Expansion of Hong Kong International Airport into a Three-Runway System
EIA Report

Comparison between With and Without the Project

Introduction

Under Clause 4.4.2(g) of the EIAO-TM, it is noted that the quality of the EIA report shall be reviewed taking into account factors including whether the assessment has considered and compared the environmental benefits and disbenefits of various scenarios with or without the project. As with previous approved EIAs, 'various scenarios with or without the project' are considered at an early stage of the project to justify the need for the project, and the subsequent 'preferred option' that is taken forward for detailed assessment. The comparison of environmental benefits and disbenefits forms part of the consideration of various scenarios to aid the decision on the preferred option, the aim of which is to come up with a preferred option that has minimised environmental impacts from the outset. This interpretation of the EIAO-TM is in line with the specific requirements set out in Clause 3.3 'Consideration of Alternatives' in the EIA Study Brief. As such, the EIA has undertaken the assessment of environmental benefits and disbenefits of the various scenarios with or without the project in Chapter 2 'Need for the Project', while the assessment of environmental benefits and disbenefits of various layouts and construction methods have been presented in Chapter 3 'Consideration of Alternatives'.

Based on the outcome of the consideration and comparison of the various scenarios / options presented in Chapters 2 and 3, a preferred option was identified, and this forms the basis for subsequent detailed technical assessments of environmental acceptability under the various environmental aspects stated in the EIA Study Brief. Each environmental aspect has its own requirements in terms of standards, methodology and evaluation approach, and it is in accordance with these specific requirements that the preferred option is assessed against each environmental aspect. The detailed assessment requirements specified in the EIAO-TM and EIA Study Brief vary between environmental aspects, but generally fall in one of the three main groups below:

- Comparison of 'without Project' versus 'with Project' scenario (i.e., direct 2RS versus 3RS comparison)
- Identification of the baseline, and the changes resulting from the Project (i.e., existing 2RS versus changes / impacts due to 3RS)
- Identification of the components of 3RS and evaluation of those components (i.e. 3RS only)

As the EIA has been conducted in accordance with the detailed assessment requirements specified in the EIAO-TM and EIA Study Brief, direct comparison of 2RS versus 3RS is not a standard requirement for each and every environmental aspect assessed and hence it is not available for every aspect. For health impact assessment which has no criteria or guideline in the EIAO-TM, the assessment was based on reference to overseas practices and was agreed with the relevant Government departments. Nevertheless, the results of the impact assessments for each environmental aspect comparing (as far as possible) between 2RS versus 3RS has been extracted and summarised in the following sections.

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1. AIR QUALITY

EIA Approach

The operational air quality assessment has determined the highest aircraft emissions scenario, established the emission inventories for both the 2RS (i.e., without project scenario) and 3RS scenarios at the worst assessment year, assessed the cumulative air quality impact for the 3RS scenario, and the incremental changes in pollutant concentrations based on a comparison with the 2RS scenario. The assessment also considered a number of enhancement measures/ initiatives aimed at further reducing air emissions from airport activities and operations.

The emission inventories of NOx, RSP, FSP, SO_2, and CO in the highest aircraft emission year (i.e. Year 2031) from airport and associated facilities operations have been established. Both the 3RS and 2RS scenarios (i.e. without project) were covered in the air quality modelling assessment. A three-tier approach has been adopted in the air quality modelling study. Airport related emissions and proximity infrastructure emissions were modelled by EPD's approved near field models (i.e AERMOD and CALINE4), while the EPD's PATH model was adopted for prediction of the future ambient air quality at the Air Sensitive Receivers (ASRs).

Summary of Results

The following tables present a comparion of the NO_2, RSP and FSP levels predicted at the key sensitive areas under the 3RS and 2RS scenarios extracted from the EIA report for easy reference:

NO_2

Predicted Maximum Cumulative 1-hour, 19th highest cumulative 1-hr and Annual Average NO_2 Concentrations in key sensitive areas (Including Background Concentrations)

Area	2RS			3RS		
	Max. 1-hour NO_2 Concentration ($\mu g/m^3$)	19th Max. 1-hour NO_2 Concentration ($\mu g/m^3$)	Annual NO_2 Concentration ($\mu g/m^3$)	Max. 1-hour NO_2 Concentration ($\mu g/m^3$)	19th Max. 1-hour NO_2 Concentration ($\mu g/m^3$)	Annual NO_2 Concentration ($\mu g/m^3$)
BCF	201	157	38	197	161	39
Tung Chung	157-236	109-140	22-33	165-267	110-151	22-33
Tung Chung West	183-220	113-138	25-29	203-234	114-147	25-30
Tung Chung East	168-225	126-132	25-27	187-237	128-137	25-28
Sha Lo Wan	177-280	116-181	21-39	201-312	125-196	21-36
Siu Ho Wan	165-246	121-133	23-30	166-248	121-148	23-30
Tuen Mun	206-214	134-160	33-38	208-218	134-161	33-38

RSP

Predicted Maximum Cumulative 24-hour and Annual Average RSP Concentrations in key sensitive area (Including Background Concentrations)

Area	2RS		3RS	
	Max. 24-hour RSP Concentration ($\mu g/m^3$)	Annual RSP Concentration ($\mu g/m^3$)	Max. 24-hour RSP Concentration ($\mu g/m^3$)	Annual RSP Concentration ($\mu g/m^3$)
BCF	122	40	122	40
Tung Chung	110-117	38-39	110-117	38-39
Tung Chung West	112-116	39-39	112-117	39-39
Tung Chung East	116-118	39-39	116-119	39-39
Sha Lo Wan	112-117	38-40	112-117	38-40
Siu Ho Wan	111-117	38-39	111-117	38-39
Tuen Mun	118-129	40-44	118-129	40-44

Comparison between With and Without the Project

FSP

Predicted Maximum Cumulative 24-hour and Annual Average FSP Concentrations in key senstive area (Including Background Concentrations)

Area	2RS		3RS	
	Max. 24-hour FSP Concentration ($\mu g/m^3$)	Annual FSP Concentration ($\mu g/m^3$)	Max. 24-hour FSP Concentration ($\mu g/m^3$)	Annual FSP Concentration ($\mu g/m^3$)
BCF	91	29	91	28
Tung Chung	83-87	27-28	83-88	27-28
Tung Chung West	84-87	27-28	84-87	27-28
Tung Chung East	87-89	27-28	87-89	27-28
Sha Lo Wan	84-88	27-28	84-88	27-28
Siu Ho Wan	83-88	27-28	83-88	27-28
Tuen Mun	89-96	29-31	89-96	29-31

Conclusion

The modelling results for the Year 2031 3RS scenario indicate that cumulative nitrogen dioxide (NO_2), RSP, FSP, sulphur dioxide (SO_2) and carbon monoxide (CO) levels comply with the relevant AQOs at all ASRs. On comparing the annual pollutant levels of the 3RS scenario with those of the 2RS scenario (i.e., "without project" case), the increase in annual NO_2, RSP and FSP are less than 1$\mu g/m^3$, 0.2 $\mu g/m^3$ and 0.1 $\mu g/m^3$ respectively, indicating relatively insignificant changes.

With respect to the incremental changes in the annual concentration of NO_2 in Sha Lo Wan (i.e., 3RS – 2RS), which is downwind of the airport (the prevailing wind at the airport is easterly), a decrease in concentration is predicted. This suggests that the 3RS will bring environmental benefit to the receivers at Sha Lo Wan and the contributing factors include:

- Shifting of dominant aircraft departure from the South Runway (2RS scenario) to the centre runway (3RS scenario);
- Assigning the South Runway as standby mode wherever practicable during the night-time period between 2300 and 0659

2. HAZARD TO HUMAN LIFE

EIA Approach

The EIA Study Brief requires the potential hazards associated with the construction and operation of the new facilities to be evaulated in terms of individual risk and societal risk.

Summary of Results

The results of the hazard to human life assessment are summarised below

2RS	3RS
The existing aviation fuel hydrant supply system and vehicle and GSE refuelling stations inside the airport have potential risks, however, evaluation of the risks associated with the existing 2RS is not required for this EIA.	The construction works near the existing aviation fuel pipelines and storage facilities, as well as operation of the new aviation fuel hydrant system (i.e. submarine pipelines; underground pipelines, hydrant pit valves, etc) and a new petrol/ diesel fuelling station would pose additional risk to human life as compared with 2RS scenario. The potential hazards associated with the construction and operation of the new facilities have been evaulated in terms of individual risk and societal risk in accordance to the Study Brief and Annex 4 of the EIAO-TM. The evaluated risk levels are all in compliance with the Hong Kong Risk Guidelines in both construction and operation phases. Cost effective mitigation measures have been recommended to further minimise the risk levels with an aim to reduce them to as low as reasonably practicable.

Conclusion

All new facilities for which the risk assessment is required have been evaluated to be in compliance with the Hong Kong Risk Guidelines. Cost effective mitigation measures have been recommended to further minimise the risk levels with an aim to reduce them to as low as reasonably practicable.

Comparison between With and Without the Project

3. NOISE

EIA Approach

An aircraft noise assessment (ANA) was prepared in accordance with the requirements stipulated in the EIA study brief. Noise criteria, in terms of noise exposure forecast (NEF) 25 and 30 as stipulated in the EIAO-TM, were adopted in the ANA. The ANA was carried out in accordance with the guidelines set out by the ICAO and Federal Aviation Administration (FAA). The FAA's integrated noise model (INM) was adopted for quantitative assessment, and the results were presented in the form of aircraft noise contours in NEF metrics. In addition to the future assessment scenarios specified in the EIA Study Brief, the EIA also covered an evaluation of the prevailing noise scenario based on the the aviation operation data for HKIA in 2011, utilising operational records and radar data provided by CAD, to describe the prevailing aircraft noise environment.

Summary of Results

The table below summarises the key findings of the ANA for 2RS under the prevailing aircraft noise environment and under the future scenarios for 3RS as presented in the EIA report. The key findings of the fixed noise impact assessment under 3RS is also presented.

