Agreement No. CE 35/2006(CE)
Kai Tak Development Engineering Study
cum Design and Construction of Advance Works –
Investigation, Design and Construction

DECOMMISSIONING OF THE FORMER KAI TAK AIRPORT OTHER THAN THE NORTH APRON ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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6 AIR QUALITY IMPACT

6.1 Introduction

6.1.1 This section presents an air quality impact assessment for the proposed Project. Potential dust impact and any air pollutant emissions arising from the demolition and decontamination works under this Project are identified and assessed. Appropriate measures are identified under this assessment to mitigate the dust / air quality impacts where necessary.

6.2 Environmental Legislation, Policies, Plans, Standards and Criteria

6.2.1 The criteria for evaluating air quality impacts and the guidelines for air quality impact assessment are set out in Annex 4 and Annex 12 of the *Technical Memorandum on Environmental Impact Assessment Process* (EIAO-TM).

Air Quality Objectives and EIAO-TM

6.2.2 The Air Pollution Control Ordinance (APCO) provides the statutory authority for controlling air pollutants from a variety of sources. The Hong Kong Air Quality Objectives (AQOs), which must be satisfied, stipulate the maximum allowable concentrations over specific periods for a number of criteria air pollutants. The relevant AQOs are listed in **Table 6.1**.

Table 6.1 Hong Kong Air Quality Objectives

Pollutant	Maximum Concentration (µg m^{-3}) (1)				
	Averaging Time				
	1 hour (2)	8 hour (3)	24 hour (3)	3 month (3)	Annual (4)
Total Suspended Particulates (TSP)	-	-	260		80
Respirable Suspended Particulates (RSP) (5)	-	-	180		55
Sulphur Dioxide (SO_2)	800	-	350		80
Nitrogen Dioxide (NO_2)	300	-	150		80
Carbon Monoxide (CO)	30,000	10,000	-		-
Lead (Pb)	-	-	-	1.5	-
Photochemical Oxidants (as Ozone, O_3) (6)	240	-	-		-

Notes:
(1) Measured at 298 K and 101.325 kPa.
(2) Not to be exceeded more than three times per year.
(3) Not to be exceeded more than once per year.
(4) Arithmetic mean.
(5) Suspended particulates in air with a nominal aerodynamic diameter of 10 µm or smaller.
(6) Photochemical oxidants are determined by measurement of ozone only.

6.2.3 The EIAO-TM stipulates that the hourly TSP level should not exceed 500 μgm^{-3} (measured at 25°C and one atmosphere) for construction dust impact assessment. Standard mitigation measures for construction sites are specified in the *Air Pollution Control (Construction Dust) Regulation*.

6.2.4 The EIAO-TM also stipulates that the odour level at air sensitive receiver should not exceed 5 odour units based on an averaging time of 5 seconds.

Air Pollution Control (Construction Dust) Regulation

6.2.5 Notifiable and regulatory works are under the control of the *Air Pollution Control (Construction Dust) Regulation*. Notifiable works are site formation, reclamation, demolition, foundation and superstructure construction for buildings and road construction. Regulatory

works are building renovation, road opening and resurfacing slope stabilisation, and other activities including stockpiling, dusty material handling, excavation, concrete production etc. This Project is expected to include both notifiable and regulatory works. Contractors and site agents are required to inform the Environmental Protection Department (EPD) on carrying out construction works and to adopt dust reduction measures to reduce dust emission to the acceptable level.

Air Quality Criteria for Non-criteria Pollutants

6.2.6 In the absence of statutory guidelines in HKSAR for non-criteria pollutants, chronic and acute criteria (the stringent criteria) from international organization including WHO, USEPA Integrated Risk Information System, California Air Resources Board (CARB) and Office of Environmental Health Hazard Assessment, California, are employed for this Study. The air quality criteria for the relevant non-criteria pollutants employed for this Study are listed in **Table 6.2**.

Table 6.2 Air Quality Criteria for Non-criteria Pollutants

Pollutant	Unit	Criteria	
		1-hour	Annual
TPH (1)	µg m^{-3}	1300 (2) (6)	60 (2) / 30 (6)
Arsenic	µg m^{-3}	0.19 (2)	0.03 (2)
Copper	µg m^{-3}	100 (3)	2.4 (3)
Ethylbenzene (1)	µg m^{-3}	1300 (2) (6)	2000 (2) / 22,000 (5)
Benzo(a)pyrene	µg m^{-3}	0.387(4)	-
Xylenes	µg m^{-3}	22000 (2)	700 (2) / 870 (5)

Note:

