香港電燈有限公司
The Hongkong Electric Co., Ltd.

Development of an Offshore Wind Farm in Hong Kong

Offshore Wind Monitoring Station

Monthly Environmental Monitoring & Audit Report

February 2012

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港燈
HK Electric

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ORDINANCE, CAP. 499

ENVIRONMENTAL PERMIT NO. EP-394/2010

DEVELOPMENT OF AN OFFSHORE WIND FARM IN HONG KONG

ENVIRONMENTAL MONITORING & AUDIT PROGRAMME

Report Title	Monthly Environmental Monitoring & Audit Report (February 2012)
Date	6 March 2012
Certified by	(Mr. FUNG Kam-Fai Kenneth, Environmental Team Leader)
Verified by	(Mr. Y T Tang, AECOM Asia Company Limited, Independent Environmental Checker)

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EXECUTIVE SUMMARY

In June 2010, The Hongkong Electric Co., Ltd. (HK Electric) was granted an Environmental Permit to construct and operate the Project entitled "Development of an Offshore Wind Farm in Hong Kong".

The major construction works for the Wind Monitoring Station (WMS) of the Project commenced in August 2011. This report, prepared by the Environmental Team, presents the Environmental Monitoring and Audit (EM&A) findings for the Project in February 2012. The installation of the LIDAR unit and associated power supply and measuring equipments for the wind monitoring station was substantially completed in end February 2012. In this regard, this is the last monthly EM&A report for the construction of WMS.

Construction Activities Undertaken

The construction activities included general site works, the remaining platform installation works for the WMS and installation of the LIDAR System.

Environmental Monitoring Works

Air quality, noise and water quality monitoring were not required for construction of the WMS other than those related to good site construction practice. With the completion of percussive piling works in October 2011, no further marine mammals / sea turtles visual monitoring for the WMS was required. No environmental exceedance or non-compliance was found during the reporting period.

Site Environmental Audit

Site audits were carried out at least twice per month to monitor environmental issues on the construction site. The site conditions were generally satisfactory.

Environmental Licensing and Permitting

License/Permit	Ref. No.	Valid Period		Authority/Holder	Date Issued
		From	To		
Environmental Permit	EP-394/2010	08/06/10	-	EPD/HK Electric	08/06/10

Implementation Status of Environmental Mitigation Measures

Environmental mitigation measures as recommended in the EM&A Manual were properly implemented.

Environmental Complaints / Prosecutions

No complaint against the construction activities was received in the reporting month. There was also no prosecution for breaches of relevant environmental legislations.

Concluding Remarks

The environmental performance of the Project was generally satisfactory.

1. INTRODUCTION

1.1 Background

The Hongkong Electric Company Ltd (hereinafter referred to as HK Electric) is developing a large-scale wind farm in Hong Kong to generate power from renewable sources (the Project). The project will produce around 100 MW of electricity, which will be supplied directly to the HK Electric grid network to help meeting the HKSAR Government commitments to renewable energy generation and reduction in greenhouse gas emissions.

In June 2010, an Environmental Permit (EP-394/2010) was granted to HK Electric for the construction and operation of the Project entitled "Development of an Offshore Wind Farm in Hong Kong". An Environmental Team was then formed to implement the Environmental Monitoring and Audit (EM&A) programme in accordance with the EM&A Manual for the Project.

The key components of the Project are outlined as follows:

- The construction of around twenty eight (28) to thirty five (35) individual 2.3 to 3.6MW class wind turbine units, including seabed works required for foundation emplacement.
- The installation of interconnecting submarine electricity cables between turbine units, to the offshore substation and to grid.
- Construction of an offshore substation. There may, however, be an option for the offshore substation to be replaced by an onshore one located at Lamma Power Station Extension subject to detailed engineering design.
- Development of an onshore lay down area and quayside for material storage and pre-assembly works.
- Development of an offshore wind monitoring station.