2RS	3RS
(Aircraft Noise)	
A NEF contour map based on the aviation operation data for HKIA in 2011 was prepared as part of the study to describe the prevailing aircraft noise environment. Considering with the noise contours prepared for the future scenarios under 3RS, it is noted that the NEF25 contour under prevailing 2RS would affect more village houses in North Lantau. With only two runways, it is not possible to introduce the flexibility of assigning the exisiting south runway on standby during nighttime period. It was estimated that some 346 village houses/ licensed structures were unavoidable from situating inside the prevailing NEF 25 contour under the two-runway system due to their close proximity to the aircraft noise. Therefore, indirect mitigation measures would be required. In accordance with Clause 2.3.1 in Appendix C of the EIA Study Brief, the aicraft noise impact assessment shall be conducted with respect to the criteria set in Annex 5 of EIAO-TM at assessment years of various operation modes, including the worst operation mode, the interim phase operation mode and the full operation mode of the 3RS. As such, there is no 2RS scenario assessed for future yeas in the EIA Report."	By introducing the use of a number of aircraft noise mitigation measures as part of the future standard operational procedures for the 3RS, the aircraft noise contours would shift northward to sea areas. Therefore, it is expected that aircraft noise impact would be improved in general, especially along North Lantau shorelines. Also, the village houses in and around Sha Lo Wan and along the North Lantau shorelines will be offered the provision of noise insulation and air-conditioning before the operation of the third runway and protected under the prevailing scenario. As reflected in Tables 7.3.2 and 7.3.20 of the EIA Report, the affected village houses / licenced structures would be decreased to about 74 in Year 2030, comparing to 346 under the prevailing scenario in Year 2011. Moreover, Table 7.3.19 of the EIA Report highlights that most of the concerned areas in Hong Kong territory would receive aircraft noise substantially below the EIAO-TM criterion of NEF25.

Comparison between With and Without the Project

Noise (Ground Noise)	
In accordance with Clause 3.3.1 in Appendix C of the EIA Study Brief, the fixed noise sources impact assessment (including ground noise impact) shall be conducted with respect to the criteria set in Annex 5 of EIAO-TM at assessment years of various operation modes, including the worst operation mode, the interim phase operation mode and the full operation mode of the 3RS. As such, there is no 2RS scenario assessed in the EIA Report.	Taking into account the commitment to put the existing south runway (i.e. the nearest runway to the representaive NSRs) on standby where possible at night between 2300 and 0659 which is not possible under the 2RS scenario, the taxiing noise noise would be shifted northward to near the centre runway. Given the increased separation distances between the noise sources and the NSRs, no adverse noise impact is predicted. A New Engine Run-up Facilitie (ERUF) has been planned to be located in the southern end of the western supporting area according to design information provided by the Project's Engineering Design Consultants (i.e. > 2.7km away from the representaive NSRs). With the incorporation of noise enclosure with required noise reduction of at least 15 dBA at both the existing and new ERUFs, no adverse noise impact is predicted.

4. WATER QUALITY

EIA Approach

Assessment of water quality impacts due to operation of 3RS is conducted by modelling the water quality in both 'without Project' and 'with Project' scenarios. The results are then compared against the water quality objectives / criteria to determine whether there are any adverse water quality impacts associated with the Project.

Summary of Results

Operation phase water quality results from the Delft3D model are summarised below.

Average Velocity (m/s)
Results show generally minimal changes in flow velocities at most WSRs except for areas immediately surrounding the project (e.g. C7a, C8 and C17). Other water quality results show insignificant change at these locations despite the change in flow velocities due to 3RS, hence there is no adverse impact associated with 3RS.

WSR	Description	2RS		3RS	
		Wet Season	Dry Season	Wet Season	Dry Season
B1, B2, B3, B6, B7, B8	Beaches in Tuen Mun	0.043 – 0.164	0.056 – 0.134	0.043 – 0.161	0.057 – 0.129
B4, B5, B9, B10, B11, B12, B13	Beaches in Tsuen Wan	0.073 – 0.281	0.051 – 0.226	0.074 – 0.282	0.052 – 0.227
C7a, C7b, C8, C17	Seawater intakes at HKIA / HKBCF	0.064 – 0.426	0.060 – 0.353	0.054 – 0.366	0.042 – 0.209
C1, C2, C3, C9, C10, C15	Seawater intakes in Tuen Mun	0.077 – 0.528	0.047 – 0.380	0.079 – 0.522	0.046 – 0.376
C4, C5, C6, C11, C18	Seawater intakes along north Lantau	0.085 – 0.337	0.054 – 0.279	0.079 – 0.378	0.051 – 0.277
C12, C13, C14, C20	Seawater intakes in Tsing Yi and Hong Kong Island	0.111 – 0.282	0.081 – 0.209	0.111 – 0.282	0.080 – 0.208
CR2, CR3	Coral sites in north Lantau	0.439 - 0.526	0.280 - 0.394	0.338 - 0.509	0.263 - 0.338
CR4, CR5	Coral sites in central waters	0.399 - 0.405	0.244 - 0.283	0.399 - 0.405	0.245 - 0.284
E1	Ecologically important sites in Deep Bay	0.117	0.123	0.117	0.123
E4, E5	Ecologically important sites in north Lantau waters	0.460 - 0.503	0.297 - 0.357	0.409 - 0.488	0.293 - 0.353
E2, E6, E7, E8, E11, E12	Ecologically important sites along north Lantau coastline	0.025 – 0.171	0.022 – 0.100	0.024 – 0.181	0.022 – 0.104
E3, E9, E10	Ecologically important sites along west Lantau coastline	0.052 – 0.774	0.062 – 0.627	0.050 – 0.774	0.063 – 0.619
F1	Ma Wan Fish Culture Zone	0.209	0.153	0.210	0.154
F2	Fish nursery area in north Lantau	0.668	0.510	0.590	0.449
F3	Fish nursery area in west Lantau	0.140	0.076	0.145	0.076
T1	Typhoon shelter at Tuen Mun	0.071	0.025	0.070	0.026
T2	Typhoon shelter at Hong Kong Island	0.181	0.159	0.181	0.158

Note: there is no water quality objective / criteria for flow velocity.

Monthly-averaged Temperature and Salinity
Results show no exceedance of the WQOs at any of the WSRs

WSR	Description	2RS		3RS	
		Temp (^{o}C)	Salinity (psu)	Temp (^{o}C)	Salinity (psu)
B1, B2, B3, B6, B7, B8	Beaches in Tuen Mun	18.3 – 28.1	7.9 – 30.6	18.3 – 28.1	7.4 – 30.5
B4, B5, B9, B10, B11, B12, B13	Beaches in Tsuen Wan	19.3 – 27.3	19.0 – 32.4	19.3 – 27.3	18.7 – 32.3
C7a, C7b, C8, C17	Seawater intakes at HKIA / HKBCF	18.1 – 27.9	10.4 – 29.8	18.2 – 28.0	10.4 – 29.9
C1, C2, C3, C9, C10, C15	Seawater intakes in Tuen Mun	17.7 – 28.2	4.9 – 30.8	17.6 – 28.2	4.6 – 30.7
C4, C5, C6, C11, C18	Seawater intakes along north Lantau	18.0 – 27.9	11.7 – 31.4	18.2 – 28.0	11.4 – 31.3
C12, C13, C14, C20	Seawater intakes in Tsing Yi and Hong Kong Island	19.4 – 27.0	21.6 – 33.9	19.4 – 27.1	21.3 – 33.9
CR2, CR3	Coral sites in north Lantau	18.4 – 27.9	9.6 – 29.6	18.4 – 27.9	10.2 – 29.5
CR4, CR5	Coral sites in central waters	19.5 – 27.0	22.3 – 33.6	19.5 – 27.0	22.1 – 33.6

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E1	Ecologically important sites in Deep Bay	16.8 – 28.7	4.3 – 21.1	16.8 – 28.7	4.0 – 21.1
E4, E5	Ecologically important sites in north Lantau waters	18.3 – 27.9	9.1 – 30.0	18.3 – 27.9	9.7 – 29.9
E2, E6, E7, E8, E11, E12	Ecologically important sites along north Lantau coastline	16.9 – 28.6	10.7 – 30.2	16.8 – 28.6	10.9 – 30.3
E3, E9, E10	Ecologically important sites along west Lantau coastline	18.4 – 27.9	11.7 – 32.9	18.4 – 27.9	11.4 – 32.8
F1	Ma Wan Fish Culture Zone	19.3 – 27.2	19.5 – 31.7	19.3 – 27.2	19.4 – 31.6
F2	Fish nursery area in north Lantau	18.4 – 27.8	10.1 – 27.4	18.4 – 27.9	9.9 – 27.6
F3	Fish nursery area in west Lantau	18.8 – 27.7	13.2 – 31.9	18.8 – 27.8	12.7 – 31.9
T1	Typhoon shelter at Tuen Mun	18.5 – 27.8	13.7 – 30.3	18.4 – 27.8	13.3 – 30.2
T2	Typhoon shelter at Hong Kong Island	20.4 – 26.8	25.8 – 33.9	20.4 – 26.8	25.7 – 33.9

Note: Water quality objective / criteria for temperature ± is ±2^{o}C and 10% for salinity.