(1) TPH is a mixture of chemicals including hexane, jet fuels, mineral oils, benzene, toluene, xylenes, naphthalene, and fluorene, as well as other petroleum products and gasoline components. There is no approved acute reference exposure level for Ethylbenzene in accordance with OEHHA/ARB. The criteria for these two chemicals are making reference to Benzene with the most stringent requirement comparing with other chemicals in the mixture.
(2) Office of Environmental Health Hazard Assessment, California, (http://www.oehha.ca.gov/air/acute_rels/allAcRELs.html / http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html)
(3) California Air Resources Board, 2001
(4) TM for Issuing Air Pollution Abatement Notices to Control Air Pollution From Stationary Polluting Processes
(5) Guidelines for Air Quality, WHO, Geneva 2000.
(6) USEPA Integrated Risk Information System (IRIS)

6.2.7 For non-criteria pollutants, health risk guidelines for the assessment of health risk from exposures to air toxics are given by California Air Resources Board, California Environmental Protection Agency (CARB). Guidelines value on acceptability of increase cancer risk from a lifetime exposure to air toxics have been provided and are shown in **Table 6.3**.

Table 6.3 Health Risk Guidelines for Exposure to Air Toxics

Acceptability of Cancer Risk	Estimated Individual Cancer Risk Level	
	Individual Life Risk	Individual Risk Per Year
Significant	$> 10^{-4}$	$> 1.4 \times 10^{-6}$
Risk should be reduced to As Low As Reasonably Practicable (ALARP)	$> 10^{-6} – 10^{-4}$	$> 1.4 \times 10^{-8} – 1.4 \times 10^{-6}$
Insignificant	10^{-6}	1.4×10^{-8}

6.3 Description of the Environment

6.3.1 The Project area is located at the south apron and runway of the former Kai Tak Airport. There is no air quality monitoring station located in the study area. EPD's Sham Shui Po and Kwun Tong air quality monitoring stations are the nearest stations to the Project site. **Table 6.4** summarises the annual average concentrations of the air pollutants recorded at these two monitoring stations in Year 2005.

Table 6.4 Annual Average Concentrations of Pollutants in Year 2005 at EPD's Sham Shui Po and Kwun Tong Air Quality Monitoring Stations

Pollutant	Annual Average AQO ($\mu g\ m^{-3}$)	Year 2005 Annual Average Concentration ($\mu g\ m^{-3}$)	
		Sham Shui Po station	Kwun Tong station
TSP	80	83	81
RSP	55	56	56
NO_2	80	65	58
SO_2	80	24	18

6.4 Air Sensitive Receivers

6.4.1 In accordance with the Annex 12 of the EIAO-TM, any domestic premises, hotel, hostel, hospital, clinic, nursery, school, educational institution, office, factory, shop, shopping centre, place of public worship, library, court of law, sports stadium or performing arts centre are considered to be air sensitive receivers (ASRs). Any other place with which, in terms of duration or number of people affected, has a similar sensitivity to the air pollutants as the aforelisted places are also considered to be an ASR, for example, playground, sitting area of parks / promenade.

6.4.2 In accordance with Section 3.4.8.3(i) of the EIA Study Brief No. ESB-160/2006, the air quality impact assessment area is defined by a distance of 500 m expanded from the Project boundary. The study area of air quality impact assessment is shown in **Drawing 6.1**.

6.4.3 The representative ASRs within the 500m study area are identified based on the existing land use and the relevant Outline Zoning Plans. Details of the existing ASRs are summarized in **Table 6.5** and their locations are indicated in **Drawing 6.1**. Referring to the construction programme, the Project would be tentatively commenced in early 2008 and completed in late 2009. Based on the latest available information, no planned ASRs are anticipated at the North Apron, South Apron, and the Runway area of the former Kai Tak

Airport before completion of the proposed decommissioning works in 2009, no planned ASRs is therefore selected for the air quality impact assessment for this Project.

Table 6.5 Details of Representative Air Sensitive Receivers

ASR	Description	Use	No. of Floors	Distance to nearest Project boundary (m)
A1	ex-EMSD Workshop	G/IC	4	373
A2	Newport Centre	Commercial	8	324
A3	3 Hing Yan Street	Residential	8	289
A4	Grand Waterfront	Residential	51	295
A5	Wei Chien Court	Residential	13	362
A6	Holy Carpenter Primary School	G/IC	6	428
A7	EMSD Headquarters	G/IC	7	2 *
A8	Hong Kong International Trade and Exhibition Centre	Commercial	14	40
A9	Kinetic Industrial Centre	Industrial	8	113
A10	Sing Tao Building	Industrial	8	75
A11	Kai Fuk Industrial Centre	Industrial	9	60
A12	Construction Industry training Authority Sheung Yuet Road Training Ground	G/IC	1	144
A13	Enterprise Square V (Mega Box)	Commercial	34	84
A14	Enterprise Square III	Commercial	41	206
A15	New Kowloon Bay Vehicle Examination Centre	G/IC	1	120
A16	Nan Fung Project (under construction)	Industrial	-	112
A17	Public Works Central Laboratory Building	G/IC	4	36

