4-2-1

Section 12A Application No. Y/I-DB/3

To Amend Discovery Bay Outline Zoning Plan

For optimising the land uses

At Area 10b, Discovery Bay

Response to Comments

October 2016

MASTERPLAN LIMITED
Planning and Development Advisors
領賢規劃顧問有限公司

Your Ref: Y/I-DB/3 26 October 2016

The Secretariat
Town Planning Board
15/F, North Point Government Offices
333 Java Road, North Point
Hong Kong

By Hand

Dear Sir,

Section 12A Application No.Y/I-DB/3
For Optimising Land Uses at Area 10b, Discovery Bay
Response to Comments

I refer to the abovementioned application which is currently being processed, and the departmental comments on the application made available by District Planning Office on 25 and 28 July 2016.

In response to the departmental comments, please find the enclosure and the below clarification for your consideration.

Revised Concept Plan

The Concept Plan has been revised to address the departmental comments received, namely to include building separation to provide for urban design and air ventilation.

As a result, there is a redistribution of GFA between the proposed "Other Specified Uses (Residential above Service Area)(B)" and the proposed "Residential (C)13(D)" zones, in the following manner:

1. The domestic GFA above the podium at "Other Specified Uses (Residential above Service Area)(B)" zone has been decreased from 24,200m^2 to 23,100m^2 (maximum).

2. The GFA at "Residential Zone (C)13(D)" has been increased from 43,300m^2 to 44,350m^2 (maximum).

The proposed land use zoning boundary remains substantially the same as shown in **Annex A**. A summary of the revised zoning provision is described in the following Table (changes highlighted):

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Proposed zoning	Sub area	Number of storeys (max)	Building height (max, including structure)	GFA (max)
Residential (Group C)13	Sub area (A)	6	31 mPD	44,350m^2
	Sub area (B)	12	57 mPD	
	Sub area (C)	18	77 mPD	
	Sub area (D)	4	21 mPD	
Other Specified Uses (Residential Above Service Area)	Sub area (A)	18 storeys Residential above Service Area	86 mPD	Domestic 23,100m^2
	Sub area (B)	5 storeys Residential above Service Area	35 mPD	Non domestic 22,000 m^2
G/IC (Sewage Treatment Works and/ or Sewage Pumping Station)	-	-	-	-
Other Specified Uses (Promenade)	-	1	10mPD	200 m^2

The total GFA for Area 10b remain the same. The change is less than 5% of the original proposal. The materials enclosed in the response are based on this revised Concept Plan. The residences above the podium towards the east will be 5 storeys and the houses at the foreshore towards the west will be 4 storeys. These are consistent with the maximum building height in the respective proposed land use zoning.

Proposed water supply and sewerage treatment approach

In addition to the response to Water Supplies Department and Environmental Protection Department, we hereby clarify the approach to the water supply and sewerage treatment for the proposed development at Area 10b below:

1. The applicant is ready and willing to provide a Water Treatment Plant to use the Discovery Bay reservoir fresh water, and an on-site Sewerage Treatment Plant where necessary. Technical assessments reports have been submitted to demonstrate the adequacy of this approach in terms of their capacity and their capability to meet the relevant standards.

2. There is a decommissioned Water Treatment Plant around the Discovery Bay reservoir, and a decommissioned Sewerage Treatment Plant within Area 10b. The applicant is familiar and experienced in this approach, which has been the case prior to the commissioning and connection to Siu Ho Wan facilities.

3. Water supply and sewerage treatment as fundamental infrastructure provision in Hong Kong is engineering matters that can be resolved. It is considered that technicalities of water supply and sewerage treatment for Area 10b should not prevent an approval for the rezoning application, as they are capable of being easily resolved.

4. As there are various on-going new developments at North Lantau and Airport, Water Supplies Department and Environmental Protection Department may consider for expansion of the Siu Ho Wan water and sewerage treatment facilities in order to provide extra water supply and sewage treatment capacity should the spare capacity for the current facility is not adequate. The Applicant believes that, should WSD and EPD plans for infrastructure expansion, all proposed future developments in the vicinity areas, including those in the Discovery Bay,

should be considered on equal and fair basis. In addition, the proposal for Area 10b is moderate in scale, the demand on the overall Government infrastructure would be insignificant. Therefore, the Applicant requests WSD and EPD to take into account the proposed development should they consider for future expansion of the Sui Ho Wan facilities.

This information clarifies and supplements the application, and does not constitute a material change identified in Town Planning Board's Guideline No.32. It is consistent with the Guideline.

Yours faithfully,

Cynthia Chan
For and on behalf of
Masterplan Limited

Enc

cc. DPO/SKI (Attn: Helena Pang) Email
Client & Consultants

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Section 12A Application No.Y/I-DB/3 for Optimisation of Land Uses at Area 10b, Discovery Bay
Applicant's response to the departmental comments made available by District Planning Office on 25, 28 July 2016

AFCD's comment	Applicant's response
(a) Our comments on terrestrial and marine ecological impacts of the captioned application remain valid.	Noted. The terrestrial impacts associated with the captioned application are considered to be wholly associated with tree felling due to the developed nature and limited ecological value of Area 10(b). As such, the issue of terrestrial ecology is dealt with in comment (b) below. In terms of marine ecology, **Section 7.3** of the revised Environmental Study in **Annex D** has outlined that dredging and reclamation are likely to be required. Given the suspected presence of species of conservation concern in Nim Shue Wan, such as Seagrass and Coral, impacts are anticipated. However, **Section 6.2** has recommended a series of mitigation measures including installing silt-curtain and controlling descent speed of grab, for the marine construction works and the pile of the deckover would be designed to avoid blocking any flow streamline during operational phase. **Section 7.3.1.4** has been revised as follow: "*Together with suspected presence of species of conservation concern in Nim Shue Wan, such as Seagrass and Coral, marine ecological impacts are anticipated. Under such circumstances, series of mitigation measures have been recommended in* ***Section 6.3***, *including the installation of silt-curtain and controlling of descent speed of grab for the marine construction works and the pile of the deckover would be designed to avoid blocking any flow streamline during the operational phase.*"
(b) The applicant should elaborate in the submitted Environmental Study that due consideration has been given in avoiding/ minimizing any potential ecological impacts and extent of tree felling in the planning stage. Considering that the Site is basically developed, the applicant should clarify if any potential terrestrial ecological impacts would be caused by the proposed development.	Out of the 6.25 ha of Area 10b, disturbed area occupies 5.12 ha which is approximately 82% of the site area. Only 1.13 ha (or 18%) of the area accommodates trees and plantation. The current development plan has exercised due consideration in avoiding and minimising terrestrial ecological impact by utilising all the 5.12 ha of disturbed area. For the existing area with trees and plantation, only 0.74 ha of that would be used. Given the developed nature of Area 10b, it is considered that the terrestrial ecological impacts associated with the captioned development, if any, would be minor. Of the trees to be felled, most are single standalone trees or part of a small group of trees which due to their highly fragmented nature, are of minimal ecological value. In addition, no rare of protected species listed under Forestry Regulations (Cap. 96 Forestry and Countryside Ordinance sub. leg.) were found within the Site. Besides, no "Old and Valuable Trees" or "Champion Trees", as defined in "Registration of Old and Valuable Trees" (ETWB TC(W) No. 29/2004) and in the book "Champion Trees in Urban Hong Kong" respectively, were found. As such, **Section 7.3** of the submitted Environmental Study has been supplemented with the following additional paragraph. "*In terms of terrestrial ecology, the impacts, if any, associated with tree felling is anticipated to be minor due to the developed nature of Area 10b. Where practical, opportunities for transplantation have been explored, where the trees which have been identified as having a good transplantation survival rate. In addition, a number of trees have been proposed to be retained.* *In total, 169 trees have been identified within Area 10b that would be felled. None of the trees identified with Area 10b are considered to be rare or of conservation value. The trees to be felled all form parts of small groups or are single standalone trees. As such, the trees are considered to be of low ecological value.*"
(c) The proposed project may involve construction of a new sewage treatment plant, dredging works and associated minor marine works/. However, the impact on fisheries was not covered as one of the environmental issues in the ES. Any potential direct or indirect impacts on fisheries should be identified and evaluated. He understands that an EIA which will cover ecological surveys and impact assessment would be subsequently prepared. The statutory EIA report shall also cover fisheries assessment. Fishermen undertakings should be consulted to gauge their views on the proposed project.	Impacts on fisheries have been supplemented in **Section 7.3.1.5** as below. "*The nearest fish culture zones (FCZs) are Cheung Sha Wan and Ma Wan which are located at more than 6.5 km and 6 km away respectively. Given these large separation distance, together with the use of deck-over approach for the reclamation and mitigation measures such as cofferdam and silt curtains, both direct and indirect impacts are considered insignificant.*"

ArchSD's comment	Applicant's response
Based on the RtC and FI provided, we note that some of our previous comments have been addressed like barrier free access, slope stabilisation and provision of greening ratio that we have no further comment and noted that BD will deal with these issues in general building plan submission stage. Nevertheless, we would like to draw the applicant's attention that items 2(a) to (d) of our previous comments (recapped below (a) to (d)) regarding the provision of EVA, unclear description for petrol filling facilities operations between RtC and revised master plan, long podium design and width of promenade are still valid as those comments have not been satisfactorily address in the current submission.	Noted.
(a) It seems that the medium-rise building blocks are not sufficiently provided with the emergency vehicular access (EVA) on the Master Layout Plan.	The EVA has been revised to meet with relevant requirements, as indicated on the Concept Plan (**Annex A**).
(b) Applicant's attention should be drawn to the planning requirements under the Chapter 12 of Hong Kong Planning Standards and Guidelines (HKPSG) and Code of Practice for Oil Storage Installations, the proposed petrol refueling station and the bus depot may not be compatible with the proposed residential use in the development. The Applicant should further elaborate the use/operation of the depot and advise what the Category of	There are 54 no. of buses running in DB. Most bus services stop around mid-night. About 8 buses stay in Tai Pak bus terminus for overnight service. Currently these buses park in Area 10b open space. They are eyesores to nearby residents and noise source at 5:30 am to 7am when they start leaving 10b to commence their routine daily services. The future depot provides a covered internal space to address such overnight bus parking need. The covered depot reduces the noise impact in the morning when many buses start their engine at more or less the same time. In the bus depot, there will be 6 maintenance bays all equipped with maintenance pits serving regular and routine repair and maintenance, in place of the existing outdoor facilities

Dangerous Goods to justify the proposed planning for further comment.	at the site. There will not be Dangerous Goods store. The proposed petrol refueling station will serve buses, golf buggy and vehicles which the numbers are restricted to local licensing. Please refer to technical note which considers the proposed location of the petrol refueling station to satisfy Chapter 12 of HKPSG in **Annex B.**
(c) The podium design of the building blocks nos. L7 to L14 is about 250m in length that is too long and monotonous. Together with the continuous layouts of the medium-rise residential blocks behind, the development may have a wall-effect and pose considerable visual impact to its vicinity. The Applicant is advised to articulate the podium design and building forms of the blocks by introducing more variety in flat-mix and elevation design, enlarging the gaps between the blocks in order to break the scale of the development.	While the design is at a conceptual stage with room for visual improvement at detail design stage, efforts have been made to ease the wall effect and monotony of the podium along buildings L7 to L14 as shown in the revised Concept Plan in **Annex A** and described below: i. As an initial concept at this preliminary stage, design of the podium has been revamped with an aim to alleviate its visual effects. Various articulations are provided such as, i) breaking down the mass and scale of the podium by introducing various layers and heights along the façade; ii) introducing slanting walls with vegetation; and iii) lowering the portion of podium abutting the driveway is further reduced in height from 6m to 4.5m. ii. A significant recess at the north-western part of the podium, where an elevator is proposed to provide convenient access to the other levels of the podium. Width and depth of the recessed area is shown on plan. iii. Part of the podium along L7 to L14 is further setback. Additional street tree planting is proposed in front to provide screening of part of the podium. iv. Part of the medium-rise residential blocks on the podium, L7-L10, are increased from 4 to 5 storeys to introduce more variety in flat mix and height differences in elevation views. Public viewers from the southwest will see a variety of houses and buildings in different heights and levels. v. The above measures are considered effective in alleviating the visual effects of the podium as illustrated in the perspective sketches in **Annex M.**
d) The proposed waterfront promenade seems to be too narrow in width. It should be extended beyond the Kaito Pier to the east of the tennis court. The Applicant should demarcate clearly the private and public zones in the proposed development. The promenade is advisable to be open for public enjoyment.	There are promenades of similar width in Discovery Bay, such as the 4 metres wide promenade at D Deck, which is the focal point of Discovery Bay around the ferry pier and has been satisfactorily serving local residents and visitors. It is considered that the proposed 4 metres wide waterfront promenade at Area 10b to be suitable in serving the amenity of the local residents and visitors. However, connections between the internal driveway and the promenade have been widened significantly. As illustrated in the Concept Plan, three 15m wide public passages have been provided in addition to the Bounty Pier and the Kaito/ service piers. Please also refer to the revised Landscape Design Proposal in **Annex M.** Regarding the extent and demarcation, we maintain our response made in our submission dated 6 June 2016.
EMSD's comment	**Applicant's response**
Electricity Safety (a) The applicant shall approach the electricity supplier for the requisition of cable plans (and overhead line alignments drawings, where applicable) to find out whether there is any underground cable (and/or overhead line) within or in the vicinity of the Site. Based on the cable plans and the relevant drawings obtained, if there is underground cable (and/or overhead line) within or in the vicinity of the site, the applicant shall carry out the following measures:	Noted.
i. For Site within the preferred working corridor of high voltage overhead lines at transmission voltage level 132kV and above as stipulated in the HKPSG, prior consultation and arrangement with the electricity supplier is necessary. ii. Prior to establishing any structure within the site, the applicant and/or his contractors shall liaise with the electricity supplier and, if necessary, ask the electricity supplier to divert the underground cable (and/or overhead line) away from the vicinity of the proposed structure. iii. The "Code of Practice on Working near Electricity Supply Lines" established under the Electricity Supply Lines (Protection) Regulation shall be observed by the applicant and his contractors when carrying out works in the vicinity of the electricity supply lines.	There are no existing overhead cables and CLP advises that they have no plan to install new high voltage overhead cables in the future. Please refer to their letter in **Annex C.** Noted. Electricity supplier will be approached subsequent to approval of this rezoning application. Noted.
LPG Storage Installations Safety (b) There is a LPG store within the Site, which supplies the piped LPG system in Discovery Bay. The developer should clarify whether there would be any re-provision of LPG store to maintain the LPG supply to the existing LPG users. (c) If a new LPG store is to be constructed, the developer should conduct a Quantitative Risk Assessment to ascertain that the new LPG store will not pose unacceptable risk to the members of the public and submit application in accordance with the Gas Safety Ordinance (Cap. 151).	There will be re-provision of LPG store elsewhere in Discovery Bay to maintain the LPG supply to the existing LPG users. Noted.
EPD's comment	**Applicant's response**
Please find below our noise, waste management, sewerage infrastructure and water quality comments on the relevant document (i.e. the R-t-C and the revised Environmental Study where applicable) in the FI. Please ask the applicant to revise the ES (and other submissions where appropriate), in	Noted. The ES has been revised to address the comments for Government Department's record in **Annex D**.

particular on water quality related chapters, and submit an adequately rectified version for our vetting. Our comments on the air quality part will be provided to you once available.	Paragraph 6.2 ii and iii of the Planning Statement have been revised to read as follow and replacement provided in **Annex E** of this response submission. *ii EPD advised in May 2015 that the design capacity of the SHWSTW has been allocated for the treatment of the sewage arising from the development of the Expansion of Hong Kong International Airport into a Three Runway System, the new town development under Tung Chung New Town Expansion and the Penny's Bay Phase 2 development, etc. Therefore, SHWSTW has no spare capacity to cater for the sewage arising from any proposed Discovery Bay further development and the Sewerage Authority has no plan to increase the design capacity of the SHWSTW in the short and medium terms* *iii Provision of a new STW at Area 10b is proposed to cater for the additional flow generated from the potential development at Area 10b.* *The Applicant believes that, should WSD and EPD plan for infrastructure expansion, all proposed future developments in the vicinity areas, including those in the Discovery Bay, should be considered on equal and fair basis. In addition, the proposal for Area 10b is moderate in scale, the demand on the overall Government infrastructure would be insignificant. Therefore, the Applicant requests WSD and EPD to take into account the proposed development should they consider for future expansion of the Sui Ho Wan facilities.*
A. <u>Water Quality</u>	
<u>General</u>	
1. The consultants stated that the purpose of these Environmental Study (ES) Reports are to demonstrate land use compatibility of the proposed development. We would like to add that, in order to support the subject rezoning, the reports should provide necessary information, findings and conclusions so as to demonstrate the acceptability of the proposed development from environmental planning point of view. The water quality assessment in the current ES reports is inadequate to meet our requirements for the reasons as detailed in comments.	Noted. The Executive Summary and Section 1.1.1.3 have been amended accordingly. <u>Executive Summary and Section 1.1.1.3</u> *"...is to demonstrate land use compatibility and acceptability of the proposed development by providing necessary information, findings and conclusions."*
2. Also, it was found that there are too many sections in the ES reports stating the various assessment would be required in the subsequent statutory EIA, in particular in the water quality chapter. The need to carry out an EIA under EIAO should NOT be regarded as a reason for us to support the rezoning application without adequate assessment. Please remove such misleading statements in the ES reports. As an alternative, please use a new section to summarize the EIAO implication of the proposed development.	Noted. All the relevant section related to EIAO implication has been removed. Instead, a section summarising EIAO implication is included in **Section 2.6**.
<u>Specific Comments</u>	
3. The consultants should carry out a preliminary assessment to identify the potential water quality impacts of the proposed developments (e.g. possible extent, duration and environmental effects on the nearby water sensitive receivers, particularly any ecologically sensitive receivers and the marina nearby) and elaborate on specific mitigation measures in sufficient details, particularly the proposed new sewage treatment plant and the outfall during operational phase so as to demonstrate that such measures are effective and technically feasible to mitigate the impact. The technical viability and implication of the proposed mitigation measures should also be elaborated.	As discussed in **Section 6.4.1.2**, a new STW will be established to receive and treat the sewage generated from the additional population from Area 10b. The maximum daily sewage flow rate is approximately 1100 m^3/day. The project proponent will be responsible for the design, operation and maintenance of the STW and the effluent treatment level can be designed to any necessary standards so as to comply with the requirements in WPCO and TM-EIAO where applicable. For example, the treatment level could be designed for nitrogen removal and disinfection as necessary. The treated effluent would be discharged into sea through a submarine outfall and it is away from Fish Culture Zones at Ma Wan and Cheung Sha Wan located at 6.5km and 6km away respectively and hence are not adversely affected. A preliminary water quality assessment has been conducted and included in **Appendix 6.3** of the Revised Environmental Study.
4. <u>S2.1.1.4 and S2.4.5.1</u> The statement (indicating that sewage generated during operational phase will be conveyed to a sewage system) does not tally with the description in the revised statement in S6.4.1.1 (indicating that the sewage generated from the proposed project would not be conveyed to the SHWSTW).	Noted. Relevant text has been amended accordingly. A new STW will be established to receive and treat the sewage generated from the additional population from Area 10b. This new STW will be designed, operated and maintained by the project proponent to achieve any treatment level required.
5. <u>S2.2.1.1 and S6.2.1.4</u> Please advise the construction method of piling work and if sediment on seabed would be disturbed which could result in water quality impact. Please provide a section plan showing the construction method of decking over piles. Please clarify whether the minor modification works for the existing seawall would be carried out below water level and the corresponding potential water quality impact, if any. Please clarify whether removal of the existing marine based facilities, e.g. such as existing submarine outfall, existing pier, etc. would be required and the corresponding potential water quality impact, if any.	As discussed in Section 6.2.1.4 and Section 6.2.1.5, in order to avoid/minimise water quality impacts due to the piling works, steel casings will firstly be installed at the proposed pile locations. The steel casings extend above the sea and will prevent soil or rock arisings from being disposed of into the sea. The arisings will be removed from within the piles to a barge anchored close to the piles. Once the materials inside the casings were removed, steel reinforcements/structural sections will be lowered inside the casing and then followed by concreting work. Silt curtain will be installed as secondary measures to prevent any accidental release of arisings into the sea. These are illustrated in **Annex F** of this response submission. Some of the minor modification works to the existing seawall, including relocation of existing piers, will need to be conducted below water level, and the details will be established in the detailed design stage. Nevertheless, all these works front will be enclosed by silt curtains. Please see above responses.

6. S2.2.1.2 and S6.2.1.5 The statement in S2.2.1.2 stating that "silt curtain" and "grab dredger" would be deployed as mitigation measures while the statement in S6.2.1.5 stating that "cofferdam" and "closed grab" would be deployed during the dredging works. Please clarify which mitigation measures would be deployed.	These sections will be updated to state that silt curtains will be provided as mitigation measures.
7. S2.4.5.1 and S6.4.1.2 Please provide details on the proposed new sewage treatment plant to demonstrate that the treated effluent would not result in significant water quality impact into the receiving waters of the study area, e.g. justification on the estimation of treatment capacity, the treatment technology to be adopted, proposed effluent standards, measures to prevent emergency bypass, etc. The consultants only recommended one marine outfall location. Apart from this location, other potential locations should be explored and the consultant should evaluate which option is the most preferable location.	According to the Study on Sewerage Systems, the capacity of the new STW to be established, operated and maintained by the project proponent will be approximately 1,100 m^3/day. The treatment level could be designed for nitrogen removal and disinfection as necessary. The effluent standards will meet WPCO and TM-EIAO as appropriate. The treated effluent will be discharged through a submarine outfall. For emergency bypass, a storage tank will be installed to allow for retention period of at least 2 hour, allowing the project proponent to response within that period of time. Relevant text has been supplemented in **Section 6.4.1.3** "*...The outfall location will be determined during the detailed design stage without affecting the land use compatibility. Nevertheless, the current tentative location is located at the area where the water depth is deeper and the current is stronger. It is also at around 300m from the marina and at least 6km from the fish culture zones in Cheung Sha Wan and Ma Wan. Besides, the current tentative location is away from Tai Pak Wan beach where, although not a gazetted beach, many people use that for recreational uses...*" A supplementary water quality assessment has been conducted (**Appendix 6.3**) and included in the Revised Environmental Study Report.
8. S6.1.3.1 Please clarify why the construction works would have impact on the Discovery Bay Reservoir Spillway and Tributaries and Nim Shue Wan Stream. Please further review the water sensitive receivers that may potentially be affected by the proposed project. The comments from AFCD on the identification of ecological resources with conservation interest in Nim Shue Wan /Discovery Bay is relevant. Please seek comments from AFCD for marine ecological sensitive receivers to be assessed in the projects.	Please see separate response to AFCD's comments. Discovery Bay Reservoir Spillway and Tributaries and Nim Shue Wan Stream may be affected by the construction works due to tidal intrusion. As such, the pollutants from construction works may be brought up to the lower section of Discovery Bay Reservoir Spillway and Tributaries and Nim Shue Wan Stream by tidal action. In addition, comments have been received from AFCD and impacts for marine ecological sensitive receivers will be assessed.
9. S6.2 As refer to our previous comment, Area 10b currently comprises of bus repair workshop, boat servicing yard, etc. should land decontamination works will be carried out during construction phase of this area, the method for handling and disposal of wastewater contaminated with chemical waste should be further elaborated.	As a general site practice of soil decontamination works (i.e. Stabilization/ Solidification or Biopile), impermeable sheeting should be used to cover stockpiles of the treated soil to prevent dust and runoff. Concrete bunds surrounding the treatment area should also be implemented to collect the possible spillage or leachate generated and recycled back to the treatment. In case there is any sign of excess leachate present within the site, the excess leachate should be diverted to a designated storage area for temporary storage and collected by a licensed chemical waste collector. Relevant text is supplemented in **Section 6.2.1.6.**
10. S6.2.1.5 Please further justify the need and extent of the proposed dredging to realign the existing navigation channel taking into consideration of future vessel size for this site. The potential contaminants release from dredged sediment, including antifoulant, e.g. TBT, should be addressed.	The estimated extent of dredging for navigation of vessels is indicated in **Figure 6.1**. According to the latest information, there have been no ship body maintenance works within the marina or along the Marina Avenue. Hence, there would not be any issue involving anti-fouling. For dredged sediment, the release of suspended solid could be readily controlled by optimising the dredging rate and the use of mitigation measures such as silt curtains.
11. S6.3.1.1 The measures to avoid any discharge of site runoff / wastewater into the nearby marina should be elaborated.	For site runoff, perimeter cut-off strains would be constructed with internal drainage works and erosion and sedimentation control facilities around the site at site establishment around the site. Channels, earth bunds and sand bag barriers would also be provided on site to direct storm water to silt removal facilities. In addition, the design of temporary on-site drainage should prevent runoff going through site surface, construction machinery and equipment to avoid polluted runoff. Sedimentation tanks with sufficient capacity should also be provided as mitigation measure for settling surface runoff prior to disposal. Also, discharge into the marina will be avoided. With the implementation of the above mitigation measures, it is anticipated that the impacts from discharge of site runoff / wastewater is not insurmountable.
12. S6.4.1.2 Please add "A discharge license will be obtained under the WPCO prior to discharge".	Noted. **Section 6.4.1.2** has been added accordingly.
B. Noise	
1. RtC(p) and undertaking letter Typical clause "to agree that EPD could disclose the content of the report and this undertaking when required" is missing in the undertaking letter. Please ask the project proponent to contact EPD for any question and for submission of a rectified undertaking letter.	Noted. The undertaking letter has been revised and included in **Annex G** of this response submission.

2. RtC(r) and S5.3.1.2 Noted that TD's endorsement is still pending.	Noted. TD's endorsement letter is included in **Annex H** of this response submission.
3. S5.5.1.2 It states that "...the existing noise sources ... will be located at a podium structure..". Please clarify whether it means that existing noise sources will be relocated inside a podium structure and will be fully enclosed. Please also provide a drawing to show the abovementioned.	It is confirmed that the existing noise sources will be relocated inside a podium structure and fully enclosed except the locations of ingress / egress of such facilities. **Section 5.5.1.2** has been revised accordingly for clarification to read as follow. *"According to the latest information, these existing noise sources such as the golf car repair workshop, bus depot, refuse collection point, will be located at a podium structure* ***which is fully enclosed****. The design of the podium will ensure that any direct line of sight between the noise sources and the surrounding residential developments will be avoided. In addition, these noise sources should be a major consideration in determining their locations and site layouts. With reference to HKPSG, where opportunity arises and having due regard to the operational requirements, the siting of such facilities should take into account the potential locations of ingress/egress and the consequent noise disturbances due to traffic routings, particularly during sensitive hours. Consideration should also be given to adopting administrative controls so that the degree of noise disturbances can be further reduced."* Please also refer to the revised Concept Plan – G/F Layout in **Annex A**.
4. S5.7 Please provide a schedule of noise mitigation measures, and drawings dedicated to show their location and extent. It is understood from S5.2.1.3 that solid wall and noise barriers are noise mitigation measures. Subject to the clarification in response to the comment above, it is also understood from S5.2.1.2 that some existing noise sources will be relocated inside a podium structure and will be fully enclosed.	Noted. As stated in **Section 5.5**, a podium structure will be provided for Area 10b to avoid direct line of sight between the noise sources and the surrounding residential developments. The relocation of existing noise sources will be fully enclosed within the podium structure except the ingress / egress of such facilities and consideration of such facilities should made reference to HKPSG. In addition, as discussed in **Section 5.2**, a number of considerations have been incorporated in the layout design of Area 10b (see **Figure 2-1**) to reduce the fixed noise impact due to these activities. Those designs include an 8m tall solid wall next to kaito pier, an 8.8m tall solid wall next to goods delivery pier and 7.8m tall solid wall at 3-storey low rise development which was near to goods delivery pier."
5. RtC(y) and Table 5.4 It appears that there is also a correction factor for barrier correction, please clarify. Otherwise, it is noted that in Appendix 5.3, please clarify whether there is potential double counting in the columns "Barrier" and "Directivity" correction.	The column of "Directivity" has been removed and **Table 5.4** has been updated accordingly.
6. Marine traffic noise and fixed noise assessment It appears that some noise sources and NSRs are both owned/managed by the project proponent themselves, please clarify. If true, please elaborate on whether the project proponent's own management/administrative measures will be used to ensure all noise will be kept at an acceptable level.	For noise assessment, it is anticipated that there would be no adverse noise impact after the implementation of the proposed mitigation measures. As such, additional proponent's own management / administrative measures are considered not necessary to keep the noise level at an acceptable level.
C. Waste Management	
To demonstrate that the waste generation due to the development is in a manageable scale with regular arrangement under the relevant regulations and requirements, the applicant should address the types of waste to be generated due to the proposal and their magnitude. The applicant should also clarify that they will fulfil the respective regulations and requirements.	Noted. Relevant text has been added in **Section 7.1** as follows to discuss the implication of waste management. *"As mentioned in Section 2, the potential development at Area 10b of Discovery Bay include residential premises together with the necessary infrastructure and landscaping elements. A podium structure would be built to cover the existing maintenance activities. In order to cater for the additional residential development, an additional narrow strip of reclamation would be proposed in form as a decking with a width of 9-34m.* *Although the construction methodologies are yet to be developed in subsequent detailed design stage, the construction and reclamation work would adopt an environmentally friendly approach. With the implementation of good site practices and waste reduction measures, the quantity of construction of demolition waste is estimated to be around 29,000 m^3"* The applicant will fulfil the respective regulations and requirements.
D. Sewerage Infrastructure	
Please note that our previous comments are still valid. The applicant should provide adequate information and make adequate rectifications in the submission to address our comments.	Noted. Please refer to the Revised Study on Drainage, Sewerage and Water Supply in **Annex L**. In addition, as there are various on-going new developments at North Lantau and Airport, Water Supplies Department and Environmental Protection Department may consider for expansion of the Siu Ho Wan water and sewerage treatment facilities in order to provide extra water supply and sewage treatment capacity should the spare capacity for the current facility is not adequate. The Clients believes that, should WSD/EPD plans for infrastructure expansion, all proposed future developments in the vicinity areas, including those in the Discovery Bay, should be considered on equal and fair basis. In addition, the proposal for Area 10b is moderate in scale, the demand on the overall Government infrastructure would be insignificant. Therefore, the Project Proponents request Water Supplies Department and Environmental Protection Department to take into account the proposed development should they consider for future expansion of the Sui Ho Wan facilities.

E. Air Quality	
1. Rtc item b Please submit the model file for review as results of 80mAG is added.	Noted. The receivers at 80mAG are included in the model files submitted previously. A set of model files has been provided again directly to EPD.
2. Rtc item e Please mark the internal access road.	Noted. The access road has been marked.
3. S4.2.2 Please clarify if the road should be Marina Avenue (S4.2.2) or Marina Drive (Figure 4-1).	The road should be Marine Drive. The typo in **Section 4.2.2** has been revised.
4. It is noted that the predicted annual NO_2 at ASR A10b-8 as shown in Table 4.3 approaches the AQO of 40 ug/m^3, it casts doubt on whether the vehicular emissions at the site, if added on the current assessment, will cause exceedance of the AQO. As such, the consultant is required to add the vehicular emissions in the assessment to prove that there will be no AQO exceedance.	The traffic forecast of Marina Drive is only 90 vehicles per hour during the peak hour. The new alignment and layout of the proposed buildings have been adjusted in the revised master plan to ensure the 5m buffer requirement in HKPSG will be achieved. It is therefore anticipated that no insurmountable air quality impact will be caused by the vehicular emission. In addition, although the annual NO_2 at ASR A10b-8 is 39 µg/m^3, the assessment on the marine traffic emissions are based on a very conservative approach. For example, a continuous operation of tug/boat and barge was assumed in the assessment, but there are only 5-6 trips per month in the real situation. Therefore, the actual annual NO_2 at ASR A10b-8 will be lower than the prediction.
5. Rtc item f, item h, and Figure 4-1 If Marina Drive is a LD, please ensure that buffer distance as required under HKPSG can be met. In Figure 4-1, the buffer distance cannot be met.	The new alignment and layout of the proposed buildings have been adjusted in the revised Concept Plan in **Annex A** to ensure the 5m buffer requirement in HKPSG will be achieved.
6. Rtc item i Please provide further information of the bus depot (e.g. operation mode, parking, maintenance, etc.)	The bus depot will be located at the podium of the buildings along the northern side of the Marina Drive. There are 54 no. of buses running in DB. Most bus services stop around mid-night. About 8 buses stay in Tai Pak bus terminus for overnight service. Currently these buses park in Area 10b open space. They are eyesores to nearby residents and noise source at 5:30 am to 7am when they start leaving 10b to commence their routine daily services. Apart from the early morning and mid-night when buses are leaving for service and coming back for overnight parking, buses are coming back for refueling and cleaning at an average rate of 5-6 buses per hour in between the morning and evening peak daily. The future depot provides a covered internal space to address such overnight bus parking need. The covered depot reduces the noise impact in the morning when many buses start their engine at more or less the same time. There are 6 no. of maintenance bays in existing bus depot, 2 of them equipped with maintenance pits. They allow regular and routine repair and maintenance to ensure all buses can run normally. As no. of buses increases, currently some repairs have to be done in external area not designed for bus maintenance. Hence 6 maintenance bays all equipped with maintenance pits are proposed in the rezoning application. In addition, night time maintenance activities are not anticipated. Apart from the maintenance bays no., the proposed depot is purely replacement of existing one. There is no DG store in existing bus depot. It is not required by the proposed depot. Buses fuel refilling is and will be done in the existing and future petro-filling station. In addition, according to EPD, Euro I, II and III buses will not be licensed by end 2019. Hence by end 2019, out of the 54 buses in the fleet, 4 buses will be at Euro IV, 48 will be at Euro V or VI. The remaining 2 buses are electric buses. Hence, impacts of bus depot are not anticipated.
7. Rtc item k It is noted that MLD refilling facility will be located outside the 500 assessment area. Please confirm that the oil tanker travelling route and the ferry travelling route to and from MLD refilling facility will be located outside the assessment area.	The operators have confirmed the routes will be outside 500m assessment area.
8. Rtc item l and m If SPS or STW is proposed, the potential air quality should be addressed.	The STW will be designed, operated and maintained by the project proponent. Odour control devices, such as covering of the tanks, installation of deodourising unit, negative pressure, activated carbon filter etc., will be designed to mitigate the odour level to acceptable level during the detailed design stage. Where necessary, water scrubbers could be considered as well. Therefore, adverse odour impact is not anticipated. **Section 4.2.6.2** has been updated as follows for clarification. "*… The tentative location of the proposed sewage treatment works is shown in Figure 4-1. Odour control devices, such as covering of the tanks, installation of deodourising unit, negative pressure, activated carbon filter etc, are required to contain the odour dispersion to the surrounding ASRs. Where necessary, water scrubbers could be considered as well. Therefore, it is anticipated that the new sewage treatment works would comply the criteria of 5 OU based on an averaging time of 5 seconds for odour prediction assessment as stipulated in the Annex 4 of the EIAO-TM. In addition, suitable buffer and landscaping features would be provided to minimise environmental and visual impacts on adjacent sensitive uses according to HKPSG. As such, adverse odour impact is therefore not anticipated…*"
9. S4.2.4.11 The new berth location is not shown in Figure 4-3, please clarify.	Noted. The location has been added in **Figure 4.3**.
10. Figure 4-3 The MLD is still located within the 500m assessment area. Please clarify.	Only Ferry, Kaito and LPG delivery tug boat / barge are presented in **Figure 4.3**. No MLD filling activities are presented.

11. Regarding the calculation spreadsheet, the calculation of max. 8-hr RSP, which subsequently be used for heavy metal impact estimation from fireworks, was calculated as 1/8 of max. 1-hr RSP output from ISC model. Please clarify and provide justifications for adopting such method instead of using running average of 8 1-hr concentrations.	Since there is only 1 firework show last for less than 60 minutes per day, the heavy metal contribution of firework will be equal to 0 for other 23 hours. In addition, it is either 1 show or no show every 8 hour running period. Therefore, the maximum running 8 hour average will be equal to maximum 1 hour divided by 8. For example, assume the maximum contribution from firework = X. As the firework show is started at 8pm, there are no shown before or after 7 hour of the show. Therefore, the maximum running 8-hour average $= \sum_{n=1}^{8} \frac{x_n}{8}$ $= \frac{(x+0+0+0+0+0+0+0)}{8}$ $= \frac{x}{8}$
FEHD's comment	**Applicant's response**
(a) It is noted that the podium accommodates the supporting facilities serving Discovery Bay in a comprehensive manner. It is thus expected that the "Refuse Collection Chamber", as one of the supporting facilities, would also serve the surrounding buildings/villages in Discovery Bay as in the case of the existing stand-alone one. (b) Nonetheless, we are of the view that the refuse collection point of about 1,000m2 as mentioned in the applicant's submission should not be regarded as G/IC facilities. The applicant is requested to revise the proposal accordingly.	Noted. Noted, should FEHD considers Refuse Collection Point without reference to it being a Government facility to be an appropriate label, the applicant has no objection. Town Planning Board could amend the proposed use accordingly in consideration of the application.
H(GEO), CEDD's comment	**Applicant's response**
It appears that the FI submitted by the applicant still does not include a Geotechnical Planning Review Report (GPRR). Hence, our previous comments are still valid (recapped below for reference): The northern side of the proposed development is overlooked by existing slopes. The applicant should submit a GPRR in support of the application and to assess the geotechnical feasibility of the proposed development. The GPRR should include a preliminary geotechnical review of the slopes, including natural terrain. Other essential contents of a GPRR are given in the enclosed GEO Advice note.	Please find a GPRR in **Annex I**.
LandsD's comment	**Applicant's response**
2. The planning statement does not contain detailed survey data of the application site. Based on the geographical location of the application site, it falls on private lot known as Lot No. 385 R.P. in D.D. 352 & the Extensions thereto ("the Lot") and held under New Grant No. 6122 as extended by three Extension Letters in 1979, 1980 and 1981 ("the New Grant"). Pursuant to S.C. (6) of the New Grant, the Lot shall be developed in accordance with the Master Plan ("MP") approved by the then Secretary for the New Territories (now being exercised by D of Lands) under lease. 3. According to the prevailing MP 6.0E7h(a) approved under S.C. (6) of the New Grant, Area 10b has a gross site area of about 50,950m^2 and is designated as "SERVICE AREAS" for accommodating various facilities as listed below:-	Noted Noted

Facility	Max. Gross Building Area (GBA) (m^2)
Godowns	3,710
Bus depot	500
Sewage treatment plant	39
Refuse collection point	1,000
Dangerous goods / LPG storage	500
Telephone exchange	700
Boat servicing facilities	1,100
Petrol filling station	240
Staff quarters	1,300
Pumping station	No restriction in Area 10b, but 4,885 in the whole lot.
Temporary helipad	N/A
Temporary marina club	N/A

<u>Comments on the Application</u>

4. The proposed development does not conform with the approved MP 6.0E7h(a).	A revised Master Plan will be submitted for Lands Department approval subsequent to this planning application approval.
5. The proposal involves reclamation of water to the south of Area 10b. The proposed reclamation area partly falls within the water previously gazetted under Foreshore and Sea-bed Ordinance (repealed by the Foreshore and Sea-bed (Reclamations) Ordinance)(Cap. 127) vide G.N. 710 of 2.4.1976 for land reclamation, and partly falls within the water previously gazetted vide G.N. 593 on 10.3.1978 for ferry pier and submarine outfall. Legal advice from D of Justice will be required to ascertain whether the said G.N.s are valid for the proposed reclamation, and if not, whether a new gazetting will be required under Cap. 127 for the proposed reclamation. This issue will have to be looked at in detail upon receipt of the application for amendment of MP (as referred to in para. 15 below).	Noted.
6. Para. 7.4 (iv) of the planning statement mentioned that there might be dredging works for the navigation channel outside the application site. The Applicant should note that no dredging works shall be carried out outside the boundary of the Lot without the necessary Government permission / approval and any dredging works which constitute reclamations are subject to the provisions in Cap. 127.	Noted.
7. S.C. (41) of the New Grant requires HKR to provide a helicopter landing site and make it available for Government use at all times. The existing helipad in Area 10b will be removed in the proposal. Advice from Civil Aviation Department, Government Flying Services and other relevant Government departments will be required. The Applicant should provide full justifications for the removal of the helicopter landing site. If removal of the helipad is not supported by the Government, the Applicant is required to provide alternative helipad within the Lot, which location shall be agreed by the Government.	The proposal is a rationalisation of the existing supporting facilities at Area 10b. It is considered that a removal of the helipad at the existing location will reduce noise disturbance to the existing residents around Area 10b and the future residents within the site, in spite of the infrequent use (less than 5 times in past 20 years). A possible new helipad location is indicated in **Annex J.**
8. The proposal involves removal of the dangerous goods storage and the vehicular ferry pier (which is mainly used for transportation of dangerous goods). The Applicant is required to advise on the future arrangement for storage and transportation of dangerous goods, and whether there will be any re-provisioning.	We understand that "dangerous good storage" refers to the underground oil tanks associated with the petrol filling station and the existing LPG store. a) The petrol filling station and associated oil tanks will be relocated to the northern part of the site as indicated in the concept plan in **Annex A**. b) The removed LPG store in Area 10b will be reprovided elsewhere in Discovery Bay. c) The vehicular ferry pier will be re-provided near the southern part at the area marked "Kaito Pier + Service Pier" in the concept plan in **Annex A**.

9. The Principal Deed of Mutual Covenant ("PDMC") dated 30.9.1982 has notionally divided the Lot into 250,000 undivided shares. The Applicant shall prove that there are sufficient undivided shares retained by them for allocation to the proposed development.	The applicant has responded to District Lands Office directly via HKR's letter to DLO dated 3 Aug 2016.
10. Area 10b forms part of the "Service Area" as defined in the PDMC. Area 10b also forms part of either the "City Common Areas" or the "City Retained Areas" in the PDMC. Pursuant to Clause 7 under Section I of the PDMC, every Owner (as defined in the PDMC) has the right and liberty to go pass and repass over and along and use Area 10b for all purposes connected with the proper use and enjoyment of the same subject to the City Rules (as defined in the PDMC). The Applicant is required to substantiate its right / capacity to develop the application site without prejudicing the provisions in the PDMC.	In our response to comment item no.9 above sent to DLO directly and separately, it is clearly demonstrated that the undivided shares of Area 10b application site are held by HKR and have never been assigned to any other party. (Full set of all DMCs, Sub-DMCs and Sub-sub-DMCs have been provided for District Lands Office's reference directly via HKR's letter to DLO dated 3 Aug 2016.). Therefore, the applicant is the sole land owner of Area 10b and has absolute right to develop the application site notwithstanding that some of the facilities located in Area 10b forms part of either the "City Common Areas" or the "City Retained Areas".
11. The Lot is subject to the height control restriction stipulated in the Deed of Restrictive Covenant ("DRC") dated 10.12.1999 entered into between the Government of the Hong Kong Special Administrative Region and Hongkong International Theme Parks Limited. Any proposed development shall comply with the DRC. Detailed examination will be conducted upon receipt of formal application (if any) with relevant site co-ordinates for revision of MP.	The proposed development complies with the DRC, as shown in Figure no. DRC-6f10b-001 in **Annex K**.
12. The refuse collection point at Area 10b is a private facility of the Lot, but only "Government Refuse Collection Point" can be found in Column 1 Uses of the Proposed "OU(Residential above Service Area)" zone. The Applicant is required to address the inconsistency between the proposal and the proposed Notes for "OU (Residential Above Service Area) zone.	Noted, as per the response to FEHD above, the applicant has no objection to the labeling of the Refuse Collection Point". Town Planning Board could amend the proposed use accordingly.
13. The existing fresh water and sewer main outside the subject lot boundary are covered by separate short term tenancies (STTs). It is revealed that the alignments of the fresh water and sewer main shown in the proposal slightly differ from our tenancy records.	Revised drawings are included in the Revised Study on Drainage, Sewerage and Water Supply in **Annex L**.
14. The Audit Commission in 2004 recommended that the D of Lands should seek ExCo's endorsement before approving any major changes to the concept of a development if the concept has been approved by ExCo when approving the land grant.	Noted.
15. Should the Town Planning Board approve the re-zoning application and the proposed amendment to the OZP has successfully gone through the usual town planning procedures, then the owner of the application site will have to apply to Lands D for approval to amend the MP so as to implement the proposed development. Upon receipt of such application, Lands D will process the proposed approval according to the established practice and seek necessary approvals, including endorsement of ExCo if it is decided that the proposal would result in a change of the development concept of the Lot. The Applicant is required to prove that they are the legal owner of the application site and has to capacity to execute the approval letter with the Government. The proposed approval, if approved by Lands D acting in the capacity as the landlord at its discretion, will be subject to such terms and conditions, including payment of premium and administrative fee, as imposed by Lands D.	Noted.

Marine Department's comment	**Applicant's response**
a) The project proponent should provide assessment to justify the extension of seawall would not affect the private moorings (PM) during the construction stage and operation phase of the project. The mitigating measures would be taken to prevent the impact on the PM should be specified.	A detailed explanation is given in the Technical Note in **Annex M**.
b) The PM and the vessels moored may need to relocate to give room for the construction works of the proposed pipeline/outfall. The project proponent needs to formulate plans for temporary relocation and consult the PM and vessel owners. The proposed pipeline/outfall should not affect the laying, maintenance and removal of the mooring components after completion of the proposed pipeline/outfall and during operation.	Relocation of the private moorings are not required for both construction and operation phases of the project. There is water space left between the moored vessels and the marine works, and close liaison with the private mooring owners will be maintained during the construction.

c). The removal of some annotations clearly indicating the piers and petrol filling stations, etc. may cause confusion on "whether such facilities are certainly allowed" under the proposed amended OZP.	The annotations indicating the piers and petrol filling stations are included in the proposed zoning plan in **Annex A**.
d). The PM owners were omitted in the preliminary consultation.	Consultation with the private mooring owners will be conducted in the detail design and construction stages.
UD&L's comment	Applicant's response
Landscape The submitted FI addressed some of our previous comments. However, the following comments are still valid.	
(a) Extent of slope upgrading works and site formation has not been studied. Since all existing trees proposed to be retained are on the north-western slope, feasibility to retain trees is in doubt and potential impact has not been addressed.	Preliminary investigations indicate that trees on the western portion of the north-western slope will not be impacted by site formation works except for a 10 to 15m corridor where the construction of the new access from Discovery Bay Road to the podium occurs. The eastern portion of the slope (comprising approximately one third of the north western slope as a whole) will likely require upgrading with soil nails. Tree impacts can be minimised by careful on-site location of soil nails around existing trees which is a common construction practice when upgrading existing vegetated slopes. We therefore consider it reasonable to conclude that the majority of trees on the north western slope can be retained.
(b) Although paths between houses are added to provide access to the waterfront, the promenade remains very narrow (3m wide) and bound by wall of private gardens behind. There is no room for a decent design to accommodate hard and soft landscape elements. The design idea of a distinctive landscape character and attractive waterfront is hardly achievable.	The waterfront promenade has been widened to 4 meters wide which can cater for pedestrian circulation and benches, as demonstrated by the existing promenade in Discovery Bay D Deck, where the promenade is also 4m wide right next to many alfresco dining areas with plenty of visitors at weekends. The back edge to the waterfront will the green garden edge of the low rise housing. The waterfront promenade is considered to be an improvement to the existing situation for the amenity of the local residents and visitors. In addition, 15m gaps are provided between the proposed houses connecting to the waterfront where soft landscape will be provided.
(c) Elevation and sectional illustrations have not been provided to show treatment of the 5-9m high wall surfaces around the enclosed bus depot. Whether the scheme is compatible with the surrounding environment is in doubt.	i. As an initial concept at this preliminary stage, design of the podium has been revamped with an aim to alleviate its visual effects. Various articulations are provided such as, i) breaking down the mass and scale of the podium by introducing various layers and heights along the façade; ii) introducing slanting walls with vegetation; and iii) lowering the portion of podium abutting the driveway is further reduced in height from 6m to 4.5m. ii. A significant recess at the north-western part of the podium, where an elevator is proposed to provide convenient access to the other levels of the podium. Width and depth of the recessed area is shown on plan. iii. Part of the podium along L7 to L14 is further setback. Additional street tree planting is proposed in front to provide screening of part of the podium. iv. Part of the medium-rise residential blocks on the podium, L7-L10, are increased from 4 to 5 storeys to introduce more variety in flat mix and height differences in elevation views. Public viewers from the southwest will see a variety of houses and buildings in different heights and levels. The above measures are considered effective in alleviating the visual effects of the podium. Please refer to the section and revised perspectives illustrating the enclosed bus depot in **Annex N**.
Urban Design 4. From urban design and visual points of view, I have the following comments on the application:	
(a) The general urban design concept for the OZP area is to maintain a low-density environment and adopt a stepped height approach with low-rise on the headland and coastal lowland and high-rise further inland. As compared to the adjacent existing blocks at Capevale Drive, the proposed tower M2 is similar in height but by virtue of a longer façade length has a larger bulk, as evident in the photomontages viewing from Nim Shue Wan Pier and Tai Shui Hang. In view of its being closer to the coast, it should be reduced in height to minimize the overbearing impact on the coast and to be in keeping with the urban design concept.	Façade length of existing midrises along Capevale are 36m along the north-south as well as east-west façade. M2 is 26m and 40m long respectively. Although M2 east-west façade length is 10%, i.e. marginally longer, the north-south direction is almost 30% substantially shorter. It is considered that M2 building form imposes less visual impact than existing midrise form taking into account the impacts viewed at all directions.
(b) There is discrepancy in building height of the 56 proposed houses along the coast between the text and the visual materials in the submission. While it is stated in the text that they are of 3 to 4 storeys and 21mPD high, they are shown to be of 3 storeys with a rooftop structure in all the plans, sections and photomontages. The visual impact assessment has yet to demonstrate the proposed 4-storey houses are compatible with the setting.	To demonstrate the visual impact of an alternative distribution of the development density, houses L15-L19 are proposed to be 4-storey high with additional rooftop structures while all other houses along the coast will be 3-storeys high with rooftop structures in the revised Landscape Design Proposal and sections in **Annex N,** and the updated photomontages in **Annex P.**
(c) The site extends along the coast overlooking Nim Shue Wan. Public viewers from the southwest would experience a long continuous building mass abutting the coast. Efforts should be made to break down the building mass with wider building gaps. Their dimensions should be indicated on the plans for easy reference. The podium footprint should also be reduced to improve the permeability of the inner street area.	Efforts have been made to ease the permeability of the inner street area as shown in the revised Concept Plan in **Annex A** and described below: i. A significant recess at the north-western part of the podium, where an elevator is proposed to provide convenient access to the other levels of the podium. Width and depth of the recessed area is shown on plan. ii. Part of the low-rise residential blocks on the podium, L7-L10, are increased from 4 to 5 storeys to introduce more variety in flat mix and height differences in elevation views. Public viewers from the southwest will see a variety of houses and buildings in different heights and levels. iii. 15m wide separations are provided between low-rise block L10 and L11 as well as between the 3 or 4 storeys houses/low-rise along the promenade. These provide visual break for every 4 low-rise blocks on the podium roof and for every 4 to 5 blocks of low-rise or houses along the promenade.

5. Our comments on the air ventilation assessment are attached in the Appendix.	
Appendix- Major Comments 1. Considering the project site is a waterfront site and its large development scale with site area about 6.29 ha, it is inevitably that the proposed development would affect the existing pedestrian wind environment. However, based on the "consideration of air ventilation" reported in Annex A, the applicant fails to provide convincing arguments and evidence to demonstrate the effectiveness of the mitigation measures such as building separations and that the proposed development would result in no adverse air ventilation impacts on the surrounding areas in this submission. As such, the subject report is considered unacceptable.	Noted.
2. In view of the above, we recommend that an initial study by CFD is more effective in demonstrating the proposal's impact to the surrounding environment due to its extensive development scale and the effectiveness of the proposed mitigation measures for supporting the rezoning application.	Noted. An AVA initial study by CFD has been carried out to demonstrate the impact from the proposed development in terms of air ventilation, in **Annex Q.** The method statement has been submitted to Planning Department for agreement.
Specific Comments 3. **Annual and summer prevailing winds** (Item 2) – Referring to the RAMS wind data, the annual prevailing winds are come from E, ESE and S, while the summer prevailing winds are come from SSE, S and SSW. To optimize the effectiveness of the proposed mitigation measures, the applicant should make reference to these prevailing wind directions.	According to the AVA technical circular, the wind directions covering 75% of the annual and summer wind frequencies shall be considered. As stated in the method statement submitted to Planning Department dated Aug 24, 2016, wind rose for grid (049, 037) from RAMS will be adopted. A total of nine wind directions, namely NNE, NE, ENE, E, ESE, SE, SSE, S and SSW, will be considered for annual condition and a total of eight wind directions, namely E, ESE, SE, SSE, S, SSW, SW, WSW, will be considered for summer condition.
4. **Existing wind environment** – In order to alleviate the potential air ventilation impact on the existing pedestrian environment, it is required to investigate the existing pedestrian wind environment and identify the existing breezeways.	Noted. The existing wind environment has been analysed in the AVA initial study report in **Annex Q**.
5. **Mitigation Measures** – We have the following comments on the proposed mitigation measures. a. Breezeways / air paths (Figure 3) – It is found that wind entrance of some identified breezeways/air paths have been blocked by the proposed mid-rise buildings. We are doubtful on the performance of such breezeways. b. Height profile (Item 9) – It is agreed that varies height profile would benefit the pedestrian wind environment by capturing the higher level. However, it is found that there are some mid-rise buildings placed along the southeast tip of the project site which may block the SE prevailing wind and sea breeze. c. Podium structure (Item 10) – It is anticipated that the massive podium structures in the middle of the project site may induce potential air ventilation impact on the existing pedestrian wind environment. The applicant should explore the relevant mitigation measures to alleviate such air ventilation impact. d. Building disposition and permeability (Item 12) – It is agreed that the provision of building separations could reduce the potential air ventilation impact on the existing pedestrian wind environment. However, building separations with the width less than 15m are considered ineffective. The applicant should clarify the width of the proposed building separations. e. Frontal length (Item 14) – In order to reduce the potential air ventilation impact, the proposed building should minimize rather than maximum its frontal length facing the prevailing winds.	Noted. Some mitigation measures has been described in method statement submitted to Planning Department dated Aug 24, 2016, such as widening building separations and terraced podium. Please refer to the AVA Initial Study in **Annex Q.**
6. Besides of the applicant's proposed mitigation measure, it should make reference to the HKPSG Chapter 11, the following recommended measures should be explored in the proposed development scheme: i. Height and disposition of proposed building blocks along the waterfront should avoid blockage of prevailing winds and sea breezes. ii. Building Permeability to follow Sustainable Building Design Guidelines PNAP APP-152; iii. Minimization of podium bulk with ground coverage of no more than	Noted. Same as item 5 above.

65% or podium free design; iv. Building setback; and v. Greenery (preferably tree planting) of no less than 30% for sites larger than 1 ha, preferably at grade. 7. **Impact on the sensitive receivers** – The applicant has failed to address whether the proposed development could induce air ventilation impact on the sensitive receivers nearby.	 As described in the method statement submitted to Planning Department dated Aug 24, 2016, several sensitive receivers (i.e. Focus Areas), were identified. Test points were evenly distributed in these areas. The air ventilation impact from the proposed buildings on these focus areas have been assessed in the AVA initial study.

WSD's comment	**Applicant's response**
It is noted that this s12A application involving Area 10b is related to another s12A application involving Area 6f. This application for Area 10b proposes an addition of 1,125 flats (2,813 residents), while the application for Area 10b proposes an addition of 476 flats (1,190 residents). Apparently, the applicant has adopted a figure of 2.5 persons per flat. Nevertheless, according to DLO's letter dated 11.9.2014 to HKRCL commenting on the proposed Discovery Bay Master Plan 7.0B, it was stated that "based on the latest information of 2011 Census, the average household size is 2.7 in Discovery Bay. The applicant should justify the assumption of 2.5 persons per flat in this case. This issue needs to be addressed, as the household size affects the population figure and thus the estimation of demands on infrastructure. If the average household size is 2.7, even the 10,000 flats previously proposed in the draft Discovery Bay Master Plan 7.0E (developer's another submission) will mean a population of 27,000, which will already exceed the maximum population of 25,000 in the Discovery Bay OZP. It should be noted that the existing water supply system is based on a maximum population of 25000 in Discovery Bay, which is the population ceiling in the approved OZP in force. In Table 6.6 of the applicant's Planning Statement (Jan 2016), it is obvious that the applicant's intention is to exceed the 25,000 population by an addition of 4,003 persons (2,813 in this application + 1,190 in another application), and the water demand by an addition of 1722 cu.m./day (1210+512). It is noted that the general planning intention of the approved OZP is for a total population of 25,000 persons for the Discovery Bay development, and infrastructural capacities were considerations. Whilst the applicant has proposed an alternative water supply arrangement to provide private water supply by using the raw water stored in the private Discovery bay Reservoir and building a private water treatment works to make a private water supply exclusively to the additional 4,000 persons in their rezoning areas, we have reservation on the rationality of this arrangement in the context of public perception, water quality control, etc. considering that the existing and planned residents (25,000) in Discovery bay are provided with WSDs fresh water supply. The applicant is required to submit further information on this alternative water supply arrangement for consideration.	According to City Management's latest record (property management company of all Discovery Bay residential units), there are about 19,585 persons living in 8,326 units, equivalent to 2.35 persons per unit. It covers all the residential units and is therefore complete and accurate. In contrary, Government census surveyed only occupied units with occupants responding to census staff that is about 4,000+ units. The Working Group on Population Distribution Projections indicate an average 2.2 persons per domestic household for Discovery Bay (and the surrounding area, in Tertiary Planning Units 932 and 934) for 2013-2021 . Development under the approved Master Plan 6.0E7h(a) is for 8,731 residential units. OZP only states maximum population for 25,000 persons. The number of household was not mentioned although it is understood that the rationale is to allow for maximum 10,000 nos of residential units i.e. 2.5 persons per unit. Accordingly, the proposed Concept Plans at Area 6f and Area 10b creating about 1,601 units for 4,003 persons in total, equivalent to 2.5 persons per unit is considered reasonable. The water quality control standard for the proposed local water treatment works (WTW) adopts the same standard as the WSD's WTW. This will control the water quality provided from the local WTW to the same quality as from the WSD's fresh water supply. Potable water in Discovery Bay had been sourced from Discovery Bay reservoir and filtration plant for about 20 years before year 2000. Discovery Bay residents were used to this arrangement and there was never any concern raised on water quality. Hence it is not anticipated to be perception concern if some villages have potable water supply sourced from WSD's WTW while others from Discovery Bay reservoir. As there are various on-going new developments at North Lantau and Airport, Water Supplies Department and Environmental Protection Department may consider for expansion of the Siu Ho Wan water and sewerage treatment facilities in order to provide extra water supply and sewage treatment capacity should the spare capacity for the current facility is not adequate. The Applicant believes that, should WSD and EPD plans for infrastructure expansion, all proposed future developments in the vicinity areas, including those in the Discovery Bay, should be considered on equal and fair basis. In addition, the proposal for Area 10b is moderate in scale, the demand on the overall Government infrastructure would be insignificant. Therefore, the Applicant requests WSD and EPD to take into account the proposed development should they consider for future expansion of the Sui Ho Wan facilities. Revised Study on Drainage, Sewerage and Water Supply incorporating the above is provided in **Annex L**.

Annex A

Revised Concept Plan

EXISTING OZP BOUNDARY FOR AREA 10b

PODIUM EXTENT

PROPOSED OZP BOUNDARY FOR AREA 10b

0 20 40 50m

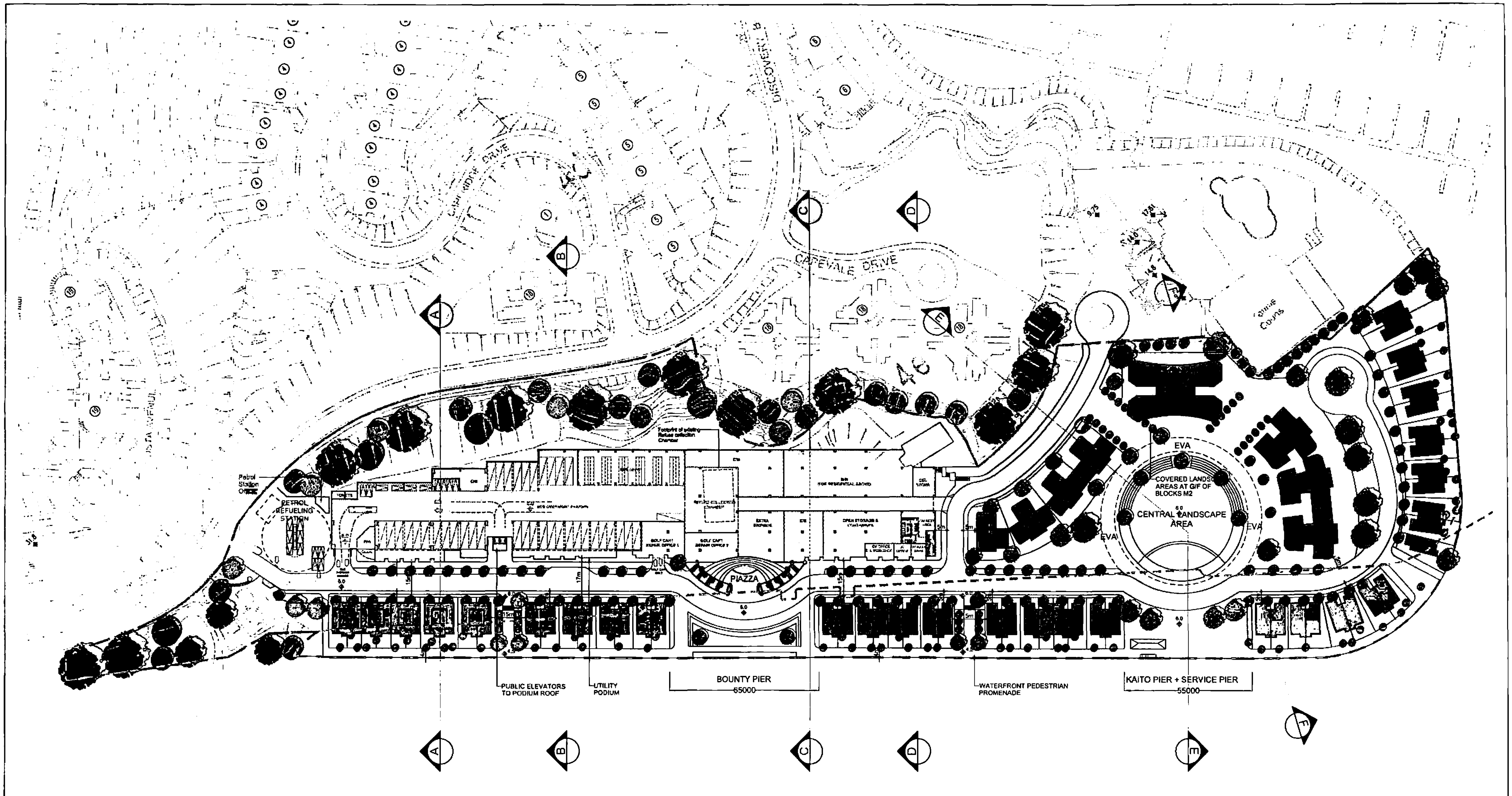
AREA 10b
PROPOSED RESIDENTIAL DEVELOPMENT

Rev.2, Aug 2016

申請編號 Application No. : Y / I - D B / 3
此頁摘自申請人提交的文件。
This page is extracted from applicant's submitted documents.

CONCEPT PLAN
Master Layout

Rev.3, Oct 2016



EXISTING OZP BOUNDARY FOR AREA 10b

PODIUM EXTENT

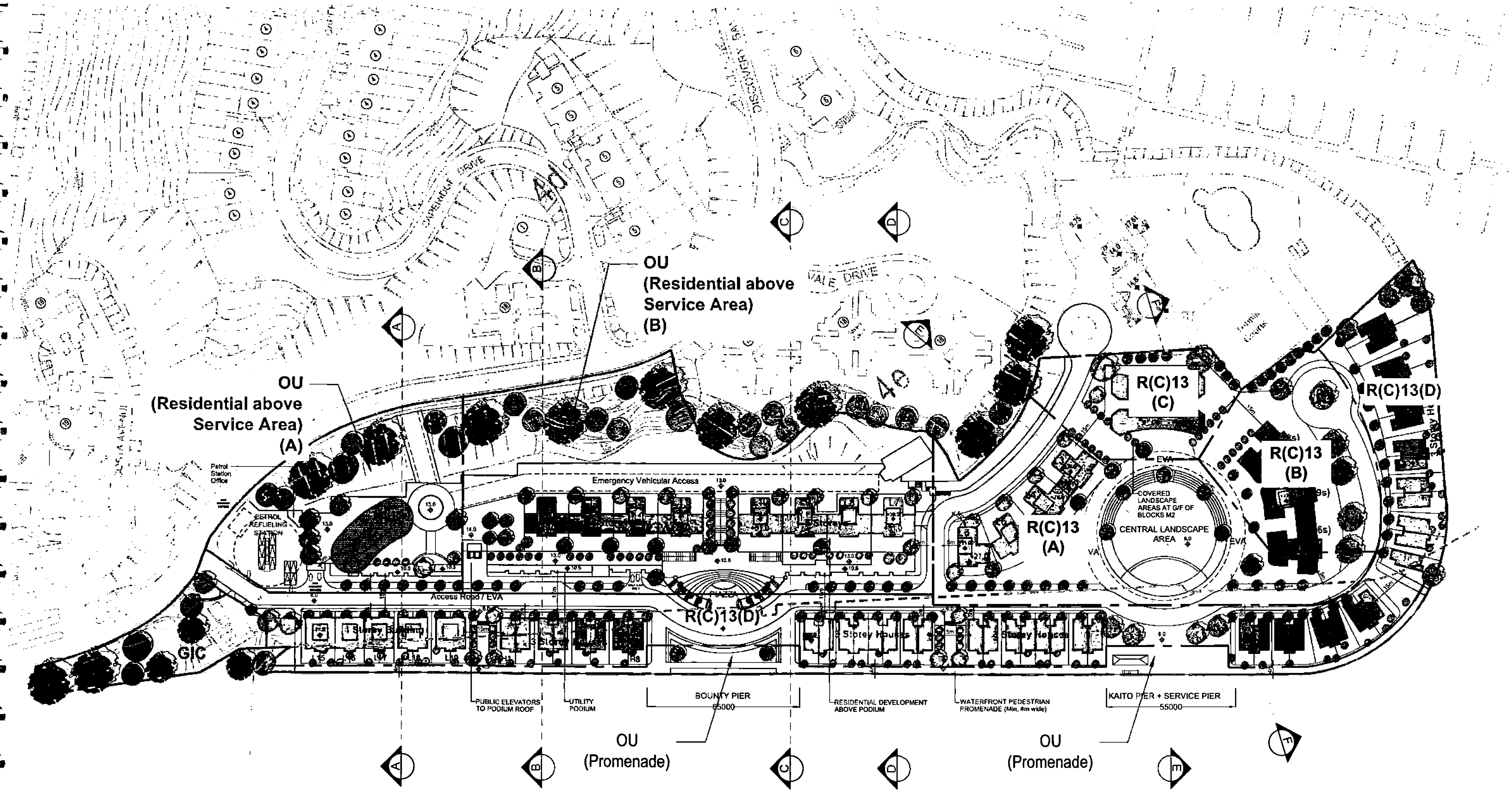
PROPOSED OZP BOUNDARY FOR AREA 10b

0 20 40 50m

AREA 10b
PROPOSED RESIDENTIAL DEVELOPMENT

CONCEPT PLAN
Ground Floor Layout

Rev.3, Oct 2016



EXISTING OZP BOUNDARY FOR AREA 10b

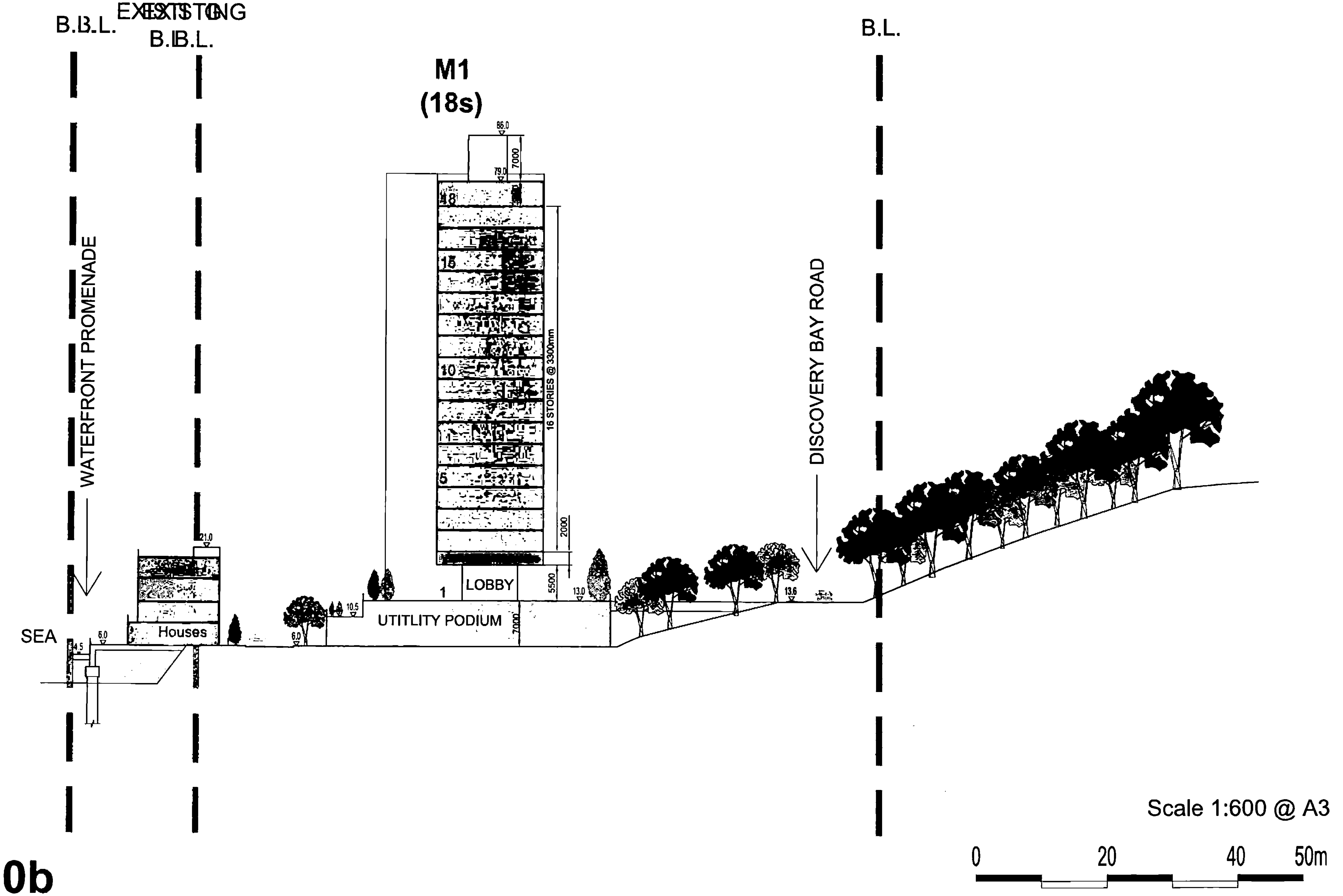
PROPOSED OZP BOUNDARY FOR AREA 10b

PODIUM EXTENT

AREA 10b
PROPOSED RESIDENTIAL DEVELOPMENT

CONCEPT PLAN
ZONING PLAN

Rev.3, Oct 2016

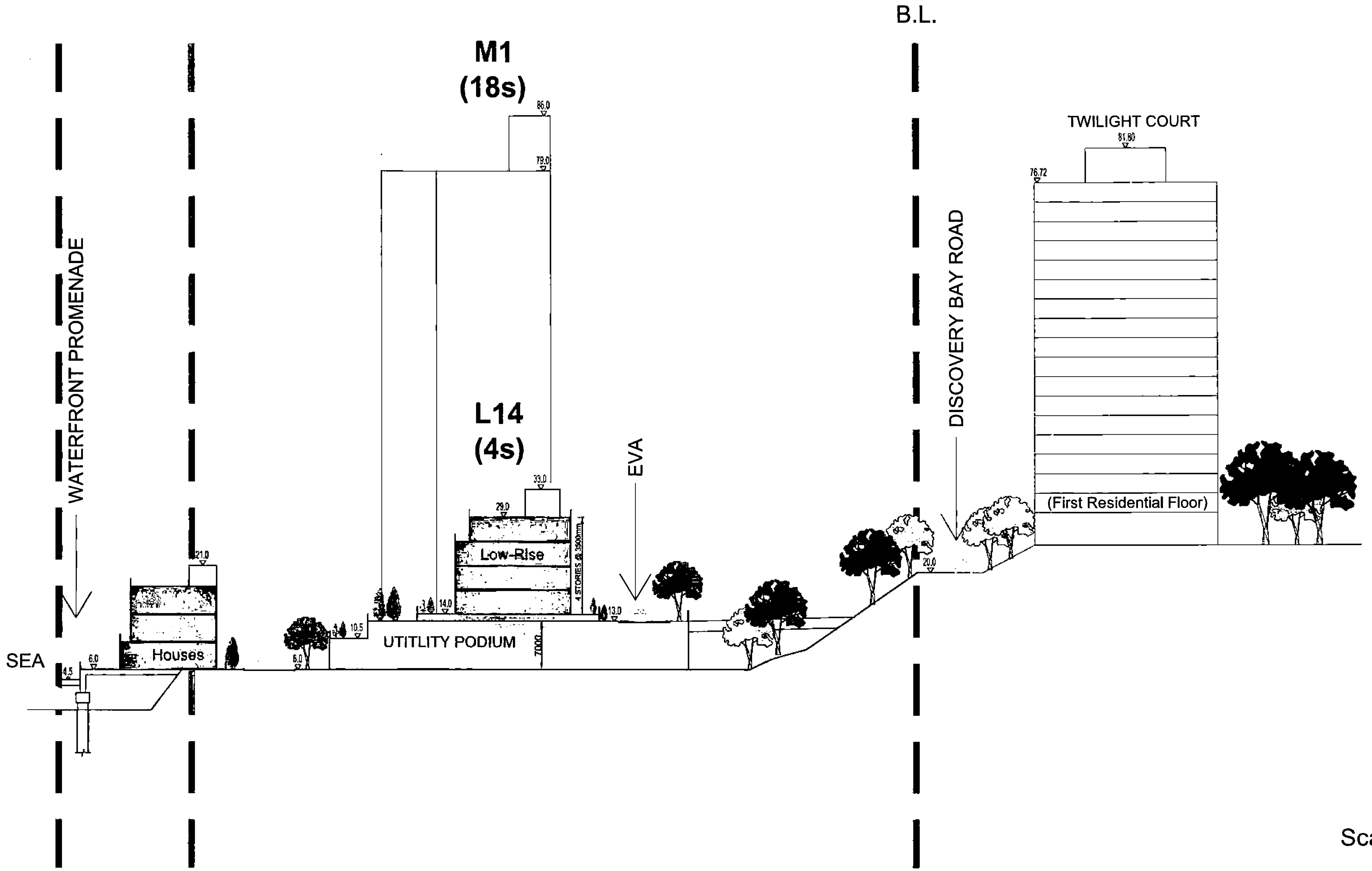


AREA 10b

PROPOSED RESIDENTIAL DEVELOPMENT

SECTION A-A

Rev.2, Aug 2016



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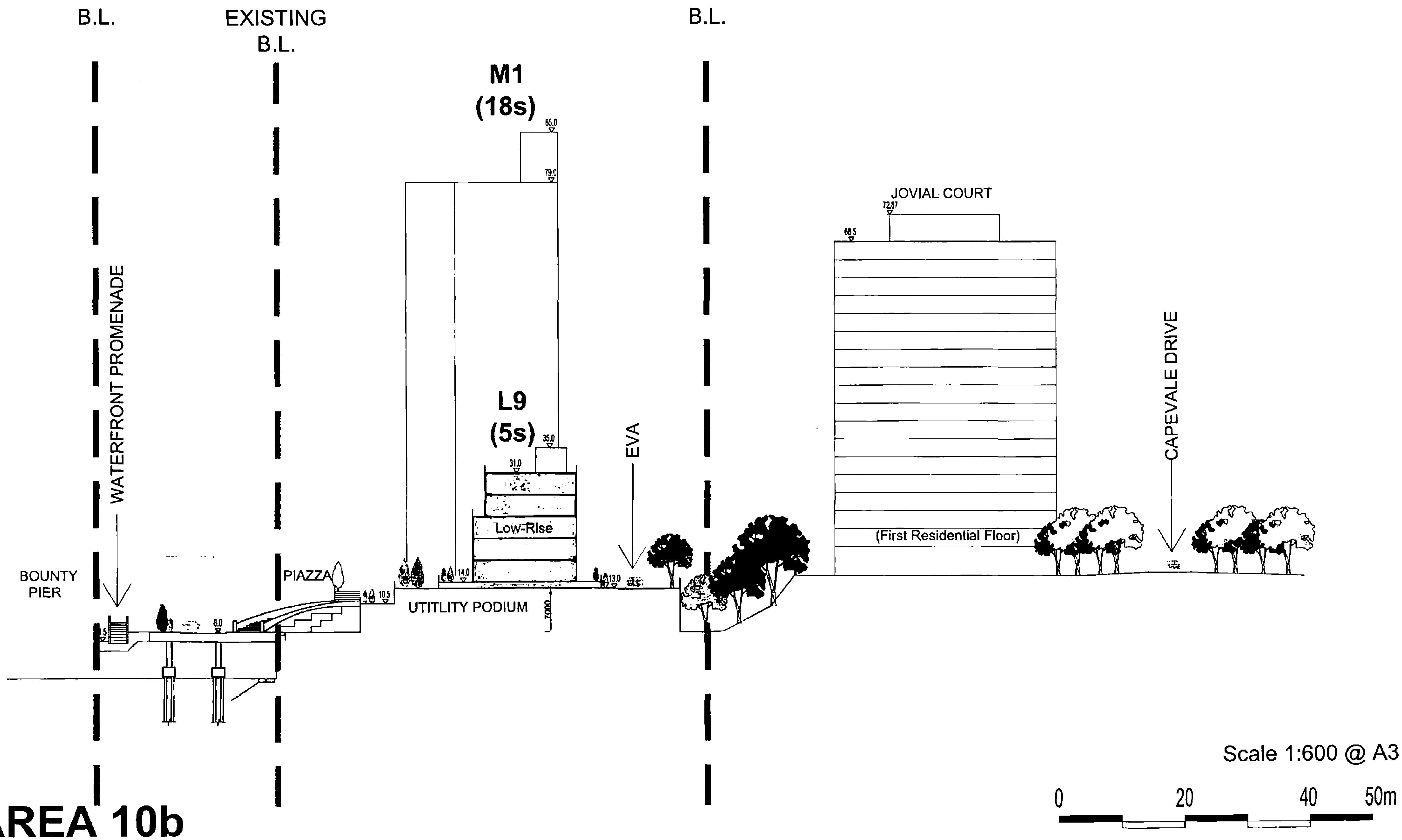
AREA 10b

PROPOSED RESIDENTIAL DEVELOPMENT

SECTION B-B

Rev.2, Aug 2016

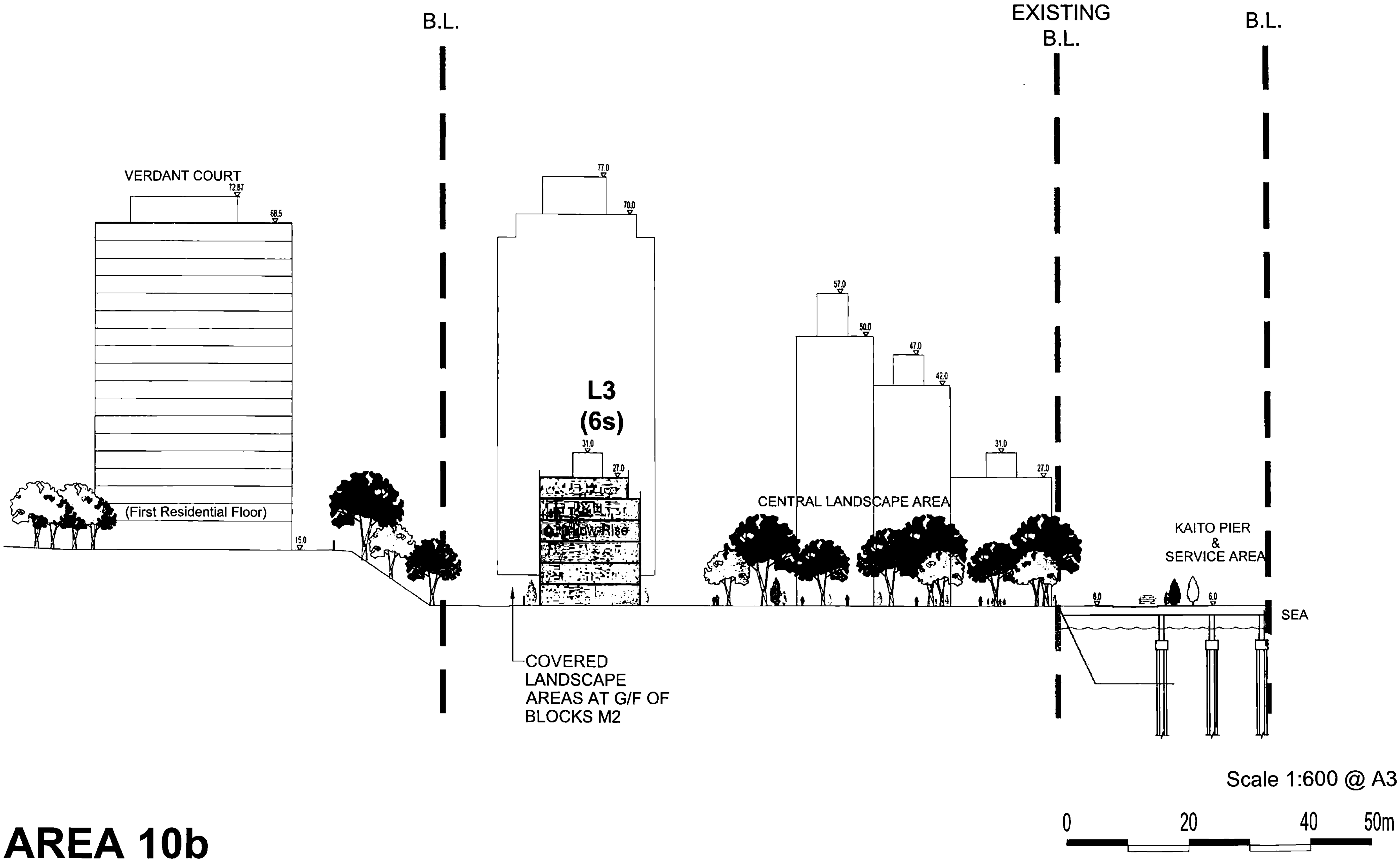


AREA 10b

PROPOSED RESIDENTIAL DEVELOPMENT

SECTION C-C

Rev.2, Aug 2016

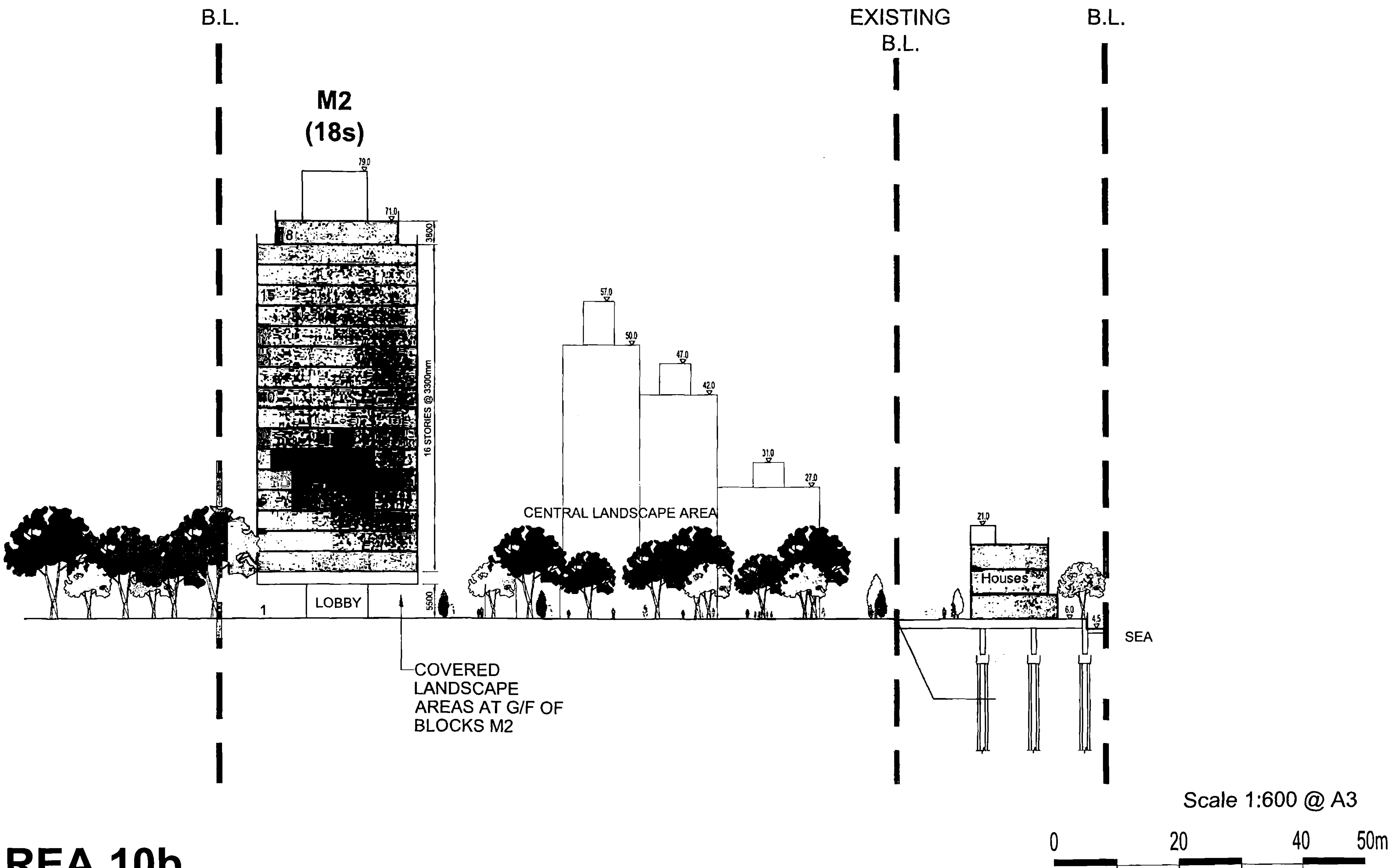


AREA 10b

PROPOSED RESIDENTIAL DEVELOPMENT

SECTION E-E

Rev.2, Aug 2016



AREA 10b

PROPOSED RESIDENTIAL DEVELOPMENT

SECTION F-F

Rev.2, Aug 2016

Annex B

Technical Note

On the Proposed Petrol Filling Station

KL CONSULTING ENGINEERS LIMITED
堅力工程顧問有限公司

Tel (852) 3153-2484 Fax (852) 3153-2485
E-mail : kenlun@netvigator.com

19 September 2016

HKR International Limited
23/F China Merchants Tower
Shun Tak Centre
168 Connaught Road Central
Hong Kong

Attn: Mr. Wilson Cheung

Dear Sirs,

<u>Proposed Petrol Filling Station in Area 10B, Discovery Bay</u>

Having reviewed the preliminary layout of the proposed petrol filling station (PFS) in Area 10B, Discovery Bay, that you provided, based on my past 40 years of experience on PFS development in Hong Kong, I would like to advise as follows:

1. The siting of this PFS does not violate any of the provisions in Chapter 12 of the Hong Kong Planning Standards and Guidelines (HKPSG) on PFS. It is not surrounded by developments; it is just near to a development and is wholly on open grounds. There have been numerous existing PFS's in similar environments in Hong Kong. Before the PFS can be built, we would have to get approval from FSD as the licensing authority on dangerous goods, which curtails compliance with the "Guidance for the Design, Construction, Modification and Maintenance of Petrol Filling Stations" (IP Code) referred to in para. 3.5.14 of Chapter 12 of the HKPSG and with other prevailing FSD requirements. To the best of my knowledge, neither the IP Code nor the prevailing FSD requirements would prohibit the siting of this PFS. The special siting requirements that apply to PFS with LPG facilities do not apply to this PFS which will have only diesel and petrol facilities.

2. For a PFS like this with only petrol and diesel facilities, the IP Code and the prevailing local FSD safety requirements have prescribed safety distances of the critical elements away from the station boundary. These critical elements include the filling points (the points at which the road tanker makes connection to fill the underground tanks), the fuel dispensers and the vent pipe outlets. From what I can see from your preliminary layout, siting these critical elements to meet the prescribed safety distances will not be a problem at all.

3. The Code of Practice for Oil Storage Installations does not apply to PFS at all. By definition, "*oil storage installations*" means "*any tank having a capacity of not less than 110 000 litres, or a group of tanks any one of which is a tank having a capacity of not less*

than 110 000 litres, constructed above ground for the purpose of storing petroleum products". It is intended to apply to oil depots / terminals. A PFS will not have any tank of capacity anywhere near 110 000 litres and will only have underground tanks.

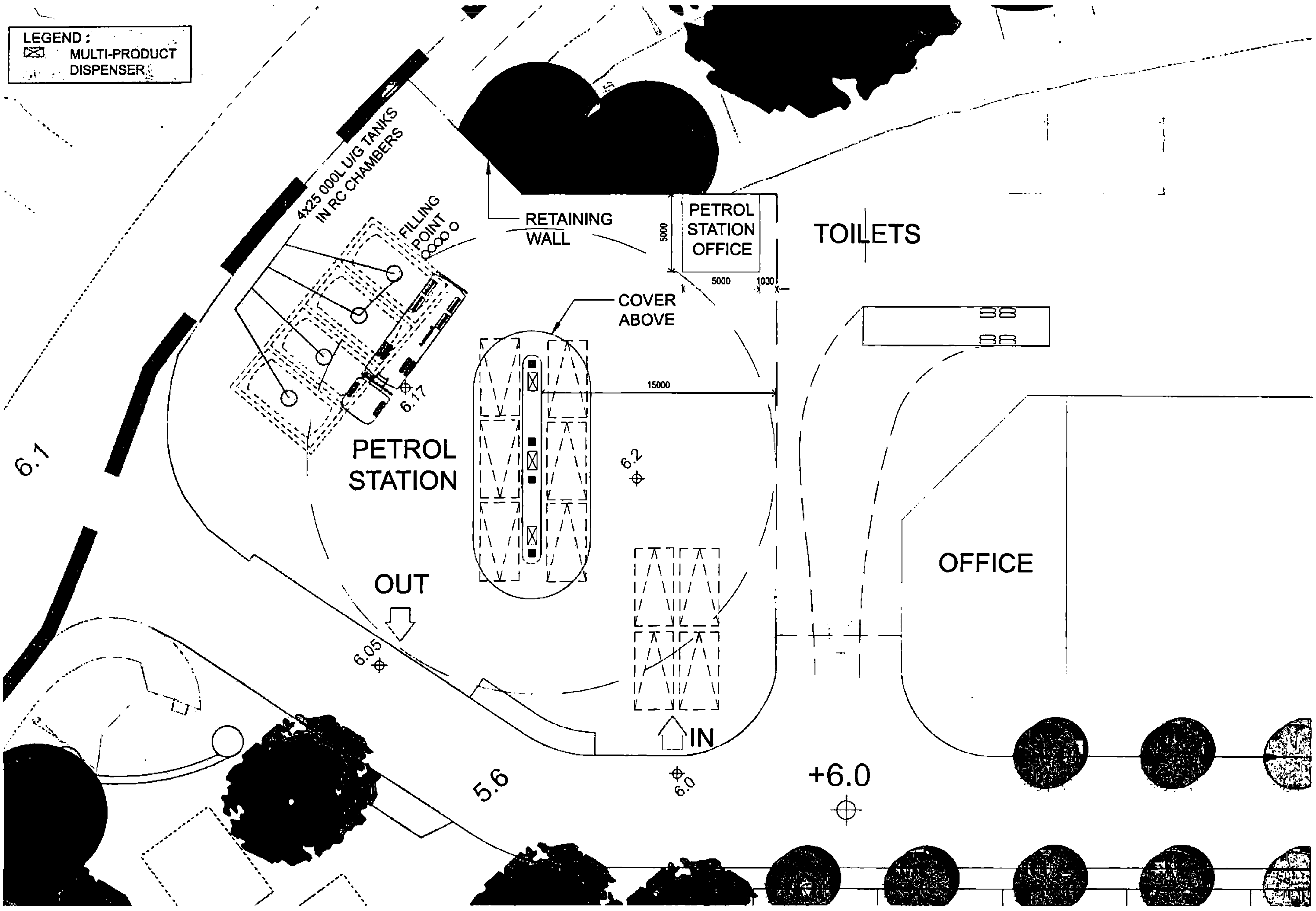
I have taken the liberty to add to your preliminary layout the proposed locations of the filling points and dispensers, which are well within the 4.25m safety distances required from the station boundary. The vent pipe outlets have not yet been indicated because they only have to be 2m away from the station boundary and there will be a lot of flexibility of locating them within the station. My sketch is attached herewith.

Should you have any further queries, please do not hesitate to contact me on 3153-2484.

Yours faithfully,

Kenneth Lun
FHKIE RPE(Civil, Gas & Energy) C Eng MICE FEI FIGEM Member NFPA
Chartered Civil, Gas & Petroleum Engineer
Authorized Person

Encl.


LEGEND :
MULTI-PRODUCT DISPENSER
4x25 000L U/G TANKS IN RC CHAMBERS
FILLING POINT
RETAINING WALL
PETROL STATION OFFICE
5000
5000
1000
TOILETS
COVER ABOVE
15000
6.17
PETROL STATION
6.2
6.1
OFFICE
OUT
6.05
IN
5.6
6.0
+6.0

CLP 中電

中華電力有限公司
CLP Power Hong Kong Limited

東西區
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香港九龍佐敦渡華路一號百周年大樓
Centenary Building, 1 To Wah Road
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網址 Website www.clpgroup.com

22 August 2016

By Post & Fax (2868 4998)

Hong Kong Resort Company Limited
23/F, China Merchants Tower
Shun Tak Centre
168 Connaught Road Central
Hong Kong

Attention: Mr. Henry Chan (Manager – Building Services)

Our ref.: WE/L/158309/16-08/MKL/TKC/DL
Your ref.: HKR/PD/10b/0313/2016

Dear Mr. Chan

Master Planning at Discovery Bay, Lantau Island in Are 10b
R.P. of Lot No. 385 Extensions Thereto in D.D. 352
Provision of 132kV Power Cable

We refer to your letter dated 1 August 2016.

