

THE HONGKONG ELECTRIC CO LTD

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Lamma Power Station Navigation Channel Improvement

Environmental Impact Assessment Executive Summary

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1. INTRODUCTION

1.1 DESCRIPTION OF THE PROJECT

- 1.1.1 The Hongkong Electric Company Limited (HEC) is responsible for the generation and supply of electricity to Hong Kong and Lamma Island. At present, all electric power is generated from Lamma Power Station (LPS) which is located on Lamma Island. LPS, with a total installed capacity of 3,420MW, comprises 2,500MW coal-fired units for base load operation and 920MW gas turbine units for peak lopping operation. The annual coal consumption in 2001 is about four million tons.
- 1.1.2 A coal jetty designed for 100,000 DWT coal vessels and a dedicated Navigation Channel (the Channel) have been in operation since the early 1980's to facilitate delivery of coal from overseas to LPS by ocean going vessels. To ensure an adequate underkeel clearance for safe operation of coal vessels involved, maintenance dredging was carried out at the Channel in 1989/90 to bring the seabed level to - 16.5mPD. Again, due to natural siltation, the water depth at the Channel has now been reduced to about - 14mPD which is close to the limit for safe navigation of coal vessels of Panamax size (about 65,000 DWT) which is the smallest class of ocean going coal vessel in the market.
- 1.1.3 Even with the first new 300MW gas-fired unit in service at Lamma Power Station Extension, the coal-fired units of LPS still have to operate to meet the majority of the electricity demand. The annual coal consumption is around four million tons.
- 1.1.4 As the siltation is building up and in view of the importance to have in place a safe navigation channel with adequate water depth for ocean going coal vessels, maintenance dredging must be carried out in 2003. Otherwise, coal supply to the LPS will be seriously hampered and the reliability of electricity supply will be jeopardized. The proposed maintenance dredging work involves deepening the existing Channel to - 16mPD with an estimated total dredging volume of 2.98 million m³. The proposed Project Area and the dredging profile are illustrated in Figure 1.
- 1.1.5 The proposed dredging operation is scheduled to take place between May 2003 and December 2003 on a 24-hour basis. Marine vessels will transport the dredged sediment to the Government approved disposal sites at East Ninepin, East Tung Lung Chau and East Sha Chau.
- 1.1.6 As the total dredging volume exceeds 500,000m³, the dredging operation of the Channel improvement is a designated project according to the Environmental Impact Assessment (EIA) Ordinance, Schedule 2, Part I, C.12. A Project Profile was submitted by HEC to EPD on 11 June 2001 for application of an EIA Study Brief, which (*Brief No. ESB-078/2001*) was issued by EPD on 23 July 2001. Hyder Consulting Ltd was commissioned by HEC to undertake the EIA Study in accordance with the EIA Study Brief.
- 1.1.7 The assessment undertaken and major findings, conclusions and recommendations of this EIA are summarised in this document.

1.2 STUDY OBJECTIVES

- 1.2.1 The objectives of the EIA Study are as follows:

- (a) To describe the proposed Project and associated works together with the requirements for carrying out the proposed Project;
- (b) To consider alternative method(s) for the dredging work and design to ensure safe delivery of fuel to the power station; and to compare the environmental benefits and dis-benefits of each of the method(s) and design in selecting a preferred one;
- (c) To identify and describe elements of the community and environment likely to be affected by the proposed Project and/or likely to cause adverse impacts to the proposed Project, including natural and man-made environment;
- (d) To propose the provision of infrastructure or mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction of the proposed Project;
- (e) To identify, predict and evaluate the residual (i.e. after practicable mitigation) environmental impacts and the cumulative effects expected to arise during the construction and operation phases of the proposed Project in relation to the sensitive receivers (SRs) and potential affected uses;
- (f) To identify, assess and specify methods, measures and standards, to be included in the detailed design and construction and operation of the proposed Project which are necessary to mitigate these environmental impacts and reducing them to acceptable levels;
- (g) To investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures, and to identify the constraints associated with the mitigation measures recommended in the EIA Study as well as provision of any necessary modification;
- (h) To identify, within the Study Area, any individual project(s) that fall under Schedule 2 of the EIA Ordinance (EIAO); to ascertain whether the findings of this EIA Study have adequately addressed the environmental impacts of those projects; and where necessary to identify the outstanding issues that need to be addressed in any further detailed EIA Study; and
- (i) To design and specify environmental monitoring and audit (EM&A) requirements, if required, to ensure the implementation and the effectiveness of the environmental protection and pollution control measures adopted.