Note: No occupants at Ex-GFS building during decontamination works.
* ASR A7 is located right next to the Project boundary, however, no decommissioning / decontamination works are anticipated in close proximity to ASR A7. The nearest distance of ASR A7 to the boundary of the proposed decommissioning / decontamination works is about 195m.

6.5 Identification of Environmental Impacts

Construction Dust

6.5.1 The dusty construction activities under the Project would be demolition works, excavation for decontaminated works, transporting and unloading the contaminated soils into the centralized decontamination works area, screening and mixing before solidification/stabilization. The Project site area covers south apron, runway and a narrow strip of north apron of the former Kai Tak Airport, however, the demolition works will only be limited to those areas with remaining existing structures / buildings and abandoned facilities of the former Kai Tak Airport. The scope of existing structures and buildings for decommissioning as well as the related construction activities will include the following:

Decommissioning Works

- Demolition of an existing fuel hydrant system buried in south apron area;
- Demolition of underground fuel tanks near the ex-GFS building and fuel supply system (including refuelling pits and underground fuel pipelines) in the ex-GFS apron area; and
- Demolition of the fuel dolphin structure down to 1m below the existing seabed level. The abandoned fuel pipelines will be left in place and, if necessary, grouting it with concrete.

Decontamination Works

- Decontamination works, including excavation, biopiling and cement solidification, for the contaminated soil identified in the south apron, the narrow strip of the north apron near the Kai Tak Tunnel and the ex-GFS apron area.

6.5.2 The construction activities of the Project would be tentatively commenced in early 2008 and completed not earlier than late 2009. The excavated areas due to decontamination works are indicated in **Drawing 6.1 and 6.2**. Since most of the work sites are located far away from nearby ASRs and the exposed area requiring excavation per day would be limited (not more than 1000 m^2 per day), adverse dust impact arising from excavation is not expected with the implementation of mitigation measures stipulated in Air Pollution Control (Construction Dust) Regulation. Regarding the transportation and unloading process of excavated soils, dust suppression measures and good site practices stipulated in **Section 6.8** would be implemented so as to prevent dust nuisance to the surrounding area. The screening and mixing processes before solidification/stabilization would be undertaken in enclosed area, therefore, fugitive dust impact arising from these processes is not anticipated.

6.5.3 Referring to construction programme of the Project, there would be a number of concurrent projects taking place in the proximity of the assessment area. The concurrent projects are:

- Kai Tak Development Advance Works – Construction of local access roads (Roads TD3, TD4 and Road L14), sewage pumping station (not defined as Schedule 2 Designated Project under EIAO), public landing steps cum fireboat berth, electricity substation (by CLP) etc commencing from 2008 to early 2012;
- Cruise Terminal Construction (including dredging, and construction of berth structure, transition structure, and terminal building) commencing from later half of 2008 until 2020;
- Operation of the barging points and works area for removal of C&D materials from Development at Choi Wan and Jordon Valley at former Kai Tak Airport runway undertaking now and to be completed by December 2008.

- Operation of the barging point at southwest of the former Kai Tak Airport runway and haul road within Kai Tak for removal of C&D materials from Development at Anderson Road commencing from January 2008 to December 2012.

6.5.4 As described in Section 2.6 of this report, the proposed decontamination works will be carried out in two phases. The first phase will mainly include the excavation of the contaminated soils identified in the south apron, the narrow strip of the north apron and the ex-GFS apron area. The excavated contaminated soil will then be transported to the soil decontamination treatment area proposed in the northern part of the south apron. After confirming that all the contaminated soil has been excavated for treatment, the excavation areas will be backfilled with clean and/or treated soil. During the second phase of the decontamination works, the decontamination activities will be limited to those carried out within the treatment area in the northern part of the south apron. The treatment area will be operated until satisfactory completion of the treatment process. **Drawings 2.4a and 2.4b** show the concurrent activities anticipated during the first phase and the second phase of the decontamination works in the vicinity of the project area. Dredging works for Cruise Terminal is marine based construction activities, negligible dust impact from the dredging activities would be expected. Kai Tak Development Advance Works at the ex-GFS apron area would only be commenced after completion of local decontaminated works (by removal of contaminated soils), therefore, no cumulative dust impact from the Kai Tak Development Advance Works is expected. The barging points on the runway area are also sited far away from the ASRs and proper dust suppression measures would be implemented at the barging points, therefore, it is also not expected that its dust emission would contribute to cumulative dust impacts at the ASRs in the vicinity of the Project boundary.