We would like to advise you that we have no plan to lay 132kV cable at the above mentioned area at this moment. Should you have any queries, please feel free to contact our Mr. T. K. Chan on telephone number 2678 9049.

Yours sincerely
for and on behalf of
CLP Power Hong Kong Limited

M. K. Lam
Senior Planning & Design Manager
(East & West Region)

mkl:tkc:dl:wm

b.c.c. TK Chan - P&D (WER)
Don Lau- P&D (WER)
YH Choi – EPD (WER)
Filed EDMS

Annex D

Revised Environmental Study

Hong Kong Resort Company Limited

Optimization of Land Use in Discovery Bay

Environmental Study (Area 10b)

235928

Final | Oct 2016

Job number 235928

Ove Arup & Partners Ltd
Level 5 Festival Walk
80 Tat Chee Avenue
Kowloon Tong
Kowloon
Hong Kong
www arup.com

ARUP

Document Verification

ARUP

Job title		Optimization of Land Use in Discovery Bay		**Job number** 235928	
Document title		Environmental Study (Area 10b)		**File reference**	
Document ref		235928			
Revision	**Date**	**Filename**	Draft EAS.docx		
Draft	July 2014	**Description**	Draft Environmental Study		
			Prepared by	Checked by	Approved by
		Name	Various	Franki Chiu	Franki Chiu
		Signature			
Revised Draft	March 2015	**Filename**	Draft EAS.docx		
		Description	Revised Environmental Study		
			Prepared by	Checked by	Approved by
		Name	Various	Franki Chiu	Franki Chiu
		Signature			
Final	December 2015	**Filename**	Final EAS.docx		
		Description	Final Environmental Study (Area 10b)		
			Prepared by	Checked by	Approved by
		Name	Various	Franki Chiu	Franki Chiu
		Signature			
Final v1	May 2016	**Filename**	Final EAS v1.docx		
		Description	Final Environmental Study (Area 10b)		
			Prepared by	Checked by	Approved by
		Name	Various	Franki Chiu	Franki Chiu
		Signature			

Document Verification

Job title		Optimization of Land Use in Discovery Bay			Job number 235928
Document title		Environmental Study (Area 10b)			File reference
Document ref		235928			
Revision	Date	Filename	Final EAS v2.docx		
Final v2	August 2016	Description	Final Environmental Study (Area 10b)		
			Prepared by	Checked by	Approved by
		Name	Various	Franki Chiu	Franki Chiu
		Signature			
Final v3	October 2016	Filename	Final EAS v3.docx		
		Description	Final Environmental Study (Area 10b)		
			Prepared by	Checked by	Approved by
		Name	Various	Franki Chiu	Franki Chiu
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document ✓

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Executive Summary

The Hong Kong Resort Company Limited (HKRCL) has been considering the feasibility of implementing additional development areas within the existing boundary of Discovery Bay to provide additional housing supply. A planning statement, titled "Optimisation of Land Use in Discovery Bay" was submitted to Planning Department (PlanD) in July 2013. A round of comments from various government departments was received on December 2013 (ref PlanD.'s letter ()L1/L/DBNC/352-17 dated 17 December 2013). Another round of submission was made on August 2014 and the corresponding set of comments was received from various government departments on December 2014 (ref PlanD.'s letter ()L1/L/DBNS/352-17(CR) dated 23 December 2014). Subsequently, another round of submission was made in March 2015 and comments were received from various government departments. In order to address those comments, the development proposal has been refined accordingly.

This Environmental Study refers to Area 10b. The potential development area is included in the latest approved Discovery Bay Outline Zoning Plan for a range of "Other Specified Uses" and "Government, Institution and Community", despite the fact that some of their development parameters and locations are proposed to be amended.

An Environmental Study for Area 10b has been conducted on the latest development proposal is to demonstrate land use compatibility and acceptability of the proposed development by providing necessary information, findings and conclusions. Some of those comments relating to the need for formal Environmental Impact Assessment Report for any Schedule 2 and Schedule 3 Designated Projects (DPs) would be separately handled when the Environmental Impact Assessment Ordinance (EIAO) process is formally initiated subsequent to a rezoning approval and prior to implementation. The issues considered in this Environmental Study include noise, air quality, water quality, land contamination and ecology. Those relating to sewerage and drainage, and water supply are separately presented in another report. The following potential Designated Projects (DPs) have been identified and these would be further investigated during the detailed design stage.

- Transport depot for buses and golf cars;
- Associated submarine outfall for the possible sewage treatment works, if required;
- Possible dredging for a navigation channel outside the approved reclamation area, if required.

Air Quality

All the relevant air emission sources in the vicinity that would have air quality impacts on the proposed developments have been identified and assessed. Key air emission sources include the marine vessels (such as the ferries between Discovery Bay and Central, kaitos, Oil Tankers and sand barges), the fireworks at Disney Theme Park, sewerage treatment works and sewage pumping station. A literature review on best available information including Environmental Protection Department (EPD)'s publications, approved Environmental Impact Assessment (EIA) Reports and operators' data has been conducted to establish the emission strengths of these air emission sources. These emission strengths are then included in EPD's approved air quality dispersion models to simulate air quality impacts on both existing and planned air sensitive receivers. The planned air sensitive receivers would unlikely be subject to adverse air quality impact.

Noise

All the relevant noise sources in the vicinity that would have noise impacts on the proposed developments have been identified and assessed. These noise sources include the marine vessels (such as the ferries between Discovery Bay and Central, kaitos, Oil Tankers and barges), sewage treatment works, sewage pumping stations, traffic along nearby road network and the firework at Disney Theme Park. Where practicable, noise measurements have been conducted to establish the noise caused by these noise sources. These measurement data is then used to assess the noise impacts on both existing and planned noise sensitive receivers. Results indicate that the predicted noise impacts would not exceed the relevant noise limits and hence the proposed land uses would not be subject to insurmountable noise impacts.

Water Quality

Although most of the development would not involve marine works, some minor reclamation work would still be required. The minor reclamation would be conducted by decking over piles and hence any water quality impacts caused would unlikely be significant. Any release of sediment would be readily controlled after the implementation of good practices. It may also be necessary to conduct some dredging to facilitate marine access for the future berths. Preliminary estimation suggests that the total amount of dredging would be less than 100,000m^3. Some marine works may also be required for the potential sewage treatment works and the associated outfall. They will be considered in the subsequent statutory EIA which will include cumulative impacts caused by various sources, including the proposed sewerage treatment works, the design of the deck-over-piles, the dredging process and the outfall etc. Refinement and appropriate mitigation measures would be required to minimise any adverse impacts on hydrodynamic and water quality during both construction and operational phases.

Other aspects

Site inspection and review of historical photos have revealed that most of the areas within the potential development area have low potential of land contamination. However, the existing bus depot and services areas have some potential for land contamination. It is recommended to prepare a Contamination Assessment Plan (CAP) after the rezoning approval and during the subsequent statutory EIA. The CAP shall cover all the potential development area and would recommend the need for Site Investigation to collect soil and ground water samples for analysis, and subsequent actions as required.

Depending on the future discussion with DSD, there may be a need for a new sewage treatment plant. The effluent discharge and the dredging work of the marine navigation channel would have certain impact on marine ecology.

Opportunities for transplantation of trees have been explored where practical to minimise the impacts to terrestrial ecology associated with tree felling. In addition to transplantation of trees which identified with good transplantation survival rate, a number of trees have also been proposed to be retained.

For marine ecology, series of mitigation measures have been recommended to minimise the marine ecological impacts during construction phase. In addition, the nearest fish culture zones are located more than 6km away from the Site. With the mitigation measures, such as the use of silt curtains, both direct and indirect impacts are considered to be insignificant.

1 Introduction

1.1 Background

1.1.1.1 The Hong Kong Resort Company Limited (HKRCL) has been considering the feasibility of implementing additional development areas within the existing boundary of Discovery Bay to provide additional housing supply. A planning statement, titled "Optimization of Land Use in Discovery Bay" was submitted to Planning Department (PlanD) in July 2013. A round of comments from various government departments was received on December 2013 (ref PlanD.'s letter ()L1/L/DBNC/352-17 dated 17 December 2013).

1.1.1.2 Another round of submission was made on August 2014 and the corresponding set of comments was received from various government departments on December 2014 (ref PlanD.'s letter ()L1/L/DBNS/352-17(CR) dated 23 December 2014). Subsequently, another round of submission was made on March 2015 and comments were received from various government departments.

1.1.1.3 Ove Arup & Partners HK Ltd (Arup) has been appointed by HKRCL to conduct assessments to address those comments relating to environmental aspects including noise, air quality, water quality, land contamination, ecology, sewerage and drainage, and water supply. However, given the purpose of this Environmental Study is to demonstrate land use compatibility and acceptability of the proposed development by providing necessary information, findings and conclusions, some of those comments relating to the need for statutory Environmental Impact Assessment Report would be separately handled when the Environmental Impact Assessment Ordinance (EIAO) process is formally initiated prior to implementation.

1.1.1.4 This report addresses those comments relating to noise, air quality, water quality, land contamination and ecology for Area 10b. Those relating to sewerage and drainage, and water supply are separately presented in another report.

1.2 Key Objectives of this Environmental Study

1.2.1.1 This Environmental Study is not intended to fulfil the statutory requirements under the EIAO for the DPs and the aim of this

Environmental Study is to support the rezoning application for Area 10b. This key objectives for this Environmental Report are given below:

- Summarise the relevant regulations and regulations that are applicable;
- Establish the baseline environmental conditions ;
- Identify the representative environmental sensitive receivers that may be affected by the proposed development;
- Present the assessment methodologies applicable to various environmental aspects;
- summarise the key findings for those relevant environmental aspects;
- Propose mitigation measures where needed; and
- Identify further studies that may be required during the subsequent statutory EIA.

2 Project Description

2.1 Land uses

2.1.1.1 The current land uses for the area include "Government, Institution and Community" and "Other Specified Use" for a range of supporting service. Once the proposed development in the area is implemented, they would be changed from the current land uses to the proposed land uses of residential and various supporting service uses. The following table summarises both the current and proposed land uses for Area 10b and **Figure 2-1** illustrates its location. The total site area for potential development area is about 6.3 ha and would accommodate a total of about 2,900 additional population.

Table 2.1: Current and proposed land uses

	Land uses	
Area	**Existing [1]**	**Proposed**
Area 10b	"OU" and "Government, Institution and Community" for various supporting service uses.	"OU" (Residential and various supporting service uses) R(C)13

[1] – As shown in OZP S/I-DB/4 - Discovery Bay

2.1.1.2 Area 10b is located along the existing seafront along Marina Avenue leading to the existing Marina. Site observation reveals that the site is mainly occupied by a number of services facilities including the depot for vehicles, petrol / LPG filling station, ferry pier etc. It is also noted that the entire depot area is paved with concrete.

2.1.1.3 Within Area 10b, it is proposed to have residential premises together with the necessary infrastructure and landscaping elements. Besides, some of the existing service would also be separated from the future housing by housing them in podium structure with access largely separated from residential developments, but still within Area 10b.

2.1.1.4 For sewerage system, a new sewerage treatment work (STW) (~ 1,100m^3 per day) will be established to receive and treat the sewage generated from the additional population from Area 10b, as discussed in the Study on Sewerage Systems accompanying this planning application. The treated effluent will be discharged via marine outfall to the marine waters. This new STW will be designed, operated and maintained by the project proponent to achieve any treatment level if required. A discharge licence will be obtained under the WPCO prior to discharge of the treated effluent.

2.1.1.5 For fresh water, it would either be supplied from Siu Ho Wan Water Treatment Works, or supplied from Discovery Bay Reservoir, in which case the previous treatment facilities would be re-commissioned.

2.1.1.6 The existing petrol filling station would also be relocated to a new location at the junction between Discovery Bay Road and Marina Avenue. A separation distance of 50m has been allowed between this new petrol filling station and the existing / planned residential premises. The existing LPG station will be relocated outside of Area 10b.

2.1.1.7 The existing seawall along Marina Avenue has adopted the configuration as a sloping seawall. In order to cater for the additional housing development, it is proposed to include an additional narrow strip of reclamation, in the form as a decking with a width of 9-34m. The total area for this additional decking would be approximately 0.86ha. It should be noted that the extent of deck would be within the gazetted zone approved under the Foreshore and Seabed Ordinance in 1977.

2.1.1.8 Similar to the existing developments within Discovery Bay, the municipal wastes from Area 10b will be transported away by vehicles.

2.2 Possible Construction Methodologies

2.2.1.1 The construction methodologies are yet to be developed in the subsequent stages. Nevertheless, the reclamation work at Area 10b would adopt an environmental friendly approach by decking over piles instead of using the conventional dredging approach. This would significantly reduce the release of sediment during the construction phase. Minor modification works would be required for the existing vertical seawall along the Area 10b, including relocation of existing piers, will need to be conducted below water level, and the details will be established in the detailed design stage. In order to avoid/minimise water quality impacts due to the piling works, steel casings will firstly be installed at the proposed pile locations. The steel casings extend above the sea and will prevent soil or rock arisings from being disposed of into the sea. The arisings will be removed from within the piles to a barge anchored close to the piles. Once the materials inside the casings were removed, steel reinforcements/structural sections will be lowered inside the casing and then followed by concreting work. Silt curtain will be installed as secondary measures to prevent any accidental release of arisings into the sea.

2.2.1.2 However, in order to facilitate access by marine vessels using the new berths (eg. the Bounty), it may be required to conduct some minor dredging to realign the existing navigation channel. The tentative extent of dredging for navigation of vessels is shown in **Figure 6-1**. The amount of dredging is estimated to be less than 100,000 m^3 and will still subject to detailed design. Mitigation measures such as silt curtains would be employed. In case a sewage treatment works is required for the development, some marine works, such as dredging, may also be required for the outfall.

2.3 Tentative Implementation Programme

2.3.1.1 According to the latest design, the tentative time for the occupation of the potential development area would be beyond 2020 and this actual date would be reviewed throughout the design process.

2.4 Designated Project

2.4.1.1 The elements within the potential development area have been reviewed to determine whether they are qualified as either Schedule 2 or Schedule 3 Designated Projects (DPs) under the EIAO. An overview of these potential DPs is given table below for further evaluation. However, it should be noted that this list of potential DPs would need to be continuously reviewed and updated as the design progresses. The following table lists out those potential DPs which are further discussed and evaluated in the following sections.

Table 2.2: Potential designated projects to be reviewed

DP Item	Description
Item A1 of Sch 2	A road which is an expressway, trunk road, primary distributor road or district distributor including new roads and major extensions or improvements to existing road.
Item A6 of Sch 2	A transport depot
Item C1, C2 & C12 of Sch 2	Reclamation works and dredging works
Item F2 of Sch 2	Sewage treatment works
Item F3 of Sch 2	Sewage pumping station
Item F6 of Sch 2	Submarine sewage outfall

DP Item	Description
Item 1 of Sch 3	Engineering feasibility study of urban development projects with a study area covering more than 20ha or involving a total population of more than 100,000.

2.4.1.2 It should be noted the potential development area are included in the latest approved OZP and has been partly implemented, despite the fact that some of their development parameters and locations are proposed to be amended.

2.4.2 Summary of Designated Projects

2.4.2.1 After the review, the following potential DPs have been identified and these would be further investigated during the detailed design stage.

- Item A6 of Schedule 2: Transport depot for buses and golf cars;
- Item C of Schedule 2: Dredging works if required.
- Item F6 of Schedule 2: The associated submarine outfall for the possible sewage treatment works for Area 10b;

2.4.3 Item A6 of Schedule 2

2.4.3.1 Item A6 of Schedule 2 refers to "*A transport depot located less than 200m from the nearest boundary of an existing or planned (a) residential area; (b) place of worship; (c) education institutions; or (d) health care institution.*" There is an existing depot for the buses and golf cars within Area 10b. Most of the maintenance area of this depot is enclosed. The nearest residential premises is the Twilight Court, which is located at around 50m away. Given that this depot has been operated before the enactment of the EIAO, it is an exempted DP under the EIAO. According to the latest design, the existing depot for buses and golf cars within Area 10b would be retained but modified and separated from the future residential units. The new depot will be housed in a podium with residential blocks on top. Vehicular and pedestrian access to the depot and residential blocks are totally separated at different level. Depot is accessed at ground level, whereas that of residential blocks is on top of podium roof. However, the future depot would be within 200m from the planned residential area in Area 10b. Obviously, housing the depot in a podium will eliminate lot of environmental issues, such as noise, air, visual etc. Moreover, this exempted DP would not have material change under EIAO. Nevertheless, this depot would still be a potential DP under Item A6 of Schedule 2.

2.4.4 Item C of Schedule 2

2.4.4.1 It should be noted the proposed development would involve certain reclamation and dredging to extend the land area by approximate 0.86ha. However, the extent of reclamation and dredging will be within the boundary of the approved under the Foreshore and Seabed Ordinance in 1977 (see **Figure 2-2**). Hence, by virtue of Clause 9(2)(c) of the EIAO, the reclamation and dredging works are exempted from the EIAO. However, dredging works outside the approved reclamation area may be required for the navigation channel that may be qualified as DP under Item C of Schedule 2. Besides, a decking over piles approach will be adopted instead of extrusive conventional dredging and filling as the construction methodology.

2.4.5 Item F6 of Schedule 2

2.4.5.1 A sewage treatment plant within Area 10b would need to be implemented to receive the sewage generated by the future population in Area 10b. The effluent standards will meet WPCO and TM-EIAO as necessary. The capacity of the sewage treatment works would be approximately 1,100m^3 per day and hence is not a DP by itself. However, depending on further studies, a new marine outfall may be required. Hence, it may be qualified as a DP under Item F6 of Schedule 2 respectively.

2.4.6 Others

2.4.6.1 Other than the above DPs, other Schedule 2 and Schedule 3 DPs have been reviewed and summarised below:

2.4.6.2 Item A1 of Schedule 2 refers to "*A road which is an expressway, trunk road, primary distributor road or district distributor including new roads and major extensions or improvements to existing road.*" According to the latest design, only local roads would be required for the potential development area. None of the roads proposed will be categorised as expressways, trunk roads, primary distributor roads or district distributors. Hence, all the local roads proposed would not be qualified as DP under Item A1 of Schedule 2.

2.4.6.3 Item F3 of Schedule 2 refers to "*A sewage pumping station larger than 300,000m^3 / day or more than 2,000m^3 / day and a boundary of which is less than 150m from uses including residential uses, place of worship,* *educational institution, health care institution, site of special scientific interest, site of cultural heritage, bathing beach, marine park or marine reserve, fish culture zone or seawater intake point.*" According to the latest design, only an additional sewage pumping station of less than 1,000m^3/day would be required within Area 10b. Hence, the proposed sewage pumping station is not qualified as a DP under Item F3 of Schedule 2. Since the capacity of the sewage treatment works, if required, is approximately 1,100 m^3 per day and is less than 5,000 m^3/day. Hence, it is not classified as a DP under F2 of schedule 2.

2.4.6.4 Item 1 of Schedule 3 refers to "*Engineering feasibility study of urban development projects with a study area covering more than 20ha or involving a total population of more than 100,000.*" According to the latest design, the total size area of Area 10b is approximately 6.3 ha and will accommodate 2,800 population. Hence, the proposed development will not be qualified as a DP under Item 1 of Schedule 3.

2.4.6.5 In accordance with the requirements of Section 5(1) of the EIAO, a project profile for the Project would need to be submitted to the Director of Environmental Protection (DEP) for application for an EIA Study Brief (EIA SB). Once the development proposal is more developed, a Project Profile (PP) will be submitted to DEP to issue an EIA SB. The project proponent would need to submit an EIA Report to fulfil all the requirements in the EIA SB and the TM-EIAO. An Environmental Permit (EP) would be required prior to the commencement of any construction works.

2.5 Concurrent Projects

2.5.1.1 A review has been conducted to collate the information on potential concurrent projects that are available from the public domain. These potential concurrent projects are discussed in the following sections to evaluate if there are potential for cumulative impacts during the construction and operation phase of the proposed development in Discovery Bay.

2.5.1.2 This is a strategic study initiated by the Government to study the feasibility of implementing artificial islands in the water to the east of Discovery Bay to support the longer term development of Hong Kong. At the time of preparing this report, there are neither development options nor confirmed development programme. Hence, this is not considered as a concurrent project for the purpose of this Environmental

Study.

2.5.1.3 Residential development is also being considered in Area 6f. Given that Area 6f is located more than 700m away, adverse cumulative impacts are unlikely.

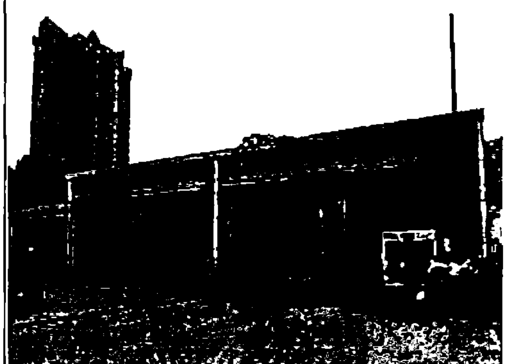
2.6 EIAO Implications

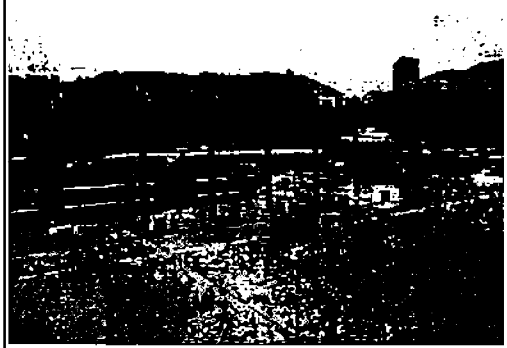
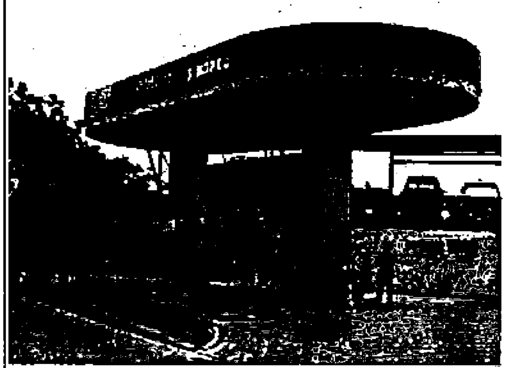
2.6.1.1 As discussed above, various construction items in the proposed development may constitute a DP under the EIAO. It is well noted the potential environmental impacts evaluated in this ES report shall be revisited in the later statutory EIA and the scope of assessments will be subject to the listed requirements in EIA SB which shall be issued by DEP after the submission of PP. Furthermore, detailed assessments/surveys shall be conducted and any proposed mitigation measures in this ES report will be further explored and agreed with relevant authorities in the future EIA.

3 Site Inspection

3.1.1.1 Several site visits were carried out in April – June 2014 and August 2016 to identify potential sources of environmental impact and sensitive receivers in the vicinity of Area 10b. The following table presents the images for Area 10b.

Table 3.1: Existing environment conditions

Viewpoint 1:Golf cart repair workshop	Viewpoint 2: Bus depot
	
Viewpoint 3: Overnight bus parking	Viewpoint 4: A public refuse collection point
	

Viewpoint 5: Nim Shue Wan	Viewpoint 6: Public ferry to Peng Chau / Mui Wo
	
Viewpoint 7: Existing boatyard	Viewpoint 8: Petrol filling station
	

4 Air Quality Assessment

4.1 Air Sensitive Receivers

4.1.1.1 Representative Air Sensitive Receivers (ASRs) [1] within the potential development area have been identified in **Table 4.1** and illustrated in **Figure 4-1.**

Table 4.1: Representative ASRs for air quality assessment

ASR ID	Description	Land use	Number of Storey	Building Hgt. Above Local Ground (approx.) (m)
A10b-1	Planned building	Residential	4	15
A10b-2	Planned building	Residential	4	15
A10b-3	Planned building	Residential	4	15
A10b-4	Planned building	Residential	4	15
A10b-5	Planned building	Residential	4	15
A10b-6	Planned building	Residential	4	15
A10b-7	Planned building	Residential	4	15
A10b-8	Planned building	Residential	3	15
A10b-9	Planned building	Residential	3	15
A10b-10	Planned building	Residential	4	15
A10b-11	Planned building	Residential	4	15
A10b-12	Planned building	Residential	4	15
A10b-13	Planned building	Residential	4	15
A10b-14	Planned building	Residential	12	51
A10b-15	Planned building	Residential	18	71

[1] In accordance to Annex 12 of the TM-EIAO, Air Sensitive Receivers (ASRs) include any domestic premises, hotel, hostel, hospital, clinic, nursery, temporary housing accommodation, school, educational institution, office, factory, shop, shopping centre, place of public worship, library, court of law, sports stadium or performing arts centre. Any other premises or places with which, in terms of duration or number of people affected, have a similar sensitivity to the air pollutant as the aforelisted premises and places would also be considered as a sensitive receiver.

ASR ID	Description	Land use	Number of Storey	Building Hgt Above Local Ground (approx.) (m)
A10b-16	Planned building	Residential	6	25
A10b-17	Planned building	Residential	6	25
A10b-18	Planned building	Residential	4-5	29[1]
A10b-19	Planned building	Residential	4-5	27[1]
A10b-20	Planned building	Residential	4-5	27[1]
A10b-21	Planned building	Residential	18	80[1]

Note:

[1] These ASRs will be located on the top of a 9m podium. The building height shown in the table refer to the total height of the building and the podium. In the air quality model, "terrain mode" that the local ground level which considered in the model was selected. The "local ground level" of these ASRs in the model was referred to the top of the podium. Therefore, the building height of A10b-18, A10b-19, A10b-20 and A10b-21 were 20m, 18m, 18m and 71m, respectively.

4.1.1.2 Other than the above planned ASRs, a number of existing ASRs are also identified. The representative existing ASRs are summarized in **Table 4.2** and illustrated in **Figure 4-1.** As shown in **Figure 4-1**, the planned ASRs are located at locations more affected by pollution sources such as marine vessel emissions. Therefore, the existing ASRs are not selected for quantitative air quality assessment.

Table 4.2: Representative Existing ASRs

ASR ID	Description	Land use	Approximate Distance from the Site Boundary
A10b-22	Discovery Bay Marina Club	Recreational	15m
A10b-23	Verdant Court	Residential	15m
A10b-24	Haven Court	Residential	15m
A10b-25	Jovial Court	Residential	20m
A10b-26	Twilight Court	Residential	15m
A10b-27	La Costa Block 22	Residential	30m
A10b-28	La Vista Block 7B	Residential	50m

4.1.1.3 The relevant legislations and standards applicable to these ASRs are summarized in **Appendix 4.1**.

4.2 Air Pollution Sources

4.2.1 Construction Activities

Construction Dust

4.2.1.1 During construction phase, the reclamation works will be conducted by decking over the piles at the seashore. No backfilling of soil and major earth moving activities are required in compared with the convectional reclamation. Any dredging work for the navigation channel would not generate adverse dust emission as well. Hence, no adverse dust impact is anticipated from the reclamation works. For the superstructure works, the construction works of the development will not be conducted at the same time, but in multiple work front on the completed decking or existing flatland and no extensive excavation and site clearance works will be required. Hence, significant dust emission is therefore not anticipated provided that the relevant mitigation measures recommended in the Air Pollution Control (Construction Dust) Regulation are implemented.

4.2.1.2 The following dust suppression measures given in the Air Pollution Control (Construction Dust) Regulation should be incorporated by the Contractor to control the dust nuisance throughout the construction phase:

- Any stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or reinstated where practicable within 24 hours of the excavation or unloading;
- Any dusty material remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;
- A stockpile of dusty material should not extend beyond the pedestrian barriers, fencing or traffic cones;
- The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak form the vehicle;
- Where practicable, vehicles washing facilities including a high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;

- When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period;
- The portion of any road leading only to construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials;
- Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously;
- Every stock of more than 20 bags of cement or dry pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the three sides;
- Immediately before leaving a construction site, every vehicle shall be washed to remove any dusty materials from its body and wheels;
- Cement or dry PFA delivered in bulk should be stored in a closed silo fitted with an audible high level alarm which is interlocked with the material filling line and no overfilling is allowed; and
- Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shortcrete or other suitable surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies.

Emission from Fuel Combustion Equipment to be used during Construction Works

4.2.1.3 Fuel combustion from the use of Powered Mechanical Equipment (PME) during construction works could be a source of NO2, SO2 and CO. To improve air quality and protect public health, EPD has introduced the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation, which came in operation on 1 June 2015, to regulate emissions from machines and non-road vehicles. Starting from 1 December 2015, only approved or exempted non-road mobile machinery are allowed to be used in construction sites. Hence, with the effect of the Regulation, the emissions from PMEs are considered relatively small and will not cause adverse air quality impact.

4.2.2 Vehicular Emission

4.2.2.1 The Hong Kong Panning Standards and Guidelines (HKPSG) has specified the minimum setback distances between ASRs and different categories of roads, including trunk road and primary distributor, district distributor and local distributor. Since all the roads within Discovery Bay are either local distributors or internal access roads, a 5m setback requirement is adopted as recommended in the HKPSG.

4.2.2.2 As per the submitted Traffic Impact Assessment, the peak traffic flows of two major local roads, Discovery Bay Road and Marina Drive, would be only approximately 120 vehicles/hour and 90 vehicles/hour with all the developments (i.e. Area 6f and Area 10b) in place, respectively.

4.2.2.3 For Discovery Bay Road, the separate distance will be at least 30m and hence more than the HKPSG requirement of 5m. Besides the traffic forecast is only 120 veh/hr during peak hour. Hence, adverse air quality impacts due to Discovery Bay Road are not anticipated.

4.2.2.4 For the future realigned Marina Drive, most of the planned ASRs within Area 10b would have a separation distance of more than 5m. However, for some of the receivers along the seashore in the southern side of Marina Drive is less than 5m away from the Marina Avenue, which is considered as a local road, and cannot fulfill the 5m buffer requirements. However, it is noted that the traffic forecast of Marina Drive is only 90 vehicles per hour during the peak hour that adverse air quality impact is not anticipated. The bus depot will be located at the podium of the buildings along the northern side of the Marina Drive. However, the exact location is yet to be devised in the detailed design stage.

4.2.2.5 There are 54 no. of buses running in DB. Most bus services stop around mid-night. About 8 buses stay in Tai Pak bus terminus for overnight service. Currently these buses park in Area 10b open space. They are eyesores to nearby residents and noise source at 5:30 am to 7am when they start leaving 10b to commence their routine daily services. Apart from the early morning and mid-night when buses are leaving for service and coming back for overnight parking, buses are coming back for refueling and cleaning at an average rate of 5-6 buses per hour in between the morning and evening peak daily.

4.2.2.6 The future depot provides a covered internal space to address such overnight bus parking need. The covered depot reduces the noise impact in the morning when many buses start their engine at more or less the same time. There are 6 no. of maintenance bays in existing bus depot, 2 of them equipped with maintenance pits. They allow regular and routine repair and maintenance to ensure all buses can run normally. As no. of buses increases, currently some repairs have to be done in external area not designed for bus maintenance. Hence 6 maintenance bays all equipped with maintenance pits are proposed in the rezoning application. In addition, night time maintenance activities are not anticipated. Apart from the maintenance bays no., the proposed depot is purely replacement of existing one. There is no DG store in existing bus depot. It is not required by the proposed depot. Buses fuel refilling is and will be done in the existing and future petro-filling station.

4.2.2.7 In addition, according to EPD, Euro I, II and III buses will not be licensed by end 2019. Hence by end 2019, out of the 54 buses in the fleet, 4 buses will be at Euro IV, 48 will be at Euro V or VI. The remaining 2 buses are electric buses. Hence, impacts of bus depot are not anticipated.

4.2.3 Industrial Emission

4.2.3.1 Site surveys conducted in May and June 2014 revealed that there is no existing chimney within 500m assessment area. Hence, no cumulative air quality impact from industrial emission is anticipated.

4.2.3.2 The proposed depot for buses and golf cars will be housed in a podium with residential blocks on top. Good design such as providing air purifying units and locating the exhaust air outlets away from the nearby residents would be implemented to avoid any air quality nuisance.

4.2.4 Marine Vessels Emission

4.2.4.1 Site inspections have revealed marine vessels activities within the 500m assessment area. These activities include:

- Passenger ferry service between Discovery Bay and Central;
- Kaito ferry service between Discovery Bay and Peng Chau;
- Kaito ferry service between Discovery Bay and Mui Wo;
- Marine light diesel refilling activities for passenger ferries (Discovery Bay / Central Route);

- Oil tanker for diesel delivery to the marine light diesel refilling facility;
- Tug boat and barge for LPG tanker vehicles delivery;
- Vessel for LPG bottle delivery;
- Sand barge;
- The Bounty and
- Yacht, speedboat and sailboat at marina and nearby area.

Passenger ferry service and Kaito ferry services

4.2.4.2 Based on the current passenger ferry and kaito schedule available from the Transport Department, the maximum marine traffic movements of the ferry services between Discovery Bay and Central, between Discovery Bay and Mui Wo, and between Discovery Bay and Peng Chau can be up to around 90, 16 and 40 trips per day respectively. As certain amounts of pollutants are generated during combustion of diesel from the ferries, emission from these ferry services are included in the near-field modelling. In addition, according to the proposed development layout shown in **Figure 2-1**, the existing pier of kaito ferry will need to be reprovided. Therefore, for the purpose of this assessment, the routes of the kaito services have been adjusted accordingly to allow for the same separation distance from the shoreline. The current and future navigation routes for various ferries are shown in **Figure 4-2** and **Figure 4-3** respectively.

4.2.4.3 There are two types of vessels, Catamaran ferries and Monohull ferries, providing ferry service between Discovery Bay and Central. The capacities of Catamaran ferries and Monohull ferries are about 500 and 300 passengers respectively. On the other hand, there is no information from the operators of kaito ferry services between Discovery Bay and Mui Wo, and between Discovery Bay and Peng Chau.

4.2.4.4 With reference to the Traffic Impact Assessment accompanying this planning statement, the existing ferry service between Discovery Bay and Central would still operate with sufficient capacity with the additional residential developments in place. Therefore, no additional trip and projection of the emission from ferry service between Discovery Bay and Central is required.

4.2.4.5 Besides, there is no need to increase the kaito ferry between Discovery Bay and Mui Wo, and Discovery Bay and Peng Chau. However, in order to consider the cumulative impacts, the emission from existing kaito ferry services is also included in the assessment.

Marine light diesel refilling activities for passenger ferries (Discovery Bay / Central Route)

4.2.4.6 The current marine light diesel (MLD) refilling facility is located at Marina Avenue next to the Discovery Bay Marina Club. In order to cater for the future residential development, ferry diesel refilling will be conducted on marine based filling station outside Discovery Bay as advised by the operator. There will be no emission from the ferries during MLD refilling, and no traveling between the ferry pier at Tsoi Yuen Wan and the refilling facility within the assessment area in the future. Hence, marine emission due to the refilling activity would not be included in this assessment.

Oil tanker (Delivery of marine light diesel to Refilling Facility)

4.2.4.7 The refilling facility will be relocated and will not be present within the assessment area in order to cater for the future development. Therefore, no emission from the oil tanker is anticipated in the future. Hence, marine emission due to the MLD delivery would not be included in the near-field model in the quantitative assessment.

Tug boat and barge (Delivery of LPG Tanker Vehicles)

4.2.4.8 A barge towed by a tug boat will carry LPG tanker vehicles to the Discovery Bay every 5 to 6 days (i.e. about 5 to 6 times per month). The engines on both tug boat and barge will be switched off during berthing, but the auxiliary engine will be intermittently used when lowering and hoisting the vehicle ramp and will last for about 10 minutes. Hence, emission from the tug boat and barge are included in the near-field model in the quantitative assessment. Based on the latest development layout plan, the uploading/unloading point will be slightly relocated from its current location and the navigation route will be changed accordingly. The current and future navigation routes are shown in **Figure 4-2** and **Figure 4-3** respectively.

Vessel for LPG Bottle Delivery and Sand Barge

4.2.4.9 A vessel for LPG bottle delivery and a sand barge for sand delivery will operate once every few months. The operating time of both vessels are limited to daytime (i.e. 7:00 am to 7:00 pm) during weekdays only and the navigation route as well as engine powers are similar to those of tug boat/barge. Due to site constraints, only one vessel can berth at the loading/unloading point at any one time. Hence, concurrent operations of these 3 types of vessel (i.e. tug boat/barge for LPG tanker vehicles delivery, vessel for LPG bottle delivery and sand barge) are not anticipated.

4.2.4.10 Based on the information from the operators, the operation of the LPG bottle delivery and sand barge would be carried out once per three months and once per week during daytime respectively. Hence, for the purpose of this study, a continuous operation of the tug boat/barge for LPG tanker vehicles delivery from 7:00 am to 7:00 pm during weekdays is assumed in the quantitative assessment. This conservative approach would cover the operations of the vessel for LPG bottle delivery and the sand barge as well.

The Bounty

4.2.4.11 The Bounty for entertainment purpose will operate very infrequently as advised by the operator. A new berth location is provided for the Bounty in the future development as shown in **Figure 4-3.** In consideration of the infrequent activities and small engine power, the air quality impact from the Bounty is unlikely to be significant. Hence, adverse cumulative air quality impact is not anticipated and therefore would not be included in the quantitative assessment.

Yachts, Speedboats and Sailboats at Marina

4.2.4.12 Several site surveys have been conducted from April to June 2014 and revealed that there are also yachts, speedboats or sailboats travelling in and out of the marina. Based on the site observations, the number of yachts, speedboats and sailboats movement is only about 1-2 vessels per hour. Once these yachts, speedboats and sailboats parked at the berths, their engines will be stopped and switched to power supplied by the marina. Together with the fact that these yachts, speedboats and sailboats have much smaller engines as compared to ferries, it is considered that their emission is unlikely significant. Hence, adverse cumulative air quality impact is not anticipated and therefore would not be included in the quantitative assessment.

4.2.5 Fireworks Displays Emission

4.2.5.1 Disneyland Theme Park is located at approximately 2.5 km north-east of Discovery Bay. There are fireworks displays every night, including weekdays and weekends. Fireworks launching location is illustrated in **Figure 4-4.** According to the schedule in Disneyland's website, fireworks displays will be conducted from 8:00 pm for a duration of about 15 minutes. According to the Theme Park EIA, firework displays in the Disneyland Park would emit RSP and heavy metals. However, emission of gaseous pollutants due to combustion of small amount of black powder is not anticipated according to Section 3.5.14 of the approved EIA study.

4.2.5.2 Hence, for the purpose of this report, assessments on the RSP and heavy metals emissions from fireworks displays are included in the near-field model. The latest Environmental Permits (EPs) (EP-01/059/2000/A, EP-01/059/2000/B and EP-01/059/2000/C) of the Disneyland Park has also been reviewed and site survey has been conducted to verify the assumptions, including types of heavy metals prohibited to be used in fireworks displays and bursting heights of fireworks.

4.2.5.3 Potential odour impact has also been considered in the approved EIA study, and it is predicted that the odour level contributed by the firework displays on Discovery Bay is only 0.05 OU, which is well below the criteria of 5 OU as stipulated in the Annex 4 of the EIAO-TM. Since there is no major odour source within the assessment area, adverse odour impact is not anticipated and quantitative assessment is not required.

4.2.6 Others

4.2.6.1 According to the current design, the existing sewage pumping station would need to be upgraded to serve the populations in Area 10b. Good design measures such as activated carbon filter and negative pressure system will be implemented as necessary to control the emanating of odour. On this basis, it is not anticipated that the existing and planned sensitive receivers will be subject to adverse odour impacts and would comply the criteria of 5 OU based on an averaging time of 5 seconds for odour prediction assessment as stipulated in the Annex 4 of the

EIAO-TM. In addition, suitable buffer and landscaping features would be provided to minimise environmental and visual impacts on adjacent sensitive uses according to HKPSG. A separate study will be conducted in later stage if necessary.

4.2.6.2 Depends on further discussion with the relevant authority, a new sewage treatment works may be required. The tentative location of the proposed sewage treatment works is shown in **Figure 4-1**. Odour control devices, such as covering of the tanks, installation of deodourising unit, negative pressure, activated carbon filter etc, are required to contain the odour dispersion to the surrounding ASRs. Where necessary, water scrubbers could be considered as well. Therefore, it is anticipated that the new sewage treatment works would comply the criteria of 5 OU based on an averaging time of 5 seconds for odour prediction assessment as stipulated in the Annex 4 of the EIAO-TM. In addition, suitable buffer and landscaping features would be provided to minimise environmental and visual impacts on adjacent sensitive uses according to HKPSG. As such, adverse odour impact is therefore not anticipated.

4.2.6.3 A new semi-confined bus depot will be provided in Area 10b. The design of the bus depot should follow the requirement of Practice Note for Professional Persons – Control of Air Pollution in Semi-confined Public Transport Interchanges (ProPECC PN1/98).

4.3 Operational Phase Air Quality Assessment on Marine Vessels Emission and Fireworks Displays

4.4 Methodology

4.4.1.1 For the marine vessels emission, operation information are collected from the operators as well as reviews on the EPD's "*Study on Marine Vessels Emission Inventory*" and other EIA studies has been conducted. Sire surveys were also conducted to supplement information.

4.4.1.2 For the fireworks displays, a review on the Theme Park EIA and the fireworks displays schedule from the operator has been conducted. Site surveys were also conducted to supplement information.

4.4.1.3 Detailed methodology of the air quality assessment is summarized in **Appendix 4.2**.

4.5 Assessment Results

4.5.1.1 The cumulative NO_2, RSP, FSP and SO_2 concentrations at each representative ASRs have been assessed. All the predicted pollutant concentrations of representative ASRs would comply with the relevant AQOs. Summary of the maximum predicted concentrations at planned ASRs among all assessment heights are presented in **Table 4.3** and assessment results at all assessment heights are detailed in **Appendix 4.3.**

Table 4.3: Cumulative NO_2, RSP, FSP and SO_2 concentrations at ASRs

ASR ID	Concentration ($\mu g/m^3$)							
	NO_2		RSP		FSP		SO_2	
	19th highest 1-hour	Annual	10th highest 24-hour	Annual	10th highest 24-hour	Annual	Max 10-minute	4th highest 24-hour
A10b-1	130	30	75	40	56	28	138	30
A10b-2	130	30	75	40	56	28	138	30
A10b-3	131	30	75	40	56	28	138	30
A10b-4	132	30	75	40	56	28	139	30
A10b-5	131	30	75	40	56	28	139	30
A10b-6	130	31	75	40	56	28	139	30
A10b-7	130	32	75	40	56	28	139	30
A10b-8	147	39	76	40	57	29	139	30
A10b-9	134	31	75	40	57	28	139	30
A10b-10	136	31	76	40	57	28	139	30
A10b-11	130	31	76	40	57	28	138	30
A10b-12	129	30	75	40	56	28	138	30
A10b-13	129	30	75	40	56	28	138	30
A10b-14	130	30	75	40	56	28	138	30
A10b-15	129	30	75	40	56	28	138	30
A10b-16	130	32	75	40	56	28	138	30

ASR ID	Concentration (µg/m³)							
	NO_2		RSP		FSP		SO_2	
	19th highest 1-hour	Annual	10th highest 24-hour	Annual	10th highest 24-hour	Annual	Max 10-minute	4th highest 24-hour
A10b-17	129	32	75	40	56	28	138	30
A10b-18	130	31	75	40	56	28	139	30
A10b-19	131	30	75	40	56	28	139	30
A10b-20	133	30	75	40	56	28	139	30
A10b-21	134	30	75	40	56	28	139	30
AQOs	200	40	100	50	75	35	500	125

4.5.1.2 As shown in **Appendix 4.3**, the worst hit level is found at 5m above ground for NO_2, annual RSP, and 10th highest 24-hour and annual FSP, 10m above ground for 10th highest 24-hour RSP, 20m above ground for 4th highest 24-hour SO_2 as well as 40m above ground for 10-minute SO_2, respectively. Contours of the 19th highest 1-hour NO_2, annual NO_2, 10th highest 24-hour RSP, annual RSP, 10th highest 24-hour FSP, annual FSP, maximum 10-minute SO_2 and 4th highest 24-hour SO_2 concentrations at the corresponding worst hit levels in the most concerned and critical area (i.e. Area 10b) are plotted in the following figures:

(1) **Figure 4-5** – Contours of Cumulative 19th highest 1-hour NO_2 Concentration at 5m above ground

(2) **Figure 4-6** – Contours of Cumulative Annual-average NO_2 Concentration at 5m above ground

(3) **Figure 4-7** – Contours of Cumulative 10th highest 24-hour RSP Concentration at 10m above ground

(4) **Figure 4-8** – Contours of Cumulative Annual-average RSP Concentration at 5m above ground

(5) **Figure 4-9** – Contours of Cumulative 10th highest 24-hour FSP Concentration at 5m above ground

(6) **Figure 4-10** – Contours of Cumulative Annual-average FSP Concentration at 5m above ground

(5) **Figure 4-11** – Contours of Cumulative maximum 10-minute SO_2 Concentration at 40m above ground

(6) **Figure 4-12** – Contours of Cumulative 4th highest 24-hour SO_2 Concentration at 20m above ground

4.5.1.3 According to the contours, it is observed that all the planned ASRs would comply with the respective criteria. Hence, no adverse air quality impact is anticipated.

4.5.1.4 In addition, the heavy metals concentrations at all planned ASRs also comply with the respective assessment criteria. The maximum predicted concentrations at ASRs among all assessment heights are presented in **Table 4.4** to **Table 4.6** below and assessment results at all assessment heights are detailed in **Appendix 4.3**. All the assessment results would comply with the relevant criteria.

Table 4.4: Maximum 1-hour heavy metals concentrations at planned ASRs

ASR ID	Max. 1-hour Concentration ($\mu g/m^3$)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
A10b-1	0.741	0.238	0.584	0.305	0.260	0.074
A10b-2	0.696	0.218	0.537	0.280	0.246	0.068
A10b-3	0.633	0.191	0.471	0.244	0.226	0.060
A10b-4	0.535	0.148	0.369	0.190	0.195	0.046
A10b-5	0.486	0.127	0.317	0.162	0.180	0.040
A10b-6	0.491	0.129	0.323	0.165	0.182	0.040
A10b-7	0.477	0.123	0.308	0.157	0.177	0.038
A10b-8	0.433	0.103	0.262	0.133	0.163	0.032
A10b-9	0.370	0.076	0.197	0.098	0.144	0.024
A10b-10	0.424	0.100	0.253	0.128	0.161	0.031
A10b-11	0.434	0.104	0.264	0.133	0.164	0.033
A10b-12	0.432	0.103	0.262	0.132	0.163	0.032
A10b-13	0.435	0.105	0.265	0.134	0.164	0.033
A10b-14	0.394	0.087	0.222	0.111	0.151	0.027
A10b-15	0.373	0.077	0.200	0.099	0.145	0.024
A10b-16	0.454	0.113	0.284	0.144	0.170	0.035
A10b-17	0.488	0.128	0.320	0.164	0.181	0.040

ASR ID	Max. 1-hour Concentration (μg/m³)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
A10b-18	0.573	0.165	0.409	0.211	0.207	0.051
A10b-19	0.560	0.159	0.395	0.204	0.203	0.050
A10b-20	0.749	0.242	0.593	0.310	0.263	0.076
A10b-21	0.882	0.300	0.732	0.384	0.305	0.094
Criteria	-	-	-	-	100	-

Table 4.5: Maximum 8-hour heavy metals concentrations at ASRs

ASR ID	Max. 8-hour Concentration (μg/m³)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
A10b-1	0.264	0.030	0.086	0.038	0.110	0.009
A10b-2	0.258	0.027	0.080	0.035	0.109	0.009
A10b-3	0.251	0.024	0.072	0.031	0.106	0.007
A10b-4	0.238	0.019	0.059	0.024	0.102	0.006
A10b-5	0.232	0.016	0.053	0.020	0.100	0.005
A10b-6	0.233	0.016	0.054	0.021	0.101	0.005
A10b-7	0.231	0.015	0.052	0.020	0.100	0.005
A10b-8	0.226	0.013	0.046	0.017	0.098	0.004
A10b-9	0.218	0.010	0.038	0.012	0.096	0.003
A10b-10	0.225	0.012	0.045	0.016	0.098	0.004
A10b-11	0.226	0.013	0.046	0.017	0.098	0.004
A10b-12	0.226	0.013	0.046	0.017	0.098	0.004
A10b-13	0.226	0.013	0.046	0.017	0.098	0.004
A10b-14	0.221	0.011	0.041	0.014	0.097	0.003
A10b-15	0.218	0.010	0.038	0.012	0.096	0.003
A10b-16	0.228	0.014	0.049	0.018	0.099	0.004
A10b-17	0.233	0.016	0.053	0.020	0.100	0.005
A10b-18	0.243	0.021	0.064	0.026	0.104	0.006
A10b-19	0.241	0.020	0.062	0.025	0.103	0.006
A10b-20	0.265	0.030	0.087	0.039	0.111	0.009
A10b-21	0.282	0.037	0.105	0.048	0.116	0.012

ASR ID	Max. 8-hour Concentration (µg/m³)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
Criteria	[illegible]	–	500	–	–	[illegible]

Table 4.6: Annual-average heavy metals concentrations at ASRs

ASR ID	Annual Concentration (µg/m³)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
A10b-1	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-2	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-3	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-4	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-5	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-6	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-7	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-8	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-9	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-10	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-11	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-12	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-13	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-14	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-15	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-16	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-17	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-18	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-19	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-20	0.196	<0.001	0.015	<0.001	0.089	<0.001
A10b-21	0.196	<0.001	0.015	<0.001	0.089	<0.001
Criteria	100	5	5	–	2.4	100

4.6 Recommended Mitigation Measures

4.6.1.1 The key air pollutants (i.e. NO_2, RSP, FSP, SO_2 and heavy metals) at all planned ASRs would comply with AQOs and relevant assessment criteria, no adverse air quality impact is therefore anticipated and no mitigation measures are required. For the potential sewage treatment works and pumping stations, suitable odour control measures would be required.

4.7 Conclusion

4.7.1.1 All the relevant air emission sources, including vehicular emission and marine vessels emission in the vicinity of Discovery Bay, and firework emission at the Disneyland Theme Park, that would have air quality impacts on the proposed developments have been identified and assessed.

4.7.1.2 Considering the comparatively low local traffic volume, significant air quality impact from vehicular emission on the proposed development is not anticipated.

4.7.1.3 Quantitative air quality assessment, taking into account the marine vessels emission in the vicinity of Discovery Bay and fireworks displays at Disneyland Theme Park, has been conducted. It is concluded that the predicted cumulative air quality impacts on all air sensitive uses would comply with the AQOs and relevant assessment criteria. Hence, adverse air quality impact on the proposed development is not anticipated.

4.7.1.4 Odour from potential sewage treatment works and sewage pumping station can be controlled by implementing suitable odour control measures.

5 Noise Assessment

5.1 Description of the Environment

5.1.1.1 The entire Discovery Bay has a relatively tranquil environment without any major noise sources that would impose adverse noise impacts on the neighbouring community. All the existing roads within Discovery Bay are local roads on which only licenced vehicles such as golf cars, shuttle buses and services vehicles are allowed to use. As observed on site, all the shuttle buses are Euro IV buses.

5.1.1.2 Other than road traffic, the commuting ferries between Discovery Bay and Central are another noise source within the Discovery Bay area. However, the majority of the residential developments in Discovery Bay have ample separation from the main navigation route. Besides, there are some services areas along the seafront north of Nim Shue Wan at which bus depot, petrol filling stations, sewage pumping station etc. are located. The kaitos commuting to Peng Chau and Mui Wo also land at this seafront.

5.2 Noise Sensitive Receivers

5.2.1.1 Several site visits were carried out in April 2014 to identify potential sources of environmental impact and sensitive receivers in the vicinity of the site. Photographs taken on site and the neighbouring areas are shown in **Section 3** to illustrate the existing context. Some general descriptions in terms of the noise environment have been described in **Section 5.1**. The following sections presents the NSRs identified for the potential development area for subsequent noise assessment.

5.2.1.2 Area 10b (see **Figure 5-1**) will accommodate residential premises within the existing services areas along Marina Avenue. The existing facilities including bus depot, petrol filling stations (for both vessels and vehicles) and landing point for kaito would be relocated to suit the development layout. Subject to further discussion with the relevant authorities, a sewage treatment works may be required. Relevant legislation that are applicable to noise impact is given in **Appendix 5.1.**

5.2.1.3 Since the future residential premises facing Nim Shue Wan would also be overlooking on the vessel movements, including the kaito movements, sand barge operations, therefore, a number of considerations have been incorporated in the layout design of Area 10b (see **Figure 2-1**) to reduce the fixed noise impact due to these activities. Those design include an 8m tall solid wall next to kaito pier, an 8.8m tall solid wall next to goods delivery pier and 7.8m tall solid wall at 3-

storey low rise development which was near to goods delivery pier. A number of representative NSRs have been selected for the purpose of this assessment. These representative NSRs include the following:

Table 5.1: Selected representative planned NSRs

NSR ID	Description	Uses
N10b-B1	3 storey development	Residential
N10b-B2	3 storey development	Residential
N10b-B4	3 storey development	Residential
N10b-B5	4 storey development	Residential
N10b-B8	4 storey development	Residential
N10b-D1	6-storey development	Residential
N10b-D5	18-storey development	Residential
N10b-D6	6-storey development	Residential
N10b-D8	6-storey development	Residential
N10b-A1	3 storey development	Residential
N10b-A2	3 storey development	Residential
N10b-A4	3 storey development	Residential
N10b-A5	3 storey development	Residential
N10b-A6	4 storey development	Residential
N10b-A8	4 storey development	Residential
N10b-A10	4 storey development	Residential
N10b-A15	4 storey development	Residential
N10b-C18	4 storey development	Residential

Table 5.2: Selected representative existing NSRs

NSR ID	Description	Uses	Approximate Distance from Site Boundary
EN10b-1	Twilight Court	Residential	20m

5.3 Road Traffic Noise Assessment

5.3.1.1 As discussed in **Section 5.1**, unlike the situations in other urban areas, all the shuttle buses operating within Discovery Bay are Euro IV type vehicles. Only licensed vehicles are allowed using the Discovery Bay Tunnel to access various parts of Discovery Bay. Besides, vans are prohibited after 6pm even if they have been issued with the license to use the Discovery Bay Tunnel.

5.3.1.2 With all the proposed developments in place, the traffic flow would only the approximately 120 veh / hr and 90 veh / hr for Discovery Bay Road and Marina Avenue respectively, which are categorized as local roads. Hence, given that relatively low traffic flows, adverse road traffic noise impacts are not anticipated and mitigation measures are not required.

5.4 Marine Traffic Noise Assessment

5.4.1 Assessment Results

5.4.1.1 Potential marine traffic noise impacts on Area 10b are anticipated from existing public ferry, kaito, tugboat with barge, the marina at Discovery Bay, sand barge and LPG container vessel. The marine traffic noise assessment methodology and source term measurement are given in **Appendix 5.2** and the predicted cumulative marine noise levels at the representative NSRs are presented in **Appendix 5.3** and summarized in the tables below.

Table 5.3: Predicted marine traffic noise impacts for Area 10b (Daytime & Evening time)

NSR ID	Period	PNL, $L_{eq\ 1hr}$	Max Predicted Noise Levels [1], dB(A)
N10b-B1	Daytime & Evening time	61	51
N10b-A1			50
N10b-A10			48
N10b-A15			47

Note:
[1] Bold value denotes non-compliance with criteria.

Table 5.4: Predicted marine traffic noise impacts for Area 10b (Nighttime)

NSR ID	Period	PNL, $L_{eq\ 1hr}$	Max Predicted Noise Levels [1], dB(A)
N10b-B1	Nighttime	56	44

NSR ID	Period	PNL, $L_{eq\ 1hr}$	Max Predicted Noise Levels [1], dB(A)
N10b-A1			42
N10b-A10			47
N10b-A15			46

Note:
[1] Bold value denotes non-compliance with criteria.

5.4.1.2 It can be seen from the above table that the predicted marine traffic noise levels at all the representative NSRs in this area will be below the PNL and hence further noise mitigation measures are not required.

5.5 Fixed Noise Assessment

Land-based Fixed Noise Sources

5.5.1.1 Existing noise sources include a golf cart repair workshop, bus depot and overnight bus parking area, a public refuse collection point, all of which are located along Marina Avenue.

5.5.1.2 According to the latest information, these existing noise sources such as the golf car repair workshop, bus depot, refuse collection point, will be located at a podium structure which is fully enclosed. The design of the podium will ensure that any direct line of sight between the noise sources and the surrounding residential developments will be avoided. In addition, these noise sources should be a major consideration in their determining their locations and site layouts. With reference to HKPSG, where opportunity arises and having due regard to the operational requirements, the siting of such facilities should take into account the potential locations of ingress/egress and the consequent noise disturbances due to traffic routings, particularly during sensitive hours. Consideration should also be given to adopting administrative controls so that the degree of noise disturbances can be further reduced.

5.5.1.3 In addition, the podium is a fully enclosed structure apart from entrance / exit of these noise sources and ventilation opening. It should also be noted that there would not be any maintenance activity within the depot during night-time period unless during emergency. Since the exact location of ventilation opening is yet available, a backward calculation of fixed noise source is conducted for the maximum allowable Sound Power Level (SWL). As the minimum distance from the proposed building to podium edge is 5m and an ASR A has been adopted (i.e. Daytime noise criterion of 55 dB(A)) for the development, the maximum SWL will be 74 dB(A) according to standard acoustic principle of point source correction with 3dB(A) facade correction. Therefore, although mechanical ventilation is required, with the use of silencer / acoustic louvre, adverse noise impacts caused by these fixed noise sources are not anticipated.

5.5.1.4 A sewage treatment work (STW) may be required at Area 10b. The existing sewage pumping station (SPS) may also be upgraded as necessary. Since the design detail is yet available, a backward calculation of fixed noise source is conducted for maximum SWL. As the minimum distance from the proposed STW and the upgraded SPS to the nearest existing NSR Twilight Court (EN10b-1) and planned NSR (N10b-C18) are 32m and 22m separately. The maximum allowable SWL of ASR A for night time criterion of 45dB(A) will be 80 dB(A) and 77 dB(A) respectively. Therefore, although mechanical ventilation is required, with the use of silencer / acoustic louvre, adverse noise impacts caused by these fixed noise sources are not anticipated.

5.5.1.5 In case the previous water treatment facilities needs to be re-commissioned, they would generate some noise during its operation. However, it is located at more than 1000m away and screened by the hilly terrains between Area 10b and the water treatment work. Hence, adverse fixed noise impact is not anticipated.

Marine-based Fixed Noise Sources

5.5.1.6 As discussed in **Section 5.5.1**, the noise generated by the idling marine vessels would be assessed as fixed noise sources. According to the latest design, the following marine-based fixed noise sources shall be considered:

- Vessels idling (e.g. kaito, tugboat, sand barge, vessel for the gas bottle supplier, bounty);
- Lift on and off landing board of barge;
- Lorries engine on barge;
- Loading and unloading of gas bottle; and
- Loading and unloading of sand barge (operation of conveyor belt on sand barge and trucks).

5.5.1.7 As discussed in **Section 5.5.1**, most of the industrial noise sources along Marina Avenue would be located to a podium structure with suitably sited opening to avoid direct line of sight between the noise sources and the surrounding residential developments. Therefore, the potential fixed noise impacts would be only due to marine activities from ferry idling at public ferry and kaito pier, idling, sand loading due to operation of conveyor at sand barge and LPG glass bottle and unloading. According to the information from operator, there would be acoustic treatment, such as acoustic mat for the conveyor belt of sand barge and temporary noise barrier for crane of LPG glass bottle loading and unloading in future operation. Typically, a noise reduction of 10dB(A) for acoustic mat and temporary noise barrier for stationary source was adopted as in other in approved EIA Reports such as that for North East New Territories New Development Areas (AEIAR-175/2013). A noise reduction of 10 dB(A) for conveyor bell during sand loading and LPG glass bottle loading by crane has therefore been adopted in this assessment. The predicted noise levels at the representative NSRs are presented in the table below. Moreover, according to the information from the operators and/or the operation pattern observed, there would be no night-time operation of sand barge, LPG container vessels, tug boat and Mui Wo kaito. As such, these activities were not included in the night-time fixed noise assessment. The fixed noise assessment methodology and source term measurement are given in **Appendix 5.4** and the detailed calculation of predicted fixed noise levels is shown in **Appendix 5.5.**

5.5.1.8 It can be seen from the table that the predicted fixed noise levels at all the representative NSRs in this area will comply with the noise criteria and hence further noise mitigation measures are not required.

Table 5.5: Fixed noise assessment results – unmitigated case (daytime and evening time)

NSR ID	Period	Criteria (ANL-5), dB(A)	Daytime max predicted noise level, dB(A)	Exceedance over ANL-5 dB(A)
N10b-B1	Daytime & Evening	55	54	-
N10b-B2			53	-
N10b-B4			54	-
N10b-B5			55	-
N10b-B8			53	-
N10b-D1			55	-
N10b-D5			50	-
N10b-D6			52	-
N10b-D8			53	-

NSRs ID	Period	Criteria (ANL-5), dB(A)	Daytime max predicted noise level, dB(A)	Exceedance over ANL-5 dB(A)
N10b-A1			52	-
N10b-A2			51	-
N10b-A4			47	-
N10b-A5			55	-
N10b-A6			55	-
N10b-A8			53	-

Table 5.6: Fixed noise assessment results – unmitigated case (nighttime)

NSRs ID	Period	Criteria (ANL-5), dB(A)	Daytime max predicted noise level, dB(A)	Exceedance over ANL-5 dB(A)
N10b-B1	Nighttime	45	43	-
N10b-B2			39	-
N10b-B4			35	-
N10b-B5			43	-
N10b-B8			40	-
N10b-D1			40	-
N10b-D5			36	-
N10b-D6			39	-
N10b-D8			40	-
N10b-A1			33	-
N10b-A2			32	-
N10b-A4			30	-
N10b-A5			34	-
N10b-A6			38	-
N10b-A8			37	-

5.6 Firework Display Noise Assessment

5.6.1 On-site firework display noise measurements were conducted at two locations (#F1 and #F2) to determine background noise level and 15-minute equivalent noise level ($L_{eq\,(15\,min)}$) during firework display period. The firework display noise measurement locations are summarized in **Table 5.6** and illustrated in **Appendix 5.6.**

Table 5.7 Possible noise source from Disneyland

Measurement locations	Description
#F1	At the existing Lookout Point

Measurement locations	Description
#F2	At the existing breakwater

5.6.2 For each noise measurement, ambient measurements were taken immediately before and after the firework display to establish the Background Noise Level (BNL). Measured Noise level (MNL) was also taken for the 15-minute timeframe during firework display. Based on these measurements, the Corrected Noise Level (CNL) was calculated and compared against the noise criterion as discussed in **Appendix 5.1.**

5.6.2.1 The predicted firework display noise levels at the two measurement locations are summarized in **Table 5.7.** Detailed calculation of firework display noise results is shown in **Appendix 5.7.**

Table 5.8: Summary of firework display noise assessment results

Noise Level	Noise Impacts, $L_{eq\,(15\,min)}$, dB(A)	
	F1	F2
Corrected Noise Level	52	53
Noise Criterion	55	
Exceedance	-	-

Note:
[1] Facade correction has been considered in noise calculation.

5.6.2.2 Two firework display noise measurement at F1 and F2 are approximately located at 3.9 km and 2.7 km from Disneyland and are within the noise criterion of $L_{eq\,(15\,min)}$ 55 dB(A). The proposed layout of Area 10b will be located further away from Disneyland than the distance between F2 from Disneyland. Hence, the existing firework display at Disneyland is not anticipated to generate adverse noise impacts.

5.7 Recommended Mitigation Measures

5.7.1.1 The noise assessments results have shown that noise impact due to road traffic, marine traffic, fixed noise, and fireworks are not anticipated.

5.7.1.2 As stated in **Section 5.5**, a podium structure will be provided for Area 10b to avoid direct line of sight between the noise sources and the surrounding residential developments. The relocation of existing noise sources will be fully enclosed within the podium structure except the ingress / egress of such facilities and consideration of such facilities should made reference to HKPSG.

5.7.1.3 In addition, as discussed in **Section** 5.2, a number of considerations have been incorporated in the layout design of Area 10b (see **Figure 5-2**) to reduce the fixed noise impact due to these activities. Those design include an 8m tall solid wall next to kaito pier, an 8.8m tall solid wall next to goods delivery pier and 7.8m tall solid wall at 3-storey low rise development which was near to goods delivery pier.

5.8 Conclusion

5.8.1.1 A noise impact assessment has been conducted to evaluate the operational impacts based on the current layout.

5.8.1.2 Road traffic noise impact has been reviewed. Results indicate that the road traffic noise impact would not be anticipated.

5.8.1.3 A preliminary assessment has been for marine noise impact based on measurement data. Results indicate that the noise impacts on NSRs would below the measured background noise level and hence further mitigation measure is not required.

5.8.1.4 A preliminary assessment has been conducted for fixed noise impact based on site measurement and operational information from operators. With implementing the consideration in layout design (such as solid walls) and acoustic mat for conveyor belt, temporary noise barrier for crane, use of silencer / acoustic louvre), adverse fixed noise impacts would not be anticipated.

5.8.1.5 A preliminary assessment has been conducted for firework display noise impact on site measurement and observation. Results indicate that the firework display noise would not cause adverse impact.

6 Water Quality Assessment

6.1 Description of the Environment

6.1.1 Existing Water Environment

6.1.1.1 The project sites fall within the Southern Water Control Zone (WCZ) and are located at Discovery Valley at east Lantau, downstream of Lo Fu Tau and Discovery Bay Reservoir. Tai Pak Wan, a non-gazetted beach, is within the boundary of Discovery Bay. Besides, a Coastal Protection Area is located at the northern edge of Tai Pak Tsui Peninsula to conserve the natural coastline.

6.1.1.2 Area 10b is located at the seawall in the southwest side of Tai Pak Tsui Peninsula. Nim Shue Wan adjoins the southern boundary of Area 10b and the water current in Nim Shue Wan is generally calm. Surface runoff from existing land area is discharged into Nim Sue Wan.

6.1.2 Existing Sewerage System

6.1.2.1 Discovery Bay has been implemented with a sewerage system to collect all the sewage and wastewater generated from daily activities. All the existing sewage and wastewater collected from the sewerage system is diverted to Siu Ho Wan Sewerage Treatment Works via pumping stations and the outfall is located at north Lantau which is far away from Discovery Bay.

6.1.3 Water Quality Sensitive Receivers

6.1.3.1 A review has been conducted to identify the Water Quality Sensitive Receivers (WSRs) in the vicinity that may be impacted by the potential development area. The following table summarizes these WSRs and they are illustrated in **Figure 6-1**. The relevant legislation and standards related to water quality are summarised in **Appendix 6.1.**

Table 6.1 Water quality sensitive receivers

Water Sensitive Receivers [1]	Description
WSR01 – Discovery Bay Reservoir	Primary reservoir for flushing, located upstream of the potential development areas
WSR 02 – Discovery Bay Reservoir Spillway and	Spillway from Discovery Bay Reservoir and the tributaries, chainage runs along Discovery Valley Road and downstream to

Water Sensitive Receivers [1]	Description
Tributaries	Tsoi Yuen Wan
WSR03 – Nim Shue Wan Stream	Natural stream downstream from the existing golf course to Nim Shue Wan
WSR04 – Tai Pak Wan	Non-gazetted beach downstream to Discovery Bay Reservoir Spillway
WSR05 – Hai Tei Wan Marina	Marina at Hai Tei Wan next to Discovery Bay Road
WSR 06 – Nim Shue Wan	Nim Shue Wan
WSR07 – Tai Pak Tsui Peninsula Coastal Protection Area (CPA)	Protected natural shoreline at north of Tai Pak Tsui Peninsula

Note:

[1] The nearest water gathering ground is located at 5.6 km away

6.2 Identification and Evaluation of Environmental Impacts during Construction Phase

6.2.1 Pollution Sources

Site Runoff

6.2.1.1 During rainstorm events, construction site runoff would come from all over the works site. These surface runoff might be polluted by:

- Runoff and erosion from site surfaces, earth working areas and stockpiles;
- Wash water from dust suppression sprays and wheel washing facilities; and
- Chemicals spillage such as fuel, oil, solvents and lubricants from maintenance of construction machinery and equipment.

6.2.1.2 Construction runoff may cause physical, biological and chemical effects. The physical effects include potential blockage of drainage channels and increase of suspended solid levels in the Southern WCZ. Runoff containing significant amounts of concrete and cement-derived material may cause primary chemical effects such as increasing turbidity and discoloration, elevation in pH, and accretion of solids. A number of secondary effects may also result in toxic effects to water biota due to elevated pH values, and reduced decay rates of faecal micro-organisms and photosynthetic rate due to the decreased light penetration. All the best practices will be implemented to reduce and minimise the generation of construction run-off.

Sewage from Workforce

6.2.1.3 Sewage effluents will arise from the sanitary facilities provided for the on-site construction workforce. According to Table T-2 of Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning, the unit flow is 0.15 m^3/day/employed population. The characteristics of sewage would include high levels of BOD_5, Ammonia and *E. coli* counts. Since sufficient portable chemical toilets and sewage holding tanks will be provided, no adverse water quality impact is anticipated.

Construction of Decking-Over Piles Along Waterfronts

6.2.1.4 The low-rise residential buildings in Area 10b will be constructed on the southwest seashore of Tai Pak Tsui Peninsula adjoining Nim Shue Wan (WSR04) and the entrance of Hai Tai Wan Marina (WSR03). As discussed in **Section 2**, the existing seafront would be expanding by a width of 9-34m. According to the latest design, in order to minimize hydrodynamic and water quality impact, the new platform along the coastline would be constructed by decking-over piles and only minor modification works would be required for the existing seawall, including relocation of existing piers, will need to be conducted below water level, and the details will be established in the detailed design stage. To avoid/minimise water quality impacts due to the piling works, steel casings will firstly be installed at the proposed pile locations. The steel casings extend above the sea and will prevent soil or rock arisings from being disposed of into the sea. The arisings will be removed from within the piles to a barge anchored close to the piles. Once the materials inside the casings were removed, steel reinforcements/structural sections will be lowered inside the casing and then followed by concreting work. To control the sediment plume that may be dispersed to nearby WSRs during seabed disturbance, environmental friendly construction methods such as installing silt curtains should be considered. However, further studies would need to be conducted to determine the size and spacing of the piles etc.

Dredging

6.2.1.5 It may be necessary to conduct some dredging to facilitate marine access for the future berths (eg for the Bounty). The tentative extent of dredging for navigation of vessels is shown in **Figure 6-1**. Preliminary estimation suggests that the total amount of dredging would be less than 100,000m^3. The dredging process would require appropriate mitigation measures to control the dispersion of the sediment plume, such as installing silt curtains. The proposed navigation channel required dredging works is shown in **Figure 6-1**.

Wastewater from Decontamination Works

6.2.1.6 As the existing site comprises bus repair workshop, boat servicing yard, etc. should land decontamination works be carried out during construction phase of this area, the method for handling and disposal of wastewater contaminated with chemical waste should be addressed. As a general site practice of soil decontamination works (i.e. Stabilization/ Solidification or Biopile), impermeable sheeting should be used to cover stockpiles of the treated soil to prevent dust and runoff. Concrete bunds surrounding the treatment area should also be implemented to collect the possible spillage or leachate generated and recycled back to the treatment. In case there is any sign of excess leachate present within the site, the excess leachate should be diverted to a designated storage area for temporary storage and collected by a licensed chemical waste collector.

6.3 Recommended Mitigation Measures during Construction Phase

6.3.1 General Construction Activities the Potential Development Area

Site Runoff and Sewage from Workforce

6.3.1.1 Given the relatively small amount of site formation work for Area 10b, the water quality impacts during construction phase is not anticipated. Nevertheless, standard good site practices such as perimeter cut off drains, silt removal facilities, temporary toilet etc. would still be required. For site runoff, perimeter cut off with internal drainage works and erosion and sedimentation control facilities around the site area shall be implemented. Channels, earth bunds and sand bag barriers would also be provided on site to direct storm water to silt removal facilities. In addition, the design of temporary on-site drainage should prevent runoff going through site surface, construction machinery and equipment to avoid polluted runoff. Sedimentation tanks with sufficient capacity should also be provided as mitigation measure for settling surface runoff prior to disposal. Also, discharge into the marina will be avoided. With the implementation of the above mitigation measures, it is anticipated that the impacts from discharge of site runoff / wastewater is not insurmountable. A comprehensive list of those standard measures is given in **Appendix 6.2**.

6.3.1.2 During the construction works for the platform along the waterfront of Area 10b, open sea dredging would be avoided and a deck will be constructed over piles. As compared to the conventional reclamation process that would demand dredging, the current methodology would have avoided the release of significant amount of sediment which may have certain impacts on the neighbouring WSRs. The following good practice shall apply for the construction of piles and dredging works for the navigation channel.

- Install efficient cage-typed silt curtains, i.e. at least 80% SS reduction, at the point of dredging/filling to control the dispersion of SS;
- Water quality monitoring should be implemented to ensure effective control of water pollution and recommend additional mitigation measures required;
- The descent speed of grabs should be controlled to minimize the seabed impact and to reduce the volume of over-dredging; and
- All vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tide conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash.

6.4 Identification and Evaluation of Environmental Impacts during Operational Phase

6.4.1.1 EPD advised in May 2015 that the design capacity of the SHWSTW has been allocated for the treatment of the sewage arising from the development of the Expansion of Hong Kong International Airport into a Three Runway System, the new town development under Tung Chung New Town Expansion and the Penny's Bay Phase 2 development, etc. Therefore, SHWSTW has no spare capacity to cater for the sewage arising from any proposed Discovery Bay further development and the Sewerage Authority has no plan to increase the design capacity of the SHWSTW in the short and medium terms.

6.4.1.2 Therefore, the current proposal is to receive the additional sewage from Area 10b, a new sewage treatment plant within Discovery Bay would need to be commissioned. A discharge license will be obtained under the WPCO prior to discharge. The design flow rate of the proposed new sewage treatment plant would be around 1,100 m^3 per day (i.e.

based on an approximate population of 2,900 for Area 10b and each has a flow rate of 370L/day (ADWF) and hence around 1,080m^3/day in total as per EPD's Technical Paper Report No. EPD/TP1/05-Guidelines for Estimating Sewage Infrastructure Planning (GESF)). A tentative marine outfall is proposed as shown in **Figure 6-1** near Area 10b. The peaking hourly flow rate would be approximately 75L/s according to table T5 of GESF by adopting a peak factor of 6.

6.4.1.3 Secondary or tertiary treatment would be implemented in the proposed sewage treatment works if the new marine outfall is located at a location near to the shore. The outfall location will be determined during the detailed design stage without affecting the land use compatibility. Nevertheless, the current tentative location is located at the area where the water depth is deeper and the current is stronger. It is also at around 300m from the marina and at least 6km from the fish culture zone in Cheung Sha Wan and Ma Wan. Besides, the current tentative location is 1.3km away from Tai Pak Wan where, although not a gazetted beach, many people uses that for recreational uses. This additional effluent would have impacts on both water quality and marine ecology. However, with the implementation of suitable treatment method, it is anticipated that the discharge from the sewage treatment works would meet the criteria of WPCO.

6.4.1.4 A preliminary water quality impact assessment has been conducted for the tentative marine outfall (see **Appendix 6.3**). The assessment indicates that the water quality in the vicinity of the marine-based WSRs would be in compliance with Water Quality Objectives (WQOs) in suspended solid, *E. coli* and unionised ammonia. Although exceedance of Total Inorganic Nitrogen (TIN) under WQO is observed, the contribution of the high TIN level is due to the background from Pearl River estuary. The computed N:P ratio concluded that the possibility of having red tide is still low. Any emergency discharge can be readily mitigated by implementing suitable standby measures and back-up retention facilities to be developed during detailed design stage.

6.4.1.5 The platform along the waterfront will be supported by decking over piles with a narrow strip of approximately 9-34m only. The pile arrays will be generally along flow directions and will not block any major flow streamlines within Nim Shue Wan (WSR04). Thus, hydrodynamic impact and the associate change to water quality regime is unlikely to be significant. However, a quantitative water quality model shall be conducted to determine the cumulative impact to quantify any changes in hydrodynamic and water quality regime. The water quality model shall also be used to study the possible impacts due to the increased surface runoff into Nim Shue Wan, and options of the design of the decks and piles (ie. in terms of size and spacing of the piles) and the design of any sewage treatment works and outfall as required.

6.4.2 Mitigation Measures

6.4.2.1 The following contingency measures are proposed in case of any emergency discharge:

Sewage Pumping Stations:

- 100% standby pump capacity
- Stockpile a spare pump of 50% pumping capacity
- Dual feed power supply
- Emergency storage within pumping station equivalent to 6 hours of average dry weather flow
- Emergency communication mechanism amongst Government departments.

Rising Mains:

- Concrete surrounding to the twin rising mains

6.4.2.2 The following initial measures can be considered as mitigation to control the emergency overflows from the Sewage Treatment Work thereby polluting the stream and the receiving water bodies at Discovery Bay:

- Provide an emergency overflow pipe from the proposed STW at Area 10b to existing sewage pumping station no. 1 (SPS1) located at the junction of Discovery Bay Road and Discovery Bay Valley Road. During emergency situation, sewage from the STW can overflow to the existing Discovery Bay sewerage network that pumps sewage flows to Siu Ho Wan Sewage Treatment Work
- Dual feed power supply for the Sewage Treatment Work
- Suitable backup of treatment process in the Sewage Treatment Work.

6.5 Conclusion

6.5.1.1 The potential issues that may arise during both the construction and operational phases have been identified. While a number of issues has been considered by implementing good design (eg. decking over instead of conventional reclamation), a quantitative water quality model shall be concluded at detail assessment to refine the design and construction methodology so as to minimise any impacts as much as practicable. During operational phase, sewage generated will be treated in a new sewage treatment work. According to the results from the water quality assessment, most of the pollution concentration would comply with relevant criteria. For TIN, the background concentration has exceeded the WQO already. The discharge concentration has therefore been reduced as much as practicable to ensure that the increase in TIN and TP are minimised. With the discharge standard, the N to P ratio is maintained greater than 18:1. Hence the occurrence of red tides will be unlikely. The assessment results should also be adopted to evaluate the need for mitigation measures required. Any emergency discharge can be mitigated by implementing suitable standby measures and contingency measures to be developed during detailed design stage. Initial mitigation measures would also be provided to control the emergency overflows.

7 Other Aspects

7.1 Review of Waste Management Issues

7.1.1.1 As mentioned in **Section 2**, the potential development at Area 10b of Discovery Bay include residential premises together with the necessary infrastructure and landscaping elements. A podium structure would be built to cover the existing maintenance activities. In order to cater for the additional residential development, an additional narrow strip of reclamation would be proposed in form as a decking with a width of 9-34m.

7.1.1.2 Although the construction methodologies are yet to be developed in subsequent detail design stage, the construction and reclamation work would adopt an environmentally friendly approach. With the implementation of good site practices and waste reduction measures, the quantity of construction of demolition waste is estimated to be around 29,000 m^3.

7.2 Review on Land Contamination Issues

7.2.1.1 A desktop review has been conducted by studying the previous aerial photos for the concerned areas for the potential development area. These photos have provided useful information to ascertain any historical land uses that may have potential for land contamination. The relevant legislation and standards relating to land contamination is given in **Appendix 7.1** and the related historic aerial photos is given in **Appendix** 7.2. The following table summarises these findings.

Table 7.1 Summary of historical aerial photographs for Area 10b

Year	**Description**
1973	• Mainly nature terrain and coastline with a number of villages scattering around. • No signs for industrial developments
1982	• Reclamation works in Area 10b were in progress. • The seawall in the marina was formed
1993	• Most of the site formation work and reclamation works had been completed. • The scale of the marina was less than that currently being operated.
2012	• Not much difference to that in 1993 except the scale of the marina was larger than that in the 90's.

7.2.2 Description of Environment

7.2.2.1 Site surveys were conducted between May and June of 2014 to ground truth the findings from desktop review to identify any land uses within the potential development area that may have the potential for contamination in soil and groundwater. Photos taken during the site inspection showing the land uses within each of the area are given in **Section 3**. The following paragraphs summarises the findings from the surveys.

7.2.2.2 The area within Area 10b is currently occupied by a number of services facilities including the depot for vehicles, petrol / LPG filling station, staff quarters, Kaito etc. The areas within those depot, petrol / LPG filling stations are paved with concrete. Some of these area may have storage for dangerous goods as well. According to the EPD's Guidance Note for Contamination Land Assessment and Remediation, these land uses have the potential for land contamination.

7.2.3 Identification of Potentially Contaminated Areas

7.2.3.1 As discussed in the above sections, locations where land contamination would be more likely would be the depot for buses and golf cars and petrol / LPG filling stations.

7.2.3.2 According to the EPD's *Guidance Note for Contaminated Land Assessment and Remediation* (GN), project proponents and professionals responsible for major works or re-development on sites associated within industrial operations listed in the GN (including depot and LPG filling stations) should, before commencement of any works, carry out a site assessment to determine whether the site is contaminated and assess the extent of any contamination and, if necessary, implement proper remedial measures to restore the land to an acceptable condition for its intended purpose.

7.2.3.3 For the purpose of this study, it is recommended a Contamination Assessment Plan (CAP) to be prepared after the rezoning approval and prior to implementation. The CAP shall cover the whole potential development area and would recommend the need for Site Investigation (SI) to collect soil and ground water samples for analysis, and any subsequent actions, as per the statutory requirements.

7.2.3.4 Following the completion of environmental SI and lab testing works, the project proponent would prepare the Contamination Assessment Report (CAR) which would present the findings of the SI and evaluate the level and extent of potential contamination. The potential environmental and human health impact based on the extent of potential contamination identified would also be evaluated.

7.2.3.5 If land contamination is identified during the proposed environmental SI and remediation is required, a Remediation Action Plan (RAP) will be prepared. The objectives of RAP are:

- To undertake further site investigation where required;
- To evaluate and recommend appropriate remedial measures for the contaminated materials identified in the assessment;
- To recommend good handling practices for the contaminated materials during the remediation works;
- To recommend approximate handling and disposal measures; and
- To formulate optimal and cost-effective mitigation and remedial measures for EPD's agreement.

7.2.3.6 A Remediation Report (RR), if required, would also be prepared to demonstrate that the clean-up works are adequate. No construction / development works would be carried out within the potentially contaminated areas prior to the agreement of the RR with EPD.

7.2.4 Conclusion

7.2.4.1 An initial land contamination appraisal has been conducted to identify any locations within the potential development area that may have the potential for contamination in soil and groundwater. The appraisal mainly includes a review of the desktop information and supplemented with site surveys.

7.2.4.2 Based on the findings at this stage, the depot area and petrol / LPG filling stations within Area 10b have been identified as potential locations for contamination. For the purpose of this report, it is recommended that a CAP to be prepared after the rezoning approval and prior to implementation. Where necessary, environmental site investigation shall be conducted to collect soil and groundwater samples to confirm the presence of any contamination, and any subsequent actions.

7.3 Review on Ecological Issues

7.3.1.1 As discussed in **Section 1**, the potential development area have been included in the approved Discovery Bay Master Plan 6.0E7h(a), and has been permitted to development, some being implemented, despite the fact that some of the planning parameters would need to be amended. For those area included in the approved Master Plan, site clearance and formation work could be commenced to implement the development parameters in the approved Master Plan.

7.3.1.2 Reclamation and dredging works are proposed for the development at Area 10b. However, the extent of reclamation and dredging will be within the boundary of the boundary approved under the Foreshore and Seabed Ordinance in 1977. Hence, by virtue of Clause 9(2)(c) of the EIAO, the reclamation and dredging works are exempted from the EIAO.

7.3.1.3 As discussed in **Section 1.3.5.1**, depending on the future discussion with DSD, there may be a need for a new sewage treatment plant for Area 10b. The effluent discharge would have certain impact on marine ecology. Similarly, the dredging works for the marine navigation channel would also inevitably generate sediment plume which would have certain impacts in marine ecology.

7.3.1.4 Together with suspected presence of species of conservation concern in Nim Shue Wan, such as Seagrass and Coral, marine ecological impacts are anticipated. Under such circumstances, series of mitigation measures have been recommended in **Section 6.3**, including the installation of silt-curtain and controlling of descent speed of grab for the marine construction works and the pile of the deckover would be designed to avoid blocking any flow streamline during the operational phase.

7.3.1.5 The nearest fish culture zones (FCZs) are Cheung Sha Wan and Ma Wan which are located at more than 6.5 km and 6 km away respectively. Given these large separation distance, together with the use of deckover approach for the reclamation and mitigation measures such as silt curtains, both direct and indirect impacts are considered insignificant.

7.3.1.6 Similarly, for the capital dredging of the new navigation channels, good measures including the use of silt curtains would be adopted. Hence, adverse direct and indirect impacts are not considered significant

7.3.1.7 In terms of terrestrial ecology, the impacts, if any, associated with tree felling is anticipated to be minor due to the developed nature of Area 10b. Where practical, opportunities for transplantation have been explored, where the trees which have been identified as having a good transplantation survival rate. In addition, a number of trees have been proposed to be retained.

7.3.1.8 In total, 169 trees have been identified within Area 10b that would be felled. None of the trees identified with Area 10b are considered to be rare or of conservation value. The trees to be felled all form parts of small groups or are single standalone trees. As such, the trees are considered to be of low ecological value.

7.3.1.9 In addition, a minor bottom part of the slope greenery interfacing the proposed development would be affected. However, the trees are not native nor significant species. Moreover, the majority of the sloop greenery would not be affected and would continue to function as a terrestrial ecology. Due considerations would be given to the location, dimensions and the area of the proposed development to avoid impact to the slope greenery. Compensatory planting would also be provided.

7.3.1.10 As discussed in **Section 6.4.1.4**, a new sewage treatment plant will be built to receive and treat the sewage generated from the additional population from Area 10b. The treated sewage would then be discharged to a new marine outfall in **Figure 6-1**. According to the results from the supplementary water quality assessment (**Appendix 6.3**), most of the pollution concentrations would comply with relevant criteria. For TIN, the background concentration has exceeded the WQO already. The discharge concentration has therefore been reduced as much as practicable to ensure that the increase in TIN and TP are minimised. With the discharge standard, the N to P ratio maintained greater than 18:1. Hence the occurrence of red tides will be unlikely.

8 Conclusion

8.1.1 An environmental assessment has been conducted to review the potential development area, Area 10b, for Discovery Bay. Key aspects that have been assessed include air quality, noise and water quality. Potential issues on land contamination and ecology have also been reviewed. Those relating to sewerage and drainage, and water supply are separately presented in another report.

8.1.2 All the relevant noise and air quality emission sources in the vicinity that would have impacts on the proposed developments have been identified and assessed. The strength of these sources have been established by measurement or from best available information and subsequently included in the assessment. Results indicate that the noise and air quality impacts on planned developments would comply with the relevant noise criteria and hence further mitigation measures are not required. The need for any additional mitigation measures for the bus depot shall be subjected to the subsequent statutory EIA.

8.1.2.1 Although most of the development would not involve major marine works, some minor reclamation work and dredging work would still be required for Area 10b. By adopting a non-dredged approach such as decking over piles and other good site practices, any release of sediment would be readily controlled and would have been minimised. The need for any additional mitigation measures shall be subject to the findings from the detailed cumulative impact assessment to be conducted as part of the subsequent statutory EIA.

8.1.2.2 Depending on future discussion with DSD, a sewage treatment work may be required and further details including location of marine outfall will be determined during the subsequent statutory EIA where applicable.

8.1.2.3 Sewage generated during operational phase will be treated in a new sewage treatment plant and discharged into the marine pipeline leading to the marine outfall at sea bottom near Area 10b. According to the results from the supplementary water quality assessment, most of the pollution concentrations would comply with relevant criteria. For TIN, the background concentration has exceeded the WQO already. The discharge concentration has therefore been reduced as much as practicable to ensure that the increase in TIN and TP are minimised. With the discharge standard, the N to P ratio is maintained greater than

18:1. Hence the occurrence of red tides will be unlikely. Any emergency discharge can be mitigated by implementing suitable standby measures and contingency measures to be developed during detailed design stage. Initial mitigation measures would also be provided to control the emergency overflows.

8.1.2.4 Potential for land contamination due to the operation of the existing bus depot and services area has been identified. Further investigation should be conducted after the rezoning and prior to implementation to collect soil and water samples as required, and hence any subsequent remediation actions to fulfil the statutory requirements.

8.1.2.5 Depending on the need and design of the sewage treatment works and dredging works for the outfall, and dredging works for any navigation channel outside the reclamation area, subsequent statutory EIA may be required to further investigate any potential environmental impacts.

Appendix 4.1

Legislation and Standards for Air Quality Impact Assessment

Legislation and Standards for Air Quality Impact Assessment

AQO Pollutants

In accordance with the Air Quality Objectives (AQOs) under Air Pollution Control Ordinance (APCO), the relevant AQOs applicable for this environmental assessment are given in **Table A4.1a** below.

Table A4.1a: Hong Kong Air Quality Objectives

Pollutant	Limits on Concentration, $\mu g/m^3$ [1] (Number of Exceedance per year allowed in brackets)				
	10-min	1-hr	8-hr	24-hr [2]	Annual [2]
Sulphur Dioxide (SO_2)	500 (3)			125 (3)	
Respirable Suspended Particulates (RSP, or PM_{10}) [3]				100 (9)	50 (0)
Fine Suspended Particulates (FSP, or $PM_{2.5}$) [4]				75 (9)	35 (0)
Carbon Monoxide (CO)		30,000 (0)	10,000 (0)		
Nitrogen Dioxide (NO_2)		200 (18)			40 (0)
Photochemical Oxidants (as ozone, O_3)			160 (9)		
Lead (Pb)					0.5 (0)

Note:

[1] Measured at 293K and 101.325 kPa.

[2] Arithmetic mean.

[3] Respirable suspended particulates (RSP) means suspended particulates in air with a nominal aerodynamic diameter of 10 micrometres or smaller.

[4] Fine suspended particulates (FSP) means suspended particulates in air with a nominal aerodynamic diameter of 2.5 micrometres or smaller.

Non-AQOs Pollutants

According to the approved EIA study "*Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures – Environmental Impact Assessment*" (AEIAR-032/2000), hereafter called "Theme Park EIA", a total of six heavy metals, including aluminium, antimony, barium, strontium, copper and titanium, was identified as the major pollutants emitted during fireworks displays at Disneyland Park.

There are no statutory criteria for these non-AQO pollutants. Hence, international guidelines from World Health Organization (WHO), and toxicity data from Integrated Risk information System (IRIS) of USEPA and from Office of Environmental Health Hazard Assessment (OEHHA) of California Environmental Protection Agency have been reviewed. Besides, the criteria that adopted in the Theme Park EIA have also been compared. The proposed assessment criteria for non-AQO pollutants to be adopted in this assessment are summarized in **Table A4.1b** below.

Table A4.1b: Assessment criteria for non-AQO pollutants

Pollutant	Limit on Concentration, μg/m³ [5]				
	WHO [1]	USEPA [2]	OEHHA [3]	Theme Park EIA[4]	Adopted for this Study
Acute (1-hour average)					
Aluminium	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA
Strontium	NA	NA	NA	NA	NA
Copper	NA	NA	100	NA	100
Titanium	NA	NA	NA	NA	NA
Chronic (Annual average, or otherwise specified)					
Aluminium	NA	NA	NA	100[6]	100
Antimony	NA	NA	NA	5[7]	5
Barium	500 (8-hr average)	NA	NA	5[7]	500 (8-hr average) 5 (Annual average)
Strontium	NA	NA	NA	NA	NA
Copper	NA	NA	2.4	2.4[8]	2.4
Titanium	NA	NA	NA	100[6]	100

Note:

[1] WHO – "Barium and Barium Compounds", World Health Organization (Geneva, 2001)

[2] USEPA – Integrated Risk information System of USEPA

[3] OEHHA – Office of Environmental Health Hazard Assessment of California Environmental Protection Agency

[4] Theme Park EIA – Table 3.5n of the approved EIA study *"Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures – Environmental Impact Assessment"* (AEIAR-032/2000)

[5] NA - Not applicable

[6] Reference to *"Occupational Exposure Limits"* published by UK Health & Safety Executive with a safety factor of 100 applied for conversing time-weight-average value to long term exposure limit and to allow for variability in human response to chemicals.

[7] Reference to "A Reference Note on Occupational Exposure Limits for Chemical Substances in the Work Environment" published by Hong Kong Labour Department with a safety factor of 100

applied for conversing time-weight-average value to long term exposure limit and to allow for variability in human response to chemicals.

[8] Reference to California Air Resources Board (CARB).

Appendix 4.2

Methodology of Air Quality Assessment

Methodology of Air Quality Assessment

Marine Vessels Emission

NO_2, RSP, FSP and SO_2 will be emitted due to fuel combustion from marine vessels and are considered as the key assessment pollutants for this study.

According to EPD's "*Study on Marine Vessels Emission Inventory*", the emission from vessels are calculated using the following equations:

$$\text{Total Emission}_{\text{(pollutant)}} = \Sigma\ \text{Emission}_{\text{(pollutant, activity mode, equipment)}}$$

$$\text{Emission}_{\text{(pollutant, activity mode, equipment)}} = P \times FL \times T \times EF$$

Where P is the engine power (kW);

FL is fractional load of engine in a specific mode;

T is operation time-in-mode; and

EF is emission factor of the engine.

Information on the engine powers, engine load factors, and time-in-modes have been obtained from the operators and where the time-in-modes are not available, they will be estimated by site survey as far as possible. Where engine power and load factors are unavailable, reference has been made to EPD's "*Study on Marine Vessels Emission Inventory*". Details are discussed in the sections below.

Passenger Ferry Service between Discovery Bay and Central

The latest passenger ferry schedule was obtained from the Transport Department's website including the arrival and departure of passenger ferries during weekdays, Saturday, and Sunday and public Holidays.

