

For discussion
on 29 March 2011

Legislative Council Panel on Development

5737CL – Dredging, management and capping of contaminated sediment disposal facility to the south of The Brothers

PURPOSE

This paper briefs Members on the proposal to upgrade **737CL** entitled “Dredging, management and capping of contaminated sediment disposal facility to the south of The Brothers” to Category A, at an estimated cost of \$590.9 million in money-of-the-day (MOD) prices, for the dredging, management and capping of a new contaminated sediment disposal facility to the south of The Brothers (the SB facility).

PROJECT SCOPE

2. The scope of works under **737CL** comprises:

- (i) forming and capping a new facility comprising two mud pits in the sea-bed to the south of The Brothers for disposal of about 5 million cubic metres of contaminated sediments;
- (ii) conducting on-site management of disposal activities; and
- (iii) implementing Environmental Monitoring and Audit (EM&A) programme.

3. Subject to the funding approval of the Finance Committee, we plan to commence the proposed works in November 2011 for completion by June 2016. The site plan showing the location of the proposed sediment disposal facility is at **Enclosure 1**.

JUSTIFICATION

4. Infrastructure projects and maintenance dredging of the harbour fairway, rivers and drainage channels will generate contaminated sediments that need proper disposal. Despite that we have implemented a mechanism to minimize contaminated sediment disposal and have introduced measures to manage sediments generated from infrastructure developments and fairway/river/drainage maintenance works in lieu of disposal, there will be substantial quantities of contaminated sediments, estimated at 13.5 million cubic metres, requiring disposal from 2011 till 2016.

5. As at end 2010, the available capacity at the existing contaminated sediment disposal facility at the east of Sha Chau (ESC), including those remaining mud pits yet to be formed, is about 9.8 million cubic metres. This available capacity will be inadequate to meet the forecast disposal demand. We need to provide a new disposal facility in time to cope with this disposal demand. Otherwise, major infrastructure developments, including the proposed Mass Transit Railway Shatin to Central Link and Kai Tak Development as well as the regular fairway/river/drainage maintenance works would be jeopardized. This will carry significant territory-wide implications to navigation safety, flood protection and the continuous development of Hong Kong.

6. From a comprehensive territory-wide search for suitable sites in Hong Kong for contaminated sediment disposal, the area to the south of The Brothers is the only remaining place within the territory found suitable for the provision of a new facility which satisfies environmental, engineering and planning requirements. We estimate that this proposed facility will provide an additional capacity of about 5 million cubic metres, which together with that of the ESC facility, will be adequate to meet the above forecast demand. As the current information indicates that the first pit of this facility needs to be available by end 2013 for meeting forecast disposal demand in 2014, there is a pressing need to start the construction of the proposed facility in late 2011.

FINANCIAL IMPLICATIONS

7. We estimate the capital cost of the project to be \$590.9 million in MOD prices, made up as follows –

		\$ million
(a)	Forming and capping of a new disposal facility	260.1
(b)	Conducting On-site management of disposal activities	35.6
(c)	Implementing EM&A programme	153.9
	(i) Consultants' fees for overall co-ordination and monitoring	13.0
	(ii) Sampling and testing work	140.9
(d)	Contingencies	44.9
	Sub-total	494.5 (in September 2010 prices)
(e)	Provision for price adjustment	96.4
	Total	590.9 (in MOD prices)

PUBLIC CONSULTATION

8. We consulted the Tourism, Agriculture, Fisheries and Environmental Hygiene Committee (TAFEHC) of the Islands District Council (IsDC) on 17 May 2010 about the project. Members raised concerns on site selection and environmental impacts of the proposed works, in particular on water quality, marine ecology, human health, leakage of contaminant and fisheries. Details of the responses to the concerns are summarised at **Enclosure 2**. Whilst members did not raise objection to the project, they further requested the Government to consider setting up a special fund outside the current ex-gratia allowance (EGA) mechanism¹ for compensation to fishermen for any economic loss caused by the proposed facility and establishing a monitoring group on the operation of the facility. In lieu of setting up a special fund, we consider it more appropriate to establish a compensation arrangement to deal with the possible economic loss of fishermen due to the construction and operation of the facility that could not be covered by the existing EGA mechanism. Under the arrangement, we will appoint an independent panel of experts to give advice on potential fisheries impact throughout the lifespan of the facility. The panel will also conduct independent investigations on fish kill incidents if any when reported by mariculturists. Should the panel establish that the

¹ Under the current EGA mechanism, EGA payments would be paid as a form of assistance to eligible fishermen, including both mariculturists and capture fisheries, affected by marine works such as dredging and dumping.

fish kill is caused by the proposed facility, the contractor or the Government will follow up with the compensation. In addition, we will invite concerned parties to set up a liaison group to monitor the implementation of the proposed facility and the associated EM&A results. On 2 March 2011 we circulated an information paper to TAFEHC of IsDC advising members of these measures. We received no further request/comment from them.