Monthly-averaged Dissolved Oxygen (DO) and Biological Oxygen Demand (BOD)

Results show no exceedance of the WQOs for DO and BOD at any of the WSRs

WSR	Description	2RS		3RS	
		DO (mg/L)	BOD (mg/L)	DO (mg/L)	BOD (mg/L)
B1, B2, B3, B6, B7, B8	Beaches in Tuen Mun	5.6 – 7.5	1.1 – 2.8	5.5 – 7.5	1.1 – 2.8
B4, B5, B9, B10, B11, B12, B13	Beaches in Tsuen Wan	5.0 – 7.0	0.6 – 1.4	5.0 – 7.0	0.6 – 1.4
C7a, C7b, C8, C17	Seawater intakes at HKIA / HKBCF	5.5 – 8.9	1.2 – 3.1	5.5 – 8.9	1.3 – 3.0
C1, C2, C3, C9, C10, C15	Seawater intakes in Tuen Mun	5.3 – 7.9	0.9 – 4.5	5.2 – 8.0	1.0 – 4.5
C4, C5, C6, C11, C18	Seawater intakes along north Lantau	5.1 – 9.0	0.8 – 3.1	5.1 – 9.1	0.9 – 3.1
C12, C13, C14, C20	Seawater intakes in Tsing Yi and Hong Kong Island	4.8 – 6.8	0.2 – 1.3	4.8 – 6.8	0.2 – 1.3
CR2, CR3	Coral sites in north Lantau	5.4 – 7.5	1.1 – 2.3	5.4 – 7.7	1.2 – 2.2
CR4, CR5	Coral sites in central waters	4.7 – 6.9	0.2 – 1.1	4.7 – 6.9	0.3 – 1.1
E1	Ecologically important sites in Deep Bay	5.6 – 11.0	3.4 – 11.7	5.6 – 11.1	3.4 - 11.9
E4, E5	Ecologically important sites in north Lantau waters	5.3 – 7.5	1.0 – 2.3	5.3 – 7.7	1.1 – 2.2
E2, E6, E7, E8, E11, E12	Ecologically important sites along north Lantau coastline	5.5 – 9.6	1.2 – 6.3	5.4 – 9.5	1.2 – 6.5
E3, E9, E10	Ecologically important sites along west Lantau coastline	5.4 – 8.0	0.7 – 2.7	5.4 – 8.1	0.7 – 2.7
F1	Ma Wan Fish Culture Zone	5.0 – 7.0	0.7 – 1.3	5.0 – 7.0	0.8 – 1.3
F2	Fish nursery area in north Lantau	5.4 – 7.4	1.2 – 2.2	5.4 – 7.5	1.3 – 2.2
F3	Fish nursery area in west Lantau	6.0 – 7.9	1.0 – 2.2	6.0 – 8.0	1.1 – 2.3
T1	Typhoon shelter at Tuen Mun	6.3 – 8.0	1.5 – 2.5	6.2 – 8.0	1.6 – 2.6
T2	Typhoon shelter at Hong Kong Island	5.3 – 6.8	0.3 – 1.1	5.3 – 6.8	0.3 – 1.1

Note: Water quality objective / criteria for depth-averaged DO is generally not less than 4mg/L. Water quality criteria for BOD (at WSD intakes only) is <10mg/L.

Annual-averaged Total Inorganic Nitrogen (TIN) and Unionised Ammonia (NH_3)

Results show WSRs C1, C9 and E1 exceed the WQO criteria for TIN of 0.5mg/L, while WSRs C9 and E1 exceed the WQO criteria for NH_3 of 0.021mg/L. These exceedances occur in both the 2RS and 3RS scenarios, hence exceedances are not due to 3RS project.

WSR	Description	2RS		3RS	
		TIN (mg/L)	NH_3 (mg/L)	TIN (mg/L)	NH_3 (mg/L)
B1, B2, B3, B6, B7, B8	Beaches in Tuen Mun	0.27 – 0.47	0.005 – 0.008	0.28 – 0.46	0.005 – 0.008
B4, B5, B9, B10, B11, B12, B13	Beaches in Tsuen Wan	0.16 – 0.21	0.004 – 0.006	0.17 – 0.22	0.004 – 0.006
C7a, C7b, C8, C17	Seawater intakes at HKIA / HKBCF	0.25 – 0.39	0.005 – 0.010	0.26 – 0.39	0.005 – 0.010
C1, C2, C3, C9, C10, C15	Seawater intakes in Tuen Mun	0.28 – 1.03	0.006 – 0.025	0.29 – 1.05	0.006 – 0.026
C4, C5, C6, C11, C18	Seawater intakes along north Lantau	0.24 – 0.32	0.005 – 0.007	0.25 – 0.33	0.005 – 0.007
C12, C13, C14, C20	Seawater intakes in Tsing Yi and Hong Kong Island	0.06 – 0.18	0.002 – 0.005	0.06 – 0.19	0.002 – 0.006
CR2, CR3	Coral sites in north Lantau	0.34 – 0.42	0.007	0.35 – 0.36	0.006 – 0.007
CR4, CR5	Coral sites in central waters	0.08 – 0.15	0.002 – 0.004	0.08 – 0.16	0.002 – 0.004
E1	Ecologically important sites in Deep Bay	3.57	0.133	3.61	0.134
E4, E5	Ecologically important sites in north Lantau waters	0.32 – 0.45	0.007	0.33 – 0.40	0.007
E2, E6, E7, E8, E11, E12	Ecologically important sites along north Lantau coastline	0.15 – 0.32	0.004 – 0.007	0.16 – 0.32	0.003 – 0.007
E3, E9, E10	Ecologically important sites along west Lantau coastline	0.12 – 0.16	0.002 – 0.003	0.12 – 0.15	0.002 – 0.003

F1	Ma Wan Fish Culture Zone	0.22	0.005	0.23	0.005
F2	Fish nursery area in north Lantau	0.44	0.008	0.43	0.008
F3	Fish nursery area in west Lantau	0.16	0.003	0.15	0.003
T1	Typhoon shelter at Tuen Mun	0.26	0.005	0.26	0.005
T2	Typhoon shelter at Hong Kong Island	0.07	0.002	0.07	0.002

Monthly-averaged Suspended Solids (SS) and E.Coli

Results show WSRs C3, C5 and C6 exceed the WSD criteria of <10mg/L for SS at WSD intakes. These exceedances occur in both the 2RS and 3RS scenarios, hence exceedances are not due to 3RS project.

Results show no exceedance of E.Coli criteria at any of the WSRs.

WSR	Description	2RS		3RS	
		SS (mg/L)	E.Coli (cfu/100ml)	SS (mg/L)	E.Coli (cfu/100ml)
B1, B2, B3, B6, B7, B8	Beaches in Tuen Mun	8.2 – 17.5	<1	8.3 – 17.5	<1
B4, B5, B9, B10, B11, B12, B13	Beaches in Tsuen Wan	4.8 – 10.0	<1	4.9 – 10.0	<1
C7a, C7b, C8, C17	Seawater intakes at HKIA / HKBCF	9.3 – 15.1	<1	9.5 – 14.9	<1
C1, C2, C3, C9, C10, C15	Seawater intakes in Tuen Mun	7.3 – 27.9	<1	7.5 – 28.0	<1
C4, C5, C6, C11, C18	Seawater intakes along north Lantau	6.2 – 15.9	<1	6.3 – 15.6	<1
C12, C13, C14, C20	Seawater intakes in Tsing Yi and Hong Kong Island	2.3 – 9.8	<1	2.3 – 9.9	<1
CR2, CR3	Coral sites in north Lantau	8.6 – 15.4	<1	8.7 – 14.4	<1
CR4, CR5	Coral sites in central waters	2.7 – 9.7	<1	2.7 – 9.8	<1
E1	Ecologically important sites in Deep Bay	44.4 – 60.6	<1	45.0 – 60.8	<1
E4, E5	Ecologically important sites in north Lantau waters	8.2 – 15.9	<1	8.2 – 15.0	<1
E2, E6, E7, E8, E11, E12	Ecologically important sites along north Lantau coastline	8.2 – 21.3	<1	8.3 – 22.0	<1
E3, E9, E10	Ecologically important sites along west Lantau coastline	4.4 – 13.6	<1	4.4 – 13.6	<1
F1	Ma Wan Fish Culture Zone	5.8 – 10.1	<1	5.9 – 10.1	<1
F2	Fish nursery area in north Lantau	9.7 – 15.6	<1	9.8 – 15.5	<1
F3	Fish nursery area in west Lantau	6.2 – 11.8	<1	6.1 – 12.0	<1
T1	Typhoon shelter at Tuen Mun	9.0 – 14.7	<1	9.1 – 14.9	<1
T2	Typhoon shelter at Hong Kong Island	2.6 – 8.4	<1	2.6 – 8.5	<1

Sedimentation

Results show no exceedance of sedimentation criteria of 200 g/m^2.

WSR	Description	2RS	3RS
		Sedimentation (g/m^2)	
CR2, CR3	Coral sites in north Lantau	<±0.01	<±0.01
CR4, CR5	Coral sites in central waters	-1.17 to -0.11	-1.17 to -0.11
E1	Ecologically important sites in Deep Bay	<±0.01	<±0.01
E4, E5	Ecologically important sites in north Lantau waters	<±0.01	<±0.01
E2, E6, E7, E8, E11, E12	Ecologically important sites along north Lantau coastline	-0.04 to 0.00	-0.03 to 0.00
E3, E9, E10	Ecologically important sites along west Lantau coastline	<±0.01	<±0.01
F1	Ma Wan Fish Culture Zone	27.26	34.74
F2	Fish nursery area in north Lantau	-0.17	-0.28
F3	Fish nursery area in west Lantau	<±0.01	<±0.01

Conclusion

The findings of the operation phase water quality model shows no exceedances in the water quality objectives / criteria due to 3RS project, thus no adverse water quality impacts during the operation phase is anticipated and no specific mitigation measures are required.

5. SEWAGE

EIA Approach

The EIA Study Brief requires a review of the capacity of the sewerage systems and sewage treatment works in north Lantau and an evaluation of the maximum sewerage flows during different phases of operation of the 3RS.

Summary of Results

The results of the sewerage assessment for the ultimate year of operation of the 3RS (Year 2038) are summarised below.

Key Concerns	2RS	3RS
Peak flow to Tung Chung Sewage Pumping Station (TCSPS)	Existing (design capacity) = 1,840 L/s	All planned / committed projects including 3RS = 3,648 L/s A government project is underway to investigate, design and construct an additional sewage rising main to convey the planned sewage flow from Tung Chung and the airport to Siu Ho Wan STW. This additional rising main would meet the additional sewage flow for planned / committed projects including 3RS.
Average dry weather flow to Siu Ho Wan STW (SHWSTW)	Baseline Year 2012 (airport component only) = 18,100 m^3/day Note: EIA Study Brief does not require projection of sewage flows for ultimate Year 2038 without 3RS project, hence such calculation is not available	3RS only = 43,500 m^3/day
Daily flow to SHWSTW	Existing (design capacity) = 180,000 m^3/day	All planned / committed projects including 3RS = 149,400 m^3/day No impact due to 3RS.
Peak flow to SHWSTW	Existing (design capacity) = 3,750 L/s	All planned / committed projects including 3RS = 4,471 L/s The SHWSTW will be upgraded by the relevant government departments to cater for the sewage treatment demand arising from future developments within the relevant sewerage catchment areas (including 3RS).

Conclusion

With implementation of the upgrading works for the gravity sewer, TCSPS and SHWSTW, there would be no adverse impacts due to the Project and no need to establish any central pre-treatment facilities or separate sewage treatment plant for the 3RS Project.

