Annex D

Revised Environmental Study

Hong Kong Resort Company Limited

Optimization of Land Use in Discovery Bay

Environmental Study (Area 6f)

235928

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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 only refers to Area 6f. The potential development area is included in the latest approved Discovery Bay Outline Zoning Plan as "Other Specified Uses (Staff Quarters)", despite the fact that some of their development parameters are proposed to be amended.

An Environmental Study for Area 6f has been conducted on the latest development proposal to demonstrate land use compatibility. 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.

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 source include the fireworks at Disney Theme Park. A literature review on best available information including Environmental Protection Department (EPD)'s publications, approved Environmental Impact Assessment (EIA) Reports and 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. Results indicate that the predicted air quality impacts would not exceed the relevant Air Quality Objectives. At the same time, the separation distance between the road and the proposed development has fulfilled the requirement stipulated in the Hong Kong Planning and Standard

Guideline. Given that the relatively low traffic volume within Discovery Bay, the proposed land uses would not be subject to insurmountable air quality impacts. In case a small separate sewage treatment work is required, it will be designed to contain any odour that may be generated.

Noise

All the relevant noise sources in the vicinity that would have noise impacts on the proposed developments have been identified and assessed. The noise sources include the 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 planned noise sensitive receivers, taking into account of a number of parameters including but not limited to the separation distance, operational schedule, screening effects etc. Results indicate that the predicted noise impacts would not exceed the relevant noise limits and hence the proposed land uses at Area 6f would not be subject to adverse noise impacts and hence mitigation measures are not required. In case a small separate sewage treatment work is required, sufficient noise attenuation measures shall be implemented to alleviate the noise generated from the operation to ensure compliance with the statutory noise requirements.

Water Quality

During the construction phase, site runoff and sewage can be readily alleviated by implementing good site practice. Sewerage generated during operational phase will be conveyed to a sewerage system. In case a small separate sewage treatment work is required, it will be designed to comply with the relevant standards for effluent discharge for inland waters and inshore waters accordingly.

Other aspects

Site inspection and review of historical photos have revealed that the area within the potential development area have low potential of land contamination. Also, adverse ecological impacts are not anticipated.

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.

1.1.1.4 This report addresses those comments relating to noise, air quality, water quality, land contamination and ecology for Area 6f. 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 aims to address the key comments mentioned by various government departments, in support of a rezoning application for Area 6f to demonstrate land use compatibility. 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; and
- Propose mitigation measures where needed.

2 Project Description

2.1 Land uses

2.1.1.1 The current land use for the area include "Other Specified Use (OU) (Staff Quarters)". 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 apartment buildings. The following table summarises both the current and proposed land uses for all the potential development area. **Figure 2-1** illustrates respective location of Area 6f.

Table 2.1: Current and proposed land uses

Area	Land uses	
	Existing [1]	Proposed
Area 6f	"OU (Staff quarters)"	Residential apartment buildings

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

2.1.1.2 Area 6f is located west of Parkvale Village around Discovery Valley Road and Parkvale Drive. Site observation reveals that the site has partly been previously formed and cleared, and is mainly occupied by grassland. Within Area 6f, it is proposed to have residential buildings, together with the necessary infrastructure and landscaping elements.

2.1.1.3 The total site area for potential development area is about 0.83 ha and would accommodate a total of about 1,190 additional population.

2.1.1.4 The key elements for the development of Area 6f include the site formation work, access road, superstructure for buildings and various utilities. For sewerage system, the sewage generated will be conveyed to a sewerage system, as discussed in the Sewerage Impact Assessment accompanying this planning application. In case a small separate sewage treatment work (~400m^3/day) is required within Area 6f, the treated effluent will be discharged in the neighbouring nullah and then discharged into the neighbouring marine water without the need for a marine outfall.

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

2.2 Possible Construction Methodologies

2.2.1.1 The construction methodologies are yet to be developed in the subsequent stages. Nevertheless, it is anticipated that the land-based site formation work for Area 6f would adopt an open cut approach.

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 Concurrent Projects

2.4.1.1 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.

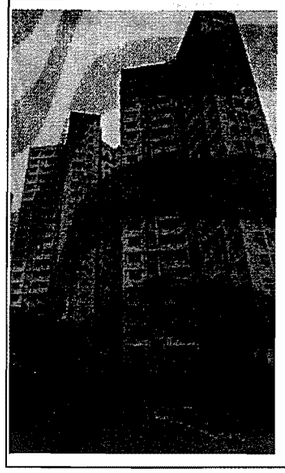
2.4.1.2 This is a strategic study initiated by the Government to study the feasibility of implementing artificial islands in the water to the east of Discovery Bay to support the longer term development of Hong Kong. At the time of preparing this report, there are neither development options nor confirmed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

2.4.1.3 Residential development is also being considered in Area 10b within Discovery Bay. Given that Area 10b is located at more than 700m away, adverse cumulative impacts are unlikely.

3 Site Inspection

3.1.1.1 Several site visits were carried out in April – June 2014 to identify potential sources of environmental impact and sensitive receivers in the vicinity of the potential development area. **Section 2** has briefly described the general context of these and the following table present the images for the potential development area.

Table 3.1: Existing environment conditions

Viewpoint 1: Existing nearby residential buildings	Viewpoint 2: Area 6f occupied by grassland and trees
	

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.** Moreover, a number of existing ASRs are also identified. The representative existing ASRs are summarized in **Table 4.2** and illustrated in **Figure 4-1.**

Table 4.1: Representative ASRs for air quality assessment

ASR ID	Description	Land use	Number of Storey	Building Height (mPD) (Podium / Upper Floor)
A6f-01	Planned high rise building	Residential	18	65
A6f-02	Planned high rise building	Residential	18	65

Table 4.2: Representative Existing ASRs

ASR ID	Description	Land use	Approximate Distance from the Site Boundary
A6f-03	Woodland Court	Residential	45m
A6f-04	Crystal Court	Residential	45m

4.1.1.2 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, construction dust will be generated from the construction activities including site formation, foundation and

[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.

superstructure works. In consideration of small scale development at Area 6f (i.e. two residential buildings only), construction dust emission from construction works is considered not significant provided that relevant mitigation measures recommended in the Air Pollution Control (Construction Dust) Regulation are implemented to control the dust emissions. Therefore, adverse construction dust impact is considered unlikely.

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 excavated or 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 backfilled 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 NO_2, SO_2 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 local distributors or internal access roads, a 5m setback requirement is adopted as recommended in the HKPSG.