In order to ascertain the wind potential at the wind farm site and to obtain all necessary meteorological data for design of the wind turbines, an offshore wind monitoring station (WMS) is to be set up towards end February 2012 at the proposed wind farm site located in the sea waters southwest of Lamma Island to carry out a minimum of a 12 month meteorological and oceanographic data collection campaign. The offshore wind monitoring station will be located towards the southeast corner of the wind farm boundary shown in Figure 1.1.

The offshore WMS will be required to measure the in-situ wind, wave and current data at the Project Site for detailed wind turbine design. The station will consist of a 4m x 4m offshore platform erected on top of a piled foundation (Figure 1.2). Wind monitoring equipment to be installed on top of the platform comprises a Light Detection And Ranging (LIDAR) unit, data logging and transmission system and a 10m met mast completed with anemometry instruments. Operations of the station will be supported by batteries powered by solar PV panels and small wind turbines with backup power from a diesel generator. An Acoustic Current Wave Profiler will be deployed onto the seabed for measurement of tidal and wave conditions.

The major construction works for the WMS commenced in August 2011. This report summarizes the EM&A findings for the Project in February 2012.

1.2 Project Organization

The management structure for the EM&A programme for the construction phase of the Project is shown in Appendix A. The key personnel contact names and telephone numbers are listed in Table 1.1.

Table 1.1 Key Personnel Contacts during Construction Phase

Role	Contact Person	Position	Phone No.
Permit Holder	Mr. F.H. Lau	General Manager (Projects)	3143-3887
Contractor (civil works)	Mr. Benjamin Chan	Project Manager	2982-0290
Contractor (E&M works)	Mr. David Malcolm	Installation and Health & Safety Package Manager	9138-2536
Environmental Team	Mr. Kenneth Fung	Environmental Team Leader	2843-3441
Independent Environmental Checker	Mr. Y.T. Tang	Executive Director	3922-9393

1.3 Construction Works undertaken during the Reporting Month

The construction programme for the WMS is shown in Appendix B, which includes civil works and E&M erection.

The main construction activities carried out during the reporting month and the corresponding environmental mitigation measures are summarized in Table 1.2. The implementation status of the major mitigation measures in the reporting month can be found in Appendix C.

Table 1.2 Construction Activities and Corresponding Environmental Mitigation Measures

Item	Activities	Environmental Mitigation Measures
1	General Site Works	*Air* – Dust suppression measures implemented. *Noise* – General noise mitigation measures employed at all work site. –

Item	Activities	Environmental Mitigation Measures
		Water – Good site practices adopted. – *Waste* – Waste Management Plan submitted and implemented – Good site practices adopted. – *Marine Ecology* – Good site practices adopted.
2	Platform and LIDAR System Installation	*Air* – Dust suppression measures implemented. *Noise* – General noise mitigation measures employed at all work site. *Water* – Good site practices adopted. – *Waste* – Waste Management Plan submitted and implemented – Good site practices adopted. – *Marine Ecology* – Good site practices adopted.

1.4 Summary of EM&A Requirements

EM&A procedures are required during the design, construction, post-construction and operational phases of the project implementation and a summary of the requirements for each of the environmental parameters is details in Table 1.3. For ease of implementation, these are presented in terms of those required for the WMS and separately for the Wind Turbines associated with the Project.

In accordance with the monitoring requirements, marine mammals /sea turtles visual monitoring for the construction of WMS conducted during all piling activities is described in Section 2. No environmental non-compliance was found during the reporting period.

Regular environmental audits on air quality, noise, water quality, waste management, marine ecology and fisheries are required. Details of the audits are summarized in Section 3 of this report.