9. Separately, we briefed the Aquaculture Fisheries Subcommittee and Capture Fisheries Subcommittee of the Advisory Committee on Agriculture and Fisheries² at their regular meetings starting from June/July 2010 about the need and progress of the project. After receiving further information on the environmental issues of the proposed facility, these two Subcommittees did not raise any further comments at their last meetings on 16 and 22 November 2010 respectively. Further, we invited views from fishermen organizations on the proposed facility. Despite our effort to meet with them to explain the project is in compliance with the relevant standard and requirement of the Environmental Impact Assessment Ordinance (Cap. 499) (EIAO) and to provide them with more details of the EGA mechanism and the arrangement in paragraph 8 above, some of them maintained their stance against the project and their request for enhanced compensation to affected fishermen including review of the EGA mechanism.

10. We also invited views from 12 green groups on the proposed facility in December 2009 and had a meeting with them on 9 June 2010. Only one green group turned up for the meeting and raised concerns on the potential impacts of the proposed facility on fisheries resources and Chinese White Dolphins. We provided our responses to these concerns to all the 12 green groups on 15 June 2010 and received no further comment from them.

11. We gazetted the proposed facility under the Foreshore and Seabed (Reclamations) Ordinance (FS(R)O) on 11 June and 18 June 2010 respectively. During the 2-month objection period, we received 111 objections in nine correspondences. Among these objections, one green group, the only party amongst those mentioned in paragraphs 9 and 10 above, lodged an objection under the FS(R)O. The remaining objections comprised one from a fishermen

² The Advisory Committee is set up by the Government with the function to advise the Government on matters pertaining to (i) the development of agriculture and fisheries production in Hong Kong, (ii) the formulation of agricultural, fisheries and other related policies, and (iii) any other matters relating to the production, distribution and marketing of agriculture and fisheries products as may arise. This Committee composes of among others academics and representatives of fishermen organizations and serves to bridge the gap between Government and practitioners on various matters and policies in agriculture and fisheries.

organisation and the others from members of the public with most of them either residing at Tuen Mun or with corresponding address at Tuen Mun area. After listening to our explanations, the green group, the fishermen organization and a member of the public residing at Tuen Mun withdrew their objections unconditionally. Having considered the details of the unresolved objections and the Administration's responses (summarised at **Enclosure 3**), the Chief Executive in Council authorized the proposed facility without modification at its meeting on 15 February 2011. The gazette for authorization of the proposed facility was published on 11 March 2011.

ENVIRONMENTAL IMPLICATIONS

12. The proposed facility is a Designated Project under Schedule 2 of the EIAO and an Environmental Permit is required for the construction and operation of the facility. We have completed an environmental impact assessment (EIA) which has concluded that the environmental impact of the proposed facility can be controlled to within the criteria under EIAO and the Technical Memorandum on EIA Process. The Director of Environmental Protection (DEP) approved the EIA report under the EIAO in September 2005. The conclusion of our EIA report in respect of cumulative impacts remains valid with reference to the findings of the previously approved EIA reports of planned projects in the vicinity. Long-term EM&A results for the existing ESC facility indicate that there is no unacceptable impact on the environment. In 2009, we conducted a review study on the findings of the approved EIA report taking into account the cumulative effects of other planned projects to be carried out in the vicinity. The review confirmed that assessment, findings and recommendations of the approved EIA report are still valid after taking into account the up-to-date information of other planned projects. We also submitted an information note in August 2010 to the Advisory Council on the Environment (ACE) to update members on latest development of this proposed facility. ACE has no comment on the findings of the environmental assessments.

13. We will implement good management practices and EM&A programme as recommended in the EIA report in the construction and operation stages of the project including the control of maximum weekly dredging rate to minimize its environmental impacts such as noise and sediment dispersion to levels within the established standards and guidelines. Appropriate measures including temporary suspension of the construction and dumping activities will be taken if there are any abnormalities in the monitoring results. We will employ independent consultants to oversee the EM&A programme and estimate that the cost of the EM&A programme to be about \$153.9 million (in September 2010 prices), which has been included in the project estimate. The objectives of the EM&A programme and details of the management practices for sediment disposal are at **Enclosures 4 and 5** respectively.

14. The proposed works will not generate any construction waste.

HERITAGE IMPLICATIONS

15. The project will not affect any heritage site, i.e. all declared monuments, proposed monuments, graded historic sites/buildings, sites of archaeological interest and Government historic sites identified by the Antiquities and Monuments Office.

LAND ACQUISITION

16. The proposed works do not require any land acquisition.

17. Under the established policy, EGA will be offered to eligible fishermen as a result of the temporary loss of their habitual fishing ground. The estimated amount of EGA for eligible fishermen is about \$4.126 million. Funds will be made available under Head 701 – Land Acquisition.

STATUTORY CONTROL UNDER DUMPING AT SEA ORDINANCE

18. The gazettal of the proposed works under the Foreshore and Sea-bed (Reclamations) Ordinance will exempt dumping operations at the new facility at the south of The Brothers from the control of Dumping at Sea Ordinance (Cap. 466) (DASO)³. In order to restore the regulatory control regime under the DASO at the new facility before dumping operation is to commence, we will initiate statutory process to include the gazetted foreshore and sea-bed back into Schedule 2 “Reclamation Areas Specified for the Purposes of Section 4(2)(a)” of the Dumping at Sea (Exemption) Order.