4.2.2.2 According to the current development layout as shown in **Figure 2-1**, the separation distance between the Discovery Valley Road and proposed development is about 45m which is larger than 5m. Besides, as advised by the Traffic Impact Assessment accompanying this planning statement, the peak traffic flows of the major local road, Discovery Valley Road, would be only approximately 85 veh/ hr with

all the developments (i.e. Area 6f and Area 10b) in place. Hence, it is anticipated that the relatively low traffic volume on Discovery Valley Road together with its separation distance would not induce significant cumulative air quality impact.

4.2.2.3 For the Parkvale, it is a local distributor with separation distance of 80m from the development. Due to the low traffic flow of Parkvale, adverse air quality impact is not anticipated.

4.2.2.4 For the new access road extended from Parkvale, similar to the Parkvale, due to the low traffic flow of the access road, adverse air quality impact is not anticipated. In addition, the residential premises will be located at least 5m above the ground level, the air quality impact to the residential premises could be further reduced.

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.

4.2.4 Marine Vessels Emission

4.2.4.1 No marine vessels activities were identified within the 500m assessment area of Area 6f. Hence, no cumulative air quality impact from marine vessels emission is anticipated.

4.2.5 Fireworks Displays Emission

4.2.5.1 Disneyland Theme Park is located at approximately 3.5 km north-east of Discovery Bay. There are fireworks displays every night, including weekdays and weekends. Fireworks launching location is illustrated in **Figure 4-2.** 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 Theme Park EIA.

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 Potential Sewage Treatment Work

4.2.6.1 In case a small separate sewage treatment work is required for Area 6f, the operation of the STW may generate some odour. Good design and practices for the STW, such as covering the sedimentation tanks, scrubbers and etc, would be sufficient to contain the dispersion of odour from the STW. A separate study will be conducted in later stage if necessary.

4.3 Operational Phase Air Quality Assessment on Fireworks Displays

4.3.1.1 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. Details methodology of the air quality assessment on fireworks displays is summarized in **Appendix 4.2.**

4.3.1.2 The cumulative RSP and FSP 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 ASRs among all assessment heights are presented in **Table 4.2** and assessment results at all assessment heights are detailed in **Appendix 4.3.** It is observed that all the air sensitive receivers would comply with the respective AQOs criteria. Hence, no adverse air quality impact is anticipated.

Table 4.2: Cumulative RSP and FSP concentrations at ASRs

ASR ID	Max. Concentration (µg/m³)			
	RSP		FSP	
	10th highest 24-hour	Annual	10th highest 24-hour	Annual
A6f-01	76	39	57	28
A6f-02	76	39	57	28
AQOs	100	50	75	35

4.3.1.3 In addition, the heavy metals concentrations at all representative ASRs also comply with the respective assessment criteria. The maximum predicted concentrations at ASRs among all assessment heights are presented in **Table 4.3** to **Table 4.5** 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 4.3: Maximum 1-hour heavy metals concentrations at ASRs

ASR ID	Max. 1-hour Concentration (µg/m³)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
A6f-01	2.111	0.836	2.015	1.072	0.690	0.261
A6f-02	1.606	0.616	1.487	0.789	0.532	0.192
Criteria	–	–	–	–	100	–

Table 4.4: Maximum 8-hour heavy metals concentrations at ASRs

ASR ID	Max. 8-hour Concentration (µg/m³)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
A6f-01	0.435	0.105	0.265	0.134	0.164	0.033
A6f-02	0.372	0.077	0.199	0.099	0.144	0.024
Criteria	–	–	500	–	–	–

Table 4.5: Annual-average heavy metals concentrations at ASRs

ASR ID	Annual Concentration (µg/m³)					
	Aluminium	Antimony	Barium	Strontium	Copper	Titanium
A6f-01	0.196	<0.001	0.015	<0.001	0.089	<0.001
A6f-02	0.196	<0.001	0.015	<0.001	0.089	<0.001
Criteria	100	5	5	–	2.4	100

4.4 Recommended Mitigation Measures

4.4.1.1 The key air pollutants (i.e. RSP, FSP and heavy metals) at all representative ASRs would comply with AQOs and relevant assessment criteria. No adverse air quality impact is therefore anticipated and hence no mitigation measures are required.

4.4.1.2 For any small sewage treatment work that may be required, good design and practices such as the use of negative pressure system and the use of activated carbon filter would be sufficient to ensure that there is no adverse odour impacts on the neighbouring receivers.

4.5 Conclusion

4.5.1.1 All the relevant air emission sources, including firework emission at the Disneyland Theme Park that would have air quality impacts on the proposed developments have been identified and assessed.

4.5.1.2 The current development layout fulfills the 5m setback requirement in HKPSG between the air sensitive receivers and local road (i.e. local distributors). In consideration of the tight control of vehicles entering the Discovery Bay, comparatively low local traffic volume and separation distance from Discovery Valley Road, adverse cumulative air quality impact on the proposed development is not anticipated.

4.5.1.3 Quantitative air quality assessment, taking into account the 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.

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.

5.2 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 area 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**.

5.2.1.2 Area 6f (see **Figure 5-1**) will accommodate 2 towers of residential blocks and a local access road leading from Parkvale Drive, and located near Discovery Valley Drive, and overlooking onto Yi Pak Wan. Relevant legislation that are applicable to noise impact is given in **Appendix 5.1**.

5.2.1.3 The nearest road is Discovery Valley Road which connects the developments located between the upper and lower part of Discovery Bay. Discovery Valley Road is also a local road and the separation distance between Discovery Valley Road and the nearest residential premises in Area 6f is more than 45m.

5.2.1.4 Representative Noise Sensitive Receivers (NSRs) within the potential development area have been identified in **Table 5.1** and illustrated in **Figure 5-1.**

Table 5.1: Representative NSRs for noise assessment

NSR ID	Description	Land Use	Number of Storey	Building Hgt Above Local Ground Topography (m)
N6f-01	Planned high rise building	Residential	18	65
N6f-02	Planned high rise building	Residential	18	65

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 be approximately 85 veh / hr for Discovery Valley Road (with a 45m separation distance to the nearest planned residential premises at Area 6f), which are categorized as local roads. Hence, given that relatively low traffic flows and large separation distance, adverse road traffic noise impacts are not anticipated and mitigation measures are not required.

5.4 Fixed Noise Assessment

5.4.1.1 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 300m away and screened by the hilly terrains between area 6f and the water treatment work. Hence, adverse fixed noise impact is not anticipated.