Table 1.3 Summary of EM&A Requirements

Parameter	Wind Monitoring Station				Wind Turbines			
	Design Phase [2]	Construction Phase	Post-Construction Phase	Operation Phase	Design Phase [2]	Construction Phase	Post-Construction Phase	Operation Phase
Water Quality								
Water Quality Monitoring						✓		
Audit		✓				✓		
Waste								
Audit		✓				✓		
Terrestrial Ecology								
Monitoring for Bird Abundance and Distribution					✓[1]	✓		✓
Bird Collision Monitoring								✓
Site Audit								
Marine Ecology								
Coral Survey / Relocation					✓			
Marine Mammal Monitoring		✓			✓	✓	✓	
Audit		✓				✓		
Noise								
Airborne Noise Monitoring [3]						✓		
Underwater Noise Monitoring [3]						✓		
Fisheries								
Safety / Exclusion Zone (500m)		✓				✓		
Audit		✓				✓		
Landscape and Visual								
Design	✓				✓	✓		
Audit						✓		
Cultural Heritage								
Audit					✓	✓		

Note:
[1] Although pre- construction monitoring may overlap the design phase, the focus of this monitoring will be to provide additional information on which to assess potential impacts through construction.
[2] EM&A requirements in the design phase shall include confirmation on the compliance for environmental designs which are specified in the EIA Report and the EP for all parameters.
[3] Due to concerns about noise emissions during piling works for the wind turbines based on the size of the proposed piles, airborne and underwater noise monitoring has been committed during percussive piling works. Further details can be found in the Report on the 112th Environmental Impact Assessment Subcommittee Meeting (ACE Paper 7/2010 – Annex C).
http://www.epd.gov.hk/epd/english/boards/advisory_council/files/ACE_Paper_7_2010_Annex_C.pdf