BACKGROUND INFORMATION

19. We included **737CL** in Category B in January 2009. We engaged a contractor to carry out site investigation in July 2009. We have charged the cost of about \$19.5 million in MOD prices to block allocation **Subhead 5101CX** “Civil engineering works, studies and investigations for items in Category D of the Public

³ DASO controls the dumping of substances and articles from vessels, vehicles, aircraft, and marine structures in the sea and under the sea-bed and the related loading operations. All these operations require a permit to be issued by the DEP as the Authority under the DASO.

Works Programme”.

20. We have substantially completed the detailed design and tender documents. We schedule to commence works in November 2011 in order that this new facility will be available in time for meeting the disposal demand.

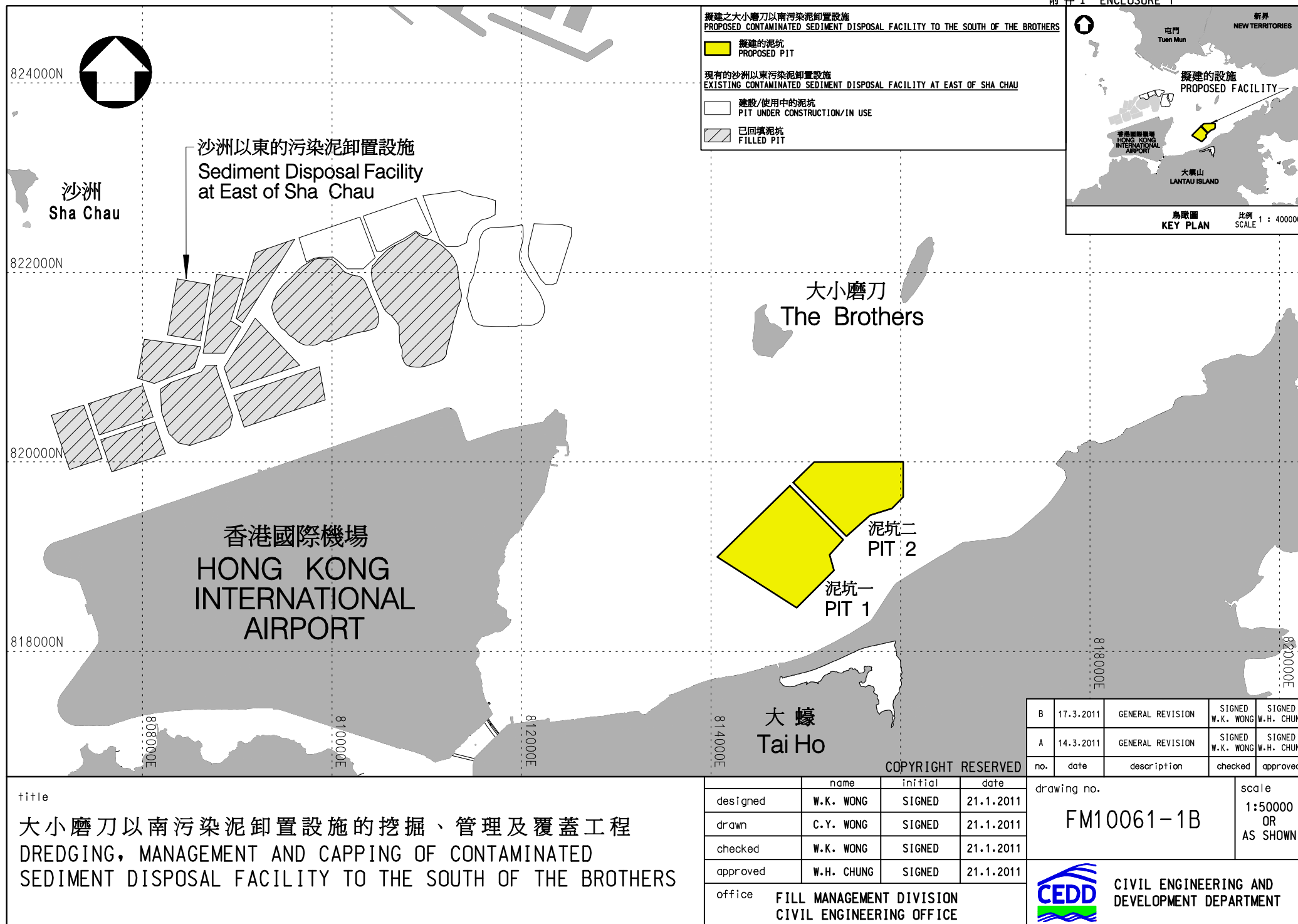
21. The proposed works will not involve any tree removal or planting proposals.

22. We estimate that the proposed works will create about 65 jobs (35 for labourers and another 30 for professional/technical staff) providing a total employment of 2 750 man-months.

WAY FORWARD

23. We plan to seek the support of the Public Works Sub-committee for upgrading **737CL** to Category A with a view to seeking funding approval from the Finance Committee in June 2011.

Development Bureau
March 2011



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contaminated sediment disposal facility to the south of The Brothers**

**Details of concerns and Administration responses during the consultation with
the Islands District Council in May 2010**

Members raised concerns on site selection and environmental impacts of the proposed facility, in particular on water quality, marine ecology, human health, leakage of contaminant and fisheries.

We advised Members that comprehensive evaluation of various potential locations in Hong Kong waters has been conducted considering various factors including water quality, nearby environment, technology and effectiveness. Results indicated that the provision of the proposed facility at the proposed location is considered most viable. The results have been considered and endorsed by the Advisory Council on the Environment (ACE).