According to the operational information, there are two types of vessels, including Catamaran Ferry (6 vessels in total) and Monohull Ferry (2 vessels in total) in operation for the service. As there is no information on which vessel type being used in individual trip, the weighted averages of emissions from the vessels are adopted as the best estimation. Detailed calculations are given in **Annex A4.2-1**. Information on the main engine and auxiliary engine powers provided by the operator are also given in **Annex A4.2-1**.

According to Appendix 3.25 of the approved EIA study "*West Kowloon Cultural District*" (AEIAR-178/2013), mechanical power equals to the product of force and velocity (i.e. Mechanical power = Force x Velocity) that force is assumed to be a constant. As a result, the load factor is proportional to speed. Therefore, the main engine load factors can be determined by the ratio of the speed under each operating mode (hotelling, manoeuvring, slow cruise and fairway cruise) to the maximum design speed of the vessel (i.e. Main Engine Load Factor = Speed of each mode / Maximum Design Speed of the Ferry).

The maximum design speeds of the ferries have been provided by the operator. However, since the operators do not have the statistics on speeds under manoeuvring and slow cruise mode, the average speeds (i.e. 4.5 knots and 10 knots, respectively) by referencing to Table 3-24 of the EPD's "*Study on Marine Vessels Emission Inventory*" have been assumed. For fairway cruise mode, the maximum navigation speeds of the ferries within Discovery Bay provided by the operator are adopted.

Information on the auxiliary engine load factors are not available from the operator. Hence, the auxiliary engine load factors of "Macau/Pearl River Delta (PRD) fast ferry" in Table 4-10 of the EPD's "*Study on Marine Vessels Emission Inventory*" are adopted.

Time-in-modes (TIMs) under manoeuvring and slow cruise modes have been made reference to that of "PRD fast ferries" in Table 4-15 of the EPD's "*Study on Marine Vessels Emission Inventory*" as the Discovery Bay/Central passenger ferry service are composed of Catamaran Ferries and Monohull Ferries, similar to PRD fast ferry. For the fairway cruise mode, TIM is estimated by using the following equation:

TIM of fairway cruise mode
= Length of navigation route under fairway cruise mode / Speed of fairway cruise mode

Length of navigation route under fairway cruise mode
= Total length of navigation route – (TIM of manoeuvring mode x Speed of manoeuvring mode) – (TIM of slow cruise mode x Speed of slow cruise mode)

Besides, site surveys have been also conducted to observe the hotelling time of ferries during arrival and departure at Discovery Bay.

Emission factors of NOx, RSP and FSP are referenced to Table 4-17 of the EPD's "*Study on Marine Vessels Emission Inventory*", assuming similar to that of the Macau/PRD fast ferries with diesel engine. With effective of the Air Pollution Control (Marine Light Diesel) Regulation on 1st April, 2014, the fuel sulphur content limit of the MLD is 0.05%. The SO_2 emission factors have been corrected based on the following equation:

SO_2 emission factor (g/kWh)
= Brake specific fuel consumption (BSFC) x 2 x 0.97753 x Fuel Sulphur Fraction

Calculations of the emission from passenger ferry service between Discovery Bay and Central, and the emission rates adopted for modelling are given in **Annex A4.2-1.**

Kaito Ferry Services between Discovery Bay and Peng Chau and Mui Wo

There are two navigation routes for the kaito ferry services between Discovery Bay and Peng Chau, including 1) the ferries travelling between Discovery Bay and Peng Chau directly, and 2) the ferries travelling between Discovery Bay and Peng Chau via Trappist Haven Monastery. On the other hand, there is only one navigation route for the kaito ferry service travelling between Discovery Bay and Mui Wo directly.

The latest kaito ferry schedules are obtained from the Transport Department's website, including the arrival/departure profiles on weekdays, Saturday, and Sunday and public holidays.

Information on the main engine and auxiliary engine powers are not available from the operator. Hence, reference has been made to Table 4-5 and Table 4-6 of the EPD's "*Study on Marine Vessels Emission Inventory*", respectively. According to the "2013 Port of Hong Kong Statistical Table" published by the Marine Department, all the licensed Primitive Vessels (i.e. kaito) have the registered tonnage less than 300 tons. Therefore, the main engine and auxiliary engine powers of the smallest vessel size (i.e. GRT 0-499 tons) in Table 4-5 and Table 4-6 of the EPD's "*Study on Marine Vessels Emission Inventory*" are adopted. As the engine sizes of the kaito ferries are relatively small compared with other river trade vessels, the engine powers adopted in the assessment are considered conservative.

The approaches on determining the load factors, TIMs, and emission factors are similar to that of passenger ferry as described above. Details and the calculation are given in **Annex A4.2-1.**

Tug boat and barge (Delivery of LPG Tanker Vehicles, Gas Bottle Delivery and Sand Barge)

There is a barge towed by a tug boat for delivering LPG tanker vehicles to Discovery Bay once every 5 to 6 days (i.e. about 5 to 6 times per month) during daytime from 7:00 a.m. to 7:00 p.m. However, as mentioned in **Section 4.3.4.10**, a continuous operation of the tug boat/barge for LPG tanker vehicles delivery is assumed to cover the operations of gas bottle vessel and the sand barge. In particular, one arrival and departure activities per hour and a continuous emission (i.e. 60 minute per hour) from the vessel during hotelling at the berth location from 7:00 a.m. to 7:00 p.m. during weekdays have been adopted for the assessment.

Information on the main engines and auxiliary engines power of the tug boat and the barge has been provided by the operator and given in **Annex A4.2-1**.

The approaches on determining the load factors, TIMs, and emission factors are similar to that of passenger ferry as described above. Details and the calculation are given in **Annex A4.2-1**.

Emission from Fireworks Displays

According to the Theme Park EIA, 42% of the total mass of the fireworks is emitted to the atmosphere and it is assumed that all of these mass will be turned into RSP as worst case scenario (i.e. 2.6kg for low-level shows and 14.7kg for mid-level shows). Details and the calculations are given in **Annex A4.2-2**.

In the EIA, two mid-level and three low-levels were modelled at the same hour every night as a worst case scenario and the shows were modelled as separate volume sources, 27,000m^3 (i.e. 30 x 30 x 30m) and 8,000m^3 (i.e. 20 x 20 x 20m) for mid-level and low-level shows, respectively. The same assumptions are also adopted in this Study with the latest fireworks displays schedule obtained from the Disneyland Park's website.

There is no information on the modelling bursting heights of the fireworks in the Theme Park EIA. A site survey has been conducted to estimate the bursting height of the fireworks. It was found that there are mainly two levels of fireworks bursting at height of about 150 mPD and 120 mPD, which are considered within the EPs' conditions that the bursting height limit of the fireworks displays in Disneyland Park is 150 mPD. Therefore, the bursting heights of 150 mPD and 120 mPD for mid-level shows and low-level shows are assumed for modelling purpose, respectively.

There is no conversion factor from RSP to FSP emission from fireworks displays. Therefore, the FSP emission from fireworks is assumed to be the same as the RSP emission for worst case assessment.

Besides, the Theme Park EIA had also considered the impacts due to heavy metals in which their concentrations were estimated by the percentage composition of heavy metal compounds within the mass of the particulate emission. The maximum 1-hour concentration, maximum 8-hour concentration and annual concentration of the heavy metals at ASRs are therefore estimated from RSP concentrations using the conversion factors in this approved EIA as presented in **Table A4.2a** below.

Table A4.2a: Conversion factors from RSP assessment results to heavy metals concentration

Heavy Metal	Percentage Composition in the pyrotechnics products	Conversion from RSP assessment results (without background) to heavy metals concentration
Aluminium	2.93%	RSP x 0.0293
Antimony	1.28%	RSP x 0.0128
Barium	3.06%	RSP x 0.0306
Strontium	1.64%	RSP x 0.0164
Copper	0.92%	RSP x 0.0092
Titanium	0.40%	RSP x 0.0040

Note:

[1] The percentage compositions of heavy metals in the pyrotechnics used for fireworks displays in Disneyland Theme Park are referenced to Section 3.5.75 of the approved EIA Study "*Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures – Environmental Impact Assessment*" (AEIAR-032/2000)

Dispersion Modelling Approach

The USEPA approved model, Industrial Source Complex - Short Term 3 (ISCST3), has been adopted to model the marine vessels emission and fireworks displays emission. The modelling parameters are listed in **Table A4.2b**.

Table A4.2b: Modelling parameters for ISCST3

Parameter	Input
Modelling mode	Rural with terrain effect
Meteorological data	Year 2010 MM5 data extracted from PATH model
Stability Class	Estimation from PCRAMMET model
Mixing Height	Year 2010 MM5 data extracted from PATH model and is capped to 121m as per the real metrological data recoded by Hong Kong Observatory in Year 2010

For the treatment of calm hours, the approach recommended in the "*Guideline on Air Quality on Air Quality Models Version 05 (USEPA*" is adopted.

Ozone Limiting Method (OLM) is adopted for the conversion of NO_x to NO_2 based on the predicted O_3 level from PATH model. The tailpipe NO_2/NO_x ratio is assumed to be 10%.

According to **Table 4.1** in the main text, the highest building of the proposed development is 71m above ground. Therefore, the impacts on the ASRs are assessed at height of 1.5m, 5m, 10m, 20m, 30m, 40m, 50m, 60m, 70m and 80m above local ground.

Cumulative Impact of Criteria Air Pollutants

As mentioned in **Section 2.3.1.1**, the population intake year of the development will be tentatively beyond Year 2020, the PATH model hourly outputs based on Year 2020 emission inventories is therefore used directly as the future background air quality for AQO pollutants. Far-field emission sources (i.e. all those outside 500m assessment area) including roads, marine, airports, power plants and industries within the Pearl River Delta Economic Zone and Hong Kong were considered in the PATH model. Details of the PATH Model and related emission inventory can be found in EPD's web site.

It is understood that there is no hourly FSP concentrations available form PATH model. According to EPD's "*Guidelines on the Estimation of PM2.5 for Air Quality Assessment in Hong Kong*", the conservative corrections from RSP concentrations to FSP concentrations are shown in the **Table A4.2c**.

Table A4.2c: Conversion factors for RSP/FSP

Annual ($\mu g/m^3$)	Daily ($\mu g/m^3$)
FSP = 0.71 x RSP	FSP = 0.75 x RSP

For SO_2, there is no 10-mintue average SO_2 concentration available in PATH model. According to EPD's *Guidelines on the Estimation of 10-mintue average SO_2 concentration for Air Quality Assessment in Hong Kong*, conversion factors from hourly SO_2 concentration to 10-minute average SO_2 concentration based on the stability class-dependent multiplicative factors have been adopted. They are given in **Table A4.2d** below.

Table A4.2d: Conversion factor for 10-mintue average SO_2 concentration

Stability Class	A	B	C	D	E	F
Conversion Factor	2.45	2.45	1.82	1.43	1.35	1.35

The cumulative operational air quality is a combination of the emission impacts contributed from the near-field and far field sources (i.e. at local scale and background air quality impact from other concurrent and regional sources) on hourly basis.

OLM is used for conversion of NO_x to NO_2 based on the O_3 level from PATH directly.

In consideration of the number of exceedance allowance of the hourly and daily AQO, the pollutant concentrations after the AQO's allowance limits (e.g. the 19th highest 1-hour NO_2 concentrations, 10th highest 24-hour RSP/ FSP concentrations, maximum 10-minute SO_2 and 4th highest 24-hour SO_2 concentrations) are determined at each ASR. The annual predicted concentrations are also assessed and all predicted levels are then compared with the AQOs.

For heavy metals, there is no background concentration available in the PATH model. Therefore, the average of the annual monitoring concentrations of aluminium, barium and copper for the latest 5 available years (i.e. Year 2010 – Year 2014) at Tung Chung Station, the nearest station to the proposed development, are adopted as their corresponding background concentrations (**Table A4.2e**). For antimony, strontium and titanium, there is no monitoring data and their background concentrations are assumed as 0 μg/m³.

Table A4.2e: Annual monitoring heavy metal concentration at Tung Chung Station (i.e. Year 2010 – Year 2014)

Year	Annual average concentration (μg/m³)		
	Aluminium	Barium	Copper
2010	0.196	0.016	0.056
2011	0.226	0.016	0.060
2012	0.171	0.014	0.047
2013	0.208	0.015	0.132
2014	0.179	0.013	0.150
5 years average	0.196	0.015	0.089

Appendix A4.2-1

Calculation of Marine Vessels Emissions

Engine Power and Load Factors under Different Operation Mode of Main Engine

Vessel Type	Main Engine Power (kW)	Maximum Design Speed of the Vessel (Knots)	Vessel Speed (Knots)				Load Factor [3]			
			Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
Catamaran Ferry	3870 [1]	34[1]	0.0	4.5[2]	10.0[2]	28.0[1]	0.00	0.13	0.29	0.82
Monohull Ferry	1680 [1]	24[1]	0.0	4.5[2]	10.0[2]	22.0[1]	0.00	0.19	0.42	0.92

Note:

[1] Information provided by the operator.

[2] Vessel speeds under maneuvering (1-8 knots) and slow cruise (8-12 knots) are referenced to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". The average speed of each mode is adopted for assessment purpose.

[3] Mechanical Power = Force x Velocity

Assume force is constant, thus load factor is proportional to speed (with reference to approved EIA for West Kowloon Cultural District (AEIAR-178/2013))

Therefore, load factor of each mode = Speed of each mode / Maximum Design Speed of the Vessel

Engine Power and Load Factors under Different Operation Mode of Auxiliary Engine

Vessel Type	Auxiliary Engine Power (kW)	Load Factor			
		Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
Catamaran Ferry	170[1]	0.45[2]	0.45[2]	0.45[2]	0.45[2]
Monohull Ferry	182[1]	0.45[2]	0.45[2]	0.45[2]	0.45[2]

[1] Information provided by the operator.

[2] No available information from operator. The load factors are referenced to PRD Ferry in Table 4-10 of EPD's "Study on Marine Vessels Emission Inventory"

Time-in-mode

Vessel Type		Time-in-mode (minutes)			
		Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
Catamaran Ferry	Arrival	5.00 [1]	1.20 [2]	1.20 [2]	0.17[4]
	Departure	5.00 [1]	1.80 [2]	1.39 [3]	0.00[3]
Monohull Ferry	Arrival	5.00 [1]	1.20 [2]	1.20 [2]	0.21[4]
	Departure	5.00 [1]	1.80 [2]	1.39 [3]	0.00[3]

Note:

[1] The hotelling time is collected from site survey

[2] TIM of maneuvering and slow cruise is referenced to Table 4.15 of EPD's "Study on Marine Vessels Emission Inventory"

[3] The total length of navigation route adopted in the near-field model is 680m for Central Ferry. During departure, the ferry will leave the modelled navigation route under slow cruise mode.

Therefore, TIM of slow cruise (departure) = Length of navigation route under slow cruise / vessel speed under slow cruise

Length of navigation route under slow cruise = Total navigation route length adopted in the near-field model - Length of navigation route under maneuvering

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

[4] TIM of fairway cruise = Length of navigation route under fairway cruise / vessel speed under fairway cruise

Length of navigation route under fairway cruise = Total navigation route length adopted in the near-field model (680m) - Length of navigation route under maneuvering - Length of navigation route under slow cruise

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

Length of navigation route under slow cruise = TIM of slow cruise x vessel speed under slow cruise

Emission Factors of Main Engine and Auxiliary Engine

Engine Type	Emission Factors (g/Kwh)				Brake Specific Fuel Consumption (BSFC) [4]	Fuel Sulphur Content (%) [5]
	NO_x	RSP	FSP	SO_2 [3]		
Main Engine [1]	13.20	0.31	0.29	0.21	213	0.05
Auxiliary Engine [2]	10.00	0.31	0.29	0.21	217	0.05

Note:

[1] The emission factors of main engine (diesel) of Macau/PRD ferry in Table 4-17 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[2] The emission factors of auxiliary engine (diesel) of Macau/PRD ferry in Table 4-17 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[3] The emission factors of SO_2 are corrected with the fuel sulphur content according to Section 4.2.31 of EPD's "Study on Marine Vessels Emission Inventory" using the following equation:

SO_2 Emission Factor = BSFC x 2 x 0.9755 x Fuel Sulphur Fraction

[4] BSFC of the vessel is referenced to Table 4-17 of EPD's "Study on Marine Vessels Emission Inventory".

[5] With effective of the Air Pollution Control (Marine Light Diesel) Regulation on 1st April, 2014, the fuel sulphur content limit of the MLD is 0.05%.

Daily Profile of Passenger Ferry Service between Discovery Bay and Central [1]

Hours	Number of Trip					
	Arrival [2]			Departure [3]		
	Weekday	Saturday	Sunday / Public Holiday	Weekday	Saturday	Sunday / Public Holiday
01	2	2	2	2	3	3
02	1	2	2	1	1	1
03	1	1	1	1	1	1
04	1	1	1	0	0	0
05	0	0	0	1	1	1
06	1	1	1	0	0	0
07	1	1	1	3	2	2
08	2	2	1	4	3	1
09	3	2	2	4	4	2
10	2	3	2	2	2	2
11	2	2	2	2	2	2
12	2	2	2	2	2	2
13	2	2	2	2	2	2
14	2	2	2	2	2	2
15	2	2	2	2	2	2
16	3	2	2	2	2	2
17	2	2	2	2	2	2
18	2	2	2	2	2	2
19	3	2	2	3	2	2
20	3	2	2	2	2	2
21	2	2	2	2	2	2
22	2	2	2	2	2	2
23	2	2	2	2	2	2
24	2	2	2	2	2	2

Note:

[1] The daily schedule and sailing time of the ferry service is referenced to Transport Department's website.

[2] The hour of arrival is determined by the departure time at central and the sailing time to arrive Discovery Bay.

E.g. If a ferry departs from Central at 12:40 (Hour 13) and the sailing time is 25 minutes from Transport Department's website, it will arrive Discovery Bay at 13:05 (Hour 14).

The arrival hour of the ferry is therefore Hour 14.

[3] The hour of departure is the hour that the ferry departs at the Discovery Bay.

Daily NO_x emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
02	1	1	64	151	316	118	64	226	367	0	68	100	201	74	68	149	234	0	65	138	287	107	65	207	333	0	3.60E-02	2.98E-01
03	1	1	64	151	316	118	64	226	367	0	68	100	201	74	68	149	234	0	65	138	287	107	65	207	333	0	3.60E-02	2.98E-01
04	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
05	0	1	0	0	0	0	64	226	367	0	0	0	0	0	68	149	234	0	0	0	0	0	65	207	333	0	1.80E-02	1.50E-01
06	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
07	1	3	64	151	316	118	191	677	1,100	0	68	100	201	74	205	448	701	0	65	138	287	107	195	620	1000	0	7.21E-02	5.98E-01
08	2	4	128	301	632	236	255	903	1,467	0	137	199	402	148	273	597	934	0	130	276	574	214	260	827	1333	0	1.08E-01	8.96E-01
09	3	4	191	452	947	354	255	903	1,467	0	205	299	604	223	273	597	934	0	195	413	861	321	260	827	1333	0	1.26E-01	1.04E+00
10	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
11	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
12	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
13	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7 21E-02	5.96E-01
14	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
15	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
16	3	2	191	452	947	354	128	452	733	0	205	299	604	223	137	299	467	0	195	413	861	321	130	413	667	0	9.01E-02	7.43E-01
17	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
18	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
19	3	3	191	452	947	354	191	677	1,100	0	205	299	604	223	205	448	701	0	195	413	861	321	195	620	1000	0	1.08E-01	8.93E-01
20	3	2	191	452	947	354	128	452	733	0	205	299	604	223	137	299	467	0	195	413	861	321	130	413	667	0	9.01E-02	7.43E-01
21	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
22	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
23	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
24	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7 21E-02	5.96E-01
Daily Emission (g)			2,869	6,774	14,211	5,315	2,996	10,612	17,232	0	3,071	4,479	9,053	3,339	3,208	7,018	10,978	0	2,919	6,200	12,921	4,821	3,049	9,713	15,669	0		
Total Daily Emission (g)			60,008								41,146								55,292									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during *Hotelling* = total emission of hotelling *during arrival and departure*

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

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Daily NO_x emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	128	301	632	236	191	677	1,100	0	137	199	402	148	205	448	701	0	130	276	574	214	195	620	1000	0	9.01E-02	7.46E-01
02	2	1	128	301	632	236	64	226	367	0	137	199	402	148	68	149	234	0	130	276	574	214	65	207	333	0	5.41E-02	4.46E-01
03	1	1	64	151	316	118	64	226	367	0	68	100	201	74	68	149	234	0	65	138	287	107	65	207	333	0	3.60E-02	2.98E-01
04	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
05	0	1	0	0	0	0	64	226	367	0	0	0	0	0	68	149	234	0	0	0	0	0	65	207	333	0	1.80E-02	1.50E-01
06	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
07	1	2	64	151	316	118	128	452	733	0	68	100	201	74	137	299	467	0	65	138	287	107	130	413	667	0	5.41E-02	4.48E-01
08	2	3	128	301	632	236	191	677	1,100	0	137	199	402	148	205	448	701	0	130	276	574	214	195	620	1000	0	9.01E-02	7.46E-01
09	2	4	128	301	632	236	255	903	1,467	0	137	199	402	148	273	597	934	0	130	276	574	214	260	827	1333	0	1.08E-01	8.96E-01
10	3	2	191	452	947	354	128	452	733	0	205	299	604	223	137	299	467	0	195	413	861	321	130	413	667	0	9.01E-02	7.43E-01
11	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
12	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
13	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
14	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
15	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
16	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
17	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
18	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
19	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
20	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
21	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
22	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
23	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
24	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
Daily Emission (g)			2,741	6,472	13,579	5,078	2,869	10,160	16,499	0	2,935	4,280	8,651	3,191	3,071	6,719	10,511	0	2,790	5,924	12,347	4,607	2,919	9,300	15,002	0		
Total Daily Emission (g)			57,399								39,358								52,889									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Project: Discovery Bay: Optimization of Land Use
Title: Calculation of Marine Emission from Passenger Ferry Service between Discovery Bay and Central

Daily NO_x emission (Sunday and Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	128	301	632	236	191	677	1,100	0	137	199	402	148	205	448	701	0	130	276	574	214	195	620	1000	0	9.01E-02	7.46E-01
02	2	1	128	301	632	236	64	226	367	0	137	199	402	148	68	149	234	0	130	276	574	214	65	207	333	0	5.41E-02	4.46E-01
03	1	1	64	151	316	118	64	226	367	0	68	100	201	74	68	149	234	0	65	138	287	107	65	207	333	0	3.60E-02	2.98E-01
04	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
05	0	1	0	0	0	0	64	226	367	0	0	0	0	0	68	149	234	0	0	0	0	0	65	207	333	0	1.80E-02	1.50E-01
06	1	0	64	151	316	118	0	0	0	0	68	100	201	74	0	0	0	0	65	138	287	107	0	0	0	0	1.80E-02	1.48E-01
07	1	2	64	151	316	118	128	452	733	0	68	100	201	74	137	299	467	0	65	138	287	107	130	413	667	0	5.41E-02	4.48E-01
08	1	1	64	151	316	118	64	226	367	0	68	100	201	74	68	149	234	0	65	138	287	107	65	207	333	0	3.60E-02	2.98E-01
09	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
10	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
11	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
12	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
13	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
14	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
15	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
16	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
17	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
18	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
19	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
20	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
21	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
22	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
23	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
24	2	2	128	301	632	236	128	452	733	0	137	199	402	148	137	299	467	0	130	276	574	214	130	413	667	0	7.21E-02	5.96E-01
Daily Emission (g)			2,614	6,171	12,948	4,842	2,614	9,257	15,032	0	2,798	4,081	8,248	3,043	2,798	6,122	9,576	0	2,660	5,649	11,773	4,392	2,660	8,473	13,668	0		
Total Daily Emission (g)			53,478								36,667								49,275									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
02	1	1	2.0	3.6	7.5	2.8	2.0	5.5	8.7	0.0	2.1	2.5	4.8	1.8	2.1	3.7	5.6	0.0	2.0	3.4	6.9	2.5	2.0	5.0	8.0	0.0	1.12E-03	7.15E-03
03	1	1	2.0	3.6	7.5	2.8	2.0	5.5	8.7	0.0	2.1	2.5	4.8	1.8	2.1	3.7	5.6	0.0	2.0	3.4	6.9	2.5	2.0	5.0	8.0	0.0	1.12E-03	7.15E-03
04	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
05	0	1	0.0	0.0	0.0	0.0	2.0	5.5	8.7	0.0	0.0	0.0	0.0	0.0	2.1	3.7	5.6	0.0	0.0	0.0	0.0	0.0	2.0	5.0	8.0	0.0	5.59E-04	3.61E-03
06	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
07	1	3	2.0	3.6	7.5	2.8	5.9	16.4	26.2	0.0	2.1	2.5	4.8	1.8	6.3	11.1	16.9	0.0	2.0	3.4	6.9	2.5	6.0	15.1	23.9	0.0	2.23E-03	1.44E-02
08	2	4	4.0	7.3	15.1	5.6	7.9	21.9	35.0	0.0	4.2	4.9	9.7	3.5	8.5	14.8	22.5	0.0	4.0	6.7	13.7	5.1	8.0	20.1	31.9	0.0	3.35E-03	2.15E-02
09	3	4	5.9	10.9	22.6	8.4	7.9	21.9	35.0	0.0	6.3	7.4	14.5	5.3	8.5	14.8	22.5	0.0	6.0	10.1	20.6	7.6	8.0	20.1	31.9	0.0	3.91E-03	2.51E-02
10	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
11	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
12	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
13	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
14	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
15	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
16	3	2	5.9	10.9	22.6	8.4	4.0	10.9	17.5	0.0	6.3	7.4	14.5	5.3	4.2	7.4	11.3	0.0	6.0	10.1	20.6	7.6	4.0	10.1	15.9	0.0	2.79E-03	1.78E-02
17	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
18	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
19	3	3	5.9	10.9	22.6	8.4	5.9	16.4	26.2	0.0	6.3	7.4	14.5	5.3	6.3	11.1	16.9	0.0	6.0	10.1	20.6	7.6	6.0	15.1	23.9	0.0	3.35E-03	2.15E-02
20	3	2	5.9	10.9	22.6	8.4	4.0	10.9	17.5	0.0	6.3	7.4	14.5	5.3	4.2	7.4	11.3	0.0	6.0	10.1	20.6	7.6	4.0	10.1	15.9	0.0	2.79E-03	1.78E-02
21	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
22	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
23	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
24	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
Daily Emission (g)			89	164	339	126	93	257	411	0	95	111	218	79	99	173	265	0	91	151	309	114	95	236	374	0		
Total Daily Emission (g)			1479								1041								1369									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Project: Discovery Bay: Optimization of Land Use
Title: Calculation of Marine Emission from Passenger Ferry Service between Discovery Bay and Central

Daily RSP emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	4.0	7.3	15.1	5.6	5.9	16.4	26.2	0.0	4.2	4.9	9.7	3.5	6.3	11.1	16.9	0.0	4.0	6.7	13.7	5.1	6.0	15.1	23.9	0.0	2.79E-03	1.79E-02
02	2	1	4.0	7.3	15.1	5.6	2.0	5.5	8.7	0.0	4.2	4.9	9.7	3.5	2.1	3.7	5.6	0.0	4.0	6.7	13.7	5.1	2.0	5.0	8.0	0.0	1.68E-03	1.07E-02
03	1	1	2.0	3.6	7.5	2.8	2.0	5.5	8.7	0.0	2.1	2.5	4.8	1.8	2.1	3.7	5.6	0.0	2.0	3.4	6.9	2.5	2.0	5.0	8.0	0.0	1.12E-03	7.15E-03
04	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
05	0	1	0.0	0.0	0.0	0.0	2.0	5.5	8.7	0.0	0.0	0.0	0.0	0.0	2.1	3.7	5.6	0.0	0.0	0.0	0.0	0.0	2.0	5.0	8.0	0.0	5.59E-04	3.61E-03
06	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
07	1	2	2.0	3.6	7.5	2.8	4.0	10.9	17.5	0.0	2.1	2.5	4.8	1.8	4.2	7.4	11.3	0.0	2.0	3.4	6.9	2.5	4.0	10.1	15.9	0.0	1.68E-03	1.08E-02
08	2	3	4.0	7.3	15.1	5.6	5.9	16.4	26.2	0.0	4.2	4.9	9.7	3.5	6.3	11.1	16.9	0.0	4.0	6.7	13.7	5.1	6.0	15.1	23.9	0.0	2.79E-03	1.79E-02
09	2	4	4.0	7.3	15.1	5.6	7.9	21.9	35.0	0.0	4.2	4.9	9.7	3.5	8.5	14.8	22.5	0.0	4.0	6.7	13.7	5.1	8.0	20.1	31.9	0.0	3.35E-03	2.15E-02
10	3	2	5.9	10.9	22.6	8.4	4.0	10.9	17.5	0.0	6.3	7.4	14.5	5.3	4.2	7.4	11.3	0.0	6.0	10.1	20.6	7.6	4.0	10.1	15.9	0.0	2.79E-03	1.78E-02
11	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
12	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
13	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
14	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
15	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
16	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
17	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
18	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
19	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
20	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
21	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
22	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
23	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
24	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
Daily Emission (g)			85	157	324	120	89	246	393	0	91	106	208	76	95	166	253	0	86	144	295	109	91	226	358	0		
Total Daily Emission (g)			1415								996								1310									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Sunday and Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	4.0	7.3	15.1	5.6	5.9	16.4	26.2	0.0	4.2	4.9	9.7	3.5	6.3	11.1	16.9	0.0	4.0	6.7	13.7	5.1	6.0	15.1	23.9	0.0	2.79E-03	1.79E-02
02	2	1	4.0	7.3	15.1	5.6	2.0	5.5	8.7	0.0	4.2	4.9	9.7	3.5	2.1	3.7	5.6	0.0	4.0	6.7	13.7	5.1	2.0	5.0	8.0	0.0	1.68E-03	1.07E-02
03	1	1	2.0	3.6	7.5	2.8	2.0	5.5	8.7	0.0	2.1	2.5	4.8	1.8	2.1	3.7	5.6	0.0	2.0	3.4	6.9	2.5	2.0	5.0	8.0	0.0	1.12E-03	7.15E-03
04	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
05	0	1	0.0	0.0	0.0	0.0	2.0	5.5	8.7	0.0	0.0	0.0	0.0	0.0	2.1	3.7	5.6	0.0	0.0	0.0	0.0	0.0	2.0	5.0	8.0	0.0	5.59E-04	3.61E-03
06	1	0	2.0	3.6	7.5	2.8	0.0	0.0	0.0	0.0	2.1	2.5	4.8	1.8	0.0	0.0	0.0	0.0	2.0	3.4	6.9	2.5	0.0	0.0	0.0	0.0	5.59E-04	3.54E-03
07	1	2	2.0	3.6	7.5	2.8	4.0	10.9	17.5	0.0	2.1	2.5	4.8	1.8	4.2	7.4	11.3	0.0	2.0	3.4	6.9	2.5	4.0	10.1	15.9	0.0	1.68E-03	1.08E-02
08	1	1	2.0	3.6	7.5	2.8	2.0	5.5	8.7	0.0	2.1	2.5	4.8	1.8	2.1	3.7	5.6	0.0	2.0	3.4	6.9	2.5	2.0	5.0	8.0	0.0	1.12E-03	7.15E-03
09	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
10	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
11	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
12	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
13	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
14	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
15	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
16	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
17	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
18	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
19	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
20	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
21	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
22	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
23	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
24	2	2	4.0	7.3	15.1	5.6	4.0	10.9	17.5	0.0	4.2	4.9	9.7	3.5	4.2	7.4	11.3	0.0	4.0	6.7	13.7	5.1	4.0	10.1	15.9	0.0	2.23E-03	1.43E-02
Daily Emission (g)			81	150	309	114	81	224	359	0	87	101	199	72	87	151	231	0	82	137	281	104	82	206	327	0		
Total Daily Emission (g)			1,318								928								1,220									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
02	1	1	1.8	3.4	7.0	2.6	1.8	5.1	8.2	0.0	2.0	2.3	4.5	1.7	2.0	3.5	5.3	0.0	1.9	3.1	6.4	2.4	1.9	4.7	7.5	0.0	1.05E-03	6.69E-03
03	1	1	1.8	3.4	7.0	2.6	1.8	5.1	8.2	0.0	2.0	2.3	4.5	1.7	2.0	3.5	5.3	0.0	1.9	3.1	6.4	2.4	1.9	4.7	7.5	0.0	1.05E-03	6.69E-03
04	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
05	0	1	0.0	0.0	0.0	0.0	1.8	5.1	8.2	0.0	0.0	0.0	0.0	0.0	2.0	3.5	5.3	0.0	0.0	0.0	0.0	0.0	1.9	4.7	7.5	0.0	5.23E-04	3.38E-03
06	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
07	1	3	1.8	3.4	7.0	2.6	5.5	15.4	24.5	0.0	2.0	2.3	4.5	1.7	5.9	10.4	15.8	0.0	1.9	3.1	6.4	2.4	5.6	14.1	22.4	0.0	2.09E-03	1.34E-02
08	2	4	3.7	6.8	14.1	5.2	7.4	20.5	32.7	0.0	4.0	4.6	9.1	3.3	7.9	13.8	21.1	0.0	3.8	6.3	12.8	4.7	7.5	18.8	29.8	0.0	3.14E-03	2.01E-02
09	3	4	5.5	10.2	21.1	7.8	7.4	20.5	32.7	0.0	5.9	6.9	13.6	5.0	7.9	13.8	21.1	0.0	5.6	9.4	19.3	7.1	7.5	18.8	29.8	0.0	3.66E-03	2.34E-02
10	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
11	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4 7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
12	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
13	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
14	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
15	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
16	3	2	5.5	10 2	21.1	7.8	3.7	10.2	16.4	0.0	5.9	6.9	13.6	5.0	4.0	6.9	10.5	0.0	5.6	9.4	19.3	7.1	3.8	9.4	14.9	0.0	2.61E-03	1.67E-02
17	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
18	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
19	3	3	5.5	10.2	21.1	7.8	5.5	15.4	24.5	0.0	5.9	6.9	13.6	5.0	5.9	10.4	15.8	0.0	5.6	9.4	19.3	7.1	5.6	14.1	22.4	0.0	3.14E-03	2.01E-02
20	3	2	5.5	10.2	21.1	7.8	3.7	10.2	16.4	0.0	5.9	6.9	13.6	5.0	4.0	6.9	10.5	0.0	5.6	9.4	19.3	7.1	3.8	9.4	14.9	0.0	2.61E-03	1.67E-02
21	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
22	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12 8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
23	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
24	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
Daily Emission (g)			83	154	317	117	87	241	384	0	89	104	204	74	93	162	247	0	85	141	289	107	88	221	350	0		
Total Daily Emission (g)			1383								974								1281									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	3.7	6.8	14.1	5.2	5.5	15.4	24.5	0.0	4.0	4.6	9.1	3.3	5.9	10.4	15.8	0.0	3.8	6.3	12.8	4.7	5.6	14.1	22.4	0.0	2.61E-03	1.68E-02
02	2	1	3.7	6.8	14.1	5.2	1.8	5.1	8.2	0.0	4.0	4.6	9.1	3.3	2.0	3.5	5.3	0.0	3.8	6.3	12.8	4.7	1.9	4.7	7.5	0.0	1.57E-03	1.00E-02
03	1	1	1.8	3.4	7.0	2.6	1.8	5.1	8.2	0.0	2.0	2.3	4.5	1.7	2.0	3.5	5.3	0.0	1.9	3.1	6.4	2.4	1.9	4.7	7.5	0.0	1.05E-03	6.69E-03
04	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
05	0	1	0.0	0.0	0.0	0.0	1.8	5.1	8.2	0.0	0.0	0.0	0.0	0.0	2.0	3.5	5.3	0.0	0.0	0.0	0.0	0.0	1.9	4.7	7.5	0.0	5.23E-04	3.38E-03
06	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
07	1	2	1.8	3.4	7.0	2.6	3.7	10.2	16.4	0.0	2.0	2.3	4.5	1.7	4.0	6.9	10.5	0.0	1.9	3.1	6.4	2.4	3.8	9.4	14.9	0.0	1.57E-03	1.01E-02
08	2	3	3.7	6.8	14.1	5.2	5.5	15.4	24.5	0.0	4.0	4.6	9.1	3.3	5.9	10.4	15.8	0.0	3.8	6.3	12.8	4.7	5.6	14.1	22.4	0.0	2.61E-03	1.68E-02
09	2	4	3.7	6.8	14.1	5.2	7.4	20.5	32.7	0.0	4.0	4.6	9.1	3.3	7.9	13.8	21.1	0.0	3.8	6.3	12.8	4.7	7.5	18.8	29.8	0.0	3.14E-03	2.01E-02
10	3	2	5.5	10.2	21.1	7.8	3.7	10.2	16.4	0.0	5.9	6.9	13.6	5.0	4.0	6.9	10.5	0.0	5.6	9.4	19.3	7.1	3.8	9.4	14.9	0.0	2.61E-03	1.67E-02
11	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
12	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
13	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
14	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
15	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
16	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
17	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
18	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
19	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
20	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
21	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
22	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
23	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
24	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
Daily Emission (g)			79	147	303	112	83	230	368	0	85	99	195	71	89	155	237	0	81	135	276	102	85	212	335	0		
Total Daily Emission (g)			1323								931								1225									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Project: Discovery Bay: Optimization of Land Use
Title: Calculation of Marine Emission from Passenger Ferry Service between Discovery Bay and Central

Daily FSP emission (Sunday and Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	3.7	6.8	14.1	5.2	5.5	15.4	24.5	0.0	4.0	4.6	9.1	3.3	5.9	10.4	15.8	0.0	3.8	6.3	12.8	4.7	5.6	14.1	22.4	0.0	2.61E-03	1.68E-02
02	2	1	3.7	6.8	14.1	5.2	1.8	5.1	8.2	0.0	4.0	4.6	9.1	3.3	2.0	3.5	5.3	0.0	3.8	6.3	12.8	4.7	1.9	4.7	7.5	0.0	1.57E-03	1.00E-02
03	1	1	1.8	3.4	7.0	2.6	1.8	5.1	8.2	0.0	2.0	2.3	4.5	1.7	2.0	3.5	5.3	0.0	1.9	3.1	6.4	2.4	1.9	4.7	7.5	0.0	1.05E-03	6.69E-03
04	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
05	0	1	0.0	0.0	0.0	0.0	1.8	5.1	8.2	0.0	0.0	0.0	0.0	0.0	2.0	3.5	5.3	0.0	0.0	0.0	0.0	0.0	1.9	4.7	7.5	0.0	5.23E-04	3.38E-03
06	1	0	1.8	3.4	7.0	2.6	0.0	0.0	0.0	0.0	2.0	2.3	4.5	1.7	0.0	0.0	0.0	0.0	1.9	3.1	6.4	2.4	0.0	0.0	0.0	0.0	5.23E-04	3.31E-03
07	1	2	1.8	3.4	7.0	2.6	3.7	10.2	16.4	0.0	2.0	2.3	4.5	1.7	4.0	6.9	10.5	0.0	1.9	3.1	6.4	2.4	3.8	9.4	14.9	0.0	1.57E-03	1.01E-02
08	1	1	1.8	3.4	7.0	2.6	1.8	5.1	8.2	0.0	2.0	2.3	4.5	1.7	2.0	3.5	5.3	0.0	1.9	3.1	6.4	2.4	1.9	4.7	7.5	0.0	1.05E-03	6.69E-03
09	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
10	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
11	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
12	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
13	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
14	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
15	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
16	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
17	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
18	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
19	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
20	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
21	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
22	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
23	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
24	2	2	3.7	6.8	14.1	5.2	3.7	10.2	16.4	0.0	4.0	4.6	9.1	3.3	4.0	6.9	10.5	0.0	3.8	6.3	12.8	4.7	3.8	9.4	14.9	0.0	2.09E-03	1.34E-02
Daily Emission (g)			76	140	289	107	76	210	335	0	81	94	186	68	81	142	216	0	77	129	263	97	77	193	305	0		
Total Daily Emission (g)			1,233								868								1,142									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]															
			Catamaran Ferry								Monohull Ferry							
			Arrival				Departure				Arrival				Departure			
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
01	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
02	1	1	1.4	2.5	5.1	1.9	1.4	3.7	5.9	0.0	1.4	1.7	3.3	1.2	1.4	2.5	3.8	0.0
03	1	1	1.4	2.5	5.1	1.9	1.4	3.7	5.9	0.0	1.4	1.7	3.3	1.2	1.4	2.5	3.8	0.0
04	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0
05	0	1	0.0	0.0	0.0	0.0	1.4	3.7	5.9	0.0	0.0	0.0	0.0	0.0	1.4	2.5	3.8	0.0
06	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0
07	1	3	1.4	2.5	5.1	1.9	4.1	11.1	17.6	0.0	1.4	1.7	3.3	1.2	4.3	7.5	11.4	0.0
08	2	4	2.7	4.9	10.1	3.7	5.4	14.7	23.5	0.0	2.9	3.3	6.5	2.4	5.8	10.0	15.2	0.0
09	3	4	4.1	7.4	15.2	5.6	5.4	14.7	23.5	0.0	4.3	5.0	9.8	3.6	5.8	10.0	15.2	0.0
10	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
11	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
12	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
13	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
14	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
15	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
16	3	2	4.1	7.4	15.2	5.6	2.7	7.4	11.8	0.0	4.3	5.0	9.8	3.6	2.9	5.0	7.6	0.0
17	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
18	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
19	3	3	4.1	7.4	15.2	5.6	4.1	11.1	17.6	0.0	4.3	5.0	9.8	3.6	4.3	7.5	11.4	0.0
20	3	2	4.1	7.4	15.2	5.6	2.7	7.4	11.8	0.0	4.3	5.0	9.8	3.6	2.9	5.0	7.6	0.0
21	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
22	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
23	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
24	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0
Daily Emission (g)			61	111	228	84	64	173	276	0	65	75	147	53	68	117	178	0
Total Daily Emission (g)			997								703							

Hour	Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
	Arrival				Departure					
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
02	1.4	2.3	4.6	1.7	1.4	3.4	5.4	0.0	7.65E-04	4.81E-03
03	1.4	2.3	4.6	1.7	1.4	3.4	5.4	0.0	7.65E-04	4.81E-03
04	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
05	0.0	0.0	0.0	0.0	1.4	3.4	5.4	0.0	3.82E-04	2.43E-03
06	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
07	1.4	2.3	4.6	1.7	4.1	10.2	16.1	0.0	1.53E-03	9.67E-03
08	2.8	4.5	9.2	3.4	5.5	13.5	21.4	0.0	2.29E-03	1.45E-02
09	4.1	6.8	13.8	5.1	5.5	13.5	21.4	0.0	2.68E-03	1.69E-02
10	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
11	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
12	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
13	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
14	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
15	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
16	4.1	6.8	13.8	5.1	2.8	6.8	10.7	0.0	1.91E-03	1.20E-02
17	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
18	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
19	4.1	6.8	13.8	5.1	4.1	10.2	16.1	0.0	2.29E-03	1.44E-02
20	4.1	6.8	13.8	5.1	2.8	6.8	10.7	0.0	1.91E-03	1.20E-02
21	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
22	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
23	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
24	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
Daily Emission (g)	62	102	208	77	65	159	252	0		
Total Daily Emission (g)	923									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	2.7	4.9	10.1	3.7	4.1	11.1	17.6	0.0	2.9	3.3	6.5	2.4	4.3	7.5	11.4	0.0	2.8	4.5	9.2	3.4	4.1	10.2	16.1	0.0	1.91E-03	1.20E-02
02	2	1	2.7	4.9	10.1	3.7	1.4	3.7	5.9	0.0	2.9	3.3	6.5	2.4	1.4	2.5	3.8	0.0	2.8	4.5	9.2	3.4	1.4	3.4	5.4	0.0	1.15E-03	7.19E-03
03	1	1	1.4	2.5	5.1	1.9	1.4	3.7	5.9	0.0	1.4	1.7	3.3	1.2	1.4	2.5	3.8	0.0	1.4	2.3	4.6	1.7	1.4	3.4	5.4	0.0	7.65E-04	4.81E-03
04	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
05	0	1	0.0	0.0	0.0	0.0	1.4	3.7	5.9	0.0	0.0	0.0	0.0	0.0	1.4	2.5	3.8	0.0	0.0	0.0	0.0	0.0	1.4	3.4	5.4	0.0	3.82E-04	2.43E-03
06	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
07	1	2	1.4	2.5	5.1	1.9	2.7	7.4	11.8	0.0	1.4	1.7	3.3	1.2	2.9	5.0	7.6	0.0	1.4	2.3	4.6	1.7	2.8	6.8	10.7	0.0	1.15E-03	7.24E-03
08	2	3	2.7	4.9	10.1	3.7	4.1	11.1	17.6	0.0	2.9	3.3	6.5	2.4	4.3	7.5	11.4	0.0	2.8	4.5	9.2	3.4	4.1	10.2	16.1	0.0	1.91E-03	1.20E-02
09	2	4	2.7	4.9	10.1	3.7	5.4	14.7	23.5	0.0	2.9	3.3	6.5	2.4	5.8	10.0	15.2	0.0	2.8	4.5	9.2	3.4	5.5	13.5	21.4	0.0	2.29E-03	1.45E-02
10	3	2	4.1	7.4	15.2	5.6	2.7	7.4	11.8	0.0	4.3	5.0	9.8	3.6	2.9	5.0	7.6	0.0	4.1	6.8	13.8	5.1	2.8	6.8	10.7	0.0	1.91E-03	1.20E-02
11	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
12	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
13	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
14	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
15	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
16	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
17	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
18	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
19	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
20	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
21	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
22	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
23	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
24	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
Daily Emission (g)			58	106	218	81	61	166	265	0	62	71	140	51	65	112	170	0	59	97	198	73	62	152	241	0		
Total Daily Emission (g)			954								672								883									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Sunday and Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]																Weighted Average Emission (g)[2]								Weighted Average Emission Rate adopted in the dispersion model (g/s)	
			Catamaran Ferry								Monohull Ferry																	
			Arrival				Departure				Arrival				Departure				Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[3]	Navigation[3]
01	2	3	2.7	4.9	10.1	3.7	4.1	11.1	17.6	0.0	2.9	3.3	6.5	2.4	4.3	7.5	11.4	0.0	2.8	4.5	9.2	3.4	4.1	10.2	16.1	0.0	1.91E-03	1.20E-02
02	2	1	2.7	4.9	10.1	3.7	1.4	3.7	5.9	0.0	2.9	3.3	6.5	2.4	1.4	2.5	3.8	0.0	2.8	4.5	9.2	3.4	1.4	3.4	5.4	0.0	1.15E-03	7.19E-03
03	1	1	1.4	2.5	5.1	1.9	1.4	3.7	5.9	0.0	1.4	1.7	3.3	1.2	1.4	2.5	3.8	0.0	1.4	2.3	4.6	1.7	1.4	3.4	5.4	0.0	7.65E-04	4.81E-03
04	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
05	0	1	0.0	0.0	0.0	0.0	1.4	3.7	5.9	0.0	0.0	0.0	0.0	0.0	1.4	2.5	3.8	0.0	0.0	0.0	0.0	0.0	1.4	3.4	5.4	0.0	3.82E-04	2.43E-03
06	1	0	1.4	2.5	5.1	1.9	0.0	0.0	0.0	0.0	1.4	1.7	3.3	1.2	0.0	0.0	0.0	0.0	1.4	2.3	4.6	1.7	0.0	0.0	0.0	0.0	3.82E-04	2.38E-03
07	1	2	1.4	2.5	5.1	1.9	2.7	7.4	11.8	0.0	1.4	1.7	3.3	1.2	2.9	5.0	7.6	0.0	1.4	2.3	4.6	1.7	2.8	6.8	10.7	0.0	1.15E-03	7.24E-03
08	1	1	1.4	2.5	5.1	1.9	1.4	3.7	5.9	0.0	1.4	1.7	3.3	1.2	1.4	2.5	3.8	0.0	1.4	2.3	4.6	1.7	1.4	3.4	5.4	0.0	7.65E-04	4.81E-03
09	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
10	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
11	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
12	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
13	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
14	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
15	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
16	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
17	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
18	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
19	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
20	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
21	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
22	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
23	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
24	2	2	2.7	4.9	10.1	3.7	2.7	7.4	11.8	0.0	2.9	3.3	6.5	2.4	2.9	5.0	7.6	0.0	2.8	4.5	9.2	3.4	2.8	6.8	10.7	0.0	1.53E-03	9.62E-03
Daily Emission (g)			55	101	208	77	55	151	241	0	59	68	134	49	59	102	155	0	56	93	189	70	56	139	220	0		
Total Daily Emission (g)			888								626								823									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] As there is no information on the vessel types used in each trip, the weighted emission from Catamaran Ferry and Monohull Ferry is adopted for assessment. As advised by the operator, the number of vessels for Catamaran Ferry and Monohull Ferry is 6 and 2 vessels respectively.

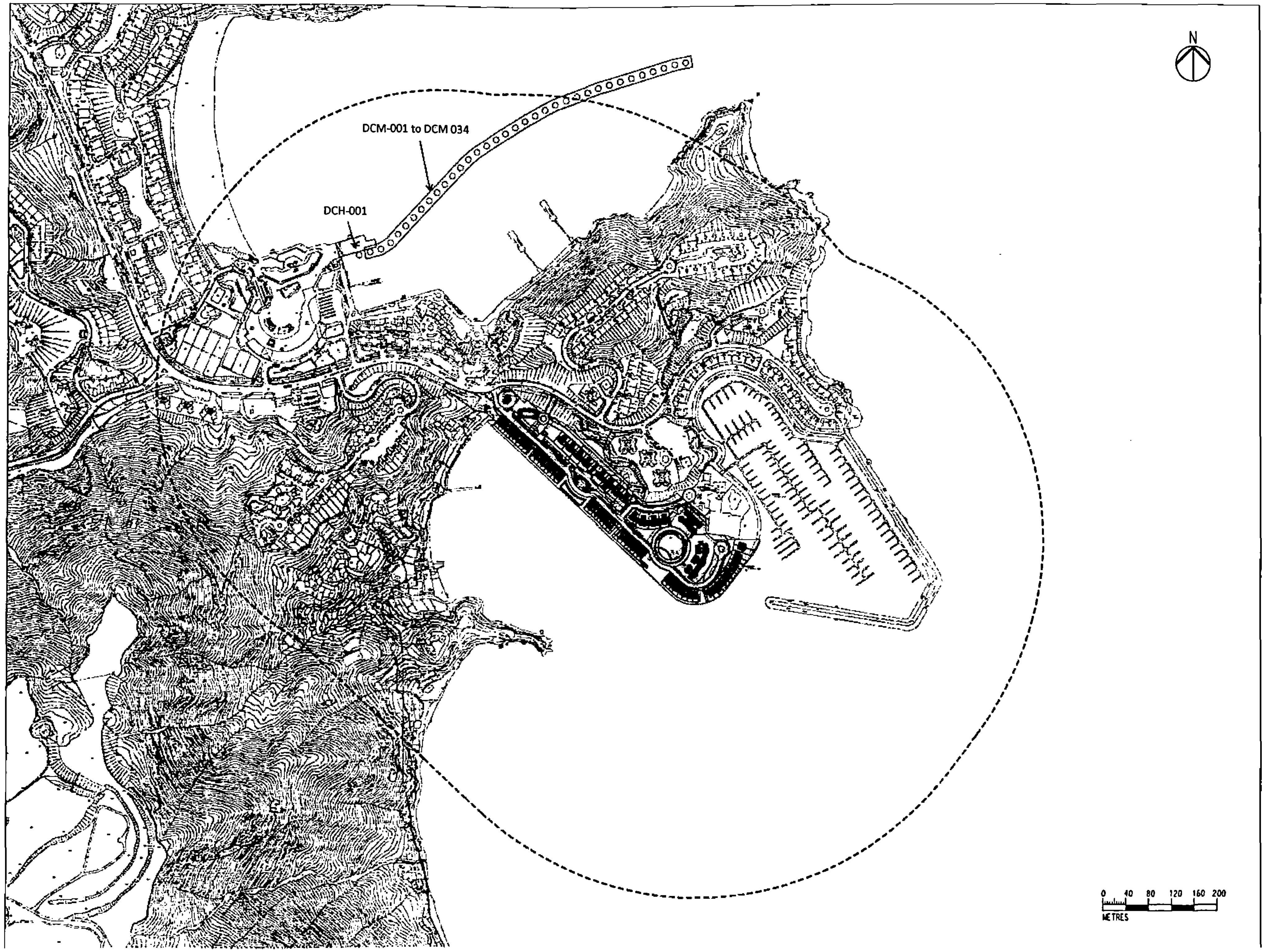
[3] Emission during Hotelling = total emission of hotelling during arrival and departure

Emission during Navigation = total emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Project: Discovery Bay: Optimization of Land Use
Title: Model Input Parameter for Passenger Ferry Service between Discovery Bay and Central

Name	Source ID	Source Type	X	Y	Stack Height / Release Height (m)[3]	Exit Temperature (K)[3]	Exit Velocity (m/s)[4]	Diameter (m)[3]	Emission Rate (g/s)
Hotelling	DCH001	Point	819882	817541	6.2	773	8	0.7	Note [1]
Navigation	DCM001	Point	819901	817546	6.2	773	8	0.7	Note [2]
	DCM002	Point	819920	817551	6.2	773	8	0.7	Note [2]
	DCM003	Point	819937	817562	6.2	773	8	0.7	Note [2]
	DCM004	Point	819951	817576	6.2	773	8	0.7	Note [2]
	DCM005	Point	819965	817591	6.2	773	8	0.7	Note [2]
	DCM006	Point	819979	817605	6.2	773	8	0.7	Note [2]
	DCM007	Point	819993	817619	6.2	773	8	0.7	Note [2]
	DCM008	Point	820007	817634	6.2	773	8	0.7	Note [2]
	DCM009	Point	820021	817648	6.2	773	8	0.7	Note [2]
	DCM010	Point	820034	817663	6.2	773	8	0.7	Note [2]
	DCM011	Point	820048	817677	6.2	773	8	0.7	Note [2]
	DCM012	Point	820062	817692	6.2	773	8	0.7	Note [2]
	DCM013	Point	820076	817706	6.2	773	8	0.7	Note [2]
	DCM014	Point	820091	817719	6.2	773	8	0.7	Note [2]
	DCM015	Point	820108	817729	6.2	773	8	0.7	Note [2]
	DCM016	Point	820125	817740	6.2	773	8	0.7	Note [2]
	DCM017	Point	820142	817751	6.2	773	8	0.7	Note [2]
	DCM018	Point	820159	817761	6.2	773	8	0.7	Note [2]
	DCM019	Point	820176	817772	6.2	773	8	0.7	Note [2]
	DCM020	Point	820194	817782	6.2	773	8	0.7	Note [2]
	DCM021	Point	820211	817792	6.2	773	8	0.7	Note [2]
	DCM022	Point	820229	817800	6.2	773	8	0.7	Note [2]
	DCM023	Point	820248	817807	6.2	773	8	0.7	Note [2]
	DCM024	Point	820266	817814	6.2	773	8	0.7	Note [2]
	DCM025	Point	820285	817821	6.2	773	8	0.7	Note [2]
	DCM026	Point	820304	817828	6.2	773	8	0.7	Note [2]
	DCM027	Point	820323	817834	6.2	773	8	0.7	Note [2]
	DCM028	Point	820342	817839	6.2	773	8	0.7	Note [2]
	DCM029	Point	820361	817845	6.2	773	8	0.7	Note [2]
	DCM030	Point	820381	817851	6.2	773	8	0.7	Note [2]
	DCM031	Point	820400	817857	6.2	773	8	0.7	Note [2]
	DCM032	Point	820419	817862	6.2	773	8	0.7	Note [2]
	DCM033	Point	820438	817868	6.2	773	8	0.7	Note [2]
	DCM034	Point	820458	817872	6.2	773	8	0.7	Note [2]

Note:
[1] Hourly Emission Rates (hotelling) are given in Daily NO_x, RSP, FSP and SO_2 Emission Summary in Page 3 to Page 14.
[2] Hourly Emission Rates (navigation) are given in Daily NO_x, RSP, FSP and SO_2 Emission Summary in Page 3 to Page 14.
Higher emission during slow cruise is found compared with that during maneuvering mode.
Due to the uncertainty on the location of navigation route under each mode, the emission during navigation is evenly distributed among the navigation route as a conservative approach.
The emission rate adopted = (Hourly emission rate of navigation (arrival) + Hourly emission rate of navigation (departure))/Number of Navigation Sources (i.e. 34 sources for this ferry route)
[3] No information from the operator is available. Information for release height, exit temperature and chimney diameter for passenger vessels based on information from approved EIA study "Expansion of Heliport Facilities at Macau Ferry Terminal" (AEIAR-095/2006)
[4] No information from the operator is available. Information for exit velocity of passenger ferries based on information from approved EIA study "Organic Waste Treatment Facilities, Phase I" (AEIAR-149/2010)



Note: As a conservative approach, the navigation route outside 500m assessment area is included in the near-field model.

Engine Power and Load Factors under Different Operation Mode of Main Engine

Main Engine Power (kW)	Vessel Speed (Knots)				Load Factor [4]			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
643 [1]	0.00	4.5[2]	10.0[2]	12.0[3]	0.00	0.30	0.45	0.45

Note:
[1] No information from operator is available. The engine power is referenced to the vessel (GRT 0-499) in Table 4-5 of EPD's "Study on Marine Vessels Emission Inventory".
[2] Vessel speeds under maneuvering (1-8 knots) and slow cruise (8-12 knots) are referenced to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". The average speed of each mode is adopted for assessment purpose.
[3] Vessel speeds under fairway cruise (>12 knots) are referenced to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". 12 knots is adopted for conservative approach that longer TIM will be resulted, hence higher emission.
[4] No information from operator is available. The load factors are referenced to vessel type "all except tug" in Table 4-7 of EPD's "Study on Marine Vessels Emission Inventory".

Engine Power and Load Factors under Different Operation Mode of Auxiliary Engine

Auxiliary Engine Power (kW)	Load Factor			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
66 [1]	0.43[2]	0.43[2]	0.43[2]	0.43[2]

Note:
[1] No information from operator is available. The engine power is referenced to the vessel (GRT 0-499) in Table 4-6 of EPD's "Study on Marine Vessels Emission Inventory".
[2] No information from operator is available. The load factors are referenced to river trade vessel in Table 4-10 of EPD's "Study on Marine Vessels Emission Inventory".

Time-in-mode

Route		Time-in-mode (minutes)			
		Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
Direct travel between Discovery Bay and Peng Chau	Arrival	5.00 [1]	1.20 [2]	1.20 [2]	0.33[5]
	Departure	5.00 [1]	1.80 [2]	1.33 [3]	0.00[3]
Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery	Arrival	5.00 [1]	1.20 [2]	1.20 [2]	0.28 [5]
	Departure	5.00 [1]	1.80 [2]	1.26 [4]	0.00[4]

Note:
[1] The hotelling time is collected from site survey
[2] TIM of maneuvering and slow cruise is referenced to Table 4.15 of EPD's "Study on Marine Vessels Emission Inventory"
[3] The total length of navigation route adopted in the near-field model is 660m for Peng Chau Kaito. During departure, the ferry will leave the modelled navigation route under slow cruise mode.
Therefore, TIM of slow cruise (departure) = Length of navigation route under slow cruise / vessel speed under slow cruise
Length of navigation route under slow cruise = Total navigation route length adopted in the near-field model - Length of navigation route under maneuvering
Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering
[4] The total length of navigation route adopted in the near-field model is 640m for Peng Chau Kaito (via Trappist Haven Monastery). During departure, the ferry will leave the modelled navigation route under slow cruise mode.
Therefore, TIM of slow cruise (departure) = Length of navigation route under slow cruise / vessel speed under slow cruise
Length of navigation route under slow cruise = Total navigation route length adopted in the near-field model - Length of navigation route under maneuvering
Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering
[5] TIM of fairway cruise = Length of navigation route under fairway cruise / vessel speed under fairway cruise
Length of navigation route under fairway cruise = Total navigation route length adopted in the near-field model - Length of navigation route under maneuvering - Length of navigation route under slow cruise
Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering
Length of navigation route under slow cruise = TIM of slow cruise x vessel speed under slow cruise

Emission Factors of Main Engine and Auxiliary Engine

Engine Type	Emission Factors (g/Kwh)				Brake Specific Fuel Consumption (BSFC) [4]	Fuel Sulphur Content (%) [5]
	NO_x	RSP	FSP	SO_2 [3]		
Main Engine [1]	10.00	0.30	0.29	0.21	213	0.05
Auxiliary Engine [2]	10.00	0.40	0.39	0.21	213	0.05

Note:
[1] The emission factors of main engine(Cat.1) (All RTVs except (a) chemical/gas/oil tankers with GRT ≥ 1,000 and (b) all tugs)) in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.
[2] The emission factors of auxiliary engine of RTVs in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.
[3] The emission factors of SO_2 are corrected with the fuel sulphur content according to Section 4.2.31 of EPD's "Study on Marine Vessels Emission Inventory" using the following equation:
SO_2 Emission Factor = BSFC x 2 x 0.9755 x Fuel Sulphur Fraction
[4] BSFC of the vessel is referenced to Section 4.2.27 of EPD's "Study on Marine Vessels Emission Inventory".
[5] With effective of the Air Pollution Control (Marine Light Diesel) Regulation on 1st April, 2014, the fuel sulphur content limit of the MLD is 0.05%.

Daily Profile of Passenger Ferry Service between Discovery Bay and Peng Chau (Direct Travel)[1]

Hours	Number of Trip					
	Arrival[2]			Departure[3]		
	Weekday	Saturday	Sunday / Public Holiday	Weekday	Saturday	Sunday / Public Holiday
01	0	0	0	0	0	0
02	0	0	0	0	0	0
03	0	0	0	0	0	0
04	0	0	0	0	0	0
05	0	0	0	0	0	0
06	0	0	0	0	0	0
07	1	1	1	1	1	1
08	1	1	1	1	1	1
09	1	1	1	1	1	0
10	0	0	0	0	0	1
11	0	0	0	0	0	1
12	0	0	0	1	1	0
13	0	0	0	1	1	1
14	1	1	2	1	1	2
15	0	0	0	0	0	0
16	0	0	0	0	0	0
17	0	0	0	1	1	1
18	1	1	1	1	1	1
19	2	2	2	2	2	2
20	1	1	1	1	1	1
21	0	1	1	1	1	1
22	0	0	0	0	0	1
23	1	1	1	1	1	1
24	0	0	0	0	0	0

Note:
[1] The daily schedule is referenced to Transport Department's website. The sailing time is collected from site survey.
[2] The hour of arrival is determined by the departure time at Peng Chau and the sailing time to arrive Discovery Bay.
E.g. If a ferry departs from Peng Chau at 06:30 (Hour 7) and the sailing time is about 10 minutes collected from site survey, it will arrive Discovery Bay at 06:40 (Hour 7).
The arrival hour of the ferry is therefore Hour 7.
[3] The hour of departure is the hour that the ferry departs at the Discovery Bay.

Daily Profile of Passenger Ferry Service between Discovery Bay and Peng Chau (via Trappist Haven Monastery)[1]

Hours	Number of Trip					
	Arrival[2]			Departure[3]		
	Weekday	Saturday	Sunday / Public Holiday	Weekday	Saturday	Sunday / Public Holiday
01	0	0	0	0	0	0
02	0	0	0	0	0	0
03	0	0	0	0	0	0
04	0	0	0	0	0	0
05	0	0	0	0	0	0
06	0	0	0	0	0	0
07	0	0	0	0	0	0
08	0	0	0	0	0	0
09	1	1	1	1	1	1
10	1	1	1	1	1	1
11	1	1	1	1	1	0
12	1	1	1	0	0	1
13	1	1	1	0	0	0
14	0	0	0	0	0	0
15	1	1	1	1	1	1
16	0	1	1	0	1	1
17	1	1	1	0	0	0
18	1	1	1	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	1	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

Note:
[1] The daily schedule is referenced to Transport Department's website. The sailing time is collected from site survey.
[2] The hour of arrival is determined by the departure time at Peng Chau and the sailing time to arrive Discovery Bay.
E.g. If a ferry departs from Peng Chau at 10:45 (Hour 11) and the sailing time is about 20 minutes collected from site survey, it will arrive Discovery Bay at 11:05 (Hour 12).
The arrival hour of the ferry is therefore Hour 12.
[3] The hour of departure is the hour that the ferry departs at the Discovery Bay.

Daily NOx emission (Weekdays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
08	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
09	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
10	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
11	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
12	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
13	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
14	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
15	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
16	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
17	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
18	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
19	2	2	47	89	127	35	47	133	141	0	2.63E-02	1.46E-01
20	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
21	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			213	398	572	158	307	863	914	0		
Total Daily Emission (g)			3,426									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Saturday)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
08	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
09	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
10	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
11	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
12	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
13	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
14	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
15	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
16	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
17	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
18	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
19	2	2	47	89	127	35	47	133	141	0	2.63E-02	1.46E-01
20	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
21	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			237	443	635	176	307	863	914	0		
Total Daily Emission (g)			3,575									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Sunday / Public Holidays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
08	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
09	1	0	24	44	64	18	0	0	0	0	6.57E-03	3.48E-02
10	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
11	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
12	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
13	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
14	2	2	47	89	127	35	47	133	141	0	2.63E-02	1.46E-01
15	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
16	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
17	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
18	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
19	2	2	47	89	127	35	47	133	141	0	2.63E-02	1.46E-01
20	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
21	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
22	0	1	0	0	0	0	24	66	70	0	6.57E-03	3.80E-02
23	1	1	24	44	64	18	24	66	70	0	1.31E-02	7.28E-02
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			260	487	699	193	355	996	1,055	0		
Total Daily Emission (g)			4,045									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Weekdays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
08	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
09	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
13	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
14	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
18	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
19	2	2	1.9	2.8	3.9	1.1	1.9	4.2	4.3	0.0	1.05E-03	4.52E-03
20	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
21	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.5	12.5	17.7	4.9	12.3	27.0	28.3	0.0		
Total Daily Emission (g)			111.1									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Saturday)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
08	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
09	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
13	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
14	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
18	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
19	2	2	1.9	2.8	3.9	1.1	1.9	4.2	4.3	0.0	1.05E-03	4.52E-03
20	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
21	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			9.5	13.8	19.6	5.4	12.3	27.0	28.3	0.0		
Total Daily Emission (g)			115.9									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Sunday / Public Holidays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
08	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
09	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.08E-03
10	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
11	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
14	2	2	1.9	2.8	3.9	1.1	1.9	4.2	4.3	0.0	1.05E-03	4.52E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
18	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
19	2	2	1.9	2.8	3.9	1.1	1.9	4.2	4.3	0.0	1.05E-03	4.52E-03
20	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
21	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
22	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.2	0.0	2.63E-04	1.18E-03
23	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.2	0.0	5.26E-04	2.26E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			10.4	15.2	21.6	6.0	14.2	31.1	32.6	0.0		
Total Daily Emission (g)			131.1									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Weekdays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
08	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
09	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
13	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
14	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
18	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
19	2	2	1.8	2.7	3.8	1.1	1.8	4.0	4.2	0.0	1.02E-03	4.39E-03
20	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
21	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.3	12.1	17.1	4.7	12.0	26.2	27.4	0.0		
Total Daily Emission (g)			107.9									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Saturday)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
08	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
09	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
13	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
14	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
18	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
19	2	2	1.8	2.7	3.8	1.1	1.8	4.0	4.2	0.0	1.02E-03	4.39E-03
20	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
21	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			9.2	13.4	19.1	5.3	12.0	26.2	27.4	0.0		
Total Daily Emission (g)			112.6									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Sunday / Public Holidays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
08	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
09	1	0	0.9	1.3	1.9	0.5	0.0	0.0	0.0	0.0	2.56E-04	1.05E-03
10	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
11	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
14	2	2	1.8	2.7	3.8	1.1	1.8	4.0	4.2	0.0	1.02E-03	4.39E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
18	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
19	2	2	1.8	2.7	3.8	1.1	1.8	4.0	4.2	0.0	1.02E-03	4.39E-03
20	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
21	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
22	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.1	0.0	2.56E-04	1.15E-03
23	1	1	0.9	1.3	1.9	0.5	0.9	2.0	2.1	0.0	5.12E-04	2.19E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			10.1	14.8	21.0	5.8	13.8	30.2	31.6	0.0		
Total Daily Emission (g)			127.4									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Weekdays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
08	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
09	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
13	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
14	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
18	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
19	2	2	1.0	1.8	2.6	0.7	1.0	2.8	2.9	0.0	5.47E-04	3.03E-03
20	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
21	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			4.4	8.3	11.9	3.3	6.4	18.0	19.0	0.0		
Total Daily Emission (g)			71.3									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Saturday)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
08	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
09	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
13	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
14	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
18	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
19	2	2	1.0	1.8	2.6	0.7	1.0	2.8	2.9	0.0	5.47E-04	3.03E-03
20	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
21	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
	Daily Emission (g)		4.9	9.2	13.2	3.7	6.4	18.0	19.0	0.0		
	Total Daily Emission (g)		74.4									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Sunday / Public Holidays)(Direct Travel between Discovery Bay and Peng Chau)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
08	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
09	1	0	0.5	0.9	1.3	0.4	0.0	0.0	0.0	0.0	1.37E-04	7.25E-04
10	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
11	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
14	2	2	1.0	1.8	2.6	0.7	1.0	2.8	2.9	0.0	5.47E-04	3.03E-03
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
18	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
19	2	2	1.0	1.8	2.6	0.7	1.0	2.8	2.9	0.0	5.47E-04	3.03E-03
20	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
21	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
22	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.5	0.0	1.37E-04	7.91E-04
23	1	1	0.5	0.9	1.3	0.4	0.5	1.4	1.5	0.0	2.74E-04	1.52E-03
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			5.4	10.1	14.6	4.0	7.4	20.7	22.0	0.0		
Total Daily Emission (g)			84.2									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Weekdays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
09	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
10	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
11	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
12	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
13	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
14	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
15	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
16	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
17	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
18	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
19	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
20	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
21	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			189	354	508	118	95	266	268	0		
Total Daily Emission (g)			1,797									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Saturday)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
09	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
10	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
11	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
12	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
13	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
14	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
15	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
16	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
17	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
18	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
19	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
20	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
21	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
22	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			213	398	572	132	142	398	401	0		
Total Daily Emission (g)			2,257									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Sunday / Public Holidays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
09	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
10	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
11	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
12	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
13	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
14	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
15	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
16	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
17	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
18	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
19	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
20	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
21	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			213	398	572	132	118	332	335	0		
Total Daily Emission (g)			2,100									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Weekdays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
10	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
11	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
12	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
13	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
18	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			7.6	11.1	15.7	3.6	3.8	8.3	8.3	0.0		
Total Daily Emission (g)			58.3									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Saturday)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
10	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
11	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
12	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
13	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
16	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
17	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
18	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.5	12.5	17.7	4.1	5.7	12.5	12.4	0.0		
Total Daily Emission (g)			73.3									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Sunday / Public Holidays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
10	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
11	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
12	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
13	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
16	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
17	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
18	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.5	12.5	17.7	4.1	4.7	10.4	10.3	0.0		
Total Daily Emission (g)			68.2									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Weekdays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
10	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
11	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
12	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
13	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
18	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			7.4	10.8	15.2	3.5	3.7	8.1	8.0	0.0		
Total Daily Emission (g)			56.7									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Saturday)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
10	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
11	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
12	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
13	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
16	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
17	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
18	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.3	12.1	17.1	4.0	5.5	12.1	12.0	0.0		
Total Daily Emission (g)			71.2									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Sunday / Public Holidays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
10	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
11	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
12	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
13	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
16	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
17	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
18	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			8.3	12.1	17.1	4.0	4.6	10.1	10.0	0.0		
Total Daily Emission (g)			66.2									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO2 emission (Weekdays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
10	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
11	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
12	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
13	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
18	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			3.9	7.4	10.6	2.5	2.0	5.5	5.6	0.0		
Total Daily Emission (g)			37.4									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO2 emission (Saturday)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
10	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
11	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
12	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
13	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
16	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
17	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
18	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			4.4	8.3	11.9	2.8	3.0	8.3	8.4	0.0		
Total Daily Emission (g)			47.0									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO2 emission (Sunday / Public Holidays)(Travel between Discovery Bay and Peng Chau via Trappist Haven Monastery)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
10	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
11	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
12	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
13	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
16	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
17	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
18	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			4.4	8.3	11.9	2.8	2.5	6.9	7.0	0.0		
Total Daily Emission (g)			43.7									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Title: Model Input Parameter for Passenger Ferry Service between Discovery Bay and Peng Chau

Name	Source ID	Source Type	X	Y	Stack Height / Release Height (m)[3]	Exit Temperature (K)[3]	Exit Velocity (m/s)[4]	Diameter (m)[3]	Emission Rate (g/s)
Hotelling (Direct Travel)	DPH001	Point	820373	817006	6.2	773	8	0.7	Note [1]
Navigation (Direct Travel)	DPM001	Point	820370	816986	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM002	Point	820367	816966	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM003	Point	820370	816946	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM004	Point	820384	816933	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM005	Point	820399	816919	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM006	Point	820413	816905	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM007	Point	820427	816891	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM008	Point	820441	816876	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM009	Point	820456	816862	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM010	Point	820470	816848	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM011	Point	820485	816836	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM012	Point	820501	816823	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM013	Point	820517	816811	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM014	Point	820532	816798	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM015	Point	820548	816786	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM016	Point	820564	816773	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM017	Point	820579	816761	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM018	Point	820595	816748	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM019	Point	820610	816736	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM020	Point	820626	816723	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM021	Point	820642	816711	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM022	Point	820657	816698	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM023	Point	820673	816686	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM024	Point	820688	816673	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM025	Point	820704	816661	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM026	Point	820720	816648	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM027	Point	820735	816636	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM028	Point	820751	816623	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM029	Point	820767	816611	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM030	Point	820782	816598	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM031	Point	820798	816586	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM032	Point	820813	816573	6.2	773	8	0.7	Note [2]
Navigation (Direct Travel)	DPM033	Point	820829	816561	6.2	773	8	0.7	Note [2]

Note:

[1] The emission rate adopted = Hourly emission of hotelling (arrival) + Hourly emission of hotelling (departure) (Hourly Emission Rates (hotelling) are given in Daily NOx, RSP, FSP and SO_2 Emission Summary in Page 19 to Page 42)

[2] The emission rate adopted = (Hourly emission rate of navigation (arrival) + Hourly emission rate of navigation (departure))/Number of Navigation Sources (i.e. 33 sources for this ferry route) (Hourly Emission Rates (navigation) are given in Daily NOx, RSP, FSP and SO_2 Emission Summary in Page 19 to Page 42)

Higher emission during slow cruise is found compared to those during fairway cruise and maneuvering modes.

Due to the uncertainty on the location of navigation route under each mode, the emission during navigation is evenly distributed among the navigation route as a conservative approach.

[3] No information from the operator is available. Information for release height, exit temperature and chimney diameter for passenger vessels based on information from approved EIA study "Expansion of Heliport Facilities at Macau Ferry Terminal"(AEIAR-095/2006)

[4] No information from the operator is available. Information for exit velocity of passenger ferries based on information from approved EIA study "Organic Waste Treatment Facilities, Phase I" (AEIAR-149/2010)

Name	Source ID	Source Type	X	Y	Stack Height / Release Height (m)[3]	Exit Temperature (K)[3]	Exit Velocity (m/s)[4]	Diameter (m)[3]	Emission Rate (g/s)
Hotelling (via Trappist Haven Monastery)	DTH001	Point	820373	817006	6.2	773	8	0.7	Note [1]
Navigation (via Trappist Haven Monastery)	DTM001	Point	820369	816986	6.2	773	8	0.7	Note [2]
	DTM002	Point	820366	816966	6.2	773	8	0.7	Note [2]
	DTM003	Point	820368	816947	6.2	773	8	0.7	Note [2]
	DTM004	Point	820382	816932	6.2	773	8	0.7	Note [2]
	DTM005	Point	820397	816918	6.2	773	8	0.7	Note [2]
	DTM006	Point	820411	816904	6.2	773	8	0.7	Note [2]
	DTM007	Point	820425	816890	6.2	773	8	0.7	Note [2]
	DTM008	Point	820439	816876	6.2	773	8	0.7	Note [2]
	DTM009	Point	820453	816862	6.2	773	8	0.7	Note [2]
	DTM010	Point	820467	816848	6.2	773	8	0.7	Note [2]
	DTM011	Point	820481	816834	6.2	773	8	0.7	Note [2]
	DTM012	Point	820494	816818	6.2	773	8	0.7	Note [2]
	DTM013	Point	820507	816802	6.2	773	8	0.7	Note [2]
	DTM014	Point	820519	816787	6.2	773	8	0.7	Note [2]
	DTM015	Point	820530	816770	6.2	773	8	0.7	Note [2]
	DTM016	Point	820535	816750	6.2	773	8	0.7	Note [2]
	DTM017	Point	820540	816731	6.2	773	8	0.7	Note [2]
	DTM018	Point	820545	816712	6.2	773	8	0.7	Note [2]
	DTM019	Point	820550	816692	6.2	773	8	0.7	Note [2]
	DTM020	Point	820555	816673	6.2	773	8	0.7	Note [2]
	DTM021	Point	820560	816654	6.2	773	8	0.7	Note [2]
	DTM022	Point	820565	816634	6.2	773	8	0.7	Note [2]
	DTM023	Point	820570	816615	6.2	773	8	0.7	Note [2]
	DTM024	Point	820575	816596	6.2	773	8	0.7	Note [2]
	DTM025	Point	820580	816576	6.2	773	8	0.7	Note [2]
	DTM026	Point	820585	816557	6.2	773	8	0.7	Note [2]
	DTM027	Point	820590	816538	6.2	773	8	0.7	Note [2]
	DTM028	Point	820596	816518	6.2	773	8	0.7	Note [2]
	DTM029	Point	820601	816499	6.2	773	8	0.7	Note [2]
	DTM030	Point	820606	816480	6.2	773	8	0.7	Note [2]
	DTM031	Point	820611	816460	6.2	773	8	0.7	Note [2]
	DTM032	Point	820616	816441	6.2	773	8	0.7	Note [2]

Note:

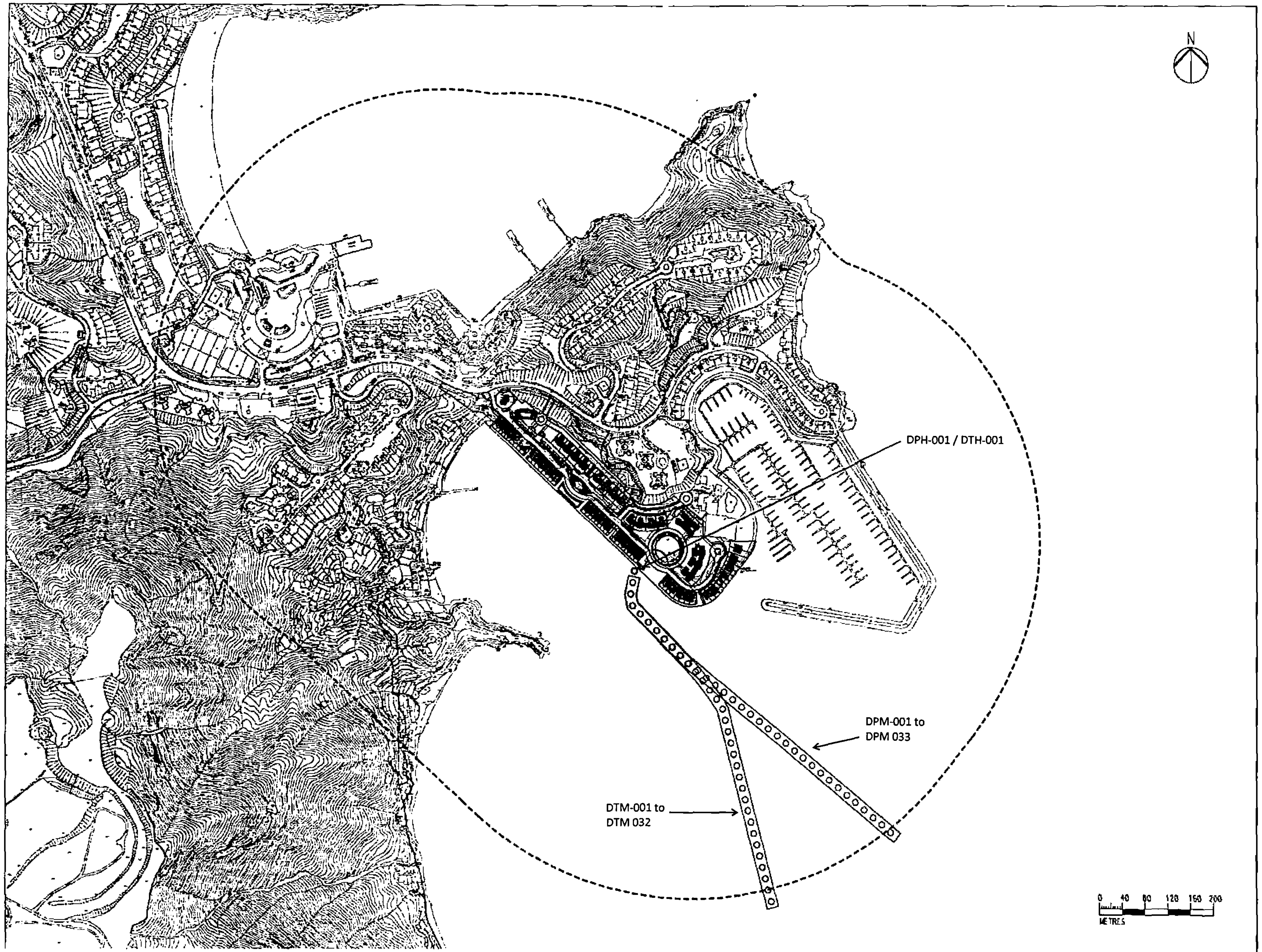
[1] The emission rate adopted = Hourly emission of hotelling (arrival) + Hourly emission of hotelling (departure) (Hourly Emission Rates (hotelling) are given in Daily NOx, RSP, FSP and SO_2 Emission Summary in Page 19 to Page 42)

[2] The emission rate adopted = (Hourly emission rate of navigation (arrival) + Hourly emission rate of navigation (departure))/Number of Navigation Sources (i.e. 32 sources for this ferry route) (Hourly Emission Rates (navigation) are given in Daily NOx, RSP, FSP and SO2 Emission Summary in Page 19 to Page 42)
Higher emission of slow cruise is found compared with fairway cruise and maneuvering mode.
Due to the uncertainty on the location of navigation route under each mode, the emission during navigation is evenly distributed among the navigation route as a conservative approach.

[3] No information from the operator is available. Information for release height, exit temperature and chimney diameter for passenger vessels based on information from approved EIA study "Expansion of Heliport Facilities at Macau Ferry Terminal"(AEIAR-095/2006)

[4] No information from the operator is available. Information for exit velocity of passenger ferries based on information from approved EIA study "Organic Waste Treatment Facilities, Phase I" (AEIAR-149/2010)

Project: Discovery Bay: Optimization of Land Use
Title: Model Input Parameter for Passenger Ferry Service between Discovery Bay and Peng Chau



Note: As a conservative approach, the navigation route outside 500m assessment area is included in the near-field model.

Engine Power and Load Factors under Different Operation Mode of Main Engine

Main Engine Power (kW)	Vessel Speed (Knots)				Load Factor [4]			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
643 [1]	0.00	4.5[2]	10.0[2]	12.0[3]	0.00	0.30	0.45	0.45

Note:

[1] No information from operator is available. The engine power is referenced to the vessel (GRT 0-499) in Table 4-5 of EPD's "Study on Marine Vessels Emission Inventory".

[2] Vessel speeds under maneuvering (1-8 knots) and slow cruise (8-12 knots) are referenced to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". The average speed of each mode is adopted for assessment purpose.

[3] Vessel speeds under fairway cruise (>12 knots) are referenced to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". 12 knots is adopted for conservative approach that longer TIM will be resulted, hence higher emission.

[4] No information from operator is available. The load factors are referenced to vessel type "all except tug" in Table 4-7 of EPD's "Study on Marine Vessels Emission Inventory".

Engine Power and Load Factors under Different Operation Mode of Auxiliary Engine

Auxiliary Engine Power (kW)	Load Factor [2]			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
66 [1]	0.43[2]	0.43[2]	0.43[2]	0.43[2]

Note:

[1] No information from operator is available. The engine power is referenced to the vessel (GRT 0-499) in Table 4-6 of EPD's "Study on Marine Vessels Emission Inventory".

[2] No information from operator is available. The load factors are referenced to river trade vessel in Table 4-10 of EPD's "Study on Marine Vessels Emission Inventory".

Time-in-mode

	Time-in-mode (minutes)			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
Arrival	5.00 [1]	1.20 [2]	1.20 [2]	0.28[4]
Departure	5.00 [1]	1.80 [2]	1.26 [3]	0.00[4]

Note:

[1] The hotelling time is collected from site survey

[2] TIM of maneuvering and slow cruise (except departure) is referenced to Table 4.15 of EPD's "Study on Marine Vessels Emission Inventory"

[3] The Total length of navigation route adopted in the near-field model is 640m for Mui Wo Kaito. During departure, the ferry will leave the modelled navigation route under slow cruise mode.

Therefore, TIM of slow cruise (departure) = Length of navigation route under slow cruise / vessel speed under slow cruise

Length of navigation route under slow cruise = Total navigation route length adopted in the near-field model - Length of navigation route under maneuvering

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

[4] TIM of fairway cruise = Length of navigation route under fairway cruise / vessel speed under fairway cruise

Length of navigation route under fairway cruise = Total navigation route length adopted in the near-field model (640m) - Length of navigation route under maneuvering - Length of navigation route under slow cruise

Length of navigation route under maneuvering = TIM of maneuvering x vessel speed under maneuvering

Length of navigation route under slow cruise = TIM of slow cruise x vessel speed under slow cruise

Emission Factors of Main Engine and Auxiliary Engine

Engine Type	Emission Factors (g/Kwh)				Brake Specific Fuel Consumption (BSFC) [4]	Fuel Sulphur Content (%) [5]
	NO_x	RSP	FSP	SO_2 [3]		
Main Engine [1]	10.00	0.30	0.29	0.21	213	0.05
Auxiliary Engine [2]	10.00	0.40	0.39	0.21	213	0.05

Note:

[1] The emission factors of main engine(Cat.1) (All RTVs except (a) chemical/gas/oil tankers with GRT ≥ 1,000 and (b) all tugs)) in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[2] The emission factors of auxiliary engine of RTVs in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[3] The emission factors of SO_2 are corrected with the fuel sulphur content according to Section 4.2.31 of EPD's "Study on Marine Vessels Emission Inventory" using the following equation:

SO_2 Emission Factor = BSFC x 2 x 0.9755 x Fuel Sulphur Fraction

[4] BSFC of the vessel is referenced to Section 4.2.27 of EPD's "Study on Marine Vessels Emission Inventory".

[5] With effective of the Air Pollution Control (Marine Light Diesel) Regulation on 1st April, 2014, the fuel sulphur content limit of the MLD is 0.05%.

Daily Profile of Passenger Ferry Service between Discovery Bay and Mui Wo [1]

Hours	Number of Trip					
	Arrival [2]			Departure [3]		
	Weekday	Saturday	Sunday / Public Holiday	Weekday	Saturday	Sunday / Public Holiday
01	0	0	0	0	0	0
02	0	0	0	0	0	0
03	0	0	0	0	0	0
04	0	0	0	0	0	0
05	0	0	0	0	0	0
06	0	0	0	0	0	0
07	0	0	0	0	0	0
08	1	0	0	0	1	0
09	0	1	0	0	0	1
10	0	0	1	0	0	0
11	0	0	0	0	1	1
12	0	1	1	0	0	1
13	0	0	1	0	0	0
14	0	0	0	0	1	1
15	0	1	1	0	0	0
16	0	0	1	1	0	1
17	0	0	0	0	1	1
18	0	1	1	0	0	0
19	0	0	0	0	1	1
20	0	1	1	0	0	0
21	0	1	1	0	1	1
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

Note:

[1] The daily schedule and sailing time of the ferry service is referenced to Transport Department's website.

[2] The hour of arrival is determined by the departure time at Mui Wo and the sailing time to arrive Discovery Bay.

E.g. If a ferry departs from Mui Wo at 07:45 (Hour 8) and the sailing time is 20 minutes from Transport Department's website, it will arrive Discovery Bay at 08:05 (Hour 9).

The arrival hour of the ferry is therefore Hour 9.

[3] The hour of departure is the hour that the ferry departs at the Discovery Bay.

Daily NOx emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
09	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
10	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
11	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
12	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
13	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
14	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
15	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
16	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
17	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
18	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
19	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
20	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
21	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			24	44	64	15	24	66	67	0		
Total Daily Emission (g)			303									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
09	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
10	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
11	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
12	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
13	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
14	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
15	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
16	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
17	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
18	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
19	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
20	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
21	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			142	266	381	88	142	398	401	0		
Total Daily Emission (g)			1,819									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily NOx emission (Sunday / Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
08	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
09	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
10	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
11	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
12	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
13	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
14	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
15	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
16	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
17	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
18	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
19	0	1	0	0	0	0	24	66	67	0	6.57E-03	3.70E-02
20	1	0	24	44	64	15	0	0	0	0	6.57E-03	3.40E-02
21	1	1	24	44	64	15	24	66	67	0	1.31E-02	7.11E-02
22	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			189	354	508	118	189	531	535	0		
Total Daily Emission (g)			2,425									

Note:
[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip
Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)
[2] Emission during Hotelling = Emission of hotelling during arrival and departure
Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
09	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
17	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
18	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0		
Total Daily Emission (g)			9.8									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
09	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
12	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
15	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
18	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
19	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
20	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
21	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			5.7	8.3	11.8	2.7	5.7	12.5	12.4	0.0		
Total Daily Emission (g)			59.0									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily RSP emission (Sunday / Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
10	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
11	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
12	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
13	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
14	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
15	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
16	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
17	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
18	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
19	0	1	0.0	0.0	0.0	0.0	0.9	2.1	2.1	0.0	2.63E-04	1.15E-03
20	1	0	0.9	1.4	2.0	0.5	0.0	0.0	0.0	0.0	2.63E-04	1.06E-03
21	1	1	0.9	1.4	2.0	0.5	0.9	2.1	2.1	0.0	5.26E-04	2.21E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			7.6	11.1	15.7	3.6	7.6	16.6	16.5	0.0		
Total Daily Emission (g)			78.7									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
09	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
17	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
18	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0		
Total Daily Emission (g)			9.6									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
09	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
12	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
15	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
18	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
19	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
20	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
21	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			5.5	8.1	11.4	2.6	5.5	12.1	12.0	0.0		
Total Daily Emission (g)			57.3									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily FSP emission (Sunday / Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
10	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
11	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
12	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
13	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
14	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
15	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
16	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
17	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
18	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
19	0	1	0.0	0.0	0.0	0.0	0.9	2.0	2.0	0.0	2.56E-04	1.12E-03
20	1	0	0.9	1.3	1.9	0.4	0.0	0.0	0.0	0.0	2.56E-04	1.03E-03
21	1	1	0.9	1.3	1.9	0.4	0.9	2.0	2.0	0.0	5.12E-04	2.14E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			7.4	10.8	15.2	3.5	7.4	16.1	16.1	0.0		
Total Daily Emission (g)			76.5									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Weekdays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
09	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
12	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
15	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
16	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
17	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
18	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
19	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
20	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0		
Total Daily Emission (g)			6.3									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip
Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure
Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Saturday)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
09	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
10	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
11	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
12	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
13	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
14	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
15	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
16	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
17	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
18	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
19	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
20	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
21	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			3.0	5.5	7.9	1.8	3.0	8.3	8.4	0.0		
Total Daily Emission (g)			37.9									

Note:

[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Daily SO_2 emission (Sunday / Public Holidays)

Hour	Number of Trip		Total Emission (g)[1]								Emission Rate (g/s)	
			Arrival				Departure					
	Arrival	Departure	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
09	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
10	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
11	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
12	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
13	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
14	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
15	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
16	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
17	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
18	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
19	0	1	0.0	0.0	0.0	0.0	0.5	1.4	1.4	0.0	1.37E-04	7.71E-04
20	1	0	0.5	0.9	1.3	0.3	0.0	0.0	0.0	0.0	1.37E-04	7.09E-04
21	1	1	0.5	0.9	1.3	0.3	0.5	1.4	1.4	0.0	2.74E-04	1.48E-03
22	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			3.9	7.4	10.6	2.5	3.9	11.1	11.1	0.0		
Total Daily Emission (g)			50.5									

Note:
[1] Total Emission = (Main Engine Emission + Auxiliary Engine Emission) x Number of Trip
Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)
[2] Emission during Hotelling = Emission of hotelling during arrival and departure
Emission during Navigation = Emission of navigation (Maneuvering + Slow Cruise + Fairway Cruise) during arrival and departure

Name	Source ID	Source Type	X	Y	Stack Height / Release Height (m)[3]	Exit Temperature (K)[3]	Exit Velocity (m/s)[4]	Diameter (m)[3]	Emission Rate (g/s)
Hotelling	DMH001	Point	820373	817006	6.2	773	8	0.7	Note [1]
Navigation	DMM001	Point	820369	816986	6.2	773	8	0.7	Note [2]
	DMM002	Point	820366	816966	6.2	773	8	0.7	Note [2]
	DMM003	Point	820368	816947	6.2	773	8	0.7	Note [2]
	DMM004	Point	820382	816932	6.2	773	8	0.7	Note [2]
	DMM005	Point	820397	816918	6.2	773	8	0.7	Note [2]
	DMM006	Point	820411	816904	6.2	773	8	0.7	Note [2]
	DMM007	Point	820425	816890	6.2	773	8	0.7	Note [2]
	DMM008	Point	820439	816876	6.2	773	8	0.7	Note [2]
	DMM009	Point	820453	816862	6.2	773	8	0.7	Note [2]
	DMM010	Point	820467	816848	6.2	773	8	0.7	Note [2]
	DMM011	Point	820481	816834	6.2	773	8	0.7	Note [2]
	DMM012	Point	820494	816818	6.2	773	8	0.7	Note [2]
	DMM013	Point	820507	816802	6.2	773	8	0.7	Note [2]
	DMM014	Point	820519	816787	6.2	773	8	0.7	Note [2]
	DMM015	Point	820530	816770	6.2	773	8	0.7	Note [2]
	DMM016	Point	820535	816750	6.2	773	8	0.7	Note [2]
	DMM017	Point	820540	816731	6.2	773	8	0.7	Note [2]
	DMM018	Point	820545	816712	6.2	773	8	0.7	Note [2]
	DMM019	Point	820550	816692	6.2	773	8	0.7	Note [2]
	DMM020	Point	820555	816673	6.2	773	8	0.7	Note [2]
	DMM021	Point	820560	816654	6.2	773	8	0.7	Note [2]
	DMM022	Point	820565	816634	6.2	773	8	0.7	Note [2]
	DMM023	Point	820570	816615	6.2	773	8	0.7	Note [2]
	DMM024	Point	820575	816596	6.2	773	8	0.7	Note [2]
	DMM025	Point	820580	816576	6.2	773	8	0.7	Note [2]
	DMM026	Point	820585	816557	6.2	773	8	0.7	Note [2]
	DMM027	Point	820590	816538	6.2	773	8	0.7	Note [2]
	DMM028	Point	820596	816518	6.2	773	8	0.7	Note [2]
	DMM029	Point	820601	816499	6.2	773	8	0.7	Note [2]
	DMM030	Point	820606	816480	6.2	773	8	0.7	Note [2]
	DMM031	Point	820611	816460	6.2	773	8	0.7	Note [2]
	DMM032	Point	820616	816441	6.2	773	8	0.7	Note [2]

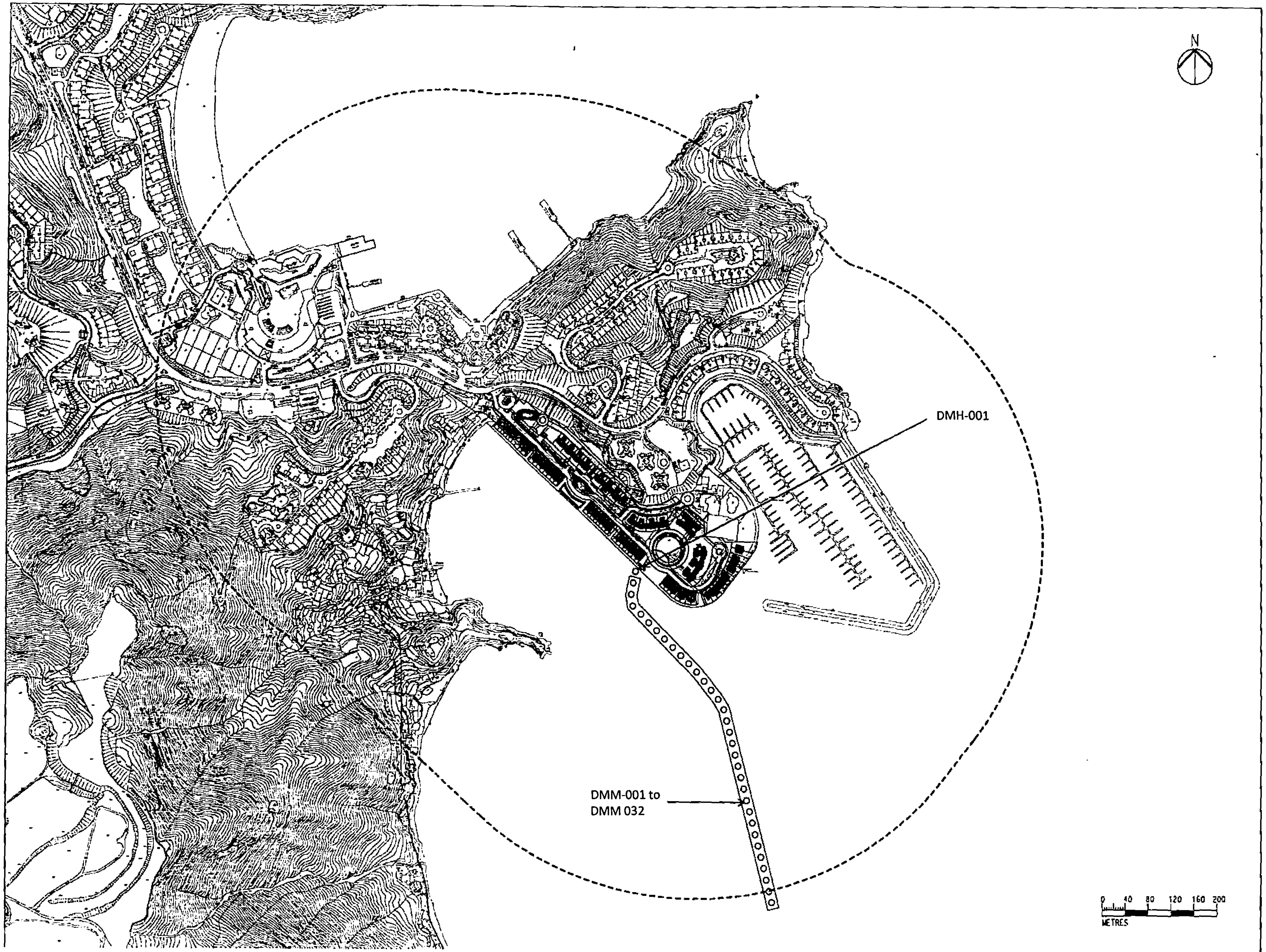
Note:

[1] The emission rate adopted = Hourly emission of hotelling (arrival) + Hourly emission of hotelling (departure) (Hourly Emission Rates (hotelling) are given in Daily NOx, RSP, FSP and SO_2 Emission Summary in Page 48 to Page 59)

[2] The emission rate adopted = (Hourly emission rate of navigation (arrival) + Hourly emission rate of navigation (departure))/Number of Navigation Sources (i.e. 32 sources for this ferry route) (Hourly Emission Rates (navigation) are given in Daily NOx, RSP, FSP and SO_2 Emission Summary in Page 48 to Page 59)
Higher emission of slow cruise is found compared with fairway cruise and maneuvering mode.
Due to the uncertainty on the location of navigation route under each mode, the emission during navigation is evenly distributed among the navigation route as a conservative approach.