5.4.1.2 Besides, in case a small separate sewage treatment work is required, suitable noise mitigation measures would be required to control the noise emitting from the plant.

5.5 Firework Display Noise Assessment

5.5.1 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 5.1** and illustrated in **Appendix 5.2.**

Table 5.1 Possible noise source from Disneyland

Measurement locations	Description
#F1	At the existing Lookout Point
#F2	At the existing breakwater

5.5.2 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**.

5.5.3 Assessment Results

5.5.3.1 The predicted firework display noise levels at the two measurement locations are summarized in **Table 5.2**. Detailed calculation of firework display noise results is shown in **Appendix 5.3**.

Table 5.2: 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.

5.5.3.2 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 layouts of Area 6f 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.

5.6 Recommended Mitigation Measures

5.6.1.1 The noise assessments results have shown that noise impact due to road traffic and fireworks are not anticipated, mitigation measures are therefore not required. In case a small separate sewage treatment work is required, mitigation measures including silencers would be required at the vents/louvres to ensure compliance with the statutory requirements.

5.7 Conclusion

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

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

5.7.1.3 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 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 6f is located at left bank of Discovery Bay Reservoir Spillway. It is within the catchment leading to the tributaries of the Discovery Bay Reservoir Spillway and the runoff would be discharged to Tsoi Yuen Wan near ferry pier ultimately.

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 Sewage Treatment Works (SHWSTW) 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**. Reference is made to the relevant legislations and standards relating to water quality which are summarised in **Appendix 6.1**.

Table 6.3 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	Spillway from Discovery Bay Reservoir and the tributaries,

Water Sensitive Receivers [1]	Description
Reservoir Spillway and Tributaries	chainage runs along Discovery Valley Road and downstream to 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 4.8 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.

6.2.2 Mitigation Measures

6.2.2.1 Given the relatively small amount of site formation work for Area 6f, adverse 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. A comprehensive list of those good site practices is given in **Appendix 6.2**.

6.3 Identification and Evaluation of Environmental Impacts during Operational Phase

6.3.1 Potential Impacts

6.3.1.1 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.

6.3.1.2 Therefore, there are two proposals for treating the sewage generated from the proposed development of Area 6f. The first proposal is to build a small separate sewage treatment work within Area 6f. The design flow rate of the proposed sewage treatment work would be around 440 m^3 per day and the treated effluent will be discharged to the nullah, which will be eventually discharged to the neighbouring marine waters without the need of a marine outfall.

6.3.1.3 Another option is to develop a separate sewage treatment work at Area 10b. The design flow rate of the proposed sewage treatment work would be around 1500 m^3 per day, which is proposed to cater for the additional sewage flows generated from the proposed development at both Area 6f and Area 10b. Since Area 6f is located around 1km apart from Area 10b, a new sewerage works along Discovery Valley Road and Discovery Bay Road is also required to convey the sewage from Area 6f to the proposed sewage treatment work in Area 10b. A new marine outfall with its location to be determined would also be required for this option (**Figure 6-1**). This additional effluent would have impacts on both water quality and marine ecology. All these would require a quantitative water quality model to be established for assessment as part of the subsequent EIA.

6.3.1.4 The design of STW for both options shall ensure that the relevant standards for effluent discharges are complied with, including the following:

- Standards for Effluent Discharged into Group D Inland Waters (Note: the nullah to be discharged to is not for abstraction for potable water supply, irrigation and pond fish culture).
- Standard for Effluent Discharged into Inshore Water of Southern Water Control Zone

6.3.1.5 The operation of the STW shall also apply for a discharge licence from the relevant authority before the operation of the STW. The proposed location of the sewage treatment work and pumping station is indicated in **Figure 6.1**.

6.4 Conclusion

6.4.1.1 The potential issues that may arise during both the construction and operational phases have been identified. Construction phase impacts are not anticipated to be significant, site runoff and sewage can be readily alleviated by implementing good site practice. During operational phase, sewage generated will be conveyed to a sewerage system, as discussed in the Sewerage Impact Assessment accompanying this planning statement. In case a small separate sewage treatment work is required, it will be designed to comply with the relevant standards for effluent discharge for inland waters and inshore waters accordingly.

7 Other Aspects

7.1 Review on Land Contamination Issues

7.1.1.1 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 Discovery Bay

Year	Description
1973	• Mainly nature terrain and coastline with a number of villages scattering around. • No signs for industrial developments
1982	• Some of the residential area near Yi Pak Wan and the reservoir were completed. • Other land based site formation work were in progress
1993	• Most of the site formation work and reclamation works had been completed.
2012	• Not much difference to that in 1993 except the scale of the marina was larger than that in the 90's.

7.1.1.2 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**.

7.1.1.3 The area within Area 6f comprises of mainly grassland. There has been no evidence that there had been activities causing contamination issues in the past. Hence, it is considered that the contamination potential for Area 6f is unlikely.

7.1.1.4 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.

7.1.1.5 Based on the findings at this stage, no area with potential land contamination is identified.

7.2 Review on Ecological Issues

7.2.1.1 As discussed in **Section 1**, Area 6f has been included in the approved Discovery Bay OZP as "OU (Staff Quarters)", despite the fact that some of the planning parameters would need to be amended. Site clearance and formation work could be commenced to implement the development parameters in the approved OZP.

7.2.1.2 Site inspection reveals that Area 6f has previously been formed and disturbed and there is currently a wooded area formed within Area 6f. As revealed from historical aerial photographs, the wooded area was likely to be developed through plantation in around 20 years ago. According to the current design, out of 0.67ha of wooded area in Area 6f, roughly 66% (0.44 ha) of the wooded area would be retained. Only 34% (0.23 ha) of the total wooded area within Area 6f would be affected by the proposed development. The wooded area to be lost from the proposed development is summarised in **Table 7.2**.

Table 7.2 Summary of wooded area in Area 6f

Item	Area (ha)
Disturbed area within Area 6f	0.15
Wooded area within Area 6f	0.67
Total area of Area 6f	**0.82**
Disturbed area to be affected	0.15 (about 100% of total disturbed area)
Wooded area to be affected	0.23 (about 34% of total wooded area)
Area to be developed	**0.38**

7.2.1.3 In addition, a recent vegetation survey undertaken in the area shows that the wooded area to be cleared consists of both exotic and native species such as *Macaranga tanarius* and *Pinus elliottii* respectively. All the species found within the development area are common species and neither protected nor of conservation concern. As such, the ecological impact associated within the site clearance are expected to be minimal. Moreover, good site practices, including dust suppression measures such as water spraying and the use of noise mitigation measures, would be implemented to mimise the indirect impacts during the construction stage. Therefore, it is considered that the impact on the surrounding ecology would be minimal.