Figure 1.1 The Project Area

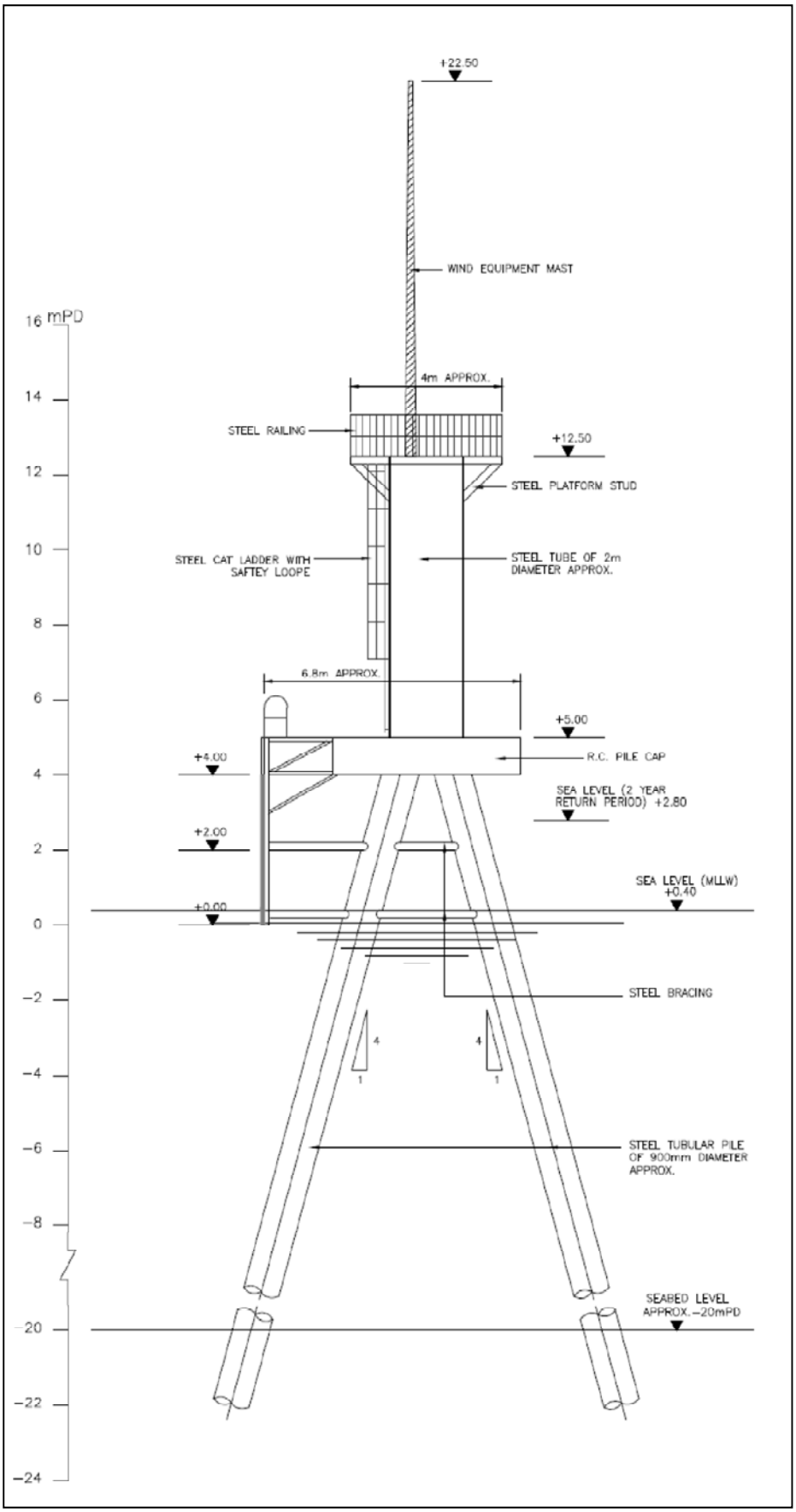


Figure 1.2 Design of the Wind Monitoring Station

2. ENVIRONMENTAL MONITORING

2.1 Air Quality

Air quality monitoring is not required for the construction of the WMS. However, site inspection was conducted at least twice per month to ensure that dust was avoided as practically as possible and, where necessary, mitigation measures were implemented to ensure that dust emission is reduced to a practical minimum.

2.2 Noise

Noise monitoring is not required for construction of the WMS other than those related good construction practices. However, site inspection is conducted at least twice per month to ensure that noise impact should be reduced as far as practicable and unnecessary noise impact was avoided.

2.3 Water Quality

Water quality monitoring is not required for construction of the WMS. However, site inspection was conducted at least twice per month to ensure that the works did not cause any visible foam, oil, grease, litter or other objectionable matter to be present in the water within and adjacent to the area.

2.4 Waste Management

Wastes generated from construction of WMS include construction and demolition (C&D) materials, chemical waste and general refuse. The Waste Management Plan submitted by the Contractor includes the procedures for handling these wastes.

Site inspection was conducted at least twice per month to ensure that all wastes produced during the construction phase were managed in accordance with the Waste Management Plan, good waste management practices, and statutory regulations and requirements.

Advice on Solid and Liquid Waste Management Status

The estimated quantities of wastes generated in February 2012 are summarized in Table 2.1.

Table 2.1 Estimated Quantities of Waste Generated in February 2012

Waste Type	**Examples**	**Estimated Amount**
Construction Waste	Inert C&D materials	Nil
Construction Waste	Non-inert C&D waste and domestic waste	Nil

Waste Type	Examples	Estimated Amount
Chemical Waste	Used lubrication oil	Nil

2.5 Marine Ecology / Fisheries

Marine Mammals / Sea Turtles Exclusion Zone

A 500m marine mammals / sea turtles exclusion zone was enforced during all marine piling operations. A qualified person was present during all piling activities and conducted visual monitoring in accordance with the monitoring requirements.

With the completion of percussive piling works in October 2011, no further marine mammals / sea turtles visual monitoring for the WMS was required. Site inspection was conducted at least twice per month to ensure that good site practices and mitigation measures for marine ecology and fisheries were properly implemented.

3. ENVIRONMENTAL AUDIT

3.1 Review of Environmental Monitoring Procedures

The environmental monitoring procedures were regularly reviewed by the Environmental Team and no modification was recommended.