6. WASTE

EIA Approach

The EIA Study Brief requires the waste arising from the Project to be identified and quantified. Quantification of the waste arising from 2RS is only provided to enable estimation / projection of the waste arising during operation phase of 3RS.

Summary of Results

The results of the waste arisings during operation phase are summarised below. It should be noted that there is no explicit criteria / limit for waste arising due to 3RS. EIA Study Brief requirements are to identify and recommend measures to control and minimise waste generation. Such measures have been recommended in the EIA, and include implementing waste recycling initiatives, following the guidelines stated in the "Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes" for chemical wastes, regular inspection and cleaning of floating refuse and proper disposal of sludge from the greywater treatment plant.

Type of Waste Arising	2RS (Baseline Condition)	3RS (Predicted Condition)
General Refuse	According to AAHK's historical records from 2008 to 2012, the annual average total waste arising per passenger from the 2RS operation was about 0.366 kg/pax. In 2012, the amount of recyclable waste materials collected for recycling by AAHK represented a waste recycling rate of around 18%.	It is anticipated that the annual average total waste arising per passenge during the future 3RS operation would be similar to that of the 2RS operation, i.e., 0.366 kg/pax, though the no. of passengers will increase according to the IATA forecast. However, with continuation and strengthening of the current waste recycling initiatives in both existing and future facilities of the project, it is anticipated that waste recycling rate would be improved in future years and the amount of general refuse to be disposal will be accordingly reduced. As one of the on-going initiatives, AAHK has recently established an internal waste management task force to set out strategies and programs to achieve its target of recycling 50% of waste generated at AAHK by 2021.
Chemical Waste	According to AAHK's historical records of chemical waste arisings during the period from 2011 to 2013, it can be estimated that the average chemical waste arising was roughly 15 ton per month, and the major types of chemical wastes generated included lubricating oil, spent fuel, non-halogenated solvent, waste batteries, etc.	It is anticipated that the major types of chemical wastes generated included lubricating oil, spent fuel, non-halogenated solvent, waste batteries will be generated from maintenance, servicing and repairing of various electrical & mechanical (E&M) equipment during operation phase of the project.
Floating Refuse	According to the cleaning contractor, roughly 13 m^3 of refuse and 70 pieces of bamboos/ wood were collected from the seawall along the North Perimeter Road in early 2013 while roughly 26 m3 of refuse and 50 pieces of bamboos/ wood were collected from the other seawalls in early 2012.	It can be estimated that roughly 65 m^3 of floating refuse would be collected from the new artificial seawall of the proposed Airport expansion area every year.
Sludge from Proposed Greywater Treatment Plant	N/A	This is a new greywater treatment plant. It can be estimated that the quantity of dewatered sludge would be approximately 0.23 ton/day.

Conclusion

Provided that all the identified wastes are handled, transported and disposed of in strict accordance with the relevant legislative requirements and the recommended mitigation measures are properly implemented, no adverse environmental impact is expected during the operation phase.

7. LAND CONTAMINATION

EIA Approach

The EIA Study Brief requires identification of any contaminated land uses and an evaluation of the potential land contamination issues that may be affected by 3RS project.

Summary of Results

The potentially contaminated land uses identified within the 3RS project area are summarised below. For these areas, the level of contamination is unknown and cannot be determined until handover of the area to 3RS project. The possible contaminants that may be found in the potentially contaminated areas include heavy metals, organic compounds, PCRs or PCBs. Possible remediation methods will be applied depending on the quantity and quality of contaminated soil. Should any areas with contaminated soil be identified during the future SI works, appropriate soil remediation works will be proposed and carried out to clean up the areas of concerns to levels in compliance with the relevant RBRGs prior to commencement of any construction works at such areas.

Potential Land Contamination Area	2RS (Baseline Condition)	3RS (Predicted Condition)
Sky City Golf Course	Potentially contaminated.	Site Investigation (SI) is proposed at the golf course prior to construction of 3RS to determine any potential land contamination impacts.
T2 Building Expansion Areas		SI is proposed at the two underground fuel storage tanks that are outside the emegency generator room located to the noth and south of T2 building, and also at the above-ground fuel tanks and emergency power generation units locationed inside the emergency generator room and the fuel tank rooms within T2 building, to determine any potential land contamination impacts.
Existing Airside Facilities		SI is proposed at both an existing petrol filling station and a fuel tank room located to the west of CAD antenna farm to determine any potential land contamination impacts.

Conclusion

With the implementation of appropriate soil remediation works (in the event that contaminated land is identified), no residual impact due to land contamination is anticipated.

8. TERRESTRIAL ECOLOGY

EIA Approach

Assessment of impacts associated with terrestrial ecology is conducted by reviewing the baseline (existing) conditions and evaluating the impact due to construction / operation of the 3RS.

Summary of Results

The results of the terrestrial ecology survey and assessment are summarised below.

Aspect Areas	2RS (Baseline Condition)	3RS (Predicted Condition)
Sha Chau Egretry	Sha Chau Egretry is located on the southeastern part of Sheung Sha Chau Island and west of the existing Aviation Fuel Receiving Facility on the island. A maximum of 97 ardeid nests comprising 61 Little Egret, 28 Black-crowned Night Heron, 5 Great Egret and 3 Pacific Reef Heron nests were observed during the egretry count between April and July 2013.	No significant change is expected on the egretry based on the following reasons: • The proposed daylighting location was shifted further northwards • Significant reduction of substantive construction activities on Sheung Sha Chau due to the adoption of pipeline pushing method from HKIA • Commitment of no construction works during the breeding season and at night time
Avifauna within Land Formation Area	A total of 65 bird species were recorded within the land formation area including both open sea and artificial seawall. The major bird group is the ardeid species, which accounts for 75.1 % of the total record, followed by landbirds (13.6 %) and seabirds (6.6%). Little Egret is the dominant species recorded in the land formation area covering both open sea and coastal habitat but their abundance in that area is relatively low. Little Egret, Pacific Reef Heron and Common Sandpiper were found foraging on the artificial seawall but in low abundance. Little Egret and Black Kite were found foraging on the open sea but again in low abundance. Both open sea and artificial seawall within the land formation area are not important foraging ground for birds.	The proposed land formation works will result in loss of 5.9 km of artificial seawall and loss of 650 ha of open sea. As the land formation area is not particularly important to ardeid in the context of northern Lantau waters, the loss of the open sea would not have significant impact to them. And for Black Kite, the potential impact is relatively low, as this ubiquitous species can make use of a wide range of habitats in Hong Kong and it has been shown that the land formation area is not particularly important for this species.
Avifauna on runways	The airfield bird data collected by the AAHK's Bird Control Unit indicates that the dominant bird species are generalists or open country species such as the Eurasian Tree Sparrow, Richard's Pipit and Crested Myna. A small number of various migratory birds were recorded on the runway, including waterbird species such as Sanderling, Red-necked Stint, plover species, and raptor species such as Common Kestrel.	After land formation, the terrestrial habitat created by this project could provide a temporary stopover point for migratory birds during the migratory journey that may have some positive effect on species abundance and diversity. But the effect is expected to be insignificant.
Wildlife in North Lantau	A total of 10 different habitats (i.e. Secondary Woodland, Plantation Woodland, Tall Shrubland, Shrubby Grassland, Seasonally Wet Grassland, Cultivated Land, Stream and Riparian, Salt Marsh, Wasteland and Developed Area) were identified on North Lantau with ecological values ranging from Very Low to High. The hilly terrain of North Lantau is dominated by hillside shrubland and woodland. Along the coastline, lowland habitat including seasonal wet grassland and shrubby grassland are found in sporadic locations, mainly near the village areas. 32 terrestrial floral species of conservation interest have been recorded in the study area (but outside the project area), most of which are found in woodland and shrubland habitats. In terms of fauna species, there are widespread records of endemic and endangered amphibian species, including Romer's Tree Frog and Short-legged Toad in North Lantau. Reptile species recorded in North Lantau are mostly widespread species except for the Tokay Gecko which has limited distribution in Hong Kong including North Lantau. Butterflies however are more widely recorded in the study area (but outside the project	No significant change to the ecology at North Lantau. With the large separation distance and implementation of the recommended mitigation measures for air quality and noise, the potential indirect air quality and noise impacts to the terrestrial ecology in North Lantau would be minimised to negligible levels.

	area), with a butterfly hotspot identified at San Tau. There are however no hotspots or endangered species for dragonfly species identified in the North Lantau study area. A few freshwater fish species of conservation interest were recorded in lowland streams in Sham Wat, Sha Lo Wan, San Tau, Tung Chung, Pak Mong and Tai Ho.	

Conclusion

With the recommended mitigation measures in place, the impacts associated with terrestrial ecology are anticipated to be low or negligible. As a result, no adverse residual impacts are anticipated during both construction and operation phases.

9. MARINE ECOLOGY

EIA Approach

Assessment of impacts associated with marine ecology is conducted by reviewing the baseline (existing) conditions and evaluating the impact due to construction / operation of the 3RS.

Summary of Results

The results of the marine ecology survey and assessment are summarised below.