8 Conclusion

8.1.1 An environmental assessment has been conducted to review Area 6f 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 mitigation measures are not required.

8.1.2.1 Potential site runoff and sewage from workforce during construction can be alleviated by the implementation of standard good site practices. Sewage generated during operational phase will be conveyed to sewerage treatment system. In case a small separate sewage treatment work is required, it will be designed to comply with the relevant standards for effluent discharge in inland waters and inshore waters accordingly. Ecological impacts have been minimized as much as practicable.

8.1.2.2 Assessment reveals that the development at Area 6f is unlikely to cause issue on land contamination and ecological issue.

Figures

Job Title

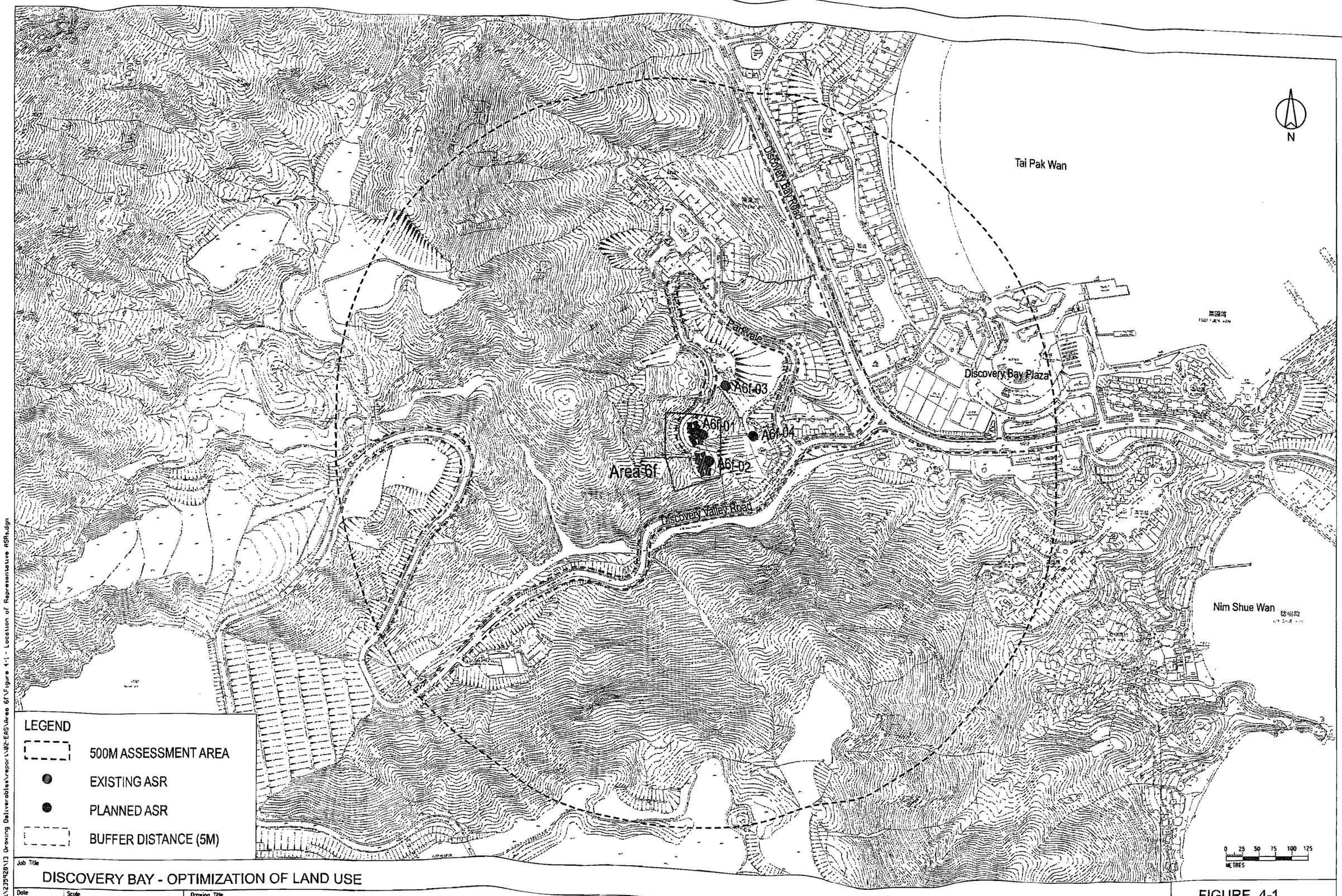
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 2-1

Date	Scale	Drawing Title
NOV 14	1 : 2000	POTENTIAL DEVELOPMENT AREA IN DISCOVERY BAY (AREA 6f)
Drawn	Job No.	
GL	235928	

ARUP

$FILES



G:\env\project\235928\13 Drawing Deliverables\report\02-EIS\Area 6f\Figure 4-1 - Location of Representative ASR 6fs.dgn