3.2 Assessment of Environmental Monitoring Results

There was no negative finding for the environmental monitoring for the reporting month and the event/action plans were not applicable.

3.3 Site Environmental Audit

Site audits were carried out by the Environmental Team at least twice per month to ensure compliance with relevant legislations and requirements. The site audit findings for the reporting month are summarized in Appendix D. The site conditions were generally satisfactory. All required mitigation measures were properly implemented.

3.4 Status of Environmental Licensing and Permitting

The licenses/permits obtained for the Project are summarised in Table 3.1.

Table 3.1 Status of Environmental Licensing and Permitting

License/Permit	Ref. No.	Valid Period		Description	Status
		From	To		
Environmental Permit	EP-394/2010	08/06/10	-	For the construction and operation of the Project	Valid

3.5 Implementation Status of Environmental Mitigation Measures

Mitigation measures detailed in the Environmental Permit and the EM&A Manual are required to be implemented. A summary of the Environmental Mitigation Implementation Schedule (EMIS) is presented in Appendix C.

3.6 Implementation Status of Event/Action Plans

There was no negative finding for the environmental monitoring for the reporting month and the event/action plans were not applicable.

3.7 Implementation Status of Environmental Complaint Handling Procedures

No complaint against the construction activities was received in the reporting month.

Table 3.2 Environmental Complaints / Enquiries Received in February 2012

Case Reference / Date, Time Received / Date, Time Concerned	**Descriptions /Actions Taken**	**Conclusion / Status**
Nil	N/A	N/A

Table 3.3 Outstanding Environmental Complaints / Enquiries Carried Over

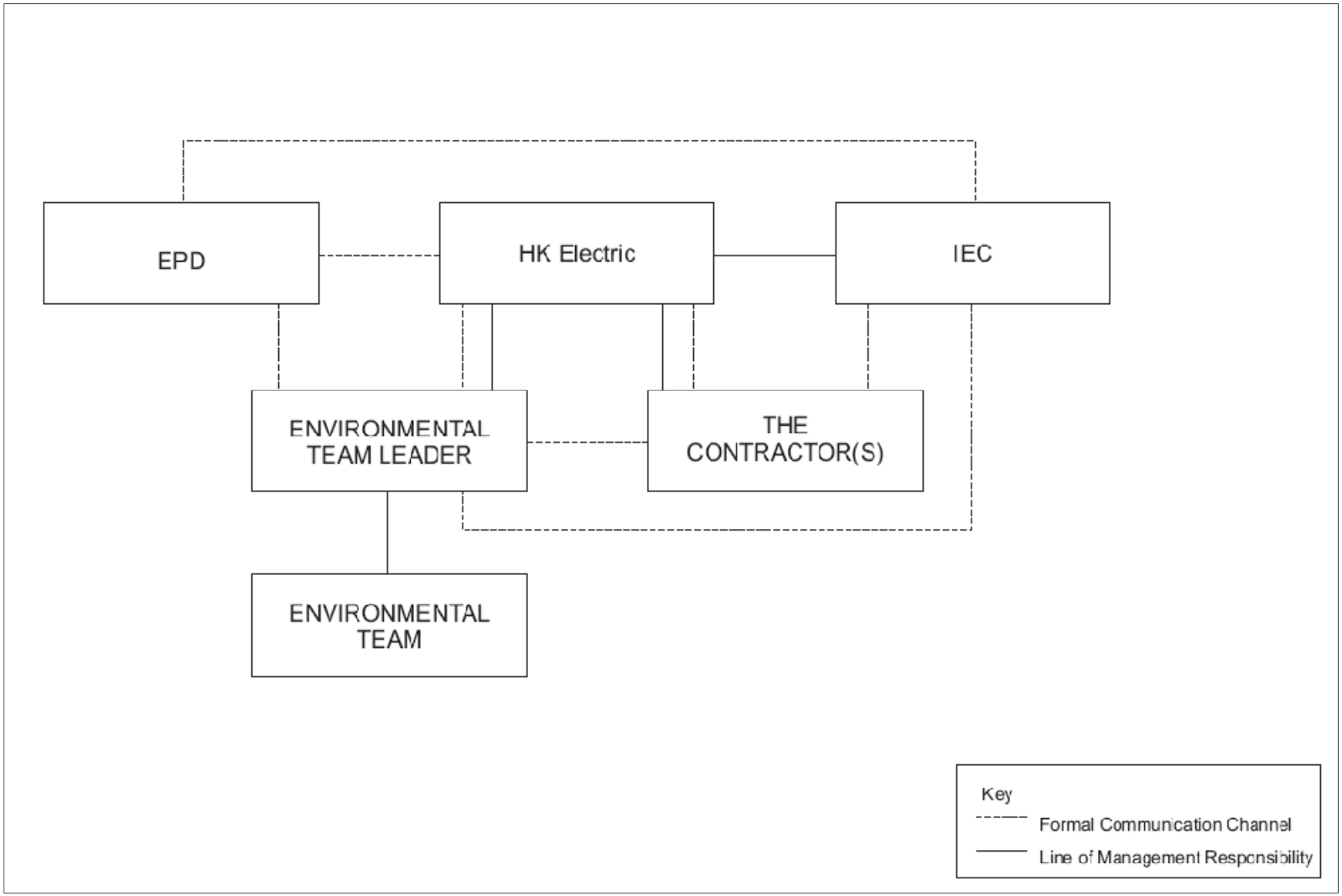
Case Reference / Date, Time Received / Date, Time Concerned	**Descriptions /Actions Taken**	**Conclusion / Status**
Nil	N/A	N/A