Air Quality Impact from Decommissioning Other than Dust Impact

6.5.5 Decontamination works would be carried out for a few localized areas within the Project area as shown in **Drawing 6.1** based on the site investigation (SI) findings as presented in **Section 3**. During the site investigation, petroleum/kerosene smell was detected at 3 soil samples in the ex-GFS apron area (Sample I.D. B03, B05 and B06A) which are considered localised and slight odour. Similar smell may be detected during soil excavation, transporting and unloading processes, however, very minor odour impact is anticipated as the excavation area would be limited and would be backfilled with clean and/or treated soil shortly after excavation, and the excavated soils would be covered with impermeable liner to minimise odour emission.

6.5.6 The land contamination site investigation identified some localized spots in the South Apron contaminated with metals and/or total petroleum hydrocarbons (TPH). One spot in the narrow strip of the north apron near the Kai Tak Tunnel was also contaminated with benzo(a)pyrene. No contamination was found in the runway area. The excavation required for the identified contamination spots would all be localized and shallow in depth. The contaminants of concern in these contamination spots include TPH, lead, copper, arsenic and benzo(a)pyrene. In view of limited amount of soil to be excavated at these contamination spots and the excavated area is small in size (only 28.3 m^2 for each contamination spot in South Apron area and North Apron area), the excavation process would be in a short time period and adverse air quality impact during excavation at these identified individual spot areas in South Apron and North Apron area would not be expected.

6.5.7 A supplementary investigation undertaken at the ex-GFS apron area revealed that the site was contaminated with metals, TPH, ethylbenzene and xylenes. Referring to the site investigation results, lead and copper were found at four contamination spots where are in small size in area. As little amount of soil contaminated by lead and copper (only 28.3 m^2 for each contamination spot) would be excavated, insignificant air quality impact arising from these contamination spots is anticipated. The contaminants of concern at the ex-GFS apron area include TPH, ethylbenzene, and xylenes as the contaminated area is large in size. Relevant data on maximum contamination levels of soils at the ex-GFS apron area are summarized in **Table 6.6** below. During site investigation, on site VOCs monitoring by

PID was also conducted. The VOCs concentration of soil samples are presented in **Table 6.7**. The VOCs sampling locations are indicated in **Appendix 6.2**.

Table 6.6 Maximum Contamination Levels of Soil at ex-GFS Apron Area

Pollutant	Unit	Max. Concentration Level
TPH	mg/kg	20,210
Ethylbenzene	mg/kg	17
Xylenes	mg/kg	9.2

Table 6.7 VOCs Concentrations detected in Soil Samples at ex-GFS Apron Area

Sample ID	VOCs Concentration Level, ppm
B-02	0 – 0.8
B-03	0 – 741
B-04	1.5 – 13.6
B-05	0 – 386
B-06a	0 – 432
B-11	0

6.5.8 During the transportation process, the excavated contaminated soils would all be covered with strong and impermeable sheeting (a geo-membrane, such as PVC nylon membrane, is a waterproof plastic) so as to prevent any VOC emissions. Based on the excavation rate of 20m^3/hour, the dump trucks for transporting the excavated soil to biopile for treatment should be not more than 4 vehicles per hour. The air quality impact due to unloading process is anticipated to be minimal.

6.5.9 All excavated contaminated soil would be treated on site. The contaminated soil would first be treated by biopiling and then by solidification. Any exhaust gas generated from the biopile shall be directed through a blower and activated carbon filter system prior to discharge to the atmosphere. The carbon filter will have a removal efficiency of at least 99% and this is commercially available and has been used in similar projects such as decommissioning works at North Apron, North Tsing Yi Shipyard and Penny's Bay. The performance of the carbon filter will be monitored regularly and the carbon replaced as required to maintain VOC emissions at acceptable levels. Referring to the Environmental Monitoring and Audit Project for decommissioning works in North Apron area and in the North Tsing Yi Shipyard, the monitoring data indicated that maximum TVOC measured during normal biopile operation was always below 20 ppm. The characteristics and pollutants levels of contaminated soil to be treated in the decommissioning works in South Apron area, narrow strip of North Apron and ex-GFS Apron area (with the highest concentration of TPH was 20,210 mg/kg) are similar to that found in the North Apron area (with the highest concentration of TPH was 21,728 mg/kg) and are much lower than those in the North Tsing Yi Shipyard site (with the highest concentration of TPH was 62,208 mg/kg).