We also responded that an Environmental Impact Assessment (EIA) covering their respective concerns has been conducted for the project and the EIA report was approved by the Director of Environmental Protection under the Environmental Impact Assessment Ordinance (EIAO). The EIA has evaluated potential environmental impacts and indicated that the proposed facility would not have unacceptable impact on the environment and the assessed impacts have complied with the requirements of the relevant standards. Key findings of the EIA report are as follows:

- (i) the proposed site at the South of The Brothers (SB) has been selected to reduce both direct and indirect impact to ecologically sensitive habitats;
- (ii) the environmental monitoring data collected since the commencement of operations of the existing contaminated sediment disposal facility at the east of Sha Chau (ESC) in 1992, summarized as follows, are environmentally acceptable:

Quality Monitoring of sediments outside facilities

Sediment concentrations of most contaminants were below their respective Lower Chemical Exceedance Level (LCEL), and exceedances of LCEL were observed for some contaminants very occasionally.

There were no observable trends of increasing contaminant concentrations in sediment with increasing proximity to the ESC facility, and all contaminants showed either no or a weak relationship between concentrations in sediment

and time.

There was no evidence of any adverse environmental impacts to sediment quality as a result of contaminated sediment disposal operations at the ESC facility.

Sediment Toxicity Testing of sediments outside facilities

Long term monitoring result indicated no history of toxic responses in organisms related to mud disposal operations as little or no toxicity was observed in sediments.

Testing for Contaminant concentration of Target Biota Species

For samples collected from demersal trawling, it was noted from the long term review that the abundance of fisheries resources was similar between the Reference and Impact stations, and occasionally, was higher in the Impact than the Reference areas. These findings indicated that disposal operations at the ESC facility may not have any adverse effects on the abundance of fisheries resources within the study area. The ESC facility and its operations are therefore considered to be environmentally acceptable in the context of fisheries resources.

For the biomonitoring, contaminant concentrations in the tissues and the whole body of the target species fluctuated over time, but no temporal trends of concern, i.e, increasing concentration over time, were observed for any of the target species.

Water Quality

There was no evidence of any adverse environmental impacts to water quality as a result of contaminated mud disposal operations at the ESC facility. The facility and its operations are considered to be environmentally acceptable in the context of water quality.

All in all, findings from the environmental monitoring data collected for the ESC facility suggest that there is no evidence of any adverse impacts caused by disposal activities in the facility. The ESC facility and its operations have proceeded in an environmentally acceptable manner. As all the dredging, backfilling and capping operations proposed for the SB facility will be designed to follow the current practice, no adverse unacceptable impacts are expected to occur;

- (iii) the SB facility is designed as two separate pits, which minimizes the exposure time of contaminated mud to the marine environment and consequently reduces the magnitude of any potential impacts;
- (iv) no unacceptable impacts to water quality if the dredging, backfilling and capping operations are carried out within the allowed working rates; and,
- (v) long term environmental data from in and around the existing capped pits at ESC demonstrate that within a relatively short period of time, recolonization by marine organisms occurs returning the site to a pre-dredged state.

In summary, the EIA study has predicted that the proposed facility will comply with all environmental standards and legislation following the implementation of the recommended mitigation measures.

During the construction and operation of the proposed SB facility, comprehensive monitoring programme, similar to that of the ESC facility, would be implemented to ensure that the potential impacts on the environment would comply with the requirements and relevant standards of the EIAO.

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Details of Objections and Administration's Responses under the Foreshore and
Sea-bed (Reclamations) Ordinance (Cap. 127)**

- (a) Most of the objectors had concerns on the potential impacts, in particular the potential cumulative impacts due to other planned projects in the vicinity, of the proposed facility to the nearby environment.

We explained to the objectors that comprehensive Environmental Impact Assessment (EIA) pursuant to the requirements and standard of the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499) has been conducted for the project and the EIA report was approved by the Director of Environmental Protection pursuant to the EIAO. The EIA has evaluated potential environmental impacts, including those raised by the objectors arising from the proposed facility as listed below:

i. Water Quality Impact

The EIA made use of computer modelling to assess the potential water quality impact on the identified sensitive receivers including bathing beaches along Tuen Mun Coastal area, marine water near Tung Chung Wan, corals, Ma Wan Fish Culture Zone, and seawater intakes at the nearby. The assessment also took into account the cumulative effect of other concurrent projects nearby. Results indicated that the potential impact on the water quality by the proposed facility, with the implementation of the appropriate mitigation measures, would only confine to the water near the proposed facility. In particular, the impacts on those sensitive receivers in terms of suspended solid concentration, dissolved oxygen, heavy metal and nutrient contents concentration would be in compliance with the relevant environmental standard and legal requirements.

ii. Impact on Chinese White Dolphin (CWD)

The EIA adopted expert advice on CWD and assessed that the proposed site was not an important living ground with infrequent sightings of the CWD. Taking into account the fact that the impact due to the proposed facility would be of transient nature and the affected seabed would be restored after completion of the capping works, it was considered that there would not be any unacceptable impact on the CWD.