4. CONCLUSION

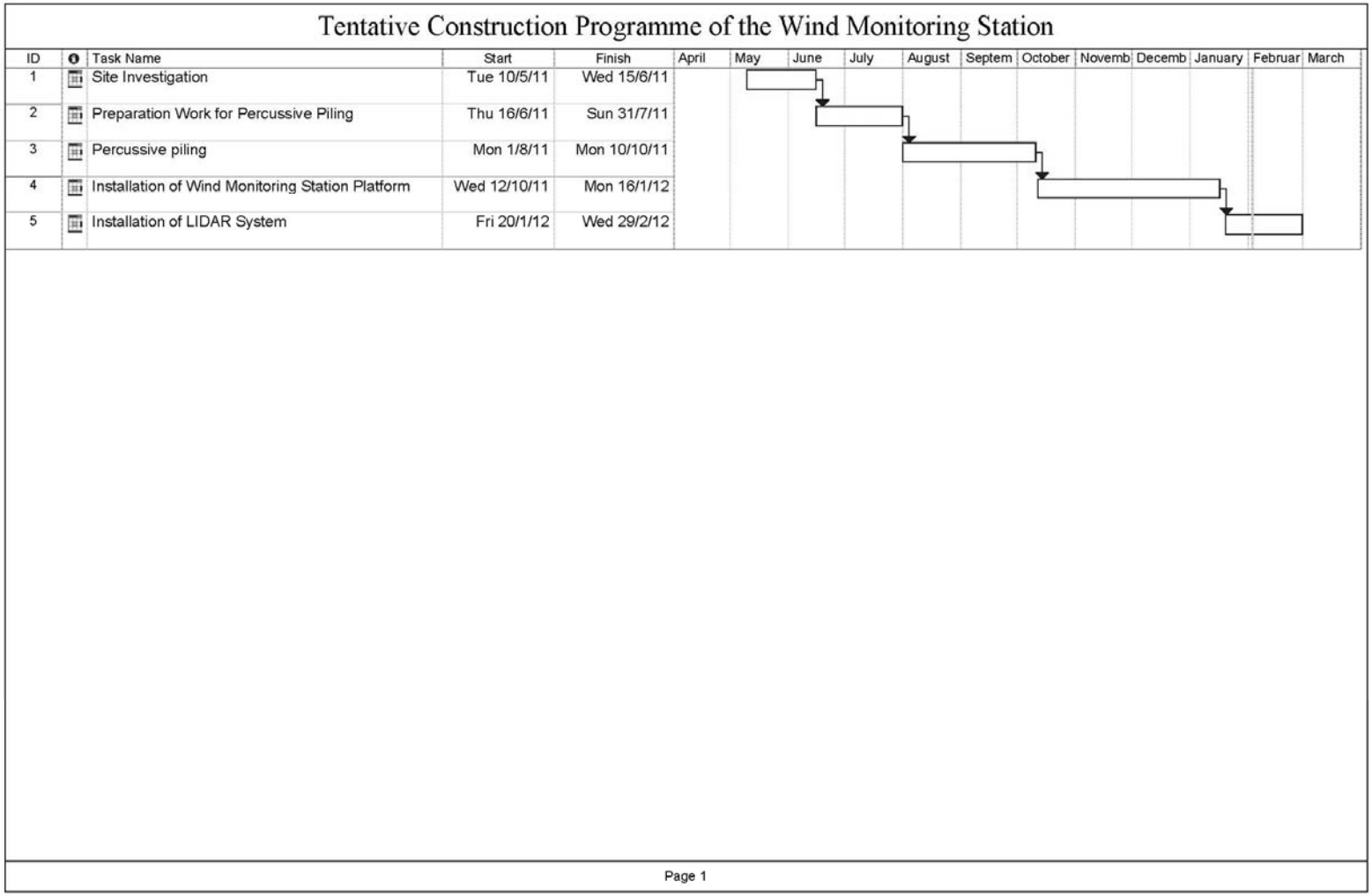
Environmental audits were performed in accordance with the EM&A Manual. All required environmental mitigation measures were properly implemented. No complaint against the construction activities was received in the reporting month. There was also no prosecution for breaches of relevant environmental legislations.