The remediation target for soil TPH in this case is determined to be the Dutch B level (1000 mg/kg) which is same as the target required in the decommissioning works in North Apron area and North Tsing Yi Shipyard. Therefore, with the installation and proper operation of a carbon absorber, the maximum TVOC measured during biopile operation would be below 20 ppm based on the previous biopiling experience in the North Apron and North Tsing Yi Shipyard. Referring to the monitoring data of North Tsing Yi Shipyard decontamination works, the air quality impacts at ASR measured in the form of Benzene concentrations were only in the range of 2.4 – 6.2 $\mu g/m^3$ at the nearest ASR, which is far below the respective hourly average criteria of 1300 $\mu g/m^3$. The distance between the nearest ASR and the biopile exhaust at the North Tsing Yi Shipyard decontamination works is 116m. For this Project, the biopile and ancillary equipment would be located at least 150m from the nearest ASR (ASR 8) and the highest TPH concentrations detected was only one third of the concentrations measured at North Tsing Yi Shipyard. Negligible amount of VOCs from the biopile operation at the ASRs would therefore be expected in this case. Monitoring programme for the exhaust gas from the carbon filter would be monitored during implementation stage to ensure the criteria would meet.

6.5.10 Solidification process would be employed to immobilise heavy metals in the soil. The metal contaminated soils would be loaded into the mixing bin and solidification agents would be added and mixed thoroughly. After sufficient residence time (about 1 week), the solidified product would be removed from the bin and suitable for reuse. During the residence period, the bin would be covered to prevent any air emission from the mixed product. The details of process refer to **Section 3**. The volume of soils for each mixing process is limited (as the total volume of metal contaminated soil is less than $600m^3$), following the requirements of the *Air Pollution Control (Construction Dust) Regulation*, TSP emission during mixing process would be insignificant. As the contaminated soil has been treated by biopiling, negligible emission of VOC contaminants during the solidification process is anticipated.

Emission Inventory

6.5.11 A summary of air emission inventory from different activities as mentioned in **Sections 6.5.1 – 6.5.10** above is shown in **Table 6.8.**

Table 6.8 Summary of Emission Inventory

Location	Activity	Typical air pollutant
Demolition Works	Material handling & Truck haulage	TSP
Decontamination Works	Excavation, Transportation & Unloading	TSP, Chemicals adhered onto dust particulates, VOC
	Solidification	TSP, Chemicals adhered onto dust particulates
	Biopiling	VOC

6.5.12 With the implementation of the requirements stipulated in the *Air Pollution Control (Construction Dust) Regulation* during demolition works, adverse dust impact would not be expected and quantitatively assessment is not necessary.

6.5.13 Regarding the air pollutant emission from the identified contaminated spots within the South Apron area (except ex-GFS apron area) and North Apron area, insignificant amount of dust emission and air pollutants emissions including benzo(a)pyrene, TPH, lead, copper and arsenic during excavation would be expected in view of the small and localized excavation areas and implementation of mitigation measures. These negligible emissions would not

cause cumulative air quality impact to other decontamination activities. Quantitative assessment on the air pollutants emissions from these identified contaminated spots are therefore considered unnecessary. As mentioned in **Section 6.5.7**, for the contaminated areas at the ex-GFS apron area, only the concerned air pollutants emissions (TPH, ethylbenzene and xylenes) due to excavation during decontamination works would be quantitatively assessed in view of the larger area involved. The contaminated areas considered in the modelling assessment are shown in **Drawing 6.2.**

6.5.14 With the implementation of mitigation measures for transportation and unloading process for excavated contaminated soil mentioned in **Section 6.8**, negligible dust and VOC emissions is anticipated and would not contribute to cumulative impact.

6.5.15 For the mixing process during solidification, insignificant amount of dust emission would be expected with the implementation of practicable dust suppression measures stipulated in the *Air Pollution Control (Construction Dust) Regulation*. With the installation and proper operation of carbon absorber for exhaust system of biopiling system and proposed mitigation measures in **Section 6.8**, insignificant VOC emission would be expected from the biopiling process. Negligible air pollutants emissions from solidification and biopile operation would not cause cumulative air quality impact to other concurrent projects. Quantitative assessments for the insignificant air pollutant emissions from the solidification and biopiling processes are therefore considered not necessary in the study.

6.5.16 There are some concurrent construction activities to be carried out within the study area of the Project. However, given the phasing and the different locations of these concurrent activities as shown in **Drawings 2.4a and 2.4b** and described in Sections 6.5.3 and 6.5.4 above, no cumulative air quality impacts and consequential health risk are anticipated.