The EIA also included a health impact assessment for the CWD. The assessment realized that adverse effect on the health of CWD were

associated with the consumption of prey items with contaminants. The assessment took into account the respective contaminant concentration at water body, polluted substances accumulated in prey items and the consumption rates and concluded that the risks of an adverse effect on the health of CWD associated with the consumption of prey items would not be increased due to the proposed facility.

iii. Fisheries Impact and EGA payment

The EIA assessed the potential impact on fisheries resources and fishing operations. The results indicated that as the proposed site was not an important fishing ground with relatively less fishing operation and fish production, the transient impact of the proposed facility on the fisheries would not be unacceptable. Furthermore, as there was no unacceptable impact on the water quality, it would not induce unacceptable indirect impact on fisheries resources near the disposal facility. Following the established mechanism, EGA payment would be made to those eligible fishermen.

iv. Noise Impact

The EIA assessed the noise impact on major residential block near the proposed facility (around 2.2km distance) at different periods of time. The assessment concluded that the noise level at the nearby major residential block at about 2.2km away would be in compliance with the relevant requirements and standards of the Noise Control Ordinance and the Technical Memorandum of the EIAO (EIAO-TM). The proposed facility thus would not induce unacceptable noise impact on the nearby residents.

v. Marine Traffic Safety

The EIA included a Marine Traffic Impact Assessment (MTIA), which indicated that the proposed facility was situated outside main navigation fairways and the marine activities within the proposed site would be subject to regulatory control of the site staff. It is to ensure the relevant activities would not affect the marine traffic safety at the nearby. Marine Department has endorsed this finding.

vi. Cultural Heritage

The EIA completed a sea-bed geophysical survey. The study concluded that no spots of important archaeological value had been identified within the proposed site and the nearby.

vii. Marine ecology

The EIA assessed the potential impact of the facility on marine ecology and concluded that as the benthic communities were of relatively low

ecological value and there were similar living environment in the vicinity of the proposed facility, the impact on the benthic communities within the proposed site would be transitional and acceptable. The benthic communities were expected to recolonise at the affected living environment after completion of the proposed capping works. Furthermore, as the proposed facility would not induce unacceptable water quality impact, there would not be unacceptable indirect impact induced by the proposed facility on the nearby marine ecology including the marine mammals, marine park, mangroves, intertidal mudflat and living ground of the horseshoe crab, and the seagrass area.

viii. Impact on human health

The EIA evaluated the potential impacts on human health by the proposed facility mainly associated with consumption of contaminants accumulated in fishes/seafood. The assessment took into account the respective contaminant concentration at water body, at seafood from the proposed site and the consumption rates and concluded that the lifetime risks, both carcinogenic and non-carcinogenic, of an adverse effect on human health associated with the consumption of seafood from the proposed site would be in accordance with the relevant guidelines of the EIAO-Technical Memorandum (EIAO-TM) and the corresponding standards of the United States Environmental Protection Agency (US EPA) recognized by EPD. Hence, it was assessed that the proposed facility would not induce unacceptable health risk to the general public. CEDD would review the human health risk assessment regularly to safeguard that no unacceptable risk to human health would be induced by the proposed facility. Furthermore, the result of examination of the fish samples regularly obtained in the vicinity of the ESC facility, revealed that the respective contaminant concentration in the bodies of fish was within the acceptable standards and was at similar level when compared with other samples collected at waters nearby.

ix. Leakage of contaminants

When the facility was fully filled, a 3m capping layer of clean material would be placed on top of the deposited contaminated sediment to prevent it from the reach of bioturbation and to protect it against wave erosion. This would seal off the deposited contaminated sediment from the nearby environment.

x. Air quality

As the proposed facility, similar to other marine works, would involve the deployment of limited number of working vessels and would be sited around 2.2km away from the nearby major residential areas, the

estimated impact on air quality due to the proposed facility would be minimal. As the objector was located away from the proposed facility much more than 2.2km, the estimated impact on the air quality near the residence of the objector would be less.

xi. Visual impact

The proposed facility would mainly involve working vessels for the dredging and backfilling operations within the proposed facility site and the working vessels would not operate at the site after completion of the respective works. Therefore, the proposed facility would not result in long term visual impact on the proposed facility site.

xii. Past Experience of Existing Facility at East Sha Chau (ESC)

The long-term EM&A results of the ESC facility indicated that the contaminated sediment disposal and the relevant activities would not induce adverse impact on the nearby environment and ecology. Furthermore, benthic recolonization had occurred at the affected living environment after completion of the capping works.

xiii. Monitoring measures

In accordance with the EIAO, we would conduct EM&A works to verify the assessment results. Appropriate measures will be taken if there are any abnormalities in the monitoring results. Long-term EM&A results of the on-going activities in the ESC facility have revealed that the contaminated sediment disposal and the related activities have no adverse impact on the nearby environment.

Results indicated that the project met the requirements of the EIAO fully when mitigation measures in specified areas are taken. The conclusion of our EIA findings in respect of cumulative impacts remains valid with reference to the findings of the recently approved EIA reports of planned projects in the vicinity.

- (b) The objectors questioned the suitability of the proposed site and requested for provision of the proposed facility at other locations.

We advised them with same responses as mentioned in Enclosure 2. All in all, it is concluded that the proposed location is considered most viable. This result had been endorsed by the Advisory Council on the Environment.

