.33	1.39	0.66	0.62	0.58	1.09	1.04	1.00
As	μg/L	50	0.39	0.42	0.38	1.29	1.25	1.34	1.28	1.22	1.26	1.45	1.51	1.46
Hg	μg/L	2	< 0.05	< 0.05	< 0.05	1.31	1.44	1.17	< 1	< 1	< 1	< 1	< 1	< 1
Turbidty	NTU		0.90	0.87	0.82	6.98	34.91	40.78	8.02	33.81	40.23	18.88	18.76	37.39
Transparency	meter		0.58	0.54	0.48	1.5	—	—	1.5	—	—	1	—	—
Silicate	μg/L		0.89	0.85	0.82	245.75	224.68	202.22	220.47	182.56	219.07	198.00	237.32	230.30
Total oil	mg/L		0.29	0.32	0.35	28.04	28.56	15.08	22.24	18.20	7.12	21.36	18.44	17.00

2017 Q1 monitoring results of marine water quality near Mailiao (3/3)

Station	Units	A type marine water quality standard	4B	4B	4B	5B	5B	5B	2C	3C	4M
Depth	meter		1	11	21	1	8	15	1	1	1
Temp.	°C		21.29	21.14	21.08	21.35	21.28	21.26	21.34	22.17	21.07
Salinity	PSU		33.696	33.709	33.697	33.739	33.771	33.773	33.203	33.232	33.476
pH	—	7.5~8.5	8.30	8.30	8.29	8.28	8.29	8.29	8.22	8.20	8.25
D.O.	mg/L	more than 5	7.80	7.57	7.47	7.48	7.63	7.51	7.53	7.59	6.69
B.O.D.	mg/L	2	1.45	1.33	1.36	1.41	1.56	1.64	1.71	1.67	1.68
E. coli	CFU/100 mL	1000	—	—	—	—	—	—	2	3	—
S.S.	mg/L		—	—	—	—	—	—	7.96	77.58	—
Cyanide	μg/L	10	6.48	9.07	9.86	10.50	10.10	18.33	6.22	8.04	18.42
Total phenols	μg/L	10	1.3	—	—	1.2	—	—	9.61	7.83	1
Mineral oil	mg/L	2	3	2	5	8	2	6	0.88	1.44	3
Chlorophyll a	μg/L		13.16	17.84	21.00	15.780	12.960	39.400	1.04	1.72	14.64
Total phosphorus	mg/L	0.05	0.021	0.021	0.031	0.014	0.020	0.021	0.025	0.027	0.057
NH_3-N	mg/L	0.3	< 0.01	< 0.01	0.01	0.03	< 0.01	0.03	0.02	0.02	0.05
Nitrite	μg/L		7.56	22.72	16.20	13.16	51.84	26.40	28.60	25.97	17.24
Nitrate	mg/L		1.52	1.56	1.44	1.16	1.56	1.48	166.11	159.73	1.48
Cd	μg/L	10	0.41	0.33	0.36	0.23	0.26	0.35	0.073	0.049	0.67
Cr (VI)	μg/L	50	20.65	20.98	31.31	13.99	19.98	20.98	0.31	0.34	56.62
Co	μg/L		127.79	176.94	161.49	162.90	182.56	109.53	< 0.05	< 0.05	234.51
Cu	μg/L	30	< 10	< 10	10.51	28.01	< 10	33.27	0.83	0.81	46.40
Ni	μg/L		15.76	15.17	18.97	15.17	12.84	14.01	0.52	0.55	28.01
Pb	μg/L	100	153.20	137.90	134.00	167.43	148.26	152.73	< 0.03	0.031	174.66
Zn	μg/L	500	0.027	0.030	0.026	0.015	0.017	0.016	0.34	0.68	0.019
Fe	μg/L		0.042	0.047	0.044	0.044	0.042	0.041	0.61	1.22	0.035
As	μg/L	50	0.38	0.36	0.35	0.25	0.24	0.26	1.25	1.61	0.50
Hg	μg/L	2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 1	< 1	< 0.05
Turbidty	NTU		0.57	0.57	0.60	0.64	0.60	0.57	49.32	52.00	0.89
Transparency	meter		0.87	0.79	0.73	0.52	0.45	0.41	0.5	0.5	0.36
Silicate	μg/L		0.84	0.85	0.82	0.86	0.83	0.78	268.22	174.13	0.83
Total oil	mg/L		0.27	0.29	0.27	0.38	0.37	0.40	12.32	5.80	0.51

2017 Q2 monitoring results of marine water quality near Mailiao (1/3)

Station	Units	A type marine water quality standard	1A	1A	1A	2A	2A	2A	3A	3A	3A	4A	4A	4A
Depth	meter		1	11	21	1	11	22	1	11	22	1	12	23
Temp.	°C		24.1	24.4	24.4	24.6	24.5	24.5	24.6	24.6	24.5	24.5	24.5	24.4
Salinity	PSU		33.9	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4
pH	—	7.5~8.5	7.9	7.9	8.0	8.2	8.2	8.2	8.2	8.2	8.2	8.1	8.1	8.1
D.O.	mg/L	more than 5	6.9	7.0	7.0	6.9	7.0	6.9	6.7	6.6	6.6	6.8	6.6	6.5
B.O.D.	mg/L	2	1.2	1.5	1.7	1.7	1.8	1.6	1.7	1.7	1.7	1.1	0.8	1.0
E. coli	CFU/100 mL	1000	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		21.3	26.7	19.3	11.9	20.9	17.7	13.1	12.0	16.8	17.0	16.4	24.9
Cyanide	μg/L	10	6.150	9.710	10.000	7.770	< 5.7	9.390	8.410	9.390	< 5.7	7.120	8.090	< 5.7
Total phenols	μg/L	10	< 4.5	< 4.5	< 4.5	< 4.5	5.3200	< 4.5	< 4.5	< 4.5	< 4.5	6.5400	4.6500	< 4.5
Mineral oil	mg/L	2	1.6	1.7	1.6	0.9	1.7	1.7	1.8	1.1	0.6	1.0	1.4	1.0
Chlorophyll a	μg/L		2.6	1.7	7.8	0.7	0.9	0.8	0.7	0.8	0.7	1.0	1.4	0.8
Total phosphorus	mg/L	0.05	0.019	0.012	0.015	0.009	0.010	0.012	0.022	0.009	0.013	0.023	0.019	0.018
NH_3-N	mg/L	0.3	0.02	0.02	0.07	0.07	0.07	0.06	0.02	0.02	0.02	0.02	0.03	0.03
Nitrite	μg/L		23.49	< 1.5	2.26	< 1.5	< 1.5	< 1.5	< 1.5	1.70	1.70	< 1.5	< 1.5	< 1.5
Nitrate	mg/L		46.70	77.30	88.80	75.00	81.20	79.50	102.20	90.90	97.50	51.00	67.70	79.90
Cd	μg/L	10	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cr (VI)	μg/L	50	0.1890	0.1830	0.1870	0.1820	0.1750	0.1710	0.1900	0.1860	0.1960	0.2170	0.2250	0.2130
Co	μg/L		0.1270	0.1250	0.1300	0.0900	0.0880	0.0920	0.0830	0.0800	0.0760	< 0.05	< 0.05	< 0.05
Cu	μg/L	30	0.6450	0.6180	0.6040	0.4590	0.4770	0.4360	0.4630	0.4500	0.4310	0.3450	0.3630	0.3770
Ni	μg/L		0.3120	0.2980	0.3070	0.2660	0.2740	0.2550	0.2440	0.2250	0.2140	0.2170	0.2040	0.1850
Pb	μg/L	100	0.1980	0.1900	0.1940	0.1040	0.0910	0.0950	0.1380	0.1450	0.1340	0.0670	0.0710	0.0660
Zn	μg/L	500	0.1400	0.1430	0.1490	0.1510	0.1420	0.1500	0.1530	0.1470	0.1520	0.1920	0.1980	0.2100
Fe	μg/L		0.6380	0.6180	0.6530	0.6660	0.6590	0.6490	0.6720	0.6920	0.6810	0.7460	0.7310	0.7230
As	μg/L	50	1.1240	0.9990	0.9440	0.8380	0.8130	0.8230	0.7030	0.7030	0.7030	0.7430	0.7330	0.7680
Hg	μg/L	2	9.7200	7.5000	6.0300	9.8500	7.8000	8.5600	8.0700	8.4500	7.5600	6.2300	5.7400	6.3100
Turbidty	NTU		19.8	17.9	15.6	4.8	9.2	8.0	9.3	9.3	9.4	9.0	17.4	11.7
Transparency	meter		1.5	—	—	4.0	—	—	3.5	—	—	2.5	—	—
Silicate	μg/L		107.910	59.130	60.610	45.820	54.690	50.260	51.740	51.740	45.820	39.910	48.780	45.820
Total oil	mg/L		17.2	8.5	17.4	18.4	11.4	16.0	11.3	15.0	16.3	16.4	6.8	20.7

2017 Q2 monitoring results of marine water quality near Mailiao (2/3)

Station	Units	A type marine water quality standard	5A	5A	5A	1B	1B	1B	2B	2B	2B	3B	3B	3B
Depth	meter		1	12	23	1	6	12	1	8	15	1	7	14
Temp.	°C		24.5	24.5	24.5	24.2	24.2	24.2	24.4	24.2	24.2	23.5	24.0	24.0
Salinity	PSU		34.4	34.4	34.4	34.2	34.3	34.3	34.0	34.3	34.3	33.7	34.2	34.2
pH	—	7.5~8.5	8.1	8.1	8.1	8.0	8.0	8.0	7.9	8.0	8.1	8.0	8.1	8.1
D.O.	mg/L	more than 5	6.6	6.5	6.5	6.8	6.8	6.7	6.8	6.8	6.7	6.7	6.8	6.7
B.O.D.	mg/L	2	1.5	1.3	1.2	1.6	1.7	1.6	1.7	1.7	1.8	1.8	1.7	1.7
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		12.2	15.9	15.5	18.3	23.2	28.6	18.1	31.4	28.8	29.4	14.2	53.5
Cyanide	μg/L	10	6.150	< 5.7	6.150	6.800	7.770	9.390	7.770	8.090	6.150	7.770	9.390	9.060
Total phenols	μg/L	10	4.5200	5.6200	< 4.5	5.1300	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	5.6800
Mineral oil	mg/L	2	1.6	1.7	1.8	1.4	1.6	1.5	1.6	1.7	1.6	1.7	0.8	1.7
Chlorophyll a	μg/L		1.0	0.9	0.9	2.0	2.5	3.3	2.9	3.2	2.8	3.3	2.8	3.0
Total phosphorus	mg/L	0.05	0.012	0.015	0.013	0.019	0.014	0.018	0.024	0.016	0.020	0.028	0.023	0.024
NH_3-N	mg/L	0.3	0.05	0.05	0.03	0.02	0.02	0.01	0.15	0.11	0.10	0.18	0.17	0.16
Nitrite	μg/L		< 1.5	< 1.5	< 1.5	4.81	2.55	< 1.5	6.79	3.40	3.68	7.92	3.96	3.68
Nitrate	mg/L		119.30	135.90	104.80	67.00	84.50	61.50	101.00	117.50	125.00	111.30	85.20	109.20
Cd	μg/L	10	0.0130	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.0100	< 0.01	0.0120	0.0170	0.0120	0.0110
Cr (VI)	μg/L	50	0.1670	0.1730	0.1700	0.2300	0.2270	0.2290	0.2300	0.2230	0.2270	0.2030	0.2020	0.2090
Co	μg/L		0.0730	0.0690	0.0760	0.0990	0.0900	0.0950	0.1060	0.1100	0.1020	0.1030	0.0960	0.0980
Cu	μg/L	30	0.4360	0.4720	0.5180	0.6630	0.6500	0.6810	0.7500	0.7180	0.6900	0.9770	0.9950	0.9680
Ni	μg/L		0.2310	0.2310	0.2440	0.3930	0.3850	0.3660	0.3310	0.3200	0.3040	0.4770	0.4610	0.4500
Pb	μg/L	100	0.1230	0.1190	0.1270	0.1650	0.1490	0.1380	0.1110	0.1210	0.1140	0.1130	0.1210	0.1160
Zn	μg/L	500	0.1710	0.1640	0.1730	0.1510	0.1570	0.1600	0.1490	0.1460	0.1490	0.1400	0.1340	0.1460
Fe	μg/L		0.6670	0.6580	0.6780	0.6450	0.6250	0.6150	0.6930	0.6860	0.6800	0.6580	0.6500	0.6650
As	μg/L	50	0.7830	0.7930	0.7780	0.8330	0.8230	0.9080	0.8930	0.8480	0.8230	0.7580	0.7380	0.7880
Hg	μg/L	2	7.6200	7.3700	6.7900	8.3200	7.1600	6.4000	7.5400	6.6900	5.2900	7.6300	6.9300	6.9900
Turbidty	NTU		5.2	6.1	9.1	16.6	25.3	23.5	18.4	31.9	25.3	33.5	32.1	7.3
Transparency	meter		2.5	—	—	1.8	—	—	1.5	—	—	0.8	—	—
Silicate	μg/L		42.870	44.350	47.300	63.560	57.650	57.650	93.130	54.690	47.300	81.300	70.950	65.040
Total oil	mg/L		19.9	22.6	18.4	12.8	16.2	18.3	13.6	17.6	13.4	15.2	11.1	16.4