[3] No information from the operator is available. Information for release height, exit temperature and chimney diameter for passenger vessels based on information from approved EIA study "Expansion of Heliport Facilities at Macau Ferry Terminal"(AEIAR-095/2006)

[4] No information from the operator is available. Information for exit velocity of passenger ferries based on information from approved EIA study "Organic Waste Treatment Facilities, Phase I" (AEIAR-149/2010)



Note: As a conservative approach, the navigation route outside 500m assessment area is included in the near-field model.

Engine Power and Load Factors under Different Operation Mode of Main Engine

Main Engine Power (kW)	Maximum Design Speed of the Vessel (Knots)	Vessel Speed (Knots)				Load Factor			
		Hotelling	Maneuvering	Slow Cruise	Fairway Cruise	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
637.83[1]	6.5[2]	0.0	3.0[2]	N/A[3]	N/A[3]	0.00	0.50[2]	N/A[3]	N/A[3]

Note:

[1] Information provided by the operator. Only the tug boast is installed with main engine.

[2] Information provided by the operator.

[3] As advised by operator, the navigation speed of tug boat/barge is 3 knots and it is defined as maneuvering mode (1-8 knots) according to Table 3-24 of EPD's "Study on Marine Vessels Emission Inventory". Therefore, there is no slow cruise (8-12 knots) and fairway cruise (>12knots) mode for tug boat/barge.

Engine Power and Load Factors under Different Operation Mode of Auxiliary Engine

Total Engine Power (kW)	Load Factor			
	Hotelling	Maneuvering	Slow Cruise	Fairway Cruise
96.77[1]	0.43[2]	0.43	N/A[2]	N/A[2]

Note:

[1] Information provided by the operator. The engine power is the total power of tug boat and barge.

[2] No available information from operator. The load factors are referenced to river trade vessels in Table 4-10 of EPD's "Study on Marine Vessels Emission Inventory"
As advised by operator, the maximum design speed of tug boat/barge is 6.5 knots, there is no slow cruise and fairway cruise mode for tug boat/barge

Time-in-mode

	Time-in-mode (minutes)			
	Hotelling [1]	Maneuvering [2]	Slow Cruise [3]	Fairway Cruise [4]
Arrival	60.00	10.80	NA	NA
Departure		10.80	NA	NA

Note:

[1] A continuous operation of the auxiliary engine is assumed from 7:00 am to 7:00pm during weekdays as a very conservative assumption.
The 60 minutes showed in the table means the engine is operating continuously in a hour for the purpose of calcualting the hourly emission.

[2] Maneuvering: TIM = Length of the navigation path adopted in the near-field model (1,000m) / navigation speed under maneuvering mode

[3] Slow Cruise: No slow cruise mode for tug boat and barge

[4] Fairway Cruise: No fairway cruise mode for tug boat and barge

Emission Factors of Main Engine and Auxiliary Engine

Engine Type	Emission Factors (g/Kwh)				Brake Specific Fuel Consumption (BSFC) [4]	Fuel Sulphur Content (%) [5]
	NO_X	RSP	FSP	SO_2 [3]		
Main Engine [1]	13.20	0.72	0.70	0.21	213	0.05
Auxiliary Engine [2]	10.00	0.40	0.39	0.21	213	0.05

Note:

[1] Emission factors of Main Engine(Cat.2) (Chemical/gas/oil tankers with GRT ≥ 1,000 and all tugs boats) in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[2] Emission factors of auxiliary engine of RTVs in Table 4-16 of EPD's "Study on Marine Vessels Emission Inventory" are adopted.

[3] The emission factors of SO_2 are corrected with the fuel sulphur content according to Section 4.2.31 of EPD's "Study on Marine Vessels Emission Inventory" using the following equation:
SO_2 Emission Factor = BSFC x 2 x 0.9755 x Fuel Sulphur Fraction

[4] BSFC of the vessel is referenced to Section 4.2.27 of EPD's "Study on Marine Vessels Emission Inventory".

[5] With effective of the Air Pollution Control (Marine Light Diesel) Regulation on 1st April, 2014, the fuel sulphur content limit of the MLD is 0.05%.

Daily NO_x emission (Weekdays only)

Hour	Number of Trip		Total Emission (g) [1]			Emission Rate (g/s)	
	Arrival	Departure	Hotelling	Arrival Maneuvering	Departure Maneuvering	Hotelling[2]	Navigation[2]
01	0	0	0	0	0	0.00E+00	0.00E+00
02	0	0	0	0	0	0.00E+00	0.00E+00
03	0	0	0	0	0	0.00E+00	0.00E+00
04	0	0	0	0	0	0.00E+00	0.00E+00
05	0	0	0	0	0	0.00E+00	0.00E+00
06	0	0	0	0	0	0.00E+00	0.00E+00
07	0	0	0	0	0	0.00E+00	0.00E+00
08	1	1	416	833	833	1.16E-01	4.63E-01
09	1	1	416	833	833	1.16E-01	4.63E-01
10	1	1	416	833	833	1.16E-01	4.63E-01
11	1	1	416	833	833	1.16E-01	4.63E-01
12	1	1	416	833	833	1.16E-01	4.63E-01
13	1	1	416	833	833	1.16E-01	4.63E-01
14	1	1	416	833	833	1.16E-01	4.63E-01
15	1	1	416	833	833	1.16E-01	4.63E-01
16	1	1	416	833	833	1.16E-01	4.63E-01
17	1	1	416	833	833	1.16E-01	4.63E-01
18	1	1	416	833	833	1.16E-01	4.63E-01
19	1	1	416	833	833	1.16E-01	4.63E-01
20	0	0	0	0	0	0.00E+00	0.00E+00
21	0	0	0	0	0	0.00E+00	0.00E+00
22	0	0	0	0	0	0.00E+00	0.00E+00
23	0	0	0	0	0	0.00E+00	0.00E+00
24	0	0	0	0	0	0.00E+00	0.00E+00
Daily Emission (g)			4,993	9,992	9,992		
Total Daily Emission (g)			24,977				

Note:

[1] Total Emission = Main Engine Emission + Auxiliary Engine Emission

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of maneuvering during arrival and departure

Daily RSP emission (Weekdays only)

Hour	Number of Trip		Total Emission (g) [1]			Emission Rate (g/s)	
	Arrival	Departure	Hotelling	Arrival Maneuvering	Departure Maneuvering	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
09	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
10	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
11	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
12	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
13	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
14	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
15	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
16	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
17	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
18	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
19	1	1	16.6	44.3	44.3	4.62E-03	2.46E-02
20	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			199.7	531.9	531.9		
Total Daily Emission (g)			1,263.6				

Note:

[1] Total Emission = Main Engine Emission + Auxiliary Engine Emission

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of maneuvering during arrival and departure

Daily FSP emission (Weekdays only)

Hour	Number of Trip		Total Emission (g) [1]			Emission Rate (g/s)	
	Arrival	Departure	Hotelling	Arrival Maneuvering	Departure Maneuvering	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
09	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
10	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
11	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
12	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
13	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
14	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
15	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
16	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
17	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
18	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
19	1	1	16.1	43.0	43.0	4.48E-03	2.39E-02
20	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			193.7	516.0	516.0		
Total Daily Emission (g)			1,225.7				

Note:

[1] Total Emission = Main Engine Emission + Auxiliary Engine Emission

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of maneuvering during arrival and departure

Daily SO_2 emission (Weekdays only)

Hour	Number of Trip		Total Emission (g) [1]			Emission Rate (g/s)	
	Arrival	Departure	Hotelling	Arrival Maneuvering	Departure Maneuvering	Hotelling[2]	Navigation[2]
01	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
02	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
03	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
04	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
05	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
06	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
07	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
08	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
09	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
10	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
11	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
12	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
13	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
14	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
15	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
16	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
17	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
18	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
19	1	1	8.7	13.5	13.5	2.41E-03	7.51E-03
20	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
21	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
22	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
23	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
24	0	0	0.0	0.0	0.0	0.00E+00	0.00E+00
Daily Emission (g)			104	162	162		
Total Daily Emission (g)				428			

Note:

[1] Total Emission = Main Engine Emission + Auxiliary Engine Emission

Emission = Engine Power (kW) x Loading Factor x Time-in-mode (hr) X Emission Factor (g/kWh)

[2] Emission during Hotelling = Emission of hotelling during arrival and departure

Emission during Navigation = Emission of maneuvering during arrival and departure

Project: Discovery Bay: Optimization of Land Use

Title: Calculation of Marine Emission from Tug Boat and Barge (Delivery of LPG Tanker Vehicles), Vessel of LPG Bottle Delivery and Sand Barge

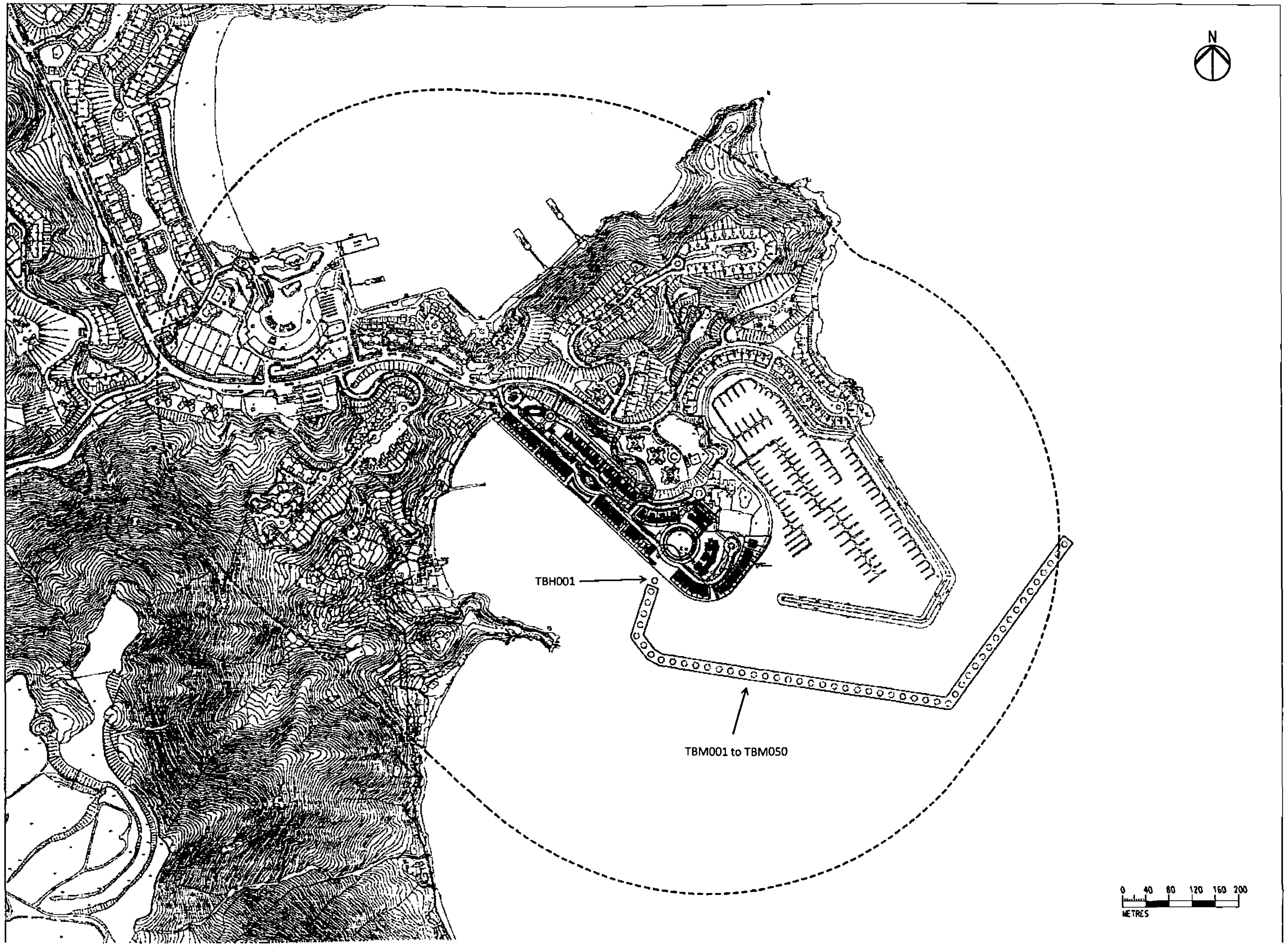
Name	Source ID	Source Type	X	Y	Stack Height / Release Height (m)[3]	Exit Temperature (K)[3]	Exit Velocity (m/s)[3]	Diameter (m)[3]	Emission Rate (g/s) during daytime of weekdays (Hour 8 - Hour 19)[1][2]			
									NO_x	RSP	FSP	SO_2
Hotelling	TBH001	Point	820389	816980	11	588	8	0.2	1.16E-01	4.62E-03	4.48E-03	2.41E-03
Navigation	TBM001	Point	820382	816961	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM002	Point	820376	816942	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM003	Point	820370	816923	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM004	Point	820364	816904	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM005	Point	820357	816885	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM006	Point	820370	816870	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM007	Point	820382	816854	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM008	Point	820400	816844	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM009	Point	820419	816841	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM010	Point	820439	816838	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM011	Point	820459	816835	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM012	Point	820479	816832	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM013	Point	820498	816830	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM014	Point	820518	816827	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM015	Point	820538	816824	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM016	Point	820558	816821	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM017	Point	820578	816818	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM018	Point	820597	816815	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM019	Point	820617	816812	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM020	Point	820637	816809	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM021	Point	820657	816806	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM022	Point	820676	816803	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM023	Point	820696	816800	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM024	Point	820716	816797	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM025	Point	820736	816794	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM026	Point	820756	816791	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM027	Point	820775	816788	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM028	Point	820795	816785	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM029	Point	820815	816782	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM030	Point	820835	816779	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM031	Point	820855	816776	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM032	Point	820874	816773	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM033	Point	820894	816770	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM034	Point	820906	816786	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM035	Point	820918	816802	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM036	Point	820930	816818	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM037	Point	820942	816834	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM038	Point	820954	816850	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM039	Point	820966	816866	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM040	Point	820978	816882	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM041	Point	820990	816898	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM042	Point	821002	816914	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM043	Point	821014	816930	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM044	Point	821026	816946	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM045	Point	821038	816962	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM046	Point	821050	816978	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM047	Point	821062	816994	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM048	Point	821074	817010	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM049	Point	821086	817026	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04
	TBM050	Point	821098	817042	11	588	8	0.2	9.25E-03	4.93E-04	4.78E-04	1.50E-04

Note:

[1] The value shown in the summary is the emission rate during daytime (07:00-19:00). For night-time (19:00-07:00), there is no emission from vessel and the emission rate is 0 g/s.

[2] The emission rate adopted for navigation = (Hourly emission rate of navigation (arrival) + Hourly emission rate of navigation (departure))/Number of Navigation Sources (i.e. 50 sources for this route)

[3] No information from the operator is available. Information of exit temperature, exit velocity and diameter are based on information from approved EIA study "Organic Waste Treatment Facilities, Phase I" (AEIAR-149/2010). The stack height is observed from site survey.



Note: As a conservative approach, the navigation route outside 500m assessment area is included in the near-field model.

Appendix A4.2-2

Calculation of Fireworks Displays Emissions

According to Section 3.5.30 of approved EIA Study "*Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures – Environmental Impact Assessment* " (AEIAR-032/2000), it is assumed that 2.6 kg and 14.7 kg RSP will be emitted for one low-level show and one mid-level show respectively.
As all the shows are modeled at the same hour as a worst case scenario, the adopted RSP emission rates:

RSP emission rate for low-level show (per show)	=	2.6	kg/hr
		7.22E-01	g/s
RSP emission rate for mid-level show (per show)	=	14.7	kg/hr
		4.08E+00	g/s

As there is no FSP emission rate available from the approved EIA study, RSP emission rates are adopted as FSP emission as a worst case scenario. Therefore, the FSP emission rates:

FSP emission rate for low-level show (per show)	=	7.22E-01	g/s
FSP emission rate for mid-level show (per show)	=	4.08E+00	g/s

Model Input Parameters for Fireworks Works Displays

Source	Source ID	Type	X	Y	Release Height [1]	Lateral Dim. (Sy)	Vertical Dim. (Sz)	Hourly RSP/FSP Emission Rate (g/s)[2]	
			(m)	(m)	(m)	(m)	(m)	Hour 21	Other Hours
Low-level show 1	LL01	Volume	822274	819292	120	4.65	4.65	7.22E-01	0.00E+00
Low-level show 2	LL02	Volume	822274	819292	120	4.65	4.65	7.22E-01	0.00E+00
Low-level show 3	LL03	Volume	822274	819292	120	4.65	4.65	7.22E-01	0.00E+00
Mid-level show 1	ML01	Volume	822274	819292	150	6.98	6.98	4.08E+00	0.00E+00
Mid-level show 2	ML02	Volume	822274	819292	150	6.98	6.98	4.08E+00	0.00E+00

Note:

[1] The release heights are observed by site survey.

[2] The fireworks displays shows are started at 20:00 (Hour 21) and last for about 15 minutes based on site survey. Therefore, there is no emission during all hours except Hour 21.

Appendix 4.3

Results Summary

Result Summary of Cumulative NO_2 Concentration for all ASRs at Various Heights above Ground

Area	ASR	19th highest 1-hour NO_2 Concentration ($\mu g/m^3$) (AQO = 200 $\mu g/m^3$)										Annual NO_2 Concentration ($\mu g/m^3$) (AQO = 40 $\mu g/m^3$)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	127	127	128	129	129	130	129	127	127	127	30	30	29	29	29	29	29	29	29	29
	A10b-02	127	127	128	129	129	130	130	128	127	127	30	30	30	29	29	29	29	29	29	29
	A10b-03	127	127	128	129	129	131	130	129	127	127	30	30	30	29	29	29	29	29	29	29
	A10b-04	127	128	128	129	129	132	130	129	127	127	30	30	30	29	29	29	29	29	29	29
	A10b-05	128	128	128	129	130	131	130	129	127	127	30	30	30	30	29	29	29	29	29	29
	A10b-06	128	128	129	129	129	130	130	129	127	127	31	31	31	30	29	29	29	29	29	29
	A10b-07	128	128	129	129	129	130	129	129	127	127	31	32	32	30	29	29	29	29	29	29
	A10b-08	129	147	143	129	129	129	129	129	127	127	35	39	36	30	29	29	29	29	29	29
	A10b-09	129	129	134	132	129	129	129	129	127	127	31	31	31	30	29	29	29	29	29	29
	A10b-10	128	134	136	130	129	129	129	129	128	127	31	31	31	30	29	29	29	29	29	29
	A10b-11	129	129	130	130	130	129	129	129	128	127	31	31	31	30	29	29	29	29	29	29
	A10b-12	128	128	129	129	129	129	129	129	128	127	30	30	30	30	29	29	29	29	29	29
	A10b-13	128	128	128	129	129	129	129	129	128	127	30	30	30	30	29	29	29	29	29	29
	A10b-14	129	129	129	130	129	129	129	129	128	127	30	30	30	30	29	29	29	29	29	29
	A10b-15	128	128	129	129	129	129	129	129	128	127	30	30	30	30	29	29	29	29	29	29
	A10b-16	129	129	130	130	129	129	129	129	128	127	32	32	31	30	29	29	29	29	29	29
	A10b-17	128	128	128	129	129	129	129	129	128	127	32	32	32	30	30	29	29	29	29	29
	A10b-18	129	129	129	129	130	130	129	129	128	127	31	31	31	30	30	29	29	29	29	29
	A10b-19	129	129	129	129	131	131	129	129	128	127	30	30	30	30	30	29	29	29	29	29
	A10b-20	129	129	129	130	133	133	129	129	128	127	30	30	30	30	30	29	29	29	29	29
	A10b-21	128	129	129	130	132	134	131	129	128	127	30	30	30	30	30	29	29	29	29	29

Note: [1] The Annual NO2 background of Area 10b (Grid 18_26) = 28.5 $\mu g/m^3$

Result Summary of Cumulative RSP Concentration for all ASRs at Various Heights above Ground

Area	ASR	10th highest 24-hour RSP Concentration (µg/m³) (AQO = 100 µg/m³)										Annual RSP Concentration (µg/m³) (AQO = 50 µg/m³)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-02	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-03	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-04	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-05	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-06	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-07	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-08	75	76	76	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-09	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-10	75	76	76	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-11	75	76	76	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-12	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-13	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-14	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-15	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-16	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-17	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-18	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-19	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-20	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40
	A10b-21	75	75	75	75	75	75	75	75	75	75	40	40	40	40	40	40	40	40	40	40

Note: [1] The Annual RSP background of Area 10b (Grid 18_26) = 39.9 µg/m³

Result Summary of Cumulative FSP Concentration for all ASRs at Various Heights above Ground

Area	ASR	10th highest 24-hour FSP Concentration ($\mu g/m^3$) (AQO = 75 $\mu g/m^3$)										Annual FSP Concentration ($\mu g/m^3$) (AQO = 35 $\mu g/m^3$)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-02	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-03	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-04	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-05	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-06	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-07	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-08	56	57	57	56	56	56	56	56	56	56	29	29	29	28	28	28	28	28	28	28
	A10b-09	56	56	57	57	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-10	57	57	57	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-11	57	57	57	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-12	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-13	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-14	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-15	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-16	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-17	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-18	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-19	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-20	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28
	A10b-21	56	56	56	56	56	56	56	56	56	56	28	28	28	28	28	28	28	28	28	28

Note: [1] The Annual FSP background of Area 10b (Grid 18_26) = 28.3 $\mu g/m^3$

Result Summary of Cumulative SO_2 Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 10-minute SO_2 Concentration (μg/m^3) (AQO = 500 μg/m^3)										4th highest 24-hour SO_2 Concentration (μg/m^3) (AQO = 125 μg/m^3)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
	A10b-01	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-02	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-03	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-04	138	138	138	138	138	139	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-05	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-06	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-07	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-08	138	138	138	138	138	139	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-09	138	138	138	138	138	139	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-10	138	138	138	138	138	139	138	138	138	138	30	30	30	30	30	30	30	30	30	30
Area 10b	A10b-11	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-12	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-13	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-14	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-15	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-16	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-17	138	138	138	138	138	138	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-18	138	138	138	138	139	139	138	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-19	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-20	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30
	A10b-21	138	138	138	138	139	139	139	138	138	138	30	30	30	30	30	30	30	30	30	30

Result Summary of Aluminum Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Aluminum Concentration (μg/m³) (No Criteria)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.220	0.221	0.225	0.240	0.268	0.312	0.376	0.463	0.574	0.741
	A10b-02	0.220	0.221	0.224	0.239	0.266	0.309	0.372	0.457	0.566	0.696
	A10b-03	0.217	0.217	0.220	0.233	0.257	0.295	0.349	0.424	0.519	0.633
	A10b-04	0.212	0.213	0.215	0.225	0.243	0.272	0.315	0.373	0.447	0.535
	A10b-05	0.223	0.223	0.224	0.226	0.237	0.261	0.298	0.347	0.410	0.486
	A10b-06	0.231	0.232	0.232	0.235	0.240	0.263	0.300	0.350	0.414	0.491
	A10b-07	0.238	0.238	0.239	0.242	0.247	0.260	0.295	0.343	0.404	0.477
	A10b-08	0.246	0.246	0.247	0.251	0.258	0.266	0.279	0.320	0.371	0.433
	A10b-09	0.253	0.254	0.255	0.259	0.266	0.276	0.287	0.299	0.318	0.370
	A10b-10	0.255	0.256	0.257	0.261	0.269	0.279	0.290	0.302	0.320	0.424
	A10b-11	0.254	0.255	0.256	0.261	0.268	0.278	0.289	0.302	0.327	0.434
	A10b-12	0.253	0.254	0.255	0.260	0.267	0.277	0.289	0.302	0.338	0.432
	A10b-13	0.253	0.254	0.255	0.260	0.268	0.279	0.291	0.305	0.329	0.435
	A10b-14	0.253	0.254	0.255	0.260	0.268	0.278	0.291	0.304	0.318	0.394
	A10b-15	0.251	0.252	0.253	0.258	0.266	0.276	0.288	0.302	0.325	0.373
	A10b-16	0.243	0.243	0.244	0.248	0.255	0.263	0.284	0.328	0.385	0.454
	A10b-17	0.235	0.235	0.236	0.239	0.244	0.260	0.297	0.347	0.411	0.488
	A10b-18	0.227	0.227	0.228	0.236	0.259	0.295	0.344	0.408	0.486	0.573
	A10b-19	0.218	0.219	0.222	0.235	0.257	0.291	0.338	0.400	0.475	0.560
	A10b-20	0.230	0.232	0.236	0.255	0.289	0.341	0.413	0.507	0.621	0.749
	A10b-21	0.231	0.233	0.237	0.258	0.294	0.351	0.430	0.535	0.664	0.882

ASR	Max 8-hour Aluminum Concentration (μg/m³) (No Criteria)									
	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
A10b-01	0.199	0.199	0.200	0.201	0.205	0.210	0.218	0.229	0.243	0.264
A10b-02	0.199	0.199	0.200	0.201	0.205	0.210	0.218	0.229	0.242	0.258
A10b-03	0.199	0.199	0.199	0.201	0.204	0.208	0.215	0.224	0.236	0.251
A10b-04	0.198	0.198	0.198	0.200	0.202	0.206	0.211	0.218	0.227	0.238
A10b-05	0.199	0.199	0.199	0.200	0.201	0.204	0.209	0.215	0.223	0.232
A10b-06	0.200	0.200	0.201	0.201	0.201	0.204	0.209	0.215	0.223	0.233
A10b-07	0.201	0.201	0.201	0.202	0.202	0.204	0.208	0.214	0.222	0.231
A10b-08	0.202	0.202	0.202	0.203	0.204	0.205	0.206	0.211	0.218	0.226
A10b-09	0.203	0.203	0.203	0.204	0.205	0.206	0.207	0.209	0.211	0.218
A10b-10	0.203	0.203	0.204	0.204	0.205	0.206	0.208	0.209	0.211	0.225
A10b-11	0.203	0.203	0.203	0.204	0.205	0.206	0.208	0.209	0.212	0.226
A10b-12	0.203	0.203	0.203	0.204	0.205	0.206	0.208	0.209	0.214	0.226
A10b-13	0.203	0.203	0.203	0.204	0.205	0.206	0.208	0.210	0.213	0.226
A10b-14	0.203	0.203	0.203	0.204	0.205	0.206	0.208	0.210	0.211	0.221
A10b-15	0.203	0.203	0.203	0.204	0.205	0.206	0.208	0.209	0.212	0.218
A10b-16	0.202	0.202	0.202	0.203	0.203	0.204	0.207	0.213	0.220	0.228
A10b-17	0.201	0.201	0.201	0.201	0.202	0.204	0.209	0.215	0.223	0.233
A10b-18	0.200	0.200	0.200	0.201	0.204	0.208	0.215	0.223	0.232	0.243
A10b-19	0.199	0.199	0.199	0.201	0.204	0.208	0.214	0.222	0.231	0.241
A10b-20	0.200	0.200	0.201	0.203	0.208	0.214	0.223	0.235	0.249	0.265
A10b-21	0.200	0.201	0.201	0.204	0.208	0.215	0.225	0.238	0.255	0.282

ASR	Annual Aluminum Concentration (μg/m³) (Criteria = 100 μg/m³)									
	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
A10b-01	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-02	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-03	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-04	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-05	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-06	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-07	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-08	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-09	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-10	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-11	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-12	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-13	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-14	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-15	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-16	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-17	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-18	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-19	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-20	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
A10b-21	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196

Result Summary of Antimony Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Antimony Concentration ($\mu g/m^3$) (No Criteria)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.011	0.011	0.013	0.019	0.031	0.051	0.079	0.117	0.165	0.238
	A10b-02	0.010	0.011	0.012	0.019	0.031	0.049	0.077	0.114	0.162	0.218
	A10b-03	0.009	0.009	0.011	0.016	0.027	0.043	0.067	0.100	0.141	0.191
	A10b-04	0.007	0.007	0.008	0.013	0.021	0.033	0.052	0.077	0.109	0.148
	A10b-05	0.012	0.012	0.012	0.013	0.018	0.029	0.044	0.066	0.094	0.127
	A10b-06	0.016	0.016	0.016	0.017	0.019	0.029	0.045	0.067	0.095	0.129
	A10b-07	0.018	0.018	0.019	0.020	0.022	0.028	0.043	0.064	0.091	0.123
	A10b-08	0.022	0.022	0.022	0.024	0.027	0.031	0.036	0.054	0.077	0.103
	A10b-09	0.025	0.025	0.026	0.028	0.031	0.035	0.040	0.045	0.053	0.076
	A10b-10	0.026	0.026	0.027	0.029	0.032	0.036	0.041	0.047	0.054	0.100
	A10b-11	0.026	0.026	0.026	0.028	0.031	0.036	0.041	0.046	0.057	0.104
	A10b-12	0.025	0.025	0.026	0.028	0.031	0.036	0.041	0.046	0.062	0.103
	A10b-13	0.025	0.025	0.026	0.028	0.031	0.036	0.042	0.048	0.058	0.105
	A10b-14	0.025	0.025	0.026	0.028	0.031	0.036	0.041	0.047	0.053	0.087
	A10b-15	0.024	0.024	0.025	0.027	0.030	0.035	0.040	0.046	0.057	0.077
	A10b-16	0.020	0.021	0.021	0.023	0.026	0.029	0.038	0.058	0.083	0.113
	A10b-17	0.017	0.017	0.017	0.019	0.021	0.028	0.044	0.066	0.094	0.128
	A10b-18	0.014	0.014	0.014	0.018	0.028	0.043	0.065	0.093	0.127	0.165
	A10b-19	0.010	0.010	0.011	0.017	0.027	0.041	0.062	0.089	0.122	0.159
	A10b-20	0.015	0.016	0.018	0.026	0.041	0.063	0.095	0.136	0.186	0.242
	A10b-21	0.015	0.016	0.018	0.027	0.043	0.068	0.102	0.148	0.205	0.300

Area	ASR	Max 8-hour Antimony Concentration ($\mu g/m^3$) (No Criteria)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.001	0.001	0.002	0.002	0.004	0.006	0.010	0.015	0.021	0.030
	A10b-02	0.001	0.001	0.002	0.002	0.004	0.006	0.010	0.014	0.020	0.027
	A10b-03	0.001	0.001	0.001	0.002	0.003	0.005	0.008	0.012	0.018	0.024
	A10b-04	<0.001	<0.001	0.001	0.002	0.003	0.004	0.006	0.010	0.014	0.019
	A10b-05	0.001	0.001	0.002	0.002	0.002	0.004	0.006	0.008	0.012	0.016
	A10b-06	0.002	0.002	0.002	0.002	0.002	0.004	0.006	0.008	0.012	0.016
	A10b-07	0.002	0.002	0.002	0.003	0.003	0.003	0.005	0.008	0.011	0.015
	A10b-08	0.003	0.003	0.003	0.003	0.003	0.004	0.005	0.007	0.010	0.013
	A10b-09	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.006	0.007	0.010
	A10b-10	0.003	0.003	0.003	0.004	0.004	0.005	0.005	0.006	0.007	0.012
	A10b-11	0.003	0.003	0.003	0.004	0.004	0.004	0.005	0.006	0.007	0.013
	A10b-12	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.006	0.008	0.013
	A10b-13	0.003	0.003	0.003	0.003	0.004	0.005	0.005	0.006	0.007	0.013
	A10b-14	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.006	0.007	0.011
	A10b-15	0.003	0.003	0.003	0.003	0.004	0.004	0.005	0.006	0.007	0.010
	A10b-16	0.003	0.003	0.003	0.003	0.003	0.004	0.005	0.007	0.010	0.014
	A10b-17	0.002	0.002	0.002	0.002	0.003	0.004	0.006	0.008	0.012	0.016
	A10b-18	0.002	0.002	0.002	0.002	0.003	0.005	0.008	0.012	0.016	0.021
	A10b-19	0.001	0.001	0.001	0.002	0.003	0.005	0.008	0.011	0.015	0.020
	A10b-20	0.002	0.002	0.002	0.003	0.005	0.008	0.012	0.017	0.023	0.030
	A10b-21	0.002	0.002	0.002	0.003	0.005	0.008	0.013	0.019	0.026	0.037

Area	ASR	Annual Antimony Concentration ($\mu g/m^3$) (Criteria = 5 $\mu g/m^3$)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-03	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-04	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-06	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-07	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-08	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-09	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-10	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-11	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-12	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-13	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-14	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-15	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-16	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-17	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-18	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-19	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-20	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-21	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Result Summary of Barium Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Barium Concentration (μg/m³) (No Criteria)										Max 8-hour Barium Concentration (μg/m³) (Criteria = 500 μg/m³)										Annual Barium Concentration (μg/m³) (Criteria = 5 μg/m³)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
	A10b-01	0.040	0.041	0.045	0.061	0.090	0.136	0.203	0.294	0.410	0.584	0.018	0.018	0.019	0.021	0.024	0.030	0.038	0.050	0.064	0.086	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-02	0.040	0.041	0.044	0.060	0.088	0.133	0.199	0.288	0.401	0.537	0.018	0.018	0.019	0.021	0.024	0.030	0.038	0.049	0.063	0.080	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-03	0.036	0.037	0.041	0.054	0.079	0.118	0.175	0.253	0.352	0.471	0.018	0.018	0.018	0.020	0.023	0.028	0.035	0.045	0.057	0.072	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-04	0.032	0.032	0.035	0.045	0.064	0.095	0.139	0.200	0.277	0.369	0.017	0.017	0.017	0.019	0.021	0.025	0.031	0.038	0.048	0.059	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-05	0.043	0.043	0.044	0.046	0.057	0.083	0.121	0.173	0.239	0.317	0.019	0.019	0.019	0.019	0.020	0.024	0.028	0.035	0.043	0.053	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-06	0.052	0.052	0.053	0.056	0.061	0.085	0.123	0.176	0.243	0.323	0.020	0.020	0.020	0.020	0.021	0.024	0.029	0.035	0.044	0.054	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-07	0.059	0.059	0.060	0.063	0.069	0.081	0.118	0.168	0.232	0.308	0.020	0.020	0.021	0.021	0.022	0.023	0.028	0.034	0.042	0.052	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-08	0.067	0.068	0.069	0.073	0.079	0.088	0.102	0.144	0.198	0.262	0.022	0.022	0.022	0.022	0.023	0.024	0.026	0.031	0.038	0.046	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-09	0.075	0.075	0.076	0.081	0.088	0.098	0.110	0.122	0.142	0.197	0.022	0.023	0.023	0.023	0.024	0.025	0.027	0.028	0.031	0.038	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-10	0.077	0.077	0.079	0.083	0.091	0.101	0.113	0.126	0.144	0.253	0.023	0.023	0.023	0.024	0.025	0.026	0.027	0.029	0.031	0.045	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Area 10b	A10b-11	0.076	0.076	0.078	0.082	0.090	0.100	0.112	0.125	0.152	0.264	0.023	0.023	0.023	0.023	0.024	0.026	0.027	0.029	0.032	0.046	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-12	0.075	0.075	0.076	0.081	0.089	0.100	0.112	0.126	0.164	0.262	0.022	0.023	0.023	0.023	0.024	0.026	0.027	0.029	0.034	0.046	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-13	0.075	0.075	0.076	0.082	0.090	0.101	0.115	0.129	0.154	0.265	0.022	0.023	0.023	0.023	0.024	0.026	0.027	0.029	0.032	0.046	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-14	0.075	0.075	0.076	0.082	0.090	0.101	0.114	0.128	0.143	0.222	0.022	0.023	0.023	0.023	0.024	0.026	0.027	0.029	0.031	0.041	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-15	0.073	0.073	0.075	0.080	0.088	0.099	0.111	0.125	0.150	0.200	0.022	0.022	0.022	0.023	0.024	0.025	0.027	0.029	0.032	0.038	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-16	0.064	0.064	0.065	0.070	0.076	0.085	0.107	0.153	0.212	0.284	0.021	0.021	0.021	0.022	0.023	0.024	0.026	0.032	0.040	0.049	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-17	0.055	0.056	0.056	0.060	0.065	0.082	0.120	0.173	0.240	0.320	0.020	0.020	0.020	0.021	0.021	0.023	0.028	0.035	0.043	0.053	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-18	0.047	0.048	0.048	0.057	0.081	0.118	0.170	0.237	0.318	0.409	0.019	0.019	0.019	0.020	0.023	0.028	0.034	0.043	0.053	0.064	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-19	0.038	0.039	0.042	0.055	0.079	0.114	0.164	0.228	0.307	0.395	0.018	0.018	0.018	0.020	0.023	0.027	0.034	0.042	0.051	0.062	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-20	0.051	0.052	0.057	0.077	0.112	0.166	0.242	0.340	0.459	0.593	0.019	0.020	0.020	0.023	0.027	0.034	0.043	0.056	0.071	0.087	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A10b-21	0.052	0.053	0.058	0.079	0.118	0.176	0.260	0.369	0.504	0.732	0.020	0.020	0.020	0.023	0.028	0.035	0.046	0.059	0.076	0.105	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015

Result Summary of Strontium Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Strontium Concentration (µg/m³) (No Criteria)										Max 8-hour Strontium Concentration (µg/m³) (No Criteria)										Annual Strontium Concentration (µg/m³) (No Criteria)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.014	0.014	0.016	0.025	0.040	0.065	0.101	0.149	0.212	0.305	0.002	0.002	0.002	0.003	0.005	0.008	0.013	0.019	0.026	0.038	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-02	0.013	0.014	0.016	0.024	0.039	0.063	0.099	0.146	0.207	0.280	0.002	0.002	0.002	0.003	0.005	0.008	0.012	0.018	0.026	0.035	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-03	0.011	0.012	0.014	0.021	0.034	0.055	0.086	0.128	0.181	0.244	0.001	0.002	0.002	0.003	0.004	0.007	0.011	0.016	0.023	0.031	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-04	0.009	0.009	0.011	0.016	0.026	0.043	0.067	0.099	0.140	0.190	0.001	0.001	0.001	0.002	0.003	0.005	0.008	0.012	0.018	0.024	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-05	0.015	0.015	0.015	0.017	0.023	0.037	0.057	0.085	0.120	0.162	0.002	0.002	0.002	0.002	0.003	0.005	0.007	0.011	0.015	0.020	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-06	0.020	0.020	0.020	0.022	0.024	0.037	0.058	0.086	0.122	0.165	0.002	0.002	0.003	0.003	0.003	0.005	0.007	0.011	0.015	0.021	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-07	0.023	0.023	0.024	0.026	0.029	0.036	0.055	0.082	0.116	0.157	0.003	0.003	0.003	0.003	0.004	0.004	0.007	0.010	0.015	0.020	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-08	0.028	0.028	0.029	0.031	0.034	0.039	0.047	0.069	0.098	0.133	0.004	0.004	0.004	0.004	0.004	0.005	0.006	0.009	0.012	0.017	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-09	0.032	0.032	0.033	0.035	0.039	0.045	0.051	0.058	0.068	0.098	0.004	0.004	0.004	0.004	0.005	0.006	0.006	0.007	0.009	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-10	0.033	0.033	0.034	0.037	0.041	0.046	0.053	0.060	0.069	0.128	0.004	0.004	0.004	0.005	0.005	0.006	0.007	0.007	0.009	0.016	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-11	0.033	0.033	0.034	0.036	0.040	0.046	0.052	0.059	0.074	0.133	0.004	0.004	0.004	0.005	0.005	0.006	0.007	0.007	0.009	0.017	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-12	0.032	0.032	0.033	0.036	0.040	0.046	0.052	0.059	0.080	0.132	0.004	0.004	0.004	0.004	0.005	0.006	0.007	0.007	0.010	0.017	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-13	0.032	0.032	0.033	0.036	0.040	0.046	0.053	0.061	0.075	0.134	0.004	0.004	0.004	0.004	0.005	0.006	0.007	0.008	0.009	0.017	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-14	0.032	0.032	0.033	0.036	0.040	0.046	0.053	0.061	0.068	0.111	0.004	0.004	0.004	0.004	0.005	0.006	0.007	0.008	0.009	0.014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-15	0.031	0.031	0.032	0.035	0.039	0.045	0.052	0.059	0.072	0.099	0.004	0.004	0.004	0.004	0.005	0.006	0.006	0.007	0.009	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-16	0.026	0.026	0.027	0.029	0.033	0.038	0.049	0.074	0.106	0.144	0.003	0.003	0.003	0.004	0.004	0.005	0.006	0.009	0.013	0.018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-17	0.022	0.022	0.022	0.024	0.027	0.036	0.056	0.084	0.120	0.164	0.003	0.003	0.003	0.003	0.003	0.005	0.007	0.011	0.015	0.020	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-18	0.017	0.017	0.018	0.023	0.036	0.055	0.083	0.119	0.162	0.211	0.002	0.002	0.002	0.003	0.004	0.007	0.010	0.015	0.020	0.026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-19	0.013	0.013	0.015	0.022	0.034	0.053	0.080	0.114	0.156	0.204	0.002	0.002	0.002	0.003	0.004	0.007	0.010	0.014	0.020	0.025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-20	0.019	0.020	0.022	0.033	0.052	0.081	0.122	0.174	0.238	0.310	0.002	0.002	0.003	0.004	0.007	0.010	0.015	0.022	0.030	0.039	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-21	0.020	0.021	0.023	0.035	0.055	0.087	0.131	0.190	0.262	0.384	0.002	0.003	0.003	0.004	0.007	0.011	0.016	0.024	0.033	0.048	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Result Summary of Copper Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Copper Concentration (µg/m³) (Criteria = 100 µg/m³)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.097	0.097	0.098	0.103	0.112	0.125	0.145	0.173	0.208	0.260
	A10b-02	0.096	0.097	0.098	0.102	0.111	0.125	0.144	0.171	0.205	0.246
	A10b-03	0.095	0.096	0.097	0.101	0.108	0.120	0.137	0.161	0.190	0.226
	A10b-04	0.094	0.094	0.095	0.098	0.104	0.113	0.126	0.145	0.168	0.195
	A10b-05	0.097	0.097	0.098	0.098	0.102	0.110	0.121	0.136	0.156	0.180
	A10b-06	0.100	0.100	0.100	0.101	0.103	0.110	0.122	0.137	0.158	0.182
	A10b-07	0.102	0.102	0.102	0.103	0.105	0.109	0.120	0.135	0.154	0.177
	A10b-08	0.105	0.105	0.105	0.106	0.108	0.111	0.115	0.128	0.144	0.163
	A10b-09	0.107	0.107	0.107	0.109	0.111	0.114	0.118	0.121	0.127	0.144
	A10b-10	0.108	0.108	0.108	0.110	0.112	0.115	0.119	0.122	0.128	0.161
	A10b-11	0.107	0.107	0.108	0.109	0.112	0.115	0.118	0.122	0.130	0.164
	A10b-12	0.107	0.107	0.107	0.109	0.111	0.115	0.118	0.122	0.134	0.163
	A10b-13	0.107	0.107	0.107	0.109	0.112	0.115	0.119	0.123	0.131	0.164
	A10b-14	0.107	0.107	0.107	0.109	0.112	0.115	0.119	0.123	0.127	0.151
	A10b-15	0.106	0.107	0.107	0.108	0.111	0.114	0.118	0.122	0.130	0.145
	A10b-16	0.104	0.104	0.104	0.105	0.107	0.110	0.117	0.130	0.148	0.170
	A10b-17	0.101	0.101	0.101	0.102	0.104	0.109	0.121	0.136	0.157	0.181
	A10b-18	0.099	0.099	0.099	0.102	0.109	0.120	0.135	0.156	0.180	0.207
	A10b-19	0.096	0.096	0.097	0.101	0.108	0.119	0.134	0.153	0.177	0.203
	A10b-20	0.100	0.100	0.102	0.108	0.118	0.134	0.157	0.187	0.223	0.263
	A10b-21	0.100	0.101	0.102	0.108	0.120	0.138	0.163	0.195	0.236	0.305

Area	ASR	Max 8-hour Copper Concentration (µg/m³) (No Criteria)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.090	0.090	0.090	0.091	0.092	0.094	0.096	0.099	0.104	0.110
	A10b-02	0.090	0.090	0.090	0.091	0.092	0.093	0.096	0.099	0.104	0.109
	A10b-03	0.090	0.090	0.090	0.090	0.091	0.093	0.095	0.098	0.102	0.106
	A10b-04	0.090	0.090	0.090	0.090	0.091	0.092	0.094	0.096	0.099	0.102
	A10b-05	0.090	0.090	0.090	0.090	0.091	0.092	0.093	0.095	0.097	0.100
	A10b-06	0.090	0.090	0.090	0.091	0.091	0.092	0.093	0.095	0.098	0.101
	A10b-07	0.091	0.091	0.091	0.091	0.091	0.091	0.093	0.095	0.097	0.100
	A10b-08	0.091	0.091	0.091	0.091	0.091	0.092	0.092	0.094	0.096	0.098
	A10b-09	0.091	0.091	0.091	0.091	0.092	0.092	0.093	0.093	0.094	0.096
	A10b-10	0.091	0.091	0.091	0.092	0.092	0.092	0.093	0.093	0.094	0.098
	A10b-11	0.091	0.091	0.091	0.092	0.092	0.092	0.093	0.093	0.094	0.098
	A10b-12	0.091	0.091	0.091	0.091	0.092	0.092	0.093	0.093	0.095	0.098
	A10b-13	0.091	0.091	0.091	0.092	0.092	0.092	0.093	0.093	0.094	0.098
	A10b-14	0.091	0.091	0.091	0.092	0.092	0.092	0.093	0.093	0.094	0.097
	A10b-15	0.091	0.091	0.091	0.091	0.092	0.092	0.093	0.093	0.094	0.096
	A10b-16	0.091	0.091	0.091	0.091	0.091	0.092	0.092	0.094	0.096	0.099
	A10b-17	0.091	0.091	0.091	0.091	0.091	0.092	0.093	0.095	0.097	0.100
	A10b-18	0.090	0.090	0.090	0.091	0.091	0.093	0.095	0.097	0.100	0.104
	A10b-19	0.090	0.090	0.090	0.091	0.091	0.093	0.095	0.097	0.100	0.103
	A10b-20	0.090	0.090	0.091	0.091	0.093	0.095	0.098	0.101	0.106	0.111
	A10b-21	0.090	0.090	0.091	0.091	0.093	0.095	0.098	0.102	0.107	0.116

Area	ASR	Annual Copper Concentration (µg/m³) (Criteria = 2.4 µg/m³)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-02	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-03	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-04	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-05	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-06	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-07	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-08	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-09	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-10	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-11	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-12	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-13	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-14	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-15	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-16	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-17	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-18	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-19	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-20	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A10b-21	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089

Result Summary of Titanium Concentration for all ASRs at Various Heights above Ground

Area	ASR	Max 1-hour Titanium Concentration (μg/m³) (No Criteria)										Max 8-hour Titanium Concentration (μg/m³) (No Criteria)										Annual Titanium Concentration (μg/m³) (Criteria = 100 μg/m³)									
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	80m
Area 10b	A10b-01	0.003	0.003	0.004	0.006	0.010	0.016	0.025	0.036	0.052	0.074	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.005	0.006	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-02	0.003	0.003	0.004	0.006	0.010	0.015	0.024	0.036	0.051	0.068	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.006	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-03	0.003	0.003	0.003	0.005	0.008	0.013	0.021	0.031	0.044	0.060	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.006	0.007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-04	0.002	0.002	0.003	0.004	0.006	0.010	0.016	0.024	0.034	0.046	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-05	0.004	0.004	0.004	0.004	0.006	0.009	0.014	0.021	0.029	0.040	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-06	0.005	0.005	0.005	0.005	0.006	0.009	0.014	0.021	0.030	0.040	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-07	0.006	0.006	0.006	0.006	0.007	0.009	0.013	0.020	0.028	0.038	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-08	0.007	0.007	0.007	0.008	0.008	0.010	0.011	0.017	0.024	0.032	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.002	0.003	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-09	0.008	0.008	0.008	0.009	0.010	0.011	0.012	0.014	0.017	0.024	<0.001	<0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-10	0.008	0.008	0.008	0.009	0.010	0.011	0.013	0.015	0.017	0.031	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-11	0.008	0.008	0.008	0.009	0.010	0.011	0.013	0.014	0.018	0.033	<0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-12	0.008	0.008	0.008	0.009	0.010	0.011	0.013	0.015	0.019	0.032	<0.001	<0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-13	0.008	0.008	0.008	0.009	0.010	0.011	0.013	0.015	0.018	0.033	<0.001	<0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-14	0.008	0.008	0.008	0.009	0.010	0.011	0.013	0.015	0.017	0.027	<0.001	<0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-15	0.008	0.008	0.008	0.008	0.010	0.011	0.013	0.014	0.018	0.024	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-16	0.006	0.006	0.007	0.007	0.008	0.009	0.012	0.018	0.026	0.035	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.002	0.002	0.003	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-17	0.005	0.005	0.005	0.006	0.007	0.009	0.014	0.021	0.029	0.040	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-18	0.004	0.004	0.004	0.006	0.009	0.013	0.020	0.029	0.040	0.051	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.005	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-19	0.003	0.003	0.004	0.005	0.008	0.013	0.019	0.028	0.038	0.050	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.002	0.003	0.005	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-20	0.005	0.005	0.005	0.008	0.013	0.020	0.030	0.043	0.058	0.076	<0.001	<0.001	<0.001	0.001	0.002	0.002	0.004	0.005	0.007	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A10b-21	0.005	0.005	0.006	0.008	0.013	0.021	0.032	0.046	0.064	0.094	<0.001	<0.001	<0.001	0.001	0.002	0.003	0.004	0.006	0.008	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Appendix 5.1

Legislation and Standards for Noise Assessment

Legislation and Standards

The relevant legislation and associated guidance applicable to present the study for the assessment of noise impacts include:

- TM on Noise from Places other than Domestic Premises, Public Places or Construction Sites (TM-Places); and
- Hong Kong Planning Standard and Guidelines (HKPSG).

Road Traffic Noise

In accordance with the HKPSG, the maximum permissible hourly noise level (L_{10}) at the external facades of domestic premises is 70dB(A). This criterion applies to domestic premises relying on open windows as a primary means for ventilation.

Fixed Noise

The HKPSG stipulates that in order to plan for a better environment, all fixed noise sources should be located and designed so that when assessed in accordance with the TM-Places, the level of the intruding noise at the facade of the nearest sensitive use should be at least 5 dB(A) below the appropriate Acceptable Noise Limit (ANL) as stipulated in TM-Places or, in the case of the background being 5 dB(A) lower than the ANL, should not be higher than the background. The following table presents the ANL for various Area Sensitivity Ratings (ASR).

Table A5.1: ANLs for fixed noise sources

Time Period	ANL, dB(A)		
	ASR A	ASR B	ASR C
Day (0700 to 1900 hours)	60	65	70
Evening (1900 to 2300 hours)	60	65	70
Night (2300 to 0700 hours)	50	55	60

Note:
[1] ASR – Area Sensitivity Rating

For Discovery Bay in particular, it comprises of a combination of both high-rise and low-rise residential and commercial developments, and landscaping areas distributing within the development boundary. Hence, it is considered appropriate to be described as "Low density residential area consisting of low-rise or isolated high-rise developments" as defined in Table 1 of TM-Places. Besides, there are no influencing factors such as industrial areas, major road with daily flow exceeding 30,000 vehicles per day in the vicinity. Hence, it is appropriate to adopt an ASR of "A". As such, the minimum of ANL-5 or prevailing noise level would be 55dB(A) for daytime and evening periods (7:00 to 23:00) and 45dB(A) for night-time period (23:00 to 7:00).

Similar to road traffic noise assessment, all these criteria only apply to NSRs relying on opened windows for ventilation.

Firework Display Noise from Disneyland

The Disneyland Theme Park is located at approximately 2.5 km north-east of Discovery Bay. This theme park is a Designated Project (DP) under the EIAO and an EIA Report was submitted to EPD and approved under the EIAO (ref AEIAR – 0323/2000). Hence, the operation of theme park is governed by the noise criteria stipulated under TM-Places and TM-EIAO.

Firework events at Disneyland are organized at 8pm every night. According to its approved EIA Report, a noise criterion of $L_{eq\ (15\ min)}$ 55 dB(A) is recommended for assessing the noise impacts due to fireworks. Hence, this $L_{eq\ (15\ min)}$ 55 dB(A) is still adopted in this assessment.

Similar to road traffic noise assessment, all these criteria only apply to NSRs relying on opened windows for ventilation.

Marine Traffic Noise

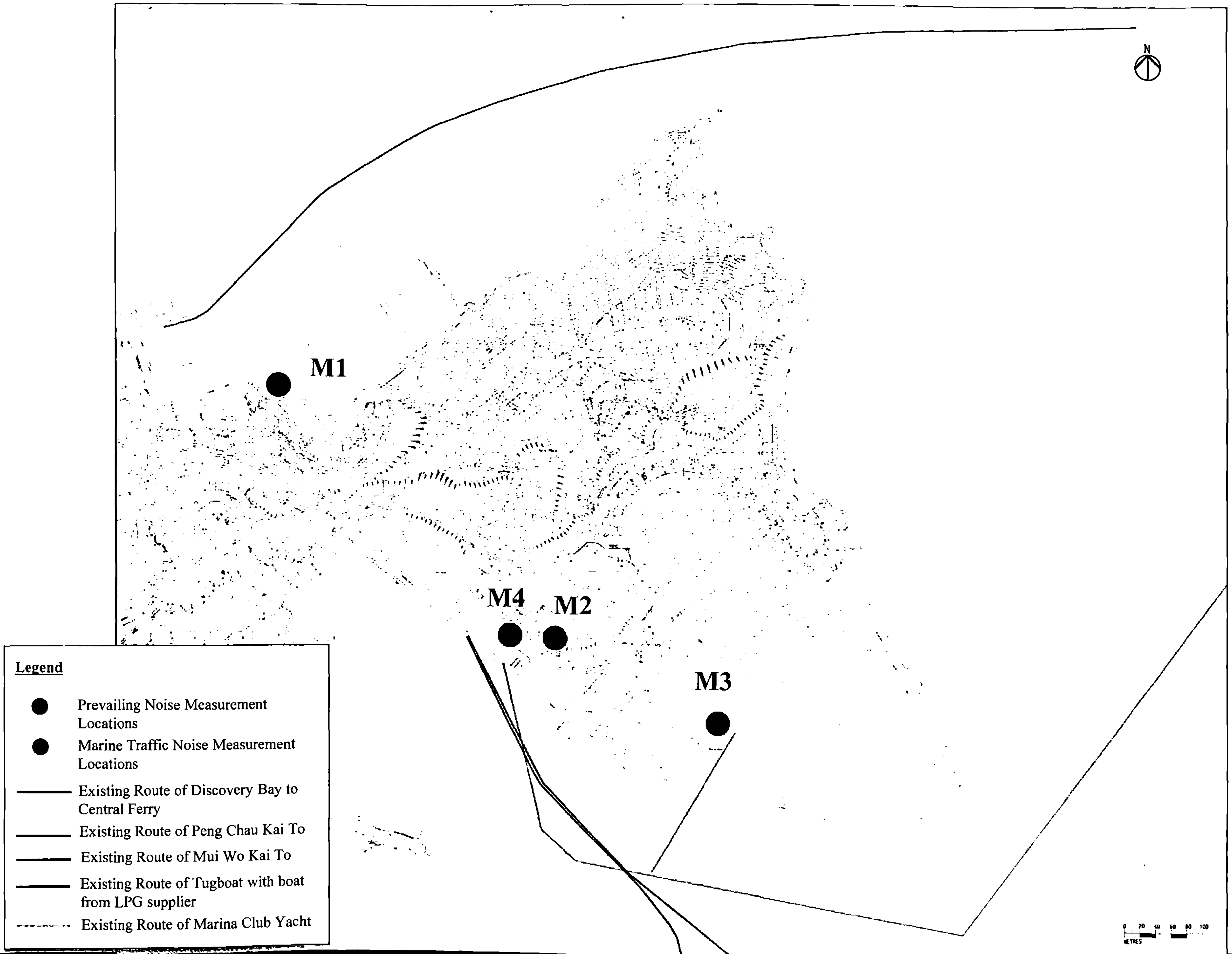
There is no statutory requirement for marine traffic noise. Additional non-statutory noise criteria may therefore need to be considered. An approach has been adopted similar to the approved EIA report for the West Kowloon Cultural District (AEIAR-178/2003). It is considered the predicted noise level will be unlikely to cause any disturbance and nuisance when the marine traffic noise is below the prevailing noise level.

The prevailing noise levels measured near Marina Avenue was 58 dB(A) for daytime / evening time periods and 53 dB(A) for nighttime period in free field setting. The selected prevailing noise measurement location is shown in this appendix. Hence, it is considered appropriate to adopt the criteria of 61 dB(A) for daytime and evening time and 56 dB(A) for nighttime periods, including a facade correction of 3 dB(A).

Similar to road traffic noise assessment, all these criteria only apply to NSRs relying on opened windows for ventilation.

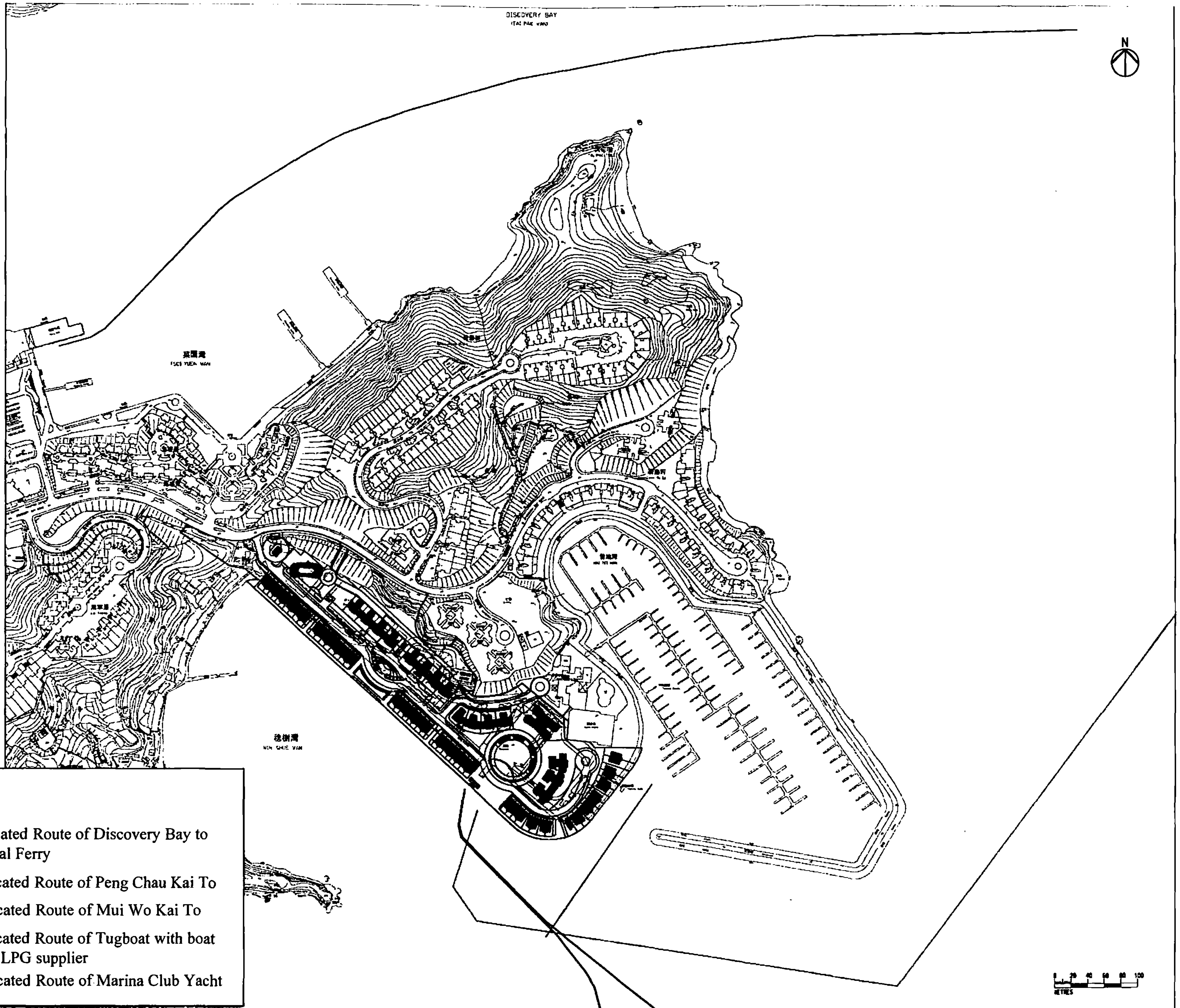
Construction Noise

It is considered the development is in a preliminary stage, there is no construction programme or construction plant inventory for this development at this moment. Once the detailed construction programmed and methodology become available during EIA stage, a quantitative construction noise assessment would be conducted. Mitigation measures will be studied and recommended in EIA stage to reduce the construction noise impacts.



Noise Measurement Locations and Existing Main Marine Traffic Routes

ARUP



Legend

Relocated Route of Discovery Bay to Central Ferry
Relocated Route of Peng Chau Kai To
Relocated Route of Mui Wo Kai To
Relocated Route of Tugboat with boat from LPG supplier
Relocated Route of Marina Club Yacht

Planned Main Marine Traffic Routes

ARUP

Appendix 5.2

Marine Traffic Noise
Assessment Methodology and
Source Term Measurement

Methodology

The following procedures will be adopted for marine traffic noise assessment. The noise generated by the vessels at stationary mode (e.g. idling) will be assessed as fixed noise sources.

General

The navigation routes located within 300m of this development area considered as the assessment area. Any representative planned sources located within the assessment area would be considered in this noise assessment, adopting the noise criteria as discussed in **Appendix 5.1**.

Operational Information of Marine Vessels

All operational information of vessels is based on either site observation or operation schedule from operators for typical days. The operational information for the existing ferry, kaito, and existing marina are summarized in the table below.

Table A5.2: Operational information for the existing ferry and marina vessels

Operation Parameters	Existing Discovery Bay Ferry	Kaito	Marina	Tug boat with barge	Sand barge	LPG container
Ferry / yacht per hour	9[1]	6[1]	3[2]	1[4]	1[4]	1[4]
Speed knots/h	~10	~10	5[3]	~2	~4	~4

Notes:

[1] According to operation schedule from operator.

[2] Based on site observation from typical days and weekends in Discovery Bay.

[3] According to Marine Department Notice No. 84, only speed at 5 knots per hour for yachts is allowed inside typhoon shelter. In addition, as advised by the marine traffic engineer, the speed for the marine route as indicated in Appendix 5.1 is in 5 knots per hour.

[4] According to operation schedule from operator, the tug boat with barge from gas supplier, sand barge and LPG container vessels would arrive the pier once per month, once per month and once per week.

Apart from existing Discovery Bay ferry, Kaito and existing marina, tugboat with barge from LPG supplier, sand barge with sand loading, LPG containers for glass bottle, bounty, oil tanker and ferries/vessels petrol filling near kaito pier are also observed.

According to latest information, the ferry petrol filling will be conducted in marine based filling station outside Discovery Bay. Therefore, the operation of oil tanker and ferries / vessels petrol filling near kaito pier would be excluded in the noise assessment.

Marine Noise Source Determination

In order to determine the Sound Exposure Level (SEL) in accordance with ISO 2922-1975(E), which has been adopted in several approved EIA, such as AEIAR-178/2013, noise measurements for marine noise source terms have been conducted as below:

- Noise measurements for marine noise source terms at Discovery Bay Marina, and Discovery Bay Public Pier and Kaito Pier for the existing ferry, kaito, marina, tugboat with barge from LPG supplier, etc.
- The measurement location at Discovery Bay Marina was about 20m from the vessels.
- For the measurements at Discovery Bay Public Pier, the separation distance was about 50 – 100m, depending on the transit route.
- For the measurements at Kai To Pier, the separation distance was about 20 – 100m, depending on the transit route.

The table below summarizes the marine noise source term.

Table A5.3: Marine noise source term measurement

Description [1]	Direction	SEL at 25m, dB(A) [2]
Peng Chau Kaito (Including those via Trappist Monastery)	Approaching	71.3
	Departing	74.5
Mui Wo Kaito	Approaching	77.7
	Departing	78.6
Discovery Bay Ferry	Approaching	85.6
	Departing	86.1
Tugboat	Approaching	80.0
	Departing	80.0
Sand Barge	Approaching	77.7 [3]
	Departing	77.7
LPG Containers	Approaching	71.2
	Departing	71.2 [4]

Notes:
[1] Only non-disturbed events have been tabulated in the above table.
[2] SEL corrected to 25m at reference speed of about 5knots/h for proposed yacht and 16knots/h for existing ferry.
[3] SEL measurement was disturbed by other noisy activities, such as bus idling and oil tanker operation. Since non-disturbed events could not be measured, SEL for "Departing" has been adopted to represent that for "Approaching".
[4] SEL measurement was disturbed by other noisy activities, such as bus idling and oil tanker operation. Since non-disturbed events could not be measured, SEL for "Approaching" has been adopted to represent that for "Departing".

Prediction of Noise Impacts

The SELs summarized in the above tables are then converted to establish the facade noise levels at NSRs, taking into account various consideration such as operation time, distances, number of concurrent vessels, facade effects. A summary of equations adopted in the marine traffic noise assessment is given in the table below.

Table A5.4: Summary of equations for marine traffic noise assessment

Parameters	Equations
SEL, dB(A)	$SEL = L_{max} + 10\log(kd/V)$, where L_{max} = Measured marine traffic passby noise level, dB(A) k = Empirical constant d = Perpendicular distance between measurement location and the marine traffic, m V = Speed of the marine traffic, m/s
$L_{eq\ 1hr}$, dB(A)	$L_{eq\ 1hr} = SEL - 10\log(d_1/d) - 10\log(T) + 10\log(N) + FC + Dir$ where d_1 = Perpendicular slant distance between marine traffic and NSR, m T = Time period under consideration (3600), s N = Number of marine traffic FC = With 3 dB(A) facade correction Dir = -10dB(A) correction for without line of sight

Since all the noise sources from the marine vessels movements would not occur at the same time, it is important to analyse and establish the possible cases during a typical 1-hour period that would constitute noise impacts. The details of different scenarios have been presented in below table and **Appendix 5.3**.

Table A5.5: Summary of all observed possible cases in a standard sample period (60mins)

Case	Description [1]						
	PC	MW	DB	Yacht	TB	SB	LPG
1	√	√[2]	√	√	√[2]		
2	√	√[2]	√	√		√[2]	
3	√	√[2]	√	√			√[2]

Note:

[1] PC – Peng Chau kaito;
MW – Mui Wo kaito;
DB – Discovery Bay Ferry;
TB – Tugboat with barge from LPG supplier;
SB – Sand Barge; and
LPG – LPG Container.

[2] Marine vessels operate in daytime only.

It can be seen that the marine vessel movements for Peng Chau kaito, Mui Wo kaito and Yacht would also occur during a typical hour. The operation of sand barge, tugboat and LPG container vessels would be carried out once a season (~3 months), once per month and once per week during daytime period respectively.

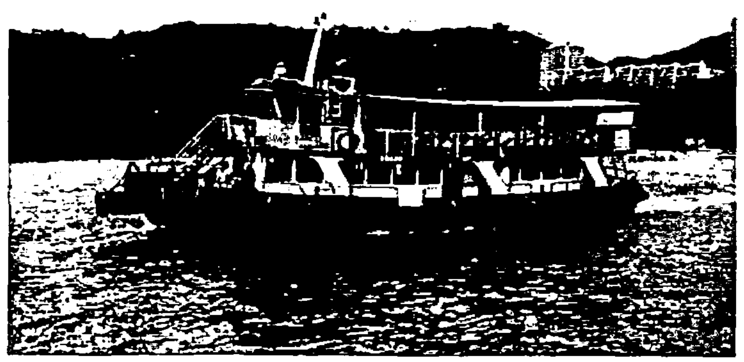
Bounty near Kai To Pier would be subject to needed basis from visitor / event organizer, etc. The frequency for the operation of the bounty would be infrequent.

However, site constraints would eliminate more than one activity for vessels for the gas bottle supplier, sand barge and bounty, and tugboat with barge to occur concurrently. Besides, all these activities would not occur during night-time period as well.

Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Determination of Ferry Noise Sources (Peng Chau Line)

Event	Description	Direction	Measured L_{max}, dB(A) [1]	Approx. Distance from ferry, m [2]	Speed, Knots/hr	Speed (V), m/s	Estimated SEL, dB(A) [3]	Non-Disturbed Events(Y/N)	SEL for non - disturbed events, dB(A)	SEL at 25m, dB(A)
PC1	Peng Chau Kaito	Approaching to Kaito Pier	63.4	20	9	5	72.8	N	-	-
PC3	Peng Chau Kaito	Approaching to Kaito Pier	61.9	20	7	4	72.3	N	-	-
PC5	Peng Chau Kaito	Approaching to Kaito Pier	61.1	20	10	5	69.8	Y	69.8	68.9
PC7	Peng Chau Kaito	Approaching to Kaito Pier	58.9	20	7	4	69.1	Y	69.1	68.2
PC9	Peng Chau Kaito	Approaching to Kaito Pier	60.8	20	11	6	69.2	Y	69.2	68.2
PC11	Peng Chau Kaito	Approaching to Kaito Pier	59.9	20	7	3	70.6	Y	70.6	69.6
PC13	Peng Chau Kaito	Approaching to Kaito Pier	62.3	20	8	4	72.2	Y	72.2	71.3
									Minimum	68.2
									Maximum	71.3
									Average	69.2
PC2	Peng Chau Kaito	Departure from Kaito Pier	62.1	20	10	5	71.0	Y	71.0	70.1
PC4	Peng Chau Kaito	Departure from Kaito Pier	61.7	20	9	5	71.1	Y	71.1	70.1
PC6	Peng Chau Kaito	Departure from Kaito Pier	61.6	20	8	4	71.8	Y	71.8	70.8
PC8	Peng Chau Kaito	Departure from Kaito Pier	62.3	20	14	7	69.8	Y	69.8	68.8
PC10	Peng Chau Kaito	Departure from Kaito Pier	63.3	20	5	3	75.1	N	-	-
PC12	Peng Chau Kaito	Departure from Kaito Pier	68.7	20	10	5	77.8	N	-	-
PC14	Peng Chau Kaito	Departure from Kaito Pier	60.8	20	5	2	73.1	Y	73.1	72.1
PC15	Peng Chau Kaito	Departure from Kaito Pier	64.9	20	7	4	75.4	Y	75.4	74.5
									Minimum	68.8
									Maximum	74.5
									Average	71.3

Note:
[1] All measurement were taken at free field condition.
[2] Perpendicular distance between the reference measurement location and the source.
[3] SEL = L_{max} + 10log(kd/V) according to Equation 2.22 of Transportation Noise Reference Book, 1987.
where k = 2 (empirical constant, d = perpendicular distance, v = speed in m/s



Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Determination of Ferry Noise Sources (Mui Wo Line)

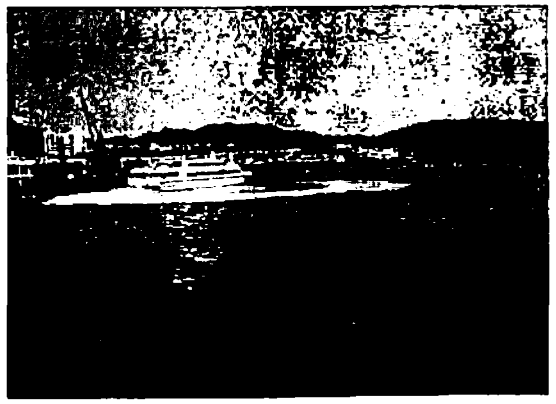
Event	Description	Direction	Measured L_{max}, dB(A) [1]	Approx. Distance from ferry, m [2]	Speed, Knots/hr	Speed (V), m/s	Estimated SEL, dB(A) [3]	Non-Disturbed Events(Y/N)	SEL for non - disturbed events, dB(A)	SEL at 25m, dB(A)
MW1	Mui Wo Kaito	Approaching to Kaito Pier	60.7	20	10	5	69.7	Y	69.7	68.8
MW3	Mui Wo Kaito	Approaching to Kaito Pier	61.1	20	7	3	71.8	Y	71.8	70.9
MW5	Mui Wo Kaito	Approaching to Kaito Pier	66.3	20	5	2	78.6	Y	78.6	77.7
MW7	Mui Wo Kaito	Approaching to Kaito Pier	64.7	20	5	2	76.8	Y	76.8	75.9
MW9	Mui Wo Kaito	Approaching to Kaito Pier	62.9	20	5	3	74.9	Y	74.9	73.9
MW11	Mui Wo Kaito	Approaching to Kaito Pier	69.9	20	5	2	82.0	N	-	-
									Minimum	68.8
									Maximum	77.7
									Average	73.4
MW2	Mui Wo Kaito	Departure from Kaito Pier	68.3	20	6	3	79.2	Y	79.2	78.3
MW4	Mui Wo Kaito	Departure from Kaito Pier	66.7	20	4	2	79.6	Y	79.6	78.6
MW6	Mui Wo Kaito	Departure from Kaito Pier	64.4	20	8	4	74.4	Y	74.4	73.4
MW8	Mui Wo Kaito	Departure from Kaito Pier	68.2	20	6	3	79.4	Y	79.4	78.5
MW10	Mui Wo Kaito	Departure from Kaito Pier	61.2	20	4	2	74.0	Y	74.0	73.0
MW12	Mui Wo Kaito	Departure from Kaito Pier	63.1	20	6	3	74.3	Y	74.3	73.4
									Minimum	73.0
									Maximum	78.6
									Average	75.9

Note:
[1] All measurement were taken at free field condition.
[2] Perpendicular distance between the reference measurement location and the source.
[3] SEL = L_{max} + 10log(kd/V) according to Equation 2.22 of Transportation Noise Reference Book, 1987.
where k = 2 (empirical constant, d = perpendicular distance, v = speed in m/s

Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Determination of Ferry Noise Sources (Discovery Bay to Central Line)

Event	Description	Direction	Measured L_{max}, dB(A) [1]	Approx. Distance from ferry, m [2]	Speed, Knots/hr	Speed (V), m/s	Estimated SEL, dB(A) [3]	Non-Disturbed Events(Y/N)	SEL for non - disturbed events, dB(A)	SEL at 25m, dB(A)
DB1	Discoery Bay No. 9	Approaching to DB Public Pier	64.5	50	10	5	77.5	Y	77.5	80.5
DB2	Discoery Bay No. 8	Approaching to DB Public Pier	64.2	50	6	3	79.0	Y	79.0	82.0
DB6	Discoery Bay No. 9	Approaching to DB Public Pier	69.7	50	10	5	82.6	Y	82.6	85.6
DB8	Discoery Bay No. 8	Approaching to DB Public Pier	67.1	50	11	5	79.7	Y	79.7	82.7
DB12	Discoery Bay No. 8	Approaching to DB Public Pier	64.7	50	4	2	81.1	Y	81.1	84.1
DB14	Discoery Bay No. 5	Approaching to DB Public Pier	64.8	50	6	3	80.1	N	-	-
DB16	Discoery Bay No. 7	Approaching to DB Public Pier	63.3	50	9	5	76.7	Y	76.7	79.7
DB18	Discoery Bay No. 5	Approaching to DB Public Pier	67.9	50	9	5	81.3	Y	81.3	84.3
DB4	Discoery Bay No. 1	Approaching to DB Public Pier	62.0	50	6	3	77.3	Y	77.3	80.3
DB10	Discoery Bay No. 1	Approaching to DB Public Pier	62.4	50	9	4	76.0	Y	76.0	79.0
									Minimum	79.0
									Maximum	85.6
									Average	82.0
DB3	Discoery Bay No. 8	Departure from DB Public Pier	68.1	50	9	5	81.5	Y	81.5	84.5
DB5	Discoery Bay No. 1	Departure from DB Public Pier	71.3	50	4	2	87.9	N	-	-
DB7	Discoery Bay No. 9	Departure from DB Public Pier	73.7	50	12	6	85.9	N	-	-
DB9	Discoery Bay No. 8	Departure from DB Public Pier	72.6	50	8	4	86.6	N	-	-
DB11	Discoery Bay No. 1	Departure from DB Public Pier	72.2	50	11	5	84.9	N	-	-
DB13	Discoery Bay No. 8	Departure from DB Public Pier	64.8	50	8	4	78.5	Y	78.5	81.5
DB15	Discoery Bay No. 5	Departure from DB Public Pier	64.6	50	8	4	78.4	Y	78.4	81.4
DB17	Discoery Bay No. 7	Departure from DB Public Pier	69.7	50	9	5	83.1	Y	83.1	86.1
DB19	Discoery Bay No. 5	Departure from DB Public Pier	67.8	50	9	4	81.3	Y	81.3	84.3
									Minimum	81.4
									Maximum	86.1
									Average	83.6

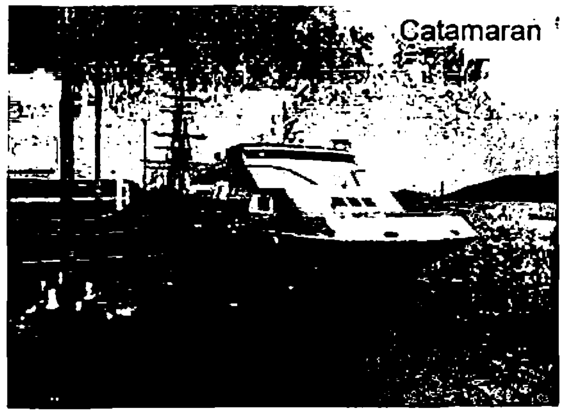
Note:
[1] All measurement were taken at free field condition.
[2] Perpendicular distance between the reference measurement location and the source.
[3] SEL = L_{max} + 10log(kd/V) according to Equation 2.22 of Transportation Noise Reference Book, 1987.
where k = 2 (empirical constant, d = perpendicular distance, v = speed in m/s

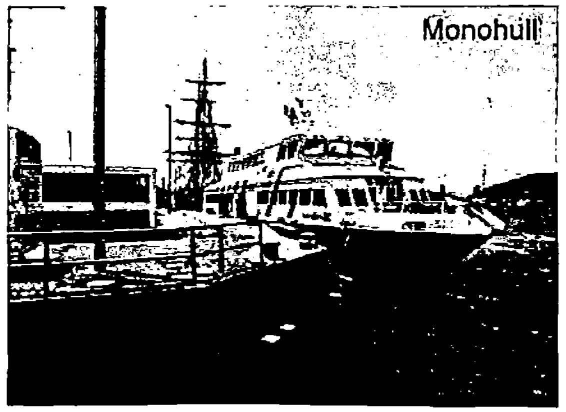


Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Determination of Ferry Noise Sources (Ferry Petrol Filling)

Event	Description	Direction	Measured L_{max}, dB(A) [1]	Approx. Distance from ferry, m [2]	Speed, Knots/hr	Speed (V), m/s	Estimated SEL, dB(A) [3]	Non-Disturbed Events(Y/N)	SEL for non - disturbed events, dB(A)	SEL at 25m, dB(A)
DB(fuel)1	Monohull petrol filling	Approaching to Oil Tank at Marina Avenue	69.2	20	4	2	82.3	Y	82.3	81.3
DB(fuel)3	Catamaran petrol filling	Approaching to Oil Tank at Marina Avenue	66.1	20	3	2	79.9	Y	79.9	78.9
									Minimum	78.9
									Maximum	81.3
									Average	80.1
DB(fuel)2	Monohull petrol filling	Departure from Oil Tank at Marina Avenue	69.4	20	3	2	83.1	Y	83.1	82.1
DB(fuel)4	Catamaran petrol filling	Departure from Oil Tank at Marina Avenue	63.4	20	3	1	78.1	Y	78.1	77.1
									Minimum	77.1
									Maximum	82.1
									Average	79.6

Note:
[1] All measurement were taken at free field condition.
[2] Perpendicular distance between the reference measurement location and the source.
[3] SEL = L_{max} + 10log(kd/V) according to Equation 2.22 of Transportation Noise Reference Book, 1987.
where k = 2 (empirical constant, d = perpendicular distance, v = speed in m/s





Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Determination of Ferry Noise Sources (Oil Tanker)

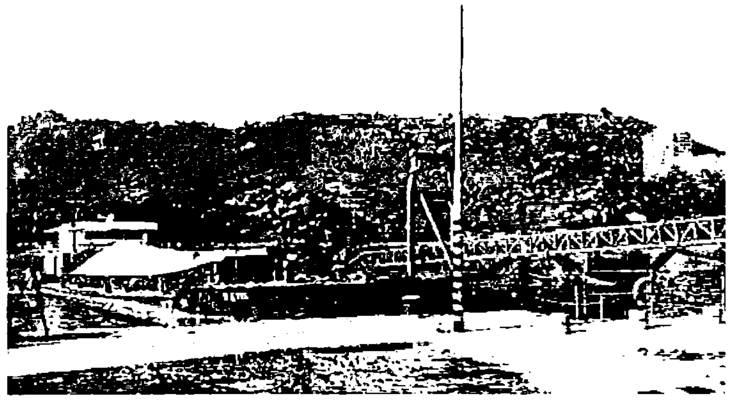
Event	Description	Direction	Measured L_{max}, dB(A) [1]	Approx. Distance from ferry, m [2]	Speed, Knots/hr	Speed (V), m/s	Estimated SEL, dB(A) [3]	Non-Disturbed Events(Y/N)	SEL for non - disturbed events, dB(A)	SEL at 25m, dB(A)
PS1	Oil Tanker	Approaching to Oil Tank at Marina Avenue	68.9	15	13	7	75.4	Y	75.4	73.2
PS2	Oil Tanker	Departure from Oil Tank at Marina Avenue	71.7	15	5	3	82.4	Y	82.4	80.2
									Minimum	73.2
									Maximum	80.2
									Average	76.7

Note:
[1] All measurement were taken at free field condition.
[2] Perpendicular distance between the reference measurement location and the source.
[3] SEL = L_{max} + 10log(kd/V) according to Equation 2.22 of Transportation Noise Reference Book, 1987.
where k = 2 (empirical constant, d = perpendicular distance, v = speed in m/s

Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Determination of Ferry Noise Sources (Sand Barge)

Event	Description	Direction	Measured L_{max}, dB(A) [1]	Approx. Distance from ferry, m [2]	Speed, Knots/hr	Speed (V), m/s	Estimated SEL, dB(A) [3]	Non-Disturbed Events(Y/N)	SEL for non - disturbed events, dB(A)	SEL at 25m, dB(A)
SB1	Sand Barge	Approaching to Sand Barge	68.0	15	4	2	79.3	N	-	-
SB2	Sand Barge	Departure from Sand Barge	67.4	15	3	2	80.0	Y	80.0	77.7
									Minimum	77.7
									Maximum	77.7
									Average	77.7

Note:
[1] All measurement were taken at free field condition.
[2] Perpendicular distance between the reference measurement location and the source.
[3] SEL = L_{max} + 10log(kd/V) according to Equation 2.22 of Transportation Noise Reference Book, 1987.



Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Determination of Ferry Noise Sources (Tug Boat with Barge)

Event	Description	Direction	Passby time, s	Travelling Distance, m	Measured L_{max}, dB(A) [1]	Approx. Distance from ferry, m [2]	Estimated Speed (km/hr)	Speed, Knots/hr	Speed (V), m/s	Estimated SEL, dB(A) [3]	Non-Disturbed Events(Y/N)	SEL for non - disturbed events, dB(A)	SEL at 25m, dB(A)
TB1	Tug Boat with Barge	Approaching to Kaito Pier	204	250	68.3	15	4	2	1.2	82.2	Y	82.2	80.0
TB2	Tug Boat with Barge	Departure from Kaito Pier	204	250	67.3	15	4	2	1.2	81.2	Y	81.2	79.0
												Minimum	79.0
												Maximum	80.0
												Average	79.5

Note:
[1] All measurement were taken at free field condition.
[2] Perpendicular distance between the reference measurement location and the source.
[3] SEL = L_{max} + 10log(kd/V) according to Equation 2.22 of Transportation Noise Reference Book, 1987.
where k = 2 (empirical constant, d = perpendicular distance, v = speed in m/s

Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Determination of Marina Noise Sources

Event	Description	Direction	Measured L_{max}, dB(A) [1]	Approx. Distance from yacht, m [2]	Speed, Knots/hr	Speed (V), m/s	Estimated SEL, dB(A) [3]	Non-Disturbed Events(Y/N)	SEL for non - disturbed events, dB(A) [5]	SEL at 25m, dB(A)
Yacht - 1	Sailboat 1 [6]	Out from Marina	57.6	20	7	4	68.2	Y	-	-
Yacht - 2	Speed boat 1	In to Marina	57.1	20	9	5	66.4	Y	66.4	64.5
Yacht - 3	Speed boat 2	Out from Marina	63.6	20	13	7	71.4	Y	71.4	69.5
Yacht - 4	Sailboat 2 [6]	Out from Marina	62.3	20	8	4	72.3	N	-	-
Yacht - 5	Speed boat 3	In to Marina	60.6	20	8	4	70.3	Y	70.3	68.4
Yacht -6	Waste collection boat 1	Out from Marina	58.9	20	8	4	68.6	Y	68.6	66.7
Yacht -7	Speed boat 4	Out from Marina	55.2	20	8	4	64.9	Y	64.9	62.9
Yacht -8	Speed boat 5	In to Marina	63.7	20	8	4	73.8	Y	73.8	71.8
Yacht -9	Yacht 1	In to Marina	61.7	20	8	4	71.5	Y	71.5	69.6
Yacht -10	Sailboat 3 [6]	Out from Marina	55.0	20	11	6	63.4	Y	-	-
Yacht -11	Speed boat 6	Out from Marina	65.8	20	12	6	74.0	Y	74.0	72.1
Yacht -12	Sailboat 4 [6]	Out from Marina	55.8	20	7	3	66.6	Y	-	-
Yacht -13	Waste collection boat 2	In to Marina	63.5	20	8	4	73.2	Y	73.2	71.2
Yacht - 14	Sailboat 5 [4]	Out from Marina	67.9	20	8	4	77.7	N	-	-
Yacht - 15	Sailboat 6 [6]	Out from Marina	57.1	20	8	4	67.2	Y	-	-
Yacht -16	Sailboat 7	Out from Marina	62.0	20	10	5	71.0	Y	71.0	69.1
Yacht -17	Speed boat 7 [4]	In to Marina	61.2	20	11	6	69.6	N	-	-
Yacht -18	Sailboat 8 [6]	Out from Marina	61.2	20	6	3	72.2	Y	-	-
Yacht -19	Sailboat 9 [4,6]	Out from Marina	61.2	20	7	4	71.5	N	-	-
Yacht -20	Speed boat 8 [4]	Out from Marina	61.2	20	11	6	69.6	N	-	-
Yacht -21	Sailboat 10 [4,6]	Out from Marina	56.3	20	7	4	66.6	N	-	-
Yacht -22	Sailboat 11 [6]	Out from Marina	58.0	20	10	5	67.0	Y	-	-
Yacht -23	Speed boat 9	Out from Marina	61.6	20	17	9	68.1	Y	68.1	66.2
Yacht -24	Sailboat 12 [6]	Out from Marina	57.9	20	11	6	66.4	Y	-	-
Yacht -25	Sailboat 13 [6]	Out from Marina	56.4	20	11	6	64.9	Y	-	-
Yacht -26	Speed boat 10	In to Marina	58.5	20	10	5	67.4	Y	67.4	65.5
Yacht -27	Speed boat 11 [4]	Out from Marina	60.3	20	10	5	69.1	N	-	-
Yacht -28	Speed boat 12	Out from Marina	62.8	20	10	5	71.6	Y	71.6	69.6
Yacht -29	Speed boat 13	In to Marina	59.5	20	7	4	70.0	Y	70.0	68.0
Yacht -30	Speed boat 14	In to Marina	56.7	20	10	5	65.7	Y	65.7	63.8
Yacht -31	Waste collection boat 3	In to Marina	57.0	20	8	4	66.7	Y	66.7	64.8
Yacht -32	Speed boat 15	Out from Marina	60.8	20	10	5	69.8	Y	69.8	67.9
Yacht -33	Speed boat 16	In to Marina	64.5	20	7	4	74.8	N	-	-
Yacht -34	Waste collection boat 4	In to Marina	56.8	20	8	4	66.6	Y	66.6	64.7
Yacht -35	Sailboat 14 [6]	Out from Marina	61.2	20	3	2	75.2	N	-	-
									Min.	62.9
									Maximum	72.1
									Average	67.6

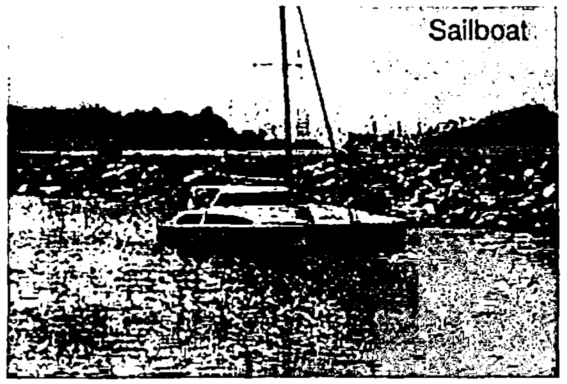
Note:
[1] All measurement were taken at free field condition.
[2] Perpendicular distance between the reference measurement location and the source.