- (c) Some objectors also had concerns on the on-site control of the disposal operation.

We advised them that disposal operation will be regulated by our site staff

following the “Drift Disposal Method”. Under this method, the site staff would check the water current speed and direction upon arrival of a dumping barge and determine from the computer modelling the best disposal location such that the disposed sediments following the water current direction would settle within the pit boundary. This method has been adopted in the existing ESC facility and proven to be successful.

- (d) One objector had concerns on the cumulative impacts from concurrent projects in the vicinity on Chinese White Dolphins including bioaccumulation of organochlorines and heavy metals as well as their toxicity to dolphins of different age groups, and on lack of updated information on fisheries resources in the vicinity of the project site.

In response to its concern, we advised the objector of the followings:

- (i) With respect to findings of the EIA report and data review of the proposed facility and other recently approved EIA reports of planned projects in the vicinity, there will be no unacceptable impacts on the Chinese White Dolphins due to the concurrent works. The potential of contaminant uptake through food chain bioaccumulation of organochlorine and heavy metals has been examined by a comprehensive bioaccumulation assessment and a marine mammal health risk assessment. Results of the assessment have indicated that the risks of an adverse effect on Chinese White Dolphins associated with the consumption of prey items at site of the proposed facility is low and acceptable as per the relevant criteria.
- (ii) Baseline conditions of fisheries resources have been updated based on available literature, mainly from the territory-wide information kept by the Agriculture, Fisheries and Conservation Department (AFCD) and the ESC Contaminated Mud Pit Environmental Monitoring and Audit (EM&A) Programme. In particular, data from the ESC EM&A programme are the most up-to-date, geographically relevant as data has been collected from monitoring stations in the vicinity of the site since 2006.
- (iii) Comprehensive EM&A programme will be conducted. The programme will help in formulation of management action and supplemental mitigation measures to be employed should any unexpected impact arise.
- (iv) More surveys with concerted efforts of other concurrent projects on Chinese White Dolphins and on fisheries resources will be conducted before, during and upon completion of the proposed facility taking into account the objector’s concerns.
- (e) Two objectors had concerns on the deteriorating water quality along the

Tuen Mun Coastline.

According to Environmental Protection Department's routine marine water quality monitoring results from the six stations at the North-western water control zone (WCZ), there was no trend of deterioration in water quality. There was 94% compliance with respective water quality objectives of the WCZ in 2009.

- (f) One objector requested for setting up of liaison group to monitor the implementation of the project and its environmental performance.

We advised the objector that same as that of the existing facility, we planned to post the EM&A results at the internet for public inspection during the proposed facility. Should there be any questions, the public can contact us according to the method suggested in the website or to contact EPD. We believed the setting up of this website could facilitate the objector and the general public to effectively monitor the progress of the proposed facility. If necessary, we will consider reporting regularly the EM&A results to the liaison group comprising various stakeholders including fishermen groups.

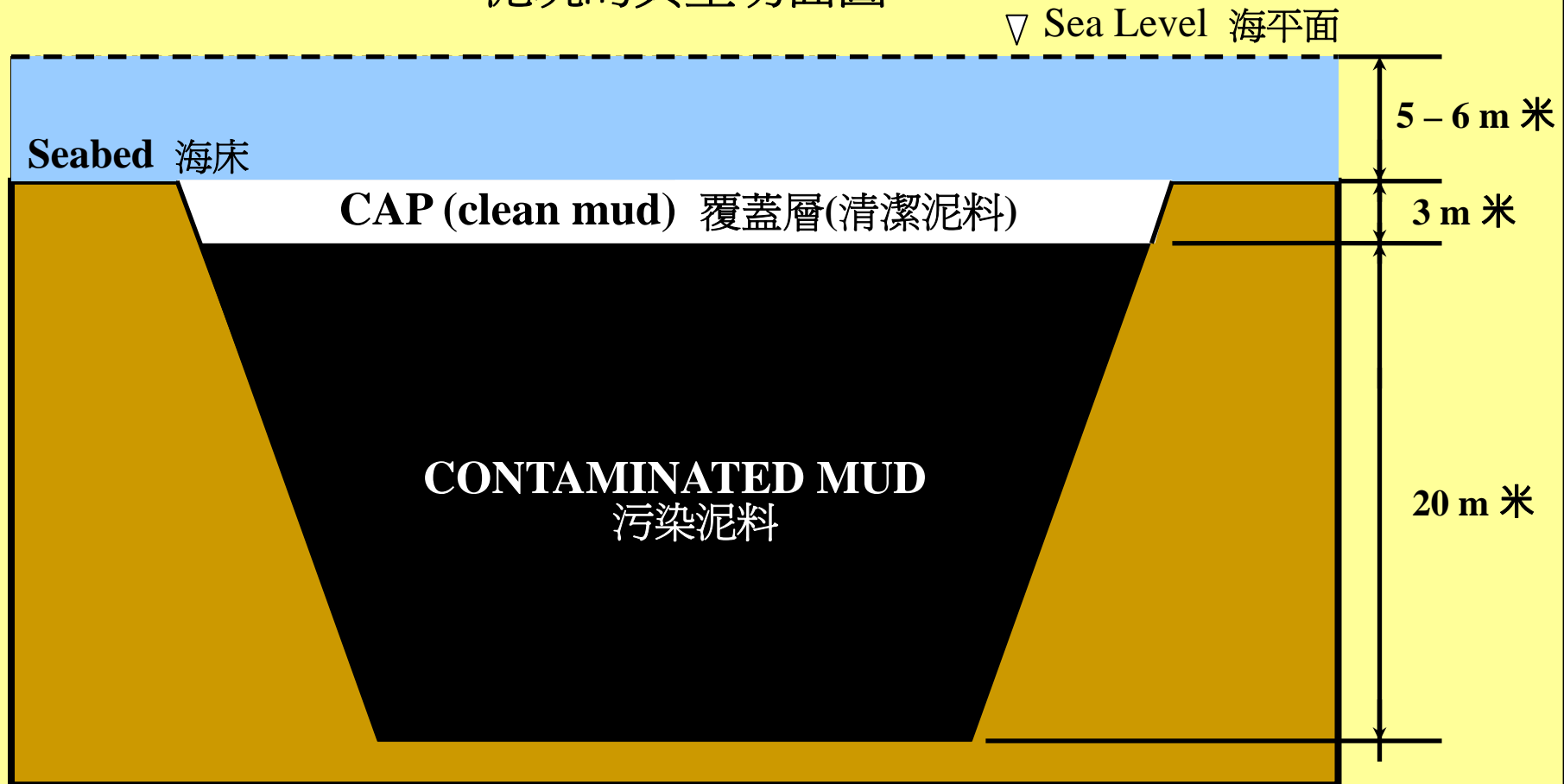
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Objectives of the EM&A Programme