2017 Q2 monitoring results of marine water quality near Mailiao (1/3)

Station	Units	A type marine water quality standard	4B	4B	4B	5B	5B	5B	2C	3C	4M
Depth	meter		1	11	22	1	8	16	1	1	1
Temp.	°C		24.4	24.4	24.4	24.4	24.4	24.4	23.2	24.4	23.8
Salinity	PSU		34.4	34.4	34.4	34.4	34.4	34.4	33.3	33.5	34.0
pH	–	7.5~8.5	8.1	8.1	8.1	8.1	8.1	8.1	7.9	8.0	8.1
D.O.	mg/L	more than 5	6.7	6.6	6.5	6.7	6.5	6.4	6.9	6.5	6.4
B.O.D.	mg/L	2	1.5	1.4	1.6	1.4	1.3	1.5	1.8	1.9	1.2
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	12	<10	<10	15
S.S.	mg/L		22.3	23.2	27.0	18.7	29.7	41.7	57.4	75.5	20.9
Cyanide	μg/L	10	5.830	< 5.7	6.470	7.120	< 5.7	< 5.7	8.410	8.740	9.390
Total phenols	μg/L	10	7.4000	6.8500	4.8900	6.9100	< 4.5	< 4.5	6.1100	6.0500	< 4.5
Mineral oil	mg/L	2	0.9	0.5	0.6	0.5	0.9	0.8	1.6	1.8	0.5
Chlorophyll a	μg/L		1.1	1.0	1.1	0.8	1.4	1.3	5.3	6.2	1.4
Total phosphorus	mg/L	0.05	0.017	0.021	0.016	0.021	0.020	0.019	0.030	0.025	0.044
NH_3-N	mg/L	0.3	0.05	0.02	0.05	0.06	0.05	0.06	0.14	0.15	0.27
Nitrite	μg/L		1.70	< 1.5	< 1.5	< 1.5	< 1.5	1.98	14.71	7.92	6.51
Nitrate	mg/L		72.60	129.40	114.90	114.90	70.30	106.30	86.30	100.80	67.30
Cd	μg/L	10	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.0100	0.0150	< 0.01	0.013
Cr (VI)	μg/L	50	0.2060	0.1980	0.2020	0.2360	0.2320	0.2280	0.1640	0.2160	0.2370
Co	μg/L		< 0.05	< 0.05	< 0.05	0.0680	0.0680	0.0650	0.0770	0.0880	< 0.0500
Cu	μg/L	30	0.3360	0.3270	0.3130	0.4630	0.5000	0.4450	0.9540	0.8090	0.5900
Ni	μg/L		0.2330	0.2230	0.2120	0.2610	0.2690	0.2390	0.4850	0.5290	0.2820
Pb	μg/L	100	0.0610	0.0550	0.0590	0.1080	0.1110	0.1020	0.1200	0.1150	0.0550
Zn	μg/L	500	0.2000	0.2060	0.2180	0.1650	0.1560	0.1800	0.1320	0.2300	0.1790
Fe	μg/L		0.7120	0.7280	0.7130	0.6060	0.5910	0.6050	0.8150	0.8570	0.7300
As	μg/L	50	0.7430	0.7380	0.7480	0.7330	0.7430	0.7630	0.9590	0.7780	1.0140
Hg	μg/L	2	6.3000	6.4200	5.2600	6.8700	5.9900	6.5000	8.0100	5.6200	7.8700
Turbidty	NTU		8.2	14.7	17.8	9.4	1.8	17.5	52.0	17.9	19.7
Transparency	meter		2.0	–	–	2.0	–	–	0.5	0.3	1.0
Silicate	μg/L		59.130	51.740	45.820	39.910	50.260	47.300	68.000	140.430	85.730
Total oil	mg/L		17.9	19.6	7.4	20.7	16.0	16.5	13.8	14.4	22.0

2017 Q3 monitoring results of marine water quality near Mailiao (1/3)

Station	Units	A type marine water quality standard	1A	1A	1A	2A	2A	2A	3A	3A	3A	4A	4A	4A
Depth	meter		1	11	21	1	11	21	1	11	22	1	11	22
Temp.	°C		30.2	30.2	30.2	30.3	30.1	30.1	30.2	30.0	30.0	30.3	30.3	30.3
Salinity	PSU		33.4	33.5	33.4	33.3	33.6	33.6	33.4	33.6	33.6	33.4	33.4	33.4
pH	—	7.5~8.5	7.9	8.0	8.0	7.9	8.0	8.0	8.0	8.1	8.1	8.1	8.0	8.0
D.O.	mg/L	more than 5	6.7	6.6	6.5	6.6	6.4	6.5	6.6	6.4	6.4	6.6	6.4	6.3
B.O.D.	mg/L	2	1.6	1.7	1.7	1.7	1.8	1.7	1.7	1.7	1.8	1.6	1.8	1.8
E. coli	CFU/100 mL	1000	<10	<10	13	<10	<10	<10	<10	<10	<10	<10	<10	11
S.S.	mg/L		31.6	32.6	34.0	28.3	32.6	38.4	24.4	28.0	25.3	28.3	29.6	26.5
Cyanide	μg/L	10	< 5.7	< 5.7	< 5.7	< 5.7	< 5.7	< 5.7	6.690	6.400	< 5.7	< 5.7	< 5.7	< 5.7
Total phenols	μg/L	10	< 4.5	< 4.5	< 4.5	9.0600	8.2900	8.1800	8.2400	9.2900	9.6500	9.5900	8.8800	9.5300
Mineral oil	mg/L	2	1.8	1.7	1.1	1.2	1.7	0.6	0.8	1.3	1.3	1.0	1.6	1.2
Chlorophyll a	μg/L		1.2	1.4	1.6	1.2	1.3	1.5	0.9	1.1	1.3	1.3	1.0	0.9
Total phosphorus	mg/L	0.05	0.012	0.015	0.011	0.012	0.013	0.015	0.017	0.016	0.016	0.009	0.014	0.023
NH_3-N	mg/L	0.3	0.08	0.07	0.09	0.09	0.03	0.07	0.06	0.07	0.07	0.03	0.26	0.25
Nitrite	μg/L		6.42	4.09	4.96	6.42	3.79	3.50	5.25	3.79	3.79	3.21	2.92	3.79
Nitrate	mg/L		61.06	87.47	107.67	50.92	37.23	46.55	40.04	41.03	25.82	14.05	18.30	14.41
Cd	μg/L	10	0.0150	0.0130	0.0120	0.0120	0.0120	0.0100	0.0140	0.0130	0.0140	0.0150	0.0140	0.0120
Cr (VI)	μg/L	50	0.2680	0.2640	0.2460	0.2880	0.2750	0.2810	0.2920	0.2830	0.2770	0.2640	0.2530	0.2450
Co	μg/L		0.0990	0.0890	0.0910	0.1340	0.1270	0.1220	0.0850	0.0900	0.0840	0.1210	0.1340	0.1220
Cu	μg/L	30	0.5100	0.5000	0.5000	0.6200	0.5900	0.5900	0.5500	0.4900	0.5200	0.6000	0.5400	0.5100
Ni	μg/L		0.5500	0.5400	0.5700	0.5300	0.5000	0.5300	0.5300	0.4800	0.5500	0.5700	0.5100	0.5200
Pb	μg/L	100	0.0400	0.0300	0.0400	0.0500	0.0500	0.0600	0.0700	0.0600	0.0700	0.1000	0.0900	0.1100
Zn	μg/L	500	0.4200	0.4100	0.3800	0.3900	0.3700	0.3500	0.3600	0.3700	0.3700	0.4100	0.3900	0.4000
Fe	μg/L		1.9000	1.8400	2.0100	2.7400	2.9000	2.8100	2.9600	2.7800	3.1100	2.7100	2.6000	3.0700
As	μg/L	50	1.0800	1.1500	1.0400	0.9900	1.0300	1.0500	1.0400	1.0600	1.1200	1.0700	1.0300	1.0500
Hg	μg/L	2	1.4400	1.3300	1.3200	2.2300	3.0100	2.9300	13.2300	15.0900	15.6800	2.5600	1.8600	2.0700
Turbidty	NTU		3.6	8.0	12.5	5.6	7.9	8.9	5.2	7.5	6.2	9.7	10.4	10.0
Transparency	meter		2.0	—	—	2.0	—	—	1.5	—	—	1.5	—	—
Silicate	μg/L		195.040	138.870	115.460	166.950	129.510	157.590	195.040	181.000	143.550	166.950	101.420	82.700
Total oil	mg/L		26.2	21.8	27.4	18.0	23.0	47.2	30.6	29.2	22.2	33.5	19.9	52.0

2017 Q3 monitoring results of marine water quality near Mailiao (2/3)

Station	Units	A type marine water quality standard	5A	5A	5A	1B	1B	1B	2B	2B	2B	3B	3B	3B
Depth	meter		1	12	22	1	6	12	1	8	15	1	7	14
Temp.	°C		30.3	30.3	30.3	30.5	30.2	30.2	30.5	30.2	30.2	30.3	30.2	30.2
Salinity	PSU		33.4	33.4	33.4	33.4	33.6	33.5	33.4	33.6	33.6	33.4	33.6	33.6
pH	—	7.5~8.5	8.1	8.1	8.0	7.9	8.1	8.0	8.0	8.0	7.9	7.9	8.0	8.0
D.O.	mg/L	more than 5	6.5	6.5	6.5	6.7	6.3	6.4	6.4	6.4	6.4	6.7	6.4	6.6
B.O.D.	mg/L	2	1.7	1.7	1.9	1.6	1.6	1.7	1.8	1.9	1.7	1.7	1.7	1.9
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		33.2	33.2	25.3	30.9	39.6	37.8	30.2	29.0	21.5	29.6	32.5	33.2
Cyanide	μg/L	10	< 5.7	< 5.7	< 5.7	< 5.7	< 5.7	< 5.7	6.400	< 5.7	6.980	9.010	9.880	< 5.7
Total phenols	μg/L	10	9.2900	9.8200	8.2400	< 4.5	< 4.5	< 4.5	9.4100	9.5300	9.2900	8.4700	7.8800	9.4100
Mineral oil	mg/L	2	1.6	0.9	1.6	1.8	1.6	0.8	1.7	1.9	1.7	1.0	1.8	1.9
Chlorophyll a	μg/L		0.7	0.9	0.3	2.4	2.2	1.7	1.8	2.0	2.0	2.4	2.0	1.7
Total phosphorus	mg/L	0.05	0.015	0.010	0.011	0.014	0.012	0.012	0.013	0.011	0.010	0.012	0.014	0.015
NH_3-N	mg/L	0.3	0.02	0.02	0.05	0.08	0.05	0.05	0.02	0.03	0.07	0.12	0.06	0.09
Nitrite	μg/L		3.50	2.92	3.21	7.88	4.38	4.09	11.38	4.38	4.96	8.17	5.54	4.67
Nitrate	mg/L		19.93	20.83	47.00	53.74	28.72	27.90	54.67	41.40	40.49	50.75	37.06	47.28
Cd	μg/L	10	0.0120	0.0110	0.0120	0.0170	0.0140	0.0130	0.0120	0.0110	0.0110	0.0180	0.0160	0.0160
Cr (VI)	μg/L	50	0.2480	0.2420	0.2290	0.2880	0.2800	0.2780	0.3020	0.2900	0.2830	0.3190	0.3130	0.3080
Co	μg/L		0.0970	0.1040	0.1120	0.1210	0.1110	0.0950	0.1510	0.1390	0.1350	0.0940	0.0900	0.1000
Cu	μg/L	30	0.5500	0.4900	0.5400	0.5200	0.5700	0.5400	0.6900	0.7000	0.6400	0.7800	0.6900	0.6100
Ni	μg/L		0.5300	0.4700	0.5600	0.5800	0.5600	0.5900	0.7500	0.6900	0.5900	0.7100	0.6600	0.5900
Pb	μg/L	100	0.0800	0.0700	0.0800	0.0600	0.0500	0.0400	0.0900	0.0900	0.0800	0.0800	0.0700	0.0700
Zn	μg/L	500	0.3900	0.3900	0.3800	0.3700	0.3600	0.3700	0.3700	0.4000	0.3800	0.3900	0.3700	0.3800
Fe	μg/L		3.0000	2.8500	3.0400	2.4300	1.9900	2.0900	2.6000	2.8300	2.8000	2.5400	2.8700	2.9400
As	μg/L	50	1.0500	1.1000	1.1300	1.0000	0.9700	1.1500	1.1000	1.0600	1.1000	1.0900	1.0500	1.0000
Hg	μg/L	2	2.0300	1.6500	1.9200	1.3400	1.2500	1.2600	3.0800	2.3300	2.0900	10.0700	10.3000	11.8600
Turbidty	NTU		3.4	4.1	4.2	5.7	19.1	20.5	6.9	13.8	8.5	7.1	11.9	8.9
Transparency	meter		3.5	—	—	1.5	—	—	2.0	—	—	1.5	—	—
Silicate	μg/L		134.190	138.870	120.140	129.510	162.270	124.820	218.440	124.820	110.780	241.850	162.270	143.550
Total oil	mg/L		33.2	18.5	14.3	36.5	17.8	14.0	37.9	34.0	30.2	19.0	50.4	33.4