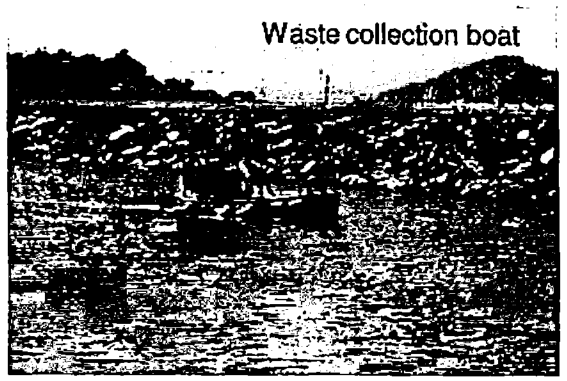
[3] SEL = L_{max} + 10log(kd/V) according to Equation 2.22 of Transportation Noise Reference Book, 1987.
where k = 2 (empirical constant, d = perpendicular distance, v = speed in m/s

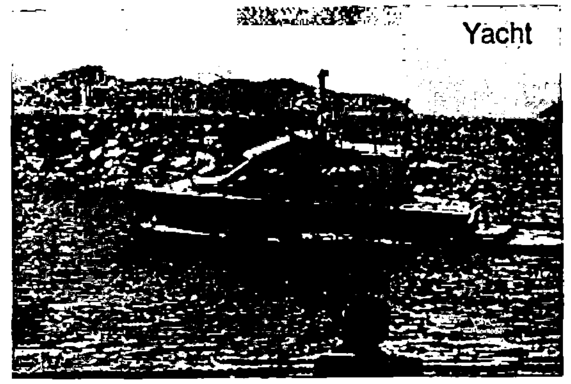
[4] Affected by noise from other marine traffic.

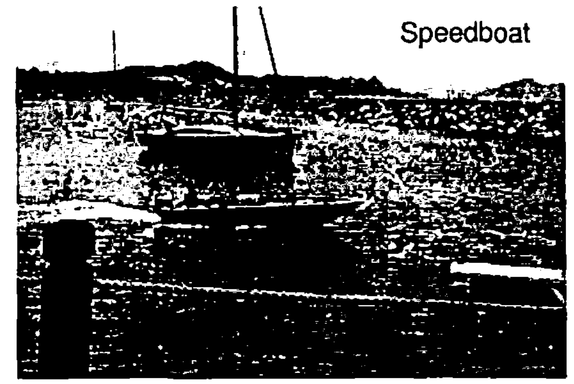
[5] Marine Department Notice No. 84 of year 2000 regarding speed limit in typhoon shelters, all vessels underway in the entrance to or within a typhoon shelter should not exceed five knots. However, yachts with speed more than 5knots per hour are still considered in the source term calculation for conservative approach.

[6] Noise events from sailboat were observed compatible to background noise level, therefore, the noise from sailboat is insignificant and concluded as no impact.









Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Determination of Ferry Noise Sources (LPG container vessel)

Event	Description	Direction	Measured L_{max}, dB(A) [1]	Approx. Distance from ferry, m [2]	Speed, Knots/hr	Speed (V), m/s	Estimated SEL, dB(A) [3]	Non-Disturbed Events(Y/N)	SEL for non - disturbed events, dB(A)	SEL at 25m, dB(A)
LPG1	LPG container vessel	Approaching to LPG container vessel	62.1	15	4	2	73.4	Y	73.4	71.2
LPG2	LPG container vessel	Departure from LPG container vessel	56.7	15	3	2	69.3	N	-	-
									Minimum	71.2
									Maximum	71.2
									Average	71.2

Note:
[1] All measurement were taken at free field condition.
[2] Perpendicular distance between the reference measurement location and the source.
[3] SEL = L_{max} + 10log(kd/V) according to Equation 2.22 of Transportation Noise Reference Book, 1987.

Appendix 5.3

Predicted SPL due to Marine Traffic

Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Marine Traffic Noise Assessment
Assessment Point: **N10b-A1**

Case 1: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & Tugboat with barge in 60mins

Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Correction, dB(A)						Predicted Noise Level, Leq (60min) dB(A)	Overall Noise Level, Leq (60min) dB(A)	Prevailing Noise Level, Leq (60min) dB(A)[5]	Remark
							Time	No.	Facade	Barrier	Directivity	Distance				
PC	Daytime / Evening time	Approaching	71.3	3600	2	50	36	3	3	0	0	-3	39			-
		Departure	74.5	3600	2	50	36	3	3	0	0	-3	42			-
MW		Approaching	77.7	3600	1	50	36	0	3	0	0	-3	42			-
		Departure	78.6	3600	1	50	36	0	3	0	0	-3	43			-
DB		Approaching	85.6	3600	5	750	36	7	3	-10	0	-15	35	51	51	-
		Departure	86.1	3600	4	750	36	6	3	-10	0	-15	35			-
Yacht		Approaching & Departure	72.1	3600	3	135	36	5	3	0	0	-7	37			-
TB		Approaching	80.0	3600	1	30	36	0	3	0	0	-1	47			For worst case 60min scenario, activity with higher SEL would be used for assessment
		Departure	79.0	3600	-	30	-	-	3	0	0	-	-			
PC	Nighttime	Approaching	71.3	3600	1	50	36	0	3	0	0	-3	36			-
		Departure	74.5	3600	1	50	36	0	3	0	0	-3	39			-
MW		Approaching	77.7	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime
		Departure	78.6	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime
DB		Approaching	85.6	3600	3	750	36	5	3	-10	0	-15	33	42	46	-
		Departure	86.1	3600	3	750	36	5	3	-10	0	-15	34			-
Yacht		Approaching & Departure	72.1	3600	-	135	-	-	3	0	0	-	-			No operation during nighttime
TB		Approaching	80.0	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime
		Departure	79.0	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime

Note:
[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; OT - Oil Tanker
[2] Estimated SEL at reference distance of 25m.
[3] Time = 3600s for 1 hour period
[4] No. of Yacht in 1 hour (Both approaching & departure)
[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Case 2: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & Sand Barge in 60mins

Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Correction, dB(A)						Predicted Noise Level, Leq (60min) dB(A)	Overall Noise Level, Leq (60min) dB(A)	Prevailing Noise Level, Leq (60min) dB(A)[5]	Remark
							Time	No.	Facade	Barrier	Directivity	Distance				
PC	Daytime / Evening time	Approaching	71.3	3600	2	50	36	3	3	0	0	-3	39			-
		Departure	74.5	3600	2	50	36	3	3	0	0	-3	42			-
MW		Approaching	77.7	3600	1	50	36	0	3	0	0	-3	42			-
		Departure	78.6	3600	1	50	36	0	3	0	0	-3	43			-
DB		Approaching	85.6	3600	5	750	36	7	3	-10	0	-15	35	50	51	-
		Departure	86.1	3600	4	750	36	6	3	-10	0	-15	35			-
Yacht		Approaching & Departure	72.1	3600	3	135	36	5	3	0	0	-7	37			-
SB		Approaching	77.7	3600	1	30	36	0	3	0	0	-1	44			For worst case 60min scenario, activity with higher SEL would be used for assessment
		Departure	77.7	3600	-	30	-	-	3	0	0	-	-			
PC	Nighttime	Approaching	71.3	3600	1	50	36	0	3	0	0	-3	36			-
		Departure	74.5	3600	1	50	36	0	3	0	0	-3	39			-
MW		Approaching	77.7	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime
		Departure	78.6	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime
DB		Approaching	85.6	3600	3	750	36	5	3	-10	0	-15	33	42	46	-
		Departure	86.1	3600	3	750	36	5	3	-10	0	-15	34			-
Yacht		Approaching & Departure	72.1	3600	-	135	-	-	3	0	0	-	-			No operation during nighttime
SB		Approaching	77.7	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime
		Departure	77.7	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime

Note:
[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; SB - Sand Barge
[2] Estimated SEL at reference distance of 25m.
[3] Time = 3600s for 1 hour period.
[4] No. of Yacht in 1 hour (Both approaching & departure)
[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Project No.: 235928

Project Title: Optimization of Land Use in Discovery Bay

Title: Marine Traffic Noise Assessment

Assessment Point: **N10b-A1**

Case 3: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & LPG container vessel in 60mins

Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Correction, dB(A) Time	No.	Facade	Barrier	Directivity	Distance	Predicted Noise Level, $Leq_{(60min)}$ dB(A)	Overall Noise Level, $Leq_{(60min)}$ dB(A)	Prevailing Noise Level, $Leq_{(60min)}$ dB(A)[5]	Remark
PC	Daytime / Evening time	Approaching	71.3	3600	2	50	36	3	3	0	0	-3	39	49	51	-
		Departure	74.5	3600	2	50	36	3	3	0	0	-3	42			-
MW		Approaching	77.7	3600	1	50	36	0	3	0	0	-3	42			-
		Departure	78.6	3600	1	50	36	0	3	0	0	-3	43			-
DB		Approaching	85.6	3600	5	750	36	7	3	-10	0	-15	35			-
		Departure	86.1	3600	4	750	36	6	3	-10	0	-15	35			-
Yacht		Approaching & Departure	72.1	3600	3	135	36	5	3	0	0	-7	37			-
LPG		Approaching	71.2	3600	1	30	36	0	3	0	0	-1	38			For worst case 60min scenario, SEL of arrival activity would be used for departure activity in the assessment
		Departure	71.2	3600	1	30	36	0	3	0	0	-1	38			
PC	Nighttime	Approaching	71.3	3600	1	50	36	0	3	0	0	-3	36	42	46	-
		Departure	74.5	3600	1	50	36	0	3	0	0	-3	39			-
MW		Approaching	77.7	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime
		Departure	78.8	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime
DB		Approaching	85.6	3600	3	750	36	5	3	-10	0	-15	33			-
		Departure	86.1	3600	3	750	36	5	3	-10	0	-15	34			-
Yacht		Approaching & Departure	72.1	3600	-	135	-	-	3	0	0	-	-			No operation during nighttime
LPG		Approaching	71.2	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime
		Departure	71.2	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime

Note:

[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; LPG - LPG container vessel

[2] Estimated SEL at reference distance of 25m.

[3] Time = 3600s for 1 hour period.

[4] No. of Yacht in 1 hour (Both approaching & departure)

[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Marine Traffic Noise Assessment
Assessment Point: **N10b-A10**

Case 1: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & Tugboat with barge in 60mins

Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Correction, dB(A)						Predicted Noise Level, Leq (60min) dB(A)	Overall Noise Level, Leq (60min) dB(A)	Prevailing Noise Level, Leq (60min) dB(A)[5]	Remark
							Time	No.	Facade	Barrier	Directivity	Distance				
		Approaching	71.3	3600	2	85	36	3	3	0	0	-5	36			-
PC		Departure	74.5	3600	2	85	36	3	3	0	0	-5	40			-
		Approaching	77.7	3600	1	85	36	0	3	0	0	-5	40			-
MW		Departure	78.6	3600	1	85	36	0	3	0	0	-5	41			-
	Daytime / Evening time	Approaching	85.6	3600	5	830	36	7	3	0	0	-15	45	51	51	-
DB		Departure	86.1	3600	4	830	36	6	3	0	0	-15	44			-
Yacht		Approaching & Departure	72.1	3600	3	55	36	5	3	0	0	-3	41			-
		Approaching	80.0	3600	1	100	36	0	3	0	0	-6	41			For worst case 60min scenario, activity with higher SEL would be used for assessment
TB		Departure	79.0	3600	-	100	-	-	3	0	0	-	-			
		Approaching	71.3	3600	1	85	36	0	3	0	0	-5	33			-
PC		Departure	74.5	3600	1	85	36	0	3	0	0	-5	37			-
		Approaching	77.7	3600	-	85	-	-	3	0	0	-	-			No operation during nighttime
MW		Departure	78.6	3600	-	85	-	-	3	0	0	-	-			No operation during nighttime
	Nighttime	Approaching	85.6	3600	3	830	36	5	3	0	0	-15	43	47	46	-
DB		Departure	86.1	3600	3	830	36	5	3	0	0	-15	43			-
Yacht		Approaching & Departure	72.1	3600	-	55	-	-	3	0	0	-	-			No operation during nighttime
		Approaching	80.0	3600	-	100	-	-	3	0	0	-	-			No operation during nighttime
TB		Departure	79.0	3600	-	100	-	-	3	0	0	-	-			No operation during nighttime

Note:
[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; OT - Oil Tanker
[2] Estimated SEL at reference distance of 25m.
[3] Time = 3600s for 1 hour period.
[4] No. of Yacht in 1 hour (Both approaching & departure)
[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Case 2: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & Sand Barge in 60mins

Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Correction, dB(A)						Predicted Noise Level, Leq (60min) dB(A)	Overall Noise Level, Leq (60min) dB(A)	Prevailing Noise Level, Leq (60min) dB(A)[5]	Remark
							Time	No.	Facade	Barrier	Directivity	Distance				
		Approaching	71.3	3600	2	85	36	3	3	0	0	-5	36			-
PC		Departure	74.5	3600	2	85	36	3	3	0	0	-5	40			-
		Approaching	77.7	3600	1	85	36	0	3	0	0	-5	40			-
MW		Departure	78.6	3600	1	85	36	0	3	0	0	-5	41			-
	Daytime / Evening time	Approaching	85.6	3600	5	830	36	7	3	0	0	-15	45	51	51	-
DB		Departure	86.1	3600	4	830	36	6	3	0	0	-15	44			-
Yacht		Approaching & Departure	72.1	3600	3	55	36	5	3	0	0	-3	41			-
		Approaching	77.7	3600	1	100	36	0	3	0	0	-6	39			For worst case 60min scenario, activity with higher SEL would be used for assessment
SB		Departure	77.7	3600	-	100	-	-	3	0	0	-	-			
		Approaching	71.3	3600	1	85	36	0	3	0	0	-5	33			-
PC		Departure	74.5	3600	1	85	36	0	3	0	0	-5	37			-
		Approaching	77.7	3600	-	85	-	-	3	0	0	-	-			No operation during nighttime
MW		Departure	78.6	3600	-	85	-	-	3	0	0	-	-			No operation during nighttime
	Nighttime	Approaching	85.6	3600	3	830	36	5	3	0	0	-15	43	47	46	-
DB		Departure	86.1	3600	3	830	36	5	3	0	0	-15	43			-
Yacht		Approaching & Departure	72.1	3600	-	55	-	-	3	0	0	-	-			No operation during nighttime
		Approaching	77.7	3600	-	100	-	-	3	0	0	-	-			No operation during nighttime
SB		Departure	77.7	3600	-	100	-	-	3	0	0	-	-			No operation during nighttime

Note:
[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; SB - Sand Barge
[2] Estimated SEL at reference distance of 25m.
[3] Time = 3600s for 1 hour period.
[4] No. of Yacht in 1 hour (Both approaching & departure)
[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Project No.: 235928

Project Title: Optimization of Land Use in Discovery Bay

Title: Marine Traffic Noise Assessment

Assessment Point: **N10b-A10**

Case 3: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & LPG container vessel in 60mins

Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Correction, dB(A) Time	No.	Facade	Barrier	Directivity	Distance	Predicted Noise Level, Leq (60min) dB(A)	Overall Noise Level, Leq (60min) dB(A)	Prevailing Noise Level, Leq (60min) dB(A) [5]	Remark
PC		Approaching	71.3	3600	2	85	36	3	3	0	0	-5	36			-
		Departure	74.5	3600	2	85	36	3	3	0	0	-5	40			-
MW		Approaching	77.7	3600	1	85	36	0	3	0	0	-5	40			-
		Departure	78.6	3600	1	85	36	0	3	0	0	-5	41			-
DB	Daytime / Evening time	Approaching	85.6	3600	5	830	36	7	3	0	0	-15	45	50	51	-
		Departure	86.1	3600	4	830	36	6	3	0	0	-15	44			-
Yacht		Approaching & Departure	72.1	3600	3	55	36	5	3	0	0	-3	41			-
LPG		Approaching	71.2	3600	1	100	36	0	3	0	0	-6	33			
		Departure	71.2	3600	1	100	36	0	3	0	0	-6	33			For worst case 60min scenario, SEL of arrival activity would be used for departure activity in the assessment
PC		Approaching	71.3	3600	1	85	36	0	3	0	0	-5	33			-
		Departure	74.5	3600	1	85	36	0	3	0	0	-5	37			-
MW		Approaching	77.7	3600	-	85	-	-	3	0	0	-	-			No operation during nighttime
		Departure	78.6	3600	-	85	-	-	3	0	0	-	-			No operation during nighttime
DB	Nighttime	Approaching	85.6	3600	3	830	36	5	3	0	0	-15	43	47	46	-
		Departure	86.1	3600	3	830	36	5	3	0	0	-15	43			-
Yacht		Approaching & Departure	72.1	3600	-	55	-	-	3	0	0	-	-			No operation during nighttime
LPG		Approaching	71.2	3600	-	100	-	-	3	0	0	-	-			No operation during nighttime
		Departure	71.2	3600	-	100	-	-	3	0	0	-	-			No operation during nighttime

Note:

[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; LPG - LPG container vessel

[2] Estimated SEL at reference distance of 25m.

[3] Time = 3600s for 1 hour period.

[4] No. of Yacht in 1 hour (Both approaching & departure)

[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Marine Traffic Noise Assessment
Assessment Point: **N10b-A15**

Case 1: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & Tugboat with barge in 60mins

							Correction, dB(A)						Predicted Noise Level, Leq (60min) dB(A)	Overall Noise Level, Leq (60min) dB(A)	Prevailing Noise Level, Leq (60min) dB(A) [5]	Remark
Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Time	No.	Facade	Barrier	Directivity	Distance				
PC	Daytime / Evening time	Approaching	71.3	3600	2	130	36	3	3	0	0	-7	35	50	51	-
		Departure	74.5	3600	2	130	36	3	3	0	0	-7	38			-
MW		Approaching	77.7	3600	1	130	36	0	3	0	0	-7	38			-
		Departure	78.6	3600	1	130	36	0	3	0	0	-7	39			-
DB		Approaching	85.6	3600	5	825	36	7	3	0	0	-15	45			-
		Departure	86.1	3600	4	825	36	6	3	0	0	-15	44			-
Yacht		Approaching & Departure	72.1	3600	3	45	36	5	3	0	0	-3	42			-
TB		Approaching	80.0	3600	1	130	36	0	3	0	0	-7	40			For worst case 60min scenario, activity with higher SEL would be used for assessment
		Departure	79.0	3600	-	130	-	-	3	0	0	-	-			
PC	Nighttime	Approaching	71.3	3600	1	130	36	0	3	0	0	-7	32	46	46	-
		Departure	74.5	3600	1	130	36	0	3	0	0	-7	35			-
MW		Approaching	77.7	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime
		Departure	78.6	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime
DB		Approaching	85.6	3600	3	825	36	5	3	0	0	-15	43			-
		Departure	86.1	3600	3	825	36	5	3	0	0	-15	43			-
Yacht		Approaching & Departure	72.1	3600	-	45	-	-	3	0	0	-	-			No operation during nighttime
TB		Approaching	80.0	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime
		Departure	79.0	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime

Note:
[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; OT - Oil Tanker
[2] Estimated SEL at reference distance of 25m.
[3] Time = 3600s for 1 hour period.
[4] No. of Yacht in 1 hour (Both approaching & departure)
[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Case 2: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & Sand Barge in 60mins

							Correction, dB(A)						Predicted Noise Level, Leq (60min) dB(A)	Overall Noise Level, Leq (60min) dB(A)	Prevailing Noise Level, Leq (60min) dB(A) [5]	Remark
Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Time	No.	Facade	Barrier	Directivity	Distance				
PC	Daytime / Evening time	Approaching	71.3	3600	2	130	36	3	3	0	0	-7	35	50	51	-
		Departure	74.5	3600	2	130	36	3	3	0	0	-7	38			-
MW		Approaching	77.7	3600	1	130	36	0	3	0	0	-7	38			-
		Departure	78.6	3600	1	130	36	0	3	0	0	-7	39			-
DB		Approaching	85.6	3600	5	825	36	7	3	0	0	-15	45			-
		Departure	86.1	3600	4	825	36	6	3	0	0	-15	44			-
Yacht		Approaching & Departure	72.1	3600	3	45	36	5	3	0	0	-3	42			-
SB		Approaching	77.7	3600	1	130	36	0	3	0	0	-7	38			For worst case 60min scenario, activity with higher SEL would be used for assessment
		Departure	77.7	3600	-	130	-	-	3	0	0	-	-			
PC	Nighttime	Approaching	71.3	3600	1	130	36	0	3	0	0	-7	32	46	46	-
		Departure	74.5	3600	1	130	36	0	3	0	0	-7	35			-
MW		Approaching	77.7	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime
		Departure	78.6	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime
DB		Approaching	85.6	3600	3	825	36	5	3	0	0	-15	43			-
		Departure	86.1	3600	3	825	36	5	3	0	0	-15	43			-
Yacht		Approaching & Departure	72.1	3600	-	45	-	-	3	0	0	-	-			No operation during nighttime
SB		Approaching	77.7	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime
		Departure	77.7	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime

Note:
[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; SB - Sand Barge
[2] Estimated SEL at reference distance of 25m.
[3] Time = 3600s for 1 hour period.
[4] No. of Yacht in 1 hour (Both approaching & departure)
[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Marine Traffic Noise Assessment
Assessment Point: **N10b-A15**

Case 3: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & LPG container vessel in 60mins

Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Correction, dB(A) Time	No.	Facade	Barrier	Directivity	Distance	Predicted Noise Level, Leq (60min) dB(A)	Overall Noise Level, Leq (60min) dB(A)	Prevailing Noise Level, Leq (60min) dB(A) [5]	Remark
PC	Daytime / Evening time	Approaching	71.3	3600	2	130	36	3	3	0	0	-7	35	50	51	-
		Departure	74.5	3600	2	130	36	3	3	0	0	-7	38			-
MW		Approaching	77.7	3600	1	130	36	0	3	0	0	-7	38			-
		Departure	78.6	3600	1	130	36	0	3	0	0	-7	39			-
DB		Approaching	85.6	3600	5	825	36	7	3	0	0	-15	45			-
		Departure	86.1	3600	4	825	36	6	3	0	0	-15	44			-
Yacht		Approaching & Departure	72.1	3600	3	45	36	5	3	0	0	-3	42			-
LPG		Approaching	71.2	3600	1	130	36	0	3	0	0	-7	31			For worst case 60min scenario, SEL of arrival activity would be used for departure activity in the assessment
		Departure	71.2	3600	1	130	36	0	3	0	0	-7	31			
PC	Nighttime	Approaching	71.3	3600	1	130	36	0	3	0	0	-7	32	46	46	-
		Departure	74.5	3600	1	130	36	0	3	0	0	-7	35			-
MW		Approaching	77.7	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime
		Departure	78.6	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime
DB		Approaching	85.6	3600	3	825	36	5	3	0	0	-15	43			-
		Departure	86.1	3600	3	825	36	5	3	0	0	-15	43			-
Yacht		Approaching & Departure	72.1	3600	-	45	-	-	3	0	0	-	-			No operation during nighttime
LPG		Approaching	71.2	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime
		Departure	71.2	3600	-	130	-	-	3	0	0	-	-			No operation during nighttime

Note:

[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; LPG - LPG container vessel

[2] Estimated SEL at reference distance of 25m.

[3] Time = 3600s for 1 hour period.

[4] No. of Yacht in 1 hour (Both approaching & departure)

[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Project No.: 235928
Project Title: Optimization of Land Use in Discovery Bay
Title: Marine Traffic Noise Assessment
Assessment Point: **N10b-B1**

Case 1: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & Tugboat with barge in 60mins

							Correction, dB(A)						Predicted Noise Level, Leq (60min) dB(A)	Overall Noise Level, Leq (60min) dB(A)	Prevailing Noise Level, Leq (60min) dB(A) [5]	Remark
Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Time	No.	Facade	Barrier	Directivity	Distance				
PC	Daytime / Evening time	Approaching	71.3	3600	2	30	36	3	3	0	0	-1	41	51	51	-
		Departure	74.5	3600	2	30	36	3	3	0	0	-1	44			-
MW		Approaching	77.7	3600	1	30	36	0	3	0	0	-1	44			-
		Departure	78.6	3600	1	30	38	0	3	0	0	-1	45			-
DB		Approaching	85.6	3600	5	690	36	7	3	-10	0	-14	36			-
		Departure	86.1	3600	4	690	36	6	3	-10	0	-14	35			-
Yacht		Approaching & Departure	72.1	3600	3	190	36	5	3	0	0	-9	36			-
TB		Approaching	80.0	3600	1	50	36	0	3	0	0	-3	44			For worst case 60min scenario, activity with higher SEL would be used for assessment
		Departure	79.0	3600	-	50	-	-	3	0	0	-	-			
PC	Nighttime	Approaching	71.3	3600	1	30	36	0	3	0	0	-1	38	44	46	-
		Departure	74.5	3600	1	30	36	0	3	0	0	-1	41			-
MW		Approaching	77.7	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime
		Departure	78.6	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime
DB		Approaching	85.6	3600	3	690	36	5	3	-10	0	-14	33			-
		Departure	86.1	3600	3	690	36	5	3	-10	0	-14	34			-
Yacht		Approaching & Departure	72.1	3600	-	190	-	-	3	0	0	-	-			No operation during nighttime
TB		Approaching	80.0	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime
		Departure	79.0	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime

Note:
[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; OT - Oil Tanker
[2] Estimated SEL at reference distance of 25m.
[3] Time = 3600s for 1 hour period.
[4] No. of Yacht in 1 hour (Both approaching & departure)
[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added

Case 2: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & Sand Barge in 60mins

							Correction, dB(A)						Predicted Noise Level, Leq (60min) dB(A)	Overall Noise Level, Leq (60min) dB(A)	Prevailing Noise Level, Leq (60min) dB(A) [5]	Remark
Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Time	No.	Facade	Barrier	Directivity	Distance				
PC	Daytime / Evening time	Approaching	71.3	3600	2	30	36	3	3	0	0	-1	41	51	51	-
		Departure	74.5	3600	2	30	36	3	3	0	0	-1	44			-
MW		Approaching	77.7	3600	1	30	36	0	3	0	0	-1	44			-
		Departure	78.6	3600	1	30	36	0	3	0	0	-1	45			-
DB		Approaching	85.6	3600	5	690	36	7	3	-10	0	-14	36			-
		Departure	86.1	3600	4	690	36	6	3	-10	0	-14	35			-
Yacht		Approaching & Departure	72.1	3600	3	190	36	5	3	0	0	-9	36			-
SB		Approaching	77.7	3600	1	50	36	0	3	0	0	-3	42			For worst case 60min scenario, activity with higher SEL would be used for assessment
		Departure	77.7	3600	-	50	-	-	3	0	0	-	-			
PC	Nighttime	Approaching	71.3	3600	1	30	36	0	3	0	0	-1	38	44	46	-
		Departure	74.5	3600	1	30	36	0	3	0	0	-1	41			-
MW		Approaching	77.7	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime
		Departure	78.6	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime
DB		Approaching	85.6	3600	3	690	36	5	3	-10	0	-14	33			-
		Departure	86.1	3600	3	690	36	5	3	-10	0	-14	34			-
Yacht		Approaching & Departure	72.1	3600	-	190	-	-	3	0	0	-	-			No operation during nighttime
SB		Approaching	77.7	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime
		Departure	77.7	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime

Note:
[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; SB - Sand Barge
[2] Estimated SEL at reference distance of 25m.
[3] Time = 3600s for 1 hour period.
[4] No. of Yacht in 1 hour (Both approaching & departure)
[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Project No.: 235928

Project Title: Optimization of Land Use in Discovery Bay

Title: Marine Traffic Noise Assessment

Assessment Point: **N10b-B1**

Case 3: Peng Chau Kaito, Mui Wo Kaito, Discovery Bay Ferry & LPG container vessel in 60mins

Line	Period	Headway	SEL @ 25m, dB(A)[2]	Time, s[3]	No. of Ferry[4]	Distance, m	Correction, dB(A) Time	No.	Facade	Barrier	Directivity	Distance	Predicted Noise Level, $Leq_{(60min)}$ dB(A)	Overall Noise Level, $Leq_{(60min)}$ dB(A)	Prevailing Noise Level, $Leq_{(60min)}$ dB(A) [5]	Remark
PC	Daytime / Evening time	Approaching	71.3	3600	2	30	36	3	3	0	0	-1	41	51	51	-
		Departure	74.5	3600	2	30	36	3	3	0	0	-1	44			-
MW		Approaching	77.7	3600	1	30	36	0	3	0	0	-1	44			-
		Departure	78.6	3600	1	30	36	0	3	0	0	-1	45			-
DB		Approaching	85.6	3600	5	690	36	7	3	-10	0	-14	36			-
		Departure	86.1	3600	4	690	36	6	3	-10	0	-14	35			-
Yacht		Approaching & Departure	72.1	3600	3	190	36	5	3	0	0	-9	36			-
LPG		Approaching	71.2	3600	1	50	36	0	3	0	0	-3	36			For worst case 60min scenario, SEL of arrival activity would be used for departure activity in the assessment
		Departure	71.2	3600	1	50	36	0	3	0	0	-3	36			
PC	Nighttime	Approaching	71.3	3600	1	30	36	0	3	0	0	-1	38	44	46	-
		Departure	74.5	3600	1	30	36	0	3	0	0	-1	41			-
MW		Approaching	77.7	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime
		Departure	78.6	3600	-	30	-	-	3	0	0	-	-			No operation during nighttime
DB		Approaching	85.6	3600	3	690	36	5	3	-10	0	-14	33			-
		Departure	86.1	3600	3	690	36	5	3	-10	0	-14	34			-
Yacht		Approaching & Departure	72.1	3600	-	190	-	-	3	0	0	-	-			No operation during nighttime
LPG		Approaching	71.2	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime
		Departure	71.2	3600	-	50	-	-	3	0	0	-	-			No operation during nighttime

Note:

[1] PC - Peng Chau Kai To; MW - Mui Wo Kai To; DB - Discovery Bay Ferry; TB - Tugboat + barge; DB fuel - Discovery Bay Ferry for petrol filling; LPG - LPG container vessel

[2] Estimated SEL at reference distance of 25m.

[3] Time = 3600s for 1 hour period.

[4] No. of Yacht in 1 hour (Both approaching & departure)

[5] Measured background noise level (BNL) at free field condition , facade correction (+3 dB(A)) has been added.

Appendix 5.4

Fixed Noise Assessment
Methodology and Source
Term Measurement

Methodology

General

The fixed noise sources located within 300m of this development are considered as assessment area. Any representative planned located within the assessment area would be considered in this noise assessment, adopting the noise criteria as discussed in **Appendix 5.1**.

Operational Information

All operational information is based on either site observation or operation schedule from operators for typical days. Based on site observation, marine-based fixed noise sources were mainly generated from Peng Chau kaito, Mui Wo kaito, tugboat with barge, vessel for the gas bottle supplier and sand barge. As shown in **Figure 1-1**, a 8m tall solid wall next to the kaito pier, a 9.8m tall solid wall next to the goods delivery pier and a 7.8m tall solid wall at 3-storey low rise development that near the goods delivery pier will be built.

Besides, further enquiry has been made with the operators, and they confirmed that there will be installed with acoustic treatment to enclose the conveyor belt on sand barge and temporary noise barrier for crane on LPG container vessels to reduce noise impact in future operation, therefore, this acoustic treatment would be considered in the noise assessment.

In addition, ferry petrol filling will be conducted in marine base filling station outside Discovery Bay. Therefore, the operation of oil tanker and ferries / vessels petrol filling near kaito pier would be excluded in the noise assessment.

Determination of Sound Power Levels (SWLs)

In order to determine the SWL of each activity, noise measurements for each selected marine-based fixed noise sources along Marina Drive have been conducted. SWLs of each activity were predicted with standard acoustic principles for noise attenuation (such as time, distance). The calculated SWL and the locations of noise sources are presented in this appendix.

Prediction of Noise Impacts

The SELs summarized in the above tables are then converted to establish the facade noise levels at NSRs, taking into account various consideration such as operation time, distances, number of concurrent vessels, facade effects. A summary of equations adopted in the marine traffic noise assessment is given in the table below.

Table A5.6: Summary of equations for marine-based fixed noise assessment

Parameters	Equations
SWL, dB(A)	$SWL = L_{eq\ (source)} + (20\log(d)+8)$,

Parameters	Equations
	where $L_{eq\ (source)}$ = Measured marine-based fixed noise level, dB(A) d = Distance between measurement location and the fixed noise source, m
$L_{eq\ 30min}$, dB(A)	$L_{eq\ 30min} = SWL - (20\log(d_1)+8) + 20\log(t_1/T) + FC + BC$ where d_1 = Distance between fixed noise source and NSR, m t_1 = Operation time of fixed noise source within a standard assessment period of 30min T = Time period under consideration (30), min FC = With 3 dB(A) facade correction BC = barrier correction (assuming worst case scenario of 125Hz) according to Figure D.3 Screening Effects of Barriers of BS5228-1 2014, Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise

Since all the noise sources from the marine vessels would not occur at the same time, it is important to analyze and establish the possible cases during a typical 30-minute period that would constitute noise impacts. The details of different scenarios are summarized in **Appendix 5.5**.

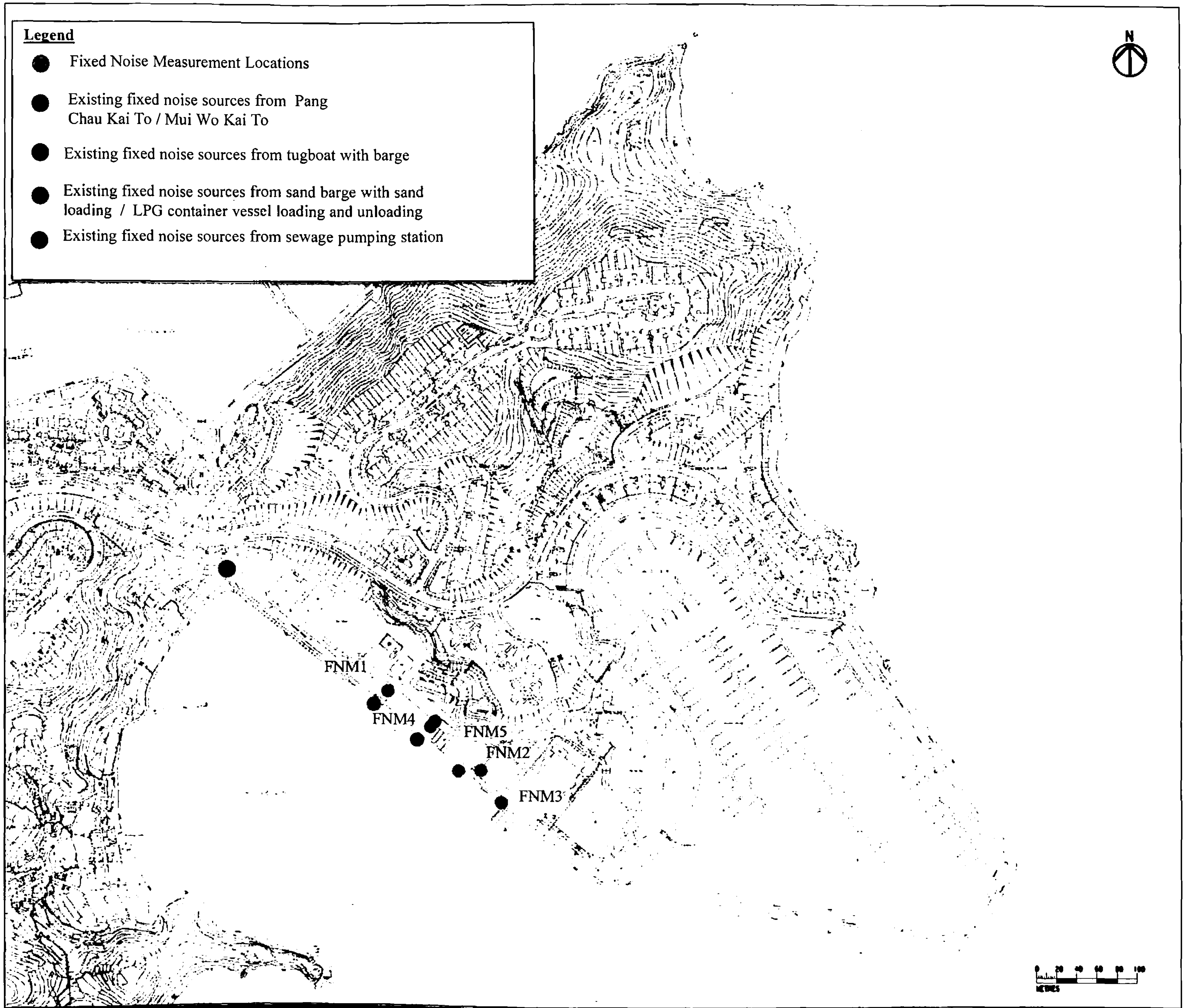
Table A5.7: Summary of all observed possible cases within 30mins

Case	Description [1]				
	PC	MW	TB	SB	LPG
1	√	√[2]	√[2]		
2	√	√[2]		√[2]	
3	√	√[2]			√[2]

Note:

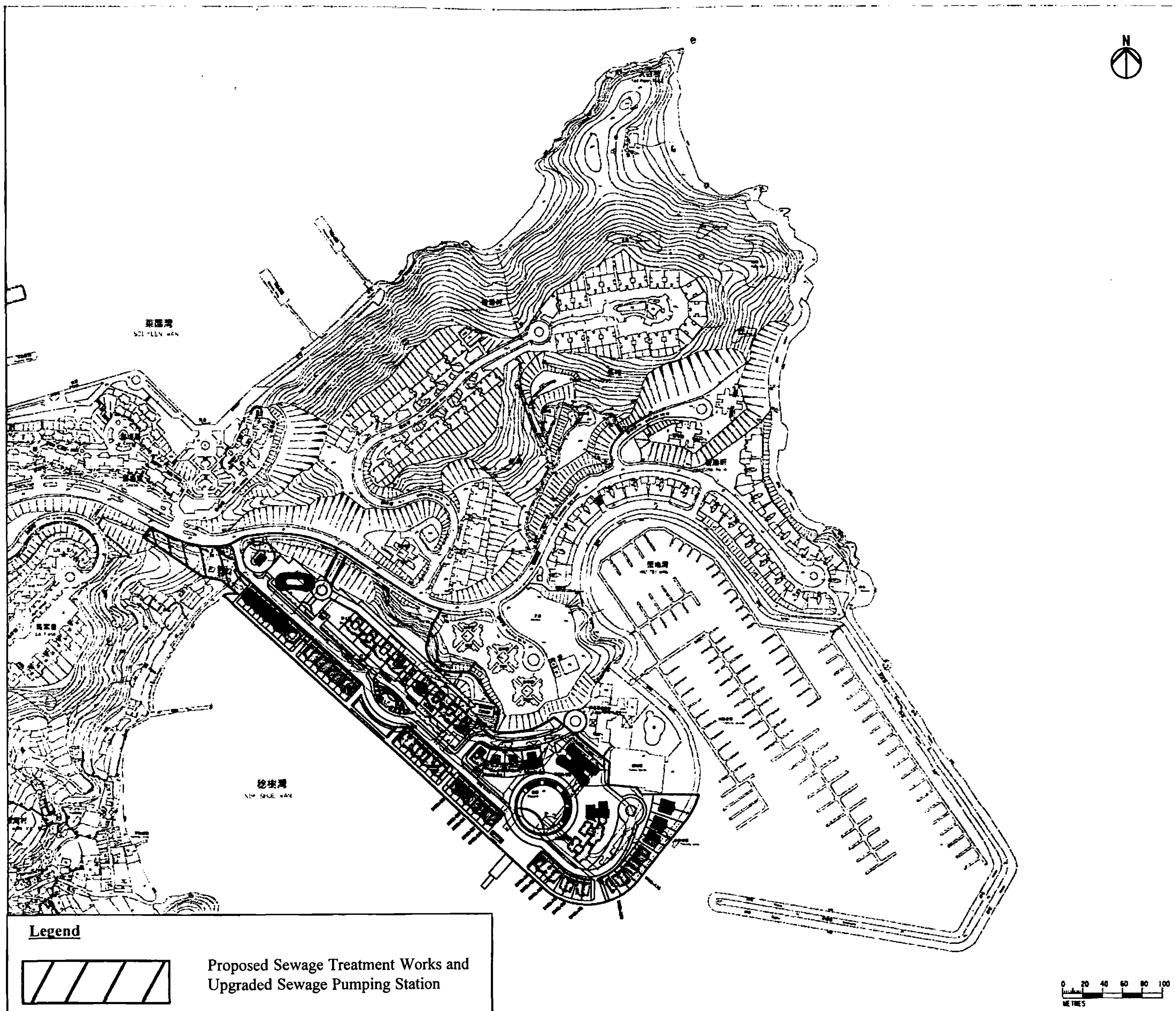
[1] PC – Peng Chau Kaito;
MW – Mui Wo Kaito;
TB – Tugboat with barge from LPG supplier;
SB – Sand barge with sand loading; and
LPG – LPG Container.

[2] Marine vessels operate in daytime only.



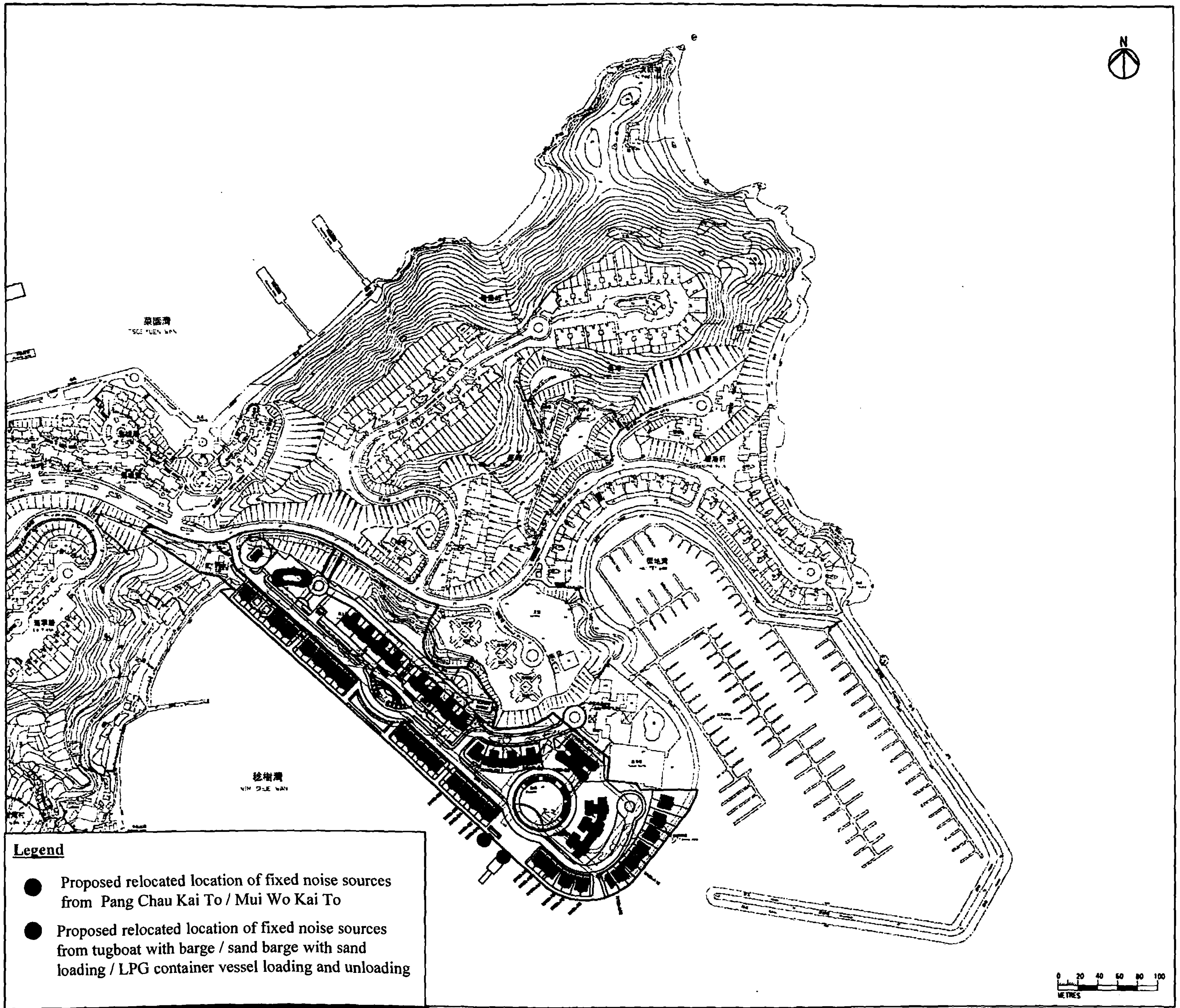
Noise Measurement Location and Existing Marine-based Fixed Noise Sources Locations

ARUP



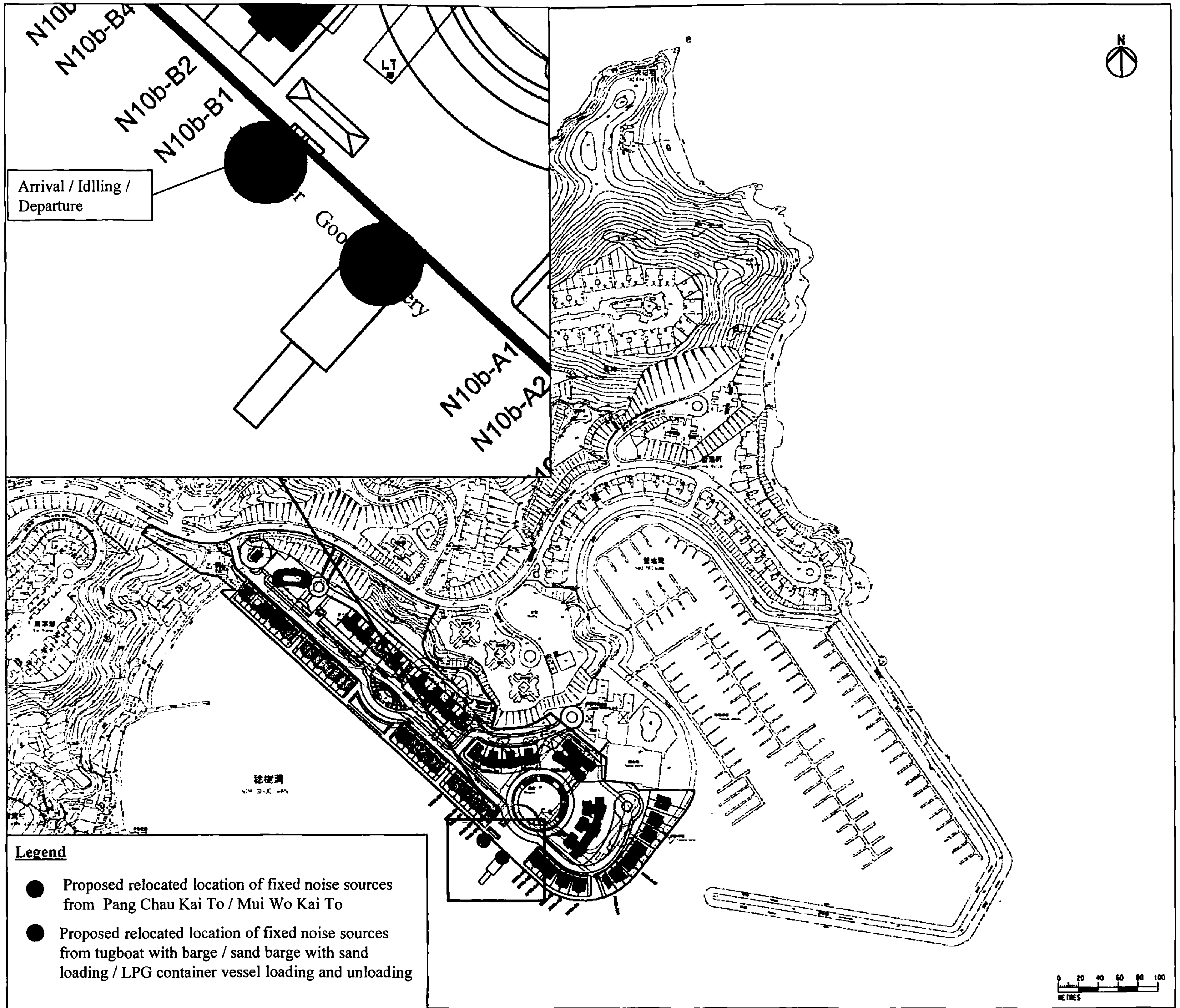
Proposed New Location for Land-Based Fixed Noise Sources

ARUP



Proposed New Locations for Marine-based Fixed Noise Sources

ARUP

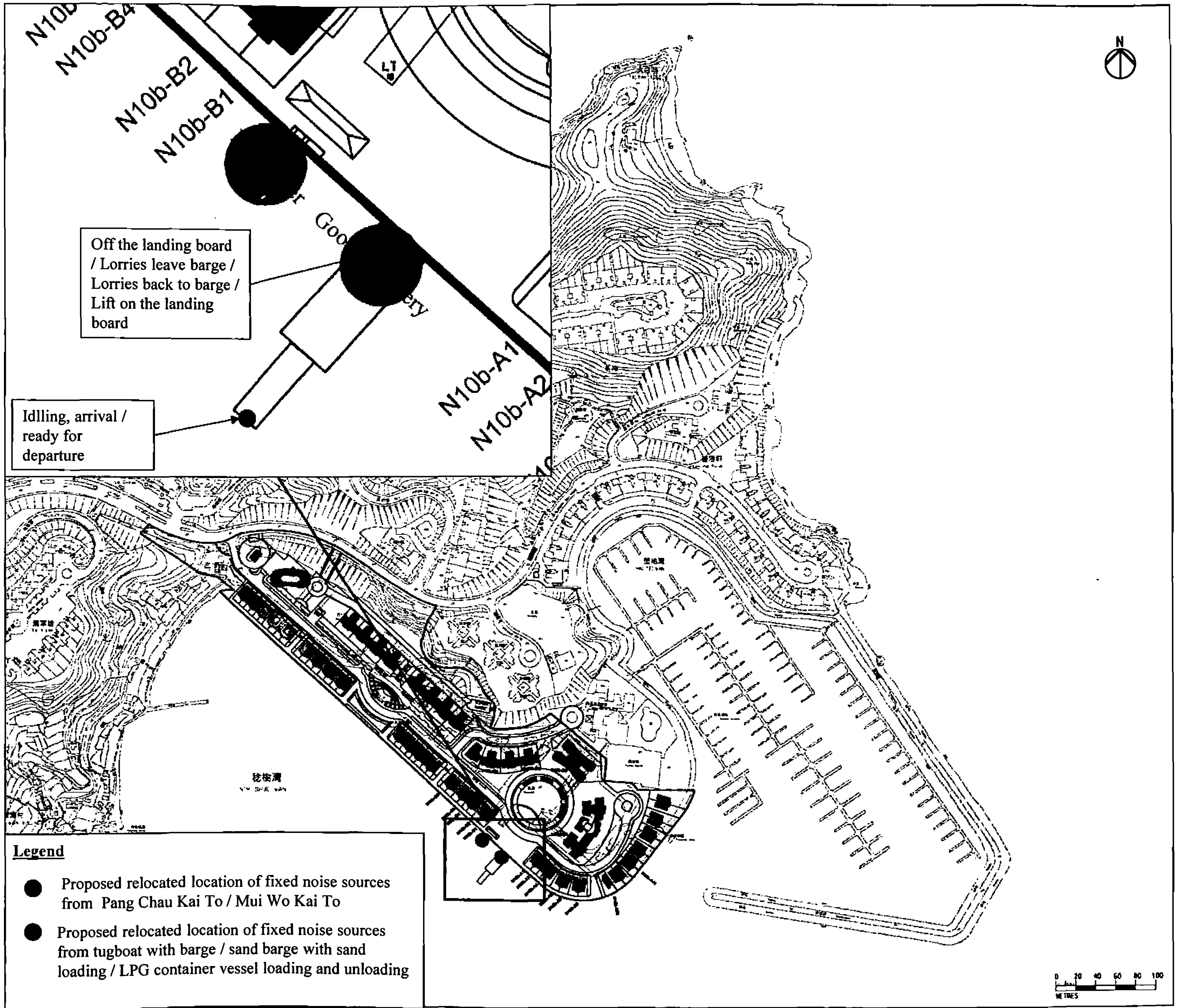


Legend

- Proposed relocated location of fixed noise sources from Pang Chau Kai To / Mui Wo Kai To
- Proposed relocated location of fixed noise sources from tugboat with barge / sand barge with sand loading / LPG container vessel loading and unloading

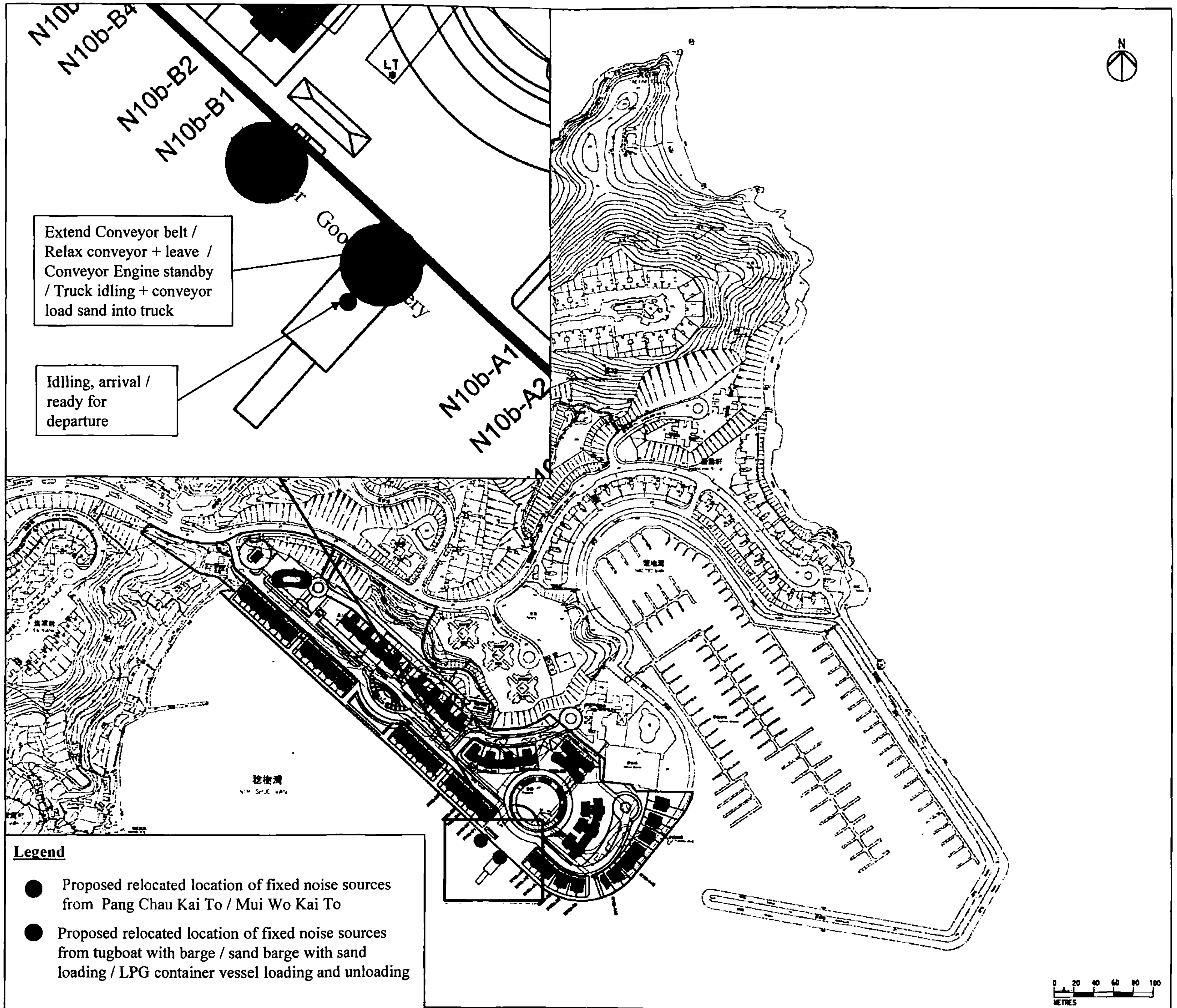
Locations of Activities for Peng Chau Kaito / Mui Wo Kaito

ARUP



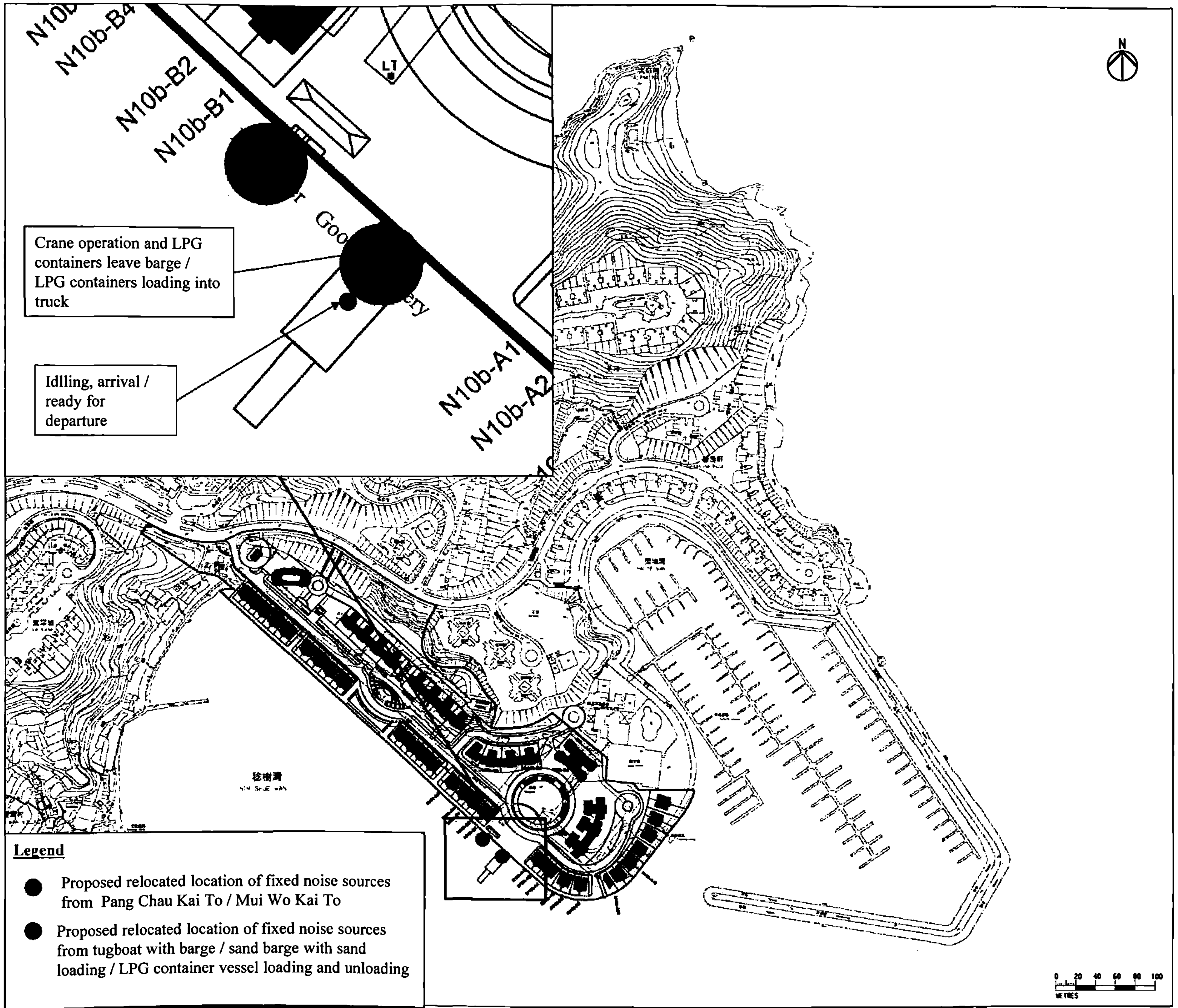
Locations of Activities for Tug Boat and Barge

ARUP



Locations of Activities for Sand Barge and Sand Loading Truck

ARUP



Locations of Activities for LPG Container Vessel and LPG Containers Loading Truck

ARUP

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of Sound Power Level (SWL) for each source

Noise Source ID	Description	Activities/Equipment	Activities ID	Measurement Distance, m	Measured SPL, dB(A)	Distance Correction, dB(A)	SWL, dB(A)	Based on observation and operator information worst operating time, min	Assumed daytime worst operating time in 30min, min	Assumed nighttime worst operating time in 30min, min	Operation Period		Remark
											Daytime	Nighttime	
PC	Peng Chau Kaito	Idlling - arrival	PC1	15.0	56.8	31.5	88	~1	1	1	Y	Y	
		Idling	PC2	15.0	56.7	31.5	88	~5	5	3	Y	Y	
		Idlling - ready for departure	PC3	15.0	59.6	31.5	91	~1	1	1	Y	Y	
MW	Mui Wo Kaito	Idlling - arrival	MW1	15.0	66	31.5	98	~1	1	0	Y	N	
		Idling	MW2	15.0	58.4	31.5	90	~5	5	0	Y	N	
		Idlling - ready for departure	MW3	15.0	66.4	31.5	98	~1	1	0	Y	N	
TB	Tug Boat + Barge	Idling for arrival	TB1	25.0	62.9	36.0	99	~10	10	0	Y	N	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
		Off the landing board	TB2	15.0	68.1	31.5	100	~1	1	0	Y	N	
		Lorries leave barge	TB3	15.0	68.3	31.5	100	~5	5	0	Y	N	
		Lorries back to barge	TB4	15.0	68.3	31.5	100	~5	5	0	Y	N	
		Lift on the landing board	TB5	15.0	66.3	31.5	98	~1	1	0	Y	N	
		Idling for departure	TB6	25.0	62.9	36.0	99	~5	5	0	Y	N	
SB	Sand Barge + Sand Loading Truck	Idling	SB1	15.0	69.8	31.5	101	~1	1	0	Y	N	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
		Extend Conveyor belt	SB2	12.0	69.5	29.6	99	~1	1	0	Y	N	
		Conveyor Engine standby	SB3	25.0	57.9	36.0	94	~30	20	0	Y	N	
		Truck idling + conveyor load sand into truck	SB4	25.0	66.8	36.0	103	~9	9	0	Y	N	
		Relax conveyor + leave	SB5	15.0	70.7	31.5	102	~1	1	0	Y	N	
LPG	LPG Container Vessel + LPG Containers Loading Truck	Idlling - arrival	LPG1	5.0	71.2	22.0	93	~1.5	2	0	Y	N	
		Crane operation and LPG containers leave barge	LPG2	10.0	84.3	28.0	112	~0.5	1	0	Y	N	
		LPG containers loading into truck	LPG3	5.0	73.5	22.0	95	~1	1	0	Y	N	
		Idlling	LPG4	5.0	69	22.0	91	~5	5	0	Y	N	
		Crane operation and LPG containers back to barge	LPG5	10.0	79.5	28.0	108	~0.5	1	0	Y	N	
		Idlling - ready for departure	LPG6	5.0	82.9	22.0	105	~1.5	2	0	Y	N	

Appendix 5.5

Predicted SPL of Fixed Noise Sources

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-B1

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	20	1	-34	-15	-8	0	3	34	
PC2		Idling	88	20	5	-34	-8	-8	0	3	41	
PC3		Idling - ready for departure	91	20	1	-34	-15	-8	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	98	20	1	-34	-15	-8	0	3	44	
MW2		Idling	90	20	5	-34	-8	-8	0	3	43	
MW3		Idling - ready for departure	98	20	1	-34	-15	-8	0	3	44	
TB1	Tug Boat + Barge	Idling for arrival	99	55	10	-43	-5	-5	0	3	49	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	43	1	-41	-15	-5	0	3	43	
TB3		Lorries leave barge	100	48	5	-42	-8	-5	0	3	49	
TB4		Lorries back to barge	100	43	5	-41	-8	-5	0	3	-	
TB5		Lift on the landing board	98	43	1	-41	-15	-5	0	3	-	
TB6		Idling for departure	99	55	5	-43	-8	-5	0	3	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						54	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	20	1	-34	-15	-8	0	3	34	
PC2		Idling	88	20	5	-34	-8	-8	0	3	41	
PC3		Idling - ready for departure	91	20	1	-34	-15	-8	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	98	20	1	-34	-15	-8	0	3	44	
MW2		Idling	90	20	5	-34	-8	-8	0	3	43	
MW3		Idling - ready for departure	98	20	1	-34	-15	-8	0	3	44	
SB1	Sand Barge + Truck sand loading	Idling	101	43	1	-41	-15	-5	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	43	1	-41	-15	-5	0	3	-	
SB3		Engine standby	94	43	20	-41	-2	-5	0	3	50	
SB4		Truck idling + conveyor load sand into truck	103	43	9	-41	-5	-5	-10	3	45	
SB5		Relax conveyor + leave	102	43	1	-41	-15	-5	0	3	45	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						54	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	20	1	-34	-15	-8	0	3	34	
PC2		Idling	88	20	5	-34	-8	-8	0	3	41	
PC3		Idling - ready for departure	91	20	1	-34	-15	-8	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	98	20	1	-34	-15	-8	0	3	44	
MW2		Idling	90	20	5	-34	-8	-8	0	3	43	
MW3		Idling - ready for departure	98	20	1	-34	-15	-8	0	3	44	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	43	2	-41	-12	-5	0	3	39	
LPG2		Crane operation and LPG containers leave barge	112	43	1	-41	-15	-5	-10	3	45	
LPG3		LPG containers loading into truck	95	43	1	-41	-15	-5	0	3	38	
LPG4		Idling	91	43	5	-41	-8	-5	0	3	41	
LPG5		Crane operation and LPG containers back to barge	108	43	1	-41	-15	-5	-10	3	41	
LPG6		Idling - ready for departure	105	43	2	-41	-12	-5	0	3	51	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						54	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS

Job No.: 235928

Title: Fixed Noise Assessment

Subtitle: Calculation of SPL at Receivers (Nighttime)

NSR ID: N10b-B1

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	20	1	-34	-15	-8	0	3	34	
PC2		Idling	88	20	3	-34	-10	-8	0	3	39	
PC3		Idling - ready for departure	91	20	1	-34	-15	-8	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB1	Tug Boat + Barge	Idling for arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB2		Off the landing board	-	-	-	-	-	-	-	-	-	
TB3		Lorries leave barge	-	-	-	-	-	-	-	-	-	
TB4		Lorries back to barge	-	-	-	-	-	-	-	-	-	
TB5		Lift on the landing board	-	-	-	-	-	-	-	-	-	
TB6		Idling for departure	-	-	-	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq (30min) dB(A)						42	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	20	1	-34	-15	-8	0	3	34	
PC2		Idling	88	20	5	-34	-8	-8	0	3	41	
PC3		Idling - ready for departure	91	20	1	-34	-15	-8	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq (30min) dB(A)						43	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	20	1	-34	-15	-8	0	3	34	
PC2		Idling	88	20	5	-34	-8	-8	0	3	41	
PC3		Idling - ready for departure	91	20	1	-34	-15	-8	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq (30min) dB(A)						43	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-B2

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	25	1	-36	-15	-10	0	3	30	
PC2		Idling	88	25	5	-36	-8	-10	0	3	37	
PC3		Idling - ready for departure	91	25	1	-36	-15	-10	0	3	33	
MW1	Mui Wo Kaito	Idling - arrival	98	25	1	-36	-15	-10	0	3	40	
MW2		Idling	90	25	5	-36	-8	-10	0	3	39	
MW3		Idling - ready for departure	98	25	1	-36	-15	-10	0	3	40	
TB1	Tug Boat + Barge	Idling for arrival	99	61	10	-44	-5	-5	0	3	49	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	50	1	-42	-15	-5	0	3	41	
TB3		Lorries leave barge	100	54	5	-43	-8	-5	0	3	48	
TB4		Lorries back to barge	100	50	5	-42	-8	-5	0	3	-	
TB5		Lift on the landing board	98	50	1	-42	-15	-5	0	3	-	
TB6		Idling for departure	99	61	5	-44	-8	-5	0	3	-	
					Predicted Overall Noise Level, Leq (30min) dB(A)						53	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	25	1	-36	-15	-10	0	3	30	
PC2		Idling	88	25	5	-36	-8	-10	0	3	37	
PC3		Idling - ready for departure	91	25	1	-36	-15	-10	0	3	33	
MW1	Mui Wo Kaito	Idling - arrival	98	25	1	-36	-15	-10	0	3	40	
MW2		Idling	90	25	5	-36	-8	-10	0	3	39	
MW3		Idling - ready for departure	98	25	1	-36	-15	-10	0	3	40	
SB1	Sand Barge + Truck sand loading	Idling	101	50	1	-42	-15	-5	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	50	1	-42	-15	-5	0	3	-	
SB3		Engine standby	94	50	20	-42	-2	-5	0	3	48	
SB4		Truck idling + conveyor load sand into truck	103	50	9	-42	-5	-5	-10	3	44	
SB5		Relax conveyor + leave	102	50	1	-42	-15	-5	0	3	43	
					Predicted Overall Noise Level, Leq (30min) dB(A)						52	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	25	1	-36	-15	-10	0	3	30	
PC2		Idling	88	25	5	-36	-8	-10	0	3	37	
PC3		Idling - ready for departure	91	25	1	-36	-15	-10	0	3	33	
MW1	Mui Wo Kaito	Idling - arrival	98	25	1	-36	-15	-10	0	3	40	
MW2		Idling	90	25	5	-36	-8	-10	0	3	39	
MW3		Idling - ready for departure	98	25	1	-36	-15	-10	0	3	40	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	50	2	-42	-12	-5	0	3	37	
LPG2		Crane operation and LPG containers leave barge	112	50	1	-42	-15	-5	-10	3	43	
LPG3		LPG containers loading into truck	95	50	1	-42	-15	-5	0	3	36	
LPG4		Idling	91	50	5	-42	-8	-5	0	3	39	
LPG5		Crane operation and LPG containers back to barge	108	50	1	-42	-15	-5	-10	3	39	
LPG6		Idling - ready for departure	105	50	2	-42	-12	-5	0	3	49	
					Predicted Overall Noise Level, Leq (30min) dB(A)						52	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-B2

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1		Idling - arrival	88	25	1	-36	-15	-10	0	3	30	
PC2	Peng Chau Kaito	Idling	88	25	3	-36	-10	-10	0	3	35	
PC3		Idlling - ready for departure	91	25	1	-36	-15	-10	0	3	33	
MW1		Idlling - arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW2	Mui Wo Kaito	Idling	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW3		Idlling - ready for departure	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB1		Idling for arrival	-	-	-	-	-	-	-	-	-	
TB2		Off the landing board	-	-	-	-	-	-	-	-	-	
TB3	Tug Boat + Barge	Lorries leave barge	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB4		Lorries back to barge	-	-	-	-	-	-	-	-	-	
TB5		Lift on the landing board	-	-	-	-	-	-	-	-	-	
TB6		Idling for departure	-	-	-	-	-	-	-	-	-	
										Predicted Overall Noise Level, Leq (30min) dB(A)	38	
										Nighttime criterion (ANL-5), dB(A)	45	
										Exceedance, dB(A)	-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1		Idlling - arrival	88	25	1	-36	-15	-10	0	3	30	
PC2	Peng Chau Kaito	Idling	88	25	5	-36	-8	-10	0	3	37	
PC3		Idlling - ready for departure	91	25	1	-36	-15	-10	0	3	33	
MW1		Idlling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2	Mui Wo Kaito	Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idlling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
SB1		Idling	101	-	1	-	-	-	-	-	-	
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3	Sand Barge + Truck sand loading	Engine standby	94	-	20	-	-	-	-	-	-	No Nighttime operation
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
										Predicted Overall Noise Level, Leq (30min) dB(A)	39	
										Nighttime criterion (ANL-5), dB(A)	45	
										Exceedance, dB(A)	-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1		Idlling - arrival	88	25	1	-36	-15	-10	0	3	30	
PC2	Peng Chau Kaito	Idling	88	25	5	-36	-8	-10	0	3	37	
PC3		Idlling - ready for departure	91	25	1	-36	-15	-10	0	3	33	
MW1		Idlling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2	Mui Wo Kaito	Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idlling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
LPG1		Idlling - arrival	93	-	2	-	-	-	-	-	-	
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3	LPG Container Vessel + LPG Containers Loading Truck	LPG containers loading into truck	95	-	1	-	-	-	-	-	-	No Nighttime operation
LPG4		Idlling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idlling - ready for departure	105	-	2	-	-	-	-	-	-	
										Predicted Overall Noise Level, Leq (30min) dB(A)	39	
										Nighttime criterion (ANL-5), dB(A)	45	
										Exceedance, dB(A)	-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-B4

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A) Distance	Time	Screening	Mitigation	Facade	Predicted SPL, dB(A)	Remark
PC1	Peng Chau Kaito	Idling - arrival	88	40	1	-40	-15	-10	0	3	26	
PC2		Idling	88	40	5	-40	-8	-10	0	3	33	
PC3		Idling - ready for departure	91	40	1	-40	-15	-10	0	3	29	
MW1	Mui Wo Kaito	Idling - arrival	98	40	1	-40	-15	-10	0	3	36	
MW2		Idling	90	40	5	-40	-8	-10	0	3	35	
MW3		Idling - ready for departure	98	40	1	-40	-15	-10	0	3	36	
TB1	Tug Boat + Barge	Idling for arrival	99	75	10	-46	-5	0	0	3	52	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	66	1	-44	-15	-10	0	3	34	
TB3		Lorries leave barge	100	69	5	-45	-8	0	0	3	50	
TB4		Lorries back to barge	100	66	5	-44	-8	0	0	3	-	
TB5		Lift on the landing board	98	66	1	-44	-15	-10	0	3	-	
TB6		Idling for departure	99	75	5	-46	-8	0	0	3	-	
										Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)	54	
										Daytime criterion (ANL-5), dB(A)	55	
										Exceedance, dB(A)	-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A) Distance	Time	Screening	Mitigation	Facade	Predicted SPL, dB(A)	Remark
PC1	Peng Chau Kaito	Idling - arrival	88	40	1	-40	-15	-10	0	3	26	
PC2		Idling	88	40	5	-40	-8	-10	0	3	33	
PC3		Idling - ready for departure	91	40	1	-40	-15	-10	0	3	29	
MW1	Mui Wo Kaito	Idling - arrival	98	40	1	-40	-15	-10	0	3	36	
MW2		Idling	90	40	5	-40	-8	-10	0	3	35	
MW3		Idling - ready for departure	98	40	1	-40	-15	-10	0	3	36	
SB1	Sand Barge + Truck sand loading	Idling	101	66	1	-44	-15	-5	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	66	1	-44	-15	-5	0	3	-	
SB3		Engine standby	94	66	20	-44	-2	-5	0	3	46	
SB4		Truck idling + conveyor load sand into truck	103	66	9	-44	-5	-5	-10	3	41	
SB5		Relax conveyor + leave	102	66	1	-44	-15	-5	0	3	41	
										Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)	49	
										Daytime criterion (ANL-5), dB(A)	55	
										Exceedance, dB(A)	-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A) Distance	Time	Screening	Mitigation	Facade	Predicted SPL, dB(A)	Remark
PC1	Peng Chau Kaito	Idling - arrival	88	40	1	-40	-15	-10	0	3	26	
PC2		Idling	88	40	5	-40	-8	-10	0	3	33	
PC3		Idling - ready for departure	91	40	1	-40	-15	-10	0	3	29	
MW1	Mui Wo Kaito	Idling - arrival	98	40	1	-40	-15	-10	0	3	36	
MW2		Idling	90	40	5	-40	-8	-10	0	3	35	
MW3		Idling - ready for departure	98	40	1	-40	-15	-10	0	3	36	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	66	2	-44	-12	-10	0	3	30	
LPG2		Crane operation and LPG containers leave barge	112	66	1	-44	-15	-5	-10	3	41	
LPG3		LPG containers loading into truck	95	66	1	-44	-15	-10	0	3	29	
LPG4		Idling	91	66	5	-44	-8	-10	0	3	32	
LPG5		Crane operation and LPG containers back to barge	108	66	1	-44	-15	-5	-10	3	37	
LPG6		Idling - ready for departure	105	67	2	-45	-12	-10	0	3	42	
										Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)	47	
										Daytime criterion (ANL-5), dB(A)	55	
										Exceedance, dB(A)	-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-B4

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	40	1	-40	-15	-10	0	3	26	
PC2		Idling	88	40	3	-40	-10	-10	0	3	31	
PC3		Idling - ready for departure	91	40	1	-40	-15	-10	0	3	29	
MW1	Mui Wo Kaito	Idling - arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB1	Tug Boat + Barge	Idling for arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB2		Off the landing board	-	-	-	-	-	-	-	-	-	
TB3		Lorries leave barge	-	-	-	-	-	-	-	-	-	
TB4		Lorries back to barge	-	-	-	-	-	-	-	-	-	
TB5		Lift on the landing board	-	-	-	-	-	-	-	-	-	
TB6		Idling for departure	-	-	-	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						34	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	40	1	-40	-15	-10	0	3	26	
PC2		Idling	88	40	5	-40	-8	-10	0	3	33	
PC3		Idling - ready for departure	91	40	1	-40	-15	-10	0	3	29	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						35	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	40	1	-40	-15	-10	0	3	26	
PC2		Idling	88	40	5	-40	-8	-10	0	3	33	
PC3		Idling - ready for departure	91	40	1	-40	-15	-10	0	3	29	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						35	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project :	Discovery Bay EAS
Job No.:	235928
Title:	Fixed Noise Assessment
Subtitle:	Calculation of SPL at Receivers (Daytime)
NSR ID:	N10b-B5

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	49	1	-42	-15	0	0	3	34	
PC2		Idling	88	49	5	-42	-8	0	0	3	41	
PC3		Idling - ready for departure	91	49	1	-42	-15	0	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	98	49	1	-42	-15	0	0	3	44	
MW2		Idling	90	49	5	-42	-8	0	0	3	43	
MW3		Idling - ready for departure	98	49	1	-42	-15	0	0	3	44	
TB1	Tug Boat + Barge	Idling for arrival	99	83	10	-46	-5	0	0	3	51	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	75	1	-46	-15	-10	0	3	33	
TB3		Lorries leave barge	100	77	5	-46	-8	0	0	3	49	
TB4		Lorries back to barge	100	75	5	-46	-8	0	0	3	-	
TB5		Lift on the landing board	98	75	1	-46	-15	-10	0	3	-	
TB6		Idling for departure	99	83	5	-46	-8	0	0	3	-	
					Predicted Overall Noise Level, Leq (30min) dB(A)						55	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	49	1	-42	-15	0	0	3	34	
PC2		Idling	88	49	5	-42	-8	0	0	3	41	
PC3		Idling - ready for departure	91	49	1	-42	-15	0	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	98	49	1	-42	-15	0	0	3	44	
MW2		Idling	90	49	5	-42	-8	0	0	3	43	
MW3		Idling - ready for departure	98	49	1	-42	-15	0	0	3	44	
SB1	Sand Barge + Truck sand loading	Idling	101	75	1	-46	-15	-5	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	75	1	-46	-15	-5	0	3	-	
SB3		Engine standby	94	75	20	-46	-2	-5	0	3	45	
SB4		Truck idling + conveyor load sand into truck	103	75	9	-46	-5	-5	-10	3	40	
SB5		Relax conveyor + leave	102	75	1	-46	-15	-5	0	3	40	
					Predicted Overall Noise Level, Leq (30min) dB(A)						52	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	49	1	-42	-15	0	0	3	34	
PC2		Idling	88	49	5	-42	-8	0	0	3	41	
PC3		Idling - ready for departure	91	49	1	-42	-15	0	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	98	49	1	-42	-15	0	0	3	44	
MW2		Idling	90	49	5	-42	-8	0	0	3	43	
MW3		Idling - ready for departure	98	49	1	-42	-15	0	0	3	44	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	75	2	-46	-12	-5	0	3	34	
LPG2		Crane operation and LPG containers leave barge	112	75	1	-46	-15	-5	-10	3	40	
LPG3		LPG containers loading into truck	95	75	1	-46	-15	-5	0	3	33	
LPG4		Idling	91	75	5	-46	-8	-5	0	3	36	
LPG5		Crane operation and LPG containers back to barge	108	75	1	-46	-15	-5	-10	3	36	
LPG6		Idling - ready for departure	105	75	2	-46	-12	-5	0	3	46	
					Predicted Overall Noise Level, Leq (30min) dB(A)						52	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-B5

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	49	1	-42	-15	0	0	3	34	
PC2		Idling	88	49	3	-42	-10	0	0	3	39	
PC3		Idling - ready for departure	91	49	1	-42	-15	0	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB1	Tug Boat + Barge	Idling for arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB2		Off the landing board	-	-	-	-	-	-	-	-	-	
TB3		Lorries leave barge	-	-	-	-	-	-	-	-	-	
TB4		Lorries back to barge	-	-	-	-	-	-	-	-	-	
TB5		Lift on the landing board	-	-	-	-	-	-	-	-	-	
TB6		Idling for departure	-	-	-	-	-	-	-	-	-	
					Predicted Overall Noise Level, $L_{eq\,(30min)}$ dB(A)						42	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	49	1	-42	-15	0	0	3	34	
PC2		Idling	88	49	5	-42	-8	0	0	3	41	
PC3		Idling - ready for departure	91	49	1	-42	-15	0	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, $L_{eq\,(30min)}$ dB(A)						43	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	49	1	-42	-15	0	0	3	34	
PC2		Idling	88	49	5	-42	-8	0	0	3	41	
PC3		Idling - ready for departure	91	49	1	-42	-15	0	0	3	37	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, $L_{eq\,(30min)}$ dB(A)						43	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-B8

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	72	1	-45	-15	0	0	3	31	
PC2		Idling	88	72	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	72	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	72	1	-45	-15	0	0	3	41	
MW2		Idling	90	72	5	-45	-8	0	0	3	40	
MW3		Idling - ready for departure	98	72	1	-45	-15	0	0	3	41	
TB1	Tug Boat + Barge	Idling for arrival	99	103	10	-48	-5	0	0	3	49	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	97	1	-48	-15	0	0	3	40	
TB3		Lorries leave barge	100	99	5	-48	-8	0	0	3	47	
TB4		Lorries back to barge	100	97	5	-48	-8	0	0	3	-	
TB5		Lift on the landing board	98	97	1	-48	-15	0	0	3	-	
TB6		Idling for departure	99	103	5	-48	-8	0	0	3	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						53	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	72	1	-45	-15	0	0	3	31	
PC2		Idling	88	72	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	72	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	72	1	-45	-15	0	0	3	41	
MW2		Idling	90	72	5	-45	-8	0	0	3	40	
MW3		Idling - ready for departure	98	72	1	-45	-15	0	0	3	41	
SB1	Sand Barge + Truck sand loading	Idling	101	97	1	-48	-15	-5	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	97	1	-48	-15	-5	0	3	-	
SB3		Engine standby	94	97	20	-48	-2	-5	0	3	43	
SB4		Truck idling + conveyor load sand into truck	103	97	9	-48	-5	-5	-10	3	38	
SB5		Relax conveyor + leave	102	97	1	-48	-15	-5	0	3	37	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						49	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	72	1	-45	-15	0	0	3	31	
PC2		Idling	88	72	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	72	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	72	1	-45	-15	0	0	3	41	
MW2		Idling	90	72	5	-45	-8	0	0	3	40	
MW3		Idling - ready for departure	98	72	1	-45	-15	0	0	3	41	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	97	2	-48	-12	-5	0	3	32	
LPG2		Crane operation and LPG containers leave barge	112	97	1	-48	-15	-5	-10	3	37	
LPG3		LPG containers loading into truck	95	97	1	-48	-15	-5	0	3	30	
LPG4		Idling	91	97	5	-48	-8	-5	0	3	33	
LPG5		Crane operation and LPG containers back to barge	108	97	1	-48	-15	-5	-10	3	33	
LPG6		Idling - ready for departure	105	97	2	-48	-12	-5	0	3	44	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						49	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-B8

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	72	1	-45	-15	0	0	3	31	
PC2		Idling	88	72	3	-45	-10	0	0	3	36	
PC3		Idling - ready for departure	91	72	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB1	Tug Boat + Barge	Idling for arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB2		Off the landing board	-	-	-	-	-	-	-	-	-	
TB3		Lorries leave barge	-	-	-	-	-	-	-	-	-	
TB4		Lorries back to barge	-	-	-	-	-	-	-	-	-	
TB5		Lift on the landing board	-	-	-	-	-	-	-	-	-	
TB6		Idling for departure	-	-	-	-	-	-	-	-	-	
					Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)						39	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	72	1	-45	-15	0	0	3	31	
PC2		Idling	88	72	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	72	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)						40	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	72	1	-45	-15	0	0	3	31	
PC2		Idling	88	72	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	72	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)						40	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-D1

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	76	1	-46	-15	0	0	3	31	
PC2		Idling	88	76	5	-46	-8	0	0	3	38	
PC3		Idling - ready for departure	91	76	1	-46	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	76	1	-46	-15	0	0	3	41	
MW2		Idling	90	76	5	-46	-8	0	0	3	40	
MW3		Idling - ready for departure	98	76	1	-46	-15	0	0	3	41	
TB1	Tug Boat + Barge	Idling for arrival	99	79	10	-46	-5	0	0	3	51	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	58	1	-43	-15	0	0	3	45	
TB3		Lorries leave barge	100	68	5	-45	-8	0	0	3	51	
TB4		Lorries back to barge	100	58	5	-43	-8	0	0	3	-	
TB5		Lift on the landing board	98	58	1	-43	-15	0	0	3	-	
TB6		Idling for departure	99	79	5	-46	-8	0	0	3	-	
										Predicted Overall Noise Level, Leq (30min) dB(A)	55	
										Daytime criterion (ANL-5), dB(A)	55	
										Exceedance, dB(A)	-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	76	1	-46	-15	0	0	3	31	
PC2		Idling	88	76	5	-46	-8	0	0	3	38	
PC3		Idling - ready for departure	91	76	1	-46	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	76	1	-46	-15	0	0	3	41	
MW2		Idling	90	76	5	-46	-8	0	0	3	40	
MW3		Idling - ready for departure	98	76	1	-46	-15	0	0	3	41	
SB1	Sand Barge + Truck sand loading	Idling	101	58	1	-43	-15	0	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	58	1	-43	-15	0	0	3	-	
SB3		Engine standby	94	58	20	-43	-2	0	0	3	52	
SB4		Truck idling + conveyor load sand into truck	103	58	9	-43	-5	0	-10	3	48	
SB5		Relax conveyor + leave	102	58	1	-43	-15	0	0	3	47	
										Predicted Overall Noise Level, Leq (30min) dB(A)	55	
										Daytime criterion (ANL-5), dB(A)	55	
										Exceedance, dB(A)	-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	76	1	-46	-15	0	0	3	31	
PC2		Idling	88	76	5	-46	-8	0	0	3	38	
PC3		Idling - ready for departure	91	76	1	-46	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	76	1	-46	-15	0	0	3	41	
MW2		Idling	90	76	5	-46	-8	0	0	3	40	
MW3		Idling - ready for departure	98	76	1	-46	-15	0	0	3	41	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	58	2	-43	-12	0	0	3	41	
LPG2		Crane operation and LPG containers leave barge	112	58	1	-43	-15	0	-10	3	47	
LPG3		LPG containers loading into truck	95	58	1	-43	-15	0	0	3	40	
LPG4		Idling	91	58	5	-43	-8	0	0	3	43	
LPG5		Crane operation and LPG containers back to barge	108	58	1	-43	-15	0	-10	3	43	
LPG6		Idling - ready for departure	105	58	2	-43	-12	0	0	3	53	
										Predicted Overall Noise Level, Leq (30min) dB(A)	55	
										Daytime criterion (ANL-5), dB(A)	55	
										Exceedance, dB(A)	-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-D1

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	76	1	-46	-15	0	0	3	31	
PC2		Idling	88	76	3	-46	-10	0	0	3	35	
PC3		Idling - ready for departure	91	76	1	-46	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB1	Tug Boat + Barge	Idling for arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB2		Off the landing board	-	-	-	-	-	-	-	-	-	
TB3		Lorries leave barge	-	-	-	-	-	-	-	-	-	
TB4		Lorries back to barge	-	-	-	-	-	-	-	-	-	
TB5		Lift on the landing board	-	-	-	-	-	-	-	-	-	
TB6		Idling for departure	-	-	-	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						38	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	76	1	-46	-15	0	0	3	31	
PC2		Idling	88	76	5	-46	-8	0	0	3	38	
PC3		Idling - ready for departure	91	76	1	-46	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						40	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	76	1	-46	-15	0	0	3	31	
PC2		Idling	88	76	5	-46	-8	0	0	3	38	
PC3		Idling - ready for departure	91	76	1	-46	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						40	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-D5

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	110	1	-49	-15	0	0	3	27	
PC2		Idling	88	110	5	-49	-8	0	0	3	34	
PC3		Idling - ready for departure	91	110	1	-49	-15	0	0	3	30	
MW1	Mui Wo Kaito	Idling - arrival	98	110	1	-49	-15	0	0	3	37	
MW2		Idling	90	110	5	-49	-8	0	0	3	36	
MW3		Idling - ready for departure	98	110	1	-49	-15	0	0	3	37	
TB1	Tug Boat + Barge	Idling for arrival	99	136	10	-51	-5	0	0	3	47	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	111	1	-49	-15	0	0	3	39	
TB3		Lorries leave barge	100	123	5	-50	-8	0	0	3	45	
TB4		Lorries back to barge	100	111	5	-49	-8	0	0	3	-	
TB5		Lift on the landing board	98	111	1	-49	-15	0	0	3	-	
TB6		Idling for departure	99	136	5	-51	-8	0	0	3	-	
					Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)						50	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	110	1	-49	-15	0	0	3	27	
PC2		Idling	88	110	5	-49	-8	0	0	3	34	
PC3		Idling - ready for departure	91	110	1	-49	-15	0	0	3	30	
MW1	Mui Wo Kaito	Idling - arrival	98	110	1	-49	-15	0	0	3	37	
MW2		Idling	90	110	5	-49	-8	0	0	3	36	
MW3		Idling - ready for departure	98	110	1	-49	-15	0	0	3	37	
SB1	Sand Barge + Truck sand loading	Idling	101	111	1	-49	-15	0	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	111	1	-49	-15	0	0	3	-	
SB3		Engine standby	94	111	20	-49	-2	0	0	3	46	
SB4		Truck idling + conveyor load sand into truck	103	111	9	-49	-5	0	-10	3	42	
SB5		Relax conveyor + leave	102	111	1	-49	-15	0	0	3	41	
					Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)						50	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	110	1	-49	-15	0	0	3	27	
PC2		Idling	88	110	5	-49	-8	0	0	3	34	
PC3		Idling - ready for departure	91	110	1	-49	-15	0	0	3	30	
MW1	Mui Wo Kaito	Idling - arrival	98	110	1	-49	-15	0	0	3	37	
MW2		Idling	90	110	5	-49	-8	0	0	3	36	
MW3		Idling - ready for departure	98	110	1	-49	-15	0	0	3	37	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	111	2	-49	-12	0	0	3	35	
LPG2		Crane operation and LPG containers leave barge	112	111	1	-49	-15	0	-10	3	41	
LPG3		LPG containers loading into truck	95	111	1	-49	-15	0	0	3	34	
LPG4		Idling	91	111	5	-49	-8	0	0	3	37	
LPG5		Crane operation and LPG containers back to barge	108	111	1	-49	-15	0	-10	3	37	
LPG6		Idling - ready for departure	105	111	2	-49	-12	0	0	3	47	
					Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)						50	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-D5

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	110	1	-49	-15	0	0	3	27	
PC2		Idling	88	110	3	-49	-10	0	0	3	32	
PC3		Idling - ready for departure	91	110	1	-49	-15	0	0	3	30	
MW1	Mui Wo Kaito	Idling - arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	-	-	-	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB1	Tug Boat + Barge	Idling for arrival	-	-	-	-	-	-	-	-	-	No Nighttime operation
TB2		Off the landing board	-	-	-	-	-	-	-	-	-	
TB3		Lorries leave barge	-	-	-	-	-	-	-	-	-	
TB4		Lorries back to barge	-	-	-	-	-	-	-	-	-	
TB5		Lift on the landing board	-	-	-	-	-	-	-	-	-	
TB6		Idling for departure	-	-	-	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						35	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	110	1	-49	-15	0	0	3	27	
PC2		Idling	88	110	5	-49	-8	0	0	3	34	
PC3		Idling - ready for departure	91	110	1	-49	-15	0	0	3	30	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						36	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	110	1	-49	-15	0	0	3	27	
PC2		Idling	88	110	5	-49	-8	0	0	3	34	
PC3		Idling - ready for departure	91	110	1	-49	-15	0	0	3	30	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	No Nighttime operation
MW2		Idling	90	-	5	-	-	-	-	-	-	No Nighttime operation
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	No Nighttime operation
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						36	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-D6