2. EVALUATION OF IMPACTS

2.1 DREDGING OPTIONS

- 2.1.1 The major potential cause of environmental impact for this Project is the associated dredging works during the construction stage. The potential environmental SRs of the dredging works have been identified and are illustrated in Figure 2.
- 2.1.2 Two dredging options have been considered. They are grab dredgers with cage-type silt curtains and trailer suction hopper dredgers (TSHD).
- 2.1.3 For the TSHD option, it was assumed that there would be only one TSHD to be deployed for the dredging works, operating intermittently at a dredging cycle of 30 minute dredging and 2 hour travelling between the dredging site and the allocated dumping site.

- 2.1.4 For the grab dredger options, it was assumed that the dredging would be carried out continuously with the dumping of the dredged material being handled by barges and tugboats. The number of grab dredgers operating at any one time will depend on the maximum dredging rates allowed, but will not be more than 5 and the grab capacity will not be less than 8 m³.
- 2.1.5 Based on the sediment quality review conducted as part of this EIA Study, the sediment to be dredged is of low contaminant levels hence will not cause any unacceptable water quality impacts at the disposal sites allocated by the Government. No further impact assessment has therefore been carried out under this Study for the disposal of the dredged material.

2.2 WATER QUALITY

- 2.2.1 The potential water quality (WQ) impact of the proposed dredging works has been assessed using the Lamma Channel Model constructed from a previous EIA study for the Lamma Power Station Extension.
- 2.2.2 The yearly tidal conditions were represented by a 15-day spring to neap tidal cycle each in the dry and wet season respectively.
- 2.2.3 The Channel to be dredged is divided equally in terms of the Northing Coordinates into four working zones: ABn, ABs, BCn and BCs as shown in Figure 3. While the location of dredging will be moving all the time within the Channel, the most adverse impact of the whole dredging operation can be represented by dredging at either Dredging Location A, B or C as shown in Figure 3.
- 2.2.4 The impact of dredging at Location A would represent the worst scenario for the water quality SRs (WQSRs) to the north of the Channel such as those in the Western Buffer Water Control Zone (WCZ). The dredging at Location C would represent the worst-case scenario for the WQSRs to the south of the Channel such as the south Lamma water. Location C represents the most southern point where the dredging will take place. According to the latest bathymetric survey of the Channel, there is already sufficient water depth and no dredging will be required in the southern part of the Channel beyond Location C. The other adverse scenarios which may not be covered by dredging at Locations A and C can be accounted for by the dredging at Location B.
- 2.2.5 As different dredging contractors may be equipped with different dredgers, HEC would like to have the flexibility of appointing the most suitable contractors for carrying out the proposed dredging works in the future. To this end, the maximum dredging rates which would ensure no unacceptable environmental impacts, have been estimated.
- 2.2.6 The maximum dredging rates were first estimated such that the SS elevation at the WQSRs resulting from the dredging at Locations A, B or C would not lead to an unacceptable level. Assessments were then carried out for the estimated maximum dredging rates to ensure no unacceptable WQ impacts in terms of the other WQ parameters.
- 2.2.7 Sediment samples have been collected at representative locations in the Channel and elutriation tests have been carried out on the samples to determine the releasing potential of various contaminants from the sediment into the receiving water during dredging. The tested parameters included heavy metals, nutrients, sediment oxygen demand and micro-pollutants (e.g. Poly Chlorinated Biphenyls (PCBs), chlorinated

pesticides, Tributyl Tin (TBT), Poly Aromatic Hydrocarbons (PAHs), etc).