2017 Q3 monitoring results of marine water quality near Mailiao (3/3)

Station	Units	A type marine water quality standard	4B	4B	4B	5B	5B	5B	2C	3C	4M
Depth	meter		1	11	22	1	8	15	1	1	1
Temp.	ºC		30.5	30.3	30.3	30.4	30.3	30.3	30.8	33.9	30.8
Salinity	PSU		32.9	33.3	33.4	33.2	33.3	33.3	32.3	33.0	32.8
pH	–	7.5~8.5	7.9	8.0	8.0	8.0	8.1	8.1	8.0	8.0	8.1
D.O.	mg/L	more than 5	6.6	6.5	6.4	6.5	6.3	6.4	6.2	6.7	6.6
B.O.D.	mg/L	2	1.7	1.7	1.8	1.7	1.7	1.8	1.8	1.9	1.8
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		25.9	25.7	29.4	29.4	36.8	31.2	47.1	121.9	29.8
Cyanide	μg/L	10	< 5.7	< 5.7	< 5.7	< 5.7	< 5.7	< 5.7	< 5.7	< 5.7	< 5.7
Total phenols	μg/L	10	9.0600	9.7100	9.2900	9.5900	8.0000	9.5300	6.2900	5.1200	9.7100
Mineral oil	mg/L	2	0.9	0.8	1.7	1.9	1.1	0.5	1.6	1.2	0.9
Chlorophyll a	μg/L		2.0	1.5	1.6	1.1	1.6	1.4	9.9	15.7	3.9
Total phosphorus	mg/L	0.05	0.026	0.022	0.022	0.015	0.020	0.016	0.009	0.009	0.014
NH_3-N	mg/L	0.3	0.24	0.23	0.27	0.04	0.04	0.03	0.03	0.02	0.26
Nitrite	μg/L		7.88	5.54	5.54	4.67	3.79	4.09	7.00	2.33	7.00
Nitrate	mg/L		32.19	31.99	24.39	18.13	19.48	19.03	56.36	28.07	37.34
Cd	μg/L	10	0.0110	0.0100	0.0120	0.0100	0.0110	0.0120	0.0130	0.0350	0.0130
Cr (VI)	μg/L	50	0.2620	0.2510	0.2400	0.2580	0.2420	0.2460	0.2890	0.2900	0.2750
Co	μg/L		0.1320	0.1280	0.1230	0.1150	0.1220	0.1180	0.1100	0.1250	0.1070
Cu	μg/L	30	0.6000	0.5700	0.6400	0.7000	0.6400	0.6200	0.5600	0.8000	0.6200
Ni	μg/L		0.5200	0.5600	0.5300	0.5400	0.5800	0.5500	0.5700	1.0000	0.5900
Pb	μg/L	100	0.1100	0.1000	0.1300	0.1200	0.1100	0.1300	0.1800	0.0900	0.1400
Zn	μg/L	500	0.3900	0.3800	0.3700	0.3800	0.3800	0.3900	0.3300	0.3900	0.3600
Fe	μg/L		2.9200	2.5600	2.8200	3.1000	2.9400	3.2100	2.8700	2.8800	3.5700
As	μg/L	50	1.1100	1.0600	1.1200	1.2100	1.1300	1.1600	1.0800	0.9700	1.1700
Hg	μg/L	2	2.4300	2.1100	2.4300	4.1400	1.5000	1.8700	2.1700	2.6800	2.2200
Turbidty	NTU		8.4	8.9	10.1	3.4	19.6	9.5	39.3	76.0	17.4
Transparency	meter		2.0	–	–	1.5	–	–	0.5	0.5	1.5
Silicate	μg/L		166.950	106.100	120.140	199.720	166.950	195.040	255.890	96.740	129.510
Total oil	mg/L		24.3	46.3	24.7	21.1	15.2	46.5	40.1	14.2	52.3

2017 Q4 monitoring results of marine water quality near Mailiao (1/3)

Station	Units	A type marine water quality standard	1A	1A	1A	2A	2A	2A	3A	3A	3A	4A	4A	4A
Depth	meter		1	12	24	1	12	24	1	12	24	1	12	23
Temp.	°C		23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	24.0	24.0	24.0
Salinity	PSU		33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.6	33.6	33.6
pH	—	7.5~8.5	8.2	8.2	8.2	8.1	8.2	8.1	8.2	8.1	8.0	8.1	8.2	8.2
D.O.	mg/L	more than 5	6.4	6.5	6.5	6.5	6.3	6.4	6.5	6.4	6.4	6.5	6.4	6.5
B.O.D.	mg/L	2	1.3	1.2	1.3	1.5	1.4	1.4	1.5	1.4	1.5	1.4	1.5	1.4
E. coli	CFU/100 mL	1000	12	<10	<10	14	12	<10	12	19	<10	14	14	<10
S.S.	mg/L		58.3	88.2	189.4	60.6	103.7	97.2	80.1	85.7	79.8	35.0	97.4	77.4
Cyanide	μg/L	10	7.710	7.370	7.370	8.040	8.040	6.370	< 5.7	< 5.7	< 5.7	6.030	< 5.7	6.700
Total phenols	μg/L	10	6.7700	5.4100	< 4.5	7.7300	4.5300	7.1100	7.2500	6.4800	7.6200	5.3800	4.6800	5.2300
Mineral oil	mg/L	2	0.7	0.9	< 0.5	< 0.5	0.8	0.9	< 0.5	0.7	1.0	1.0	1.0	0.8
Chlorophyll a	μg/L		1.5	0.8	0.9	1.0	0.9	0.5	0.6	0.7	0.4	1.7	0.9	1.0
Total phosphorus	mg/L	0.05	0.034	0.027	0.029	0.032	0.042	0.034	0.031	0.018	0.017	0.020	0.021	0.022
NH_3-N	mg/L	0.3	0.05	0.23	0.20	0.31	0.32	0.11	0.16	0.19	0.09	0.29	0.29	0.28
Nitrite	μg/L		15.21	12.29	13.16	10.53	10.82	8.48	9.36	4.68	7.61	9.07	7.31	6.73
Nitrate	mg/L		342.59	158.00	332.99	307.59	312.80	156.53	290.33	162.22	285.93	568.02	314.74	352.67
Cd	μg/L	10	0.0260	0.0280	0.0290	0.0250	0.0370	0.0400	0.0240	0.0250	0.0270	0.0180	0.0190	0.0190
Cr (VI)	μg/L	50	0.4500	0.4300	0.4200	0.5100	0.4600	0.4800	0.5700	0.5600	0.5400	0.5200	0.4900	0.5100
Co	μg/L		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cu	μg/L	30	0.7900	0.8800	0.9300	0.8100	0.8200	0.7600	0.8100	0.7900	0.8500	0.6600	0.6300	0.7100
Ni	μg/L		0.7900	0.7500	0.7800	0.7400	0.8000	0.8400	0.7700	0.7400	0.8500	0.6900	0.6400	0.7800
Pb	μg/L	100	0.1000	0.1000	0.1000	0.0900	0.0800	0.1000	0.1000	0.1100	0.1100	0.0900	0.0900	0.0900
Zn	μg/L	500	0.5000	0.4900	0.4800	0.4900	0.4800	0.5000	0.5400	0.5400	0.5300	0.4600	0.4700	0.4400
Fe	μg/L		2.1300	2.3400	2.1600	2.1300	1.8700	1.9400	1.8600	1.7900	1.8300	1.8600	1.8900	1.9500
As	μg/L	50	1.0300	1.2200	1.1900	1.1400	1.1000	1.1800	1.0900	1.1600	1.2000	1.0800	1.0300	1.1000
Hg	μg/L	2	12.0300	10.1800	11.1400	11.7800	13.8700	12.4700	12.7300	11.9100	11.6200	11.9000	11.8300	11.0500
Turbidty	NTU		25.3	41.5	94.0	57.0	41.3	33.1	29.7	38.2	38.8	96.0	46.9	48.6
Transparency	meter		0.5	—	—	0.5	—	—	0.5	—	—	0.5	—	—
Silicate	μg/L		251.720	260.910	266.420	207.620	238.860	255.390	235.180	262.740	244.370	246.210	248.040	242.530
Total oil	mg/L		5.0	6.8	2.5	1.5	9.3	10.4	2.5	5.4	9.0	9.6	7.5	6.1

2017 Q4 monitoring results of marine water quality near Mailiao (2/3)

Station	Units	A type marine water quality standard	5A	5A	5A	1B	1B	1B	2B	2B	2B	3B	3B	3B
Depth	meter		1	12	23	1	8	15	1	9	18	1	8	16
Temp.	°C		24.1	24.1	24.1	24.0	23.9	24.0	24.0	24.0	24.0	23.9	23.9	23.9
Salinity	PSU		33.7	33.7	33.7	33.3	33.4	33.3	33.4	33.4	33.4	33.4	33.3	33.3
pH	—	7.5~8.5	8.2	8.2	8.2	8.2	8.1	8.1	8.2	8.2	8.2	8.0	8.0	8.0
D.O.	mg/L	more than 5	6.5	6.5	6.5	6.4	6.5	6.4	6.5	6.3	6.4	6.4	6.4	6.4
B.O.D.	mg/L	2	1.4	1.5	1.4	1.3	1.4	1.5	1.5	1.3	1.3	1.4	1.4	1.4
E. coli	CFU/100 mL	1000	<10	14	12	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		48.2	55.4	55.6	14.4	51.0	67.2	49.7	92.7	117.0	49.6	78.8	100.4
Cyanide	μg/L	10	< 5.7	< 5.7	7.370	6.370	6.700	< 5.7	8.040	5.700	6.700	6.370	8.710	6.700
Total phenols	μg/L	10	9.3900	9.0600	8.6900	< 4.5	6.4400	6.2200	6.2600	< 4.5	4.7100	< 4.5	< 4.5	5.6700
Mineral oil	mg/L	2	< 0.5	0.9	0.8	0.8	1.1	0.5	< 0.5	1.2	1.0	< 0.5	0.9	0.6
Chlorophyll a	μg/L		0.6	0.7	0.9	0.3	0.6	0.6	0.8	1.0	0.9	0.4	0.5	0.4
Total phosphorus	mg/L	0.05	0.031	0.032	0.032	0.036	0.032	0.032	0.035	0.029	0.031	0.020	0.026	0.023
NH_3-N	mg/L	0.3	0.39	0.40	0.48	0.21	0.09	0.15	0.04	0.19	0.31	0.18	0.12	0.34
Nitrite	μg/L		7.31	5.85	6.14	15.21	15.21	14.63	12.58	13.46	13.16	10.53	11.41	13.16
Nitrate	mg/L		327.28	310.18	340.46	279.93	337.22	378.73	163.21	279.11	375.96	205.53	102.99	159.31
Cd	μg/L	10	0.0160	0.0150	0.0160	0.0190	0.0180	0.0240	0.0220	0.0220	0.0340	0.0290	0.0320	0.0320
Cr (VI)	μg/L	50	0.3900	0.3700	0.3500	0.5400	0.4900	0.5100	0.7000	0.7700	0.6800	0.6800	0.6600	0.6200
Co	μg/L		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cu	μg/L	30	0.5700	0.5200	0.5100	0.7000	0.6500	0.6800	0.7700	0.7400	0.8200	1.0900	1.0100	1.1200
Ni	μg/L		0.6000	0.5600	0.6400	0.8100	0.7700	0.8600	0.8600	0.8900	0.9300	0.9000	0.9400	0.9100
Pb	μg/L	100	0.0900	0.0900	0.1000	0.1000	0.0900	0.0900	0.1000	0.1200	0.1200	0.1000	0.1000	0.1000
Zn	μg/L	500	0.4700	0.4600	0.4600	0.4800	0.4800	0.4900	0.5000	0.4900	0.5100	0.5300	0.5300	0.5200
Fe	μg/L		1.7400	1.6900	1.7300	2.3700	2.3000	2.4500	2.0300	2.3900	2.1500	2.0800	1.9300	2.3500
As	μg/L	50	1.1100	1.0400	1.0200	1.1900	1.1600	1.1400	1.2100	1.1400	1.1800	1.1800	1.1200	1.0900
Hg	μg/L	2	11.2200	11.5000	12.4400	11.4800	11.0200	9.0500	12.1500	11.8500	12.3100	11.9900	11.9500	11.4300
Turbidty	NTU		26.9	32.7	48.6	12.4	30.3	36.6	27.6	40.5	28.5	31.9	40.3	45.5
Transparency	meter		0.5	—	—	1.0	—	—	0.5	—	—	0.5	—	—
Silicate	μg/L		229.670	216.810	218.650	251.720	266.420	251.720	270.090	203.950	246.210	275.610	273.770	251.720
Total oil	mg/L		2.7	9.4	4.6	4.4	9.0	4.2	2.9	10.6	8.7	1.5	8.6	3.7