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	82	1	-46	-15	0	0	3	30	
PC2		Idling	88	82	5	-46	-8	0	0	3	37	
PC3		Idling - ready for departure	91	82	1	-46	-15	0	0	3	33	
MW1	Mui Wo Kaito	Idling - arrival	98	82	1	-46	-15	0	0	3	40	
MW2		Idling	90	82	5	-46	-8	0	0	3	39	
MW3		Idling - ready for departure	98	82	1	-46	-15	0	0	3	40	
TB1	Tug Boat + Barge	Idling for arrival	99	114	10	-49	-5	0	0	3	48	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	92	1	-47	-15	0	0	3	41	
TB3		Lorries leave barge	100	102	5	-48	-8	0	0	3	47	
TB4		Lorries back to barge	100	92	5	-47	-8	0	0	3	-	
TB5		Lift on the landing board	98	92	1	-47	-15	0	0	3	-	
TB6		Idling for departure	99	114	5	-49	-8	0	0	3	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						52	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	82	1	-46	-15	0	0	3	30	
PC2		Idling	88	82	5	-46	-8	0	0	3	37	
PC3		Idling - ready for departure	91	82	1	-46	-15	0	0	3	33	
MW1	Mui Wo Kaito	Idling - arrival	98	82	1	-46	-15	0	0	3	40	
MW2		Idling	90	82	5	-46	-8	0	0	3	39	
MW3		Idling - ready for departure	98	82	1	-46	-15	0	0	3	40	
SB1	Sand Barge + Truck sand loading	Idling	101	92	1	-47	-15	0	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	92	1	-47	-15	0	0	3	-	
SB3		Engine standby	94	92	20	-47	-2	0	0	3	48	
SB4		Truck idling + conveyor load sand into truck	103	92	9	-47	-5	0	-10	3	43	
SB5		Relax conveyor + leave	102	92	1	-47	-15	0	0	3	43	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						51	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	82	1	-46	-15	0	0	3	30	
PC2		Idling	88	82	5	-46	-8	0	0	3	37	
PC3		Idling - ready for departure	91	82	1	-46	-15	0	0	3	33	
MW1	Mui Wo Kaito	Idling - arrival	98	82	1	-46	-15	0	0	3	40	
MW2		Idling	90	82	5	-46	-8	0	0	3	39	
MW3		Idling - ready for departure	98	82	1	-46	-15	0	0	3	40	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	92	2	-47	-12	0	0	3	37	
LPG2		Crane operation and LPG containers leave barge	112	92	1	-47	-15	0	-10	3	43	
LPG3		LPG containers loading into truck	95	92	1	-47	-15	0	0	3	36	
LPG4		Idling	91	92	5	-47	-8	0	0	3	39	
LPG5		Crane operation and LPG containers back to barge	108	92	1	-47	-15	0	-10	3	39	
LPG6		Idling - ready for departure	105	92	2	-47	-12	0	0	3	49	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						52	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-D6

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	82	1	-46	-15	0	0	3	30	
PC2		Idling	88	82	5	-46	-8	0	0	3	37	
PC3		Idling - ready for departure	91	82	1	-46	-15	0	0	3	33	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
TB1	Tug Boat + Barge	Idling for arrival	99	-	10	-	-	-	-	-	-	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	-	1	-	-	-	-	-	-	
TB3		Lorries leave barge	100	-	5	-	-	-	-	-	-	
TB4		Lorries back to barge	100	-	5	-	-	-	-	-	-	
TB5		Lift on the landing board	98	-	1	-	-	-	-	-	-	
TB6		Idling for departure	99	-	5	-	-	-	-	-	-	
					Predicted Overall Noise Level, $L_{eq\ (30min)}$ dB(A)						39	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	82	1	-46	-15	0	0	3	30	
PC2		Idling	88	82	5	-46	-8	0	0	3	37	
PC3		Idling - ready for departure	91	82	1	-46	-15	0	0	3	33	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, $L_{eq\ (30min)}$ dB(A)						39	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	82	1	-46	-15	0	0	3	30	
PC2		Idling	88	82	5	-46	-8	0	0	3	37	
PC3		Idling - ready for departure	91	82	1	-46	-15	0	0	3	33	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, $L_{eq\ (30min)}$ dB(A)						39	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-D8

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	70	1	-45	-15	0	0	3	31	
PC2		Idling	88	70	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	70	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	70	1	-45	-15	0	0	3	41	
MW2		Idling	90	70	5	-45	-8	0	0	3	40	
MW3		Idling - ready for departure	98	70	1	-45	-15	0	0	3	41	
TB1	Tug Boat + Barge	Idling for arrival	99	106	10	-49	-5	0	0	3	49	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	90	1	-47	-15	0	0	3	41	
TB3		Lorries leave barge	100	97	5	-48	-8	0	0	3	47	
TB4		Lorries back to barge	100	90	5	-47	-8	0	0	3	-	
TB5		Lift on the landing board	98	90	1	-47	-15	0	0	3	-	
TB6		Idling for departure	99	106	5	-49	-8	0	0	3	-	
					Predicted Overall Noise Level, $L_{eq\,(30min)}$ dB(A)						53	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	70	1	-45	-15	0	0	3	31	
PC2		Idling	88	70	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	70	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	70	1	-45	-15	0	0	3	41	
MW2		Idling	90	70	5	-45	-8	0	0	3	40	
MW3		Idling - ready for departure	98	70	1	-45	-15	0	0	3	41	
SB1	Sand Barge + Truck sand loading	Idling	101	90	1	-47	-15	0	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	90	1	-47	-15	0	0	3	-	
SB3		Engine standby	94	90	20	-47	-2	0	0	3	48	
SB4		Truck idling + conveyor load sand into truck	103	90	9	-47	-5	0	-10	3	44	
SB5		Relax conveyor + leave	102	90	1	-47	-15	0	0	3	43	
					Predicted Overall Noise Level, $L_{eq\,(30min)}$ dB(A)						52	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	70	1	-45	-15	0	0	3	31	
PC2		Idling	88	70	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	70	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	70	1	-45	-15	0	0	3	41	
MW2		Idling	90	70	5	-45	-8	0	0	3	40	
MW3		Idling - ready for departure	98	70	1	-45	-15	0	0	3	41	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	90	2	-47	-12	0	0	3	37	
LPG2		Crane operation and LPG containers leave barge	112	90	1	-47	-15	0	-10	3	43	
LPG3		LPG containers loading into truck	95	90	1	-47	-15	0	0	3	36	
LPG4		Idling	91	90	5	-47	-8	0	0	3	39	
LPG5		Crane operation and LPG containers back to barge	108	90	1	-47	-15	0	-10	3	39	
LPG6		Idling - ready for departure	105	90	2	-47	-12	0	0	3	49	
					Predicted Overall Noise Level, $L_{eq\,(30min)}$ dB(A)						52	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-D8

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	70	1	-45	-15	0	0	3	31	
PC2		Idling	88	70	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	70	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
TB1	Tug Boat + Barge	Idling for arrival	99	-	10	-	-	-	-	-	-	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	-	1	-	-	-	-	-	-	
TB3		Lorries leave barge	100	-	5	-	-	-	-	-	-	
TB4		Lorries back to barge	100	-	5	-	-	-	-	-	-	
TB5		Lift on the landing board	98	-	1	-	-	-	-	-	-	
TB6		Idling for departure	99	-	5	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						40	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	70	1	-45	-15	0	0	3	31	
PC2		Idling	88	70	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	70	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						40	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	70	1	-45	-15	0	0	3	31	
PC2		Idling	88	70	5	-45	-8	0	0	3	38	
PC3		Idling - ready for departure	91	70	1	-45	-15	0	0	3	34	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						40	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-A1

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	50	1	-42	-15	-10	0	3	24	
PC2		Idling	88	50	5	-42	-8	-10	0	3	31	
PC3		Idling - ready for departure	91	50	1	-42	-15	-10	0	3	27	
MW1	Mui Wo Kaito	Idling - arrival	98	50	1	-42	-15	-10	0	3	34	
MW2		Idling	90	50	5	-42	-8	-10	0	3	33	
MW3		Idling - ready for departure	98	50	1	-42	-15	-10	0	3	34	
TB1	Tug Boat + Barge	Idling for arrival	99	41	10	-40	-5	-10	0	3	47	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	25	1	-36	-15	-10	0	3	42	
TB3		Lorries leave barge	100	32	5	-38	-8	-10	0	3	47	
TB4		Lorries back to barge	100	25	5	-36	-8	-10	0	3	-	
TB5		Lift on the landing board	98	25	1	-36	-15	-10	0	3	-	
TB6		Idling for departure	99	41	5	-40	-8	-10	0	3	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						61	
					Daytime criterion (ANL-5), dB(A)						65	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	50	1	-42	-15	-10	0	3	24	
PC2		Idling	88	50	5	-42	-8	-10	0	3	31	
PC3		Idling - ready for departure	91	50	1	-42	-15	-10	0	3	27	
MW1	Mui Wo Kaito	Idling - arrival	98	50	1	-42	-15	-10	0	3	34	
MW2		Idling	90	50	5	-42	-8	-10	0	3	33	
MW3		Idling - ready for departure	98	50	1	-42	-15	-10	0	3	34	
SB1	Sand Barge + Truck sand loading	Idling	101	25	1	-36	-15	-10	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	25	1	-36	-15	-10	0	3	-	
SB3		Engine standby	94	25	20	-36	-2	-10	-10	3	39	
SB4		Truck idling + conveyor load sand into truck	103	25	9	-36	-5	-10	-10	3	45	
SB5		Relax conveyor + leave	102	25	1	-36	-15	-10	0	3	44	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						49	
					Daytime criterion (ANL-5), dB(A)						65	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	50	1	-42	-15	-10	0	3	24	
PC2		Idling	88	50	5	-42	-8	-10	0	3	31	
PC3		Idling - ready for departure	91	50	1	-42	-15	-10	0	3	27	
MW1	Mui Wo Kaito	Idling - arrival	98	50	1	-42	-15	-10	0	3	34	
MW2		Idling	90	50	5	-42	-8	-10	0	3	33	
MW3		Idling - ready for departure	98	50	1	-42	-15	-10	0	3	34	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	25	2	-36	-12	-10	0	3	38	
LPG2		Crane operation and LPG containers leave barge	112	25	1	-36	-15	-10	-10	3	44	
LPG3		LPG containers loading into truck	95	25	1	-36	-15	-10	0	3	37	
LPG4		Idling	91	25	5	-36	-8	-10	0	3	40	
LPG5		Crane operation and LPG containers back to barge	108	25	1	-36	-15	-10	-10	3	40	
LPG6		Idling - ready for departure	105	25	2	-36	-12	-10	0	3	50	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						52	
					Daytime criterion (ANL-5), dB(A)						65	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-A1

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	50	1	-42	-15	-10	0	3	24	
PC2		Idling	88	50	5	-42	-8	-10	0	3	31	
PC3		Idling - ready for departure	91	50	1	-42	-15	-10	0	3	27	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
TB1	Tug Boat + Barge	Idling for arrival	99	-	10	-	-	-	-	-	-	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	-	1	-	-	-	-	-	-	
TB3		Lorries leave barge	100	-	5	-	-	-	-	-	-	
TB4		Lorries back to barge	100	-	5	-	-	-	-	-	-	
TB5		Lift on the landing board	98	-	1	-	-	-	-	-	-	
TB6		Idling for departure	99	-	5	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						33	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	50	1	-42	-15	-10	0	3	24	
PC2		Idling	88	50	5	-42	-8	-10	0	3	31	
PC3		Idling - ready for departure	91	50	1	-42	-15	-10	0	3	27	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						33	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	50	1	-42	-15	-10	0	3	24	
PC2		Idling	88	50	5	-42	-8	-10	0	3	31	
PC3		Idling - ready for departure	91	50	1	-42	-15	-10	0	3	27	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						33	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-A2

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idlling - arrival	88	56	1	-43	-15	-10	0	3	23	
PC2		Idling	88	56	5	-43	-8	-10	0	3	30	
PC3		Idlling - ready for departure	91	56	1	-43	-15	-10	0	3	26	
MW1	Mui Wo Kaito	Idlling - arrival	98	56	1	-43	-15	-10	0	3	33	
MW2		Idling	90	56	5	-43	-8	-10	0	3	32	
MW3		Idlling - ready for departure	98	56	1	-43	-15	-10	0	3	33	
TB1	Tug Boat + Barge	Idling for arrival	99	45	10	-41	-5	-10	0	3	46	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	31	1	-38	-15	-10	0	3	40	
TB3		Lorries leave barge	100	37	5	-39	-8	-10	0	3	46	
TB4		Lorries back to barge	100	31	5	-38	-8	-10	0	3	-	
TB5		Lift on the landing board	98	31	1	-38	-15	-10	0	3	-	
TB6		Idling for departure	99	45	5	-41	-8	-10	0	3	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						50	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idlling - arrival	88	56	1	-43	-15	-10	0	3	23	
PC2		Idling	88	56	5	-43	-8	-10	0	3	30	
PC3		Idlling - ready for departure	91	56	1	-43	-15	-10	0	3	26	
MW1	Mui Wo Kaito	Idlling - arrival	98	56	1	-43	-15	-10	0	3	33	
MW2		Idling	90	56	5	-43	-8	-10	0	3	32	
MW3		Idlling - ready for departure	98	56	1	-43	-15	-10	0	3	33	
SB1	Sand Barge + Truck sand loading	Idling	101	31	1	-38	-15	-10	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	31	1	-38	-15	-10	0	3	-	
SB3		Engine standby	94	31	20	-38	-2	-10	0	3	47	
SB4		Truck idling + conveyor load sand into truck	103	31	9	-38	-5	-10	-10	3	43	
SB5		Relax conveyor + leave	102	31	1	-38	-15	-10	0	3	42	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						50	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idlling - arrival	88	56	1	-43	-15	-10	0	3	23	
PC2		Idling	88	56	5	-43	-8	-10	0	3	30	
PC3		Idlling - ready for departure	91	56	1	-43	-15	-10	0	3	26	
MW1	Mui Wo Kaito	Idlling - arrival	98	56	1	-43	-15	-10	0	3	33	
MW2		Idling	90	56	5	-43	-8	-10	0	3	32	
MW3		Idlling - ready for departure	98	56	1	-43	-15	-10	0	3	33	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idlling - arrival	93	31	2	-38	-12	-10	0	3	36	
LPG2		Crane operation and LPG containers leave barge	112	31	1	-38	-15	-10	-10	3	42	
LPG3		LPG containers loading into truck	95	31	1	-38	-15	-10	0	3	35	
LPG4		Idling	91	31	5	-38	-8	-10	0	3	38	
LPG5		Crane operation and LPG containers back to barge	108	31	1	-38	-15	-10	-10	3	38	
LPG6		Idlling - ready for departure	105	31	2	-38	-12	-10	0	3	48	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						51	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-A2

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	56	1	-43	-15	-10	0	3	23	
PC2		Idling	88	56	5	-43	-8	-10	0	3	30	
PC3		Idlling - ready for departure	91	56	1	-43	-15	-10	0	3	26	
MW1	Mui Wo Kaito	Idlling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idlling - ready for departure	98	-	1	-	-	-	-	-	-	
TB1	Tug Boat + Barge	Idling for arrival	99	-	10	-	-	-	-	-	-	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	-	1	-	-	-	-	-	-	
TB3		Lorries leave barge	100	-	5	-	-	-	-	-	-	
TB4		Lorries back to barge	100	-	5	-	-	-	-	-	-	
TB5		Lift on the landing board	98	-	1	-	-	-	-	-	-	
TB6		Idling for departure	99	-	5	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						32	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idlling - arrival	88	56	1	-43	-15	-10	0	3	23	
PC2		Idling	88	56	5	-43	-8	-10	0	3	30	
PC3		Idlling - ready for departure	91	56	1	-43	-15	-10	0	3	26	
MW1	Mui Wo Kaito	Idlling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idlling - ready for departure	98	-	1	-	-	-	-	-	-	
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						32	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idlling - arrival	88	56	1	-43	-15	-10	0	3	23	
PC2		Idling	88	56	5	-43	-8	-10	0	3	30	
PC3		Idlling - ready for departure	91	56	1	-43	-15	-10	0	3	26	
MW1	Mui Wo Kaito	Idlling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idlling - ready for departure	98	-	1	-	-	-	-	-	-	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idlling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idlling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						32	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-A4

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	73	1	-45	-15	-10	0	3	21	
PC2		Idling	88	73	5	-45	-8	-10	0	3	28	
PC3		Idling - ready for departure	91	73	1	-45	-15	-10	0	3	24	
MW1	Mui Wo Kaito	Idling - arrival	98	73	1	-45	-15	-10	0	3	31	
MW2		Idling	90	73	5	-45	-8	-10	0	3	30	
MW3		Idling - ready for departure	98	73	1	-45	-15	-10	0	3	31	
TB1	Tug Boat + Barge	Idling for arrival	99	57	10	-43	-5	-10	0	3	44	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	46	1	-41	-15	-10	0	3	37	
TB3		Lorries leave barge	100	51	5	-42	-8	-10	0	3	43	
TB4		Lorries back to barge	100	46	5	-41	-8	-10	0	3	-	
TB5		Lift on the landing board	98	46	1	-41	-15	-10	0	3	-	
TB6		Idling for departure	99	57	5	-43	-8	-10	0	3	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						47	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	73	1	-45	-15	-10	0	3	21	
PC2		Idling	88	73	5	-45	-8	-10	0	3	28	
PC3		Idling - ready for departure	91	73	1	-45	-15	-10	0	3	24	
MW1	Mui Wo Kaito	Idling - arrival	98	73	1	-45	-15	-10	0	3	31	
MW2		Idling	90	73	5	-45	-8	-10	0	3	30	
MW3		Idling - ready for departure	98	73	1	-45	-15	-10	0	3	31	
SB1	Sand Barge + Truck sand loading	Idling	101	46	1	-41	-15	-10	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	46	1	-41	-15	-10	0	3	-	
SB3		Engine standby	94	46	20	-41	-2	-10	0	3	44	
SB4		Truck idling + conveyor load sand into truck	103	46	9	-41	-5	-10	-10	3	40	
SB5		Relax conveyor + leave	102	46	1	-41	-15	-10	0	3	39	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						47	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	73	1	-45	-15	-10	0	3	21	
PC2		Idling	88	73	5	-45	-8	-10	0	3	28	
PC3		Idling - ready for departure	91	73	1	-45	-15	-10	0	3	24	
MW1	Mui Wo Kaito	Idling - arrival	98	73	1	-45	-15	-10	0	3	31	
MW2		Idling	90	73	5	-45	-8	-10	0	3	30	
MW3		Idling - ready for departure	98	73	1	-45	-15	-10	0	3	31	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	46	2	-41	-12	-10	0	3	33	
LPG2		Crane operation and LPG containers leave barge	112	46	1	-41	-15	-10	-10	3	39	
LPG3		LPG containers loading into truck	95	46	1	-41	-15	-10	0	3	32	
LPG4		Idling	91	46	5	-41	-8	-10	0	3	35	
LPG5		Crane operation and LPG containers back to barge	108	46	1	-41	-15	-10	-10	3	35	
LPG6		Idling - ready for departure	105	46	2	-41	-12	-10	0	3	45	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						47	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-A4

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	73	1	-45	-15	-10	0	3	21	
PC2		Idling	88	73	5	-45	-8	-10	0	3	28	
PC3		Idling - ready for departure	91	73	1	-45	-15	-10	0	3	24	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
TB1	Tug Boat + Barge	Idling for arrival	99	-	10	-	-	-	-	-	-	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	-	1	-	-	-	-	-	-	
TB3		Lorries leave barge	100	-	5	-	-	-	-	-	-	
TB4		Lorries back to barge	100	-	5	-	-	-	-	-	-	
TB5		Lift on the landing board	98	-	1	-	-	-	-	-	-	
TB6		Idling for departure	99	-	5	-	-	-	-	-	-	
										Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)	30	
										Nighttime criterion (ANL-5), dB(A)	45	
										Exceedance, dB(A)	-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	73	1	-45	-15	-10	0	3	21	
PC2		Idling	88	73	5	-45	-8	-10	0	3	28	
PC3		Idling - ready for departure	91	73	1	-45	-15	-10	0	3	24	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
										Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)	30	
										Nighttime criterion (ANL-5), dB(A)	45	
										Exceedance, dB(A)	-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	73	1	-45	-15	-10	0	3	21	
PC2		Idling	88	73	5	-45	-8	-10	0	3	28	
PC3		Idling - ready for departure	91	73	1	-45	-15	-10	0	3	24	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
										Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)	30	
										Nighttime criterion (ANL-5), dB(A)	45	
										Exceedance, dB(A)	-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-A5

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	84	1	-46	-15	-5	0	3	25	
PC2		Idling	88	84	5	-46	-8	-5	0	3	32	
PC3		Idling - ready for departure	91	84	1	-46	-15	-5	0	3	28	
MW1	Mui Wo Kaito	Idling - arrival	98	84	1	-46	-15	-5	0	3	35	
MW2		Idling	90	84	5	-46	-8	-5	0	3	34	
MW3		Idling - ready for departure	98	84	1	-46	-15	-5	0	3	35	
TB1	Tug Boat + Barge	Idling for arrival	99	67	10	-45	-5	0	0	3	53	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	58	1	-43	-15	-10	0	3	35	
TB3		Lorries leave barge	100	62	5	-44	-8	0	0	3	51	
TB4		Lorries back to barge	100	58	5	-43	-8	0	0	3	-	
TB5		Lift on the landing board	98	58	1	-43	-15	-10	0	3	-	
TB6		Idling for departure	99	67	5	-45	-8	0	0	3	-	
										Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)	55	
										Daytime criterion (ANL-5), dB(A)	55	
										Exceedance, dB(A)	-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	84	1	-46	-15	-5	0	3	25	
PC2		Idling	88	84	5	-46	-8	-5	0	3	32	
PC3		Idling - ready for departure	91	84	1	-46	-15	-5	0	3	28	
MW1	Mui Wo Kaito	Idling - arrival	98	84	1	-46	-15	-5	0	3	35	
MW2		Idling	90	84	5	-46	-8	-5	0	3	34	
MW3		Idling - ready for departure	98	84	1	-46	-15	-5	0	3	35	
SB1	Sand Barge + Truck sand loading	Idling	101	58	1	-43	-15	-5	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	58	1	-43	-15	-5	0	3	-	
SB3		Engine standby	94	58	20	-43	-2	-5	0	3	47	
SB4		Truck idling + conveyor load sand into truck	103	58	9	-43	-5	-5	-10	3	43	
SB5		Relax conveyor + leave	102	58	1	-43	-15	-5	0	3	42	
										Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)	50	
										Daytime criterion (ANL-5), dB(A)	55	
										Exceedance, dB(A)	-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	84	1	-46	-15	-5	0	3	25	
PC2		Idling	88	84	5	-46	-8	-5	0	3	32	
PC3		Idling - ready for departure	91	84	1	-46	-15	-5	0	3	28	
MW1	Mui Wo Kaito	Idling - arrival	98	84	1	-46	-15	-5	0	3	35	
MW2		Idling	90	84	5	-46	-8	-5	0	3	34	
MW3		Idling - ready for departure	98	84	1	-46	-15	-5	0	3	35	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	58	2	-43	-12	-5	0	3	36	
LPG2		Crane operation and LPG containers leave barge	112	58	1	-43	-15	-5	-10	3	42	
LPG3		LPG containers loading into truck	95	58	1	-43	-15	-5	0	3	35	
LPG4		Idling	91	58	5	-43	-8	-5	0	3	38	
LPG5		Crane operation and LPG containers back to barge	108	58	1	-43	-15	-5	-10	3	38	
LPG6		Idling - ready for departure	105	58	2	-43	-12	-5	0	3	48	
										Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)	50	
										Daytime criterion (ANL-5), dB(A)	55	
										Exceedance, dB(A)	-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-A5

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	84	1	-46	-15	-5	0	3	25	
PC2		Idling	88	84	5	-46	-8	-5	0	3	32	
PC3		Idling - ready for departure	91	84	1	-46	-15	-5	0	3	28	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
TB1	Tug Boat + Barge	Idling for arrival	99	-	10	-	-	-	-	-	-	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	-	1	-	-	-	-	-	-	
TB3		Lorries leave barge	100	-	5	-	-	-	-	-	-	
TB4		Lorries back to barge	100	-	5	-	-	-	-	-	-	
TB5		Lift on the landing board	98	-	1	-	-	-	-	-	-	
TB6		Idling for departure	99	-	5	-	-	-	-	-	-	
						Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)					34	
						Nighttime criterion (ANL-5), dB(A)					45	
						Exceedance, dB(A)					-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	84	1	-46	-15	-5	0	3	25	
PC2		Idling	88	84	5	-46	-8	-5	0	3	32	
PC3		Idling - ready for departure	91	84	1	-46	-15	-5	0	3	28	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
						Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)					34	
						Nighttime criterion (ANL-5), dB(A)					45	
						Exceedance, dB(A)					-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	84	1	-46	-15	-5	0	3	25	
PC2		Idling	88	84	5	-46	-8	-5	0	3	32	
PC3		Idling - ready for departure	91	84	1	-46	-15	-5	0	3	28	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
						Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)					34	
						Nighttime criterion (ANL-5), dB(A)					45	
						Exceedance, dB(A)					-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-A6

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	90	1	-47	-15	0	0	3	29	
PC2		Idling	88	90	5	-47	-8	0	0	3	36	
PC3		Idling - ready for departure	91	90	1	-47	-15	0	0	3	32	
MW1	Mui Wo Kaito	Idling - arrival	98	90	1	-47	-15	0	0	3	39	
MW2		Idling	90	90	5	-47	-8	0	0	3	38	
MW3		Idling - ready for departure	98	90	1	-47	-15	0	0	3	39	
TB1	Tug Boat + Barge	Idling for arrival	99	74	10	-45	-5	0	0	3	52	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	65	1	-44	-15	0	0	3	44	
TB3		Lorries leave barge	100	68	5	-45	-8	0	0	3	51	
TB4		Lorries back to barge	100	65	5	-44	-8	0	0	3	-	
TB5		Lift on the landing board	98	65	1	-44	-15	0	0	3	-	
TB6		Idling for departure	99	74	5	-45	-8	0	0	3	-	
					Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)						55	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	90	1	-47	-15	0	0	3	29	
PC2		Idling	88	90	5	-47	-8	0	0	3	36	
PC3		Idling - ready for departure	91	90	1	-47	-15	0	0	3	32	
MW1	Mui Wo Kaito	Idling - arrival	98	90	1	-47	-15	0	0	3	39	
MW2		Idling	90	90	5	-47	-8	0	0	3	38	
MW3		Idling - ready for departure	98	90	1	-47	-15	0	0	3	39	
SB1	Sand Barge + Truck sand loading	Idling	101	65	1	-44	-15	-5	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	65	1	-44	-15	-5	0	3	-	
SB3		Engine standby	94	65	20	-44	-2	-5	0	3	46	
SB4		Truck idling + conveyor load sand into truck	103	65	9	-44	-5	-5	-10	3	42	
SB5		Relax conveyor + leave	102	65	1	-44	-15	-5	0	3	41	
					Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)						50	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	90	1	-47	-15	0	0	3	29	
PC2		Idling	88	90	5	-47	-8	0	0	3	36	
PC3		Idling - ready for departure	91	90	1	-47	-15	0	0	3	32	
MW1	Mui Wo Kaito	Idling - arrival	98	90	1	-47	-15	0	0	3	39	
MW2		Idling	90	90	5	-47	-8	0	0	3	38	
MW3		Idling - ready for departure	98	90	1	-47	-15	0	0	3	39	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idlling - arrival	93	65	2	-44	-12	-5	0	3	35	
LPG2		Crane operation and LPG containers leave barge	112	65	1	-44	-15	-5	-10	3	41	
LPG3		LPG containers loading into truck	95	65	1	-44	-15	-5	0	3	34	
LPG4		Idling	91	65	5	-44	-8	-5	0	3	37	
LPG5		Crane operation and LPG containers back to barge	108	65	1	-44	-15	-5	-10	3	37	
LPG6		Idlling - ready for departure	105	65	2	-44	-12	-5	0	3	47	
					Predicted Overall Noise Level, $Leq_{(30min)}$ dB(A)						50	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-A6

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	90	1	-47	-15	0	0	3	29	
PC2		Idling	88	90	5	-47	-8	0	0	3	36	
PC3		Idling - ready for departure	91	90	1	-47	-15	0	0	3	32	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
TB1	Tug Boat + Barge	Idling for arrival	99	-	10	-	-	-	-	-	-	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	-	1	-	-	-	-	-	-	
TB3		Lorries leave barge	100	-	5	-	-	-	-	-	-	
TB4		Lorries back to barge	100	-	5	-	-	-	-	-	-	
TB5		Lift on the landing board	98	-	1	-	-	-	-	-	-	
TB6		Idling for departure	99	-	5	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						38	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	90	1	-47	-15	0	0	3	29	
PC2		Idling	88	90	5	-47	-8	0	0	3	36	
PC3		Idling - ready for departure	91	90	1	-47	-15	0	0	3	32	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						38	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	90	1	-47	-15	0	0	3	29	
PC2		Idling	88	90	5	-47	-8	0	0	3	36	
PC3		Idling - ready for departure	91	90	1	-47	-15	0	0	3	32	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$dB(A)						38	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Daytime)
NSR ID: N10b-A8

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	107	1	-49	-15	0	0	3	28	
PC2		Idling	88	107	5	-49	-8	0	0	3	35	
PC3		Idling - ready for departure	91	107	1	-49	-15	0	0	3	31	
MW1	Mui Wo Kaito	Idling - arrival	98	107	1	-49	-15	0	0	3	38	
MW2		Idling	90	107	5	-49	-8	0	0	3	37	
MW3		Idling - ready for departure	98	107	1	-49	-15	0	0	3	38	
TB1	Tug Boat + Barge	Idling for arrival	99	91	10	-47	-5	0	0	3	50	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	82	1	-46	-15	0	0	3	42	
TB3		Lorries leave barge	100	86	5	-47	-8	0	0	3	49	
TB4		Lorries back to barge	100	82	5	-46	-8	0	0	3	-	
TB5		Lift on the landing board	98	82	1	-46	-15	0	0	3	-	
TB6		Idling for departure	99	91	5	-47	-8	0	0	3	-	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						53	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	107	1	-49	-15	0	0	3	28	
PC2		Idling	88	107	5	-49	-8	0	0	3	35	
PC3		Idling - ready for departure	91	107	1	-49	-15	0	0	3	31	
MW1	Mui Wo Kaito	Idling - arrival	98	107	1	-49	-15	0	0	3	38	
MW2		Idling	90	107	5	-49	-8	0	0	3	37	
MW3		Idling - ready for departure	98	107	1	-49	-15	0	0	3	38	
SB1	Sand Barge + Truck sand loading	Idling	101	82	1	-46	-15	-5	0	3	-	For worst case 30 minutes scenario, SB3, SB4 &SB5 have selected for assessment.
SB2		Extend Conveyor belt	99	82	1	-46	-15	-5	0	3	-	
SB3		Engine standby	94	82	20	-46	-2	-5	0	3	44	
SB4		Truck idling + conveyor load sand into truck	103	82	9	-46	-5	-5	-10	3	39	
SB5		Relax conveyor + leave	102	82	1	-46	-15	-5	0	3	39	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						48	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	107	1	-49	-15	0	0	3	28	
PC2		Idling	88	107	5	-49	-8	0	0	3	35	
PC3		Idling - ready for departure	91	107	1	-49	-15	0	0	3	31	
MW1	Mui Wo Kaito	Idling - arrival	98	107	1	-49	-15	0	0	3	38	
MW2		Idling	90	107	5	-49	-8	0	0	3	37	
MW3		Idling - ready for departure	98	107	1	-49	-15	0	0	3	38	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	82	2	-46	-12	-5	0	3	33	
LPG2		Crane operation and LPG containers leave barge	112	82	1	-46	-15	-5	-10	3	39	
LPG3		LPG containers loading into truck	95	82	1	-46	-15	-5	0	3	32	
LPG4		Idling	91	82	5	-46	-8	-5	0	3	35	
LPG5		Crane operation and LPG containers back to barge	108	82	1	-46	-15	-5	-10	3	35	
LPG6		Idling - ready for departure	105	82	2	-46	-12	-5	0	3	45	
					Predicted Overall Noise Level, Leq $_{(30min)}$ dB(A)						48	
					Daytime criterion (ANL-5), dB(A)						55	
					Exceedance, dB(A)						-	

Project : Discovery Bay EAS
Job No.: 235928
Title: Fixed Noise Assessment
Subtitle: Calculation of SPL at Receivers (Nighttime)
NSR ID: N10b-A8

Case 1 Peng Chau Kaito, Mui Wo Kaito & Tug Boat with Barge

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	107	1	-49	-15	0	0	3	28	
PC2		Idling	88	107	5	-49	-8	0	0	3	35	
PC3		Idling - ready for departure	91	107	1	-49	-15	0	0	3	31	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
TB1	Tug Boat + Barge	Idling for arrival	99	-	10	-	-	-	-	-	-	For worst case 30 minutes scenario, TB1, TB2 & TB3 have selected for assessment.
TB2		Off the landing board	100	-	1	-	-	-	-	-	-	
TB3		Lorries leave barge	100	-	5	-	-	-	-	-	-	
TB4		Lorries back to barge	100	-	5	-	-	-	-	-	-	
TB5		Lift on the landing board	98	-	1	-	-	-	-	-	-	
TB6		Idling for departure	99	-	5	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq (30min) dB(A)						37	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Case 2 Peng Chau Kaito, Mui Wo Kaito & Sand Barge + Truck sand loading

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	107	1	-49	-15	0	0	3	28	
PC2		Idling	88	107	5	-49	-8	0	0	3	35	
PC3		Idling - ready for departure	91	107	1	-49	-15	0	0	3	31	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
SB1	Sand Barge + Truck sand loading	Idling	101	-	1	-	-	-	-	-	-	No Nighttime operation
SB2		Extend Conveyor belt	99	-	1	-	-	-	-	-	-	
SB3		Engine standby	94	-	20	-	-	-	-	-	-	
SB4		Truck idling + conveyor load sand into truck	103	-	9	-	-	-	-	-	-	
SB5		Relax conveyor + leave	102	-	1	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq (30min) dB(A)						37	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

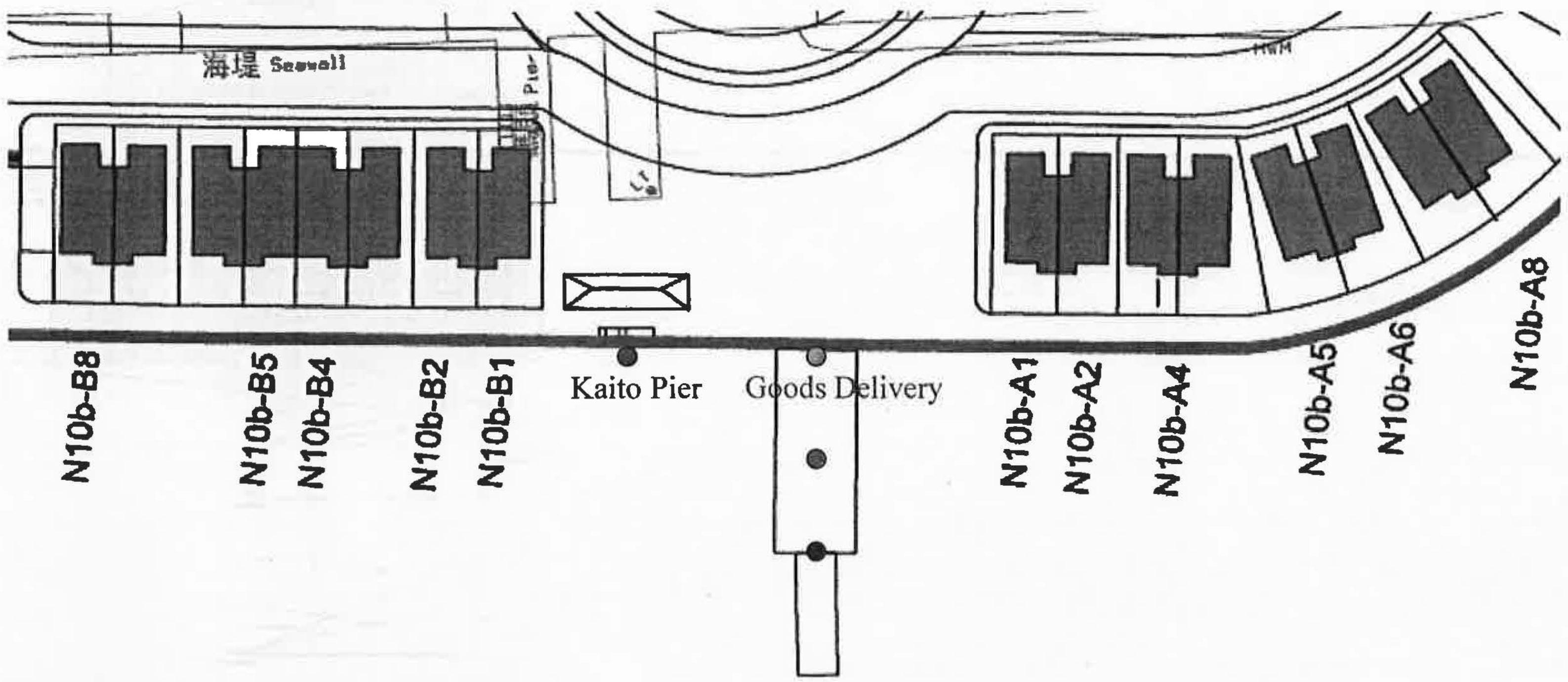
Case 3 Peng Chau Kaito, Mui Wo Kaito & LPG Container Vessel + LPG Containers Loading Truck

Noise Source ID	Description	Activities/Equipment	SWL, dB(A)	Shortest separation distance (m)	Worst operating time (min)	Correction, dB(A)					Predicted SPL, dB(A)	Remark
						Distance	Time	Screening	Mitigation	Facade		
PC1	Peng Chau Kaito	Idling - arrival	88	107	1	-49	-15	0	0	3	28	
PC2		Idling	88	107	5	-49	-8	0	0	3	35	
PC3		Idling - ready for departure	91	107	1	-49	-15	0	0	3	31	
MW1	Mui Wo Kaito	Idling - arrival	98	-	1	-	-	-	-	-	-	
MW2		Idling	90	-	5	-	-	-	-	-	-	
MW3		Idling - ready for departure	98	-	1	-	-	-	-	-	-	
LPG1	LPG Container Vessel + LPG Containers Loading Truck	Idling - arrival	93	-	2	-	-	-	-	-	-	No Nighttime operation
LPG2		Crane operation and LPG containers leave barge	112	-	1	-	-	-	-	-	-	
LPG3		LPG containers loading into truck	95	-	1	-	-	-	-	-	-	
LPG4		Idling	91	-	5	-	-	-	-	-	-	
LPG5		Crane operation and LPG containers back to barge	108	-	1	-	-	-	-	-	-	
LPG6		Idling - ready for departure	105	-	2	-	-	-	-	-	-	
					Predicted Overall Noise Level, Leq (30min) dB(A)						37	
					Nighttime criterion (ANL-5), dB(A)						45	
					Exceedance, dB(A)						-	

Mitigated (Barrier)

Daytime		Noise Impact, dB(A)	Exceedance	Noise Impact, dB(A)	Exceedance	Noise Impact, dB(A)	Exceedance
NSR	Criteria	Case 1	Case 1	Case 2	Case 2	Case 3	Case 3
N10b-B1	55	54	-	54	-	54	-
N10b-B2	55	53	-	52	-	52	-
N10b-B4	55	54	-	49	-	47	-
N10b-B5	55	55	-	52	-	52	-
N10b-B8	55	53	-	49	-	49	-
N10b-D1	55	55	-	55	-	55	-
N10b-D5	55	50	-	50	-	50	-
N10b-D6	55	52	-	51	-	52	-
N10b-D8	55	53	-	52	-	52	-
N10b-A1	55	51	-	49	-	52	-
N10b-A2	55	50	-	50	-	51	-
N10b-A4	55	47	-	47	-	47	-
N10b-A5	55	55	-	50	-	50	-
N10b-A6	55	55	-	50	-	50	-
N10b-A8	55	53	-	48	-	48	-

Nighttime		Noise Impact, dB(A)	Exceedance	Noise Impact, dB(A)	Exceedance	Noise Impact, dB(A)	Exceedance
NSR	Criteria	Case 1	Case 1	Case 2	Case 2	Case 3	Case 3
N10b-B1	45	42	-	43	-	43	-
N10b-B2	45	38	-	39	-	39	-
N10b-B4	45	34	-	35	-	35	-
N10b-B5	45	42	-	43	-	43	-
N10b-B8	45	39	-	40	-	40	-
N10b-D1	45	38	-	40	-	40	-
N10b-D5	45	35	-	36	-	36	-
N10b-D6	45	39	-	39	-	39	-
N10b-D8	45	40	-	40	-	40	-
N10b-A1	45	33	-	33	-	33	-
N10b-A2	45	32	-	32	-	32	-
N10b-A4	45	30	-	30	-	30	-
N10b-A5	45	34	-	34	-	34	-
N10b-A6	45	38	-	38	-	38	-
N10b-A8	45	37	-	37	-	37	-



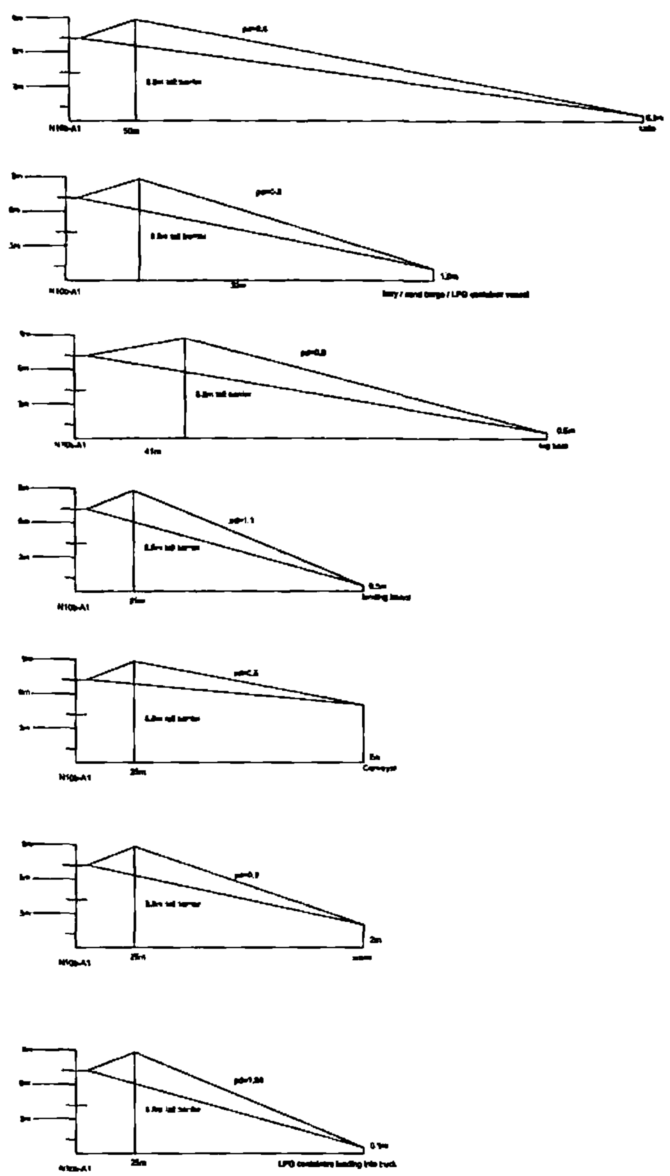
Legend

- Proposed relocated location of fixed noise sources from Pang Chau Kai To / Mui Wo Kai To
- Proposed relocated location of fixed noise sources from operation of landing board / conveyor / crane / loading and unloading of LPG containers into truck
- Proposed relocated location of fixed noise sources from loading and unloading of lorry / LPG container vessel / sand barge
- Proposed relocated location of fixed noise sources from tug boat

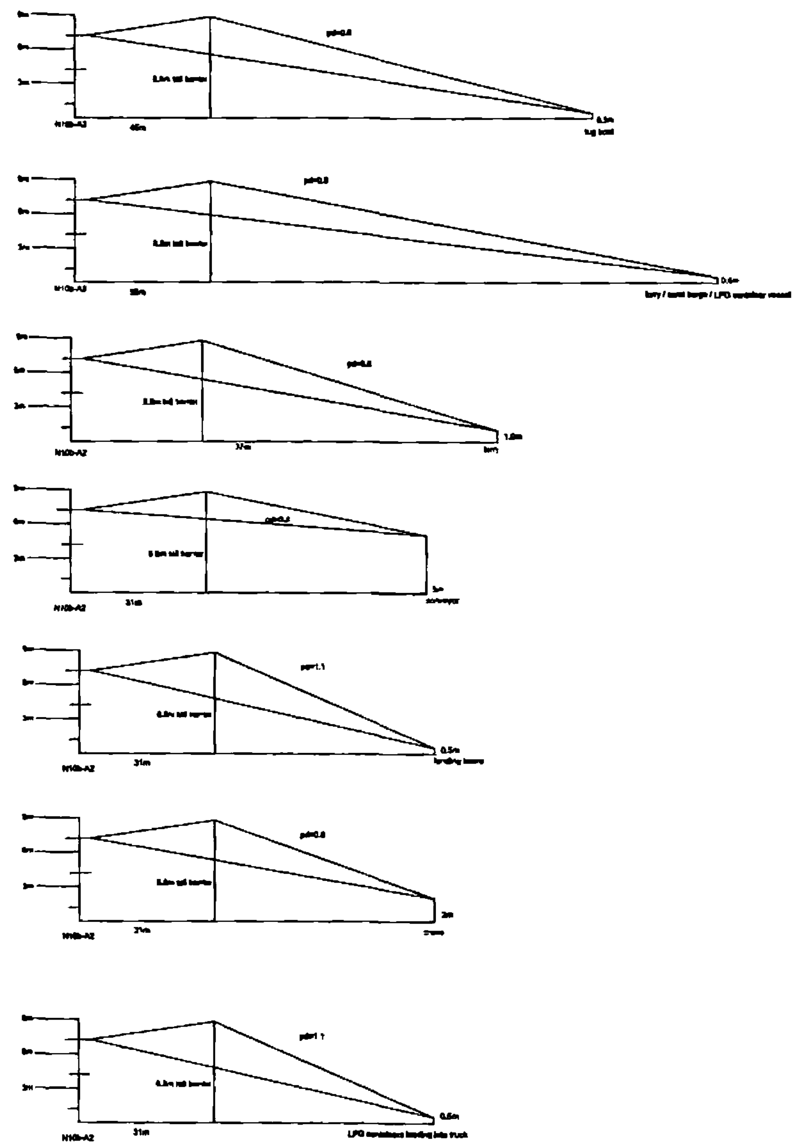
Existing Marine-based Fixed Noise Sources Locations

ARUP

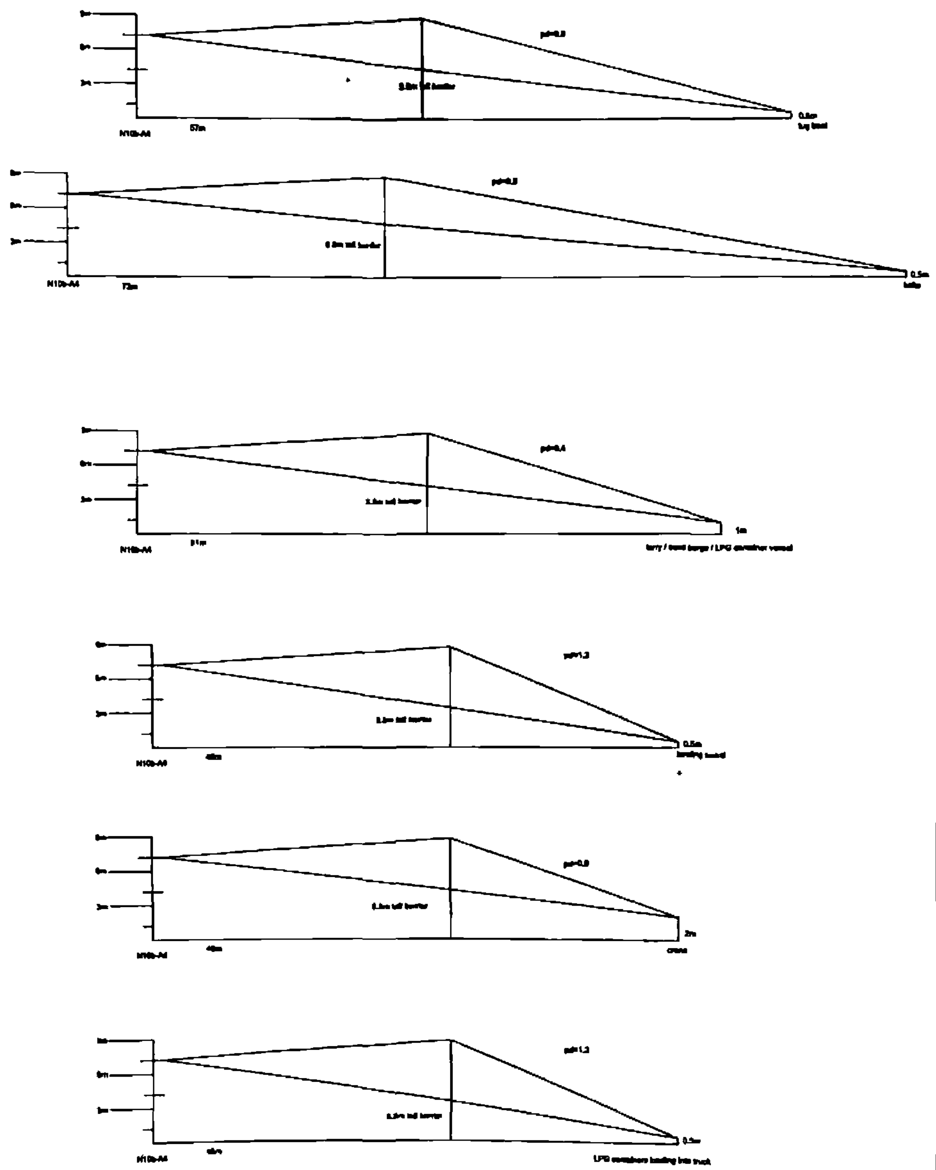
N10b-A1



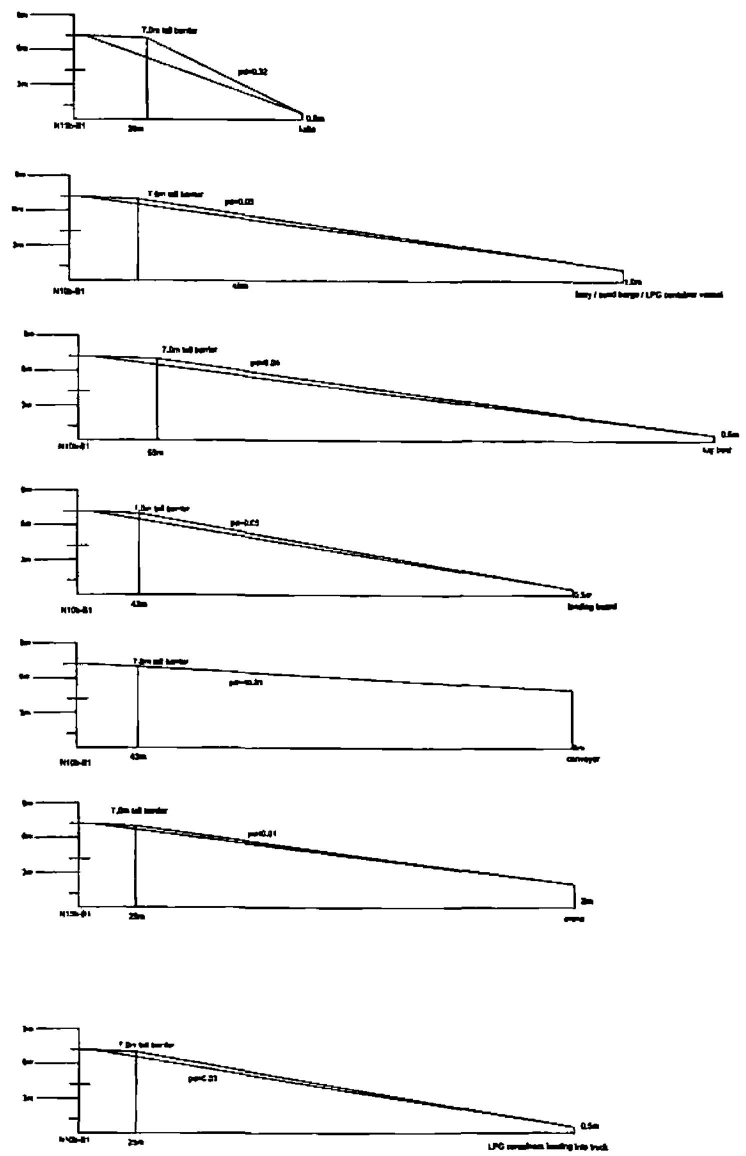
N10b-A2



N10b-A4



N10b-B1



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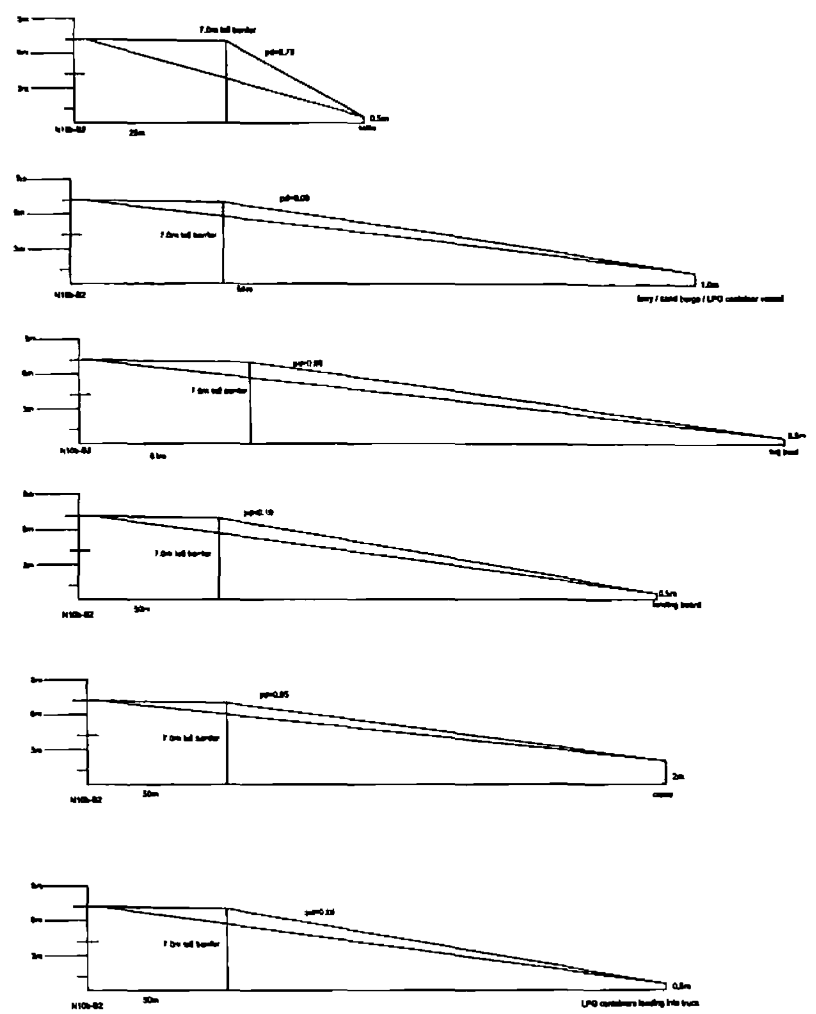

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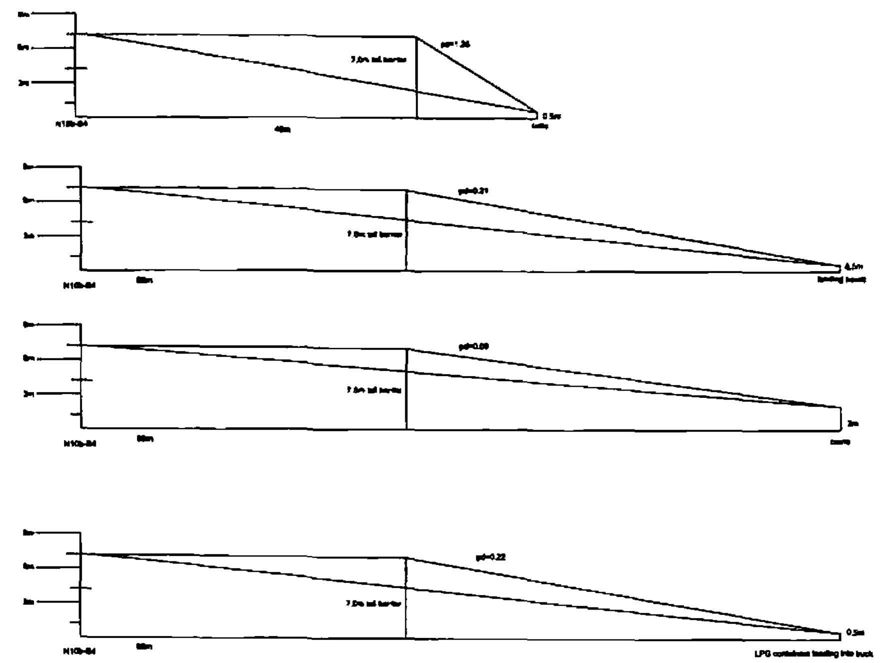
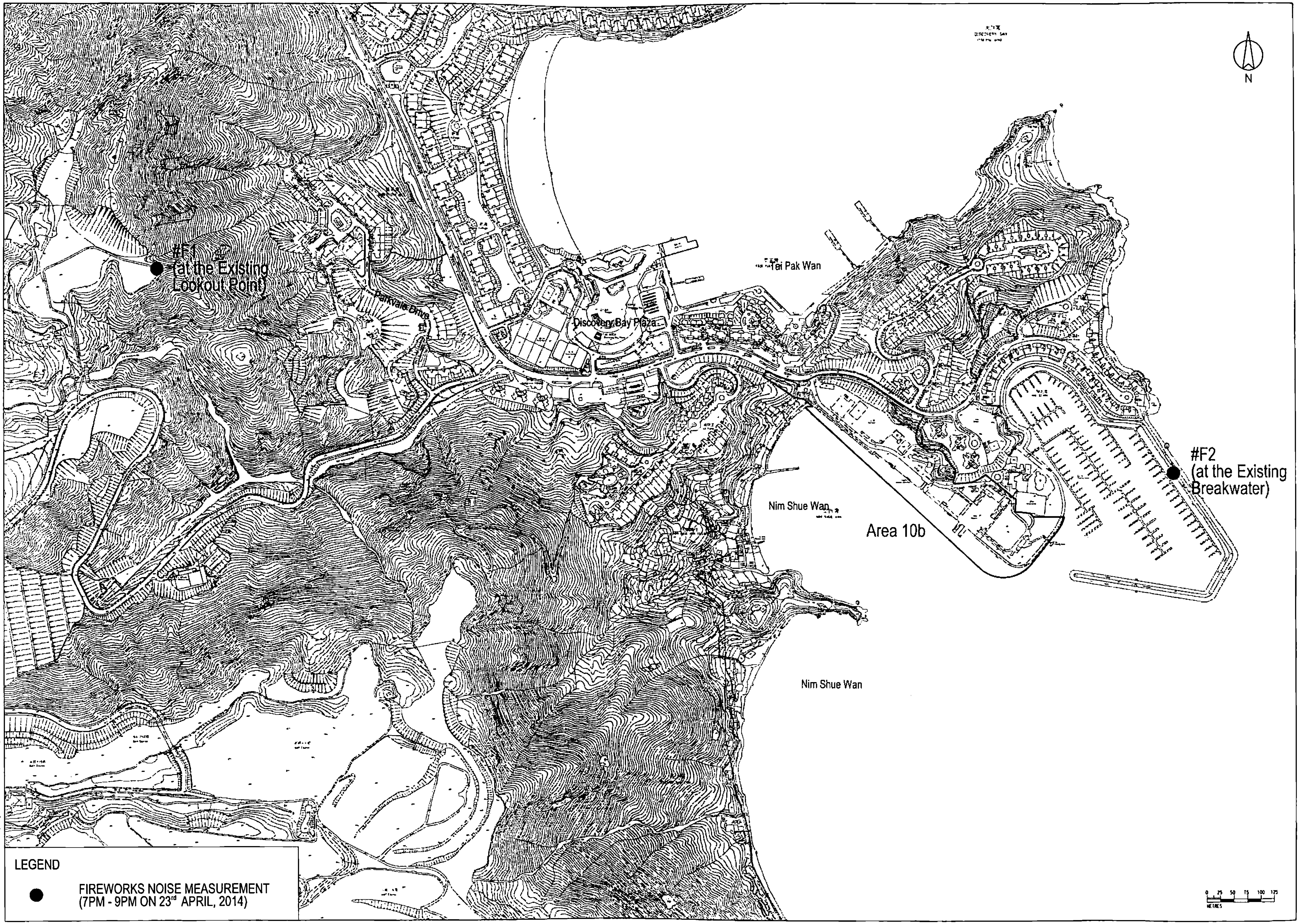


Appendix 5.6

Firework Display
Noise Measurement
Location



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Appendix 5.7

Firework Display Noise Result Summary

Project : Discovery Bay EAS
Job No.: 235928
Title: Firework Display Noise Assessment
Subtitle: Firework Display Noise Measurement Results

Noise Level	Location F1	Location F2
Measured Noise Level, Leq (15 min) , dB(A) [3]	52	53
Background Noise Level (Before firework display), Leq (15 min) , dB(A) [1]	50	50
Background Noise Level (After firework display), Leq (15 min) , dB(A) [2]	48	50
Average Background Noise Level, dB(A) [3]	49	50
Facade correction [4]	3	
Corrected Noise Level, Leq (15 min) , dB(A)	52	53
Noise Criterion [5]	55	
Exceedance, dB(A)	-	-

Note:
[1] Background noise level was measured 15 minutes before the firework display.
[2] Background noise level was measured 15 minutes after the firework display.
[3] Logarithmic average of [1] and [2]
[4] Facade correction has been considered in noise calculation.
[5] The firework display noise criteria is referenced to Environmental Impact Assessment - Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures (AEIAR – 0323/2000) and Hong Kong International Theme Parks Limited - Air Quality and Noise Monitoring During Fireworks Dress Rehearsal: Monitoring Report.

Appendix 6.1

Legislation and Standards for Water Quality Assessment

Legislation and Standards for Water Quality Assessment

The relevant legislations, standards and guidelines applicable to present study for the assessment of water quality impacts include:

- Water Pollution Control Ordinance (WPCO) CAP 358;
- Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems Inland and Coastal Waters (TM-DSS);
- Hong Kong Planning Standards and Guidelines (HKPSG); and
- ProPECC PN 1/94 "Construction Site Drainage"

Water Pollution Control Ordinance, CAP 358

The Project is located in the Southern Water Control Zone (WCZ) under the Water Pollution Control Ordinance (WPCO) (CAP 358) and the corresponding WQOs are summarised in below table.

Table A6.1: Water quality objectives for Southern Water Control Zones

Parameters	Objectives	Sub-Zone
Aesthetic Appearance	Waste discharges shall cause no objectionable odours or discolouration of the water.	Whole zone
	Tarry residues, floating wood, articles made of glass, plastic, rubber or of any other substance should be absent.	
	Mineral oil should not be visible on the surface. Surfactants should not give rise to a lasting foam.	
	There should be no recognisable sewage-derived debris.	
	Floating, submerged and semi-submerged objects of a size likely to interfere with the free movement of vessels, or cause damage to vessels, should be absent.	
	Waste discharges shall not cause the water to contain substances which settle to form objectionable deposits.	
Bacteria	*Escherichia coli* < 610/100 mL, geometric mean in one calendar year.	Secondary Contact, Recreation Subzones and Fish Culture Subzones
	Escherichia coli < 180/100 mL, geometric mean from March to October inclusive in one calendar year. Samples at least 3 times in a calendar month at intervals of between 3 and 14 days.	Bathing Beach Subzones
Dissolved Oxygen	> 4 mg/L at depth-averaged for 90% of the samples > 2 mg/L within 2m of the seabed for 90% of the	Marine waters excepting Fish Culture

Parameters	Objectives	Sub-Zone
	samples	Subzones
	> 5 mg/L at depth averaged for 90% of the samples > 2 mg/L within 2 metres of the seabed for 90% of the sample.	Fish Culture Subzones
	> 4 mg/L	Inland waters of the Zone
pH	In the range of 6.5 – 8.5 Change due to waste discharge < 0.2	Marine waters excepting Bathing Beach Subzones; Mui Wo (A), Mui Wo (B), Miu Wo (C), Mui Wo (E) and Mui Wo (F) Subzones.
	In the range of 6.0 – 9.0 Change due to waste discharge < 0.2	Mui Wo (D) Sub-zone and other inland waters.
	In the range of 6.0 – 9.0 for 90% of samples Change due to waste discharge < 0.5	Bathing Beach Subzones.
Temperature	Change due to waste discharge < 2.0 degC	Whole zone
Salinity	Change due to waste discharges < 10% of ambient levels	Whole zone
Suspended solids	Change due to waste discharge < 30% of ambient levels	Marine waters
	< 20 mg/L, annual median	Mui Wo (A), Mui Wo (B), Mui Wo (C), Mui Wo (E) and Mui Wo (F) Subzones.
	< 25 mg/L, annual median	Mui Wo (D) Subzone and other inland waters.
Unionized Ammonia (UIA)	< 0.021 mg/L, annual arithmetic mean	Whole zone
Nutrient	Shall not cause excessive or nuisance algal growth Total inorganic nitrogen (TIN) < 0.1 mg/L, annual mean of depth averaged	Marine waters
5-Day Biochemical Oxygen Demand (BOD_5)	< 5 mg/L	Inland waters of the Zone
Chemical Oxygen Demand (COD)	< 30mg/L	Inland waters of the Zone
Dangerous Substances	Waste discharges shall not cause the concentrations of dangerous substances in marine waters to attain such levels as to produce significant toxic effects in humans, fish or any other aquatic organisms, with due regard to biologically cumulative effects in food chains and to toxicant interactions with each other.	Whole zone

Parameters	Objectives	Sub-Zone
	Waste discharges of dangerous substances shall not put a risk to any beneficial uses of the aquatic environment.	Whole zone

Technical Memorandum for Effluents Discharge into Drainage and Sewerage Systems, Inland & Coastal Waters

Apart from the WQOs, Annex 1 of CAP358AK also specifies the limits to control the physical, chemical and microbial parameters for effluent discharges into drainage and sewage system at both inland and coastal waters under the TM-DSS. The discharge limits vary with the effluent flowrates and the sewage from the Project (treated after sewage treatment works) should comply with the standards for effluent discharged into marine water. The effluent discharge standards are presented in tables below.

Table A6.2: Standards for effluents discharged into the marine waters of Southern WCZ (in mg/L unless otherwise indicated)

Flow rate (m^3/day)	≤10	>10 and ≤200	>200 and ≤400	>400 and ≤600	>600 and ≤800	>800 and ≤1000	>1000 and ≤1500	>1500 and ≤2000	>2000 and ≤3000	>3000 and ≤4000	>4000 and ≤5000	>5000 and ≤6000
pH (pH units)	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10	6-10
Temperature (degC)	45	45	45	45	45	45	45	45	45	45	45	45
Colour (lovibond units) (25mm cell length)	4	1	1	1	1	1	1	1	1	1	1	1
Suspended solids	500	500	500	300	200	200	100	100	50	50	40	30
BOD	500	500	500	300	200	200	100	100	50	50	40	30
COD	1000	1000	1000	700	500	400	300	200	150	100	80	80
Oil & Grease	50	50	50	30	25	20	20	20	20	20	20	20
Iron	20	15	13	10	7	6	4	3	2	1.5	1.2	1
Boron	6	5	4	3.5	2.5	2	1.5	1	0.7	0.5	0.4	0.3
Barium	6	5	4	3.5	2.5	2	1.5	1	0.7	0.5	0.4	0.3
Mercury	0.1	0.1	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.1	0.1	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Other toxic metals individually	2	1.5	1.2	0.8	0.6	0.5	0.32	0.24	0.16	0.12	0.1	0.1
Total toxic metals	4	3	2.4	1.6	1.2	1	0.64	0.48	0.32	0.24	0.2	0.14
Cyanide	1	0.5	0.5	0.5	0.4	0.3	0.2	0.15	0.1	0.08	0.06	0.04
Phenols	0.5	0.5	0.5	0.3	0.25	0.2	0.13	0.1	0.1	0.1	0.1	0.1

Flow rate (m^3/day)	**≤10**	**>10 and ≤200**	**>200 and ≤400**	**>400 and ≤600**	**>600 and ≤800**	**>800 and ≤1000**	**>1000 and ≤1500**	**>1500 and ≤2000**	**>2000 and ≤3000**	**>3000 and ≤4000**	**>4000 and ≤5000**	**>5000 and ≤6000**
Sulphide	5	5	5	5	5	5	2.5	2.5	1.5	1	1	0.5
Total residual chlorine	1	1	1	1	1	1	1	1	1	1	1	1
Total nitrogen	100	100	80	80	80	80	50	50	50	50	50	50
Total phosphorus	10	10	8	8	8	8	5	5	5	5	5	5
Surfactants (total)	30	20	20	20	15	15	15	15	15	15	15	15
E. coli (count/100ml)	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000

Hong Kong Planning Standards and Guidelines

Chapter 9 of the Hong Kong Planning Standards and Guidelines (HKPSG) outlines the environmental requirements that need to be considered in land use planning. The recommended guidelines, standards and guidance cover the selection of suitable locations for the developments and sensitive uses, provision of environmental facilities, and design, layout, phasing and operational controls to minimise adverse environmental impacts. It also lists out environmental factors that influence land use planning and recommends buffer distances for land uses.

ProPECC PN 1/94 "Construction Site Drainage"

The Practice Note for Professional Persons (ProPECC Note PN1/94) on Construction Site Drainage provides guidelines for the handling and disposal of construction discharges. It is applicable to this study for the control of site runoff and wastewater generated during the construction phase. The types of discharges from construction sites outlined in the ProPECC Note PN1/94 include:

- Surface runoff;
- Groundwater;
- Boring and drilling water;
- Wastewater from concrete batching plant;
- Wheel washing water;
- Bentonite slurries;
- Water for testing and sterilization of water retaining structures and water pipes;
- Wastewater from building construction and site facilities; and
- Acid cleaning, etching and pickling wastewater.

Appendix 6.2

Standard Practice for Site Drainage

Standard Practice for Site Drainage

Site Runoff

In accordance with the Practice Note for Professional Persons on Construction Site Drainage, Environmental Protection Department, 1994 (ProPECC PN 1/94), best management practices should be implemented as far as practicable as below:

- At the start of site establishment, perimeter cut-off drains to direct off-site water around the site should be constructed with internal drainage works. Channels (both temporary and permanent drainage pipes and culverts), earth bunds or sand bag barriers should be provided on site to direct stormwater to silt removal facilities.
- The dikes or embankments for flood protection should be implemented around the boundaries of earthwork areas. Temporary ditches should be provided to facilitate the runoff discharge into an appropriate watercourse, through a silt/sediment trap. The silt/sediment traps should be incorporated in the permanent drainage channels to enhance deposition rates.
- The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 1/94. The detailed design of the sand/silt traps should be undertaken by the contractor prior to the commencement of construction.
- The design of temporary on-site drainage should prevent runoff going through site surface, construction machinery and equipment in order to avoid or minimize polluted runoff. Sedimentation tanks with sufficient capacity, constructed from pre-formed individual cells of approximately 6 to 8 m3 capacities, are recommended as a general mitigation measure which can be used for settling surface runoff prior to disposal. The system capacity shall be flexible and able to handle multiple inputs from a variety of sources and suited to applications where the influent is pumped.
- Construction works should be programmed to minimize surface excavation works during the rainy seasons (April to September). All exposed earth areas should be completed and vegetated as soon as possible after earthworks have been completed. If excavation of soil cannot be avoided during the rainy season, or at any time of year when rainstorms are likely, exposed slope surfaces should be covered by tarpaulin or other means.
- All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit should be removed regularly and disposed of by spreading evenly over stable, vegetated areas.
- All open stockpiles of construction materials (for example, aggregates, sand and fill material) should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into any drainage system.
- Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or

debris being washed into the drainage system and storm runoff being directed into foul sewers.

- Precautions to be taken at any time of year when rainstorms are likely, actions to be taken when a rainstorm is imminent or forecasted, and actions to be taken during or after rainstorms are summarized in Appendix A2 of ProPECC PN 1/94. Particular attention should be paid to the control of silty surface runoff during storm events.
- All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and sited wheel washing facilities should be provided at every construction site exit where practicable. Wash-water should have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road should be paved with sufficient backfall toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains.
- Oil interceptors should be provided in the drainage system downstream of any oil/fuel pollution sources. The oil interceptors should be emptied and cleaned regularly to prevent the release of oil and grease into the storm water drainage system after accidental spillage. A bypass should be provided for the oil interceptors to prevent flushing during heavy rain.
- Construction solid waste, debris and rubbish on site should be collected, handled and disposed of properly to avoid water quality impacts.
- All fuel tanks and storage areas should be provided with locks and sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank to prevent spilled fuel oils from reaching water sensitive receivers nearby.
- Regular environmental audit on the construction site should be carried out in order to prevent any malpractices. Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the water bodies, marsh and ponds.

By adopting the best management practices, it is anticipated that the impacts of general site operation will be reduced to acceptable levels before discharges. The details of best management practices will be highly dependent to actual site condition and Contractor shall apply for a discharge license under WPCO.

Sewage from Workforce

Mitigation measures to manage the sewage from workforce include the following:

- Portable chemical toilets and sewage holding tanks should be provided for handling the construction sewage generated by the workforce.
- A licensed contractor should be employed to provide appropriate and adequate portable toilets to cater 0.15m3/day/employed population and be responsible for appropriate disposal and maintenance.

- Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the Project.
- Regular environmental audit on the construction site should be conducted in order to provide an effective control of any malpractices and achieve continual improvement of environmental performance on site.

Appendix 6.3

Preliminary Water Quality Assessment

1 Introduction

1.1.1.1 This technical note is prepared for supporting the Section 12A Application No. Y/I-DB/3 of rezoning the permissible use from "Other Specified Use" ("OU") and "Government, Institution and Community" for various supporting service uses to "OU" (Residential and various supporting service uses) R(C)13 at Area 10b. It summarises the results of preliminary water quality impact assessment for the proposed sewage treatment works (STW) in Area 10b to the water sensitive receivers during operational phase.

1.1.1.2 The proposed STW will be established to receive and treat the sewage generated from Area 10b which will accommodate a total of about 2,800 additional population. The maximum daily sewage flow rate of the proposed STW is approximately 1,100 m3/day. Nitrogen removal and disinfection will be implemented into the proposed STW. As discussed in Study on Sewerage accompanying the Planning Statement of Area 10b, the treated effluent from the proposed STW would be conveyed to a sewerage system, and finally discharged via a submarine outfall. Mitigation measures will be proposed as necessary to achieve compliance of Water Quality Objectives (WQOs).

2 Baseline Condition

2.1 Marine Water Quality

2.1.1.1 The WQOs include various parameters, which describe the physical, chemical and biological properties of the marine environment. **Table 2.1** summarises the key baseline conditions of SS (suspended solids), *E. coli*, UIA (Un-ionized Ammonia Nitrogen), TIN (Total Inorganic Nitrogen) and TP (Total Phosphorus) at EPD's marine monitoring location SM10 from year 2005 to 2014. The annual average of the baseline condition at SM10 from year 2005 to 2014 is presented in **Appendix A**. It should be noted that the baseline TIN level (0.35 mg/L) already exceeds the WQO of 0.1 mg/L in Southern Water Control Zone (WCZ), due to high TIN level in the background of Pearl River estuary[1].

Table 2.1 Baseline condition of EPD's marine monitoring station SM10 from year 2005 to 2014

SS (mg/L)	*E. coli* (counts/100ml)	UIA (mg/L)	TIN (mg/L)	TP (mg/L)	PO_4 (mg/L)
6.92	8	0.0042	<u>0.35</u>	0.04	0.017

[1] EPD Marine Water Quality in Hong Kong in 2014.

Notes:
[1] Unless otherwise specified, data presented are depth averaged and are the annual arithmetic mean except for *E. coli* which is in geometric mean.
[2] Underlined indicates occurrence of non-compliance with that parameter of WQO.

3 Water Sensitive Receivers

3.1.1.1 Water sensitive receivers (WSRs) have been identified and shown in **Figure 3.1**. The treated effluent from the STW in Area 10b would be conveyed to the planned sewerage system, and eventually discharged to the marine outfall near Nim Shue Wan.

3.1.1.2 The distances between the discharge point of the marine outfall and WSRs are listed in **Table 3.1**. The nearest WSR is Hai Tei Wan Marina (WSR 05) at 320m.

Table 3.1 Description of water sensitive receivers within 2500 meters

WSR	Name	Description	Distance from the discharge location (m)
WSR01	Discovery Bay Reservoir	Primary reservoir for flushing, located upstream of the potential development areas	-[1]
WSR02	Discovery Bay Reservoir Spillway and Tributaries	Spillway from Discovery Bay Reservoir and the tributaries, drainage runs along Discovery Valley Road and downstream to Tsoi Yuen Wan	-[1]
WSR03	Nim Shue Wan Stream	Natural stream downstream from the existing golf course to Nim Shue Wan	-[1]
WSR04	Tai Pak Wan	Non-gazetted beach downstream to Discovery Bay Reservoir Spillway	2500
WSR05	Hai Tei Wan Marina	Marina at Hai Tei Wan next to Discovery Bay Road	320
WSR06	Nim Shue Wan	Nim Shue Wan Beach	650
WSR07	Tai Pak Tsui Peninsula Coastal Protection Area (CPA)	Protected natural shoreline at north of Tai Pak Tsui Peninsula	1600

Note:
[1] Inland WSR.

4 Assessment Methodology

4.1 Effluent Discharge Standards

4.1.1.1 **Table 4.1** shows the effluent discharge standards of the proposed STW.

Table 4.1 Effluent discharge standards of the proposed STW

Parameters	Discharge standard provided by sub-contractor (Flow rate estimated as 690 m^3/day)
pH	6-10
Temperature	< 30°C
Colour	< 1 lovibond units
Suspended Solids (SS)	30 mg/L
5-Day Biochemical Oxygen Demand (BOD_5)	20 mg/L
Chemical Oxygen Demand (COD)	< 80 mg/L
Oil & Grease	< 10 mg/L
Total phosphorus	2 mg/L
Ammonia Nitrogen	8 mg/L
Nitrate + nitrite nitrogen	12 mg/L
Surfactants	< 15 mg/L
E. coli	10 count/100ml

Note:
[1] Mercury, Cadmium, Cyanide, Phenols, Sulphide, Sulphate, Chloride, Fluoride, Iron, Boron, Barium and other toxic metals are not the major pollutants in the domestic sewage and are excluded in the comparison.

4.2 WQOs in Southern WCZ

4.2.1.1 **Table 4.2** shows the criteria of SS, *E. coli*, UIA and TIN under WQOs in Southern Water Control Zone. As discussed in **Section 2**, the baseline TIN level has already exceeded the WQO criterion of 0.1 mg/L.

Table 4.2 Criteria from WQOs in Southern WCZ

SS [2] (mg/L)	*E. coli* (counts/100ml)	UIA (mg/L)	TIN (mg/L)
8.99	180/610[1]	0.021	0.1

Note:
[1] The criteria for *E. coli* are 610 counts/100ml for Secondary Contact Recreational Subzones, and 180 counts/100ml for bathing beaches in wet season.
[2] SS criteria is established based on WQO that water discharge shall not cause the natural ambient level to be raised by 30% for marine water WCZ.

4.3 Design of Proposed Marine Outfall

4.3.1.1 **Table 4.3** shows the tentative details of proposed marine outfall. These assumptions would be further refined and developed during the detailed design stage.

Table 4.3 Tentative design details for the diffuser in the proposed marine outfall

Parameters	Description
No. of discharge ports in the diffuser	8
Design discharge speed at the port	1 m/s
Length of diffuser base	10m
Configuration of discharge ports	Each discharge ports are distributed evenly on the diffuser line. The ports are pointing horizontally with alternating directions.
Location of the diffuser/discharge outfall	Approximately 300m offshore[1]
Depth of the discharge port	4.5m from water surface (at sea bottom)

Note:
[1] The outfall location is also tentatively set at a location with a water depth of approximately 4.5m. The location would be further refined during the detailed design stage.

4.4 Modelling Scenario

4.4.1.1 The effluent dispersion scenarios are simulated by a near-field model, CORMIX. The key inputs to the CORMIX include outfall configuration, ambient current speed, vertical density profile and effluent flow rate.

4.4.1.2 The ambient velocity of 10, 50 and 90 percentile at 0.013, 0.042 and 0.076 m/s respectively has been estimated from the approved Delft 3D modelling results from HATS Stage 2A EIA (AEIAR-121/2008) and presented in **Appendix B**.

4.4.1.3 To cater for the different tidal conditions, the following scenarios have been modelled under CORMIX:

- The 90 percentile of ambient velocity of 0.076 m/s. Under this scenario, the effluent discharge flow is in the same direction as the ambient flow. The pollutant plume is then flowing towards the WSR by the maximum ambient flow.
- The 50 percentile of ambient velocity of 0.042 m/s. Under this scenario, the effluent discharge flow is in the same direction as the ambient flow. The pollutant plume is then flowing towards the WSR by the average ambient flow.
- The 10 percentile of ambient velocity of 0.013 m/s. Under this scenario, the ambient velocity is near stagnant. The dispersion of the plume is dominated by diffusion.

4.4.1.4 **Table 4.4** presents the modelling parameters of the worst case scenario for ambient in co-flow situation.

Table 4.4 Modelling scenario and corresponding parameters for the model

Parameter		**Scenario**	
Season		Dry	Wet
Effluent Discharge Parameters	Total Discharge Flow Rate	1 m/s[1] · 1100m³/day	
	Concentration of Effluent at Peak Flow	NH_3-N: 8 mg/L (UIA[2]: 0.424 mg/L) SS: 30 mg/L *E. coli*: 10 counts/100ml TIN[3]: 12 + 8 mg/L TP: 2 mg/L, PO_4[4]: 1.77 mg/L	
	Effluent Density	1000 kg/m	
	Discharge height above bottom	0 m (sea bottom)	
Ambient Conditions	Ambient Velocity	Ambient flow of 10, 50 and 90 percentile at 0.013, 0.042 and 0.076 m/s respectively (See **Appendix B**) with 90 deg of diffuser line	
	Ambient Density [5]	Surface 1,022 kg/m³ ; Bottom 1,022 kg/m³	Surface 1,017 kg/m³ ; Bottom 1,017.7 kg/m³
	Water Depth	4.5 m [6]	
	Wind speed	2 m/s [7]	

Note:

[1] Reference to the designed effluent velocity of the proposed marine outfall discharging to sea.

[2] UIA is estimated by multiplying a percentage factor to NH3-N. This factor depends on temperature and pH. The average temp and pH from EPD water quality monitoring stations in Southern WCZ are 23.8°C and 8.0 respectively. According to the "Aqueous Ammonia Equilibrium- Tabulation of Percent Unionized Ammonia" from USEPA, the conversion factor is 5.3%.

[3] TIN concentration is the sum of the concentration of NH_3-N, NO_2-N and NO_3-N (see **Table 4.1**).

[4] The level of orthophosphate phosphorus (PO_4) is estimated based on the ratio of TP:PO_4 of 1.13:1 for secondary treatment of STWs from HATS Stage 2A EIA.

[5] Ambient density is estimated from the EPD water quality monitoring station SM10 from year 2005-2014.

[6] Water depth at Discovery Bay are obtained from nautical chart in Hong Kong, published by the Hydrographic Office, Marine Department of HKSAR Government (**Appendix C**).

[7] CORMIX's recommended value for conservative design condition.

5 Evaluation of Impacts

5.1.1.1 **Table 5.1** shows the dilution factors for SS and UIA required to meet the WQOs in marine waters. Since the *E. coli* level of treated effluent has already met the WQO criteria, it is not included in the assessment. The calculation of dilution factor is based on **Equation 5.1**. The WQO criteria can be complied if the predicted dilution factor at the WSRs is higher than the required dilution factor presented in **Table 5.1.**

Table 5.1 Dilution factors for SS and UIA to meet the WQO criteria

	SS (mg/L)	UIA (mg/L)	Remark
Criteria/Target Limit of Conc. ($C_{criteria}$)	8.99	0.021	See **Table 4.2**
Baseline Conc. ($C_{baseline}$)	6.92	0.004	See **Table 2.1**
Effluent Discharge Conc. ($C_{effluent}$)	30	0.424	See **Table 4.3**
Dilution Factor to Meet the Criteria	11	25	Calculation based on **Equation 5.1**

Note:
As a sample calculation, the required dilution factor for the SS criterion would be (30.00 – 6.92)/(8.99 – 6.92) ≈ 11.

$$DF = \frac{C_{effluent} - C_{baseline}}{C_{criteria} - C_{baseline}}$$ **Equation 5.1**

where

$C_{effluent}$ is the effluent concentration at the discharge point.

$C_{baseline}$ is the baseline concentration at the WSR.

$C_{criteria}$ is the criteria/ target limit of concentration.

5.1.1.2 **Table 5.2** shows the dilution factor for the simulated scenario at 320 m of the closest WSR (WSR 05 Hai Tei Wan Marina). The details of CORMIX outputs are presented in **Appendix D**. The lowest predicted dilution factor can be achieved is 306.

Table 5.2 Predicted dilution factors at the WSR05 (i.e. 320 m from discharge point)

Season	Ambient flow (m/s)	Dilution Factor
Dry	0.013	480
	0.042	737
	0.076	620
Wet	0.013	306
	0.042	614
	0.076	686

5.1.1.3 Since the predicted dilution factor at the nearest WSR is higher than the required dilution presented in **Table 5.1**, it is anticipated that SS and UIA level would comply with the WQO criteria at all marine based WSRs. The summary of compliance for different water quality parameters is presented in **Table 5.3**.

Table 5.3 Summary of compliance for different water quality parameters for WSR 05

Season	Ambient flow (m/s)	SS (mg/L)			*E.coli* (mg/L)			UIA (mg/L)			TIN (mg/L)		
		Predicted Value	**Criteria**	**Compliance**	**Predicted Value**	**Criteria**	**Compliance**	**Predicted Value**	**Criteria**	**Compliance**	**Predicted Value**	**Criteria**	**Compliance**
Dry	0.013	6.97	8.99	Yes	8	610	Yes	0.005	0.021	Yes	0.391	0.1	No [1]
	0.042	6.95	8.99	Yes	8	610	Yes	0.005	0.021	Yes	0.377	0.1	No [1]
	0.076	6.96	8.99	Yes	8	610	Yes	0.005	0.021	Yes	0.382	0.1	No [1]
Wet	0.013	7.00	8.99	Yes	8	610	Yes	0.006	0.021	Yes	0.414	0.1	No [1]
	0.042	6.96	8.99	Yes	8	610	Yes	0.005	0.021	Yes	0.382	0.1	No [1]
	0.076	6.95	8.99	Yes	8	610	Yes	0.005	0.021	Yes	0.379	0.1	No [1]

Note:
[1] Baseline TIN level already exceeds the WQO criterion.

5.1.1.4 Using **Equation 5.1** and the effluent standards in **Section 4.1**, the predicted levels of total inorganic nitrogen (TIN) and total phosphorus (TP) with predicted dilution factors are presented in **Table 5.4**.

Table 5.4 Predicted nitrogen and phosphorus levels at the nearest WSR

Season	Ambient flow (m/s)	TIN (mg/L)	PO_4 (mg/L)[1]	TIN:PO_4
Dry	0.013	0.391	0.021	19:1
	0.042	0.377	0.019	19:1
	0.076	0.382	0.020	19:1
Wet	0.013	0.414	0.023	18:1
	0.042	0.382	0.020	19:1
	0.076	0.379	0.020	19:1

Note:
[1] Background level has been included

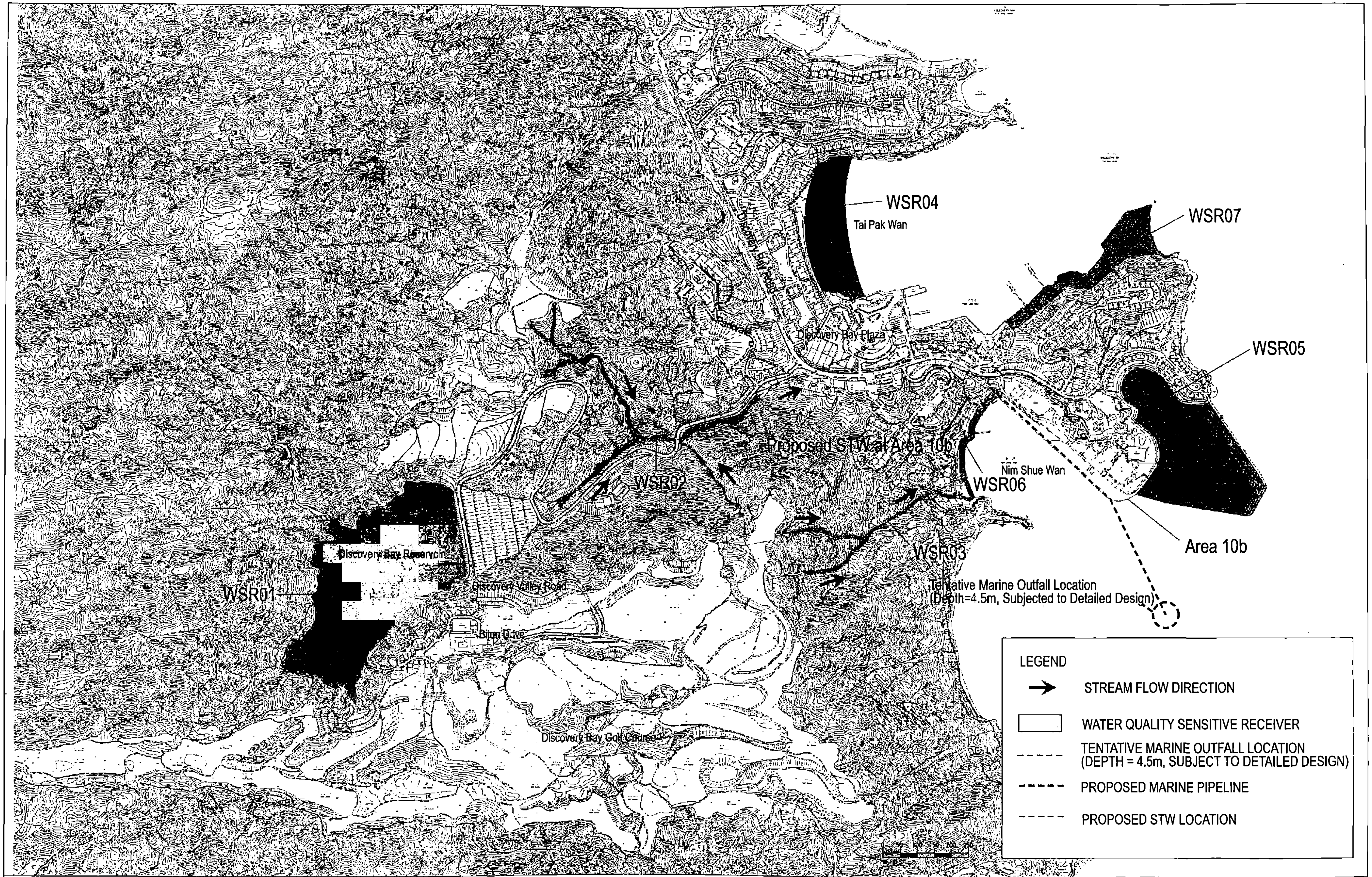
5.1.1.5 The predicted value of TIN exceeds the baseline value of 0.35 mg/L at the nearest WSR 05 (Hai Tei Wan Marina). However it is below the maximum value of 0.7 mg/L in 2014. The contribution is due to high TIN level in background from Pearl River estuary. TIN is a source for the formation of red tide. According to the literature[2], the nitrogen and phosphorus (N:P) ratio for red tide growth is 7:1 by weight. As shown from EPD monitoring data, the N:P ratio (TIN/PO_4) from the baseline data at SM10 is 21:1. Phosphorus would be the limiting nutrient for the algae growth. Based on **Table 5.4**, the predicted N:P ratio in the operational phase is in the range of 18:1 to 19:1. Hence, the possibility of red tide occurrence is still low.

[2] Redfield A.C., On the proportions of organic derivations in seawater and their relation to the composition of plankton. In James Johnson Memorial Volume (ed. R.J. Daniel). University Press of Liverpool, pp.177-192, 1934.

6 Conclusion

6.1.1.1 The preliminary water quality impact assessment of the proposed sewage treatment works in Area 10b to the water sensitive receivers during operational phase has be conducted. The effluent discharge standards meet the TM-DSS for Inland Waters. The modelling result indicates that the water quality in the vicinity of marine-based WSRs would be in compliance with WQOs in SS, *E. coli* and UIA. Exceedance of TIN under WQO is observed. However the contribution is due to high TIN level in background from Pearl River estuary. According to the computed N:P ratio, the possibility of having red tide is still low.