The environmental performance of the Project was generally satisfactory. This is the last monthly EM&A report for the construction of WMS.

Appendix A Organization Chart



Appendix B Construction Programme of the Wind Monitoring Station



Appendix C Summary of EMIS

Table C.1 Construction Phase Mitigation Measures and their Implementation for Wind Monitoring Station in the Reporting Month

EM&A Log Ref.	Mitigation Measures	Implementation Status
	WATER QUALITY	
1	The contractor(s) will ensure that the works cause no visible foam, oil, grease, litter or other objectionable matter to be present in the water within and adjacent to the area of marine works.	Complied
2	Control and monitoring systems will be used to alert the crew to leaks or any other potential risks.	Complied
3	All plant will be fully serviced and inspected before use to limit any potential discharges to the marine environment.	Complied
4	Avoid spillage of oil, fuel and chemicals from structures by adopting appropriate good site practices.	Complied
5	The storage areas of oil fuel and chemical will be surrounded by bunds or other containment device to prevent spilled oil, fuel and chemicals from reaching the receiving waters.	Complied
6	The Contractors will prepare guidelines and procedures for immediate clean-up actions following any spillages of oil, fuel or chemicals.	Complied
7	Any grout used would conform to the relevant environmental standards. In addition, the adoption of appropriate operational management by the contractor should lead to low potential for leakage during the pumping phase.	Complied
8	No debris shall be willingly discharged to sea. However, should debris be placed on the seabed, this will be removed (wherever practicable).	Complied
	WASTE MANAGEMENT	
9	The Contractor shall prepare and implement a Waste Management Plan which incorporates site-specific factors, such as the designation of areas for the segregation and temporary storage of reusable and recyclable materials.	Complied
10	The Contractor shall ensure only licensed waste collectors are used to collect chemical waste for delivery to a licensed treatment facility.	Complied
11	The Contractor shall apply for and obtain the appropriate licenses/permits for the disposal public fill and chemical waste.	Complied
12	EM&A of waste handling, storage, transportation, disposal procedures and documentation through the site audit programme shall be undertaken.	Complied
	MARINE ECOLOGY	
13	The vessel operators will be required to control and manage all effluent from vessels.	Complied
14	A policy of no dumping of rubbish, food, oil, or chemicals will be strictly enforced. This will also be covered in the contractor briefings.	Complied
15	Vessel operators working on the Project construction or operation will be given a briefing, alerting them to the possible presence of marine mammals in the area, and guidelines for safe vessel operations in the presence of cetaceans. If high speed vessels are used, they will be required to slow to 10 knots when passing through a high density dolphin area.	Complied