2017 Q4 monitoring results of marine water quality near Mailiao (3/3)

Station	Units	A type marine water quality standard	4B	4B	4B	5B	5B	5B	2C	3C	4M
Depth	meter		1	12	23	1	8	16	1	1	1
Temp.	ºC		23.9	23.9	24.0	23.9	23.9	23.9	24.5	24.7	24.17
Salinity	PSU		33.4	33.4	33.4	33.4	33.4	33.3	33.0	33.0	33.2
pH	–	7.5~8.5	8.2	8.1	8.2	8.2	8.2	8.2	8.0	8.0	8.2
D.O.	mg/L	more than 5	6.6	6.4	6.4	6.6	6.5	6.4	6.4	6.0	6.2
B.O.D.	mg/L	2	1.4	1.5	1.4	1.4	1.5	1.2	1.5	1.3	1.4
E. coli	CFU/100 mL	1000	10	21	<10	14	14	12	<10	<10	13
S.S.	mg/L		60.1	110.8	108.6	65.0	103.8	186.2	153.8	85.1	26.3
Cyanide	μg/L	10	7.370	6.370	5.700	7.710	< 5.7	< 5.7	7.370	< 5.7	< 5.7
Total phenols	μg/L	10	9.4300	9.7200	9.4300	7.2200	7.6600	< 4.5	8.9800	9.0600	7.5800
Mineral oil	mg/L	2	< 0.5	1.5	1.1	0.4	1.1	< 0.5	0.8	0.5	0.6
Chlorophyll a	μg/L		0.8	0.6	0.7	0.7	0.9	0.7	1.7	2.4	0.7
Total phosphorus	mg/L	0.05	0.034	0.028	0.031	0.035	0.034	0.033	0.036	0.047	0.037
NH_3-N	mg/L	0.3	0.31	0.28	0.37	0.50	0.27	0.25	0.08	0.30	0.46
Nitrite	μg/L		40.08	34.81	38.32	48.56	54.41	54.70	47.39	50.61	52.07
Nitrate	mg/L		511.43	466.01	426.46	556.86	532.13	626.87	389.21	503.80	366.92
Cd	μg/L	10	0.0200	0.0200	0.0190	0.0240	0.0240	0.0230	0.0250	0.0320	0.0210
Cr (VI)	μg/L	50	0.5500	0.5200	0.5100	0.4000	0.3800	0.3500	0.5900	0.8200	0.4100
Co	μg/L		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cu	μg/L	30	0.7100	0.6700	0.7700	0.8600	0.7800	0.7700	0.7100	1.0400	1.4900
Ni	μg/L		0.7100	0.6300	0.6800	0.8500	0.8300	0.7700	1.0200	1.2600	0.8600
Pb	μg/L	100	0.1000	0.0900	0.0900	0.0900	0.1000	0.1000	0.1200	0.1200	0.1300
Zn	μg/L	500	0.3900	0.3700	0.4200	0.4600	0.4800	0.4600	0.4600	0.4800	0.4400
Fe	μg/L		1.8400	1.8200	1.9100	1.7700	1.7200	1.8000	2.1800	2.3000	2.4800
As	μg/L	50	1.1100	1.1500	1.0800	1.2200	1.2200	1.2400	1.2200	1.2900	1.1400
Hg	μg/L	2	12.8700	12.0100	11.2300	11.4300	11.3700	12.8300	12.3800	9.9200	11.9000
Turbidty	NTU		46.3	65.0	75.0	41.7	64.0	33.0	57.0	41.9	21.2
Transparency	meter		0.3	–	–	0.4	–	–	0.5	0.5	1.0
Silicate	μg/L		321.540	316.030	321.540	290.300	299.490	356.450	374.820	350.940	358.290
Total oil	mg/L		2.9	15.9	11.3	2.6	9.0	1.4	6.7	4.0	4.74

2018 Q1 monitoring results of marine water quality near Mailiao (1/3)

Station	Units	A type marine water quality standard	1A	1A	1A	2A	2A	2A	3A	3A	3A	4A	4A	4A
Depth	meter		1	8	16	1	8	16	1	13	26	1	11.5	23
Temp.	°C		22.9	22.3	22.2	20.5	20.7	20.9	23.9	23.1	21.1	24.2	23.2	21.9
Salinity	PSU		34.0	34.1	34.0	33.0	33.5	33.5	34.0	34.1	34.1	34.1	34.1	34.1
pH	—	7.5~8.5	8.2	8.1	8.1	8.1	8.0	8.0	8.2	8.1	8.1	8.1	8.1	8.1
D.O.	mg/L	more than 5	7.0	7.0	6.8	7.0	7.0	7.0	7.0	7.0	6.8	7.0	7.0	6.8
B.O.D.	mg/L	2	0.4	0.2	0.8	0.8	1.2	1.1	0.7	0.5	0.7	0.8	0.8	0.8
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		5.2	6.6	6.0	8.3	12.9	17.3	1.3	2.5	3.2	4.2	2.2	5.0
Cyanide	μg/L	10	3.800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total phenols	μg/L	10	ND	1.4000	1.8000	1.4000	1.9000	ND	ND	ND	ND	1.7000	ND	1.1000
Mineral oil	mg/L	2	ND	1.2	0.8	ND	ND	1.8	0.8	ND	ND	0.7	0.8	ND
Chlorophyll a	μg/L		0.7	0.7	1.3	0.7	2.0	1.3	1.4	ND	0.7	0.7	0.7	0.7
Total phosphorus	mg/L	0.05	0.008	0.010	0.015	0.041	0.036	0.039	0.006	0.008	0.009	0.012	0.017	0.013
NH_3-N	mg/L	0.3	0.05	0.06	0.04	0.07	0.08	0.08	0.04	0.06	0.06	0.04	0.05	0.06
Nitrite	μg/L		3.90	5.00	3.60	10.10	10.30	10.70	1.70	2.70	2.10	2.30	2.70	3.00
Nitrate	mg/L		0.23	0.13	0.13	0.33	0.28	0.28	0.09	0.10	0.07	0.16	0.11	0.19
Cd	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cr (VI)	μg/L	50	0.5300	0.5200	0.4800	0.4900	0.4800	0.6100	0.5900	0.4500	0.5000	0.5100	0.5300	0.6000
Co	μg/L		0.0900	0.0400	0.0400	0.1400	0.1500	0.1900	0.0100	0.0300	0.0400	0.0600	0.0200	0.0400
Cu	μg/L	30	ND	0.0300	ND	0.0800	0.2400	0.0800	ND	ND	ND	ND	ND	ND
Ni	μg/L	100	ND	ND	ND	0.0800	0.2000	0.4200	ND	ND	0.0400	0.8600	0.1800	0.2100
Pb	μg/L	10	0.2800	0.1100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zn	μg/L	500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.9800
Fe	μg/L		ND	ND	ND	0.2300	ND	ND	ND	ND	ND	ND	ND	ND
As	μg/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hg	μg/L	1	0.6100	0.0100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Turbidty	NTU		1.0	1.2	2.4	0.6	2.5	18.5	10.5	0.8	0.7	0.9	2.5	1.8
Transparency	meter		6.0	—	—	1.0	—	—	7.0	—	—	6.0	—	—
Silicate	μg/L		0.330	0.300	0.190	0.260	0.290	0.300	0.230	0.320	0.220	0.380	0.350	0.330
Total oil	mg/L		33.6	19.0	17.6	5.4	25.2	27.5	26.1	23.0	21.3	33.0	39.1	33.3

2018 Q1 monitoring results of marine water quality near Mailiao (2/3)

Station	Units	A type marine water quality standard	5A	5A	5A	1B	1B	1B	2B	2B	2B	3B	3B	3B
Depth	meter		1	11	22	1	2.5	5	1	2.5	5	1	11	22
Temp.	°C		23.8	23.2	21.8	19.9	19.9	20.1	20.5	20.4	20.6	23.3	23.0	21.9
Salinity	PSU		34.2	34.2	34.2	32.3	32.3	33.5	32.9	33.0	33.5	34.1	34.2	34.1
pH	—	7.5~8.5	8.2	8.1	8.1	8.1	8.0	8.0	8.1	8.0	7.9	8.1	8.1	8.1
D.O.	mg/L	more than 5	6.8	6.6	6.6	6.8	7.0	6.3	6.6	6.6	7.0	6.9	7.0	6.8
B.O.D.	mg/L	2	0.9	1.1	1.5	0.5	0.5	0.3	0.9	1.1	1.1	0.9	0.9	0.8
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	36	<10
S.S.	mg/L		6.5	4.4	15.7	9.0	10.8	11.9	11.9	15.5	18.0	5.2	4.0	4.3
Cyanide	μg/L	10	ND	ND	ND	ND	5.200	ND	5.000	ND	ND	ND	ND	ND
Total phenols	μg/L	10	1.9000	1.6000	1.6000	2.0000	1.6000	1.3000	1.5000	2.0000	ND	1.4000	1.5000	2.0000
Mineral oil	mg/L	2	1.6	ND	1.0	0.9	ND	ND	1.0	ND	0.7	ND	1.0	1.5
Chlorophyll a	μg/L		1.3	2.0	0.7	0.7	0.7	ND	1.4	2.0	0.7	ND	0.7	0.7
Total phosphorus	mg/L	0.05	0.018	0.017	0.024	0.038	0.036	0.031	0.041	0.039	0.037	0.007	0.007	0.006
NH_3-N	mg/L	0.3	0.05	0.06	0.06	0.11	0.10	0.07	0.09	0.07	0.07	0.10	0.06	0.06
Nitrite	μg/L		2.30	2.70	2.60	14.20	11.80	8.60	10.90	11.30	11.20	2.90	3.50	2.90
Nitrate	mg/L		0.10	0.23	0.14	0.37	0.33	0.24	0.23	0.31	0.29	0.06	0.09	0.07
Cd	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cr (VI)	μg/L	50	0.5700	0.4400	0.5900	0.5300	0.4900	0.5200	0.4900	0.6300	0.6100	0.6900	0.5400	0.5300
Co	μg/L		0.0300	0.0200	0.0300	0.3200	0.2200	0.1200	0.1400	0.3200	0.1400	0.0500	0.0300	0.0900
Cu	μg/L	30	ND	ND	ND	0.4900	0.2500	0.1200	ND	0.5100	0.3900	ND	ND	0.6500
Ni	μg/L	100	0.3600	0.1900	0.0300	0.2900	0.1900	0.2700	ND	0.2300	0.1300	1.3300	0.4600	3.4900
Pb	μg/L	10	0.1600	ND	ND	ND	ND	ND	ND	0.2000	0.1300	ND	0.0500	ND
Zn	μg/L	500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fe	μg/L		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
As	μg/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hg	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Turbidty	NTU		1.0	1.0	5.1	8.8	9.5	14.1	15.9	10.3	15.0	0.7	1.3	1.2
Transparency	meter		7.0	—	—	1.0	—	—	1.0	—	—	7.0	—	—
Silicate	μg/L		0.370	0.510	0.750	0.600	0.500	0.310	0.370	0.650	0.570	0.280	0.320	0.500
Total oil	mg/L		28.6	26.8	31.8	26.8	17.8	22.1	16.2	33.7	34.6	24.4	23.8	31.9

2018 Q1 monitoring results of marine water quality near Mailiao (3/3)

Station	Units	A type marine water quality standard	4B	4B	4B	5B	5B	5B	2C	3C	4M
Depth	meter		1	9.5	19	1	10	20	1	1	1
Temp.	°C		24.2	23.8	23.0	24.0	23.4	22.6	19.4	19.5	20.2
Salinity	PSU		34.1	34.2	34.2	34.1	34.2	34.2	32.9	31.6	34.1
pH	—	7.5~8.5	8.2	8.1	8.2	8.2	8.1	8.1	8.0	8.0	8.1
D.O.	mg/L	more than 5	6.8	6.8	6.8	6.8	6.6	6.6	6.4	6.4	6.4
B.O.D.	mg/L	2	0.7	0.7	0.7	0.8	0.9	0.9	1.5	1.1	1.3
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	24	18	<10
S.S.	mg/L		2.8	8.1	7.1	4.5	11.7	4.9	24.8	23.9	8.6
Cyanide	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total phenols	μg/L	10	ND	ND	ND	1.9000	1.6000	1.5000	1.5000	1.4000	1.6000
Mineral oil	mg/L	2	ND	1.1	1.8	1.3	1.2	ND	0.7	ND	ND
Chlorophyll a	μg/L		0.7	0.7	ND	ND	0.7	0.7	2.0	1.2	1.4
Total phosphorus	mg/L	0.05	0.014	0.007	0.011	0.010	0.026	0.022	0.015	0.022	0.025
NH_3-N	mg/L	0.3	0.05	0.06	0.06	0.05	0.05	0.06	0.10	0.11	0.07
Nitrite	μg/L		1.80	2.10	2.40	2.00	1.70	1.50	10.00	12.80	6.60
Nitrate	mg/L		0.07	0.05	0.08	0.15	0.05	0.04	0.27	0.31	0.19
Cd	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cr (VI)	μg/L	50	0.4800	0.4700	0.4200	1.4800	0.4300	0.4300	0.5200	0.5200	0.4800
Co	μg/L		0.0100	0.0200	0.0100	0.0200	0.0200	0.0300	0.1100	0.1100	0.0900
Cu	μg/L	30	ND	ND	ND	ND	ND	ND	0.7100	0.1500	ND
Ni	μg/L	100	ND	0.1700	ND	ND	0.1500	ND	0.3400	0.1900	0.1000
Pb	μg/L	10	0.0600	ND	0.7700	ND	ND	ND	ND	ND	ND
Zn	μg/L	500	ND	ND	0.0100	ND	ND	ND	ND	ND	ND
Fe	μg/L		ND	ND	ND	ND	ND	ND	ND	ND	ND
As	μg/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hg	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Turbidty	NTU		0.5	0.8	0.9	0.8	0.8	0.9	20.4	24.7	4.4
Transparency	meter		8.0	—	—	7.0	—	—	0.5	0.5	1.5
Silicate	μg/L		0.350	0.360	0.520	0.350	0.150	0.420	0.310	0.660	0.080
Total oil	mg/L		21.5	13.2	22.2	29.2	39.9	40.5	30.3	61.5	22.3