Figures



Job Title			
DISCOVERY BAY - OPTIMIZATION OF LAND USE			FIGURE 3.1
Date: Sept 22	Scale: 1:10000	Drawing Title: Water Quality Sensitive Receivers	ARUP
Drawn: GL	Job No: 235928		

Appendix A

EPD Marine Water Quality Monitoring Data

Figure A1 Locations of the Environmental Protection Department's marine monitoring measurement sites, captured from the EPD's marine water reports 2014

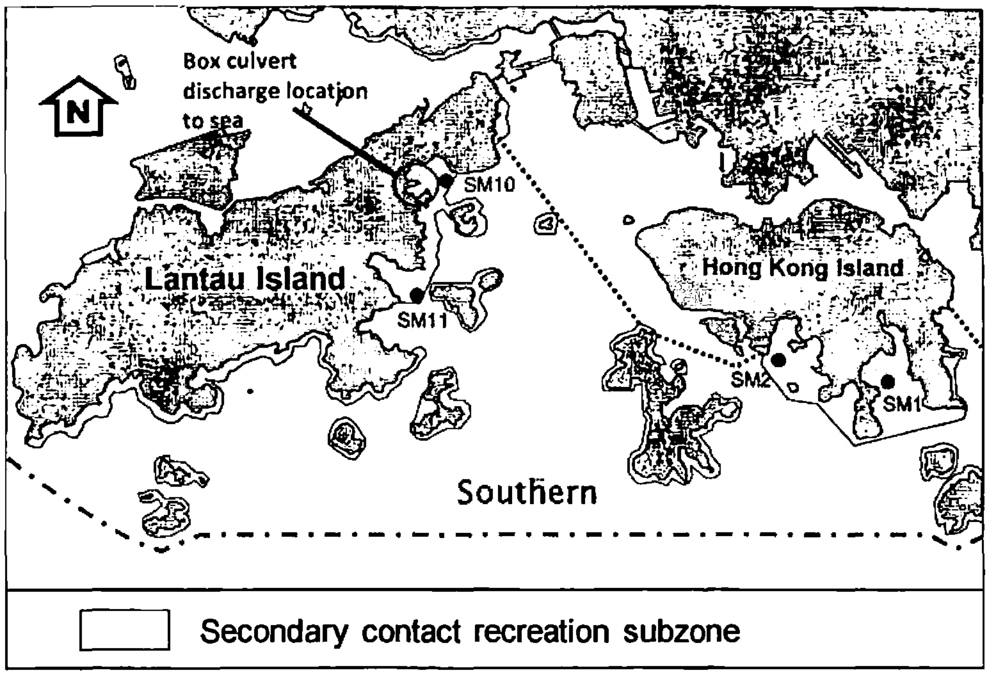


Table A1 Annual average of the water quality parameters at EPD's marine monitoring site SM10

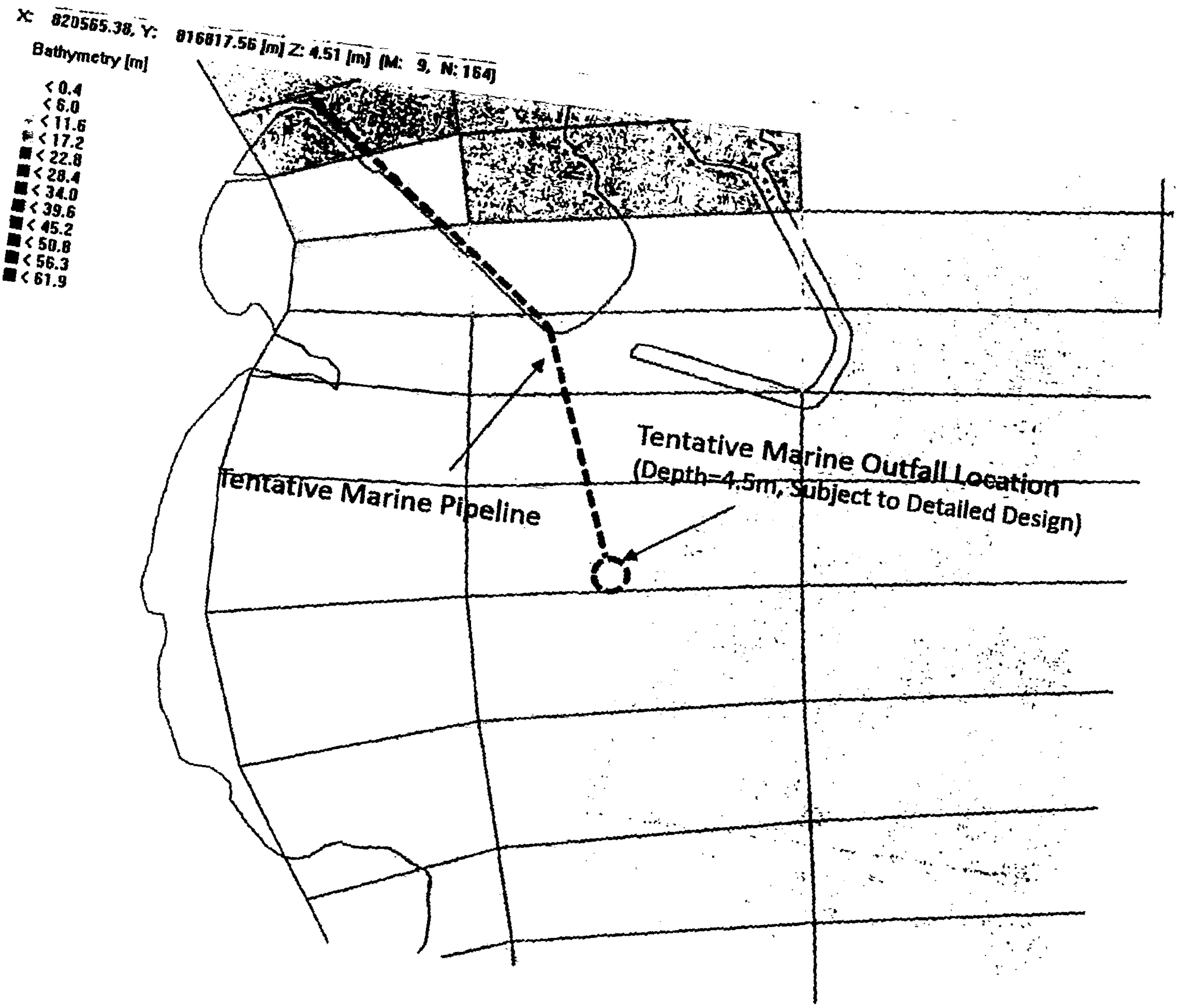
Year	Total Inorganic Nitrogen (mg/L)	*E. coli* [1] (cfu/100mL)	Suspended Solids (mg/L)	Unionised Ammonia (mg/L)	Total Phosphorus (mg/L)
2005	0.35	9.44	7.10	0.005	0.038
2006	0.32	19.04	9.06	0.006	0.044
2007	0.32	11.28	8.15	0.006	0.046
2008	0.37	14.59	7.33	0.005	0.041
2009	0.28	10.51	8.28	0.003	0.037
2010	0.33	5.00	5.46	0.003	0.035
2011	0.36	2.37	7.12	0.003	0.039
2012	0.42	2.82	7.20	0.003	0.038
2013	0.35	2.78	3.92	0.003	0.039
2014	0.30	4.30	4.68	0.004	0.045

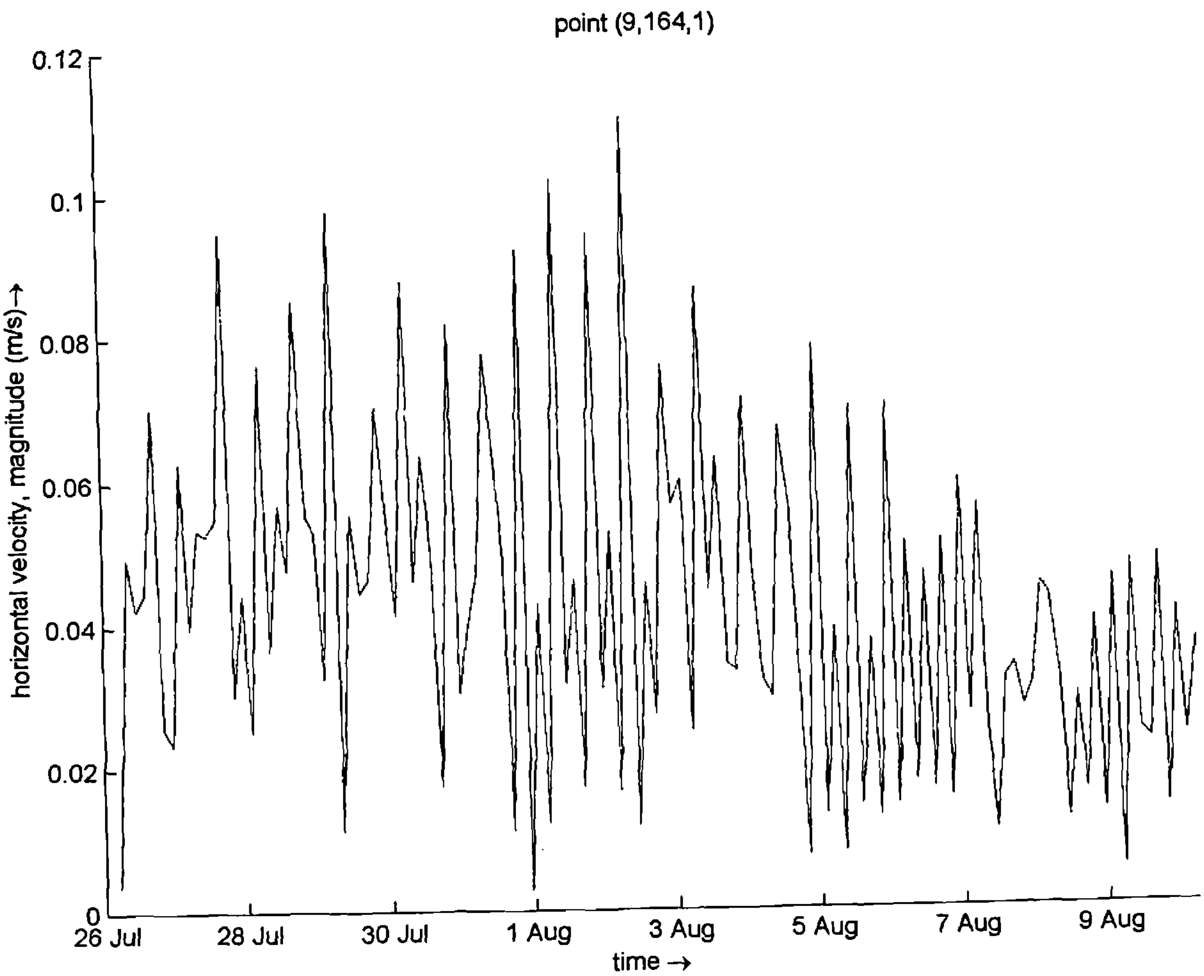
Note:

[1] According to WQO, the criterion for *E. coli* should be calculated as annual geometric mean of its concentration, instead of the annual arithmetic mean.

Appendix B

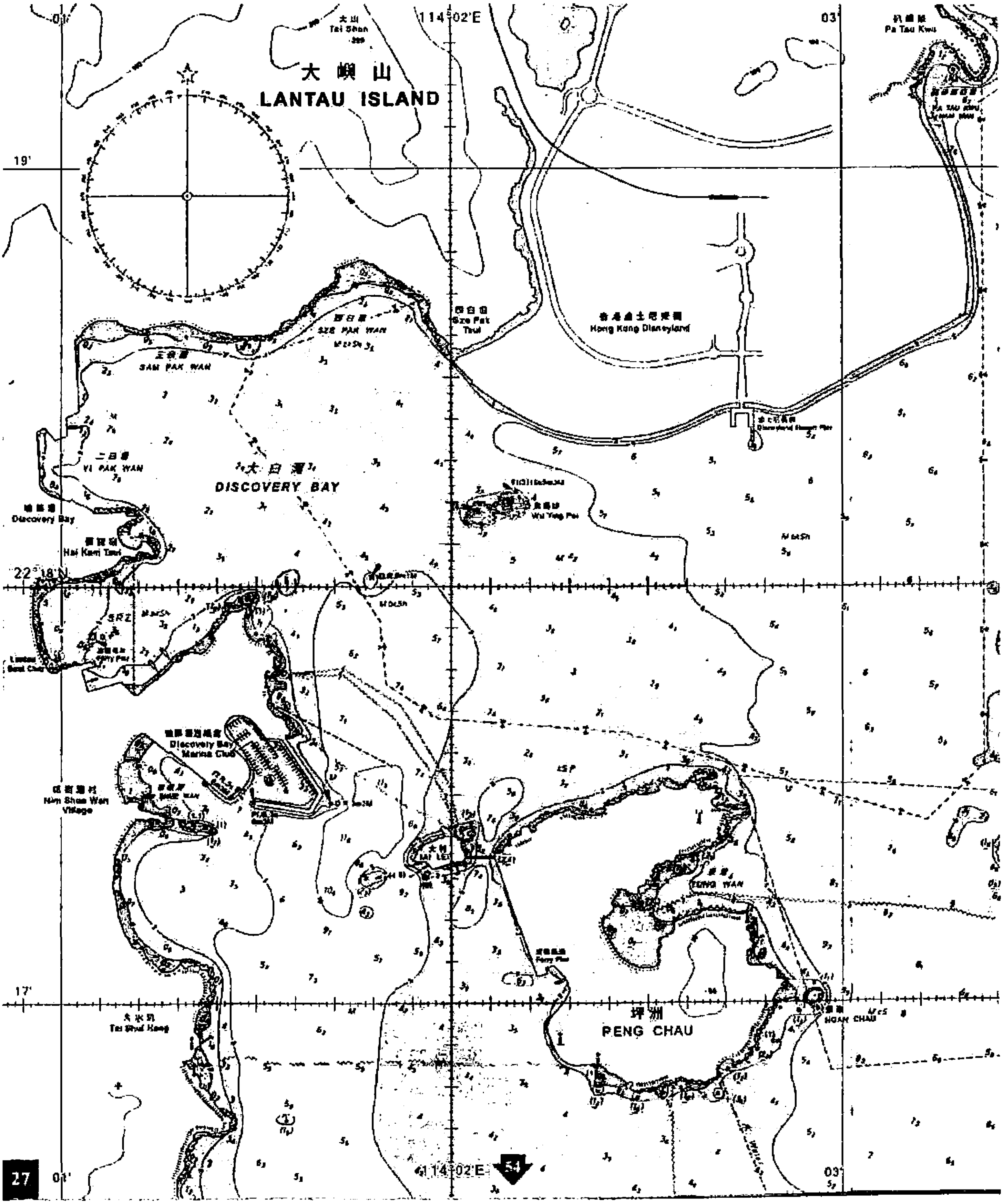
Delft 3D Modelling Result


X: 820565.38, Y: 816817.56 [m] Z: 4.51 [m] (M: 9, N: 164)
Bathymetry [m]
< 0.4
< 6.0
< 11.6
< 17.2
< 22.8
< 28.4
< 34.0
< 39.6
< 45.2
< 50.8
< 56.3
< 61.9
Tentative Marine Pipeline
Tentative Marine Outfall Location
(Depth=4.5m, Subject to Detailed Design)


point (9,164,1)
horizontal velocity, magnitude (m/s)→
0.12
0.1
0.08
0.06
0.04
0.02
0
26 Jul
28 Jul
30 Jul
1 Aug
3 Aug
5 Aug
7 Aug
9 Aug
time →

Appendix C

Bathymetry of Discovery Bay



大嶼山
LANTAU ISLAND
Tai Shan
Pa Tau Kwu
114°02'E
03'
01'
19'
22°18'N
17'
大白灣
DISCOVERY BAY
SAM PAK WAN
YI PAK WAN
SZE PAK WAN
Sze Pak Tsui
Hong Kong Disneyland
Discovery Bay
Hai Kam Tsui
Wu Yeung Pai
Discovery Bay Marina Club
Nim Shue Wan Village
Tai Shui Hang
TAI LEI
TUNG WAN
坪洲
PENG CHAU
27
54

圖例

地貌 TOPOGRAPHY

自然地貌 Natural Features

海岸線(已測量)
Coastline, surveyed

陡岸
Steep coast

沙質岸
Sandy shore

石質岸
Stony shore

等高線(附數值)及高程點
Contour lines with values and spot height

河流、溪澗
River, Stream

水庫、塘
Reservoir, Pond

鹽田
Salt pans

紅樹
Mangrove

沼澤
Marsh

人工地貌 Cultural Features

市區
Urban area

道路
Road

機場
Airport, Airfield

最高天文潮至橋底的垂直淨空
Vertical clearance above the Highest Astronomical Tide

架空索道、附垂直淨空
Overhead transporter, Aerial cableway with vertical clearance

陸地標記 Landmarks

廟宇
Temple

塔
Tower

煙囪、紀念碑
Chimney, Monument

風力發電機、旗桿
Wind turbine, Flagstaff

無線電桅、無線電塔
Radio mast, Radio tower

碟形天線
Dish aerial

貯存庫
Tanks

港口 Ports

海堤
Seawall

防波堤
Breakwater

突堤(附泊位設施)
Mole (with berthing facilities)

順岸碼頭
Quay, Wharf

突堤式碼頭
Pier, Jetty

浮碼頭、登岸梯級
Pontoon, Landing steps

泊位編號
Designation of berth

繫船柱
Dolphin

船台滑道
Slipway

浮塢
Floating dock

輔航設備 NAVIGATION AIDS

燈標、立標 Lights, Beacons

主燈標
Major light

導燈
Leading lights

定向燈
Direction light

扇形燈
Sector light

燈標標記
Lighted marks

一般立標
Beacon in general

電纜著陸點的立標
Cable landing beacon

浮標 Buoys

浮標形狀(錐形、罐形、球形、柱形)
Shapes of buoys (conical, can, spherical, pillar)

繫泊浮標
Mooring buoy

方位浮標(北、東、南、西)
Cardinal buoys (North, East, South, West)

孤立危險物浮標
Isolated danger buoy

安全水域浮標
Safe water buoys

特殊浮標
Special buoys

霧號、雷達 Fog Signal, Radar

燈立標上的霧角
(響號一次，間隔15秒)
Lighted beacon, with horn giving a single blast every 15 seconds

雷達應答器
Radar transponder beacon

自動識別系統發射機
Automatic Identification System transmitter

一般信號站
Signal station in general

航道走向
Direction of buoyage

LEGEND

海道測量及服務 HYDROGRAPHY & SERVICES

深度
Depths

實際位置的水深
Soundings in true position

乾出高度
Drying heights

維持航道或區域(附維護深度)
Dredged channel or area with maintained depth

維護深度 15 米
Maintained Depth 15m

等深線
Depth contours

礁石灘
Rocky area, which covers and uncovers

底質
Nature of the Seabed

S	沙	*Sand*
M	泥	*Mud*
Cy	黏土	*Clay*
Si	淤泥	*Silt*
St	石	*Stones*
G	沙礫	*Gravel*
P	小卵石	*Pebbles*
Cb	鵝卵石	*Cobbles*
R	礁石	*Rock*
Co	珊瑚	*Coral*
Sh	貝殼	*Shells*
S/M	雙層底質，例如上沙下泥	*Two layers, e.g. Sand over Mud*
fS M Sh	混合底質，主要成份居先，例如幼沙混合泥、貝殼。	*The main constituent is given first for mixtures, e.g. fine sand with mud and shells*

礁石
Rocks

危險線
Danger line

乾出礁(高度在海圖基準以上)
Rock which covers and uncovers, height above Chart Datum

適淹礁(在海圖基準面)
Rock awash at the level of Chart Datum

危險暗礁(深度不明)
Dangerous underwater rock of uncertain depth

危險暗礁(已知深度)
Dangerous underwater rock of known depth

非危險暗礁(已知深度)
Non-dangerous rock, depth known

浪花
Breakers

沉船、障礙物
Wrecks, Obstructions

部份船體露出海圖基準面的沉船
Wreck showing any portion of hull at level of chart datum

僅桅杆露出海圖基準面的沉船
Wreck of which the mast(s) only are visible at Chart Datum

已知最小深度的沉船
Wreck, least depth known by sounding only

最小深度不明的沉船，對航行有潛在危險
Wreck, least depth unknown, considered to be potentially dangerous to some surface vessels

碇錨地，對航行無危險，但應避免拋錨、拖網等。
Foul ground, not dangerous to surface navigation but to be avoided by vessels anchoring, trawling etc.

已知最小深度的障礙物
Obstruction, least depth known by sounding only

魚礁(附最小深度)
Fish haven with minimum depth

海產養殖場
Marine farm

近岸設施
Offshore Installations

海底電纜
Submarine cable

海底電纜區
Submarine cable area

海底輸電纜
Submarine power cable

海底輸電纜區
Submarine power cable area

棄用海底電纜
Disused submarine cable

供應管道
Supply pipeline

排放管道
Outfall and Intake

棄用管道
Disused pipeline/outfall

服務
Services

領港員登船站
Pilot boarding place

遊艇會
Marina

指定供應燃料區
Designated bunkering area

航路
Tracks, Routes

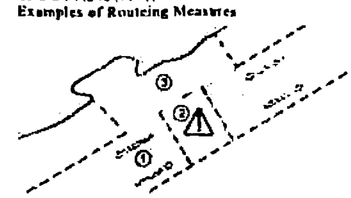
導航線(實線為應遵循的航路)
Leading line (firm line is the track to be followed)

沒有固定導航標誌的建議航路
Recommended tracks not based on a system of fixed marks

規定航向
Established direction of traffic flow

無線電報告點
Radio reporting points

航路分隔措施(附例)：
Examples of Routeing Measures



① 分道航行制(以分隔帶/線隔開)
Traffic Separation Scheme: traffic separated by separation zone/line

② 警戒區
Precautionary area

③ 沿岸航行區
Inshore traffic zone

區域、界線
Areas, Limits

限制區
Restricted area

禁區界線(不准進入)
Limit of area into which entry is prohibited

錨地
Anchorage area

禁止拋錨區
Anchoring prohibited area

禁止捕魚區
Fishing prohibited area

鳥類保育區
Bird sanctuary

海岸保護區
Marine Reserve

航速限制區
Speed Restricted Zone

海港界線
Harbour limit

香港特別行政區區界
Boundary of the Hong Kong Special Administrative Region

Appendix D

CORMIX model output

dry_u010.prd

```
CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222
                    CORMIX MIXING ZONE EXPERT SYSTEM
         Subsystem CORMIX2:  Multiport Diffuser Discharges
                        CORMIX Version 5.0GT
                  HYDRO2 Version 5.0.1.0 December 2007
--------------------------------------------------------------------------
--------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:
 Design case:
 FILE NAME:           C:\...5928\cormix\Area10b\8port_lower_flow\dry_u010.prd
 Time stamp:          Thu Oct 20 10:30:15 2016

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA     =       4.50 HD     =       4.50
 UA     =      0.013 F      =      0.019 USTAR =0.6338E-03
 UW     =      2.000 UWSTAR=0.2198E-02
 Uniform density environment
 STRCND=  U          RHOAM = 1022.0000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= alternating_perpendicular
 BANK   =  LEFT      DISTB =     305.00 YB1    =     300.00 YB2    =     310.00
 LD     =      10.00 NOPEN =    8       SPAC   =       1.43
 D0     =      0.045 A0     =      0.002 H0     =       0.00 SUB0   =       4.50
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =       90.00 THETA =       0.00 SIGMA =        0.00 BETA   =      90.00
 U0     =      0.998 Q0     =      0.013       =0.1270E-01
 RHO0   = 1000.0000 DRHO0 =0.2200E+02 GP0    =0.2111E+00
 C0     =0.1000E+01 CUNITS=  mg/l
 IPOLL =  1          KS     =0.0000E+00 KD     =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     =0.1270E-02 m0     =0.1268E-02 j0     =0.2681E-03 SIGNJ0=       1.0
 Associated 2-d length scales (meters)
 lQ=B   =      0.001 lM     =       0.31 lm     =       7.50
 lmp    =  99999.00 lbp    =   99999.00 la     =   99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     =0.1270E-01 M0     =0.1268E-01 J0     =0.2681E-02
 Associated 3-d length scales (meters)
 LQ     =       0.04 LM     =       0.73 Lm     =       8.66 Lb     =    1220.30
                                        Lmp    =   99999.00 Lbp    =   99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =      60.90 FRD0   =      10.24 R      =      76.78 PL     =       73.
 (slot)              (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:    m0     =0.8909E-04 M0     =0.8909E-03
 lQ=B   =      0.018 lM     =       0.02 lm     =       0.53 lmp    =   99999.00
 LQ     =      0.030 LM     =       0.10 Lm     =       2.30 Lmp    =   99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0     =      0.070 D0     =      0.170 A0     =      0.023 THETA =      90.00
 FR0    =       1.13 FRD0   =       0.37 R      =       5.40
 (slot)              (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =     MU1V   2
 2  Applicable layer depth HS =      4.50  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     =0.1000E+01 CUNITS=  mg/l
 NTOX   =  0
```

```
NSTD  =  1          CSTD  =0.4700E-02
REGMZ =  0
XINT  =    2000.00  XMAX  =    2000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       305.00 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP =  50 display intervals per module
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X         Y        Z         S       C         BV        BH
     0.00      0.00     0.00      1.0 0.100E+01    0.08      0.08

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:                THETAE=     85.61  SIGMAE=       0.00
  LE     =        0.13  XE     =       0.01  YE     =      0.00  ZE     =      0.13

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X         Y        Z         S       C         BV        BH
  Individual jet/plumes before merging:
     0.01      0.00     0.13      1.0 0.100E+01    0.08      0.08
     0.01      0.00     0.13      1.0 0.100E+01    0.08      0.08
     0.08      0.00     0.33      1.7 0.596E+00    0.07      0.07
     0.20      0.00     0.51      3.1 0.325E+00    0.09      0.09
     0.33      0.00     0.68      4.8 0.209E+00    0.12      0.12
     0.47      0.00     0.84      6.7 0.149E+00    0.15      0.15
     0.62      0.00     0.99      8.8 0.113E+00    0.18      0.18
     0.79      0.00     1.12     11.0 0.906E-01    0.20      0.20
     0.97      0.00     1.24     13.3 0.752E-01    0.23      0.23
     1.16      0.00     1.34     15.5 0.643E-01    0.25      0.25
     1.36      0.00     1.43     17.8 0.561E-01    0.27      0.27
     1.55      0.00     1.51     20.1 0.498E-01    0.29      0.29
     1.76      0.00     1.59     22.3 0.448E-01    0.32      0.32
     1.96      0.00     1.65     24.6 0.407E-01    0.34      0.34
     2.17      0.00     1.71     26.9 0.372E-01    0.36      0.36
     2.37      0.00     1.76     29.1 0.344E-01    0.38      0.38
     2.58      0.00     1.81     31.4 0.319E-01    0.40      0.40
     2.79      0.00     1.86     33.6 0.298E-01    0.42      0.42
     3.00      0.00     1.90     35.9 0.279E-01    0.43      0.43
     3.21      0.00     1.94     38.2 0.262E-01    0.45      0.45
     3.42      0.00     1.98     40.5 0.247E-01    0.47      0.47
     3.63      0.00     2.02     42.8 0.233E-01    0.49      0.49
     3.84      0.00     2.06     45.2 0.221E-01    0.51      0.51
     4.06      0.00     2.10     47.7 0.210E-01    0.52      0.52
     4.27      0.00     2.14     50.2 0.199E-01    0.54      0.54
     4.48      0.00     2.18     52.7 0.190E-01    0.56      0.56
     4.69      0.00     2.22     55.2 0.181E-01    0.58      0.58
     4.90      0.00     2.26     57.8 0.173E-01    0.59      0.59
     5.11      0.00     2.30     60.4 0.165E-01    0.61      0.61
     5.32      0.00     2.34     63.1 0.158E-01    0.63      0.63
     5.53      0.00     2.38     65.8 0.152E-01    0.65      0.65
```

```
     5.74      0.00     2.42     68.6 0.146E-01   0.66      0.66
     5.95      0.00     2.46     71.3 0.140E-01   0.68      0.68
     6.16      0.00     2.50     74.2 0.135E-01   0.70      0.70
     6.38      0.00     2.53     77.0 0.130E-01   0.71      0.71
 Merging of individual jet/plumes to form plane jet/plume:
     6.40      0.00     2.54    100.9 0.991E-02   0.90      5.90
     6.80      0.00     2.60    104.7 0.955E-02   0.93      5.93
     7.01      0.00     2.64    106.7 0.938E-02   0.94      5.94
     7.22      0.00     2.67    108.6 0.921E-02   0.96      5.96
     7.43      0.00     2.70    110.6 0.904E-02   0.98      5.98
     7.65      0.00     2.73    112.6 0.888E-02   0.99      5.99
     7.86      0.00     2.77    114.5 0.873E-02   1.01      6.01
     8.07      0.00     2.80    116.5 0.858E-02   1.03      6.03
     8.28      0.00     2.83    118.5 0.844E-02   1.04      6.04
     8.49      0.00     2.87    120.4 0.830E-02   1.06      6.06
     8.71      0.00     2.90    122.4 0.817E-02   1.08      6.08
     8.92      0.00     2.93    124.4 0.804E-02   1.09      6.09
     9.13      0.00     2.97    126.4 0.791E-02   1.11      6.11
     9.34      0.00     3.00    128.4 0.779E-02   1.13      6.13
     9.55      0.00     3.04    130.4 0.767E-02   1.14      6.14
     9.76      0.00     3.07    132.4 0.755E-02   1.16      6.16
     9.98      0.00     3.10    134.4 0.744E-02   1.18      6.18
 Cumulative travel time =          90.1355 sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

  Vertical angle of layer/boundary impingement    =       9.11 deg
  Horizontal angle of layer/boundary impingement  =       0.00 deg

 UPSTREAM INTRUSION PROPERTIES:
        Upstream intrusion length                  =     319.35 m
        X-position of upstream stagnation point    =    -309.37 m
        Thickness in intrusion region              =       0.02 m
        Half-width at downstream end               =     447.20 m
        Thickness at downstream end                =       0.47 m

 In this case, the upstream INTRUSION IS VERY LARGE, exceeding 10 times
   the local water depth.
 This may be caused by a very small ambient velocity, perhaps in
   combination with large discharge buoyancy.
 If the ambient conditions are strongly transient (e.g. tidal), then the
   CORMIX steady-state predictions of upstream intrusion are probably
   unrealistic.
 The plume predictions prior to boundary impingement and wedge formation
   will be acceptable, however.

  Control volume inflow:
       X         Y        Z        S       C        BV       BH
     9.98      0.00     3.10    134.4 0.744E-02   1.18      6.18

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

       X         Y        Z        S       C        BV       BH       ZU       ZL
   -309.37     0.00     4.50   9999.9 0.000E+00   0.00      0.00     4.50     4.50
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.470E-02 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
```

-298.51	0.00	4.50	581.5	0.172E-02	0.01	63.24	4.50	4.49
-245.30	0.00	4.50	241.3	0.414E-02	0.01	153.62	4.50	4.49
-192.09	0.00	4.50	181.9	0.550E-02	0.02	207.84	4.50	4.48
-138.89	0.00	4.50	155.8	0.642E-02	0.02	250.59	4.50	4.48
-85.68	0.00	4.50	142.3	0.703E-02	0.02	287.04	4.50	4.48
-32.47	0.00	4.50	135.8	0.736E-02	0.02	319.36	4.50	4.48
20.74	0.00	4.50	137.1	0.729E-02	0.03	424.24	4.50	4.47
73.95	0.00	4.50	217.5	0.460E-02	0.15	430.55	4.50	4.35
127.16	0.00	4.50	332.9	0.300E-02	0.32	436.43	4.50	4.18
180.37	0.00	4.50	402.9	0.248E-02	0.43	441.96	4.50	4.07
233.58	0.00	4.50	432.1	0.231E-02	0.47	447.20	4.50	4.03

Cumulative travel time = 17290.1152 sec

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

** End of NEAR-FIELD REGION (NFR) **

In this design case, the diffuser is located CLOSE TO BANK/SHORE.
Some boundary interaction occurs at end of near-field.
This may be related to a design case with a VERY LOW AMBIENT VELOCITY.
The dilution values in one or more of the preceding zones may be too high.
Carefully evaluate results in near-field and check degree of interaction.

Consider locating outfall further away from bank or shore.
In the next prediction module, the plume centerline will be set
to follow the bank/shore.

BEGIN MOD241: BUOYANT AMBIENT SPREADING

Plume is ATTACHED to LEFT bank/shore.
Plume width is now determined from LEFT bank/shore.

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
233.58	305.00	4.50	432.1	0.231E-02	0.56	752.20	4.50	3.94
268.90	305.00	4.50	455.5	0.220E-02	0.57	775.13	4.50	3.93
304.23	305.00	4.50	480.0	0.208E-02	0.59	797.69	4.50	3.91
339.56	305.00	4.50	505.8	0.198E-02	0.60	819.91	4.50	3.90
374.89	305.00	4.50	532.9	0.188E-02	0.62	841.84	4.50	3.88
410.22	305.00	4.50	561.3	0.178E-02	0.64	863.48	4.50	3.86
445.55	305.00	4.50	590.9	0.169E-02	0.65	884.86	4.50	3.85
480.87	305.00	4.50	621.9	0.161E-02	0.67	906.00	4.50	3.83
516.20	305.00	4.50	654.3	0.153E-02	0.69	926.92	4.50	3.81
551.53	305.00	4.50	688.0	0.145E-02	0.71	947.64	4.50	3.79
586.86	305.00	4.50	723.2	0.138E-02	0.73	968.16	4.50	3.77
622.19	305.00	4.50	759.7	0.132E-02	0.75	988.50	4.50	3.75
657.52	305.00	4.50	797.7	0.125E-02	0.77	1008.67	4.50	3.73
692.85	305.00	4.50	837.2	0.119E-02	0.80	1028.69	4.50	3.70
728.17	305.00	4.50	878.1	0.114E-02	0.82	1048.55	4.50	3.68
763.50	305.00	4.50	920.5	0.109E-02	0.84	1068.27	4.50	3.66
798.83	305.00	4.50	964.4	0.104E-02	0.87	1087.85	4.50	3.63
834.16	305.00	4.50	1009.9	0.990E-03	0.89	1107.31	4.50	3.61
869.49	305.00	4.50	1057.0	0.946E-03	0.92	1126.64	4.50	3.58
904.82	305.00	4.50	1105.6	0.905E-03	0.94	1145.86	4.50	3.56
940.15	305.00	4.50	1155.8	0.865E-03	0.97	1164.96	4.50	3.53
975.47	305.00	4.50	1207.6	0.828E-03	1.00	1183.96	4.50	3.50
1010.80	305.00	4.50	1261.1	0.793E-03	1.02	1202.85	4.50	3.48
1046.13	305.00	4.50	1316.2	0.760E-03	1.05	1221.65	4.50	3.45
1081.46	305.00	4.50	1372.9	0.728E-03	1.08	1240.35	4.50	3.42
1116.79	305.00	4.50	1431.4	0.699E-03	1.11	1258.95	4.50	3.39

1152.12	305.00	4.50	1491.6	0.670E-03	1.14	1277.47	4.50	3.36
1187.44	305.00	4.50	1553.4	0.644E-03	1.17	1295.90	4.50	3.33
1222.77	305.00	4.50	1617.1	0.618E-03	1.20	1314.25	4.50	3.30
1258.10	305.00	4.50	1682.4	0.594E-03	1.23	1332.52	4.50	3.27
1293.43	305.00	4.50	1749.6	0.572E-03	1.27	1350.71	4.50	3.23
1328.76	305.00	4.50	1818.5	0.550E-03	1.30	1368.82	4.50	3.20
1364.09	305.00	4.50	1889.3	0.529E-03	1.33	1386.85	4.50	3.17
1399.42	305.00	4.50	1961.9	0.510E-03	1.36	1404.82	4.50	3.14
1434.74	305.00	4.50	2036.3	0.491E-03	1.40	1422.71	4.50	3.10
1470.07	305.00	4.50	2112.6	0.473E-03	1.43	1440.54	4.50	3.07
1505.40	305.00	4.50	2190.7	0.456E-03	1.47	1458.29	4.50	3.03
1540.73	305.00	4.50	2270.8	0.440E-03	1.50	1475.98	4.50	3.00
1576.06	305.00	4.50	2352.8	0.425E-03	1.54	1493.61	4.50	2.96
1611.39	305.00	4.50	2436.6	0.410E-03	1.58	1511.17	4.50	2.92
1646.71	305.00	4.50	2522.5	0.396E-03	1.61	1528.67	4.50	2.89
1682.04	305.00	4.50	2610.2	0.383E-03	1.65	1546.11	4.50	2.85
1717.37	305.00	4.50	2700.0	0.370E-03	1.69	1563.49	4.50	2.81
1752.70	305.00	4.50	2791.7	0.358E-03	1.73	1580.82	4.50	2.77
1788.03	305.00	4.50	2885.4	0.347E-03	1.76	1598.08	4.50	2.74
1823.36	305.00	4.50	2981.2	0.335E-03	1.80	1615.29	4.50	2.70
1858.69	305.00	4.50	3079.0	0.325E-03	1.84	1632.44	4.50	2.66
1894.01	305.00	4.50	3178.8	0.315E-03	1.88	1649.54	4.50	2.62
1929.34	305.00	4.50	3280.7	0.305E-03	1.92	1666.58	4.50	2.58
1964.67	305.00	4.50	3384.7	0.295E-03	1.96	1683.58	4.50	2.54
2000.00	305.00	4.50	3490.8	0.286E-03	2.01	1700.52	4.50	2.49

Cumulative travel time = 153168.9375 sec

Simulation limit based on maximum specified distance = 2000.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD241: BUOYANT AMBIENT SPREADING

CORMIX2: Multiport Diffuser Discharges End of Prediction File

2222222222222222222222222222222222222222222222222222222222222222222222222222

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CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORMIX MIXING ZONE EXPERT SYSTEM
         Subsystem CORMIX2:  Multiport Diffuser Discharges
                           CORMIX Version 5.0GT
                     HYDRO2 Version 5.0.1.0 December 2007
----------------------------------------------------------------------------
----------------------------------------------------------------------------

CASE DESCRIPTION
 Site name/label:
 Design case:
 FILE NAME:          C:\...5928\cormix\Area10b\8port_lower_flow\dry_u050.prd
 Time stamp:         Thu Oct 20 10:31:02 2016

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA     =       4.50  HD     =       4.50
 UA     =      0.042  F      =      0.019 USTAR =0.2048E-02
 UW     =      2.000  UWSTAR=0.2198E-02
 Uniform density environment
 STRCND=  U           RHOAM = 1022.0000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:       DITYPE= alternating_perpendicular
 BANK   =  LEFT       DISTB =     305.00  YB1    =     300.00  YB2    =     310.00
 LD     =      10.00  NOPEN =     8       SPAC   =       1.43
 D0     =      0.045  A0     =      0.002 H0     =       0.00  SUB0   =       4.50
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA  =      90.00  THETA  =       0.00 SIGMA  =       0.00  BETA   =      90.00
 U0     =      0.998  Q0     =      0.013        =0.1270E-01
 RHO0   = 1000.0000   DRHO0 =0.2200E+02   GP0    =0.2111E+00
 C0     =0.1000E+01   CUNITS=  mg/l
 IPOLL  =  1          KS     =0.0000E+00  KD     =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     =0.1270E-02  m0     =0.1268E-02  j0     =0.2681E-03  SIGNJ0=        1.0
 Associated 2-d length scales (meters)
 lQ=B   =      0.001 lM     =       0.31  lm     =       0.72
 lmp    =  99999.00  lbp    =   99999.00  la     =   99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     =0.1270E-01  M0     =0.1268E-01  J0     =0.2681E-02
 Associated 3-d length scales (meters)
 LQ     =       0.04  LM     =       0.73  Lm     =       2.68  Lb     =      36.19
                                           Lmp    =   99999.00  Lbp    =   99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =      60.90  FRD0   =      10.24  R      =      23.77  PL     =       73.
 (slot)               (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:     m0     =0.8909E-04  M0     =0.8909E-03
 lQ=B   =      0.018 lM     =       0.02  lm     =       0.05  lmp    =   99999.00
 LQ     =      0.030 LM     =       0.10  Lm     =       0.71  Lmp    =   99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0     =      0.070 D0     =      0.170 A0     =      0.023 THETA =      90.00
 FR0    =       1.13 FRD0   =       0.37 R      =       1.67
 (slot)               (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1H   2
 2  Applicable layer depth HS =    4.50   2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     =0.1000E+01  CUNITS=  mg/l
 NTOX   =  0
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NSTD  =  1          CSTD  =0.4700E-02
REGMZ =  0
XINT  =   2000.00   XMAX  =   2000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       305.00 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP =  50 display intervals per module
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X         Y         Z         S        C        BV       BH
     0.00      0.00      0.00      1.0 0.100E+01   0.08     0.08

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in strong crossflow.

 Zone of flow establishment:              THETAE=     76.07  SIGMAE=      0.00
  LE    =       0.00  XE    =       0.00  YE    =      0.00  ZE    =      0.00

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X         Y         Z         S        C        BV       BH
  Individual jet/plumes before merging:
     0.00      0.00      0.00      1.0 0.100E+01   0.08     0.08
     0.66      0.00      0.24      3.6 0.279E+00   0.11     0.11
     1.33      0.00      0.43      7.6 0.132E+00   0.16     0.16
     2.03      0.00      0.55     12.1 0.825E-01   0.22     0.22
     2.72      0.00      0.65     17.0 0.590E-01   0.27     0.27
     3.42      0.00      0.73     22.0 0.455E-01   0.31     0.31
     4.12      0.00      0.79     27.1 0.369E-01   0.35     0.35
     4.82      0.00      0.84     32.3 0.310E-01   0.39     0.39
     5.52      0.00      0.88     37.5 0.266E-01   0.43     0.43
     6.23      0.00      0.92     43.0 0.233E-01   0.47     0.47
     6.93      0.00      0.96     48.6 0.206E-01   0.50     0.50
     7.63      0.00      1.00     54.3 0.184E-01   0.54     0.54
     8.33      0.00      1.04     60.2 0.166E-01   0.57     0.57
     9.03      0.00      1.08     66.3 0.151E-01   0.61     0.61
     9.74      0.00      1.11     72.5 0.138E-01   0.64     0.64
    10.44      0.00      1.15     78.8 0.127E-01   0.67     0.67
    11.14      0.00      1.19     85.3 0.117E-01   0.70     0.70
  Merging of individual jet/plumes to form plane jet/plume:
    11.49      0.00      1.20    109.5 0.913E-02   0.90     5.90
    12.54      0.00      1.25    116.0 0.862E-02   0.95     5.95
    13.24      0.00      1.29    120.3 0.831E-02   0.98     5.98
    13.95      0.00      1.32    124.6 0.803E-02   1.02     6.02
    14.65      0.00      1.35    128.9 0.776E-02   1.05     6.05
    15.35      0.00      1.38    133.2 0.751E-02   1.09     6.09
    16.05      0.00      1.42    137.5 0.727E-02   1.13     6.13
    16.75      0.00      1.45    141.9 0.705E-02   1.16     6.16
    17.46      0.00      1.48    146.2 0.684E-02   1.20     6.20
    18.16      0.00      1.52    150.6 0.664E-02   1.23     6.23
    18.86      0.00      1.55    154.9 0.645E-02   1.27     6.27
    19.56      0.00      1.59    159.3 0.628E-02   1.30     6.30
    20.27      0.00      1.62    163.7 0.611E-02   1.34     6.34
```

```
    20.97       0.00      1.66     168.1 0.595E-02    1.37        6.37
    21.67       0.00      1.69     172.5 0.580E-02    1.41        6.41
    22.37       0.00      1.73     176.9 0.565E-02    1.45        6.45
    23.08       0.00      1.76     181.3 0.552E-02    1.48        6.48
    23.78       0.00      1.80     185.7 0.538E-02    1.52        6.52
    24.48       0.00      1.83     190.2 0.526E-02    1.55        6.55
    25.18       0.00      1.87     194.6 0.514E-02    1.59        6.59
    25.89       0.00      1.90     199.1 0.502E-02    1.63        6.63
    26.59       0.00      1.94     203.6 0.491E-02    1.66        6.66
    27.29       0.00      1.98     208.1 0.481E-02    1.70        6.70
    27.99       0.00      2.01     212.6 0.470E-02    1.73        6.73
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.470E-02 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
    28.70       0.00      2.05     217.1 0.461E-02    1.77        6.77
    29.40       0.00      2.09     221.6 0.451E-02    1.81        6.81
    30.10       0.00      2.12     226.1 0.442E-02    1.84        6.84
    30.80       0.00      2.16     230.6 0.434E-02    1.88        6.88
    31.51       0.00      2.20     235.2 0.425E-02    1.92        6.92
    32.21       0.00      2.23     239.8 0.417E-02    1.95        6.95
    32.91       0.00      2.27     244.3 0.409E-02    1.99        6.99
    33.61       0.00      2.31     248.9 0.402E-02    2.03        7.03
    34.31       0.00      2.35     253.5 0.394E-02    2.06        7.06
    35.02       0.00      2.39     258.1 0.387E-02    2.10        7.10
 Cumulative travel time =          414.8818 sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD235: LAYER/BOUNDARY/TERMINAL LAYER APPROACH

  Control volume inflow:
      X          Y         Z          S        C         BV         BH
    35.02       0.00      2.39     258.1 0.387E-02    2.10        7.10

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

      X          Y         Z          S        C         BV         BH        ZU        ZL
    32.92       0.00      4.50     258.1 0.387E-02    0.00        0.00      4.50      4.50
    34.18       0.00      4.50     258.1 0.387E-02    3.36        6.32      4.50      1.14
    35.44       0.00      4.50     264.5 0.378E-02    3.94       14.09      4.50      0.56
    36.70       0.00      4.50     334.9 0.299E-02    4.27       14.11      4.50      0.23
    37.96       0.00      4.50     397.7 0.251E-02    4.44       14.12      4.50      0.06
    39.22       0.00      4.50     420.6 0.238E-02    4.50       14.13      4.50      0.00
 Cumulative travel time =          514.8773 sec

END OF MOD235: LAYER/BOUNDARY/TERMINAL LAYER APPROACH
-----------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **
-----------------------------------------------------------------------------
BEGIN MOD241: BUOYANT AMBIENT SPREADING

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)
```

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
39.22	0.00	4.50	420.6	0.238E-02	4.50	14.13	4.50	0.00
64.10	0.00	4.50	508.6	0.197E-02	2.55	30.10	4.50	1.95
88.99	0.00	4.50	555.2	0.180E-02	1.98	42.47	4.50	2.52
113.88	0.00	4.50	588.9	0.170E-02	1.67	53.21	4.50	2.83
138.77	0.00	4.50	616.2	0.162E-02	1.48	62.91	4.50	3.02
163.65	0.00	4.50	639.8	0.156E-02	1.35	71.89	4.50	3.15
188.54	0.00	4.50	661.2	0.151E-02	1.24	80.31	4.50	3.26
213.43	0.00	4.50	681.2	0.147E-02	1.17	88.28	4.50	3.33
238.32	0.00	4.50	700.4	0.143E-02	1.10	95.88	4.50	3.40
263.20	0.00	4.50	719.0	0.139E-02	1.05	103.16	4.50	3.45
288.09	0.00	4.50	737.4	0.136E-02	1.01	110.17	4.50	3.49
312.98	0.00	4.50	755.9	0.132E-02	0.98	116.94	4.50	3.52
337.87	0.00	4.50	774.4	0.129E-02	0.95	123.50	4.50	3.55
362.75	0.00	4.50	793.3	0.126E-02	0.92	129.87	4.50	3.58
387.64	0.00	4.50	812.5	0.123E-02	0.90	136.07	4.50	3.60
412.53	0.00	4.50	832.3	0.120E-02	0.89	142.11	4.50	3.61
437.42	0.00	4.50	852.5	0.117E-02	0.87	148.01	4.50	3.63
462.31	0.00	4.50	873.5	0.114E-02	0.86	153.78	4.50	3.64
487.19	0.00	4.50	895.0	0.112E-02	0.85	159.42	4.50	3.65
512.08	0.00	4.50	917.4	0.109E-02	0.84	164.96	4.50	3.66
536.97	0.00	4.50	940.4	0.106E-02	0.83	170.39	4.50	3.67
561.86	0.00	4.50	964.3	0.104E-02	0.83	175.72	4.50	3.67
586.74	0.00	4.50	989.1	0.101E-02	0.83	180.96	4.50	3.67
611.63	0.00	4.50	1014.7	0.985E-03	0.82	186.12	4.50	3.68
636.52	0.00	4.50	1041.3	0.960E-03	0.82	191.19	4.50	3.68
661.41	0.00	4.50	1068.8	0.936E-03	0.82	196.20	4.50	3.68
686.29	0.00	4.50	1097.2	0.911E-03	0.82	201.13	4.50	3.68
711.18	0.00	4.50	1126.7	0.888E-03	0.83	205.99	4.50	3.67
736.07	0.00	4.50	1157.2	0.864E-03	0.83	210.79	4.50	3.67
760.96	0.00	4.50	1188.7	0.841E-03	0.83	215.52	4.50	3.67
785.84	0.00	4.50	1221.3	0.819E-03	0.84	220.21	4.50	3.66
810.73	0.00	4.50	1254.9	0.797E-03	0.84	224.83	4.50	3.66
835.62	0.00	4.50	1289.6	0.775E-03	0.85	229.41	4.50	3.65
860.51	0.00	4.50	1325.5	0.754E-03	0.86	233.93	4.50	3.64
885.39	0.00	4.50	1362.5	0.734E-03	0.86	238.41	4.50	3.64
910.28	0.00	4.50	1400.6	0.714E-03	0.87	242.84	4.50	3.63
935.17	0.00	4.50	1439.9	0.694E-03	0.88	247.23	4.50	3.62
960.06	0.00	4.50	1480.4	0.675E-03	0.89	251.58	4.50	3.61
984.94	0.00	4.50	1522.1	0.657E-03	0.90	255.89	4.50	3.60
1009.83	0.00	4.50	1565.0	0.639E-03	0.91	260.16	4.50	3.59
1034.72	0.00	4.50	1609.1	0.621E-03	0.92	264.40	4.50	3.58
1059.61	0.00	4.50	1654.4	0.604E-03	0.93	268.60	4.50	3.57
1084.49	0.00	4.50	1701.0	0.588E-03	0.94	272.77	4.50	3.56
1109.38	0.00	4.50	1748.9	0.572E-03	0.95	276.90	4.50	3.55
1134.27	0.00	4.50	1798.0	0.556E-03	0.97	281.00	4.50	3.53
1159.16	0.00	4.50	1848.4	0.541E-03	0.98	285.07	4.50	3.52
1184.04	0.00	4.50	1900.1	0.526E-03	0.99	289.12	4.50	3.51
1208.93	0.00	4.50	1953.1	0.512E-03	1.01	293.13	4.50	3.49
1233.82	0.00	4.50	2007.5	0.498E-03	1.02	297.12	4.50	3.48
1258.71	0.00	4.50	2063.2	0.485E-03	1.04	301.08	4.50	3.46
1283.59	0.00	4.50	2120.2	0.472E-03	1.05	305.02	4.50	3.45

Cumulative travel time = 30142.9121 sec

Plume is ATTACHED to LEFT bank/shore.
Plume width is now determined from LEFT bank/shore.

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
1283.59	305.00	4.50	2120.2	0.472E-03	1.05	610.00	4.50	3.45
1297.92	305.00	4.50	2151.4	0.465E-03	1.06	612.09	4.50	3.44
1312.25	305.00	4.50	2182.8	0.458E-03	1.07	614.19	4.50	3.43
1326.58	305.00	4.50	2214.4	0.452E-03	1.09	616.28	4.50	3.41
1340.91	305.00	4.50	2246.2	0.445E-03	1.10	618.37	4.50	3.40
1355.23	305.00	4.50	2278.3	0.439E-03	1.11	620.46	4.50	3.39
1369.56	305.00	4.50	2310.6	0.433E-03	1.12	622.55	4.50	3.38

1383.89	305.00	4.50	2343.1	0.427E-03	1.13	624.63	4.50	3.37
1398.22	305.00	4.50	2375.8	0.421E-03	1.15	626.72	4.50	3.35
1412.55	305.00	4.50	2408.7	0.415E-03	1.16	628.80	4.50	3.34
1426.88	305.00	4.50	2441.9	0.410E-03	1.17	630.88	4.50	3.33
1441.20	305.00	4.50	2475.3	0.404E-03	1.18	632.96	4.50	3.32
1455.53	305.00	4.50	2508.9	0.399E-03	1.19	635.04	4.50	3.31
1469.86	305.00	4.50	2542.8	0.393E-03	1.21	637.12	4.50	3.29
1484.19	305.00	4.50	2576.9	0.388E-03	1.22	639.20	4.50	3.28
1498.52	305.00	4.50	2611.2	0.383E-03	1.23	641.27	4.50	3.27
1512.84	305.00	4.50	2645.7	0.378E-03	1.24	643.34	4.50	3.26
1527.17	305.00	4.50	2680.5	0.373E-03	1.26	645.41	4.50	3.24
1541.50	305.00	4.50	2715.5	0.368E-03	1.27	647.48	4.50	3.23
1555.83	305.00	4.50	2750.7	0.364E-03	1.28	649.55	4.50	3.22
1570.16	305.00	4.50	2786.1	0.359E-03	1.29	651.62	4.50	3.21
1584.48	305.00	4.50	2821.8	0.354E-03	1.31	653.68	4.50	3.19
1598.81	305.00	4.50	2857.8	0.350E-03	1.32	655.75	4.50	3.18
1613.14	305.00	4.50	2893.9	0.346E-03	1.33	657.81	4.50	3.17
1627.47	305.00	4.50	2930.3	0.341E-03	1.34	659.87	4.50	3.16
1641.80	305.00	4.50	2966.9	0.337E-03	1.36	661.92	4.50	3.14
1656.13	305.00	4.50	3003.7	0.333E-03	1.37	663.98	4.50	3.13
1670.45	305.00	4.50	3040.8	0.329E-03	1.38	666.04	4.50	3.12
1684.78	305.00	4.50	3078.1	0.325E-03	1.39	668.09	4.50	3.11
1699.11	305.00	4.50	3115.7	0.321E-03	1.41	670.14	4.50	3.09
1713.44	305.00	4.50	3153.5	0.317E-03	1.42	672.19	4.50	3.08
1727.77	305.00	4.50	3191.5	0.313E-03	1.43	674.24	4.50	3.07
1742.09	305.00	4.50	3229.8	0.310E-03	1.44	676.29	4.50	3.06
1756.42	305.00	4.50	3268.3	0.306E-03	1.46	678.33	4.50	3.04
1770.75	305.00	4.50	3307.0	0.302E-03	1.47	680.37	4.50	3.03
1785.08	305.00	4.50	3346.0	0.299E-03	1.48	682.42	4.50	3.02
1799.41	305.00	4.50	3385.2	0.295E-03	1.50	684.46	4.50	3.00
1813.73	305.00	4.50	3424.6	0.292E-03	1.51	686.49	4.50	2.99
1828.06	305.00	4.50	3464.3	0.289E-03	1.52	688.53	4.50	2.98
1842.39	305.00	4.50	3504.2	0.285E-03	1.53	690.57	4.50	2.97
1856.72	305.00	4.50	3544.4	0.282E-03	1.55	692.60	4.50	2.95
1871.05	305.00	4.50	3584.8	0.279E-03	1.56	694.63	4.50	2.94
1885.38	305.00	4.50	3625.4	0.276E-03	1.57	696.66	4.50	2.93
1899.70	305.00	4.50	3666.3	0.273E-03	1.59	698.69	4.50	2.91
1914.03	305.00	4.50	3707.5	0.270E-03	1.60	700.71	4.50	2.90
1928.36	305.00	4.50	3748.8	0.267E-03	1.61	702.74	4.50	2.89
1942.69	305.00	4.50	3790.5	0.264E-03	1.63	704.76	4.50	2.87
1957.02	305.00	4.50	3832.3	0.261E-03	1.64	706.78	4.50	2.86
1971.34	305.00	4.50	3874.4	0.258E-03	1.65	708.80	4.50	2.85
1985.67	305.00	4.50	3916.8	0.255E-03	1.67	710.82	4.50	2.83
2000.00	305.00	4.50	3959.4	0.253E-03	1.68	712.84	4.50	2.82

Cumulative travel time = 47200.1914 sec

Simulation limit based on maximum specified distance = 2000.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD241: BUOYANT AMBIENT SPREADING

CORMIX2: Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222

dry_u090.prd

```
CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222222
                         CORMIX MIXING ZONE EXPERT SYSTEM
         Subsystem CORMIX2:  Multiport Diffuser Discharges
                           CORMIX Version 5.0GT
                       HYDRO2 Version 5.0.1.0 December 2007
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:
 Design case:
 FILE NAME:          C:\...5928\cormix\Area10b\8port_lower_flow\dry_u090.prd
 Time stamp:         Thu Oct 20 10:31:30 2016

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA     =        4.50  HD     =        4.50
 UA     =       0.076  F      =       0.019  USTAR =0.3705E-02
 UW     =       2.000  UWSTAR=0.2198E-02
 Uniform density environment
 STRCND=  U            RHOAM = 1022.0000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:        DITYPE= alternating_perpendicular
 BANK   =  LEFT        DISTB =      305.00  YB1    =      300.00  YB2    =     310.00
 LD     =       10.00  NOPEN =     8        SPAC   =        1.43
 D0     =       0.045  A0     =       0.002  H0     =        0.00  SUB0   =       4.50
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =       90.00  THETA =        0.00  SIGMA =        0.00  BETA   =      90.00
 U0     =       0.998  Q0     =       0.013               =0.1270E-01
 RHO0   = 1000.0000   DRHO0 =0.2200E+02  GP0    =0.2111E+00
 C0     =0.1000E+01   CUNITS=  mg/l
 IPOLL =  1           KS     =0.0000E+00  KD     =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     =0.1270E-02  m0     =0.1268E-02  j0     =0.2681E-03  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B   =       0.001 lM     =        0.31  lm     =        0.22
 lmp    =    99999.00  lbp    =    99999.00  la     =    99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     =0.1270E-01  M0     =0.1268E-01  J0     =0.2681E-02
 Associated 3-d length scales (meters)
 LQ     =        0.04  LM     =        0.73  Lm     =        1.48  Lb     =       6.11
                                             Lmp    =    99999.00  Lbp    =   99999.00

NON-DIMENSIONAL PARAMETERS
 FR0    =       60.90  FRD0   =       10.24  R      =       13.13  PL     =       73.
 (slot)                (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:      m0     =0.8909E-04  M0     =0.8909E-03
 lQ=B   =       0.018 lM     =        0.02  lm     =        0.02  lmp    =   99999.00
 LQ     =       0.030 LM     =        0.10  Lm     =        0.39  Lmp    =   99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0     =       0.070 D0     =       0.170  A0     =       0.023  THETA =      90.00
 FR0    =        1.13  FRD0   =        0.37  R      =        0.92
 (slot)                (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)        =    MU8    2
 2  Applicable layer depth HS =     4.50  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     =0.1000E+01  CUNITS=  mg/l
 NTOX   =  0
```

```
NSTD  =  1         CSTD  =0.4700E-02
REGMZ =  0
XINT  =   2000.00  XMAX  =   2000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       305.00 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP =  50 display intervals per module
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

        X         Y         Z         S        C       BV        BH
      0.00      0.00      0.00      1.0 0.100E+01   0.01      5.00

END OF MOD201: DIFFUSER DISCHARGE MODULE
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD234: UNSTABLE RECIRCULATION REGION OVER LAYER DEPTH

 INITIAL LOCAL VERTICAL INSTABILITY REGION:
   Bulk dilution (S = 292.49) occurs in a limited region (horizontal extent
   =     0.30 m) surrounding the discharge location.

  Control volume inflow:
        X         Y         Z         S        C       BV        BH
      0.00      0.00      0.00      1.0 0.100E+01   0.01      5.00

  Control volume outflow:
        X         Y         Z         S        C       BV        BH
      0.30      0.00      2.25    292.5 0.342E-02   4.50     16.25

END OF MOD234: UNSTABLE RECIRCULATION REGION OVER LAYER DEPTH
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD234a: UPSTREAM SPREADING AFTER NEAR-FIELD INSTABILITY

 UPSTREAM INTRUSION PROPERTIES:
        Upstream intrusion length              =       0.57 m
        X-position of upstream stagnation point =      -0.27 m
        Thickness in intrusion region          =       1.22 m
        Half-width at downstream end           =       7.48 m
        Thickness at downstream end            =       3.54 m

  Control volume inflow:
        X         Y         Z         S        C       BV        BH
      0.30      0.00      2.25    292.5 0.342E-02   4.50     16.25

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.470E-02 due to mixing in this control volume.
 The actual extent of the zone at whose boundary the water quality
   standard or the CCC is exceeded will be smaller than the control
   volume outflow values predicted below.

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
```

```
 ZL = lower plume boundary (Z-coordinate)
 S  = hydrodynamic average (bulk) dilution
 C  = average (bulk) concentration (includes reaction effects, if any)
```

X	Y	Z	S	C	BV	BH	ZU	ZL
-0.27	0.00	4.50	9999.9	0.000E+00	0.00	0.00	4.50	4.50
-0.19	0.00	4.50	603.4	0.166E-02	0.59	6.31	4.50	3.91
0.24	0.00	4.50	294.7	0.339E-02	1.21	15.34	4.50	3.29
0.66	0.00	4.50	293.4	0.341E-02	1.30	12.17	4.50	3.20
1.08	0.00	4.50	296.4	0.337E-02	1.59	11.33	4.50	2.91
1.50	0.00	4.50	300.8	0.332E-02	2.01	10.62	4.50	2.49
1.93	0.00	4.50	305.4	0.327E-02	2.45	9.98	4.50	2.05
2.35	0.00	4.50	309.5	0.323E-02	2.84	9.41	4.50	1.66
2.77	0.00	4.50	312.6	0.320E-02	3.14	8.88	4.50	1.36
3.19	0.00	4.50	314.7	0.318E-02	3.33	8.38	4.50	1.17
3.62	0.00	4.50	315.8	0.317E-02	3.44	7.92	4.50	1.06
4.04	0.00	4.50	316.9	0.316E-02	3.54	7.48	4.50	0.96

```
Cumulative travel time =        49.1919 sec

END OF MOD234a: UPSTREAM SPREADING AFTER NEAR-FIELD INSTABILITY
-----------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **
-----------------------------------------------------------------------------
BEGIN MOD241: BUOYANT AMBIENT SPREADING

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

 Plume Stage 1 (not bank attached):
```

X	Y	Z	S	C	BV	BH	ZU	ZL
4.04	0.00	4.50	316.9	0.316E-02	3.54	7.48	4.50	0.96
43.96	0.00	4.50	410.2	0.244E-02	1.65	20.71	4.50	2.85
83.88	0.00	4.50	455.3	0.220E-02	1.25	30.42	4.50	3.25
123.80	0.00	4.50	490.1	0.204E-02	1.06	38.73	4.50	3.44
163.71	0.00	4.50	521.7	0.192E-02	0.94	46.20	4.50	3.56
203.63	0.00	4.50	553.0	0.181E-02	0.87	53.08	4.50	3.63
243.55	0.00	4.50	585.6	0.171E-02	0.82	59.51	4.50	3.68
283.47	0.00	4.50	620.3	0.161E-02	0.79	65.59	4.50	3.71
323.39	0.00	4.50	657.8	0.152E-02	0.77	71.38	4.50	3.73
363.31	0.00	4.50	698.5	0.143E-02	0.76	76.94	4.50	3.74
403.23	0.00	4.50	742.9	0.135E-02	0.75	82.28	4.50	3.75
443.15	0.00	4.50	791.3	0.126E-02	0.76	87.45	4.50	3.74
483.07	0.00	4.50	843.8	0.119E-02	0.76	92.45	4.50	3.74
522.99	0.00	4.50	900.7	0.111E-02	0.77	97.32	4.50	3.73
562.91	0.00	4.50	962.3	0.104E-02	0.79	102.06	4.50	3.71
602.83	0.00	4.50	1028.7	0.972E-03	0.81	106.69	4.50	3.69
642.75	0.00	4.50	1100.0	0.909E-03	0.83	111.22	4.50	3.67
682.66	0.00	4.50	1176.4	0.850E-03	0.85	115.66	4.50	3.65
722.58	0.00	4.50	1258.1	0.795E-03	0.88	120.01	4.50	3.62
762.50	0.00	4.50	1345.2	0.743E-03	0.90	124.28	4.50	3.60
802.42	0.00	4.50	1437.7	0.696E-03	0.93	128.48	4.50	3.57
842.34	0.00	4.50	1535.9	0.651E-03	0.97	132.61	4.50	3.53
882.26	0.00	4.50	1639.8	0.610E-03	1.00	136.68	4.50	3.50
922.18	0.00	4.50	1749.5	0.572E-03	1.04	140.69	4.50	3.46
962.10	0.00	4.50	1865.2	0.536E-03	1.08	144.65	4.50	3.42
1002.02	0.00	4.50	1986.9	0.503E-03	1.12	148.55	4.50	3.38
1041.94	0.00	4.50	2114.7	0.473E-03	1.16	152.41	4.50	3.34
1081.86	0.00	4.50	2248.8	0.445E-03	1.20	156.21	4.50	3.30
1121.78	0.00	4.50	2389.2	0.419E-03	1.25	159.98	4.50	3.25
1161.70	0.00	4.50	2536.0	0.394E-03	1.29	163.70	4.50	3.21
1201.62	0.00	4.50	2689.3	0.372E-03	1.34	167.38	4.50	3.16
1241.53	0.00	4.50	2849.1	0.351E-03	1.39	171.03	4.50	3.11
1281.45	0.00	4.50	3015.7	0.332E-03	1.44	174.64	4.50	3.06

1321.37	0.00	4.50	3189.0	0.314E-03	1.50	178.21	4.50	3.00
1361.29	0.00	4.50	3369.1	0.297E-03	1.55	181.75	4.50	2.95
1401.21	0.00	4.50	3556.1	0.281E-03	1.60	185.26	4.50	2.90
1441.13	0.00	4.50	3750.0	0.267E-03	1.66	188.73	4.50	2.84
1481.05	0.00	4.50	3951.0	0.253E-03	1.72	192.18	4.50	2.78
1520.97	0.00	4.50	4159.2	0.240E-03	1.78	195.60	4.50	2.72
1560.89	0.00	4.50	4374.5	0.229E-03	1.84	198.99	4.50	2.66
1600.81	0.00	4.50	4597.1	0.218E-03	1.90	202.35	4.50	2.60
1640.73	0.00	4.50	4827.0	0.207E-03	1.96	205.69	4.50	2.54
1680.65	0.00	4.50	5064.3	0.197E-03	2.02	209.00	4.50	2.48
1720.57	0.00	4.50	5309.0	0.188E-03	2.09	212.29	4.50	2.41
1760.49	0.00	4.50	5561.3	0.180E-03	2.16	215.56	4.50	2.34
1800.40	0.00	4.50	5821.1	0.172E-03	2.22	218.80	4.50	2.28
1840.32	0.00	4.50	6088.6	0.164E-03	2.29	222.02	4.50	2.21
1880.24	0.00	4.50	6363.9	0.157E-03	2.36	225.22	4.50	2.14
1920.16	0.00	4.50	6646.9	0.150E-03	2.43	228.39	4.50	2.07
1960.08	0.00	4.50	6937.7	0.144E-03	2.50	231.55	4.50	2.00
2000.00	0.00	4.50	7236.4	0.138E-03	2.58	234.68	4.50	1.92

Cumulative travel time = 26311.8594 sec

Simulation limit based on maximum specified distance = 2000.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD241: BUOYANT AMBIENT SPREADING

CORMIX2: Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222

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CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                    CORMIX MIXING ZONE EXPERT SYSTEM
         Subsystem CORMIX2:  Multiport Diffuser Discharges
                      CORMIX Version 5.0GT
                   HYDRO2 Version 5.0.1.0 December 2007
----------------------------------------------------------------------------
----------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:
 Design case:
 FILE NAME:         C:\...5928\cormix\Area10b\8port_lower_flow\wet_u010.prd
 Time stamp:        Thu Oct 20 10:31:43 2016

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA     =       4.50 HD     =       4.50
 UA     =      0.013 F      =      0.019 USTAR =0.6338E-03
 UW     =      2.000 UWSTAR=0.2198E-02
 Density stratified environment
 STRCND=  A          RHOAM = 1017.3500
 RHOAS = 1017.0000   RHOAB = 1017.7000  RHOAH0= 1017.7000  E     =0.1499E-02

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= alternating_perpendicular
 BANK  =  LEFT       DISTB =    305.00  YB1    =    300.00  YB2    =    310.00
 LD    =      10.00  NOPEN =    8       SPAC   =      1.43
 D0    =      0.045  A0    =      0.002 H0     =      0.00  SUB0   =      4.50
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =      90.00  THETA =      0.00  SIGMA =       0.00  BETA   =     90.00
 U0    =      0.998  Q0    =      0.013        =0.1270E-01
 RHO0  = 1000.0000   DRHO0 =0.1770E+02  GP0    =0.1706E+00
 C0    =0.1000E+01   CUNITS=  mg/l
 IPOLL =  1          KS    =0.0000E+00  KD     =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.1270E-02  m0    =0.1268E-02  j0     =0.2166E-03  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B  =      0.001 lM    =      0.35  lm     =      7.50
 lmp   =      0.95  lbp   =      1.55  la     =      0.34

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.1270E-01  M0    =0.1268E-01  J0     =0.2166E-02
 Associated 3-d length scales (meters)
 LQ    =      0.04  LM    =      0.81  Lm     =      8.66  Lb     =    985.93
                                       Lmp    =      1.71  Lbp    =      2.47

NON-DIMENSIONAL PARAMETERS
 FR0   =     67.76  FRD0  =     11.39  R      =     76.78  PL     =     68.
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.8181E-04  M0     =0.8181E-03
 lQ=B  =      0.020 lM    =      0.02  lm     =      0.48  lmp    =      0.38
 LQ    =      0.029 LM    =      0.10  Lm     =      2.20  Lmp    =      0.86
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.064 D0    =      0.177 A0     =      0.025 THETA =     90.00
 FR0   =      1.11  FRD0  =      0.37  R      =      4.95
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MS8  2
 2  Applicable layer depth HS =    4.50  2
 222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.1000E+01  CUNITS=  mg/l
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 NTOX   =  0
 NSTD   =  1          CSTD   =0.4700E-02
 REGMZ  =  0
 XINT   =    2000.00  XMAX   =    2000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       305.00 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP =  50 display intervals per module
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

        X         Y        Z         S       C         BV        BH
      0.00      0.00     0.00      1.0 0.100E+01   0.09      0.09

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Plume-like motion in linear stratification with weak crossflow.

 Zone of flow establishment:               THETAE=     85.22  SIGMAE=      0.00
  LE     =        0.12  XE     =      0.00  YE     =      0.00  ZE     =      0.12

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

        X         Y        Z         S       C         BV        BH
  Individual jet/plumes before merging:
      0.00      0.00     0.12      1.0 0.100E+01   0.09      0.09
      0.00      0.00     0.12      1.0 0.100E+01   0.09      0.09
      0.12      0.00     0.35      1.9 0.532E+00   0.07      0.07
      0.28      0.00     0.56      3.6 0.280E+00   0.11      0.11
      0.46      0.00     0.75      5.6 0.178E+00   0.14      0.14
      0.65      0.00     0.93      7.9 0.127E+00   0.17      0.17
      0.87      0.00     1.07     10.3 0.971E-01   0.20      0.20
      1.10      0.00     1.20     12.7 0.786E-01   0.23      0.23
      1.34      0.00     1.31     15.2 0.659E-01   0.26      0.26
      1.58      0.00     1.40     17.6 0.568E-01   0.29      0.29
      1.83      0.00     1.48     20.0 0.499E-01   0.32      0.32
      2.08      0.00     1.55     22.4 0.446E-01   0.34      0.34
      2.34      0.00     1.61     24.8 0.403E-01   0.37      0.37
      2.60      0.00     1.66     27.2 0.367E-01   0.39      0.39
      2.86      0.00     1.71     29.6 0.338E-01   0.41      0.41
      3.11      0.00     1.75     32.0 0.313E-01   0.44      0.44
      3.37      0.00     1.80     34.4 0.291E-01   0.46      0.46
      3.63      0.00     1.84     36.8 0.272E-01   0.48      0.48
      3.89      0.00     1.88     39.3 0.254E-01   0.51      0.51
      4.15      0.00     1.92     41.8 0.239E-01   0.53      0.53
      4.41      0.00     1.96     44.4 0.225E-01   0.55      0.55
      4.67      0.00     1.99     47.0 0.213E-01   0.58      0.58
      4.93      0.00     2.03     49.6 0.202E-01   0.60      0.60
      5.19      0.00     2.07     52.2 0.192E-01   0.62      0.62
      5.45      0.00     2.10     54.9 0.182E-01   0.64      0.64
      5.71      0.00     2.14     57.6 0.174E-01   0.66      0.66
      5.97      0.00     2.17     60.3 0.166E-01   0.69      0.69
      6.23      0.00     2.20     63.0 0.159E-01   0.71      0.71
  Merging of individual jet/plumes to form plane jet/plume:
      6.28      0.00     2.21     82.5 0.121E-01   0.90      5.90
```

6.75	0.00	2.26	85.8	0.117E-01	0.94	5.94
7.01	0.00	2.28	87.6	0.114E-01	0.97	5.97
7.27	0.00	2.31	89.4	0.112E-01	1.00	6.00
7.53	0.00	2.33	91.1	0.110E-01	1.02	6.02
7.80	0.00	2.36	92.8	0.108E-01	1.05	6.05
8.06	0.00	2.38	94.5	0.106E-01	1.08	6.08
8.32	0.00	2.40	96.2	0.104E-01	1.11	6.11
8.58	0.00	2.43	97.8	0.102E-01	1.13	6.13
8.84	0.00	2.45	99.5	0.101E-01	1.16	6.16
9.10	0.00	2.47	101.1	0.990E-02	1.19	6.19
9.36	0.00	2.49	102.6	0.974E-02	1.22	6.22
9.62	0.00	2.51	104.2	0.960E-02	1.25	6.25
9.89	0.00	2.52	105.7	0.946E-02	1.28	6.28
10.15	0.00	2.54	107.2	0.932E-02	1.31	6.31
10.41	0.00	2.56	108.7	0.920E-02	1.34	6.34
10.67	0.00	2.57	110.2	0.908E-02	1.37	6.37
10.93	0.00	2.59	111.6	0.896E-02	1.39	6.39
11.20	0.00	2.60	113.0	0.885E-02	1.42	6.42
11.46	0.00	2.61	114.4	0.874E-02	1.45	6.45
11.72	0.00	2.62	115.7	0.864E-02	1.48	6.48
11.98	0.00	2.63	117.0	0.855E-02	1.51	6.51
12.24	0.00	2.64	118.2	0.846E-02	1.53	6.53
12.50	0.00	2.64	119.4	0.838E-02	1.56	6.56

Terminal level in stratified ambient has been reached.
Cumulative travel time = 157.1202 sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD236: TERMINAL LAYER IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 1.24 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

UPSTREAM INTRUSION PROPERTIES:

Maximum elevation of jet/plume rise	=	4.07 m
Layer thickness in impingement region	=	0.81 m
Upstream intrusion length	=	5.64 m
X-position of upstream stagnation point	=	6.86 m
Thickness in intrusion region	=	0.81 m
Half-width at downstream end	=	44.78 m
Thickness at downstream end	=	1.62 m

Control volume inflow:

X	Y	Z	S	C	BV	BH
12.50	0.00	2.64	119.4	0.838E-02	1.56	6.56

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH	ZU	ZL
6.86	0.00	2.64	9999.9	0.000E+00	0.00	0.00	2.64	2.64

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
The pollutant concentration in the plume falls below water quality standard
or CCC value of 0.470E-02 in the current prediction interval.
This is the spatial extent of concentrations exceeding the water quality
standard or CCC value.

7.42	0.00	2.64	302.9	0.330E-02	0.32	6.33	2.80	2.48
10.17	0.00	2.64	133.8	0.747E-02	0.72	15.38	3.00	2.28
12.92	0.00	2.64	119.4	0.837E-02	0.81	31.56	3.05	2.24
15.66	0.00	2.64	121.6	0.822E-02	0.87	33.92	3.08	2.21
18.41	0.00	2.64	126.5	0.790E-02	1.00	35.94	3.14	2.14
21.16	0.00	2.64	132.6	0.754E-02	1.17	37.72	3.23	2.06

23.90	0.00	2.64	138.3	0.723E-02	1.33	39.34	3.31	1.98
26.65	0.00	2.64	142.7	0.701E-02	1.46	40.83	3.37	1.91
29.40	0.00	2.64	145.7	0.687E-02	1.54	42.23	3.41	1.87
32.15	0.00	2.64	147.3	0.679E-02	1.58	43.54	3.43	1.85
34.89	0.00	2.64	148.7	0.673E-02	1.62	44.78	3.45	1.83

Cumulative travel time = 1879.2767 sec

END OF MOD236: TERMINAL LAYER IMPINGEMENT/UPSTREAM SPREADING

** End of NEAR-FIELD REGION (NFR) **

BEGIN MOD242: BUOYANT TERMINAL LAYER SPREADING

Profile definitions:
- BV = top-hat thickness, measured vertically
- BH = top-hat half-width, measured horizontally in y-direction
- ZU = upper plume boundary (Z-coordinate)
- ZL = lower plume boundary (Z-coordinate)
- S = hydrodynamic average (bulk) dilution
- C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
34.89	0.00	2.64	148.7	0.673E-02	1.62	44.78	3.45	1.83
39.53	0.00	2.64	159.6	0.627E-02	1.32	59.27	3.30	1.98
44.16	0.00	2.64	167.3	0.598E-02	1.15	71.33	3.22	2.07
48.80	0.00	2.64	173.4	0.577E-02	1.03	81.90	3.16	2.13
53.43	0.00	2.64	178.4	0.560E-02	0.95	91.43	3.12	2.17
58.06	0.00	2.64	182.8	0.547E-02	0.89	100.18	3.09	2.20
62.70	0.00	2.64	186.7	0.536E-02	0.84	108.31	3.06	2.22
67.33	0.00	2.64	190.1	0.526E-02	0.80	115.93	3.04	2.24
71.97	0.00	2.64	193.4	0.517E-02	0.77	123.13	3.03	2.26
76.60	0.00	2.64	196.3	0.509E-02	0.74	129.96	3.01	2.27
81.24	0.00	2.64	199.2	0.502E-02	0.71	136.49	3.00	2.29
85.87	0.00	2.64	201.8	0.495E-02	0.69	142.74	2.99	2.30
90.50	0.00	2.64	204.4	0.489E-02	0.67	148.75	2.98	2.31
95.14	0.00	2.64	206.8	0.483E-02	0.65	154.55	2.97	2.32
99.77	0.00	2.64	209.2	0.478E-02	0.64	160.15	2.96	2.32
104.41	0.00	2.64	211.5	0.473E-02	0.62	165.58	2.95	2.33
109.04	0.00	2.64	213.8	0.468E-02	0.61	170.85	2.95	2.34
113.68	0.00	2.64	216.0	0.463E-02	0.60	175.97	2.94	2.34
118.31	0.00	2.64	218.2	0.458E-02	0.59	180.96	2.94	2.35
122.94	0.00	2.64	220.4	0.454E-02	0.58	185.83	2.93	2.35
127.58	0.00	2.64	222.6	0.449E-02	0.57	190.59	2.93	2.36
132.21	0.00	2.64	224.7	0.445E-02	0.56	195.24	2.92	2.36
136.85	0.00	2.64	226.8	0.441E-02	0.55	199.80	2.92	2.37
141.48	0.00	2.64	229.0	0.437E-02	0.55	204.26	2.92	2.37
146.12	0.00	2.64	231.1	0.433E-02	0.54	208.64	2.91	2.37
150.75	0.00	2.64	233.2	0.429E-02	0.53	212.95	2.91	2.38
155.38	0.00	2.64	235.3	0.425E-02	0.53	217.18	2.91	2.38
160.02	0.00	2.64	237.5	0.421E-02	0.52	221.34	2.90	2.38
164.65	0.00	2.64	239.6	0.417E-02	0.52	225.44	2.90	2.38
169.29	0.00	2.64	241.8	0.414E-02	0.51	229.48	2.90	2.39
173.92	0.00	2.64	243.9	0.410E-02	0.51	233.46	2.90	2.39
178.56	0.00	2.64	246.1	0.406E-02	0.51	237.39	2.90	2.39
183.19	0.00	2.64	248.3	0.403E-02	0.50	241.27	2.89	2.39
187.82	0.00	2.64	250.5	0.399E-02	0.50	245.10	2.89	2.39
192.46	0.00	2.64	252.8	0.396E-02	0.50	248.89	2.89	2.39
197.09	0.00	2.64	255.0	0.392E-02	0.49	252.63	2.89	2.40
201.73	0.00	2.64	257.3	0.389E-02	0.49	256.34	2.89	2.40
206.36	0.00	2.64	259.5	0.385E-02	0.49	260.01	2.89	2.40
211.00	0.00	2.64	261.8	0.382E-02	0.49	263.64	2.89	2.40
215.63	0.00	2.64	264.1	0.379E-02	0.48	267.24	2.88	2.40
220.26	0.00	2.64	266.5	0.375E-02	0.48	270.80	2.88	2.40
224.90	0.00	2.64	268.8	0.372E-02	0.48	274.34	2.88	2.40
229.53	0.00	2.64	271.2	0.369E-02	0.48	277.85	2.88	2.40
234.17	0.00	2.64	273.6	0.366E-02	0.48	281.33	2.88	2.40
238.80	0.00	2.64	276.0	0.362E-02	0.47	284.78	2.88	2.41

243.44	0.00	2.64	278.4	0.359E-02	0.47	288.21	2.88	2.41
248.07	0.00	2.64	280.9	0.356E-02	0.47	291.62	2.88	2.41
252.70	0.00	2.64	283.4	0.353E-02	0.47	295.00	2.88	2.41
257.34	0.00	2.64	285.9	0.350E-02	0.47	298.36	2.88	2.41
261.97	0.00	2.64	288.4	0.347E-02	0.47	301.70	2.88	2.41
266.61	0.00	2.64	290.9	0.344E-02	0.47	305.03	2.88	2.41

Cumulative travel time = 19703.4395 sec

Plume is ATTACHED to LEFT bank/shore.
Plume width is now determined from LEFT bank/shore.

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
266.61	305.00	2.64	290.9	0.344E-02	0.47	610.00	2.88	2.41
301.27	305.00	2.64	306.2	0.327E-02	0.47	630.24	2.88	2.41
335.94	305.00	2.64	321.6	0.311E-02	0.48	650.74	2.88	2.40
370.61	305.00	2.64	337.0	0.297E-02	0.49	671.46	2.89	2.40
405.28	305.00	2.64	352.5	0.284E-02	0.50	692.38	2.89	2.39
439.95	305.00	2.64	368.1	0.272E-02	0.50	713.46	2.89	2.39
474.61	305.00	2.64	383.8	0.261E-02	0.51	734.69	2.90	2.39
509.28	305.00	2.64	399.6	0.250E-02	0.52	756.05	2.90	2.38
543.95	305.00	2.64	415.6	0.241E-02	0.52	777.53	2.90	2.38
578.62	305.00	2.64	431.6	0.232E-02	0.53	799.11	2.91	2.38
613.29	305.00	2.64	447.8	0.223E-02	0.53	820.78	2.91	2.38
647.95	305.00	2.64	464.1	0.215E-02	0.54	842.54	2.91	2.37
682.62	305.00	2.64	480.6	0.208E-02	0.54	864.37	2.91	2.37
717.29	305.00	2.64	497.2	0.201E-02	0.55	886.27	2.92	2.37
751.96	305.00	2.64	513.9	0.195E-02	0.55	908.24	2.92	2.37
786.62	305.00	2.64	530.7	0.188E-02	0.56	930.26	2.92	2.36
821.29	305.00	2.64	547.7	0.183E-02	0.56	952.34	2.92	2.36
855.96	305.00	2.64	564.8	0.177E-02	0.57	974.47	2.93	2.36
890.63	305.00	2.64	582.1	0.172E-02	0.57	996.65	2.93	2.36
925.30	305.00	2.64	599.5	0.167E-02	0.57	1018.87	2.93	2.36
959.96	305.00	2.64	617.0	0.162E-02	0.58	1041.14	2.93	2.35
994.63	305.00	2.64	634.7	0.158E-02	0.58	1063.44	2.93	2.35
1029.30	305.00	2.64	652.4	0.153E-02	0.59	1085.77	2.94	2.35
1063.97	305.00	2.64	670.4	0.149E-02	0.59	1108.15	2.94	2.35
1098.64	305.00	2.64	688.4	0.145E-02	0.59	1130.55	2.94	2.35
1133.30	305.00	2.64	706.6	0.142E-02	0.60	1152.99	2.94	2.34
1167.97	305.00	2.64	724.9	0.138E-02	0.60	1175.45	2.94	2.34
1202.64	305.00	2.64	743.3	0.135E-02	0.61	1197.95	2.95	2.34
1237.31	305.00	2.64	761.8	0.131E-02	0.61	1220.47	2.95	2.34
1271.97	305.00	2.64	780.5	0.128E-02	0.61	1243.02	2.95	2.34
1306.64	305.00	2.64	799.3	0.125E-02	0.62	1265.59	2.95	2.33
1341.31	305.00	2.64	818.2	0.122E-02	0.62	1288.19	2.95	2.33
1375.98	305.00	2.64	837.2	0.119E-02	0.62	1310.80	2.95	2.33
1410.65	305.00	2.64	856.4	0.117E-02	0.63	1333.45	2.96	2.33
1445.31	305.00	2.64	875.6	0.114E-02	0.63	1356.11	2.96	2.33
1479.98	305.00	2.64	895.0	0.112E-02	0.63	1378.79	2.96	2.33
1514.65	305.00	2.64	914.5	0.109E-02	0.64	1401.49	2.96	2.32
1549.32	305.00	2.64	934.1	0.107E-02	0.64	1424.22	2.96	2.32
1583.99	305.00	2.64	953.9	0.105E-02	0.64	1446.96	2.96	2.32
1618.65	305.00	2.64	973.7	0.103E-02	0.65	1469.71	2.97	2.32
1653.32	305.00	2.64	993.6	0.101E-02	0.65	1492.49	2.97	2.32
1687.99	305.00	2.64	1013.7	0.986E-03	0.65	1515.28	2.97	2.32
1722.66	305.00	2.64	1033.9	0.967E-03	0.66	1538.09	2.97	2.31
1757.32	305.00	2.64	1054.2	0.949E-03	0.66	1560.92	2.97	2.31
1791.99	305.00	2.64	1074.5	0.931E-03	0.66	1583.76	2.97	2.31
1826.66	305.00	2.64	1095.0	0.913E-03	0.67	1606.61	2.98	2.31
1861.33	305.00	2.64	1115.6	0.896E-03	0.67	1629.49	2.98	2.31
1896.00	305.00	2.64	1136.3	0.880E-03	0.67	1652.37	2.98	2.31
1930.66	305.00	2.64	1157.1	0.864E-03	0.67	1675.27	2.98	2.31
1965.33	305.00	2.64	1178.0	0.849E-03	0.68	1698.18	2.98	2.30
2000.00	305.00	2.64	1199.0	0.834E-03	0.68	1721.11	2.98	2.30

Cumulative travel time = 153041.3594 sec

Simulation limit based on maximum specified distance = 2000.00 m.

This is the REGION OF INTEREST limitation.

END OF MOD242: BUOYANT TERMINAL LAYER SPREADING

CORMIX2: Multiport Diffuser Discharges   End of Prediction File

2222222222222222222222222222222222222222222222222222222222222222222222222222

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CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222222
                    CORMIX MIXING ZONE EXPERT SYSTEM
        Subsystem CORMIX2:  Multiport Diffuser Discharges
                      CORMIX Version 5.0GT
                   HYDRO2 Version 5.0.1.0 December 2007
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:
 Design case:
 FILE NAME:         C:\...5928\cormix\Area10b\8port_lower_flow\wet_u050.prd
 Time stamp:        Thu Oct 20 10:32:29 2016

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA     =       4.50 HD     =       4.50
 UA     =      0.042 F      =      0.019 USTAR =0.2048E-02
 UW     =      2.000 UWSTAR=0.2198E-02
 Density stratified environment
 STRCND=  A          RHOAM = 1017.3500
 RHOAS = 1017.0000   RHOAB = 1017.7000   RHOAH0= 1017.7000  E     =0.1499E-02

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= alternating_perpendicular
 BANK   =  LEFT      DISTB =     305.00 YB1    =     300.00 YB2    =    310.00
 LD     =      10.00 NOPEN =   8         SPAC   =       1.43
 D0     =      0.045 A0     =      0.002 H0     =       0.00 SUB0   =      4.50
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =      90.00  THETA =       0.00 SIGMA =        0.00 BETA   =     90.00
 U0     =      0.998 Q0     =      0.013       =0.1270E-01
 RHO0   = 1000.0000  DRHO0 =0.1770E+02 GP0    =0.1706E+00
 C0     =0.1000E+01  CUNITS=  mg/l
 IPOLL =  1          KS     =0.0000E+00 KD     =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     =0.1270E-02  m0     =0.1268E-02 j0     =0.2166E-03 SIGNJ0=       1.0
 Associated 2-d length scales (meters)
 lQ=B   =      0.001 lM     =       0.35 lm     =       0.72
 lmp    =       0.95 lbp    =       1.55 la     =       1.08

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     =0.1270E-01  M0     =0.1268E-01 J0     =0.2166E-02
 Associated 3-d length scales (meters)
 LQ     =       0.04 LM     =       0.81 Lm     =       2.68 Lb     =     29.24
                                        Lmp    =       1.71 Lbp    =      2.47

NON-DIMENSIONAL PARAMETERS
 FR0    =      67.76 FRD0   =      11.39 R      =      23.77 PL     =     68.
 (slot)              (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:    m0     =0.8181E-04 M0     =0.8181E-03
 lQ=B   =      0.020 lM     =       0.02 lm     =       0.05 lmp    =      0.38
 LQ     =      0.029 LM     =       0.10 Lm     =       0.68 Lmp    =      0.86
 Properties of riser group with  1 ports/nozzles each:
 U0     =      0.064 D0     =      0.177 A0     =      0.025 THETA =      90.00
 FR0    =       1.11 FRD0   =       0.37 R      =       1.53
 (slot)              (riser group)

FLOW CLASSIFICATION
 2222222222222222222222222222222222222222
 2  Flow class (CORMIX2)        =   MS5    2
 2  Applicable layer depth HS =     4.50  2
 2222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     =0.1000E+01  CUNITS=  mg/l
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NTOX = 0
NSTD = 1 CSTD =0.4700E-02
REGMZ = 0
XINT = 2000.00 XMAX = 2000.00

X-Y-Z COORDINATE SYSTEM:
ORIGIN is located at the bottom and the diffuser mid-point:
305.00 m from the LEFT bank/shore.
X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 50 display intervals per module

BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

X	Y	Z	S	C	BV	BH
0.00	0.00	0.00	1.0	0.100E+01	0.09	0.09

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

Plume-like motion in linear stratification with strong crossflow.