- 2.2.8 The elutriation test results were then used to assess the potential elevation of the pollution levels in terms of those pollutants at the WQSRs during the dredging operations at the estimated dredging rates.
- 2.2.9 The contents of all heavy metals and organic micro-pollutants were found to be below the detection limits. It was therefore concluded that the proposed dredging works would not result in unacceptable environmental effects in terms of the potential release of heavy metals and the organic micro-pollutants.
- 2.2.10 The proposed dredging would result in some depletion of dissolved oxygen in the WQSRs, but the effect was predicted to be within the acceptable level.
- 2.2.11 The ammoniacal nitrogen level resulting from the dredging works was found to be negligible. The baseline total inorganic nitrogen level in the WQSRs already exceeds the threshold value of the Water Quality Objectives (WQOs).
- 2.2.12 Under the maximum dredging rates estimated, the predicted deposition rates were less than 0.01 kg/m²/day along the western coast of Lamma Island and less than 0.001 kg/m²/day in the south Lamma waters for all dredging scenarios, below the level of any ecological concern.
- 2.2.13 The cumulative effects of other concurrent dredging/disposal activities on the WQSRs of this Project were found to be minimal.

2.3 RECOMMENDED MAXIMUM DREDGING RATES AND PROPOSED WORKS SCHEDULE

2.3.1 The estimated maximum dredging rates, less 10% to allow for contingency and the cumulative effects from other concurrent projects, have been recommended as the maximum daily dredging rates. Based on the maximum dredging rates for dredging at Dredging Locations A, B or C, the maximum dredging rates for dredging at the individual working zones have been conservatively estimated as in Table 1. The recommended maximum dredging rate for a working zone is the total dredging rates at any one time, assuming all dredging activities take place within that working zone.

Table 1 Recommended Maximum Dredging Rates

Season		Wet Season (April – September)				Dry Season (October – March)			
Working Zone		ABn	ABs	BCn	BCs	ABn	ABs	BCn	BCs
Grab Dredger with Cage-Type Silt Curtains (Grab Capacity ≥ 8 m ³)	m ³ /day	33,800	31,400	26,300	21,200	43,800	33,200	33,200	34,200
	m ³ /hr	1,549	1,439	1,205	972	2,008	1,522	1,522	1,568
TSHD	m ³ /day	12,500	11,300	8,300	5,300	39,500	34,300	27,000	19,700
	m ³ /cycle	1,432	1,295	951	607	4,526	3,930	3,094	2,257

Note: The maximum daily dredging rates are based on 24-hour operations. If the daily working hours are restricted, the maximum daily dredging rates should be reduced proportionally.

2.3.2 For the grab dredger option, dredging may be carried out concurrently at more than one working zones during some time periods. In this case, the combined dredging rates during those time periods should not exceed the lowest of the maximum rates recommended for the concerned working zones. Take the grab dredger option in the wet season for example. If the dredging work is carried out at ABn, ABs and BCn

concurrently, the combined maximum dredging rate should not exceed 26,300 m³/d. For the TSHD option, there will be only one TSHD working in the Channel during the works period.

- 2.3.3 All dredging at the dredging location A, B or C at the estimated maximum dredging rates represent the worst-case scenarios in terms of the potential environmental impacts. As long as the dredging rates do not exceed the above recommended maximum dredging rates for the respective working zones, the proposed Channel Improvement works would not lead to WQ non-compliance with the WQOs in any of the WQSRs throughout the dredging period.

2.4 MARINE ECOLOGY

- 2.4.1 Literature and studies on the marine and coastal ecology of the Study Area has been reviewed in detail for this EIA and supplemented with additional coral dive field survey where considered necessary.

2.4.2 The coastal stretches and waters off southern to south-western Lamma are of an important ecological value. Coastal areas here have SSSI status and have been proposed for consideration as a Marine Park. Southern Lamma's coastal waters support hard and soft corals, Finless Porpoises, nesting sites for Green Turtles and a more diverse and abundant benthic infauna and exposed soft shore communities.