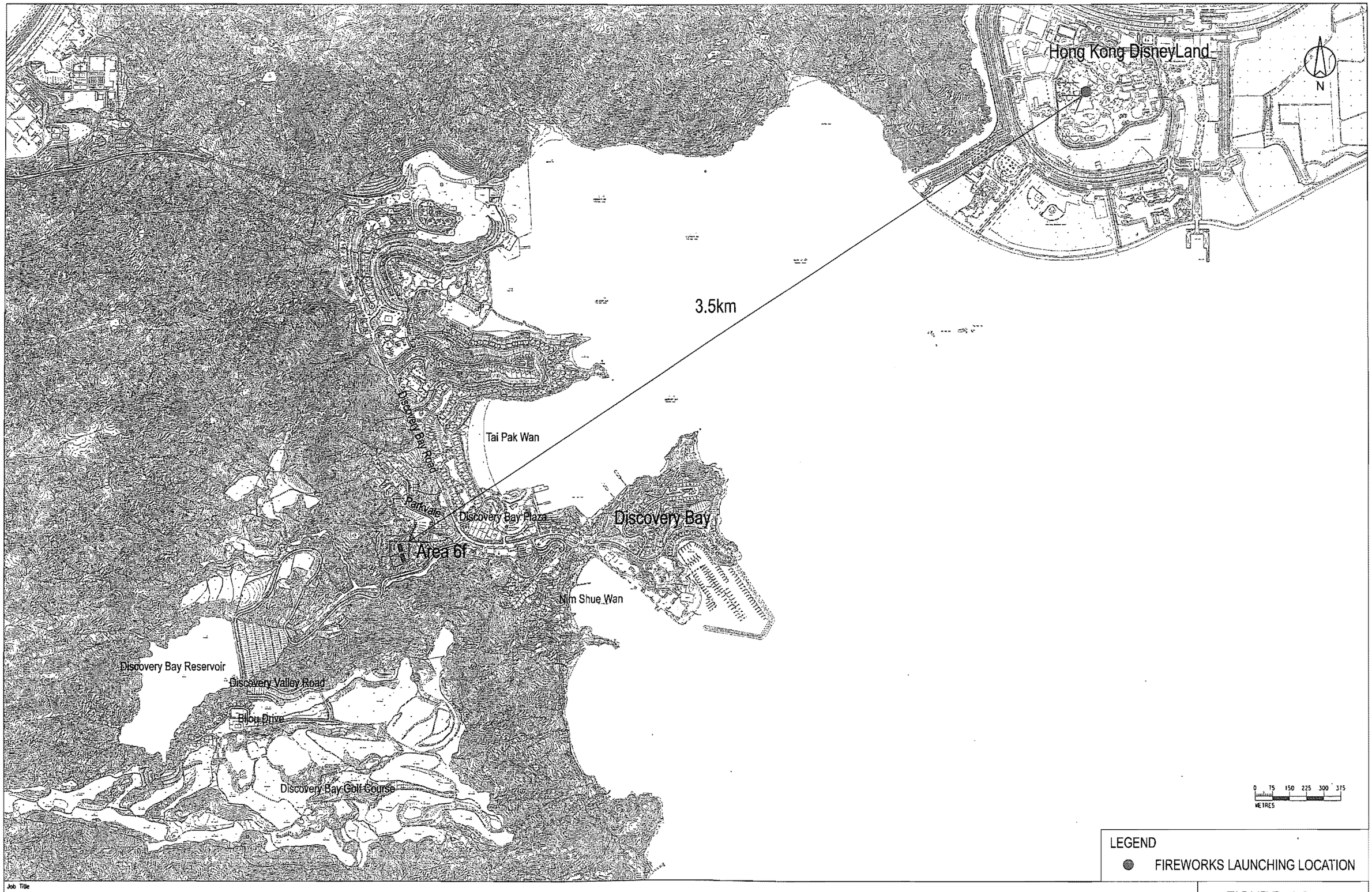
Job Title

DISCOVERY BAY - OPTIMIZATION OF LAND USE

Date	Scale	Drawing Title
MAY16	1:5000	LOCATION OF REPRESENTATIVE ASR
Drawn	Job No.	
GL	235928	

FIGURE 4-1

ARUP



Job Title

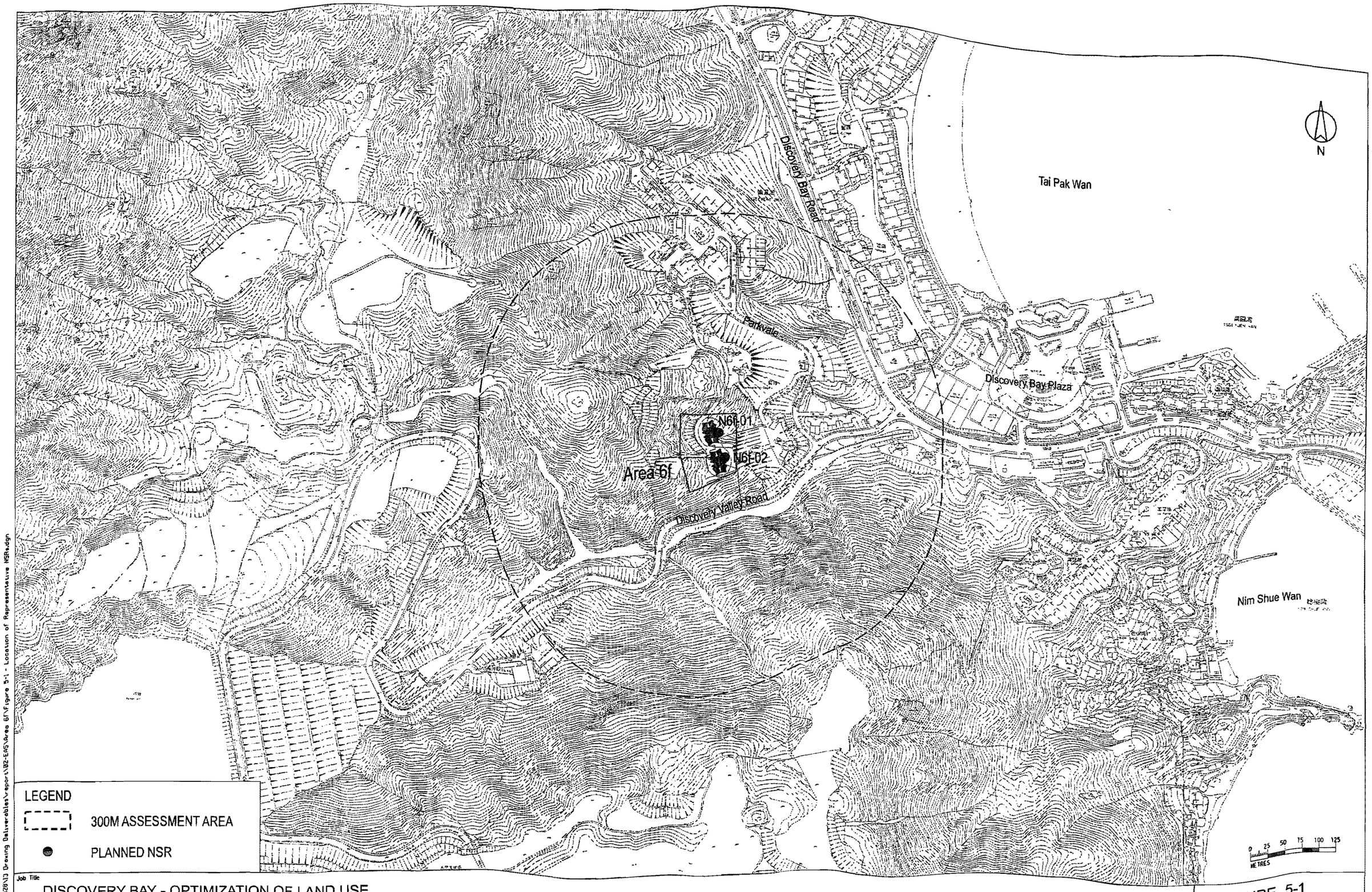
DISCOVERY BAY - OPTIMIZATION OF LAND USE