Zone of flow establishment: THETAE= 74.89 SIGMAE= 0.00
LE = 0.00 XE = 0.00 YE = 0.00 ZE = 0.00

Profile definitions:
BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane normal to trajectory
after merging: top-hat half-width in horizontal plane parallel to diffuser line
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
Individual jet/plumes before merging:						
0.00	0.00	0.00	1.0	0.100E+01	0.09	0.09
0.62	0.00	0.21	3.2	0.316E+00	0.10	0.10
1.26	0.00	0.38	6.5	0.154E+00	0.16	0.16
1.91	0.00	0.50	10.3	0.972E-01	0.20	0.20
2.56	0.00	0.58	14.3	0.699E-01	0.25	0.25
3.21	0.00	0.65	18.5	0.541E-01	0.29	0.29
3.87	0.00	0.71	22.7	0.440E-01	0.33	0.33
4.53	0.00	0.76	27.0	0.370E-01	0.37	0.37
5.18	0.00	0.80	31.3	0.319E-01	0.40	0.40
5.84	0.00	0.83	35.7	0.280E-01	0.44	0.44
6.50	0.00	0.86	40.2	0.249E-01	0.47	0.47
7.16	0.00	0.90	44.7	0.224E-01	0.50	0.50
7.82	0.00	0.93	49.4	0.203E-01	0.53	0.53
8.47	0.00	0.96	54.1	0.185E-01	0.56	0.56
9.13	0.00	0.99	58.9	0.170E-01	0.59	0.59
9.79	0.00	1.02	63.7	0.157E-01	0.61	0.61
10.45	0.00	1.04	68.6	0.146E-01	0.64	0.64
11.11	0.00	1.07	73.6	0.136E-01	0.67	0.67
11.76	0.00	1.10	78.6	0.127E-01	0.69	0.69
Merging of individual jet/plumes to form plane jet/plume:						
12.29	0.00	1.12	101.6	0.984E-02	0.90	5.90
13.08	0.00	1.15	105.4	0.949E-02	0.93	5.93
13.74	0.00	1.17	108.6	0.921E-02	0.96	5.96
14.40	0.00	1.19	111.6	0.896E-02	0.99	5.99
15.05	0.00	1.21	114.7	0.872E-02	1.02	6.02
15.71	0.00	1.23	117.7	0.849E-02	1.05	6.05
16.37	0.00	1.26	120.7	0.828E-02	1.08	6.08
17.03	0.00	1.28	123.7	0.808E-02	1.11	6.11
17.69	0.00	1.30	126.6	0.790E-02	1.14	6.14
18.35	0.00	1.32	129.5	0.772E-02	1.17	6.17

```
    19.00      0.00      1.34    132.3 0.756E-02    1.20       6.20
    19.66      0.00      1.35    135.1 0.740E-02    1.23       6.23
    20.32      0.00      1.37    137.9 0.725E-02    1.26       6.26
    20.98      0.00      1.39    140.6 0.711E-02    1.29       6.29
    21.64      0.00      1.41    143.3 0.698E-02    1.32       6.32
    22.30      0.00      1.42    145.9 0.686E-02    1.35       6.35
    22.96      0.00      1.44    148.4 0.674E-02    1.37       6.37
    23.62      0.00      1.45    150.9 0.662E-02    1.40       6.40
    24.28      0.00      1.47    153.4 0.652E-02    1.43       6.43
    24.93      0.00      1.48    155.8 0.642E-02    1.45       6.45
    25.59      0.00      1.50    158.2 0.632E-02    1.48       6.48
    26.25      0.00      1.51    160.5 0.623E-02    1.51       6.51
    26.91      0.00      1.52    162.7 0.615E-02    1.53       6.53
    27.57      0.00      1.53    164.9 0.606E-02    1.56       6.56
    28.23      0.00      1.54    167.1 0.599E-02    1.58       6.58
    28.89      0.00      1.55    169.1 0.591E-02    1.61       6.61
    29.55      0.00      1.56    171.1 0.584E-02    1.63       6.63
    30.21      0.00      1.57    173.1 0.578E-02    1.65       6.65
    30.86      0.00      1.57    175.0 0.571E-02    1.67       6.67
    31.52      0.00      1.58    176.8 0.565E-02    1.70       6.70
    32.18      0.00      1.58    178.6 0.560E-02    1.72       6.72
    32.84      0.00      1.58    180.3 0.555E-02    1.74       6.74
 Terminal level in stratified ambient has been reached.
 Cumulative travel time =          442.4950 sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
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-----------------------------------------------------------------------------
BEGIN MOD235: LAYER/BOUNDARY/TERMINAL LAYER APPROACH

  Control volume inflow:
        X         Y         Z         S         C          BV         BH
    32.84      0.00      1.58    180.3 0.555E-02    1.74       6.74

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

        X         Y         Z         S         C          BV         BH        ZU        ZL
    31.11      0.00      1.58    180.3 0.555E-02    0.00       0.00      1.58      1.58
    32.15      0.00      1.58    180.3 0.555E-02    3.36       4.34      3.26      0.00
    33.19      0.00      1.58    184.6 0.542E-02    3.94       9.69      3.55      0.00
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.470E-02 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
    34.23      0.00      1.58    231.7 0.432E-02    4.27       9.70      3.72      0.00
    35.27      0.00      1.58    273.7 0.365E-02    4.44       9.70      3.81      0.00
    36.31      0.00      1.58    289.1 0.346E-02    4.50       9.71      3.83      0.00
 Cumulative travel time =          525.1552 sec

END OF MOD235: LAYER/BOUNDARY/TERMINAL LAYER APPROACH
-----------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **
-----------------------------------------------------------------------------
BEGIN MOD242: BUOYANT TERMINAL LAYER SPREADING

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
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wet_u050.prd

C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
36.31	0.00	1.58	289.1	0.346E-02	4.50	9.71	3.83	0.00
52.59	0.00	1.58	401.9	0.249E-02	1.68	36.17	2.42	0.74
68.87	0.00	1.58	440.6	0.227E-02	1.28	51.99	2.23	0.94
85.15	0.00	1.58	465.9	0.215E-02	1.09	64.64	2.13	1.04
101.43	0.00	1.58	485.2	0.206E-02	0.97	75.52	2.07	1.10
117.71	0.00	1.58	501.2	0.200E-02	0.89	85.22	2.03	1.14
133.99	0.00	1.58	514.9	0.194E-02	0.83	94.07	2.00	1.17
150.27	0.00	1.58	527.2	0.190E-02	0.78	102.25	1.97	1.19
166.55	0.00	1.58	538.5	0.186E-02	0.74	109.90	1.95	1.21
182.83	0.00	1.58	549.0	0.182E-02	0.71	117.12	1.94	1.23
199.11	0.00	1.58	559.0	0.179E-02	0.68	123.96	1.93	1.24
215.38	0.00	1.58	568.7	0.176E-02	0.66	130.49	1.91	1.26
231.66	0.00	1.58	578.0	0.173E-02	0.64	136.75	1.90	1.27
247.94	0.00	1.58	587.2	0.170E-02	0.62	142.78	1.90	1.27
264.22	0.00	1.58	596.3	0.168E-02	0.61	148.59	1.89	1.28
280.50	0.00	1.58	605.2	0.165E-02	0.59	154.22	1.88	1.29
296.78	0.00	1.58	614.2	0.163E-02	0.58	159.69	1.88	1.29
313.06	0.00	1.58	623.2	0.160E-02	0.57	165.00	1.87	1.30
329.34	0.00	1.58	632.2	0.158E-02	0.56	170.18	1.87	1.30
345.62	0.00	1.58	641.2	0.156E-02	0.55	175.25	1.86	1.31
361.90	0.00	1.58	650.4	0.154E-02	0.55	180.20	1.86	1.31
378.18	0.00	1.58	659.6	0.152E-02	0.54	185.05	1.85	1.32
394.46	0.00	1.58	669.0	0.149E-02	0.53	189.82	1.85	1.32
410.74	0.00	1.58	678.4	0.147E-02	0.53	194.50	1.85	1.32
427.02	0.00	1.58	688.0	0.145E-02	0.52	199.10	1.85	1.32
443.29	0.00	1.58	697.7	0.143E-02	0.52	203.64	1.84	1.33
459.57	0.00	1.58	707.5	0.141E-02	0.51	208.11	1.84	1.33
475.85	0.00	1.58	717.5	0.139E-02	0.51	212.53	1.84	1.33
492.13	0.00	1.58	727.6	0.137E-02	0.51	216.89	1.84	1.33
508.41	0.00	1.58	737.9	0.136E-02	0.50	221.20	1.84	1.33
524.69	0.00	1.58	748.3	0.134E-02	0.50	225.46	1.84	1.33
540.97	0.00	1.58	758.8	0.132E-02	0.50	229.69	1.83	1.33
557.25	0.00	1.58	769.5	0.130E-02	0.50	233.87	1.83	1.34
573.53	0.00	1.58	780.3	0.128E-02	0.50	238.02	1.83	1.34
589.81	0.00	1.58	791.2	0.126E-02	0.49	242.14	1.83	1.34
606.09	0.00	1.58	802.3	0.125E-02	0.49	246.22	1.83	1.34
622.37	0.00	1.58	813.5	0.123E-02	0.49	250.28	1.83	1.34
638.65	0.00	1.58	824.8	0.121E-02	0.49	254.31	1.83	1.34
654.92	0.00	1.58	836.3	0.120E-02	0.49	258.31	1.83	1.34
671.20	0.00	1.58	847.9	0.118E-02	0.49	262.29	1.83	1.34
687.48	0.00	1.58	859.6	0.116E-02	0.49	266.26	1.83	1.34
703.76	0.00	1.58	871.5	0.115E-02	0.49	270.20	1.83	1.34
720.04	0.00	1.58	883.5	0.113E-02	0.49	274.12	1.83	1.34
736.32	0.00	1.58	895.6	0.112E-02	0.49	278.03	1.83	1.34
752.60	0.00	1.58	907.8	0.110E-02	0.49	281.92	1.83	1.34
768.88	0.00	1.58	920.1	0.109E-02	0.49	285.80	1.83	1.34
785.16	0.00	1.58	932.6	0.107E-02	0.49	289.66	1.83	1.34
801.44	0.00	1.58	945.1	0.106E-02	0.49	293.51	1.83	1.34
817.72	0.00	1.58	957.8	0.104E-02	0.49	297.35	1.83	1.34
834.00	0.00	1.58	970.6	0.103E-02	0.49	301.18	1.83	1.34
850.28	0.00	1.58	983.4	0.102E-02	0.49	305.00	1.83	1.34

Cumulative travel time = 19905.2246 sec

Plume is ATTACHED to LEFT bank/shore.

Plume width is now determined from LEFT bank/shore.

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
850.28	305.00	1.58	983.4	0.102E-02	0.49	610.01	1.83	1.34
873.27	305.00	1.58	998.9	0.100E-02	0.49	614.41	1.83	1.34
896.26	305.00	1.58	1014.3	0.986E-03	0.50	618.85	1.83	1.34
919.26	305.00	1.58	1029.7	0.971E-03	0.50	623.33	1.83	1.33
942.25	305.00	1.58	1044.9	0.957E-03	0.50	627.85	1.84	1.33

965.25	305.00	1.58	1060.1	0.943E-03	0.51	632.39	1.84	1.33
988.24	305.00	1.58	1075.2	0.930E-03	0.51	636.97	1.84	1.33
1011.24	305.00	1.58	1090.3	0.917E-03	0.51	641.58	1.84	1.33
1034.23	305.00	1.58	1105.3	0.905E-03	0.52	646.22	1.84	1.33
1057.23	305.00	1.58	1120.2	0.893E-03	0.52	650.89	1.84	1.32
1080.22	305.00	1.58	1135.1	0.881E-03	0.52	655.59	1.85	1.32
1103.22	305.00	1.58	1150.0	0.870E-03	0.53	660.31	1.85	1.32
1126.21	305.00	1.58	1164.9	0.858E-03	0.53	665.05	1.85	1.32
1149.20	305.00	1.58	1179.7	0.848E-03	0.53	669.82	1.85	1.32
1172.20	305.00	1.58	1194.5	0.837E-03	0.54	674.62	1.85	1.32
1195.19	305.00	1.58	1209.3	0.827E-03	0.54	679.43	1.85	1.32
1218.19	305.00	1.58	1224.1	0.817E-03	0.54	684.27	1.86	1.31
1241.18	305.00	1.58	1238.8	0.807E-03	0.54	689.13	1.86	1.31
1264.18	305.00	1.58	1253.5	0.798E-03	0.55	694.00	1.86	1.31
1287.17	305.00	1.58	1268.3	0.788E-03	0.55	698.90	1.86	1.31
1310.17	305.00	1.58	1283.0	0.779E-03	0.55	703.81	1.86	1.31
1333.16	305.00	1.58	1297.7	0.771E-03	0.55	708.75	1.86	1.31
1356.15	305.00	1.58	1312.4	0.762E-03	0.56	713.70	1.86	1.31
1379.15	305.00	1.58	1327.1	0.754E-03	0.56	718.66	1.86	1.31
1402.14	305.00	1.58	1341.8	0.745E-03	0.56	723.64	1.86	1.30
1425.14	305.00	1.58	1356.5	0.737E-03	0.56	728.64	1.87	1.30
1448.13	305.00	1.58	1371.2	0.729E-03	0.57	733.66	1.87	1.30
1471.13	305.00	1.58	1385.9	0.722E-03	0.57	738.68	1.87	1.30
1494.12	305.00	1.58	1400.7	0.714E-03	0.57	743.72	1.87	1.30
1517.12	305.00	1.58	1415.4	0.707E-03	0.57	748.78	1.87	1.30
1540.11	305.00	1.58	1430.1	0.699E-03	0.57	753.85	1.87	1.30
1563.11	305.00	1.58	1444.9	0.692E-03	0.58	758.93	1.87	1.30
1586.10	305.00	1.58	1459.7	0.685E-03	0.58	764.02	1.87	1.30
1609.09	305.00	1.58	1474.4	0.678E-03	0.58	769.12	1.87	1.29
1632.09	305.00	1.58	1489.2	0.671E-03	0.58	774.24	1.88	1.29
1655.08	305.00	1.58	1504.0	0.665E-03	0.58	779.37	1.88	1.29
1678.08	305.00	1.58	1518.8	0.658E-03	0.59	784.51	1.88	1.29
1701.07	305.00	1.58	1533.7	0.652E-03	0.59	789.66	1.88	1.29
1724.07	305.00	1.58	1548.5	0.646E-03	0.59	794.81	1.88	1.29
1747.06	305.00	1.58	1563.4	0.640E-03	0.59	799.98	1.88	1.29
1770.06	305.00	1.58	1578.2	0.634E-03	0.59	805.16	1.88	1.29
1793.05	305.00	1.58	1593.1	0.628E-03	0.59	810.35	1.88	1.29
1816.04	305.00	1.58	1608.1	0.622E-03	0.60	815.55	1.88	1.29
1839.04	305.00	1.58	1623.0	0.616E-03	0.60	820.75	1.88	1.29
1862.03	305.00	1.58	1637.9	0.611E-03	0.60	825.97	1.88	1.28
1885.03	305.00	1.58	1652.9	0.605E-03	0.60	831.19	1.89	1.28
1908.02	305.00	1.58	1667.9	0.600E-03	0.60	836.42	1.89	1.28
1931.02	305.00	1.58	1682.9	0.594E-03	0.60	841.66	1.89	1.28
1954.01	305.00	1.58	1698.0	0.589E-03	0.61	846.90	1.89	1.28
1977.01	305.00	1.58	1713.0	0.584E-03	0.61	852.16	1.89	1.28
2000.00	305.00	1.58	1728.1	0.579E-03	0.61	857.42	1.89	1.28

Cumulative travel time = 47279.6055 sec

Simulation limit based on maximum specified distance = 2000.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD242: BUOYANT TERMINAL LAYER SPREADING

CORMIX2: Multiport Diffuser Discharges End of Prediction File

22222222222222222222222222222222222222222222222222222222222222222222222222222

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CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222
                    CORMIX MIXING ZONE EXPERT SYSTEM
          Subsystem CORMIX2:  Multiport Diffuser Discharges
                         CORMIX Version 5.0GT
                   HYDRO2 Version 5.0.1.0 December 2007
----------------------------------------------------------------------------
----------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:
 Design case:
 FILE NAME:          C:\...5928\cormix\Area10b\8port_lower_flow\wet_u090.prd
 Time stamp:         Thu Oct 20 10:33:02 2016

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA     =        4.50  HD     =        4.50
 UA     =       0.076  F      =       0.019 USTAR =0.3705E-02
 UW     =       2.000  UWSTAR=0.2198E-02
 Density stratified environment
 STRCND=  A            RHOAM = 1017.3500
 RHOAS = 1017.0000     RHOAB = 1017.7000   RHOAH0= 1017.7000  E     =0.1499E-02

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:        DITYPE= alternating_perpendicular
 BANK   =  LEFT        DISTB =    305.00  YB1    =    300.00  YB2    =   310.00
 LD     =       10.00  NOPEN =    8       SPAC   =      1.43
 D0     =       0.045  A0     =      0.002 H0     =      0.00  SUB0   =     4.50
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =       90.00   THETA =       0.00  SIGMA =        0.00  BETA   =    90.00
 U0     =       0.998  Q0     =      0.013        =0.1270E-01
 RHO0   = 1000.0000    DRHO0 =0.1770E+02   GP0    =0.1706E+00
 C0     =0.1000E+01    CUNITS=  mg/l
 IPOLL =  1            KS    =0.0000E+00   KD     =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0     =0.1270E-02  m0     =0.1268E-02  j0     =0.2166E-03  SIGNJ0=        1.0
 Associated 2-d length scales (meters)
 lQ=B   =       0.001 lM     =       0.35  lm     =      0.22
 lmp    =       0.95  lbp    =       1.55  la     =      1.96

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0     =0.1270E-01  M0     =0.1268E-01  J0     =0.2166E-02
 Associated 3-d length scales (meters)
 LQ     =        0.04  LM     =       0.81  Lm     =      1.48  Lb     =     4.93
                                           Lmp    =      1.71  Lbp    =     2.47

NON-DIMENSIONAL PARAMETERS
 FR0    =       67.76  FRD0   =      11.39  R      =     13.13  PL     =      68.
 (slot)                (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:      m0     =0.8181E-04  M0     =0.8181E-03
 lQ=B   =       0.020 lM     =       0.02  lm     =      0.01  lmp    =     0.38
 LQ     =       0.029 LM     =       0.10  Lm     =      0.38  Lmp    =     0.86
 Properties of riser group with  1 ports/nozzles each:
 U0     =       0.064 D0     =      0.177 A0     =      0.025 THETA =     90.00
 FR0    =        1.11 FRD0   =       0.37 R      =      0.85
 (slot)                (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)       =    MS5    2
 2  Applicable layer depth HS =     4.50  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0     =0.1000E+01  CUNITS=  mg/l
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NTOX   =  0
NSTD   =  1          CSTD   =0.4700E-02
REGMZ  =  0
XINT   =    2000.00  XMAX   =    2000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
       305.00 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP =  50 display intervals per module
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X          Y         Z          S        C        BV        BH
     0.00       0.00      0.00       1.0 0.100E+01    0.09      0.09

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Plume-like motion in linear stratification with strong crossflow.

 Zone of flow establishment:                THETAE=      63.95  SIGMAE=       0.00
  LE     =       0.00  XE     =        0.00 YE     =      0.00  ZE     =       0.00

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

       X          Y         Z          S        C        BV        BH
  Individual jet/plumes before merging:
     0.00       0.00      0.00       1.1 0.931E+00    0.09      0.09
     1.17       0.00      0.20       4.5 0.221E+00    0.12      0.12
     2.34       0.00      0.33       9.7 0.103E+00    0.18      0.18
     3.52       0.00      0.43      15.3 0.654E-01    0.23      0.23
     4.71       0.00      0.49      21.0 0.476E-01    0.28      0.28
     5.89       0.00      0.55      26.8 0.374E-01    0.32      0.32
     7.07       0.00      0.59      32.5 0.308E-01    0.35      0.35
     8.26       0.00      0.63      38.1 0.262E-01    0.38      0.38
     9.44       0.00      0.66      43.7 0.229E-01    0.41      0.41
    10.63       0.00      0.69      49.3 0.203E-01    0.44      0.44
    11.81       0.00      0.72      54.9 0.182E-01    0.47      0.47
    12.99       0.00      0.74      60.6 0.165E-01    0.49      0.49
    14.18       0.00      0.77      66.3 0.151E-01    0.52      0.52
    15.36       0.00      0.80      72.0 0.139E-01    0.54      0.54
    16.55       0.00      0.82      77.8 0.129E-01    0.56      0.56
    17.73       0.00      0.84      83.6 0.120E-01    0.59      0.59
    18.92       0.00      0.87      89.4 0.112E-01    0.61      0.61
    20.10       0.00      0.89      95.2 0.105E-01    0.63      0.63
    21.29       0.00      0.91     101.0 0.990E-02    0.65      0.65
    22.47       0.00      0.94     106.8 0.937E-02    0.67      0.67
    23.66       0.00      0.96     112.6 0.888E-02    0.69      0.69
    24.84       0.00      0.98     118.3 0.845E-02    0.71      0.71
  Merging of individual jet/plumes to form plane jet/plume:
    25.41       0.00      0.99     145.6 0.687E-02    0.90      5.90
    27.21       0.00      1.01     150.9 0.663E-02    0.93      5.93
    28.40       0.00      1.03     154.4 0.648E-02    0.95      5.95
    29.58       0.00      1.05     157.8 0.634E-02    0.97      5.97
    30.77       0.00      1.06     161.2 0.620E-02    1.00      6.00
    31.95       0.00      1.08     164.5 0.608E-02    1.02      6.02
    33.14       0.00      1.09     167.7 0.596E-02    1.04      6.04
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     34.32      0.00     1.11    170.9 0.585E-02   1.06      6.06
     35.51      0.00     1.12    174.0 0.575E-02   1.08      6.08
     36.69      0.00     1.13    177.1 0.565E-02   1.10      6.10
     37.88      0.00     1.15    180.1 0.555E-02   1.12      6.12
     39.06      0.00     1.16    183.1 0.546E-02   1.14      6.14
     40.25      0.00     1.17    185.9 0.538E-02   1.16      6.16
     41.43      0.00     1.19    188.7 0.530E-02   1.18      6.18
     42.62      0.00     1.20    191.5 0.522E-02   1.20      6.20
     43.80      0.00     1.21    194.2 0.515E-02   1.21      6.21
     44.99      0.00     1.22    196.8 0.508E-02   1.23      6.23
     46.17      0.00     1.23    199.3 0.502E-02   1.25      6.25
     47.36      0.00     1.24    201.8 0.496E-02   1.26      6.26
     48.54      0.00     1.24    204.2 0.490E-02   1.28      6.28
     49.73      0.00     1.25    206.5 0.484E-02   1.30      6.30
     50.92      0.00     1.26    208.8 0.479E-02   1.31      6.31
     52.10      0.00     1.27    210.9 0.474E-02   1.33      6.33
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.470E-02 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
     53.28      0.00     1.27    213.0 0.469E-02   1.34      6.34
     54.47      0.00     1.28    215.1 0.465E-02   1.35      6.35
     55.66      0.00     1.28    217.0 0.461E-02   1.37      6.37
     56.84      0.00     1.28    218.9 0.457E-02   1.38      6.38
     58.03      0.00     1.29    220.7 0.453E-02   1.39      6.39
     59.21      0.00     1.29    222.4 0.450E-02   1.40      6.40
  Terminal level in stratified ambient has been reached.
 Cumulative travel time =          625.3839 sec

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD235: LAYER/BOUNDARY/TERMINAL LAYER APPROACH

  Control volume inflow:
        X          Y        Z        S         C       BV        BH
     59.21      0.00     1.29    222.4 0.450E-02   1.40      6.40

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
   C  = average (bulk) concentration (includes reaction effects, if any)

        X          Y        Z        S         C       BV        BH       ZU       ZL
     57.81      0.00     1.29    222.4 0.450E-02   0.00      0.00     1.29     1.29
     58.65      0.00     1.29    222.4 0.450E-02   2.78      3.49     2.68     0.00
     59.49      0.00     1.29    227.4 0.440E-02   3.26      7.80     2.92     0.00
     60.33      0.00     1.29    281.9 0.355E-02   3.54      7.80     3.06     0.00
     61.18      0.00     1.29    330.6 0.303E-02   3.68      7.81     3.13     0.00
     62.02      0.00     1.29    348.3 0.287E-02   3.73      7.81     3.15     0.00
 Cumulative travel time =          662.3197 sec

END OF MOD235: LAYER/BOUNDARY/TERMINAL LAYER APPROACH
-----------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **
-----------------------------------------------------------------------------
BEGIN MOD242: BUOYANT TERMINAL LAYER SPREADING

 Profile definitions:
   BV = top-hat thickness, measured vertically
   BH = top-hat half-width, measured horizontally in y-direction
   ZU = upper plume boundary (Z-coordinate)
   ZL = lower plume boundary (Z-coordinate)
   S  = hydrodynamic average (bulk) dilution
```

C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
62.02	0.00	1.29	348.3	0.287E-02	3.73	7.81	3.15	0.00
91.70	0.00	1.29	486.9	0.205E-02	1.37	29.65	1.98	0.60
121.39	0.00	1.29	535.0	0.187E-02	1.05	42.68	1.81	0.77
151.08	0.00	1.29	567.8	0.176E-02	0.89	53.11	1.74	0.84
180.76	0.00	1.29	594.6	0.168E-02	0.80	62.11	1.69	0.89
210.45	0.00	1.29	618.5	0.162E-02	0.74	70.19	1.66	0.92
240.14	0.00	1.29	641.1	0.156E-02	0.69	77.60	1.63	0.94
269.82	0.00	1.29	663.3	0.151E-02	0.66	84.51	1.62	0.96
299.51	0.00	1.29	685.6	0.146E-02	0.63	91.04	1.60	0.97
329.20	0.00	1.29	708.4	0.141E-02	0.61	97.27	1.59	0.98
358.88	0.00	1.29	731.8	0.137E-02	0.59	103.25	1.59	0.99
388.57	0.00	1.29	755.9	0.132E-02	0.58	109.03	1.58	1.00
418.26	0.00	1.29	780.9	0.128E-02	0.57	114.65	1.57	1.00
447.94	0.00	1.29	806.8	0.124E-02	0.56	120.14	1.57	1.01
477.63	0.00	1.29	833.5	0.120E-02	0.55	125.52	1.57	1.01
507.32	0.00	1.29	861.2	0.116E-02	0.55	130.81	1.56	1.01
537.00	0.00	1.29	889.6	0.112E-02	0.55	136.02	1.56	1.02
566.69	0.00	1.29	919.0	0.109E-02	0.54	141.17	1.56	1.02
596.38	0.00	1.29	949.1	0.105E-02	0.54	146.27	1.56	1.02
626.06	0.00	1.29	980.1	0.102E-02	0.54	151.32	1.56	1.02
655.75	0.00	1.29	1011.8	0.988E-03	0.54	156.35	1.56	1.02
685.44	0.00	1.29	1044.2	0.958E-03	0.54	161.34	1.56	1.02
715.12	0.00	1.29	1077.3	0.928E-03	0.54	166.31	1.56	1.02
744.81	0.00	1.29	1111.1	0.900E-03	0.54	171.26	1.56	1.02
774.50	0.00	1.29	1145.5	0.873E-03	0.54	176.20	1.56	1.02
804.18	0.00	1.29	1180.6	0.847E-03	0.54	181.13	1.56	1.02
833.87	0.00	1.29	1216.2	0.822E-03	0.55	186.05	1.56	1.02
863.56	0.00	1.29	1252.4	0.798E-03	0.55	190.96	1.56	1.02
893.24	0.00	1.29	1289.2	0.776E-03	0.55	195.88	1.56	1.01
922.93	0.00	1.29	1326.5	0.754E-03	0.55	200.79	1.57	1.01
952.62	0.00	1.29	1364.3	0.733E-03	0.55	205.70	1.57	1.01
982.30	0.00	1.29	1402.7	0.713E-03	0.56	210.61	1.57	1.01
1011.99	0.00	1.29	1441.5	0.694E-03	0.56	215.52	1.57	1.01
1041.68	0.00	1.29	1480.8	0.675E-03	0.56	220.44	1.57	1.01
1071.36	0.00	1.29	1520.6	0.658E-03	0.56	225.36	1.57	1.01
1101.05	0.00	1.29	1560.8	0.641E-03	0.57	230.28	1.57	1.01
1130.74	0.00	1.29	1601.5	0.624E-03	0.57	235.21	1.57	1.00
1160.42	0.00	1.29	1642.6	0.609E-03	0.57	240.15	1.57	1.00
1190.11	0.00	1.29	1684.1	0.594E-03	0.57	245.09	1.58	1.00
1219.80	0.00	1.29	1726.1	0.579E-03	0.58	250.04	1.58	1.00
1249.48	0.00	1.29	1768.4	0.565E-03	0.58	255.00	1.58	1.00
1279.17	0.00	1.29	1811.2	0.552E-03	0.58	259.97	1.58	1.00
1308.86	0.00	1.29	1854.3	0.539E-03	0.58	264.94	1.58	1.00
1338.54	0.00	1.29	1897.8	0.527E-03	0.59	269.92	1.58	1.00
1368.23	0.00	1.29	1941.7	0.515E-03	0.59	274.90	1.58	0.99
1397.92	0.00	1.29	1986.0	0.504E-03	0.59	279.90	1.59	0.99
1427.60	0.00	1.29	2030.7	0.492E-03	0.60	284.90	1.59	0.99
1457.29	0.00	1.29	2075.7	0.482E-03	0.60	289.91	1.59	0.99
1486.98	0.00	1.29	2121.0	0.471E-03	0.60	294.93	1.59	0.99
1516.66	0.00	1.29	2166.7	0.462E-03	0.60	299.96	1.59	0.99
1546.35	0.00	1.29	2212.8	0.452E-03	0.61	305.00	1.59	0.99

Cumulative travel time = 20193.0273 sec

Plume is ATTACHED to LEFT bank/shore.
Plume width is now determined from LEFT bank/shore.

Plume Stage 2 (bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
1546.35	305.00	1.29	2212.8	0.452E-03	0.61	609.99	1.59	0.99
1555.42	305.00	1.29	2225.2	0.449E-03	0.61	611.27	1.59	0.98
1564.50	305.00	1.29	2237.5	0.447E-03	0.61	612.55	1.59	0.98
1573.57	305.00	1.29	2249.8	0.444E-03	0.61	613.84	1.60	0.98
1582.64	305.00	1.29	2262.1	0.442E-03	0.61	615.14	1.60	0.98

1591.72	305.00	1.29	2274.3	0.440E-03	0.62	616.44	1.60	0.98
1600.79	305.00	1.29	2286.5	0.437E-03	0.62	617.74	1.60	0.98
1609.86	305.00	1.29	2298.7	0.435E-03	0.62	619.05	1.60	0.98
1618.93	305.00	1.29	2310.8	0.433E-03	0.62	620.36	1.60	0.98
1628.01	305.00	1.29	2322.8	0.431E-03	0.62	621.67	1.60	0.98
1637.08	305.00	1.29	2334.9	0.428E-03	0.63	623.00	1.60	0.98
1646.15	305.00	1.29	2346.9	0.426E-03	0.63	624.32	1.60	0.98
1655.23	305.00	1.29	2358.8	0.424E-03	0.63	625.65	1.60	0.97
1664.30	305.00	1.29	2370.8	0.422E-03	0.63	626.99	1.61	0.97
1673.37	305.00	1.29	2382.7	0.420E-03	0.63	628.32	1.61	0.97
1682.45	305.00	1.29	2394.6	0.418E-03	0.64	629.67	1.61	0.97
1691.52	305.00	1.29	2406.4	0.416E-03	0.64	631.01	1.61	0.97
1700.59	305.00	1.29	2418.2	0.414E-03	0.64	632.36	1.61	0.97
1709.66	305.00	1.29	2430.0	0.412E-03	0.64	633.72	1.61	0.97
1718.74	305.00	1.29	2441.8	0.410E-03	0.64	635.08	1.61	0.97
1727.81	305.00	1.29	2453.5	0.408E-03	0.64	636.44	1.61	0.97
1736.88	305.00	1.29	2465.2	0.406E-03	0.65	637.80	1.61	0.97
1745.96	305.00	1.29	2476.9	0.404E-03	0.65	639.17	1.61	0.97
1755.03	305.00	1.29	2488.6	0.402E-03	0.65	640.55	1.61	0.96
1764.10	305.00	1.29	2500.2	0.400E-03	0.65	641.93	1.61	0.96
1773.18	305.00	1.29	2511.9	0.398E-03	0.65	643.31	1.62	0.96
1782.25	305.00	1.29	2523.5	0.396E-03	0.65	644.69	1.62	0.96
1791.32	305.00	1.29	2535.0	0.394E-03	0.66	646.08	1.62	0.96
1800.39	305.00	1.29	2546.6	0.393E-03	0.66	647.47	1.62	0.96
1809.47	305.00	1.29	2558.1	0.391E-03	0.66	648.86	1.62	0.96
1818.54	305.00	1.29	2569.7	0.389E-03	0.66	650.26	1.62	0.96
1827.61	305.00	1.29	2581.2	0.387E-03	0.66	651.66	1.62	0.96
1836.69	305.00	1.29	2592.6	0.386E-03	0.66	653.07	1.62	0.96
1845.76	305.00	1.29	2604.1	0.384E-03	0.66	654.48	1.62	0.96
1854.83	305.00	1.29	2615.6	0.382E-03	0.67	655.89	1.62	0.96
1863.91	305.00	1.29	2627.0	0.381E-03	0.67	657.30	1.62	0.96
1872.98	305.00	1.29	2638.4	0.379E-03	0.67	658.72	1.62	0.95
1882.05	305.00	1.29	2649.8	0.377E-03	0.67	660.14	1.62	0.95
1891.12	305.00	1.29	2661.2	0.376E-03	0.67	661.56	1.63	0.95
1900.20	305.00	1.29	2672.6	0.374E-03	0.67	662.99	1.63	0.95
1909.27	305.00	1.29	2683.9	0.373E-03	0.68	664.42	1.63	0.95
1918.34	305.00	1.29	2695.3	0.371E-03	0.68	665.85	1.63	0.95
1927.42	305.00	1.29	2706.6	0.369E-03	0.68	667.29	1.63	0.95
1936.49	305.00	1.29	2717.9	0.368E-03	0.68	668.73	1.63	0.95
1945.56	305.00	1.29	2729.3	0.366E-03	0.68	670.17	1.63	0.95
1954.64	305.00	1.29	2740.6	0.365E-03	0.68	671.61	1.63	0.95
1963.71	305.00	1.29	2751.8	0.363E-03	0.68	673.06	1.63	0.95
1972.78	305.00	1.29	2763.1	0.362E-03	0.68	674.51	1.63	0.95
1981.85	305.00	1.29	2774.4	0.360E-03	0.69	675.96	1.63	0.95
1990.93	305.00	1.29	2785.6	0.359E-03	0.69	677.42	1.63	0.95
2000.00	305.00	1.29	2796.9	0.358E-03	0.69	678.87	1.63	0.94

Cumulative travel time = 26162.0820 sec

Simulation limit based on maximum specified distance = 2000.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD242: BUOYANT TERMINAL LAYER SPREADING

CORMIX2: Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222

Appendix 7.1

Legislation and Standards for
Land Contamination Assessment

Legislation and Standards for Land Contamination Assessment

The relevant legislation, standards and guidelines applicable to the present study for the assessment of land contamination include:

- Annex 19 of the Technical Memorandum on Environmental Impact Assessment Ordinance (TM-EIAO), Guidelines for Assessment of Impact Assessment Process (TM-EIA), Guidelines for Assessment of Impact On Sites of Cultural Heritage and Other Impacts (Section 3: Potential Contaminated Land Issues), Environmental Protection Department (EPD), 1997;
- Guidance Note for Contaminated Land Assessment and Remediation EPD 2007;
- Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management, EPD, 2007; and
- Practice Guide for Investigation and Remediation of Contaminated Land, EPD, 2011.

Under Annex 19 of the TM-EIAO, a number of potentially contaminating historical land uses should be considered, including oil installations, gas works, metal workshops, car repair and dismantling workshops, which have the potential to cause or have caused land contamination.

In accordance with EPD's *Guidance Note for Contamination Land Assessment and Remediation*, a contamination assessment evaluation should:

- provide a clear and detailed account of the present land-use and the relevant past land history, in relation to possible land contamination;
- identify areas of potential contamination and associated impacts, risks or hazards; and
- submit a plan to evaluate the actual contamination conditions for soil and/or groundwater, if required.

The *Guidance Manual for Use of Risk-Based Remediation Goals (RBRGs) for Contaminated Land Management* introduces the risk based approach in land contamination assessment and present instructions for comparison of soil and groundwater data to the Risk-Based Remediation Goals (RBRGs) for 54 chemicals of concern commonly found in Hong Kong. The RBRGs were derived to suit Hong Kong conditions by following the international practice of adopting a risk-based methodology for contaminated land assessment and remediation and were designed to protect the health of people who could potentially be exposed to land impacted by chemicals under four broad post restoration land use categories. The RBRGs also serve as the remediation targets if remediation is necessary.

The EPD's *Practice Guide for Investigation and Remediation of Contaminated Land* includes a summary of the general steps of a contamination assessment study, which include site appraisal, site investigation and remediation.

Appendix 7.2

Historical Aerial Photos for Discovery Bay

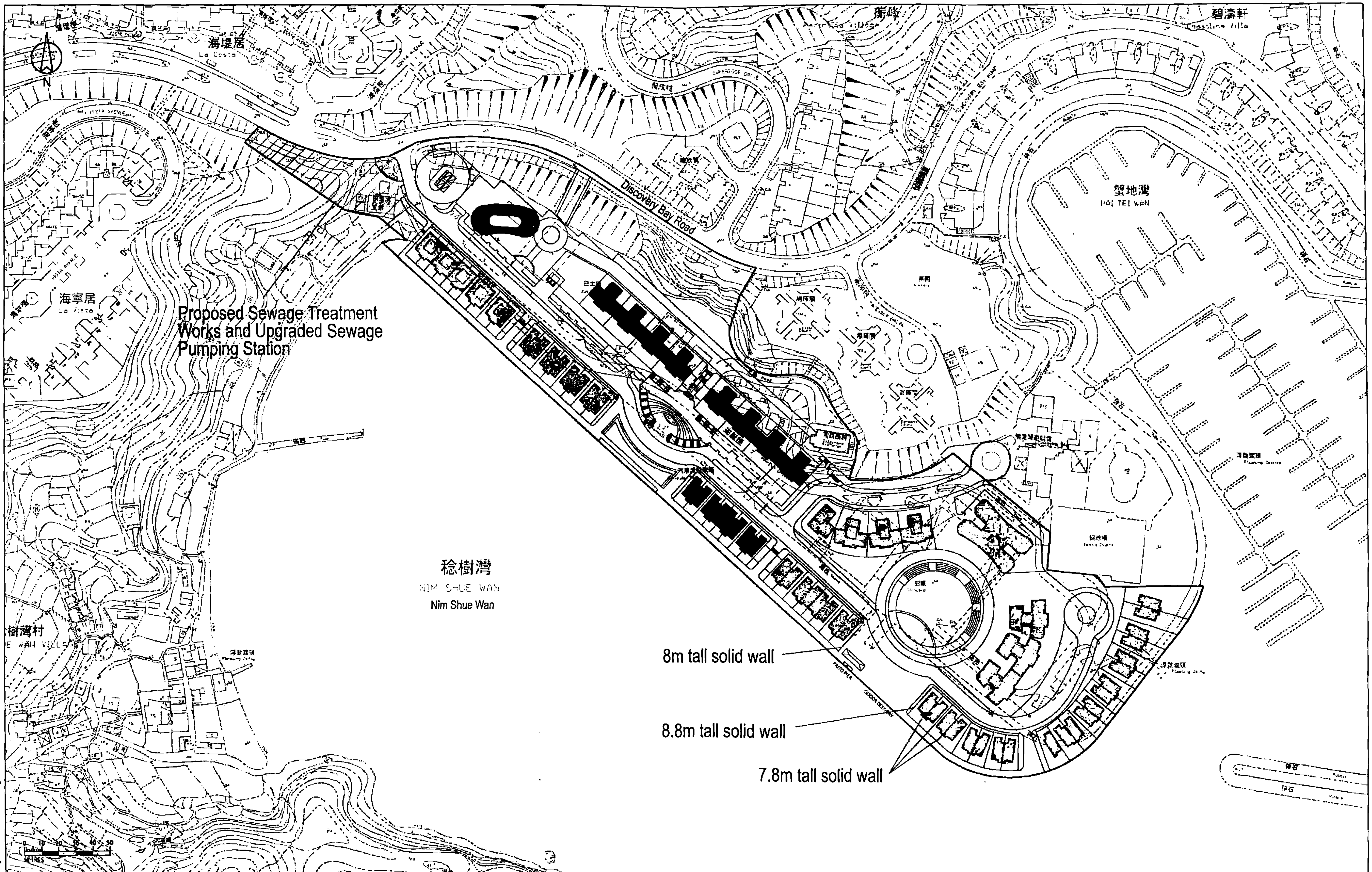
G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Aerial Photo_1973.dgn

G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Aerial Photo_1982.dgn

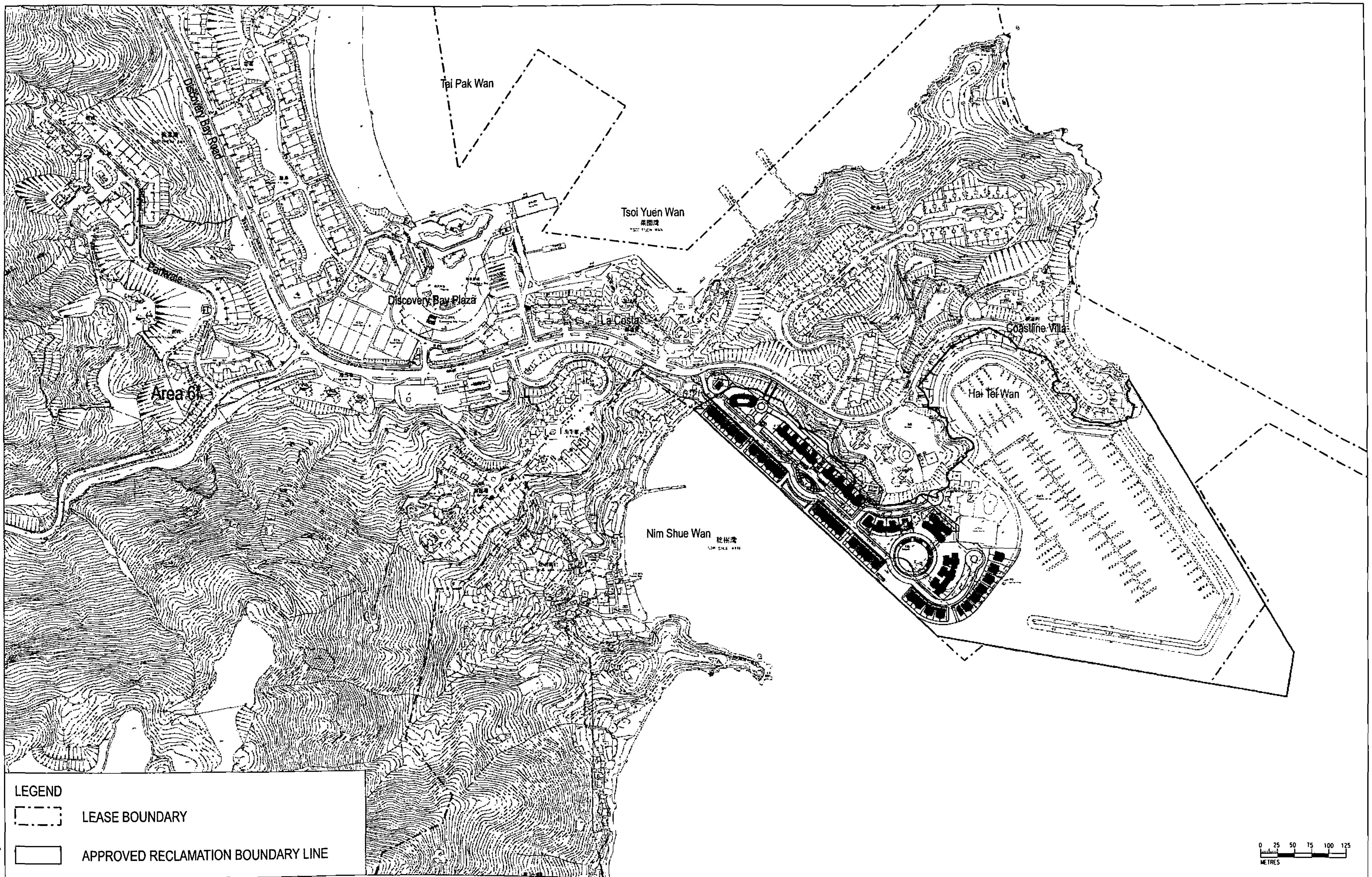
G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Aerial Photo_1993.dgn


YEAR 2012
N
Tai Pak Wan
Discovery
Plaza
Nim Shue Wan
Area 10b
Nim Shue Wan
0 25 50 75 100 125
METRES

Figures



Job Title		FIGURE 2-1
DISCOVERY BAY - OPTIMIZATION OF LAND USE		
Date: OCT 16	Scale: 1 : 2000	Drawing Title: POTENTIAL DEVELOPMENT AREA IN DISCOVERY BAY (AREA 10b)
Drawn: MW	Job No: 235928	ARUP



Job Title: DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 2-2

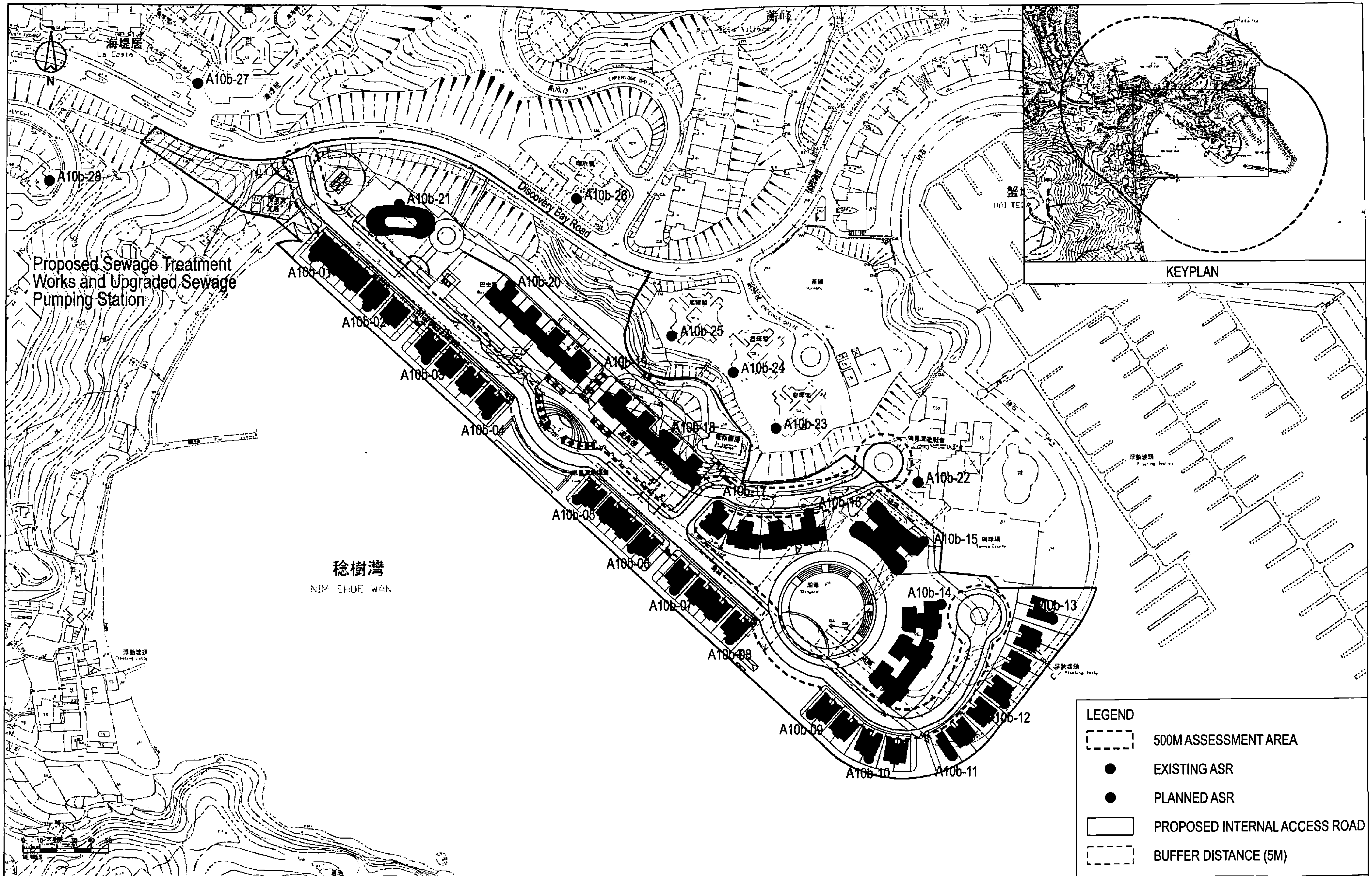
Date: OCT 16 | Scale: 1:5000

Drawn: MW | Job No.: 235928

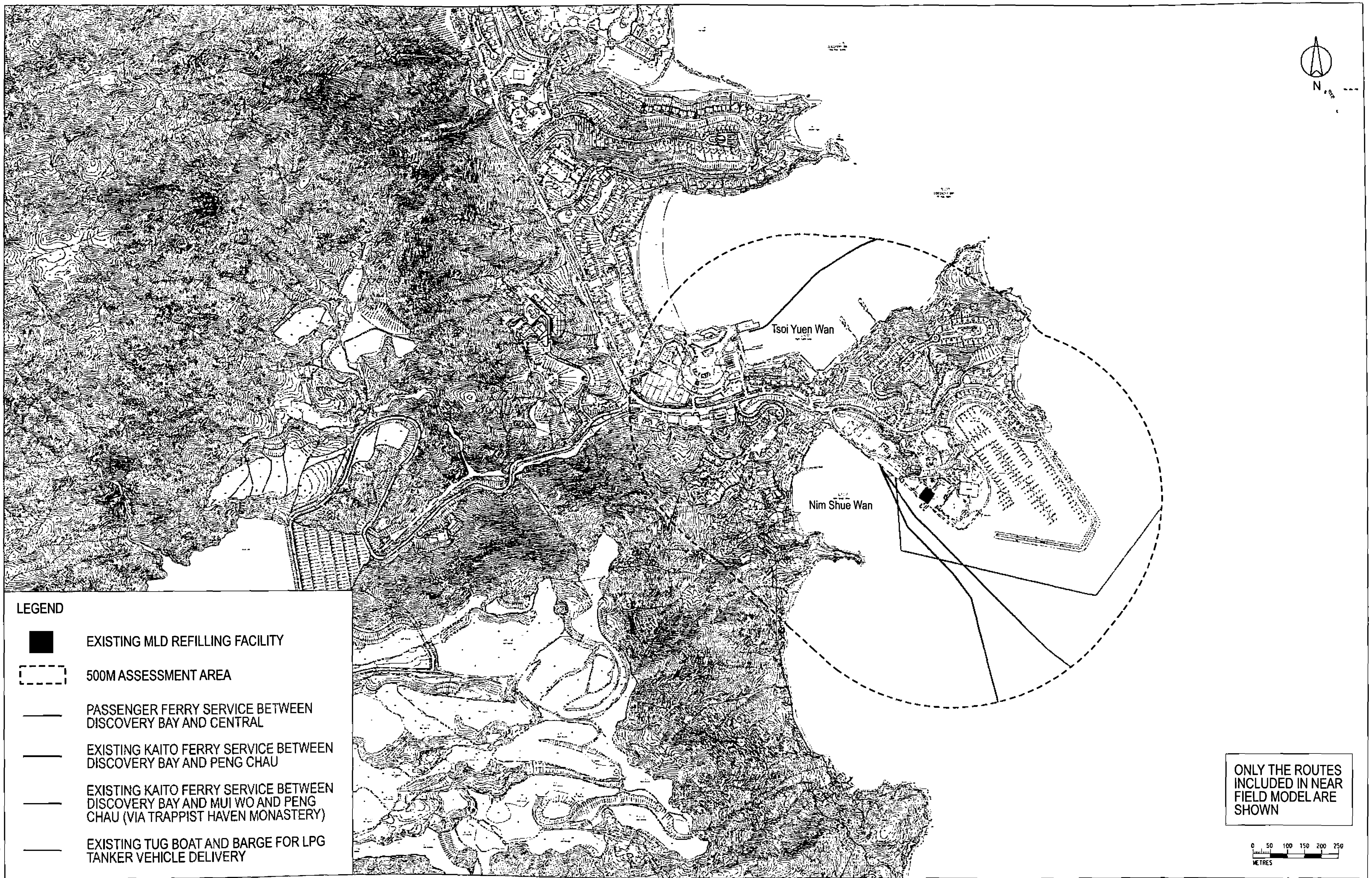
Drawing Title: APPROVED RECLAMATION BOUNDARY UNDER THE FORESHORE ON SEABED ORDINANCE IN 1977

ARUP

G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 2-2 - Approved Reclamation Boundary under the Foreshore on Seabed Ordinance in 1977.dgn



Job Title		
DISCOVERY BAY - OPTIMIZATION OF LAND USE		FIGURE 4-1
Date: SEP 16	Scale: 1 : 2000	Drawing Title: LOCATION OF REPRESENTATIVE ASRs
Drawn: GL	Job No. 235928	ARUP

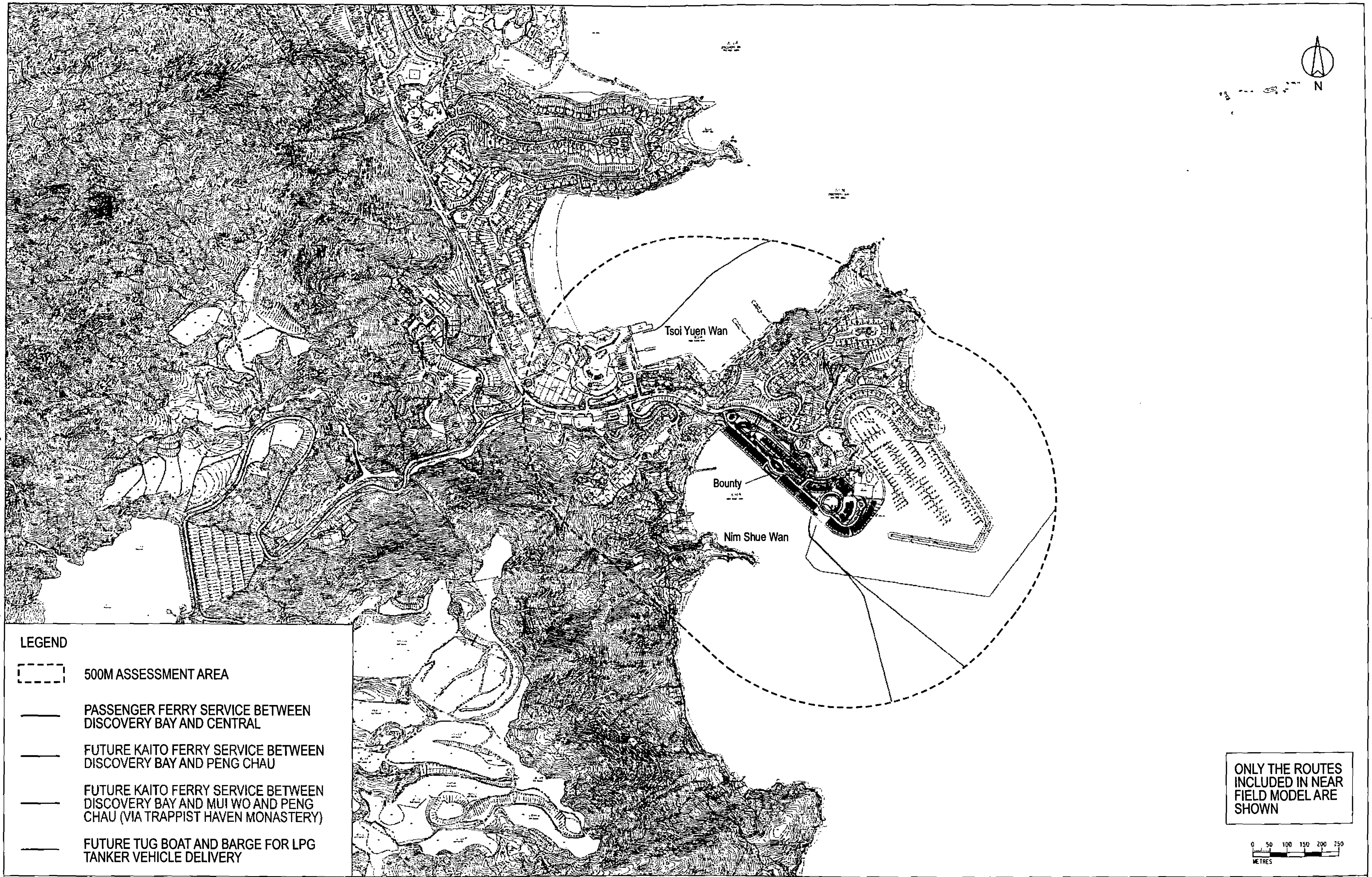


Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-2

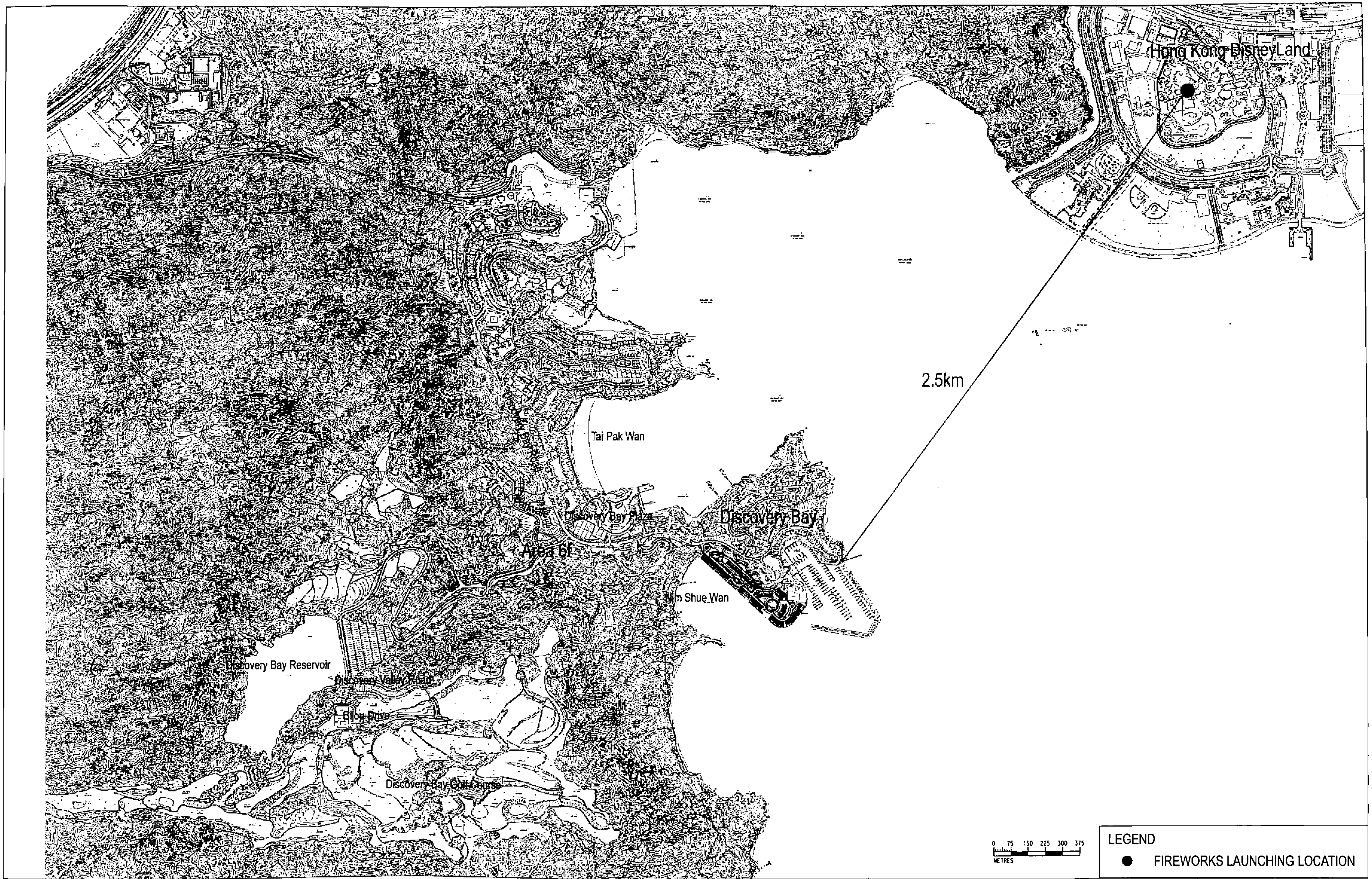
Date	Scale	Drawing Title
OCT 16	1:10000	CURRENT NAVIGATION ROUTES OF VESSELS WITHIN ASSESSMENT AREA
Drawn: GL	Job No. 235928	

ARUP



Job Title			FIGURE 4-3
DISCOVERY BAY - OPTIMIZATION OF LAND USE			
Date: OCT 16	Scale: 1:10000	Drawing Title: Future Navigation Routes of Vessels within Assessment Area	ARUP
Drawn: MW	Job No.: 235928		

G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-3 - Future Navigation Routes of Vessels within Assessmen Area.dgn

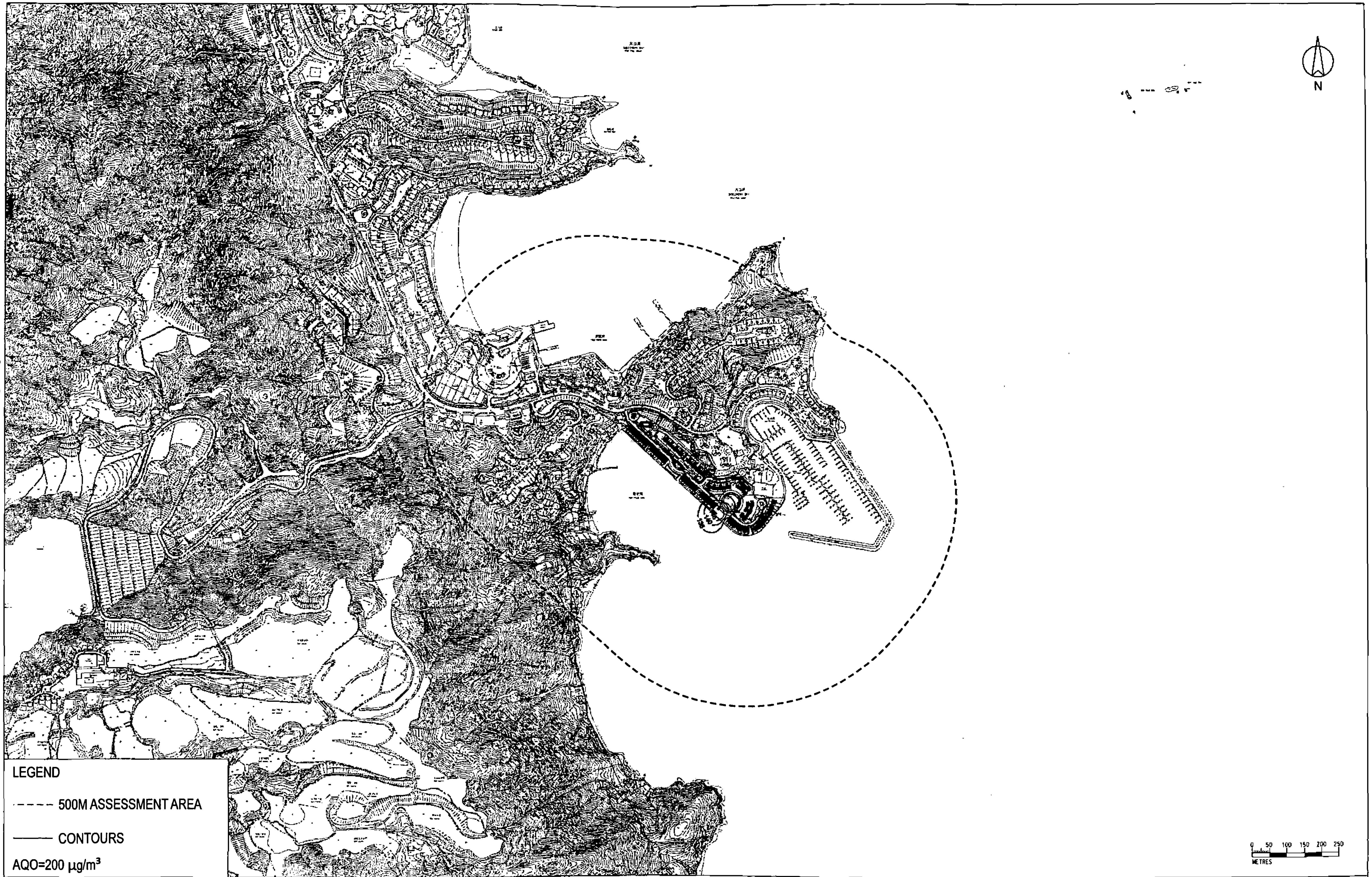


Job Title: DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-4

Date	Scale	Drawing Title
OCT 16	AS SHOWN	Fireworks Launching Location
Drawn: MW	Job No.: 235928	

ARUP



LEGEND

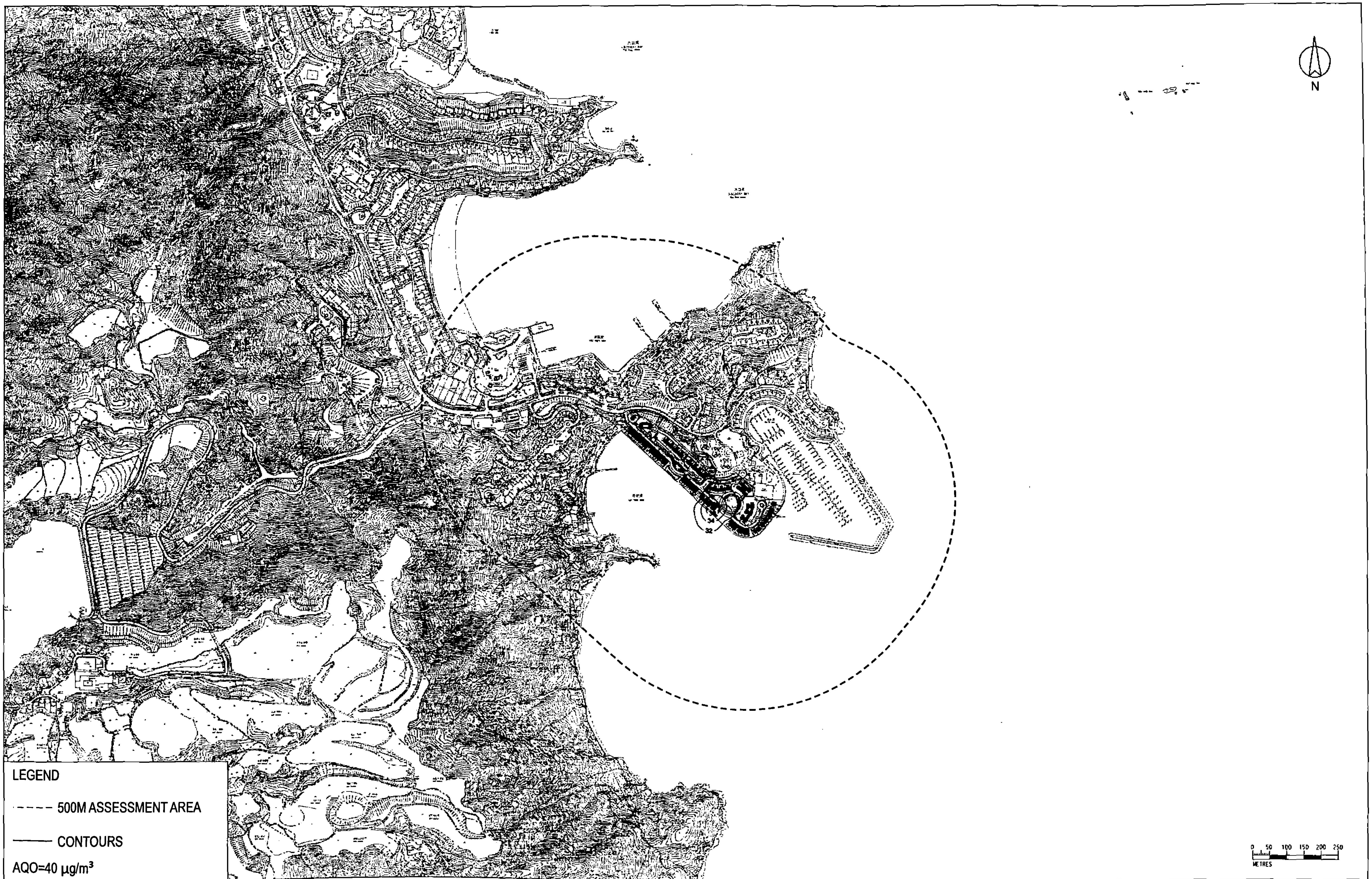
- - - - 500M ASSESSMENT AREA

——— CONTOURS

AQO=200 $\mu g/m^3$

Job Title			
DISCOVERY BAY - OPTIMIZATION OF LAND USE			FIGURE 4-5
Date: OCT 16	Scale: 1:10000	Drawing Title: Contours of Cumulative 19th highest 1-hour NO_2 Concentration at 5m above ground	ARUP
Drawn: GL	Job No. 235928		

G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-5.Contours of Cumulative 19th highest 1-hour NO2 Concentration at 5m above ground.dgn



LEGEND

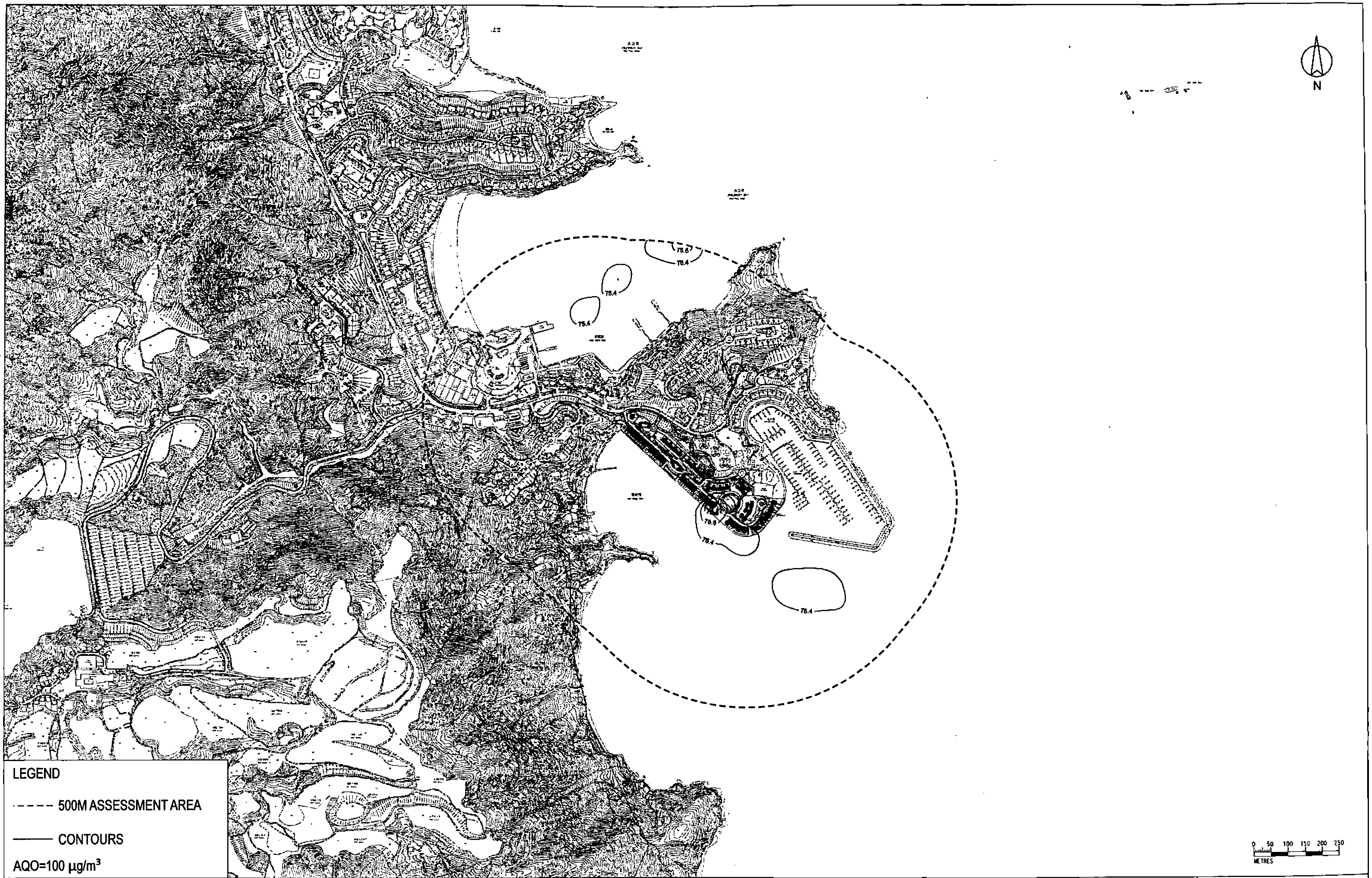
- - - - 500M ASSESSMENT AREA

——— CONTOURS

AQO=40 $\mu g/m^3$

Job Title			
DISCOVERY BAY - OPTIMIZATION OF LAND USE			FIGURE 4-6
Date: OCT 16	Scale: 1:10000	Drawing Title: Contours of Cumulative Annual-average NO_2 Concentration at 5m above ground	ARUP
Drawn: GL	Job No.: 235928		

G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-6_Contours of Cumulative Annual-average NO2 Concentration at 5m above ground.dgn



Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-7

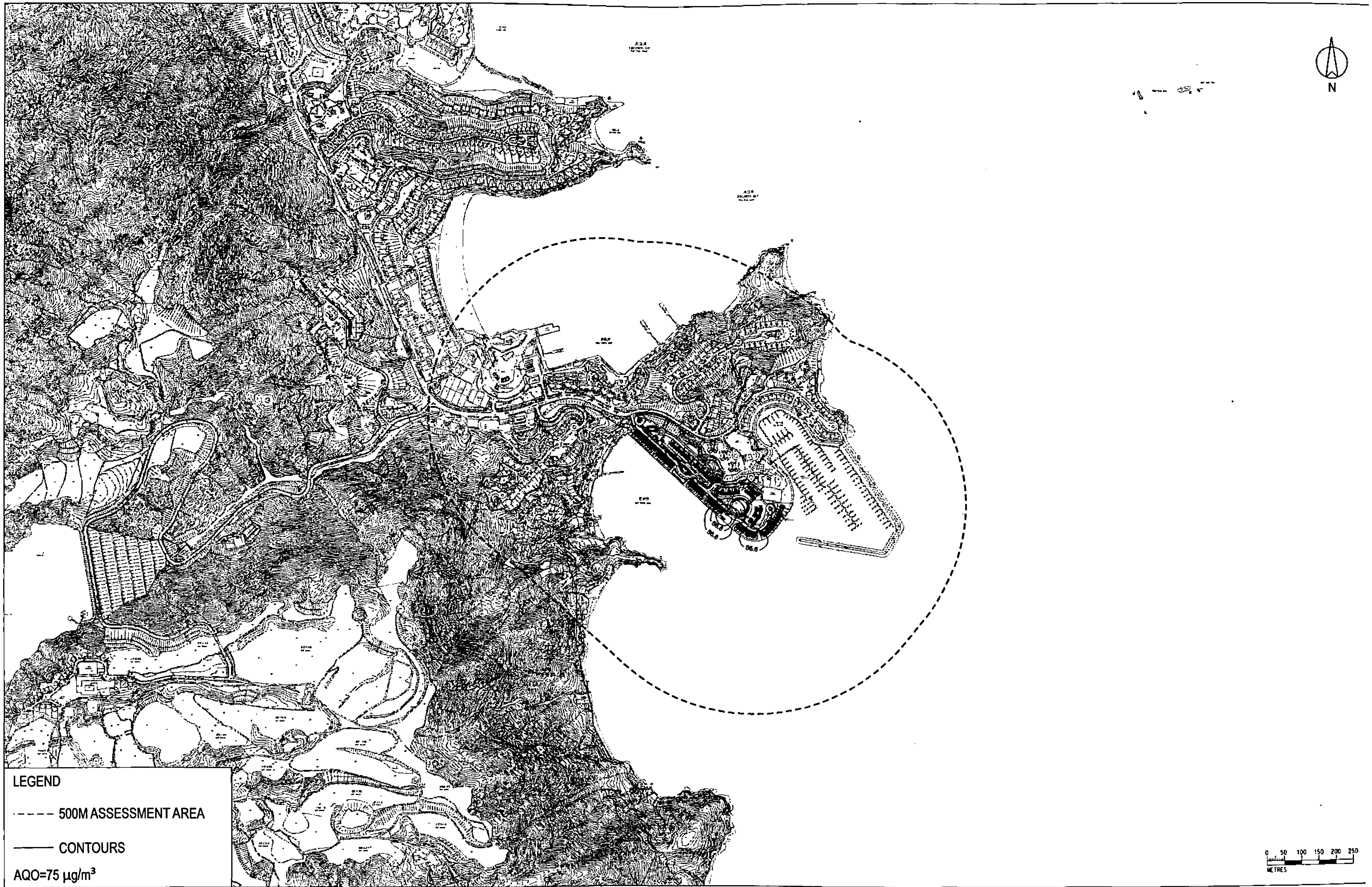
Date	Scale	Drawing Title
OCT 16	1:10000	Contours of Cumulative 10th highest 24-hour RSP Concentration at 10m above ground
Drawn: GL	Job No.: 235928	

ARUP

G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-7_Contours of Cumulative 10th highest 24-hour RSP Concentration at 10m above ground.dgn

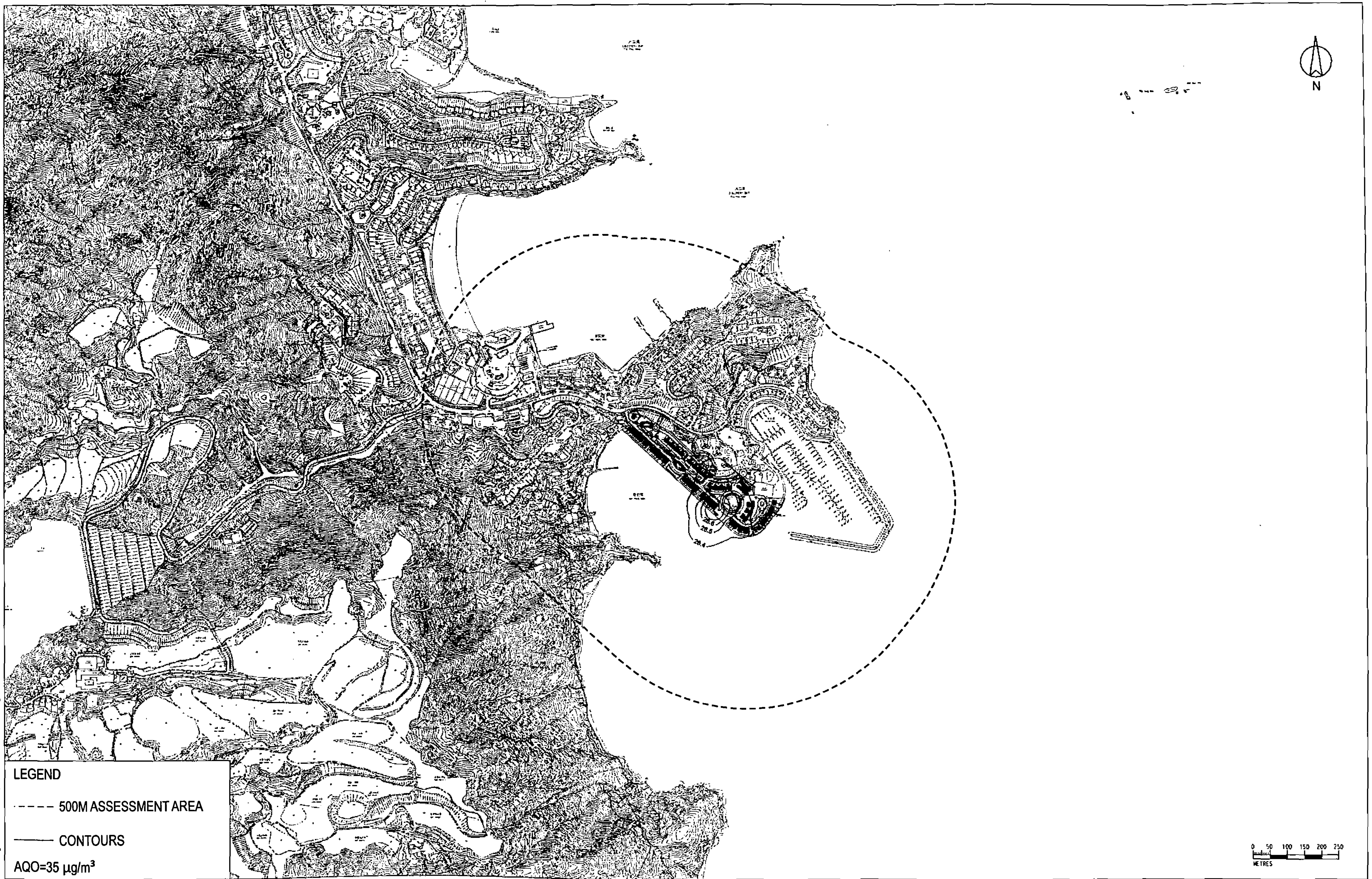
Job Title			FIGURE 4-8
DISCOVERY BAY - OPTIMIZATION OF LAND USE			
Date: OCT 16	Scale: 1:10000	Drawing Title: Contours of Cumulative Annual-average RSP Concentration at 5m above ground	ARUP
Drawn: GL	Job No. 235928		

G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-8.Contours of Cumulative Annual-average RSP Concentration at 5m above ground.dgn

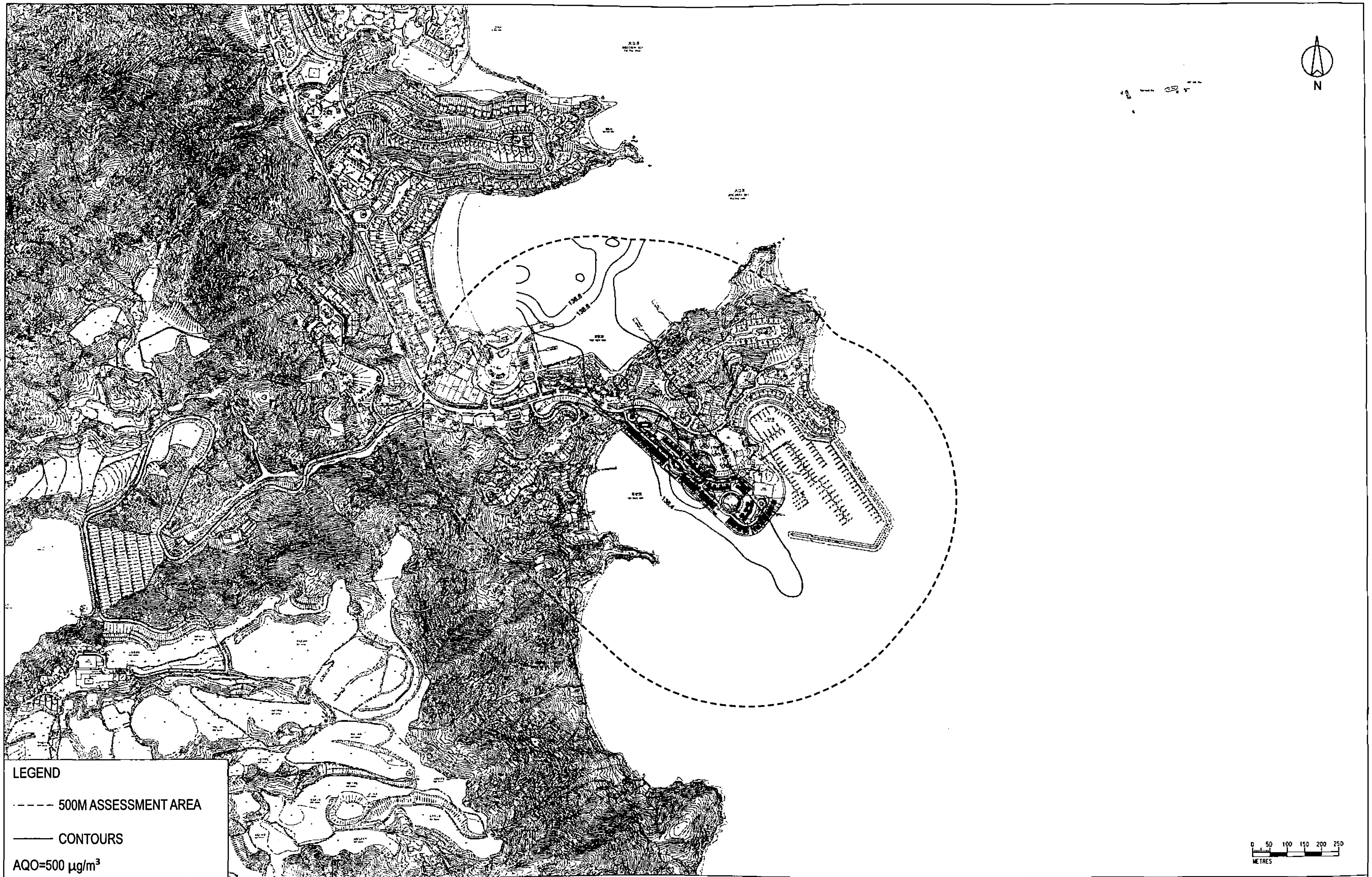


G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-9_Contours of Cumulative 10th highest 24-hour FSP Concentration at 5m above ground.dgn

Job Title: DISCOVERY BAY - OPTIMIZATION OF LAND USE			FIGURE 4-9
Date: OCT 16	Scale: 1:10000	Drawing Title: Contours of Cumulative 10th highest 24-hour FSP Concentration at 5m above ground	ARUP
Drawn: GL	Job No. 235928		

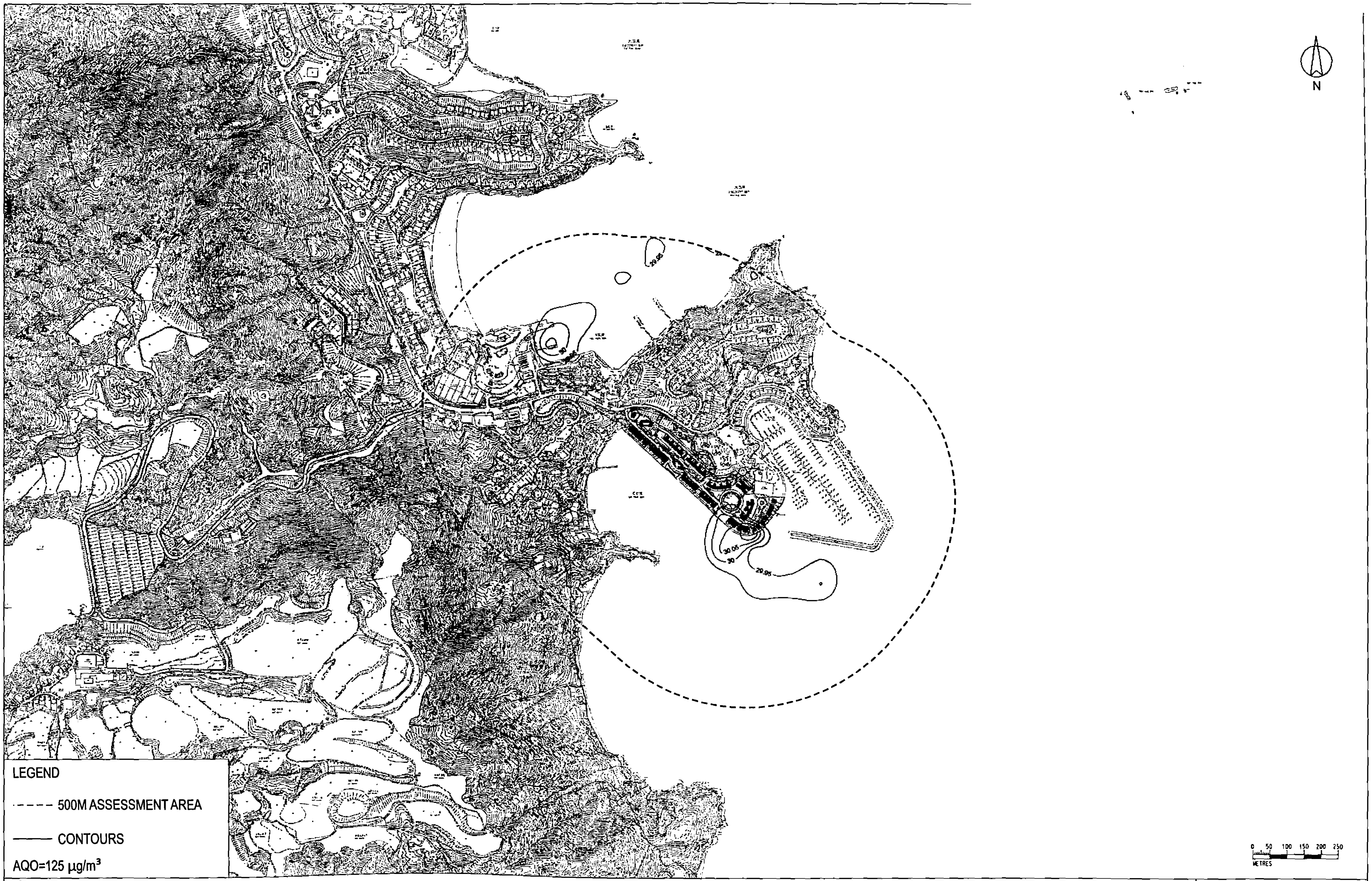


Job Title			
DISCOVERY BAY - OPTIMIZATION OF LAND USE			FIGURE 4-10
Date: OCT 16	Scale: 1:10000	Drawing Title: Contours of Cumulative Annual-average FSP Concentration at 5m above ground	ARUP
Drawn: GL	Job No.: 235928		



Job Title			FIGURE 4-11
DISCOVERY BAY - OPTIMIZATION OF LAND USE			
Date: OCT 16	Scale: 1:10000	Drawing Title: Contours of Cumulative Maximum 10-minute SO_2 Concentration at 40m above ground	ARUP
Drawn: GL	Job No. 235928		

G:\env\project\235928\13 Drawing Deliverables\report\02-EAS\Area 10b\Figure 4-11_Contours of Cumulative Maximum 10-minute SO2 Concentration at 40m above ground.dgn

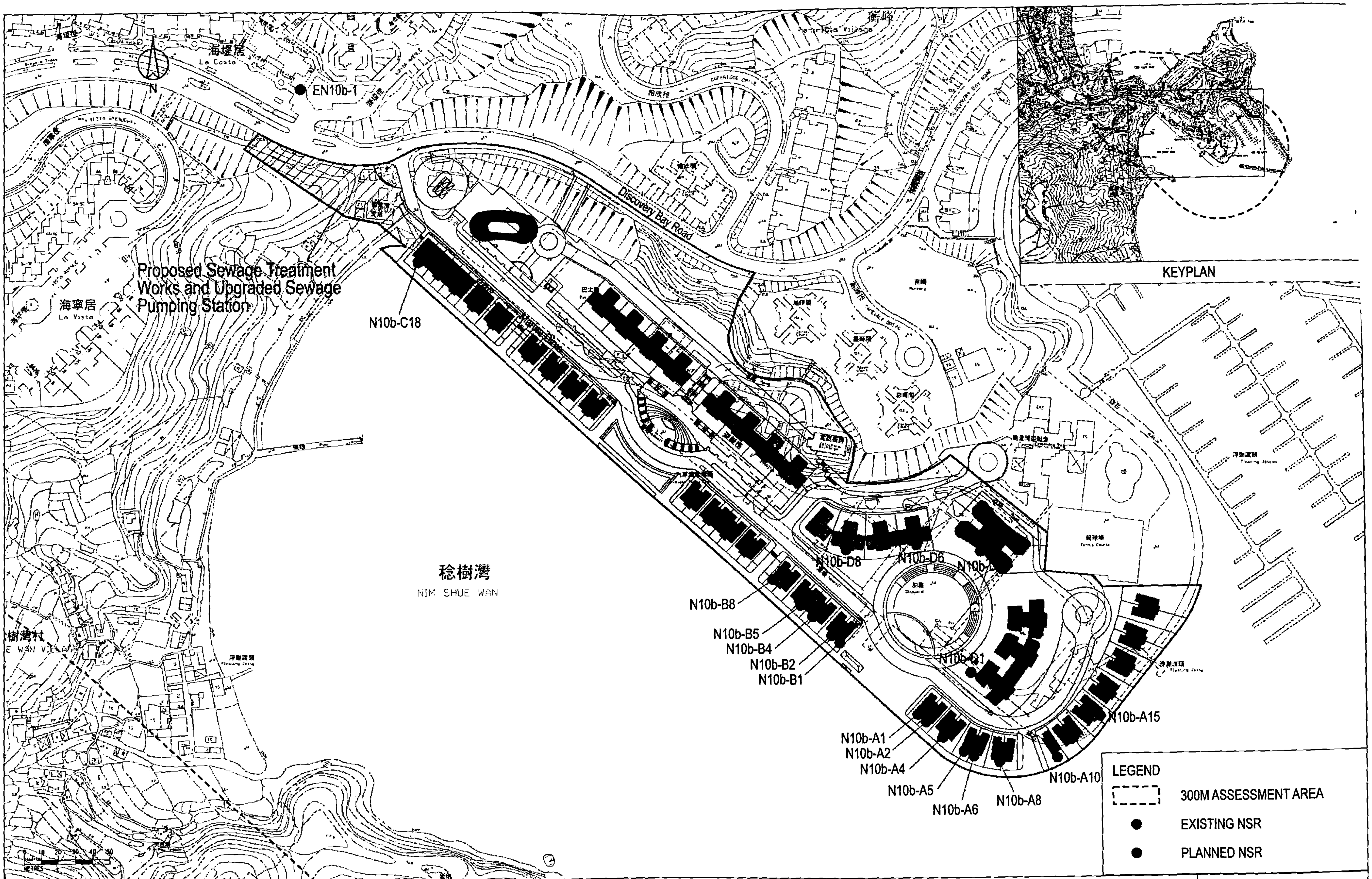


Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

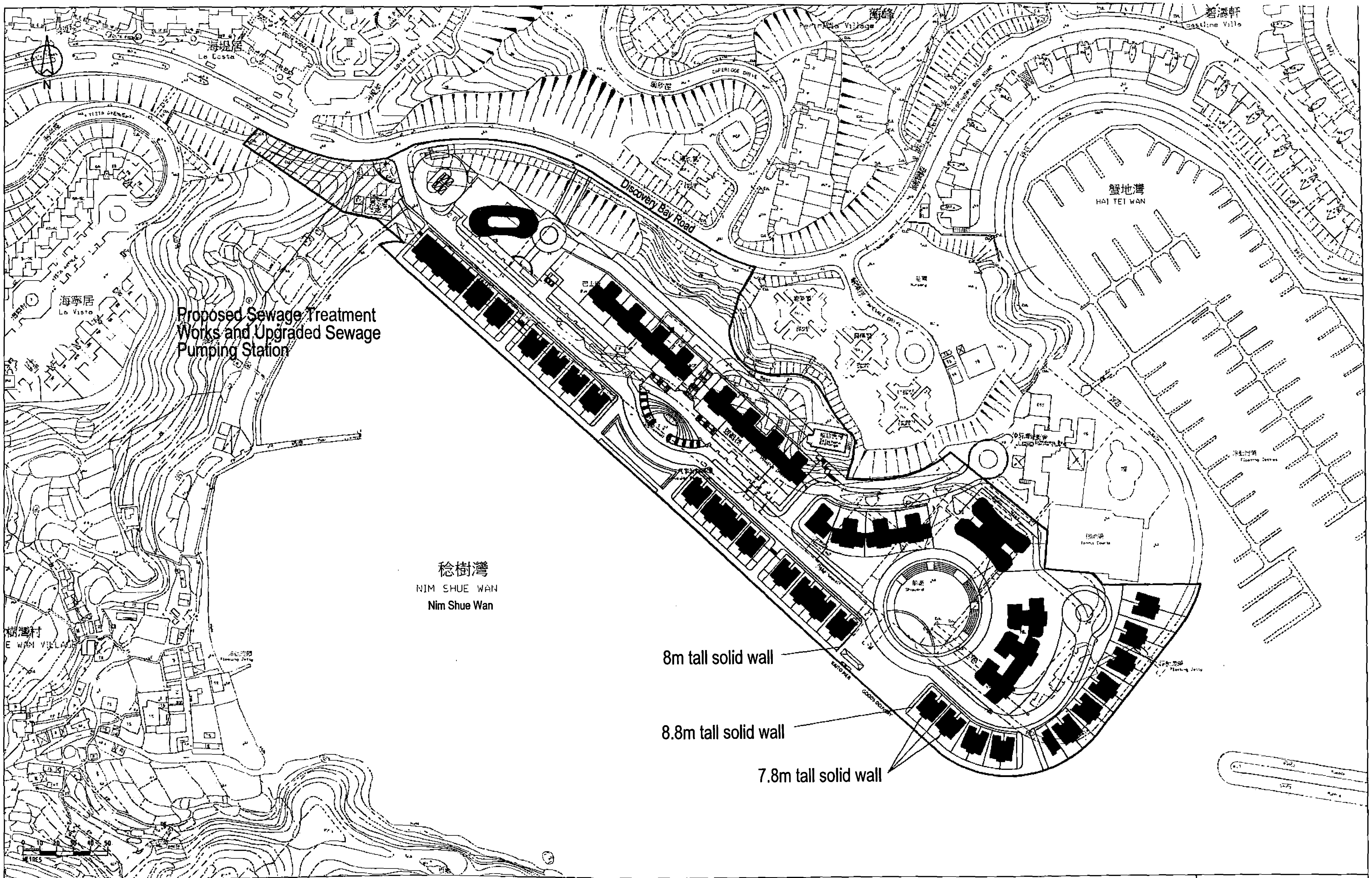
FIGURE 4-12

Date	Scale	Drawing Title
OCT 16	1:10000	Contours of Cumulative 4th highest 24-hour SO_2 Concentration at 20m above ground
Drawn: GL	Job No. 235928	

ARUP



Job Title			
DISCOVERY BAY - OPTIMIZATION OF LAND USE			FIGURE 5-1
Date: OCT 16	Scale: 1 : 2000	Drawing Title: LAYOUT AND SELECTED NSRs OF AREA 10B	ARUP
Drawn: MW	Job No. 235928		



Job Title: DISCOVERY BAY - OPTIMIZATION OF LAND USE			FIGURE 5-2
Date: OCT 16	Scale: 1 : 2000	Drawing Title: LOCATIONS OF NOISE MITIGATION MEASURES (AREA 10b)	ARUP
Drawn: MW	Job No. 235928		