- 2.4.3 The Finless Porpoises were considered to be the key species potentially affected both directly and indirectly by works given that the southern extent of the Study Area is considered to be an important habitat of the porpoises, particularly in the winter/spring months.

2.4.4 The areas around the Lamma Power Station and immediately to the south have been disturbed frequently, comprise fine sediments and generally support less diverse benthic and intertidal communities. The Finless Porpoises and Chinese White Dolphins are found only infrequently in these waters. Corals in this area are extremely sparse and patchy and already showing signs of stress. Furthermore they did not support significant reef communities and are of low ecological value when put into the Hong Kong context. When compared to other sites on Lamma, the eastern coast (Tung O Wan) and southern coast (Sham Wan) support more extensive and significant coral communities.

- 2.4.5 WQ modelling has indicated that the potential WQ impact of the proposed dredging works would be small and would not lead to the exceedance of the WQOs at the SRs. The highest SS elevation would be in the immediate vicinity of the works area, which will likely be avoided temporarily by mobile organisms such as fish and cetaceans. Increases in SS concentrations and sedimentation rates have been predicted to be sufficiently low so as not to result in harmful effects on remaining patches of the corals along the west coast. Indirect impacts on the Finless Porpoises and their prey are expected to be minimal. The Green Turtle nesting site at Sham Wan and the sensitive coral sites at the east and south coast of Lamma will not be affected by this Project.

2.5 FISHERIES

- 2.5.1 Waters around West Lamma are relatively important fishing grounds with the exception of Pak Kok which has a fairly low ranking in Hong Kong in terms of value and production. Po Law Tsui contains the most valuable fishing grounds off western Lamma in terms of production per hectare. These fishing grounds encompass the

waters around the Lamma Power Station. Of the species most commonly caught in the Study Area, *Pseudosciaena crocea* and *Oratosquilla spp* are high value species. The remainder are commonly regarded as trash species that are generally sold as fish feed to mariculturalists.

- 2.5.2 Short-term impacts on fisheries could potentially arise as a result of sediment releases associated with dredging. As elevations in SS levels would not lead to non-compliance with the WQOs, the potential impact is unlikely to be significant.

2.6 CONSTRUCTION NOISE

- 2.6.1 No operational noise impact is anticipated from this Project. Powered Mechanical Equipment (PME) will be the primary source of construction noise. The noise impact on the noise SRs (NSRs) of this Project has been assessed based on the estimation of the provisional plant inventory and the proposed working schedule. The construction noise impact during the normal working hours has been found to be negligible and the cumulative noise levels at the NSRs after taking into account the other concurrent projects are well below the noise limits set by EIAO Technical Memorandum (EIA-TM).

- 2.6.2 It is planned that the dredging operation will be on a 24-hour basis and a Construction Noise Permit is required during the restricted hours. It is predicted that the noise impact of this Project will comply with the noise criteria for issuing a Construction Noise Permit.

2.7 WASTE MANAGEMENT

- 2.7.1 The dredged marine sediment is the only waste source generated from the proposed Channel Improvement works. Based on the recent data collected in and around the Channel the marine sediment has been classified as Category L and is suitable for open sea disposal. The disposal sites at East Tung Lung Chau, East Ninepin and East Sha Chau have provisionally been allocated by the Marine Fill Committee (MFC) for the Channel Improvement works.

2.8 OPERATIONAL IMPACTS

- 2.8.1 The potential operational impact is the changes in the local hydrodynamic regime arising from restoring the Channel water depth to its design level, which could lead to changes in the local WQ and the local sediment transport regime.
- 2.8.2 The effect on the local hydrodynamic regime was concluded to be minimal and the impact on the local WQ conditions and the local sediment transport regime is negligible.