2018 Q2 monitoring results of marine water quality near Mailiao (1/3)

Station	Units	A type marine water quality standard	1A	1A	1A	2A	2A	2A	3A	3A	3A	4A	4A	4A
Depth	meter		1	8	16	1	8	16	1	13	26	1	11.5	23
Temp.	°C		26.0	25.9	25.9	27.0	25.8	25.8	26.2	25.8	25.7	25.7	25.7	25.7
Salinity	PSU		33.7	33.8	33.9	32.1	33.2	33.0	34.8	34.8	34.8	34.8	34.8	34.8
pH	—	7.5~8.5	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
D.O.	mg/L	more than 5	6.6	6.6	6.1	5.9	6.1	6.1	6.3	6.3	6.3	5.9	5.9	5.9
B.O.D.	mg/L	2	0.8	ND	0.7	ND	ND	ND	0.3	ND	0.4	ND	ND	ND
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		10.3	12.8	15.5	6.3	9.6	28.2	8.0	11.9	26.2	7.2	12.9	12.8
Cyanide	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total phenols	μg/L	10	ND	ND	1.2000	ND	ND	ND	ND	ND	2.0000	ND	ND	ND
Mineral oil	mg/L	2	ND	ND	1.0	1.1	1.0	ND	1.1	ND	1.1	1.1	0.7	0.8
Chlorophyll a	μg/L		1.5	1.9	1.8	0.7	1.3	1.2	1.3	2.7	2.5	0.9	1.3	1.0
Total phosphorus	mg/L	0.05	0.008	0.013	0.010	0.019	0.019	0.014	0.014	0.009	0.017	0.024	0.027	0.032
NH_3-N	mg/L	0.3	0.07	0.08	0.09	0.09	0.11	0.10	0.10	0.09	0.12	0.13	0.09	0.10
Nitrite	μg/L		1.70	1.80	3.60	4.70	ND	ND	3.80	2.70	3.00	ND	ND	ND
Nitrate	mg/L		0.06	0.05	0.06	0.08	0.07	0.07	0.08	0.09	0.10	0.10	0.06	0.04
Cd	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cr (VI)	μg/L	50	1.8300	1.9000	1.9400	1.9900	1.9700	0.4900	1.1100	0.6400	0.7000	0.7900	0.6000	0.6400
Co	μg/L		0.1500	ND	0.0800	0.0700	ND	0.1200	0.2600	0.2100	0.3600	0.2700	ND	0.1400
Cu	μg/L	30	0.9400	0.6600	0.8200	0.9100	0.6000	0.6000	1.7900	1.0000	7.8000	1.7500	0.6500	8.2800
Ni	μg/L	100	3.2000	1.0000	1.6000	1.5000	1.2000	3.0000	4.3000	0.5000	3.0000	5.7000	8.6000	3.9000
Pb	μg/L	10	1.3800	1.4700	1.3800	1.5100	1.4700	0.1400	0.3700	0.3000	0.2300	0.3900	0.7500	0.4200
Zn	μg/L	500	5.4000	3.0000	9.0000	3.7000	3.8000	3.8000	ND	5.3000	0.5000	0.6000	1.0000	ND
Fe	μg/L		28.3000	30.3000	29.8000	33.5000	32.2000	2.9000	18.0000	1.9000	3.1000	7.4000	1.3000	ND
As	μg/L	50	1.0600	1.2600	1.1600	1.0700	1.1300	1.3000	1.0800	1.4200	1.0200	1.2200	1.2600	0.9400
Hg	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Turbidty	NTU		5.6	8.1	2.4	3.7	2.9	6.7	4.7	6.0	6.6	1.5	5.4	7.5
Transparency	meter		2.5	—	—	2.0	—	—	2.1	—	—	2.0	—	—
Silicate	μg/L		0.430	0.270	0.300	0.140	0.240	0.230	0.290	0.340	0.160	0.380	0.320	0.200
Total oil	mg/L		49.8	45.2	24.2	35.3	31.4	34.5	37.0	32.7	27.2	20.9	39.9	41.5

2018 Q2 monitoring results of marine water quality near Mailiao (2/3)

Station	Units	A type marine water quality standard	5A	5A	5A	1B	1B	1B	2B	2B	2B	3B	3B	3B
Depth	meter		1	11	22	1	2.5	5	1	2.5	5	1	11	22
Temp.	°C		25.9	25.8	25.8	27.0	26.2	26.1	26.4	26.3	26.2	25.8	25.8	25.8
Salinity	PSU		34.7	34.7	34.7	32.3	32.4	32.9	33.6	34.8	34.7	34.8	34.8	34.8
pH	—	7.5~8.5	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
D.O.	mg/L	more than 5	6.1	6.3	6.3	5.8	6.1	5.9	6.6	6.8	6.8	6.1	6.3	6.3
B.O.D.	mg/L	2	ND	ND	ND	ND	0.3	0.5	ND	ND	ND	ND	0.5	1.0
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		11.0	21.7	27.8	8.1	14.0	29.5	8.3	22.7	20.9	6.5	9.0	13.6
Cyanide	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total phenols	μg/L	10	1.6000	ND	ND	ND	ND	ND	ND	ND	1.6000	1.0000	ND	1.7000
Mineral oil	mg/L	2	ND	ND	ND	0.6	ND	ND	0.8	0.9	1.3	0.8	0.8	ND
Chlorophyll a	μg/L		1.6	1.9	1.2	1.5	2.7	3.0	2.4	2.8	3.0	0.7	0.9	1.5
Total phosphorus	mg/L	0.05	0.040	0.032	0.030	0.014	0.015	0.018	0.020	0.018	0.020	0.014	0.016	0.040
NH_3-N	mg/L	0.3	0.10	0.11	0.10	0.13	0.11	0.12	0.11	0.14	0.13	0.09	0.10	0.13
Nitrite	μg/L		ND	ND	2.60	4.40	5.00	4.50	3.80	3.90	3.30	ND	ND	ND
Nitrate	mg/L		0.03	0.04	0.11	0.07	0.07	0.09	0.12	0.14	0.21	0.04	0.06	0.05
Cd	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cr (VI)	μg/L	50	1.6400	0.6100	1.3600	0.7700	0.6200	0.6200	0.6200	1.0600	0.6600	0.5700	0.8600	0.8100
Co	μg/L		ND	ND	0.7500	0.0800	0.1800	ND	0.0900	0.2200	ND	ND	ND	0.1500
Cu	μg/L	30	1.2200	1.7500	ND	1.9700	0.9600	2.1100	0.1700	1.5800	0.2300	0.4400	1.2600	2.2500
Ni	μg/L	100	7.9000	3.2000	12.8000	7.4000	4.2000	3.4000	2.0000	5.7000	3.5000	4.8000	7.4000	10.4000
Pb	μg/L	10	1.9300	2.5000	1.2200	0.8400	0.4700	0.6800	0.3200	0.9600	0.4100	0.2900	0.5500	0.6300
Zn	μg/L	500	6.7000	3.0000	11.6000	8.3000	3.1000	2.3000	6.0000	5.7000	6.4000	0.6000	9.9000	16.2000
Fe	μg/L		18.0000	ND	12.0000	8.5000	11.9000	2.9000	1.4000	21.2000	2.9000	1.5000	5.4000	4.0000
As	μg/L	50	1.6400	1.4700	1.3200	1.1500	1.8400	1.4000	1.7200	1.6000	1.2100	1.1700	1.5100	2.0500
Hg	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Turbidty	NTU		5.6	14.3	2.6	4.1	6.5	8.0	5.1	11.9	11.1	1.9	4.3	3.9
Transparency	meter		2.0	—	—	1.5	—	—	2.0	—	—	1.8	—	—
Silicate	μg/L		0.170	0.170	0.400	0.200	0.190	0.330	0.260	0.290	0.220	0.200	0.190	0.330
Total oil	mg/L		48.9	36.4	35.0	43.8	31.0	35.9	39.1	49.1	43.4	43.8	31.0	35.9

2018 Q2 monitoring results of marine water quality near Mailiao (3/3)

Station	Units	A type marine water quality standard	4B	4B	4B	5B	5B	5B	2C	3C	4M
Depth	meter		1	9.5	19	1	10	20	1	0.3	3.8
Temp.	°C		26.0	26.0	26.0	25.9	25.9	25.9	27.3	27.4	26.5
Salinity	PSU		34.6	34.6	34.6	34.7	34.7	34.7	33.7	33.1	34.5
pH	—	7.5~8.5	8.2	8.2	8.2	8.2	8.2	8.2	8.0	8.0	8. 2
D.O.	mg/L	more than 5	5.9	6.3	6.1	6.6	6.6	6.8	6.1	6.3	6.4
B.O.D.	mg/L	2	0.3	0.5	ND	0.7	0.4	0.8	0.7	0.6	ND
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		8.5	11.9	24.6	17.8	13.5	15.5	23.5	26.8	22.2
Cyanide	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total phenols	μg/L	10	ND	1.6000	1.2000	ND	ND	ND	1.2000	1.9000	2.0000
Mineral oil	mg/L	2	ND	ND	ND	ND	0.7	1.0	ND	1.0	0.8
Chlorophyll a	μg/L		1.9	2.7	2.7	2.8	0.9	2.7	7.3	5.9	0.7
Total phosphorus	mg/L	0.05	0.032	0.029	0.037	0.037	0.026	0.030	0.015	0.029	0.029
NH_3-N	mg/L	0.3	0.12	0.10	0.10	0.08	0.08	0.09	0.12	0.12	0.10
Nitrite	μg/L		3.60	4.20	3.80	2.40	2.30	2.00	5.10	4.70	1.70
Nitrate	mg/L		0.07	0.09	0.07	0.12	0.07	0.08	0.15	0.11	0.17
Cd	μg/L	10	ND	0.1900	ND	ND	ND	ND	0.1700	0.1600	ND
Cr (VI)	μg/L	50	0.6000	0.5900	0.7200	0.7700	0.7400	0.5800	0.8900	0.8100	0.7700
Co	μg/L		0.1000	ND	ND	0.0900	ND	ND	0.3400	0.2700	0.2900
Cu	μg/L	30	0.2000	3.2200	ND	0.3400	0.2100	1.2000	2.4600	2.1000	2.8300
Ni	μg/L	100	3.1000	8.1000	3.4000	2.9000	5.2000	5.7000	11.5000	7.2000	10.6000
Pb	μg/L	10	0.7500	0.9400	0.7800	0.3100	0.4600	0.2400	0.6000	0.6800	2.2500
Zn	μg/L	500	ND	10.3000	ND	ND	ND	2.2000	5.4000	1.1000	1.2000
Fe	μg/L		11.1000	7.5000	6.8000	19.5000	15.4000	ND	34.4000	9.1000	8.8000
As	μg/L	50	1.6000	1.6700	1.4900	1.1700	1.4500	1.3500	1.5800	1.3600	1.4100
Hg	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Turbidty	NTU		3.9	2.0	6.0	4.3	1.7	2.2	12.6	10.0	5.2
Transparency	meter		2.4	—	—	2.3	—	—	1.0	0.2	1.6
Silicate	μg/L		0.170	0.140	0.180	0.250	0.320	0.150	0.260	0.160	0.160
Total oil	mg/L		47.8	35.3	39.6	35.5	29.8	31.1	42.6	38.4	44.1

2018 Q3 monitoring results of marine water quality near Mailiao (1/3)

Station	Units	A type marine water quality standard	1A	1A	1A	2A	2A	2A	3A	3A	3A	4A	4A	4A
Depth	meter		1.1	8.6	15.1	1.0	8.8	22.0	2.1	12.1	24.2	1.4	11.3	23.1
Temp.	°C		29.4	29.4	29.4	29.5	29.4	29.4	29.2	29.2	29.2	29.2	29.2	29.2
Salinity	PSU		33.1	33.1	33.1	33.0	33.0	33.0	33.8	33.8	33.8	33.8	33.8	33.8
pH	—	7.5~8.5	8.2	8.2	8.2	8.3	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
D.O.	mg/L	more than 5	5.9	5.8	5.8	5.9	5.8	5.7	6.0	5.6	5.8	5.9	6.0	5.9
B.O.D.	mg/L	2	0.8	0.8	1.4	0.4	0.3	0.5	0.5	0.8	0.7	0.8	1.0	0.4
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		7.5	17.8	11.1	5.9	14.1	12.9	4.5	5.8	6.5	5.8	7.3	8.6
Cyanide	μg/L	10	ND	3.900	3.900	ND	3.900	ND	ND	ND	ND	ND	ND	ND
Total phenols	μg/L	10	1.2000	ND	ND	1.7000	1.2000	ND	ND	ND	ND	ND	ND	1.2000
Mineral oil	mg/L	2	0.7	0.8	1.1	ND	0.8	0.8	1.6	1.2	1.5	0.7	ND	0.7
Chlorophyll a	μg/L		4.0	2.7	3.7	2.8	4.7	3.7	2.1	2.5	2.4	2.4	2.5	1.5
Total phosphorus	mg/L	0.05	0.008	0.012	0.009	0.015	0.026	0.022	0.013	ND	0.010	0.039	0.034	0.034
NH_3-N	mg/L	0.3	0.16	0.17	0.18	0.15	0.15	0.13	0.12	0.14	0.13	0.28	0.15	0.15
Nitrite	μg/L		1.80	ND	ND	1.60	1.90	ND	ND	ND	ND	ND	1.60	ND
Nitrate	mg/L		0.10	0.08	0.09	0.10	0.05	0.09	0.02	0.05	0.05	0.28	0.20	0.16
Cd	μg/L	10	0.0220	0.0280	0.0340	0.0250	0.0280	0.0240	0.0180	0.0240	0.0470	0.0240	0.0200	0.0260
Cr (VI)	μg/L	50	0.5320	0.5010	0.6730	0.5930	0.6180	0.5800	0.5410	0.6310	0.5940	0.5880	0.5550	0.5990
Co	μg/L		0.1210	0.1020	0.1450	0.1160	0.1170	0.1060	0.0920	0.1100	0.1370	0.1040	0.0960	0.1350
Cu	μg/L	30	0.4100	0.2930	0.9210	0.5280	0.5300	0.3820	0.2540	1.2000	0.5330	0.5640	0.3560	0.8680
Ni	μg/L	100	2.5100	0.8700	3.8600	0.9200	1.0500	0.7500	0.4000	1.9900	1.1600	0.8100	0.7500	1.1900
Pb	μg/L	10	0.0110	<0.006	0.0540	0.0380	0.0560	0.0260	0.0320	0.0590	0.0430	0.0270	0.0170	0.0320
Zn	μg/L	500	0.3500	1.2400	30.7000	0.8100	3.1300	4.3500	5.0100	27.0000	5.1500	0.5300	16.5800	10.4600
Fe	μg/L		1.5140	1.6060	1.8800	1.7450	1.8010	1.8690	1.8110	1.8710	1.8290	1.8920	1.7490	1.7280
As	μg/L	50	0.7730	0.7960	0.8910	0.8720	0.8790	0.9450	0.8710	0.9590	0.9010	0.9380	0.9150	0.9690
Hg	μg/L	1	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Turbidty	NTU		1.2	2.1	2.1	0.9	1.6	2.5	1.2	0.7	1.5	1.2	1.8	1.8
Transparency	meter		1.5	—	—	2.5	—	—	2.3	—	—	2.0	—	—
Silicate	μg/L		0.220	0.190	0.170	0.280	0.360	0.210	0.390	0.290	0.280	0.410	0.360	0.230
Total oil	mg/L		28.7	31.9	9.1	36.9	19.6	19.0	22.8	26.5	29.3	46.1	27.7	28.5