EM&A Log Ref.	Mitigation Measures	Implementation Status
16	The vessel operators will be required to use predefined and regular routes, as these will become known to porpoise using these waters. This measure will further serve to minimize disturbance to marine mammals due to vessel movements.	Complied
17	To reduce underwater sound levels associated with percussive piling, the following steps will be taken: - Quieter hydraulic hammers should be used instead of the noisier diesel hammers; - - Acoustic decoupling of noisy equipment on work barges should be undertaken.	Complied
18	Best practices are recommended to reduce the impacts to marine mammals: - Instigate 'ramping-up' of the piling hammer to provide an advance warning system to marine mammals in the vicinity; - Activities will be continuous without short-breaks and avoiding sudden random loud sound emissions	Complied
19	An exclusion zone of 500 m radius will be scanned around the work area for at least 30 minutes prior to the start of percussive piling. If marine mammals/sea turtles are observed in the exclusion zone, piling will be delayed until they have left the area.	Complied
20	No piling works for the wind monitoring station will be conducted during the finless porpoise peak seasons between December and May.	Complied
21	Marine percussive piling works to be restricted to a daily maximum of 12 hours within daylight operations.	Complied
	FISHERIES	
22	The impacts to fisheries resources will be minimized by adopting the following measures: - The use of competent and experienced contractors and vessels operators; - Good planning of the installation sequence to avoid possible clashes; - Good promulgation of information relating to construction activities; - Thorough auditing of all vessels; - Observing good industry construction practices by the Contractors; and,	Complied
23	Inform fishermen of possible developments of the Project in advance	Complied
24	Using good engineering practice, including the use of appropriately sized piles (smaller piles generate lower levels of underwater sound) and piling equipment.	Complied
25	Using ramp-up piling procedures. Blow frequency during this ramping up period should replicate the intensity that would be undertaken during full piling (e.g. one blow every two seconds) to provide cues for fish to localize the sound source. Pile blow energy should be ramped up gradually over the 'soft start' period.	Complied
26	The relevant authorities will be notified of activities in the wind monitoring station area during construction activities, including dates of any works. In addition, the Marine Department will be notified of the final location of the wind monitoring station structures so that these can be updated on marine charts.	Complied
27	All vessels engaged in construction activities will be equipped with a Maritime VHF radio and an agreed frequency channel maintained. All	Complied

EM&A Log Ref.	Mitigation Measures	Implementation Status
	vessels involved in the construction works will show the correct lights and shapes and ensure that all movements are promulgated through the Marine Department.	
28	Consider the use of Guard Ship during the construction phase, particularly in periods of high activity.	Complied
29	A safety / exclusion zone of 500 m from any area of construction works will be established for all non-Project vessels subject to approval of Marine Department.	Complied
30	Temporary lighting should be provided for incomplete structures during construction.	Complied
31	The wind monitoring station should be marked according to the requirements of the Marine Department. The precise marking arrangement will be agreed during the Detailed Design Phase.	Not applicable at this stage
	LANDSCAPE AND VISUAL	
32	Appropriate colours for the wind monitoring station should be selected to reduce their visibility.	Not applicable at this stage