Aspect Areas	2RS (Baseline Condition)	3RS (Predicted Condition)
San Tau Beach SSSI	San Tau Beach is located at the west of Tung Chung Bay, at about 5 km from the project site. It is a shallow sheltering beach of about 2.7 ha with a mix of fine sand and silt. There are also some mangroves near the landward side of the beach. Species of conservation importance including three seagrass species and two horseshoe crab species. Moderate species diversity. Abundance/richness of wildlife is moderate and ecological value is high.	There will be no direct habitat loss on the San Tau Beach SSSI due to the 3RS project. The unmitigated SS level elevation is not detectable (i.e. 0 mg/L) with no exceedance of the SS crtierion under both worst case scenario A and B during construction phase. The predicted maximum DO depletion level is up to 3.00E-02 mg/L which is insignificant. The modelling results show that the concentrations of all nutrients and contaminants at San Tau are below the relevant criteria or baseline. Change in flow velocity is up to 0.15 m/s, which would not induce significant changes in the hydrodynamic regime. Changes in water quality associated with changes in hydrodynamics from 3RS are assessed to be insignificant, therefore there is no significant impact expected on San Tau Beach marine ecology.
Sha Chau and Lung Kwu Chau Marine Park	Habitats found within SCLKCMP are common in western Hong Kong, and with 17 species of conservation importance found within its boundary it has high ecological value, with moderate species diversity and moderate abundance/ richness of marine fishes.	There will be no permanent direct habitat loss on the SCLKCMP and planned BMP due to the 3RS project. The unmitigated SS level elevation at BMP may cause 1.41 mg/L exceedance at bottom depth level during wet season under the worst case scenario A during construction, with frequency of exceedance at about 0.1%. The highest sedimentation rate estimated at BMP and SCLKCMP are 11.21 g/m^2/day and 10.76 g/m^2/day respsectively, which are both below 200 g/m2/day specified that may cause moderate to high impact on corals. Predicted maximum DO depth levels at SCLKCMP and BMP are 9.79E-03 and 5.64E-03 mg/L respectively during construction phase, which are considered insignificant. All contaminants' concentrations are below the relevant criteria or baseline. Change in flow velocity is up to 0.15 m/s, which would not induce significant changes in the hydrodynamic regime at both Marine Parks. Changes in water quality during the construction phase represent the most significant direct impact, however, with the proposed water quality mitigation measures in place, elevated suspended solids and associated changes in water quality (e.g. dissolved oxygen depletion) are assessed to be of low-moderate significance for corals and insignificant to low significance for other marine park habitats. Similarly, release of contaminants from pore water, oil/ chemical spillage, and changes in
Planned Brothers Marine Park	The size of the planned marine park will be about 850 ha and will include within its boundary scattered coral colonies, an area of moderate fisheries value and important spawning grounds for commercial fisheries resources. Six species of conservation importance was found in BMP.	

		water quality associated with changes in hydrodynamics with the 3RS are assessed to be insignificant. Disturbance to the function and quality of the Marine Parks is assessed to be of low-moderate to moderate significance, but there will be no significant residual impacts with the proposed mitigation measures in place.
Potential Southwest Lantau Marine Park	The potential SWLMP has approximate 657 ha consisting of habitats that are common in western Hong Kong. It has moderate diversity with high ecological value. Three species of conservation importance were recorded in the potential SWLMP.	There will be no direct habitat loss on the potential SLMP due to the 3RS project. The unmitigated SS level elevation would be up to 0.32 mg/L under the worst case scenario A during construction phase, and up to 0.44 mg/L under worse case scenario. There is no exceedance of the SS criterion under both scenarios. The maximum sediment deposition rate is 0.78 g/m^2/day, well under the critiera of 200 g/m^2/day specified for corals. The predicted maximum DO depletion level is up to 2.44E-03 mg/L which is insignificant. The modelling results show that the concentrations of all nutrients and contaminants at SWLMP are below the relevant criteria or baseline. Change in flow velocity is < 0.1 m/s, which would not induce significant changes in the hydrodynamic regime. Changes in water quality associated with changes in hydrodynamics with the 3RS are assessed to be insignificant; while disturbance to the function and quality of the potential Marine Park is of low significance.
Subtidal shores/ coral communities	Only one species of hermatypic coral has been reported. While octocorals and ahermatypic cup coral are relatively common, within the vicinity of the airport island. However, the coral percentage cover recorded was generally low (less than 5%) as the hard substrate was often dominated by other sessile organisms. Three species of conservation importance was recorded in Sha Chau to be included in the assessment.	With the proposed water quality mitigation measures in place, release of suspended solids and associated changes in water quality including dissolved oxygen depletion is assessed to be of low – moderate significance for corals, and insignificant to low significance for other habitats. Changes in water quality associated with change in hydrodynamics are assessed to be insignificant. Habitat loss is assessed to be of moderate significance upon completion of construction, but there will be no significant residual impacts with the extension of artificial seawall habitats for the operation of 3RS and the proposed establishment of the Marine Park. Pre-construction coral dive survey will also be conducted to review the feasibility of coral translocation prior to the commencement of construction. The operation of future HKIAAA will also benefit the conservation of marine ecology.
Artificial reefs (AR)	There are two ARs within the study area, located at the northeastern area of HKIAAA of Chek Lap Kok waters and at SCLKCMP. However, since the AR sites in the Chek Lap Kok waters are significantly affected by the construction of HKBCF, they are not considered as a marine ecological sensitive receiver. There are 6 AR deployment sites at the SCLKCMP. They comprise 24 units of ferro-cement river barges with a total volume of 4,640 m^3 and 42 concrete-coated container of volume 940 m^3 deployed in the SCLKCMP.	Since the AR sites in Chek Lap Kok waters are affected by HKBCF construction, they are not considered as a marine ecological sensitive receiver. The artificial reefs deployed in SCLKCMP may be affected by the sediment laden that inhabited the colonization of corals and invertebrates, thus the subsequent function of marine resources enhancement to the area could not be achieved. The maximum SS elevation levels at SCLKCMP ARs are within the assessment criterion of SS levels under the WQO at all depths in both wet and dry seasons. The highest sedimentation rate estimated SCLKCMP is 10.76 g/m^2/day, which is below 200 g/m^2/day specified that may cause moderate to high impact on corals. As such , the impact of SS elevation associated with the 3RS project on the ARs in SCLKCMP is of insignificant impact.

Comparison between With and Without the Project

		The predicted maximum DO depletion level is 9.79E-03 mg/L, which is considered insignificant. The predicted lowest depth averaged DO level is 6.1 mg/L, which is well above the DO crtierion of > 4mg/L at depth averaged. The modelling results show that the concentrations of all nutrients and contaminants at the SCLKCMP ARs are below the relevant criteria or baseline. Change in flow velocity is up to 0.15 m/s, which would not induce significant changes in the hydrodynamic regime. With the proposed water quality mitigation measures in place, release of suspended solids and associated changes in water quality including dissolved oxygen depletion is assessed to be of low – moderate significance for corals, and insignificant to low significance for other habitats.
Benthic macro-infauna communities	None of the species recorded within the project footprint were mentioned in the IUCN Red List. The marine benthic macro-fauna in North Lantau was composed of a high diversity of polychaete species and a low diversity of other taxa, which is characteristic in the North-western waters of Hong Kong.	Habitat loss is assessed to be of moderate significance upon completion of construction. Loss of prey resources for CWD as a result of loss of benthic habitat is assessed to be of low significance. There will be no significant residual impacts with the proposed establishment of the Marine Park. The operation of future HKIAAA will also benefit the conservation of marine ecology.
Artificial shores intertidal communities	The number of species recorded at artificial shores is between 30 at North Tung Chung and 53 at Chek Lap Kok. All species recorded in aritificial shores were common in artificial / rocky shores of Hong Kong. No species of conservation importance was recorded at this habitat.	Habitat loss is assessed to be of low-moderate significance in construction phase and upon completion of construction. There will be no adverse residual impact with the extension of artificial seawall habitat for the operation of 3RS which provide similar habitat for the recolonisation of intertidal communities.
Rocky shores	Rocky shore is the dominant habitat along the natural coastline within the Study Area. This habitat is sparsely vegetated with salt-tolerant floral species. A total of 68 floral species have been recorded in this habitat. Overall the species diversity and evenness at the relatively undisturbed rocky shores of north-western Lantau, Sha Chau area and Tai Mo To are moderate. Rocky shores at South Chek Lap Kok and San Tau, where more human disturbance is present, have relatively lower species diversity and evenness. No species of conservation importance was recorded at this habitat.	Habitat loss is assessed to be of low significance and only occurred at the daylighting location of the pipeline diversion at the Sha Chau rocky shore. Changes in species distribution, abundance and patterns of habitat use is assessed to be of low significance Release of suspended solids and associated changes in water quality including dissolved oxygen depletion are assessed to be insignificant to low significance.
Sandy shores	Sandy shore is found discontinuously along the North Lantau coastline in which the sandy substrate is mainly fine and silty in nature. This habitat is sparsely covered with vegetation, particularly close to the coastline. Number of species recorded at this habitat is between18 and 94. No species of conservation importance was recorded at these locations.	There will be no direct loss of sandy shore habitat due to the 3RS project. Changes in water quality associated with changes in hydrodynamics are assessed to be insignificant Release of suspended solids and associated changes in water quality including dissolved oxygen depletion is assessed to be insignificant
Mangroves and intertidal mudflats	Mangroves are found along the North Lantau coastline in the intertidal zone. This habitat is densely covered with true mangrove species with other salt-tolerant floral species commonly observed. Number of species recorded at this habitat is between 52 and 128. Five species of conservation importance was recorded at this habitat.	There will be no direct habitat loss of mangroves and intertidal mudflats due to the 3RS project. Indirect disturbance due to the release of suspended solids and associated changes in water quality including dissolved oxygen depletion are assessed to be insignificant to low significance. Changes in water quality associated with change in hydrodynamics is assessed to be insignificant.
Seagrass beds	The presence of seagrass beds at San Tau was verified in this survey with two seagrass	There will be no direct habitat loss of seagrass beds due to the 3RS project.