6.6 Assessment Methodology

6.6.1 The pollutants in contaminated soil such as TPH, Ethylbenzene and Xylenes may be vaporized or be adhered on the dust particles in the dispersion during excavation. Hence, the pollutants were assessed in the form of vapour and dust respectively.

6.6.2 The maximum pollutant concentrations from the site investigation data (refer to **Table 6.6** and **6.7**) have been employed to calculate the emission factors to produce conservative prediction. **Table 6.9** and **6.10** shows the emission rates for TPH, ethylbenzene, xylenes and VOCs (in the form of dust and vapour) during excavation. The locations of the area sources to be considered in the model run are indicated in **Drawing 6.2**. Detailed calculation of emission rates is shown in **Appendices 6.1** and **6.2**.

Table 6.9 Pollutant Emission Rate (in the Form of Dust) during Excavation

Pollutant	Emission Rate	Remarks
TPH	1.356×10^{-5} g/s	• Excavation rate: 20m^3/hr or 40 Mg/hr • TSP emission factor: 0.0604 g/Mg
Ethylbenzene	1.889×10^{-1} g/s	• Excavation rate: 20m^3/hr or 40 Mg/hr • Density: 2 Mg/m^3 • All Ethylbenzene vaporize during excavation
Xylenes	1.022×10^{-1} g/s	• Excavation rate: 20m^3/hr or 40 Mg/hr • Density: 2 Mg/m^3 • All Xylenes vaporize during excavation

Pollutant	Emission Rate	Remarks

Note: (1) The assumed excavation rate is agreed by CEDD.

Table 6.10 Pollutant Emission Rate (in the Form of Vapour) during Excavation

Pollutant	Emission Rate	Remarks
TPH	0 – 0.01315 g/s	• Excavation rate: 20 m^3/hr or 40 Mg/hr • Molecular weight is based on Benzene, 78.11 g/mol • All TPH vaporize during excavation
Ethylbenzene	0 – 0.017874 g/s	• Excavation rate: 20 m^3/hr or 40 Mg/hr • Molecular weight : 106.16 g/mol • All Ethylbenzene vaporize during excavation
Xylenes	0 – 0.017874 g/s	• Excavation rate: 20 m^3/hr or 40 Mg/hr • Molecular weight: 106.16 g/mol • All Xylenes vaporize during excavation

Note: (1) The assumed excavation rate is agreed by CEDD.

Air Dispersion Model

6.6.3 EPD approved Fugitive Dust Model (FDM) and Industrial Source Complex Model (ISC3) were employed to predict the pollutants (TPH, Ethylbenzene and Xylenes) concentrations at representative ASRs in the vicinity of the contaminated area at ex-GFS apron area. Dust emission rates and associated particle size distributions were determined based on USEPA AP42.

6.6.4 The construction activities would be undertaken during daytime and negligible dust would be expected during night time with the implementation of dust suppression measures. The worst case meteorological data during daytime were therefore employed for the FDM run. As VOC may be vaporized during nighttime, the worst case meteorological data during nighttime were adopted for the ISC3 model run.

- Wind direction — all 360 degree
- Wind direction resolution — 1 degree
- Wind speed — 1 m/s
- Stability class — D class (for dust particles) & F class (for VOC)
- Mixing height — 500 m
- Surface roughness — 1 m

Health Risk Analysis

6.6.5 In accordance with the Integrated Risk Information System (IRIS) USEPA, ethylbenzene, xylenes and TPH are not classifiable as human carcinogens, no cancer risk from these two chemicals is anticipated during excavation, transportation and unloading of excavated

contaminated soils and decontamination works. For other contaminants found in the contaminated soils including benzo(a)pyrene, lead, copper and arsenic identified in the contaminated spots, in view of small amount of soil contaminated by these heavy metals and chemicals and implementation of dust suppression measures, very minor dust emission attached with these heavy metals and chemicals would be generated from excavation, transportation and unloading and decontamination works. In addition to short period of decontamination work within the site (lasting for a few months only), no adverse health risk is therefore anticipated at the nearby ASRs.

6.7 Prediction and Evaluation of Environmental Impacts

6.7.1 The potential impacts of TPH, ethylbenzene and xylenes emissions (in the form of dust and vapour) arising from excavation of contaminated soil at the ex-GFS apron area as shown in **Drawing 6.2** were assessed and their maximum hourly concentrations at representative ASRs nearest to the excavation site namely ASRs 10 to 17 are summarized in **Table 6.11** and **6.12**. As the excavation activities to be carried out at ground level, the assessment height of the ASRs was 1.5m above ground which is the average height of human breathing zone.