We will implement an Environmental Monitoring and Audit (EM&A) programme throughout the construction and operation as a checking mechanism to safeguard the environmental acceptability of the proposed facility. Similar EM&A programmes have been in place for all existing mud pits at ESC before. Each EM&A programme involves various field sampling and laboratory testing works to collect measurements for verifying that:

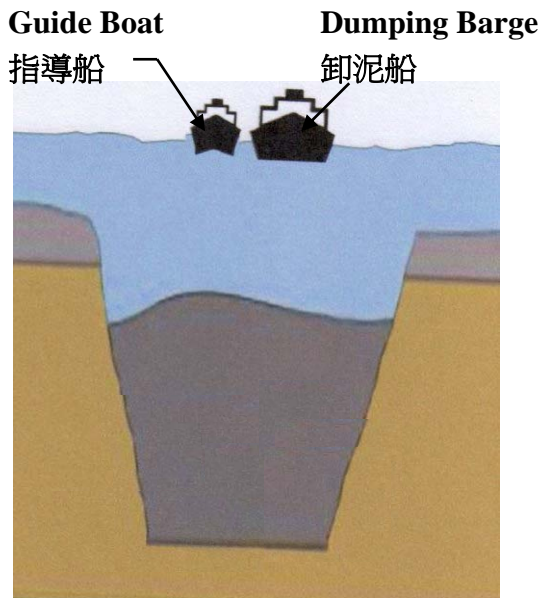
- (i) the construction of the facility, mainly comprising dredging works, will not lead to any exceedances of water quality objectives of the water control zone at where the facility is situated;
- (ii) the operation of the facility will not result in any exceedances of the water quality objectives of the water control zone at where the facility is situated;
- (iii) the operation of the facility will not increase sediment contaminant concentrations over time at individual stations or a trend of increasing concentrations with proximity to the active pit;
- (iv) the operation of the facility will not increase sediment toxicity over time at individual stations or a trend of increasing toxicity with proximity to the pit;
- (v) the operation of the facility will not affect the abundance of the fisheries resources and will not increase the tissue or whole body contaminant concentration over time in selected target species; and
- (vi) recolonisation is occurring at the capped pits such that the affected seabed will return to its pre-dredged state for marine organisms.

Typical Cross-section of Mud Pit 泥坑的典型切面圖



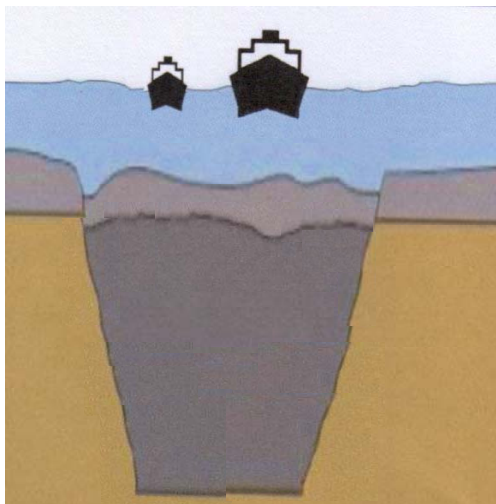
Schematic diagram showing the design of Contaminated Sediment Disposal Pits used in Hong Kong 香港採用的污染泥卸置坑設計示意圖
(Not to Scale) (不按比例)