	species. The presence of seagrass beds of *Halophila beccarii* at Tai Ho Wan was also verified in this survey. Recently, no seagrass beds were found at Tung Chung Bay or Yan O. On the other hand, it is worth noting that a new locality of *Halophila beccarii* was found at Sham Wat Wan in this survey. This Sham Wat Wan locality represents the most western extent of distribution of seagrass beds in Hong Kong.	Indirect disturbance due to the release of suspended solids and associated changes in water quality including dissolved oxygen depletion during construction phase is assessed to be insignificant to low significance. Changes in water quality associated with change in hydrodynamics are assessed to be insignificant.
Horseshoe crab breeding and nursery sites	Two horseshoe crab species were recorded within the study area. Individuals of juvenile horseshoe crab were also found at Hau Hok Wan and Sham Wat Wan. They could not be identified to species level due to the indistinct characteristics. It was observed that *T. tridentatus* was the abundant horseshoe crab species at San Tau and Tung Chung Bay; while *C. rotundicauda* was abundant at Tai Ho Wan. At Sham Wat Wan, both species were found in similar abundance. No mating activity of horseshoe crab was observed during the course of survey.	There will be no direct habitat loss of horseshoe crab breeding and nursery sites due to the 3RS project. Indirect disturbance due to the release of suspended solids and associated changes in water quality including dissolved oxygen depletion during construction phase are assessed to be insignificant to low significance. Release of contaminants from pore water is assessed to be insignificant. Potential impact due to oil/ chemical spillage is assessed to be insignificant. Changes in water quality associated with changes in hydrodynamics are assessed to be insignificant.
Estuarine fauna	Three relevant estuarine macroinvertebrate species of conservation importance were reported. For estuarine fish, eight species of conservation importance were reported from literature review. The findings for estuarine macroinvertebrates indicated that Tung Chung had the highest species diversity in dry season. Sha Lo Wan also had a moderate-high evenness index similar to Tung Chung. In wet season, Sha Lo Wan had the highest diversity and evenness records. Hau Hok Wan also had a high evenness index similar to Sha Lo Wan, which indicated the species recorded are evenly distributed. For the estuarine fish records, Sham Wat had the highest species diversity index while Hau Hok Wan had the highest species evenness index in dry season. In wet season, Tai Ho had both the highest species diversity and evenness records.	There will be no direct habitat loss of estuarine habitats due to the 3RS project. Indirect disturbance due to the release of suspended solids and associated changes in water quality including dissolved oxygen depletion during construction phase are assessed to be insignificant to low significance.
Marine fish and other fauna	The field surveys conducted for this project have recorded a total of 182 species, including 134 fish species from 75 families, six species of mantis shrimps from one family, 11 species of shrimps from three families, 13 species of crabs from six families, and 18 species from 16 other families. There are 10 species of conservation importance identified from the survey findings.	Loss of carrying capacity and habitat fragmentation is assessed to be of low significance. Changes in species distribution, abundance and patterns of habitat use are assessed to be of low significance. Indirect disturbance due to the release of suspended solids and associated changes in water quality including dissolved oxygen depletion during construction phase are assessed to be of low significance Release of contaminants from pore water and oil/chemical spillage are assessed to be insignificant Importation and transportation of marine fill and filling activities are assessed to be of low significance Bored piling activities and associated underwater noise is assessed to be of low significance Changes in hydrodynamics are assessed to be of low significance

<table>
<tr><td></td><td></td><td>Changes in water quality associated with changes in hydrodynamics and indirect disturbance of habitats due to deterioration of water quality during operational phase are assessed to be insignificant

Impingement and entrainment due to seawater intakes is assessed to be of low significance.

Indirect disturbance of marine fauna due to aircraft noise is assessed to be insignificant.

Six marine fish species of conservation importance may be affected due to direct habitat loss. Habitat loss is assessed to be of moderate significance due to the high mobility of the species and suitable habitats are available in adjacent waters but the large area to be affected,

There will be no significant residual impacts with the proposed establishment of the Marine Park, implementation of mitigation measures proposed for controlling the water quality impact and measures for conservation of other marine ecology. The operation of future HKIAAA will also benefit the conservation of marine ecology.</td></tr>
<tr><td>Chinese White Dolphin</td><td>Occurrence/ Distribution: CWDs occur throughout the survey area (both airport north and airport west)
Group Sizes: Average about 3.6, similar to AFCD database results
Density/ Abundance: CWDs densities and abundance are moderate
Behaviour/ Activities: CWDs use the airport north area mainly for travelling
CWDs use the airport west mainly for travelling and foraging
Acoustic data generally indicate more use of nearshore areas at night
Movements/ Residency: Survey area used as portion of larger range by several dozen CWDs
No evidence that CWDs use survey area as entire range</td><td>
<table>
<tr><th>Type of Impact</th><th>Significance of Impact</th></tr>
<tr><td>Construction Stage</td><td></td></tr>
<tr><td>• Temporary habitat loss due to land formation</td><td>Moderate - high</td></tr>
<tr><td>• Loss of carrying capacity</td><td>Moderate</td></tr>
<tr><td>• Habitat fragmentation</td><td>Moderate</td></tr>
<tr><td>• Loss of travelling area and connectivity between core habitats</td><td>Moderate</td></tr>
<tr><td>• Loss of prey resources</td><td>Low</td></tr>
<tr><td>• Disturbance to use of travelling area and connectivity</td><td>Moderate</td></tr>
<tr><td>• Changes to species distribution, abundance and patterns of habitat use</td><td>Moderate</td></tr>
<tr><td>• Effects due to water quality impacts</td><td>Insignificant – low</td></tr>
<tr><td>• Acoustic disturbance from general construction works</td><td>Low – moderate</td></tr>
<tr><td>• Disturbance from night time construction works</td><td>Moderate</td></tr>
<tr><td>• Acoustic disturbance from marine vessels</td><td>Low</td></tr>
<tr><td>• Risk of injury / mortality from high speed ferries</td><td>High</td></tr>
<tr><td>• Changes in movement patterns due to marine traffic</td><td>Low – moderate</td></tr>
<tr><td>• Disturbance to function and quality of Marine Parks</td><td>Low to moderate</td></tr>
<tr><td>Operation Stage</td><td></td></tr>
<tr><td>• Permenant habitat loss due to land formation</td><td>High</td></tr>
<tr><td>• Loss of carrying capacity</td><td>Moderate</td></tr>
<tr><td>• Habitat fragmentation</td><td>Moderate</td></tr>
<tr><td>• Loss of travelling area and connectivity between core habitats</td><td>Moderate</td></tr>
<tr><td>• Loss of prey resources</td><td>Low</td></tr>
<tr><td>• Changes to species distribution, abundance and patterns of habitat use</td><td>Moderate</td></tr>
<tr><td>• Effects due to hydrodynamic and water quality changes</td><td>Low</td></tr>
<tr><td>• Acoustic disturbance from increased marine traffic</td><td>Moderate - high</td></tr>
<tr><td>• Risk of injury / mortality from high speed ferries</td><td>High</td></tr>
</table>
</td></tr>
</table>

		• Changes in movement patterns due to marine traffic	Moderate - high
		• Disturbance to function and quality of Marine Parks	Low to moderate

Taking into account the impacts due to 3RS, a range of mitigation measures have been proposed, including the establishment of a large new marine park which will provide approximately 2,400 ha of new protected waters and critical linkages with the planned Brothers Marine Park and the existing Sha Chau and Lung Kwu Chau Marine Park as well as with the significant area of HKIAAA marine exclusion zone. SkyPier ferry route diversions and speed restrictions are expected to minimise impacts of vessel traffic on the animals, in addition to the benefits provided by restrictions on other activities once the marine park is established, including the 10-knots speed limit.

Conclusion

With the implementation of the recommended mitigation measures, predicted impacts would be expected to be reduced to acceptable levels and the residual impacts are expected to comply with the TM-EIAO.

10. FISHERIES

EIA Approach

Assessment of impacts associated with fisheries is conducted by reviewing the baseline (existing) conditions and evaluating the impact due to construction / operation of the 3RS.

Summary of Results

The results of the fisheries survey and assessment are summarised below.

Areas of Concern	2RS (Baseline Condition)	3RS (Predicted Condition)
Project footprint	In terms of abundance and yield, most of dominant species recorded in this area are with low or no commercial value. The overall fisheries production in terms of weight was low and in terms of value was moderately low to moderate. The level of overall fishing operations was moderately low to moderate (approx. 50-400 vessels/year) within the proposed land formation footprint. The ichthyoplankton and post-larvae densities (6.42 ± 9.33 larvae m-3) and family richness (3.67 ± 2.24) were low, and mostly consisted of families of low commercial values.	The land formation and seawall construction works may cause direct loss of 1,392 ha of fishing ground during construction phase and 768 ha upon completion of construction. There will be a permanent loss of 672 ha fisheries habitats (and resources) which is considered to be of moderate significance with the project in place. It is proposed to compensate for the loss of fisheries habitats / fishing ground by designating a Marine Park to connect with the existing SCLKCMP, the planned BMP and the existing / future HKIAAA to improve the ecological connectivity. There will be positive synergistic effect on marine ecology and fisheries resources conservation. Indirect fisheries impact on water quality and subsequently disturb the fisheries habitats outside the land formation footprint is also anticipated. The potential impact is considered temporary, as the seawall construction would be substantially completed by the end of 2017, which thereafter would effectively limit the sediment plume dispersal.
Spawning ground of commercial fisheries resources in northern Lantau waters	Northern Lantau waters had been identified as spawning grounds of commercial fisheries. The highest number of reproductive individuals was observed during May to August, while other months with increased spawning activities included March to April, and December to January. Places with high fisheries production in terms of value included waters around SCLKCMP, and western Lantau waters off Tai O.	Approximately 78 ha of the project footprint will be within this identified spawning ground. There is no marked difference between fish density or number of fish families detected between identified spawning ground of commercial fisheries resources in northern Lantau and the adjacent areas and most of the ichthyoplankton and post-larvae of low commercial value. As such, the loss of 78 ha of identified spawning ground of commercial fisheries resources is considered to be of low significance.
Sha Chau and Lung Kwu Chau Marine Park	Moderate to high yield of fisheries production was observed with dominant species of no to high commercial values. Estimated number of vessels operating frequently within SCLKCMP each year is around 100 – 400. Ichthyoplankton and post-larvae densities (1.13 ± 1.98 larvae m^{-3}) and family richness (6.79 ± 3.34) were low, and mostly consisted of families of low commercial values.	Marine Site Investigation will be conducted for submarine aviation fuel pipeline. Approximate 0.12m^2 fisheries habitat will be affected. But the impact will be temporary loss of marine waters for a few months.
Artificial Reef at Sha Chau and Lung Kwu Chau Marine Park	Soft corals were observed in low density on the artificial reefs, with macroinvertebrates and sessile fauna recorded as being attached to the artificial reefs. This indicated the artificial reefs do serve the function of providing hard substrates for the colonisation of benthic fisheries resources at the artificial reefs of SCLKCMP.	Chek Lap Kok ARs is not considered as a site of fisheries importance for this study. However, the artificial reefs proposed to be reprovisioned at the planned marine park at the Brothers and the existing ARs at the Sha Chau and Lung Kwu Chau Marine Park may be subject to indirect water quality impact due to this project. The maximum SS elevation levels at SCLKCMP ARs (CR2) are within the assessment criterion of SS levels under the WQO at all depth levels in both wet and dry seasons. The highest sedimentation rate estimated at SCLKCMP is 10.76 g/m^2/day, which is below 200 g/m^2/day. Thereby, the impact significance on these artificial reefs due to the land formation works is anticipated to be low.
Ma Wan Marine Fish Culture Zone (FCZ)	Ma Wan Fish Culture Zone is over 13 km away from the project footprint. There are 13,200 m^2 of aquaculture rafts in the Ma Wan Fish Culture Zone with about 50	Water modeling results show that the unmitigated SS level at Ma Wan Marine FCZ (F1) (due to the project only) would be up to 1.14 mg/L for scenario A and 1.90 mg/L for