FIGURE 4-2

Date	Scale	Drawing Title
NOV 15	AS SHOWN	Fireworks Launching Location
Drawn	Job No.	
GL	235928	

ARUP

G:\env_Projects\235928\3 Drawing Deliverables\report\02-EAS\Area 6f\Figure 4-2 - Fireworks Launching Location.dgn



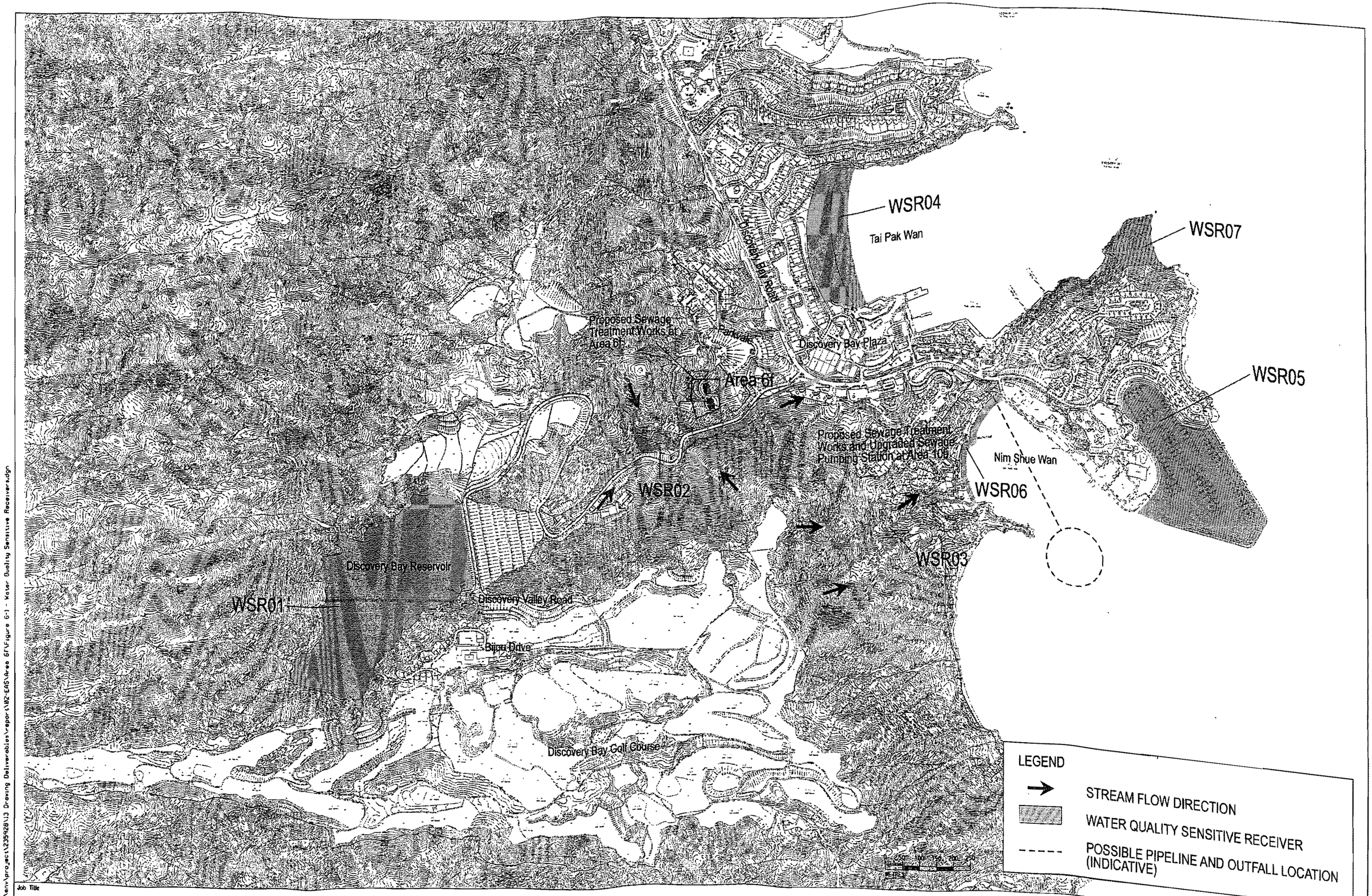
G:\env\projects\235928\13 Drawing Deliverables\report\02-EIA\Area 6f\Figure 5-1 - Location of Representative NSR.dgn

Job Title
DISCOVERY BAY - OPTIMIZATION OF LAND USE

Date	Scale	Drawing Title
NOV 15	1:5000	LOCATION OF REPRESENTATIVE NSR
Drawn	Job No.	
GL	235928	

FIGURE 5-1

ARUP



\\HKGNT522\acoustic\env\projects\235928\03 Drawing Deliverables\report\02-EAS\Area 6F\Figure 6-1 - Water Quality Sensitive Receiver

Job Title

DISCOVERY BAY - OPTIMIZATION OF LAND USE

Date	Scale	Drawing Title
MAY 16	1:10000	Water Quality Sensitive Receivers
Drawn	Job No.	
GL	235928	

FIGURE 6-1

ARUP

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, $\mu g/m^3$ [5]				
	WHO [1]	USEPA [2]	OEHHA [3]	Theme Park EIA [4]	Adopted for the 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 on Fireworks Displays

Methodology of Air Quality Assessment on Fireworks Displays

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 A4.2-1**.

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

Heavy Metal	Percentage Composition in the pyrotechnics products	Conversion from RSP assessment results (without background) to heavy metals concentration
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 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.

According to **Table 4.1** in the main text, the highest building of the proposed development is 66.5m above ground. Therefore, the impacts on the ASRs are assessed at height of 1.5m, 5m, 10m, 20m, 30m, 40m, 50m, 60m and 70m 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 (μg/m³)	Daily (μg/m³)
FSP = 0.71 x RSP	FSP = 0.75 x RSP

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.

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. 10th highest 24-hour RSP/ FSP 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 A4.2d**). For antimony, strontium and titanium, there is no monitoring data and their background concentrations are assumed as 0 $\mu g/m^3$.