Table 6.11 Maximum Hourly Pollutant Concentrations (in the Form of Dust) During Excavation

ASR	Distance between ASR and Emission Source (m)	Hourly Concentration(µg/m^3)		
		TPH	Ethylbenzene	Xylenes
10	575	0.0006	7.29	3.95
11	503	0.0006	8.96	4.85
12	432	0.0008	10.92	5.91
13	313	0.0012	17.77	9.62
14	316	0.0012	17.27	9.35
15	208	0.0026	35.99	19.48
16	202	0.0024	32.14	17.39
17	157	0.0034	46.14	24.97
Criteria		*1300*	*1300*	*22000*

Table 6.12 Maximum Hourly Pollutant Concentrations (in the Form of Vapour) During Excavation

ASR	Distance between ASR and Emission Source (m)	Hourly Concentration(µg/m^3)		
		TPH	Ethylbenzene	Xylenes
10	575	3.53	4.80	4.80

ASR	Distance between ASR and Emission Source (m)	Hourly Concentration(μg/m^3)		
		TPH	Ethylbenzene	Xylenes
11	503	4.20	5.71	5.71
12	432	4.89	6.64	6.64
13	313	7.34	9.97	9.97
14	316	6.85	9.31	9.31
15	208	11.49	15.62	15.62
16	202	13.71	18.63	18.63
17	157	20.91	28.43	28.43
Criteria		*1300*	*1300*	*22000*

6.7.2 The air quality assessment results in **Table 6.11** and **6.12** indicated that the predicted air pollutant concentrations at the nearest representative ASRs during excavation would comply with and far below the respective criteria whether the pollutants are dispersed in the form of dust or vapour. The duration of excavation for contaminated soils would likely to last for only a few months and annual average pollutant concentrations are therefore not relevant for this assessment. In view of very low concentrations of pollutants predicted at the nearest ASRs due to excavation, the air quality impacts arising from transportation and unloading process are also considered to be negligible.

6.7.3 The contours of the 1-hour average concentration of TPH, ethylbenzene and xylenes in the form of dust at the worst affected heights (1.5m above ground) are plotted and are shown in **Drawings 6.3**, **6.4** and **6.5**. The contours of the 1-hour average concentration of TPH, and ethylbenzene/xylenes in the form of vapour at the worst affected heights (1.5m above ground) are plotted and are shown in **Drawings 6.6** and **6.7**. The modelling results indicated that the predicted air pollutant concentrations at excavation work boundary would not exceed the respective criteria.

6.8 Mitigation of Adverse Environmental Impacts

6.8.1 In order to ensure compliance with the acceptable criteria at the ASRs at all time, requirements of the *Air Pollution Control (Construction Dust) Regulation* shall be adhered to during the construction period. Misting for any stockpile of materials and provision of windbreaks on three sides are proposed to prevent wind erosion. An environmental monitoring and auditing program shall be implemented to monitor the construction process in order to enforce controls and modify methods of work if dusty conditions are arisen. In addition, the following good site practices are recommended to minimise dust and other air pollutants impacts during soil excavation, transportation, loading and unloading the excavated contaminated soils:

- Excavation profiles should be properly designed and executed.
- The excavation area should be limited to as small in size as possible and backfilled with clean and/or treated soil shortly after excavation work.
- The exposed excavated area shall be covered by the tarpaulin during night time.

- The top layer soils shall be sprayed with fine misting of water immediately before the excavation.
- Stockpiling site(s) shall be lined with impermeable sheeting and bunded. Stockpiles shall be fully covered by impermeable sheeting to reduce dust and other air pollutants emission.
- Misting for the dusty material shall be carried out before being loaded into the vehicle.
- Any vehicle with an open load carrying area shall have properly fitted side and tail boards.
- Material having the potential to create dust shall not be loaded from a level higher than the side and tail boards and shall be dampened and covered by a clean tarpaulin.
- The tarpaulin shall be properly secured and shall extent at least 300 mm over the edges of the sides and tailboards. The material shall also be dampened if necessary before transportation.
- The vehicles shall be restricted to maximum speed of 10 km per hour and confined haulage and delivery vehicle to designated roadways insider the site. On-site unpaved roads shall be compacted and kept free of lose materials.
- Vehicle washing facilities should be provided at every vehicle exit point.
- The area where vehicle washing takes place and the section of the road between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores.
- Every main haul road should be scaled with concrete and kept clear of dusty materials or sprayed with water so as to maintain the entire road surface wet.
- Every stock of more than 20 bags of cement should be covered entirely by impervious sheeting placed in an area sheltered on the top and the three sides.
- Every vehicle should be washed to remove any dusty materials from its body and wheels before leaving the construction sites.