Disposal Methodology 卸置方法



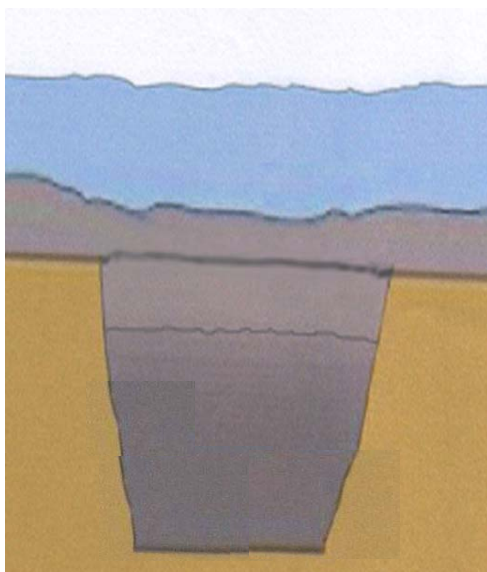
Disposal of contaminated mud in the disposal pit up to a level of 3m below the surrounding seabed

將污染泥料卸置在坑中，最高回填水平必須低於周圍海床 3 米



Capping using uncontaminated mud to isolate the disposed contaminated mud from environment

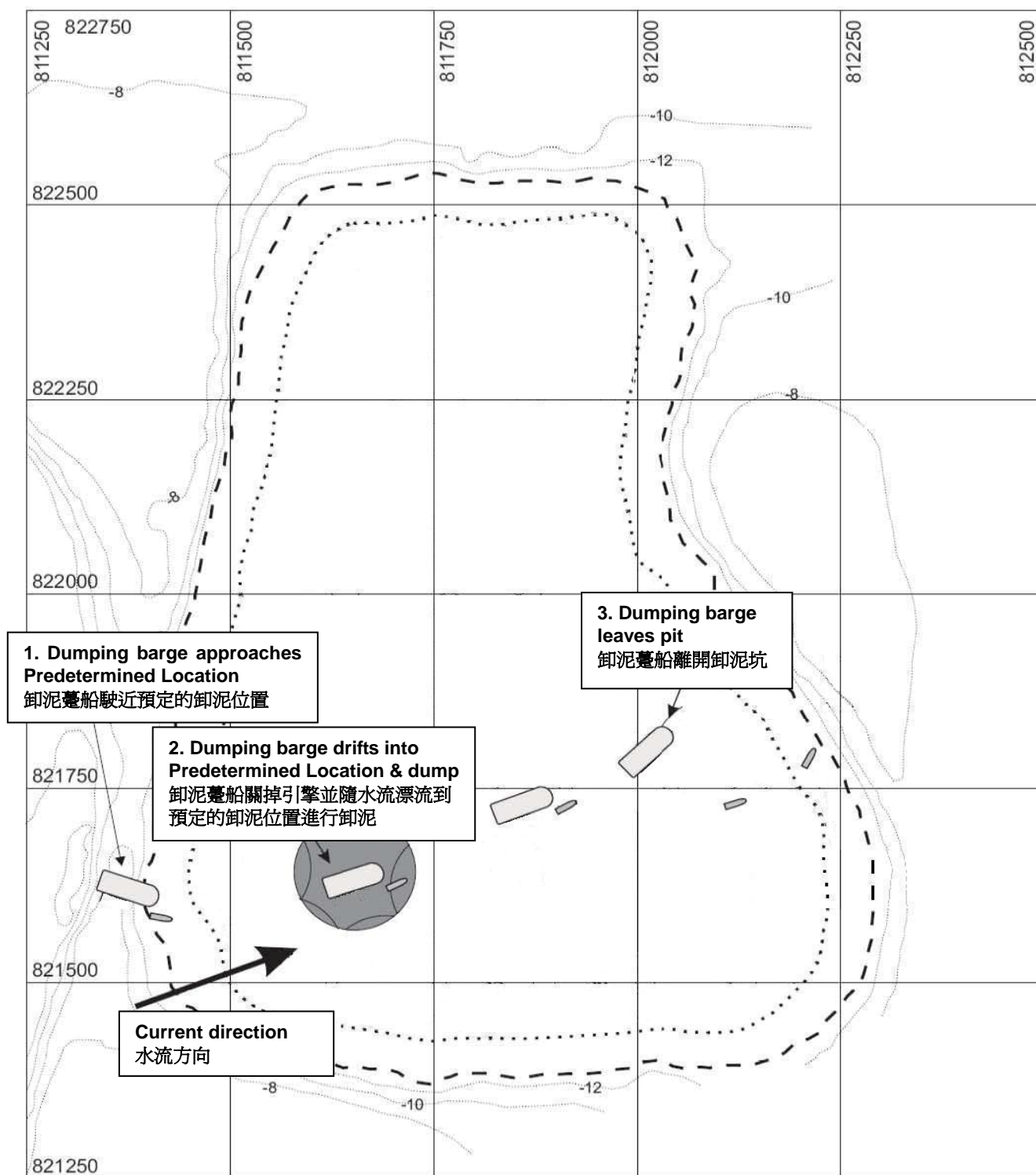
將清潔泥料覆蓋在污染泥料上，使之與周圍環境隔離



Completion of capping the pit to the original seabed level

覆蓋完成後，泥坑位置的海床會回復原狀

Operation Procedure 運作程序



--- Maximum backfill level 最高回填水平

..... Limit of dumping area 卸泥區範圍



Predetermined Location 預定的卸泥位置



Dumping barge 卸泥臺船



Guide boat 指導船