2018 Q3 monitoring results of marine water quality near Mailiao (2/3)

Station	Units	A type marine water quality standard	5A	5A	5A	1B	1B	1B	2B	2B	2B	3B	3B	3B
Depth	meter		1.1	11.5	22.5	1.0	3.2	6.0	1.5	3.1	6.9	1.6	11.8	24.0
Temp.	°C		29.1	29.1	29.0	29.3	29.3	29.3	29.4	29.4	29.4	29.4	29.3	29.3
Salinity	PSU		33.8	33.8	33.9	32.9	32.9	32.9	32.9	32.9	32.9	33.7	33.7	33.7
pH	—	7.5~8.5	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
D.O.	mg/L	more than 5	5.8	5.8	5.9	5.8	5.9	5.8	6.0	5.6	5.7	5.8	5.9	5.8
B.O.D.	mg/L	2	0.4	ND	0.4	0.6	0.3	0.7	0.8	1.0	0.6	1.0	0.3	0.4
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	36	<10
S.S.	mg/L		9.0	4.7	8.6	5.8	9.3	19.5	7.6	6.8	65.6	5.4	5.4	6.0
Cyanide	μg/L	10	ND	ND	5.200	ND	ND	3.900	3.600	ND	3.900	ND	ND	ND
Total phenols	μg/L	10	ND	ND	ND	ND	ND	1.1000	ND	ND	1.6000	1.1000	1.1000	ND
Mineral oil	mg/L	2	0.5	ND	0.7	ND	0.6	1.5	0.7	1.7	1.5	0.6	1.0	0.6
Chlorophyll a	μg/L		2.2	2.1	2.2	9.5	9.6	8.0	6.8	9.0	9.2	2.2	3.4	2.5
Total phosphorus	mg/L	0.05	0.023	0.030	0.016	0.026	0.019	0.021	0.019	0.023	0.021	0.019	0.012	0.013
NH_3-N	mg/L	0.3	0.15	0.16	0.18	0.19	0.21	0.14	0.12	0.17	0.13	0.13	0.13	0.13
Nitrite	μg/L		1.60	ND	ND	1.60	2.00	2.00	2.20	1.90	ND	1.60	ND	ND
Nitrate	mg/L		0.10	0.06	0.11	0.19	0.07	0.10	0.02	0.07	0.03	0.05	0.06	0.05
Cd	μg/L	10	0.0230	0.0210	0.0200	0.0280	0.0230	0.0280	0.0440	0.0250	0.0250	0.0170	0.0220	0.0210
Cr (VI)	μg/L	50	0.5470	0.5800	0.5660	0.5800	0.5220	0.5190	0.5370	0.6120	0.5210	0.5060	0.5890	0.4890
Co	μg/L		0.0960	0.0970	0.1120	0.1850	0.1070	0.0990	0.1220	0.1160	0.0810	0.0850	0.1150	0.0960
Cu	μg/L	30	0.4140	0.5730	1.2960	0.7720	0.5110	0.5690	0.5130	0.6520	0.4600	0.4270	1.0210	0.3730
Ni	μg/L	100	0.3200	0.7600	3.2200	1.5400	1.0100	1.2200	1.2400	1.1700	1.0600	0.7100	5.3500	0.4700
Pb	μg/L	10	0.0150	0.0410	0.0400	<0.006	0.0170	0.0250	0.0350	0.0650	0.0160	<0.006	0.0430	<0.006
Zn	μg/L	500	2.3100	3.1300	2.4300	2.7800	4.9500	0.7600	6.5500	1.7000	26.4300	10.2000	3.8100	6.3500
Fe	μg/L		1.6370	1.7430	1.7850	1.8170	1.7150	1.7350	1.7480	1.7080	1.6120	1.6800	1.8030	1.6740
As	μg/L	50	0.9230	0.9230	0.8860	0.8790	0.9720	0.9400	0.9620	0.9060	0.9450	0.9150	0.8940	0.9420
Hg	μg/L	1	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Turbidty	NTU		1.6	1.5	1.3	5.6	4.4	7.8	1.8	6.5	27.0	4.3	2.0	1.1
Transparency	meter		2.5	—	—	1.5	—	—	2.0	—	—	2.2	—	—
Silicate	μg/L		0.270	0.430	0.450	0.160	0.300	0.160	0.190	0.120	0.260	0.250	0.130	0.190
Total oil	mg/L		29.2	24.2	20.3	24.2	34.3	31.7	33.9	25.1	28.0	38.5	35.1	23.5

2018 Q3 monitoring results of marine water quality near Mailiao (3/3)

Station	Units	A type marine water quality standard	4B	4B	4B	5B	5B	5B	2C	3C	4M
Depth	meter		1.0	9.7	19.2	0.8	10.0	20.4	1.2	0.8	1.3
Temp.	°C		29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.2	29.5
Salinity	PSU		33.6	33.7	33.2	33.5	33.8	33.8	32.8	32.8	33.4
pH	—	7.5~8.5	8.3	8.2	8.2	8.2	8.2	8.2	8.1	8.1	8.2
D.O.	mg/L	more than 5	5.8	5.8	5.9	5.8	5.7	5.9	5.6	5.6	6.1
B.O.D.	mg/L	2	0.5	0.5	0.8	0.7	0.5	0.6	0.5	ND	0.6
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	24	18	<10
S.S.	mg/L		9.1	7.9	7.4	8.4	10.2	9.9	13.9	32.4	10.3
Cyanide	μg/L	10	ND	ND	4.200	ND	3.900	ND	ND	ND	ND
Total phenols	μg/L	10	1.4000	ND	ND	ND	1.2000	1.3000	ND	ND	ND
Mineral oil	mg/L	2	ND	0.8	ND	ND	1.5	0.8	ND	0.6	ND
Chlorophyll a	μg/L		2.5	3.0	1.3	2.4	1.5	1.2	13.5	11.3	4.7
Total phosphorus	mg/L	0.05	0.028	0.027	0.016	0.044	0.017	0.026	0.039	0.036	0.048
NH_3-N	mg/L	0.3	0.18	0.18	0.16	0.13	0.15	0.13	0.14	0.15	0.14
Nitrite	μg/L		1.90	1.60	1.60	2.00	1.60	ND	1.60	2.20	ND
Nitrate	mg/L		0.09	0.08	0.07	0.07	0.04	0.07	0.07	0.11	0.05
Cd	μg/L	10	0.0340	0.0200	0.0230	0.0340	0.0210	0.0230	0.0230	0.0270	0.0230
Cr (VI)	μg/L	50	0.5650	0.5230	0.5170	0.5740	0.5000	0.5660	0.5580	0.5810	0.5470
Co	μg/L		0.1330	0.0970	0.0920	0.1220	0.0890	0.0900	0.1470	0.1720	0.1240
Cu	μg/L	30	0.5430	0.4210	0.4760	1.1110	0.4430	0.4790	0.5940	0.3590	0.8920
Ni	μg/L	100	4.0100	2.4200	1.0100	6.5800	0.7300	0.8700	3.3700	5.7800	2.6200
Pb	μg/L	10	0.0400	0.0060	0.0100	0.0380	<0.0060	0.0110	<0.0060	0.0110	<0.0060
Zn	μg/L	500	51.1700	12.1400	10.3600	3.9500	2.1500	2.1900	2.2400	8.2200	12.1300
Fe	μg/L		1.6030	1.5550	1.7430	1.7980	1.7080	1.6320	1.9340	2.0570	1.8890
As	μg/L	50	0.9840	0.9220	0.9130	0.9450	0.8860	0.8960	1.0230	1.0320	1.0801
Hg	μg/L	1	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Turbidty	NTU		4.7	2.7	2.8	2.5	2.6	1.7	5.2	8.8	3.9
Transparency	meter		2.6	—	—	2.3	—	—	1	1	1.6
Silicate	μg/L		0.190	0.390	0.280	0.260	0.260	0.190	0.070	0.180	0.200
Total oil	mg/L		33.1	32.0	26.6	23.8	27.0	36.2	28.0	32.0	34.8

2018 Q4 monitoring results of marine water quality near Mailiao (1/3)

Station	Units	A type marine water quality standard	1A	1A	1A	2A	2A	2A	3A	3A	3A	4A	4A	4A
Depth	meter		1.5	11.0	21.0	1.3	10.5	21.0	1.5	13.2	22.0	0.9	10.5	20.1
Temp.	°C		24.7	24.7	24.5	24.7	24.8	24.5	24.8	24.8	24.8	24.8	24.8	24.8
Salinity	PSU		32.1	32.1	32.1	32.1	32.1	32.1	32.5	32.5	32.5	33.0	33.0	33.0
pH	—	7.5~8.5	8.2	8.1	8.1	8.1	8.1	8.1	8.2	8.2	8.1	8.1	8.1	8.1
D.O.	mg/L	more than 5	6.8	6.7	6.3	6.7	6.5	6.5	7.1	7.0	6.9	6.7	6.7	6.6
B.O.D.	mg/L	2	1.0	1.1	0.7	1.1	1.1	0.9	0.8	0.9	0.9	1.0	0.9	1.2
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		19.3	24.4	37.2	18.7	22.9	47.4	17.4	19.2	19.9	19.3	19.6	23.0
Cyanide	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total phenols	μg/L	10	ND	ND	ND	ND	ND	ND	1.9100	2.4100	2.9900	ND	ND	ND
Mineral oil	mg/L	2	ND	ND	0.5	1.3	1.5	1.2	1.1	1.5	0.7	0.5	0.5	ND
Chlorophyll a	μg/L		1.2	0.3	ND	0.7	1.5	0.9	0.9	1.3	1.0	1.3	ND	0.6
Total phosphorus	mg/L	0.05	0.032	0.041	0.018	0.024	0.025	0.027	0.024	0.023	0.024	0.025	0.020	0.037
NH_3-N	mg/L	0.3	0.18	0.20	0.21	0.19	0.20	0.19	0.20	0.16	0.15	0.14	0.17	0.12
Nitrite	μg/L		4.59	4.74	4.88	4.74	4.59	5.02	2.44	2.01	1.87	6.17	6.46	6.03
Nitrate	mg/L		0.23	0.19	0.20	0.17	0.15	0.25	0.16	0.06	0.08	0.17	0.24	0.21
Cd	μg/L	10	0.0077	0.0102	0.0090	0.0086	0.0095	0.0067	0.0081	0.0066	0.0198	0.0091	0.0139	0.0128
Cr (VI)	μg/L	50	1.0900	1.1200	1.0600	1.1000	1.0500	1.0700	1.0800	1.0500	1.0900	0.9770	1.0300	1.0000
Co	μg/L		0.2230	0.2410	0.2170	0.2290	0.2100	0.2110	0.2010	0.1830	0.2160	0.1670	0.1890	0.1630
Cu	μg/L	30	0.5980	0.8190	0.7530	0.6250	0.6680	0.9610	0.7470	0.7080	0.9770	0.5600	0.7890	0.6210
Ni	μg/L	100	0.9360	1.0800	1.0400	0.9220	1.0100	1.7800	1.6100	1.2400	2.4900	0.9540	1.8800	0.7220
Pb	μg/L	10	0.0650	0.0400	0.0330	0.0340	0.0300	0.0960	0.0590	0.0490	0.0670	0.0080	0.0670	0.0580
Zn	μg/L	500	0.4700	1.1500	0.2900	0.4300	0.0300	0.5300	1.8700	0.2100	2.9900	0.6000	4.2400	0.5700
Fe	μg/L		1.4900	1.2600	1.7300	1.5300	1.1000	2.2800	1.8700	1.3900	1.7800	1.0900	1.0300	1.1300
As	μg/L	50	0.7820	0.7930	0.8220	0.7980	0.8130	0.7310	0.7440	0.7280	0.6740	0.7640	0.7870	0.8370
Hg	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0260	ND
Turbidty	NTU		10.9	18.4	23.0	10.4	13.8	35.4	8.5	14.7	10.6	9.9	12.1	11.8
Transparency	meter		0.6	—	—	0.4	—	—	1.9	—	—	1.5	—	—
Silicate	μg/L		0.73	0.87	0.24	0.11	0.37	0.54	0.26	0.75	0.52	0.66	0.63	0.50
Total oil	mg/L		38.2	38.8	32.3	32.8	23.4	39.4	42.2	41.8	36.5	17.6	18.9	19.5