6.8.2 Occupational safety measures for the contaminated soil excavation have been described in **Section 3**.

6.8.3 The mitigation measures shall be implemented during the process of solidification and biopiling are described as follows.

Solidification

- The solidification pit/area shall be provided with dust suppression measures.
- Handling and mixing of cement shall follow Air Pollution Control (Construction Dust) Regulation to limit cement emission.
- The bin should be covered during residence period after mixing process.

Biopiling

- During the course of biopile formation, the stockpiled soils at the biopiles shall be covered by tarpaulin or low permeable sheet to avoid fugitive emissions of dust or any air pollutants from the biopiles affecting the surrounding environment and to minimise runoff from the stockpiled soils. Biopile(s) shall be covered by impermeable sheeting (such that no longer than 5m of a biopile shall be exposed to open air) to avoid fugitive emissions of dust or any pollutants from the biopile(s).

- Upon formation of a biopile, the biopile shall be covered by low permeable geotextiles to prevent dust emission and runoff.
- During the operation of biopile, the biopiles shall be fully covered to control the extraction of VOCs.
- Carbon absorber with 99% control efficiency shall be installed for the biopiling system to treat the off-gas prior to discharge and the location of the exhaust of the carbon filter should be sited as far away as possible from the nearby ASRs.
- Spent activated carbon of the carbon absorber shall be replaced regularly such that the VOC emission rate from the system is acceptable (i.e. the measured TVOC is below 20 ppm). The carbon adsorption system should also be monitored regularly to check the performance of the carbon filter.
- Gas samples at the exhaust of the carbon filter for VOCs should be monitored regularly. The biopile operation shall be terminated when unacceptable air quality is monitored at the site boundary. Resumption of biopiling will only be allowed after confirmation and implementation of appropriate mitigation measures.

6.9 Evaluation of Residual Impacts

6.9.1 With the implementation proposed mitigation measures, no residual dust and air quality impacts would be expected at the nearby ASRs.

6.10 Environmental Monitoring and Audit

6.10.1 With the implementation of the recommended air quality mitigation measures, good site practices, and dust and VOCs monitoring (including VOCs monitoring at biopiling discharge and ambient monitoring of VOCs at the site boundary) and audit programme, acceptable air quality impact would be expected at the ASRs during the decontamination process. Details of EM&A Programme are provided in the EM&A Manual.

6.11 Conclusion

6.11.1 The Project site area covers south apron, runway and a narrow strip of north apron of the former Kai Tak Airport, however, the demolition works will only be limited to those areas with remaining existing structures / buildings and abandoned facilities of the former Kai Tak Airport. With the implementation of the requirements stipulated in the Air Pollution Control (Construction Dust) Regulation and proposed dust suppression measures during demolition works, soil excavation, transportation and unloading of excavated contaminated soil into the centralized decontamination work area, adverse dust impact would not be expected. There would be a number of concurrent projects taking place in the proximity of the assessment area, however, no cumulative dust impacts from these concurrent projects are expected.

6.11.2 Regarding the air pollutant emission from decontamination works, insignificant amount of pollutant emissions during excavation from the identified contaminated spots within the South Apron area (except ex-GFS apron area) and North Apron area would be expected in view of the small and localized excavation areas. For the contaminated areas at the ex-GFS apron area, the major concerned air emissions during excavation include TPH, ethylbenzene and xylenes. The modelling results indicated that the predicted air pollutant concentrations would comply with and are far below the respective criteria at the nearest ASRs and no exceedances of the respective criteria are predicted at the excavation work boundary.

6.11.3 No adverse air quality impact would be expected during transportation and unloading of excavated contaminated soil with the implementation of the proposed mitigation measures. The contaminated soil would be treated on site by solidification and biopiling. As the volume of soil for mixing process during solidification would be limited and carbon absorber with 99% removal efficiency would be installed at biopile facilities to treat off-gas prior to

discharge, adverse air quality impact from decommissioning other than dust impact is therefore not anticipated. Air monitoring and audit programme is proposed to ensure proper implementation of mitigation measures

6.11.4 Insignificant odour impact (petroleum/kerosene smell) is anticipated during soil excavation as the excavation area would be limited and clean material would backfill immediately after excavation, and the excavated soils would be covered with impermeable liner to minimise odour emission.

6.11.5 No adverse health risk from dust emission attached with heavy metals would be anticipated in view of small amount of soils contaminated by heavy metals and implementation of dust suppression measures during excavation, transportation and unloading and decontamination works.