Comparison between With and Without the Project

	aquaculturists operating marine fish culture.	scenario B, well below 50 mg/L, which is the criterion derived from the international marine water quality guidelines for the protection of ecosystems. The estimated DO depletion at Ma Wan Marine FCZ due to the water jetting and excavation works would be up to 1.58E-03 mg/L, with depth averaged DO level not lower than 5.20 mg/L. Therefore, there would be neither appreciable changes in DO concentration from baseline nor exceedance of the WQO criteria for DO.
Oyster production area at Deep Bay mudflat	The oyster production area in Deep Bay is over 14 km away from the project footprint. In 2013, the production was about 108 tonnes (meat only) valued at $9 million.	Water modeling results show that the unmitigated SS level at the oyster production area would be undetectable. No SS elevation and exceedance level was observed in both oyster production area at Deep Bay mudflat.
Tai O	The western Lantau waters off Tai O have the highest adult fish production in terms of weight (400 – 600 kg/ha/year). The area also had moderate level of fishing operation (approx. 100-400 vessels).	The water modelling results show that area with high production of capture fisheries at Tai O would mostly be within WQO criterion for SS elevation. No SS elevation and exceedance level was observed in area of high production of capture fisheries off Tai O. DO depletion levels due to the above works at Tai O area is up to 3.60E-03 mg/L which is insignificant. The depth averaged DO levels of fisheries importance is predicted to be above 6.30 mg/L, which is within the DO criterion of >4 mg/L. The modelling results show that concentrations of all contaminants at Tai O area is below the relevant criteria or baseline.
The Brothers	Low to high yield were observed in this area with dominant species of no to high commercial values. A conservative estimation of the number of vessels frequently operating within the waters of the planned BMP each year is around 100 - 400. The ichthyoplankton and post-larvae densities (8.66 ± 24.80 larvae m-3) and family richness (3.54 ± 1.56) were low and mostly consisted of families of low commercial values.	The unmitigated SS level elevation would be up to 9.09 mg/L under the worst case scenario A, and up to respectively 4.56 mg/L under the worst case scenario B. All the exceedances are at 0.1% of the time. DO depletion level is up to 5.64E-03 mg/L which is insignificant. The modelling results show that concentrations of all contaminants at the planned BMP is below the relevant criteria or baseline. The unmitigated sedimentation rate at the hard corals recorded at the Brothers is up to 11.21 g/m^2/day, well below the criterion.

Conclusion

With the implementation of the recommended water quality mitigation measures during construction and operation phases as well as the proposed establishment of new Marine Park to compensate the permanent loss of fisheries habitats (and resources), no adverse residual impact on fisheries is anticipated.

11. LVIA

EIA Approach

Assessment of landscape and visual impacts is conducted by reviewing the cumulative baseline with planned / committed projects (e.g. HKBCF) in the absense of 3RS and evaluating the impact due to construction / operation of the 3RS. The reference baseline year adopted is Year 2016.

Summary of Results

The baseline landscape resources, landscape character and visually sensitive receivers (i.e. 2RS), and the residual impact after mitigation on the ultimate scenario with 3RS in place (i.e. Year 10 after operation of 3RS) are summarised below.

2RS

Landscape Resources (LR)

LR	Description	Sensitivity to Change
CLK/LR1, SC/LR3	Coastal waters of North Lantau / Sha Chau islands	High
CLK/LR2, LR3, LR6, LR12, LR13	Landscaped / grass / turf areas around the existing airport and future HKBCF / HKLR facilities, grassland / shrub on vacant land, and artificial coastline	Low
CLK/LR4a, LR4b	Roadside vegetation	Low – Medium
CLK/LR5, LR9, SC/LR1, LR2, LR4	Natural coastline, rocky / sandy shore, and vegetation at Sha Chau islands	High
CLK/LR7, LR8, LR11	Stream, agricultural land, and urban park	Medium
CLK/LR10a, LR10b	Coastal woodland	High

Landscape Character Areas (LCA)

LCA	Description	Sensitivity to Change
CLK/LCA1	Airport landscape	Low
CLK/LCA2	Inshore water landscape	High
CLK/LCA3	Straits landscape	Medium
CLK/LCA4a, LCA4b, LCA6	Coastal upland and hillside, and rural coastal plain landscape	High
CLK/LCA5, LCA7, LCA8	Mixed modern comprehensive development, transportation corridor, and on-going major development landscape	Low
SC/LCA1, LCA2	Island landscape / Sha Chau islands inshore water landscape	High

Visually Sensitive Receivers (VSRs)

VSRs	Description	Value / Quality of Existing	Availability of Alternative	Sensitivity to Change (Operation

3RS

Landscape Resources (LR)

LR	Description	Residual Impact after Mitigation (Operation Phase)
CLK/LR1	Coastal waters of North Lantau	Substantial
SC/LR1	Natural rocky coastline of Sha Chau islands	Slight
CLK/LR2, LR3, LR4a, LR4b, LR12, LR13, SC/LR2	Landscaped / grass / turf areas around the existing airport, roadside vegetation, grassland / shrub on vacant land, artificial coastline, and vegetation at Sha Chau islands	Insubstantial
All others		None

Landscape Character Areas (LCA)

LCA	Description	Residual Impact after Mitigation (Operation Phase)
CLK/LCA2	Inshore water landscape	Substantial
CLK/LCA1, LCA8, SC/LCA1	Airport landscape, on-going major developments landscape, island landscape	Insubstantial
All others		None

Visually Sensitive Receivers (VSRs)

VSRs	Description	Residual Impact after Mitigation (Operation Phase)
REC-13, 21	Passengers / drivers of recreational marine craft in north Lantau waters, and recreational users of Sha Chau islands	Moderate
RES-3, 4, 5, 6, 7, 9, 20 REC-1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 16, 19	Residents of Tung Chung, Tuen Mun, Gold Coast, Siu Lam, Tung Chung East and West, and Yat Tung Estate. Visitors to AsiaWorld-Expo, SkyCity Marriott Hotel, Hong Kong Airport Passenger Terminal,	Slight

Comparison between With and Without the Project

		Views	Views	Phase)
RES-1	Residents of villages of Tai O	Good	Yes	High
RES-2, 12, 15, 16	Residents of villages of Sha Lo Wan, San Tau, Kau Liu, Tin Sam, Sheung Ling Pei, and Ma Wan New Village.	Fair	No	High
RES-3, 7, 9, 20	Residents of Tung Chung, future Tung Chung East and West, and Yat Tung Estate	Good	Yes	High
RES-4, 5, 6, 8	Residents of Tuen Mun, Gold Coast, Siu Lam, and Lung Kwu Tan	Good	Yes	High
RES-10, 11, 13, 14, 17, 18 , 19, 21	Residents of Sham Shek Tsuen, Sai Tso Wan Village, Shek Lau Po and Mok Ka, Tung Hing Village, Pak Mong Village, Ngau Kwu Long Village, San Shek Wan Village, and Tai Ho San Tsuen	Good	No	High
REC-1	Visitors to AsiaWorld-Expo	Poor	No	Medium
REC-2, 3, 4	Visitors to SkyCity Marriott Hotel, Hong Kong Airport Passenger Terminal, and Regal Hotel	Fair	No	High
REC-5, 6, 7, 8, 9, 10, 12, 20, 22	Hikers of Nei Lak Shan, Fung Wong Shan, Tai Tung Shan, Lantau North and South Country Park, Scenic Hill, users of planned entertainment node (Sunny Bay), and Sha Chau	Good	Yes	High
REC-11, 25, 26	Recreational users of future Tung Chung East and West, and visitors of proposed NCD hotels and commercial facilities	Fair	Yes	High
REC-13, 14, 19	Recreational marine craft in north Lantau, Castle Peak Bay, and Tai Lam Country Park	Good	Yes	High
REC-15, 16, 22	Recreational users of Butterfly Beach, Golden Beach, and hikers of Castle Peak	Good	Yes	High
REC-17, 18	Recreational users of Tung Chung Outdoor Recreation Camp, and Man Tung Road Park	Fair	No	High
REC-23, 24	Hikers from Tung Chung to Tai O, and visitors to Tai Ho	Good	No	High
REC-27	Users of proposed columbarium developments for Tsuen Wan	Good	Yes	Low
T-1, 9	Passengers / drivers of vehicles and MTR along North Lantau Highway, and planned HKBCF	Good	No	Medium
T-2, 3, 4, 5, 6, 7, 8, 10, 11, 13	Passengers / drivers of vehicles and MTR along Cheong Wing Road, Castle Peak Road, Tuen Mun Road, Lung Mun Road, Tung Chung Road, commercial aircraft, proposed TM-CLKL, proposed HKLR, ferries in north Lantau waters, ferry passengers from Tung Chung to	Good	Yes	Medium
T-2, 3 O-17, 18	Regal Hotel, and Cable Cars of Ngong Ping 360. Hikers of Nei Lak Shan, Fung Wong Shan, Lantau North and South Country Park, Scenic Hill, Castle Peak, Tai Lam Country Park, and recreational users of Tung Chung East. Passengers / drivers of vehicles and MTR along Cheong Wing Road, commercial aircraft, proposed HKLR, and ferries in north Lantau waters. Future workers of Tung Chung East and West.			
All others				Insubstantial

	Tai O, and at Public Pier in Tuen Mun			
T-12	Ferry passengers at Public Pier in Tung Chung	Fair	No	Medium
O-1	Workers of AsiaWorld-Expo	Poor	No	Low
O-2, 5, 6	Workers of SkyCity Marriott Hotel, Hong Kong Passenger Terminal, and Regal Hotel	Fair	No	Low
O-3, 4, 9, 14, 15	Workers of Chek Lap Kok facilities, Hong Kong Aircraft Engineering Ltd, commercial aircraft on and around Chek Lap Kok, planned HKBCF, proposed NCD hotels and commercial facilities	Fair	Yes	Low
O-7, 12, 17, 18	Workers of Pillar Point, Castle Peak Power Station, and future Tung Chung East and West	Fair	Yes	Low
O-8, 10, 13	Workers of EcoPark, planned Lantau Logistics Park, and Siu Ho Wan	Good	Yes	Low
O-11, 16	Workers of Cathay Pacific City, and Siu Ho Wan MTR Depot	Good	No	Low

Conclusion

In accordance to the criteria and guidelines for evaluating and assessing impacts as stated in Annex 10 and 18 of the EIAO-TM, the overall residual landscape and visual impacts of the proposed 3RS are marginally acceptable with mitigation during the construction and operation phases.