2018 Q4 monitoring results of marine water quality near Mailiao (2/3)

Station	Units	A type marine water quality standard	5A	5A	5A	1B	1B	1B	2B	2B	2B	3B	3B	3B
Depth	meter		1.4	10.4	20.0	1.0	5.0	9.0	1.0	6.0	5.0	1.0	11.2	22.6
Temp.	°C		24.8	24.8	24.8	24.5	24.5	24.5	24.6	24.5	24.5	24.8	24.8	24.7
Salinity	PSU		33.0	33.0	33.1	32.0	32.0	32.0	32.0	32.0	32.0	33.0	33.0	32.9
pH	—	7.5~8.5	8.1	8.1	8.2	8.1	8.1	8.1	8.1	8.1	8.1	8.2	8.1	8.2
D.O.	mg/L	more than 5	6.4	6.3	6.2	6.7	6.6	6.4	6.6	6.4	6.3	6.8	6.7	6.6
B.O.D.	mg/L	2	0.8	0.6	0.7	1.0	1.2	1.0	0.9	0.6	0.7	1.2	0.9	1.1
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		19.2	22.4	20.5	24.7	28.6	37.5	34.4	34.4	42.5	17.4	16.1	17.6
Cyanide	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total phenols	μg/L	10	1.1300	3.1200	1.3900	ND	ND	ND	ND	ND	ND	1.3900	ND	ND
Mineral oil	mg/L	2	ND	ND	ND	1.2	0.5	0.5	ND	ND	1.0	0.9	0.5	0.9
Chlorophyll a	μg/L		1.6	0.7	0.3	2.1	1.5	1.2	1.5	1.8	1.5	0.7	1.2	1.5
Total phosphorus	mg/L	0.05	0.011	0.010	0.010	0.030	0.029	0.030	0.040	0.043	0.042	0.015	0.014	0.022
NH_3-N	mg/L	0.3	0.19	0.17	0.19	0.20	0.20	0.18	0.20	0.19	0.19	0.18	0.19	0.19
Nitrite	μg/L		ND	ND	ND	4.88	5.45	5.60	5.45	5.74	6.03	2.73	1.87	1.87
Nitrate	mg/L		0.06	0.08	0.07	0.19	0.21	0.18	0.29	0.28	0.22	0.10	0.14	0.14
Cd	μg/L	10	0.0048	0.0086	0.0068	0.0089	0.0154	0.0108	0.0149	0.0121	0.0121	0.0090	0.0055	0.0117
Cr (VI)	μg/L	50	1.0500	1.0900	1.0100	1.0800	1.0200	1.0600	1.1000	1.0900	1.1300	0.9650	0.9570	1.0300
Co	μg/L		0.1450	0.1830	0.1950	0.2170	0.2000	0.2180	0.2450	0.2200	0.2230	0.1940	0.1670	0.2230
Cu	μg/L	30	0.6180	0.8040	0.6740	0.6470	0.5740	0.7220	1.1800	0.7770	0.9960	0.4640	0.5570	1.0200
Ni	μg/L	100	0.8650	2.5700	2.8400	1.7600	0.9260	1.3100	2.6900	2.1300	2.1400	0.6210	0.4140	1.6200
Pb	μg/L	10	0.0340	0.0390	0.0080	0.0420	0.0330	0.0340	0.3360	0.0320	0.0390	0.0230	0.0270	0.0330
Zn	μg/L	500	0.5700	2.2500	1.7000	0.4100	0.2100	0.1700	2.4900	0.2800	1.0200	3.3000	1.0400	6.2200
Fe	μg/L		2.6300	1.9700	1.1800	2.0100	1.5700	1.4100	1.2100	1.3900	1.4900	1.0000	0.7200	0.9700
As	μg/L	50	0.7040	0.6580	0.6330	0.8510	0.8540	0.8850	0.8210	0.8420	0.8890	0.7480	0.6610	0.5750
Hg	μg/L	1	ND	ND	ND	ND	0.0090	ND	ND	ND	ND	0.0420	ND	ND
Turbidty	NTU		7.1	11.9	12.8	16.9	22.6	31.4	23.1	37.0	24.2	9.5	11.7	9.1
Transparency	meter		1.5	—	—	0.6	—	—	0.4	—	—	1.5	—	—
Silicate	μg/L		0.390	0.560	0.530	0.350	0.360	0.540	0.220	0.370	0.560	0.400	0.470	0.470
Total oil	mg/L		38.3	28.0	29.0	20.6	26.5	28.7	24.7	45.8	29.8	19.1	36.8	30.2

2018 Q4 monitoring results of marine water quality near Mailiao (3/3)

Station	Units	A type marine water quality standard	4B	4B	4B	5B	5B	5B	2C	3C	4M
Depth	meter		1.0	10.3	21.1	1.4	11.1	22.6	1.0	1.0	4.8
Temp.	ºC		24.3	24.3	24.2	24.4	24.4	24.4	24.3	24.2	24.2
Salinity	PSU		32.6	32.6	32.6	32.7	32.7	32.7	32.0	32.0	32.2
pH	–	7.5~8.5	8.0	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
D.O.	mg/L	more than 5	6.7	6.6	6.5	7.0	6.9	6.8	6.7	6.7	6.4
B.O.D.	mg/L	2	0.9	0.8	0.7	1.2	1.0	0.9	1.0	1.0	0.9
E. coli	CFU/100 mL	1000	<10	<10	<10	<10	<10	<10	<10	<10	<10
S.S.	mg/L		17.0	19.6	17.6	19.4	22.3	21.9	20.0	20.5	16.9
Cyanide	μg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total phenols	μg/L	10	ND	ND	ND	ND	ND	ND	1.3900	1.6900	1.3700
Mineral oil	mg/L	2	0.6	0.5	1.2	1.0	0.6	1.0	0.7	1.1	1.5
Chlorophyll a	μg/L		0.2	1.5	0.7	0.4	1.2	0.7	1.2	2.8	1.0
Total phosphorus	mg/L	0.05	0.022	0.022	0.027	0.029	0.013	0.046	0.029	0.033	0.038
NH_3-N	mg/L	0.3	0.15	0.11	0.11	0.16	0.16	0.16	0.12	0.16	0.16
Nitrite	μg/L		2.01	2.15	6.17	5.02	5.17	4.88	6.03	6.31	6.46
Nitrate	mg/L		0.16	0.06	0.18	0.16	0.21	0.15	0.17	0.18	0.18
Cd	μg/L	10	0.0073	0.0063	0.0079	0.0079	0.0142	0.0110	0.0085	0.0081	0.0089
Cr (VI)	μg/L	50	1.0300	0.9880	1.0500	1.3100	1.0300	1.1000	1.0200	1.1200	0.9850
Co	μg/L		0.1820	0.1460	0.1780	0.2770	0.1730	0.2330	0.1920	0.2400	0.1670
Cu	μg/L	30	0.6850	0.6010	0.9980	0.7350	0.6430	1.0800	0.7400	0.8180	0.9500
Ni	μg/L	100	1.4200	0.3950	2.0400	5.8900	1.2700	3.4500	1.9300	4.2600	1.1300
Pb	μg/L	10	0.0440	0.0120	0.0220	0.0180	0.0780	0.0320	0.1530	0.1150	0.0720
Zn	μg/L	500	2.7100	4.3900	2.3900	0.9400	0.9300	3.6400	2.5800	3.6600	2.100
Fe	μg/L		2.1300	1.7400	2.0100	1.4800	2.0200	1.1600	1.8500	2.1600	3.3700
As	μg/L	50	0.6050	0.6530	0.6660	0.6890	0.8010	0.6960	0.8130	0.8280	0.8130
Hg	μg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Turbidty	NTU		8.0	12.1	10.1	11.1	16.9	12.4	21.9	23.5	11.7
Transparency	meter		1.0	–	–	0.9	–	–	0.5	0.3	0.6
Silicate	μg/L		0.650	0.470	0.440	0.720	0.570	0.470	0.450	0.500	0.510
Total oil	mg/L		26.3	31.1	36.4	27.1	22.6	28.9	32.5	27.8	21.0

Appendix 2 - monitoring results of harbor area water quality

2017 Q1 monitoring results of harbor area water quality

Monitoring items	Units	2017 Q1 (The range of data)			A type marine water quality standard
		3H	4H	5H	
Temp.	℃	18.8~19	19.9~20.1	19.9~20.3	–
Salinity	PSU	29.4	29.5	29.4	–
D.O.	mg/L	6.1~6.7	6.5~6.6	6.4~6.7	≧5.0
pH	–	8	8	8.1	7.5~8.5
S.S.	mg/L	4.7~8.6	3.4~8.6	4.4~7.5	–
Nitrate-N	mg/L	0.18~0.23	0.2	0.19~0.21	–
B.O.D.	mg/L	<1.0	<1.0	<1.0	≦2
C.O.D.	mg/L	2.2~3.6	2.2~3.2	2.2~4.1	–
Nitrite-N	mg/L	0.03	0.03	0.03	–
Chlorophyll a	mg/m3	1.1~1.3	0.7~0.9	0.9~1.2	≦2
Mineral oil	mg/L	<1.7	<1.7	<1.7	≦0.3
NH_3-N	mg/L	0.12	0.08~0.11	0.08~0.1	≦0.05
Total phosphorus	mg P/L	0.039~0.044	0.039~0.04	0.037~0.041	≦0.005
Total phenols	mg/L	<0.0016	<0.0016	<0.0016	≦0.01
Cyanide	mg/L	<0.001	<0.001	<0.001	≦1,000
E. coli	CFU/100mL	10~45	<10	<10	–
T.O.C.	mg/L	0.8~1.3	0.7~1	0.7~1.1	–
Fe	mg/L	0.0184~0.0924	0.0148~0.0178	0.0063~0.0231	–
Total Cr	mg/L	<0.0021	<0.0021	<0.0021	–
Zn	mg/L	0.011~0.0137	0.0092~0.0263	0.0085~0.0321	≦0.5
Cd	mg/L	<0.0002	<0.0002	<0.0002	≦0.005
Pb	mg/L	<0.0022	<0.0022	<0.0022	≦0.01
Cu	mg/L	0.0023~0.0035	0.0019~0.002	0.0015~0.0019	≦0.03
Co	mg/L	0.0002	0.0001~0.0002	0.0001~0.0001	–
Ni	mg/L	0.0008~0.001	0.0006~0.0007	0.0006	≦0.1
As	mg/L	0.0018~0.0021	0.0018~0.0019	0.0018~0.0019	≦0.05
Hg	mg/L	0.0005~0.0007	0.0006~0.0006	<0.0005	≦0.001

2017 Q2 monitoring results of harbor area water quality

Monitoring items	Units	2017 Q2 (The range of data)			A type marine water quality standard
		3H	4H	5H	
Temp.	℃	31.6~31.8	31.7~31.8	25~31.6	–
Salinity	PSU	33.9	33.8	33.8	–
D.O.	mg/L	6.2~6.6	6.2~6.6	6.2~6.6	≧5.0
pH	–	8.142~8.148	8.14~8.15	8.146~8.148	7.5~8.5
S.S.	mg/L	5.6~5.8	2.9~3	3~4.8	–
Nitrate-N	mg/L	0.01~0.03	0.01~0.03	0.02~0.05	–
B.O.D.	mg/L	<1.0	<1.0	<1.0	≦2
C.O.D.	mg/L	2.9~4.1	2~3.4	2.5~3.8	–
Nitrite-N	mg/L	N.D.	N.D.	<0.002	–
Chlorophyll a	mg/m3	3.4~5.3	2.3~2.8	4.4~4.5	≦2
Mineral oil	mg/L	N.D.	N.D.	N.D.	≦0.3
NH_3-N	mg/L	0.07~0.09	0.06	0.06~0.08	≦0.05
Total phosphorus	mg P/L	0.022~0.04	0.023~0.026	0.032	≦0.005
Total phenols	mg/L	N.D.	N.D.	N.D.	≦0.01
Cyanide	mg/L	N.D.	N.D.	N.D.	≦1,000
E. coli	CFU/100mL	<10	15	<10	–
T.O.C.	mg/L	0.8~0.9	0.8~1.1	0.8~1	–
Fe	mg/L	0.0048~0.0694	0.0043~0.0083	0.0046~0.0595	–
Total Cr	mg/L	N.D.	N.D.	N.D.	–
Zn	mg/L	0.0029~0.019	0.0077~0.0084	0.0065~0.008	≦0.5
Cd	mg/L	0.002	N.D.	N.D.	≦0.005
Pb	mg/L	0.008	N.D.	N.D.	≦0.01
Cu	mg/L	0.0025	<0.0010	<0.0010	≦0.03
Co	mg/L	<0.0001	<0.0001	<0.0001	–
Ni	mg/L	0.0004~0.0007	0.0004	0.0004	≦0.1
As	mg/L	0.0012~0.0013	0.0011~0.0012	0.0013	≦0.05
Hg	mg/L	N.D.	N.D.	N.D.	≦0.001