Table A4.2d: 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 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_s	Y_s	Release Height [1]	Lateral Dim. (S_y)	Vertical Dim. (S_z)	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

Summary of Air Quality Assessment Results

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	1.5m	5m	10m	20m	30m	40m	50m	60m	70m
Area 6f	A6f-01	76	76	76	76	76	76	76	76	76	39	39	39	39	39	39	39	39	39
	A6f-02	76	76	76	76	76	76	76	76	76	39	39	39	39	39	39	39	39	39

Note: [1] The Annual RSP background of Area 6f (Grid 17_26) = 39.4 μg/m³

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

Area	ASR	10th highest 24-hour FSP Concentration (μg/m³) (AQO = 75 μg/m³)									Annual FSP Concentration (μg/m³) (AQO = 35 μg/m³)								
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m
Area 6f	A6f-01	57	57	57	57	57	57	57	57	57	28	28	28	28	28	28	28	28	28
	A6f-02	57	57	57	57	57	57	57	57	57	28	28	28	28	28	28	28	28	28

Note: [1] The Annual FSP background of Area 6f (Grid 17_26) = 28.0 μg/m³

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

Area	ASR	Max 1-hour Aluminum Concentration (µg/m^3) (No Criteria)									Max 8-hour Aluminum Concentration (µg/m^3) (No Criteria)									Annual Aluminum Concentration (µg/m^3) (Criteria = 100 µg/m^3)								
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m
Area 6f	A6f-01	0.576	0.580	0.592	0.637	0.707	0.987	1.350	1.746	2.111	0.244	0.244	0.245	0.251	0.260	0.295	0.340	0.390	0.435	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196	0.196
	A6f-02	0.557	0.560	0.571	0.614	0.680	0.778	1.045	1.337	1.606	0.241	0.242	0.243	0.248	0.256	0.269	0.302	0.339	0.372	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 (µg/m^3) (No Criteria)									Max 8-hour Antimony Concentration (µg/m^3) (No Criteria)									Annual Antimony Concentration (µg/m^3) (Criteria = 5 µg/m^3)								
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m
Area 6f	A6f-01	0.166	0.168	0.173	0.193	0.223	0.346	0.504	0.677	0.836	0.021	0.021	0.022	0.024	0.028	0.043	0.063	0.085	0.105	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A6f-02	0.158	0.159	0.164	0.183	0.211	0.254	0.371	0.498	0.616	0.020	0.020	0.020	0.023	0.026	0.032	0.046	0.062	0.077	<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/m^3) (No Criteria)									Max 8-hour Barium Concentration (µg/m^3) (Criteria = 500 µg/m^3)									Annual Barium Concentration (µg/m^3) (Criteria = 5 µg/m^3)								
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m
Area 6f	A6f-01	0.412	0.416	0.428	0.476	0.548	0.841	1.220	1.634	2.015	0.065	0.065	0.067	0.073	0.082	0.118	0.166	0.217	0.265	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
	A6f-02	0.392	0.395	0.407	0.451	0.520	0.623	0.902	1.206	1.487	0.062	0.063	0.064	0.070	0.078	0.091	0.126	0.164	0.199	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/m^3) (No Criteria)									Max 8-hour Strontium Concentration (µg/m^3) (No Criteria)									Annual Strontium Concentration (µg/m^3) (No Criteria)								
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m
Area 6f	A6f-01	0.213	0.215	0.221	0.247	0.286	0.443	0.646	0.867	1.072	0.027	0.027	0.028	0.031	0.036	0.055	0.081	0.108	0.134	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A6f-02	0.202	0.204	0.210	0.234	0.271	0.326	0.475	0.638	0.789	0.025	0.025	0.026	0.029	0.034	0.041	0.059	0.080	0.099	<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/m^3) (Criteria = 100 µg/m^3)									Max 8-hour Copper Concentration (µg/m^3) (No Criteria)									Annual Copper Concentration (µg/m^3) (Criteria = 2.4 µg/m^3)								
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m
Area 6f	A6f-01	0.208	0.210	0.213	0.227	0.249	0.337	0.451	0.576	0.690	0.104	0.104	0.105	0.106	0.109	0.120	0.134	0.150	0.164	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
	A6f-02	0.202	0.203	0.207	0.220	0.241	0.272	0.356	0.447	0.532	0.103	0.103	0.104	0.105	0.108	0.112	0.122	0.134	0.144	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/m^3) (No Criteria)									Max 8-hour Titanium Concentration (µg/m^3) (No Criteria)									Annual Titanium Concentration (µg/m^3) (Criteria = 100 µg/m^3)								
		1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m	1.5m	5m	10m	20m	30m	40m	50m	60m	70m
Area 6f	A6f-01	0.052	0.052	0.054	0.060	0.070	0.108	0.157	0.212	0.261	0.006	0.007	0.007	0.008	0.009	0.013	0.020	0.026	0.033	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	A6f-02	0.049	0.050	0.051	0.057	0.066	0.079	0.116	0.156	0.192	0.006	0.006	0.006	0.007	0.008	0.010	0.014	0.019	0.024	<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 for Noise Assessment

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

However, as discussed in **Section 2**, the present project is to plan for a residential development which differs from planning a fixed noise source, albeit that some of the existing noise sources would need to be slightly relocated to suit the development plan, and it would not aggravate the ambient noise condition and result in a high future background level. Hence it is proposed to adopt a noise limit of ANL - 5 dB(A).

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 ANL-5 criteria 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 3.5km north-east of Area 6f. 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.

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. In consideration of small scale development at Area 6f (i.e. two residential buildings only), construction noise impacts at existing sensitive receiver are considered not anticipated. Given that temporary noise barrier, quiet plant, good site practice would be adopted during construction of Area 6f, insurmountable construction noise impacts are not anticipated.