3. MITIGATION MEASURES AND GOOD SITE PRACTICE

3.1 MITIGATION MEASURES

For Both Grab Dredger and TSHD Options

- 3.1.1 The dredging rate should not exceed the recommended maximum dredging rates for respective working zones, dredging options and seasons.
- 3.1.2 Should the WQ monitoring during the construction stage indicate any exceedance of

the WQOs due to this Project, the dredging rate should be further reduced.

- 3.1.3 To minimise impacts to sensitive species in the waters around southern Lamma, all vessel movements to disposal grounds will bypass the Finless Porpoise habitat area and be subject to a maximum speed limit of 10 knots in south Lamma waters.
- 3.1.4 The southern-most sections (Working Zone BCs) will not be dredged during the most critical period of the Finless Porpoise calving season i.e. February to April.
- 3.1.5 If dredging work is carried out in more than one working zones in any day, the lowest maximum rate in the affected zones should apply for that day.
- 3.1.6 The number of dredgers and operation conditions specified in the applicable CNPs should be strictly followed.

For Grab Dredger Option Only

- 3.1.7 The total number of grab dredgers deployed concurrently for the proposed dredging works should not be more than 5.
- 3.1.8 Cage-type silt curtains should be used for the grab dredger options, the grab capacity should not be less than 8 m³ and the silt curtains should be extended to the seabed level as far as possible.

For TSHD Option Only

- 3.1.9 There should not be more than one TSHD to be deployed concurrently for the proposed dredging works.

3.2 GOOD SITE PRACTICE

- 3.2.1 In order to further minimize the potential WQ impact, the following good site practice, which is applicable to both dredging options, is recommended:
 - Although the maximum dredging rates are in terms of the dredging volume per day, the daily dredging volume should be spread as evenly as possible over the 24 hour period whenever practical to avoid sudden surge of pollution elevation during short spells, in particular when dredging at the recommended maximum rates;
 - Special care should be taken during lowering and lifting grabs to minimize unnecessary disturbance to the seabed;
 - Vessels used should have adequate clearance of the seabed in order to reduce undue turbidity generated by turbulence from vessel movement or propeller wash;
 - Barges should be fitted with tight fitting seals to their bottom openings to prevent leakage of material;
 - The contractor should ensure that grabs are tightly closed and hoist speed is suitably low;
 - Barges should not be filled to a level which will cause overflow of materials during loading and transportation;
 - Large objects should be removed from the grab to avoid losses from partially closed grabs; and

- Appropriate monitoring of WQ during dredging works should be undertaken to allow the implementation of appropriate Action Plans to prevent any unacceptable WQ impacts.

3.2.2 In order to avoid potential impacts on cetaceans, all vessel operators working on the Project should be thoroughly briefed on:

- the possible presence of dolphins and porpoises in the vicinity of the Study Area and along routes to the Project Area
- rules for safe vessel operation around cetaceans; and
- slowing to 10 knots in the presence of cetaceans
- the dumping of chemicals, rubbish, oils etc into the water is strictly prohibited and enforced.

4. ENVIRONMENTAL MONITORING & AUDIT

4.1.1 A comprehensive Environmental Monitoring and Audit (EM&A) programme for the construction phase has been recommended. The EM&A requirements cover WQ and waste management and are a full reflection of the recommendations made from the EIA. No EM&A monitoring work would be required during the operational phase as this Project has no operation impact on the environment.

4.1.2 The dredging contractor is required to maintain a daily log book to record the disposal volume of the dredged sediment by every shipment. This information can be used to audit the dredging rates. However, real-time reporting of the monitoring data is considered to be unnecessary.

4.1.3 With the inclusion of the recommended EM&A requirements into the works programme, it is anticipated that the works can be carried out with full compliance of the requirements set by the EIA-TM.

5. SUMMARY AND CONCLUSIONS

5.1.1 The proposed maintenance dredging in the Channel would comply with all environmental standards and legislations, provided that the recommended maximum dredging rates for the respective dredging options are not exceeded and the proper mitigation measures and good site practice recommended in this EIA are fully implemented.