2017 Q3 monitoring results of harbor area water quality

Monitoring items	Units	2017 Q3 (The range of data)			A type marine water quality standard
		3H	4H	5H	
Temp.	℃	31.6~31.7	31.7~31.8	31.5~31.7	–
Salinity	PSU	31.6~31.7	31.8~31.9	31.8~31.9	–
D.O.	mg/L	5.9	5.8~5.9	5.8~5.9	≧5.0
pH	–	8.062~8.08	8.052~8.07	8.07~8.076	7.5~8.5
S.S.	mg/L	2.6~2.8	3.1~4.4	2.8~5.3	–
Nitrate-N	mg/L	0.03~0.04	0.03	0.02~0.06	–
B.O.D.	mg/L	<1.0	<1.0	<1.0	≦2
C.O.D.	mg/L	2.3~4.8	3.1~3.9	3.7~5.7	–
Nitrite-N	mg/L	N.D.	N.D.	<0.01	–
Chlorophyll a	mg/m3	1.3~2.2	4.8~5.6	5.8~6.2	≦2
Mineral oil	mg/L	N.D.	N.D.	N.D.	≦0.3
NH_3-N	mg/L	0.08~0.11	0.06~0.08	0.04~0.1	≦0.05
Total phosphorus	mg P/L	0.027~0.04	0.024~0.029	0.021~0.021	≦0.005
Total phenols	mg/L	N.D.	N.D.	N.D.	≦0.01
Cyanide	mg/L	N.D.	N.D.	N.D.	≦1,000
E. coli	CFU/100mL	35~85	10~65	<10	–
T.O.C.	mg/L	0.9~1.4	1.2~1.7	1.1~1.6	–
Fe	mg/L	0.0072~0.0127	0.0077~0.0279	0.0105~0.018	–
Total Cr	mg/L	N.D.	N.D.	N.D.	–
Zn	mg/L	0.0111~0.021	0.0045~0.0196	0.0044~0.0053	≦0.5
Cd	mg/L	<0.0010	N.D.	N.D.	≦0.005
Pb	mg/L	N.D.	N.D.	N.D.	≦0.01
Cu	mg/L	0.0013~0.0021	<0.0010	<0.0010	≦0.03
Co	mg/L	<0.0001	<0.0001	<0.0001	–
Ni	mg/L	0.0002~0.001	0.0003	0.0002~0.0003	≦0.1
As	mg/L	0.0015	0.0015	0.0015~0.0016	≦0.05
Hg	mg/L	N.D.	N.D.	N.D.	≦0.001

2017 Q4 monitoring results of harbor area water quality

Monitoring items	Units	2017 Q4 (The range of data)			A type marine water quality standard
		3H	4H	5H	
Temp.	℃	17.8~18	17.8	17.7~18.3	–
Salinity	PSU	32.3~32.5	32.3~32.5	31.8~32.4	–
D.O.	mg/L	7.1~7.4	7.1~7.2	7.2~7.4	≧5.0
pH	–	8.1	8~8.1	7.8~8.1	7.5~8.5
S.S.	mg/L	12.6~14.6	6.2~13.8	12.6~14.6	–
Nitrate-N	mg/L	0.22~0.24	0.22~0.25	0.2~0.26	–
B.O.D.	mg/L	<2.0	<2.0	<2.0	≦2
C.O.D.	mg/L	3.1~4	3~3.3	2.8~3.5	–
Nitrite-N	mg/L	0.02	0.01	0.01	–
Chlorophyll a	mg/m3	0.4~0.5	0.2~0.3	0.2~0.3	≦2
Mineral oil	mg/L	<1.0	<1.0	<1.0	≦0.3
NH_3-N	mg/L	0.07~0.23	0.08~0.09	0.09~0.2	≦0.05
Total phosphorus	mg P/L	0.043~0.049	0.039~0.042	0.035~0.049	≦0.005
Total phenols	mg/L	N.D.	N.D.	N.D.	≦0.01
Cyanide	mg/L	N.D.	N.D.	N.D.	≦1,000
E. coli	CFU/100mL	1.3x102	45~70	15~25	–
T.O.C.	mg/L	0.4	0.4~0.5	0.5~0.7	–
Fe	mg/L	0.034~0.181	0.051~0.098	0.053~0.078	–
Total Cr	mg/L	N.D.	N.D.	N.D.	–
Zn	mg/L	0.0118~0.0118	<0.0050	0.0096~0.0122	≦0.5
Cd	mg/L	N.D.	N.D.	N.D.	≦0.005
Pb	mg/L	N.D.	N.D.	N.D.	≦0.01
Cu	mg/L	0.0011~0.0012	0.001~0.0015	0.0019~0.0027	≦0.03
Co	mg/L	<0.0005	<0.0005	<0.0005	–
Ni	mg/L	N.D.	N.D.	N.D.	≦0.1
As	mg/L	0.0005~0.0006	0.0005	0.0004~0.0009	≦0.05
Hg	mg/L	N.D.	N.D.	N.D.	≦0.001

2018 Q1 monitoring results of harbor area water quality

Monitoring items	Units	2018 Q1 (The range of data)			A type marine water quality standard
		3H	4H	5H	
Temp.	℃	19.6~19.9	19.8~20	19.1~19.4	–
Salinity	PSU	32.2~32.6	32.3~32.4	31.9~32.1	–
D.O.	mg/L	6.2~6.3	6~6.1	6.2~6.3	≧5.0
pH	–	8~8.1	8.1	8	7.5~8.5
S.S.	mg/L	7.8~11.6	6.6~14.8	12~14.9	–
Nitrate-N	mg/L	0.14~0.18	0.16~0.2	0.22~0.27	–
B.O.D.	mg/L	<2.0	<2.0	<2.0	≦2
C.O.D.	mg/L	3.3~3.7	3.2~3.5	3.5~3.9	–
Nitrite-N	mg/L	0.03	0.03	0.02~0.03	–
Chlorophyll a	mg/m3	0.2~0.3	0.8~0.8	0.5~1.1	≦2
Mineral oil	mg/L	<1.0	<1.0	<1.0	≦0.3
NH_3-N	mg/L	0.05~0.06	0.05~0.06	0.05~0.06	≦0.05
Total phosphorus	mg P/L	0.03~0.048	0.028~0.032	0.037~0.047	≦0.005
Total phenols	mg/L	N.D.	N.D.	N.D.	≦0.01
Cyanide	mg/L	N.D.	N.D.	N.D.	≦1,000
E. coli	CFU/100mL	<10	10~10	10~15	–
T.O.C.	mg/L	2.3	2.7~3.1	2.2	–
Fe	mg/L	0.033~0.091	0.059~0.122	0.098~0.172	–
Total Cr	mg/L	N.D.	N.D.	N.D.	–
Zn	mg/L	<0.0050	0.0068~0.0068	<0.0050	≦0.5
Cd	mg/L	N.D.	N.D.	N.D.	≦0.005
Pb	mg/L	N.D.	N.D.	N.D.	≦0.01
Cu	mg/L	0.0012~0.0013	0.0011~0.0016	0.0015~0.0025	≦0.03
Co	mg/L	<0.0005	<0.0005	<0.0005	–
Ni	mg/L	N.D.	N.D.	N.D.	≦0.1
As	mg/L	0.0007~0.0009	0.0008~0.001	0.0006~0.001	≦0.05
Hg	mg/L	N.D.	N.D.	N.D.	≦0.001

2018 Q2 monitoring results of harbor area water quality

Monitoring items	Units	2018 Q2 (The range of data)			A type marine water quality standard
		3H	4H	5H	
Temp.	℃	24.7~26.7	25.1~26.8	25.4~26.7	–
Salinity	PSU	33.5~33.9	34.2	32.9~33.2	–
D.O.	mg/L	5.7~6.1	5.8~6.1	5.6~5.7	≧5.0
pH	–	8.1~8.2	8.2	7.9~8.2	7.5~8.5
S.S.	mg/L	9.6~14.4	11~12.2	12.1~13	–
Nitrate-N	mg/L	0.43~0.49	0.36~0.38	0.35~0.4	–
B.O.D.	mg/L	<2.0	<2.0	<2.0	≦2
C.O.D.	mg/L	6.3~7	6.1~6.7	5.8~7.4	–
Nitrite-N	mg/L	<0.01	<0.01	<0.01	–
Chlorophyll a	mg/m3	0.9~1.4	0.3~1.7	0.6~0.6	≦2
Mineral oil	mg/L	<1.0	<1.0	<1.0	≦0.3
NH_3-N	mg/L	0.04~0.05	0.04~0.05	0.03~0.04	≦0.05
Total phosphorus	mg P/L	0.011~0.047	0.02~0.047	0.023~0.037	≦0.005
Total phenols	mg/L	N.D.	N.D.	N.D.	≦0.01
Cyanide	mg/L	N.D.	N.D.	N.D.	≦1,000
E. coli	CFU/100mL	<10	<10	<10	–
T.O.C.	mg/L	3.1	3.08~3.08	<2.5	–
Fe	mg/L	0.046~0.179	0.035~0.139	0.024~0.102	–
Total Cr	mg/L	N.D.	N.D.	N.D.	–
Zn	mg/L	0.0186~0.0187	0.0075~0.009	0.0067~0.0086	≦0.5
Cd	mg/L	N.D.	N.D.	N.D.	≦0.005
Pb	mg/L	N.D.	N.D.	N.D.	≦0.01
Cu	mg/L	0.0013~0.0045	0.0014~0.0021	0.001~0.0014	≦0.03
Co	mg/L	<0.0005	<0.0005	<0.0005	–
Ni	mg/L	N.D.	N.D.	N.D.	≦0.1
As	mg/L	0.001~0.0014	0.0011	0.0011~0.0012	≦0.05
Hg	mg/L	N.D.	N.D.	N.D.	≦0.001

2018 Q3 monitoring results of harbor area water quality

Monitoring items	Units	2018 Q3 (The range of data)			A type marine water quality standard
		3H	4H	5H	
Temp.	℃	29.7~30.3	29.7~30.2	29.6~29.7	–
Salinity	PSU	29.7~29.9	28.9~29.7	29.5~30.1	–
D.O.	mg/L	5.2~6.1	5.7~6.8	5.7~6.1	≧5.0
pH	–	7.9~8	7.9~8	7.8~8.1	7.5~8.5
S.S.	mg/L	4.7~8.5	5.3~13.7	4.4~10.5	–
Nitrate-N	mg/L	0.27~0.33	0.2~0.27	0.27~0.31	–
B.O.D.	mg/L	<2.0	<2.0	<2.0	≦2
C.O.D.	mg/L	5.5~6.3	5.3~6.2	5.6~6.5	–
Nitrite-N	mg/L	N.D.	<0.01	N.D.	–
Chlorophyll a	mg/m3	0.4~1.1	0.9~3.2	0.2~3	≦2
Mineral oil	mg/L	<1.0	<1.0	<1.0	≦0.3
NH_3-N	mg/L	0.04~0.05	0.03~0.06	0.02~0.03	≦0.05
Total phosphorus	mg P/L	0.025~0.036	0.033~0.049	0.021~0.035	≦0.005
Total phenols	mg/L	N.D.	N.D.	N.D.	≦0.01
Cyanide	mg/L	N.D.	N.D.	N.D.	≦1,000
E. coli	CFU/100mL	35~40	40	20~25	–
T.O.C.	mg/L	2.8~4.2	2.6~2.6	2.6~3.1	–
Fe	mg/L	0.008~0.048	0.103~0.173	0.019~0.062	–
Total Cr	mg/L	N.D.	N.D.	N.D.	–
Zn	mg/L	0.0062~0.0108	0.0062~0.0092	0.0063~0.0128	≦0.5
Cd	mg/L	N.D.	N.D.	N.D.	≦0.005
Pb	mg/L	<0.0010	<0.0010	<0.0010	≦0.01
Cu	mg/L	0.0012~0.004	0.0012~0.0023	0.0024~0.0049	≦0.03
Co	mg/L	<0.0005	<0.0005	<0.0005	–
Ni	mg/L	N.D.	N.D.	N.D.	≦0.1
As	mg/L	0.0017~0.002	0.0017	0.0017~0.0018	≦0.05
Hg	mg/L	N.D.	N.D.	N.D.	≦0.001

2018 Q4 monitoring results of harbor area water quality

Monitoring items	Units	2018 Q4 (The range of data)			A type marine water quality standard
		3H	4H	5H	
Temp.	℃	23.8~24.3	23.9~24.7	24.1~24.6	–
Salinity	PSU	33~33.2	33.1~33.5	33.2~33.5	–
D.O.	mg/L	6.3	6.4~6.7	6.4~6.6	≧5.0
pH	–	8~8.1	8	8~8.1	7.5~8.5
S.S.	mg/L	8.4~13.7	7.7~13.1	8.6~12.4	–
Nitrate-N	mg/L	0.24~0.35	0.28~0.37	0.3~0.38	–
B.O.D.	mg/L	1.5~1.9	1.6~1.9	1.6~1.9	≦2
C.O.D.	mg/L	5.8~6.4	5.5~5.9	5.7~6.1	–
Nitrite-N	mg/L	0.08	0.08~0.09	0.07~0.08	–
Chlorophyll a	mg/m3	1.27~1.66	1.22~1.61	1.26~1.59	≦2
Mineral oil	mg/L	<1.0	<1.0	<1.0	≦0.3
NH_3-N	mg/L	0.07~0.14	0.07~0.09	0.1~0.13	≦0.05
Total phosphorus	mg P/L	0.018~0.048	0.034~0.049	0.029~0.032	≦0.005
Total phenols	mg/L	N.D.	N.D.	N.D.	≦0.01
Cyanide	mg/L	0.003	N.D.	0.002~0.002	≦1,000
E. coli	CFU/100mL	<10	<10	10~45	–
T.O.C.	mg/L	4.1	<2.5	<2.5	–
Fe	mg/L	0.028~0.053	0.027~0.046	0.027~0.07	–
Total Cr	mg/L	N.D.	N.D.	N.D.	–
Zn	mg/L	0.0131~0.0316	0.0093~0.0241	0.007~0.0139	≦0.5
Cd	mg/L	N.D.	N.D.	N.D.	≦0.005
Pb	mg/L	N.D.	N.D.	N.D.	≦0.01
Cu	mg/L	0.0015~0.0021	0.0011~0.0015	0.0007~0.0017	≦0.03
Co	mg/L	<0.0005	<0.0005	<0.0005	–
Ni	mg/L	N.D.	N.D.	N.D.	≦0.1
As	mg/L	0.0012~0.0013	0.001~0.0013	0.0013~0.0017	≦0.05
Hg	mg/L	N.D.	N.D.	N.D.	≦0.001

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