Appendix 5.2

Firework Display Noise
Measurement Location

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Appendix 5.3

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)

Parameter	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

Parameter	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
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
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

Note:
[1] All units in mg/L unless otherwise stated

Table A6.3: Standards for effluents discharged into the Group D Inland Waters

Parameter	Flow rate (m^3/day)							
	≤ 200	> 200 and ≤400	> 400 and ≤ 600	> 600 and ≤ 800	> 800 and ≤ 1000	> 1000 and ≤ 1500	> 1500 and ≤ 2000	> 2000 and ≤ 3000
pH (pH units)	6–10	6–10	6–10	6–10	6–10	6–10	6–10	6–10
Temperature (°C)	30	30	30	30	30	30	30	30
Colour (lovibond units) (25mm cell length)	1	1	1	1	1	1	1	1
Suspended solids	30	30	30	30	30	30	30	30
BOD	20	20	20	20	20	20	20	20
COD	80	80	80	80	80	80	80	80
Oil & Grease	10	10	10	10	10	10	10	10
Iron	10	8	7	5	4	2.7	2	1.3
Boron	5	4	3.5	2.5	2	1.5	1	0.7
Barium	5	4	3.5	2.5	2	1.5	1	0.7
Mercury	0.1	0.05	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.1	0.05	0.001	0.001	0.001	0.001	0.001	0.001
Other toxic metals individually	1	1	0.8	0.8	0.5	0.5	0.2	0.2
Total Toxic metals	2	2	1.6	1.6	1	1	0.5	0.4
Cyanide	0.4	0.4	0.3	0.3	0.21	0.1	0.1	0.05
Phenols	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1
Sulphide	1	1	1	1	1	1	1	1
Sulphate	800	600	600	600	600	400	400	400
Chloride	1000	800	800	800	600	600	400	400
Fluoride	10	8	8	8	5	5	3	3
Total phosphorus	10	10	10	8	8	8	5	5
Ammonia nitrogen	20	20	20	20	20	20	20	10

Parameter	Flow rate (m^3/day)							
	≤ 200	> 200 and ≤400	> 400 and ≤ 600	> 600 and ≤ 800	> 800 and ≤ 1000	> 1000 and ≤ 1500	> 1500 and ≤ 2000	> 2000 and ≤ 3000
Nitrate + nitrite nitrogen	50	50	50	30	30	30	30	20
Surfactants (total)	15	15	15	15	15	15	15	15
E. coli (cfu/100ml)	1000	1000	1000	1000	1000	1000	1000	1000

Note:
[1] All units in mg/L unless otherwise stated

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 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

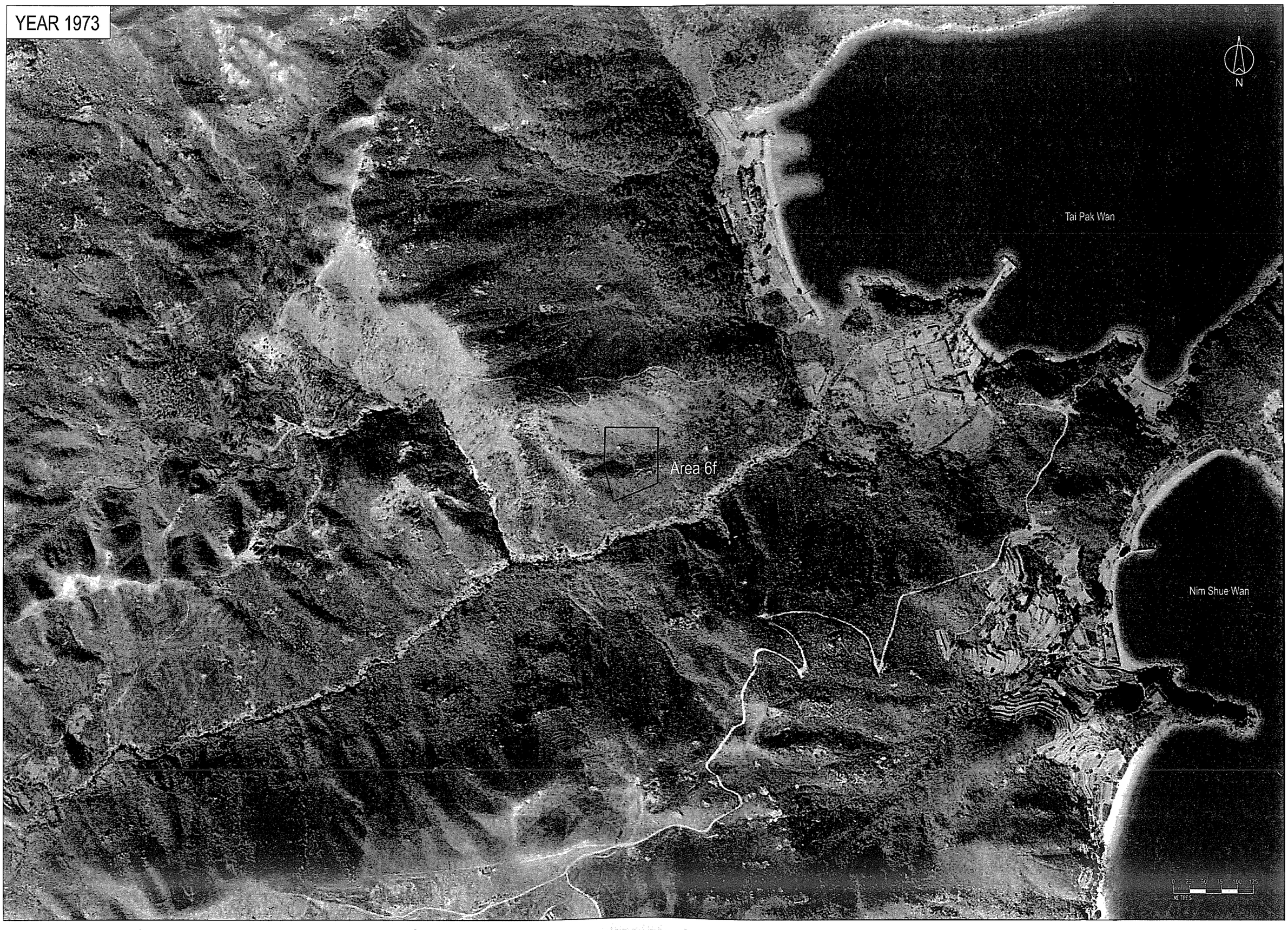
four broad post restoration land use categories. The RBRGs also serve as the remediation targets if remediation is necessary.

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 Area 6f

YEAR 1973



\\HKGNTS21\acoustic\env\project\235926\13 Drawing Deliverables\report\02-EIA\Area 6f\Aerial Photo_1973.dgn

YEAR 1982

\\HKGNTS22\acoustic\env\project\239928\13 Drawing Deliverables\report\02-EAS\Area 6f\Aerial Photo_1982.dgn

YEAR 1993

\\HKGNTS22\acoustic\env\project\235926\13 Drawing Deliverables\report\02-EAS\Area 6f\Aerial Photo_1993.dgn

YEAR 2012

\\HKGNTS22\acoustic\env\project\235928\13 Drawing Deliverables\report\02-EA3\Area 6f\Aerial Photo_2012.dgn