12. CHIA

EIA Approach

Assessment of cultural heritage impacts is conducted by reviewing the baseline conditions and evaluating the impact due to construction / operation of the 3RS.

Summary of Results

The results of the cultural heritage survey and assessment are summarised below.

2RS (Baseline Condition)	3RS (Predicted Condition)
Marine Archaeology	Not applicable (no archaeological artefacts identified during the marine archaeological investigation and surveys)
Tung Chung Battery (Declared Monument)	No impact
Tin Hau Temple at Sha Chau (Nil Grade Historic Building)	No impact
Ha Law Wan Site of Archaeological Interest	The road improvement works has avoided direct encroachment onto this site, hence there is no impact during operation phase and insignificant impact during construction phase
Sha Chau Site of Archaeological Interest	The submarine pipeline construction method has avoided direct encroachment onto this site, hence there is no impact during operation phase and insignificant impact during construction phase
Fu Tei Wan Kiln Site of Archaeological Interest	No impact
San Tau Site of Archaeological Interest	No impact
Sha Lo Wan Site of Archaeological Interest	No impact
Sha Lo Wan (West) Site of Archaeological Interest	No impact

Conclusion

There will be no impacts to cultural heritage during construction and operation phase of 3RS.

Comparison between With and Without the Project

13. HEALTH

EIA Approach

The air Health Impact Assessment (HIA) focused on toxic air pollutants (TAP) and criteria pollutants. Health risk determination based on acute, chronic non-cancer risk and cancer risk forms the basis of many of the reviewed literatures, and this was adopted as the approach for the HIA of the project and consisted of the following steps: (i) hazard identification, (ii) exposure assessment, (iii) dose-response assessment, and (iv) risk characterisation.

On the other hand, the noise HIA focused on comparing the changes of health impacts between the operation of 3RS and 2RS in 2030, i.e., the year of "worst operation mode", which represented the maximum total aircraft noise emission. The locations of interest include those populated areas adjacent to the NEF25 contour line, namely Sha Lo Wan, Tung Chung, North Lantau, Ma Wan and Siu Lam, which are collectively identified as the assessment area for this HIA. The assessment involved a quantitative analysis for both annoyance and self-reported sleep disturbance as the two main aspects.

Summary of Results

The results of the HIA are summarised below:

<table>
<tr><th>2RS</th><th>3RS</th></tr>
<tr><td>Health (emissions)</td><td></td></tr>
<tr><td><u>TAP</u>

The short-term (i.e 1-hour / 24-hour) and long-term (i.e. annual) TAP concentrations due to the operation of 2RS modeled at all potential human receptors would comply with the respective acute and chronic non-carcinogenic risk criteria. The acute risk and non-carcinogenic chronic risk due to 2RS are considered as acceptable.

<u>Criteria Pollutants</u>
Incremental risk due to the 3RS is assesssed in the EIA Report and results are as presented in the "3RS" column on the right.</td><td><u>TAP</u>

The maximum incremental life time carcinogenic health risk (3RS -2RS) calculated are summarised below:
<table><tr><th>Area</th><th>Maximum incremental life time carcinogenic health risk</th></tr><tr><td>Siu Ho Wan</td><td>2.82E-06 (0.2%)</td></tr><tr><td>Sha Lo Wan</td><td>1.14E-05 (0.6%)</td></tr><tr><td>San Shek Wan</td><td>6.11E-06 (0.4%)</td></tr><tr><td>San Tau</td><td>9.99E-06 (0.6%)</td></tr><tr><td>Sham Wat</td><td>2.37E-06 (0.1%)</td></tr><tr><td>Tung Chung</td><td>7.65E-06 (0.4%)</td></tr></table>Incremental percentage change is listed in the ( ).

<u>Criteria Pollutants</u>
Incremental unit risk of hospital admission per annum (3RS – 2RS) attributable to NO_2, RSP and SO_2 calculated are summarised below:
<table><tr><th rowspan="2">Major Area</th><th colspan="2">Incremental Unit Risk per Annum of Hospital Admission [1] & [2]</th></tr><tr><th>Cardiovascular Disease</th><th>Respiratory Disease</th></tr></table></td></tr>
</table>

Tung Chung	8.20E-06	5.75E-06
	(5.69E-06 – 1.06E-05)	(3.28E-06 – 8.21E-06)
San Tau	1.15E-05	7.45E-06
	(7.66E-06 – 1.51E-05)	(3.73E-06 – 1.11E-05)
Sha Lo Wan	-4.17E-05	-3.36E-05
	(-5.22E-05 – -3.08E-05)	(-4.47E-05 – -2.26E-05)
San Shek Wan	-1.86E-05	-1.62E-05
	(-2.30E-05 – -1.41E-05)	(-2.09E-05 – -1.15E-05)
Sham Wat	7.59E-06	5.10E-06
	(5.00E-06 – 1.00E-05)	(2.60E-06 – 7.60E-06)
Siu Ho Wan	6.31E-06	4.53E-06
	(4.41E-06 – 8.11E-06)	(2.65E-06 – 6.39E-06)
Airport	4.65E-05	2.68E-05
	(3.17E-05 – 6.02E-05)	(1.25E-05 – 4.10E-05)

[1] The unit risk on number of hospital admission = the number of hospital admission in the predicted year / the population in the concerned area.
[2] With reference to incremental change of annual-avg. concentration for averaged daily concentration determination.

Incremental unit risk of premature deaths (short-term mortality) due to all-causes per annum (3RS – 2RS) attributable to NO_2, RSP and SO_2 are summarised below:

Major Area	**Incremental Unit Risk per Annum of All-cause Premature Deaths (Short-Term Mortality) [1] & [2]**
Tung Chung	2.23E-06 (1.40E-06 – 3.06E-06)
San Tau	3.07E-06 (1.81E-06 – 4.32E-06)
Sha Lo Wan	-1.17E-05 (-1.54E-05 – -8.01E-06)
San Shek Wan	-5.27E-06 (-6.83E-06 – -3.70E-06)
Sham Wat	2.00E-06 (1.15E-06 – 2.85E-06)
Siu Ho Wan	1.73E-06 (4.53E-07 – 1.09E-06)
Airport	1.27E-05 (7.92E-06 – 1.75E-05)

Notes:
[1] The unit risk on number of deaths = the number of deaths in the predicted year / the

<table>
<tr><td></td><td>population in the concerned area.
[2] With reference to incremental change of annual-avg. concentration for averaged daily concentration determination.

Incremental unit risk of premature deaths (long-term mortality) due to all-causes per annum (3RS - 2RS) attributable to FSP are summarised below:
<table><tr><th>Major Area</th><th>Incremental Unit Risk of All-cause Premature Deaths per Annum (Long-Term Mortality) [1]</th></tr><tr><td>Tung Chung</td><td>3.99E-07 (1.03E-07 - 7.68E-07)</td></tr><tr><td>San Tau</td><td>5.65E-07 (1.45E-07 - 1.09E-06)</td></tr><tr><td>Sha Lo Wan</td><td>6.61E-07 (1.70E-07 - 1.27E-06)</td></tr><tr><td>San Shek Wan</td><td>5.20E-07 (1.34E-07 - 1.00E-06)</td></tr><tr><td>Sham Wat</td><td>2.94E-07 (7.56E-08 - 5.66E-07)</td></tr><tr><td>Siu Ho Wan</td><td>2.26E-07 (5.83E-08 - 4.36E-07)</td></tr></table>Notes:
[1] The unit risk on number of deaths = the number of deaths in the predicted year / the population in the concerned area.
[2] The incremental unit risks are estimated with references to the average values of RR. The values in the brackets indicate 95% confidence intervals of RR.</td></tr>
<tr><td>Health (noise)</td><td></td></tr>
<tr><td>Under the 2RS scenario, it is anticipated that more future population would be subject to annoyance and self-reported sleep disturbance compared with the 3RS scenario.</td><td>As concluded in Section 17.3.8 of the EIA Report, with the implementation of 3RS, there will be an overall reduction in future population that would be subject to annoyance and self-reported sleep disturbance with about 10% (ie. -3,700 in population) and 50% (ie. -9,000 in population) reduction of population affected respectively in Year 2030.</td></tr>
</table>

Conclusion

From the air HIA, it is noted that the short-term (i.e 1-hour / 24-hour) and long-term (i.e. annual) TAP concentrations due to the operation of 3RS modeled at all potential human receptors would comply with the respective acute and chronic non-carcinogenic risk criteria. The acute risk and non-carcinogenic chronic risk due to 3RS are considered as acceptable. The maximum increase in carcinogenic health risk due to TAP is around 1.14×10^{-5} for the 3RS. The increase in carcinogenic health risk due to the 3RS is considered as acceptable.

For short-term exposure to criteria pollutants, the short-term concentrations of CO (1-hour), NO_2 (1-hour) and SO_2 (10-minute) comply with the AQO in the assessment areas. Moreover, the estimated largest yearly increases in risks of hospital admission and premature death (short-term mortality risk) associated with short-term exposure to NO_2, RSP and SO_2 due to the operation of the 3RS compared with 2RS are relatively small (i.e., maximum incremental unit risk of premature deaths per annum is predicted to be around 1.27 x 10-5). Therefore, the short-term health risk associated with short-term exposure of the concerned criteria pollutants is considered acceptable.

The incremental change arising from the operation of 3RS against 2RS for annual concentrations of NO_2, RSP, FSP and SO_2 are less than 3% in the assessment areas. In addition, the estimated largest yearly increase in premature death (long-term mortality risk) associated with long-term exposure to FSP due to the operation of the 3RS compared with 2RS is relatively small. Therefore, the long-term health impact associated with long-term exposure of the concerned criteria pollutants is considered acceptable.

The noise HIA findings identified that under the operation of 3RS, there would be a reduction in future population that would be subject to potential annoyance and self-reported sleep disturbance

(with about 10% and 50% reduction of population affected respectively) in the assessment area when compared with the 2RS.