4 AIR QUALITY IMPACT ASSESSMENT

4.1 Introduction

This Chapter evaluates the likely air quality impacts associated with the construction and operation phases of Scheme 2 Development. The key issues will still be dust impacts during the construction phase and vehicle fumes and odour impacts during the operational phase.

4.2 Assessment Criteria

The assessment criteria as described in Section 4.2 in Volume 1 of this Report are applicable.

4.3 Description of Surrounding Environment

The existing environment in respect of air quality has been described in Section 4.3 in Volume 1 of this Report.

4.4 Air Sensitive Receivers (ASRs)

As in the Volume 1 of this Report, representative Air Sensitive Receivers were identified for the assessment of the likely air quality impacts during the construction and operation phases. Table 4.1 lists the air sensitive receivers, the land use and the receiver height.

Table 4.1 Representative Air Sensitive Receivers

ASR ID	Description	Land Use	Receiver Height
1	Office Block	C	1.5 AG
2	Services Apartment	R	12.5 - 19.5 mPD
3	Cyber Mall	C	12.5 - 19.5 mPD
4	Cyber Mall	C	1.5 AG
5	Cyber Mall	C	1.5 AG
6	Office Block	C	1.5 AG
7	House	R	1.5 AG
8	Office Block	C	1.5 AG
9	High-rise Residential	R	1.5 AG
10	High-rise Residential	R	1.5 AG
11	High-rise Residential	R	1.5 AG
12	High-rise Residential	R	1.5 AG
13	Low-rise Residential	R	1.5 AG
14	House	R	1.5 AG
15	House	R	1.5 AG
16	House	R	1.5 AG
17	House	R	1.5 AG

ASR ID	Description	Land Use	Receiver Height
18	High-rise Residential	R	1.5 AG
19	High-rise Residential	R	1.5 AG
20	High-rise Residential	R	1.5 AG

4.5 Meteorology

The meteorology of the Study Area has been fully described in the Volume 1 of this Report.

4.6 Construction Phase Air Quality Impacts

As mentioned in Section 4.6.3 in Volume 1 of this Report, dust impact will arise from the following activities:

- Advance Works for Telegraph bay Development, including earthworks and surcharging on the reclamation areas
- Main Construction Works for Telegraph Bay Development, including access road-works, civil works and superstructure construction
- Route 7 Construction within Telegraph Bay Area.

The assessment has showed that the proposed development as well as the Route 7 construction are likely to cause excessive dust levels at the identified ASR, i.e. 1-hr dust levels higher than 500 $\mu g/m^3$. As similar works will be required for Scheme 2 Development, it is therefore anticipated that the dust impact on the ASRs should be similar to that for Scheme 1 and therefore similar mitigation measures, i.e. material handling, vehicle movements, watering, covering of stockpiles, etc. will also be required. A full assessment of construction dust assessment has been given in Section 4.6.3 in Volume 1 of this Report. The details of the required mitigation measures for the construction phase (Advance Works/Main Construction Works/Construction of Route 7) are stated in Table 13.1.

According to the Outline Development Programme in Figure 2.7, the advance works and the majority of the infrastructural works including Roads D1 and D2, should have been completed before the intake of population in early 2002. The key air quality issue for sensitive receivers in the development will be the potential dust impacts arising from building construction and Route 7 construction.

In general, building construction is not dusty. Nevertheless, the works would be phased and the works sequence would be scheduled so that relatively dusty activities, e.g. site clearance and foundation works, at adjacent areas or phases can be completed before the intake of population so as to minimise the impacts. Furthermore, a comprehensive dust monitoring and audit programme would be implemented to monitor the construction dust levels at the worst affected receiver locations and site-specific action plans would be drawn up to minimise cumulative dust impacts.

4.7 Operational Phase Air Quality Impacts

4.7.1 Vehicle Emissions

4.7.1.1 Impact Assessment and Prediction

A re-assessment of the likely air quality impacts arising from road traffic has been carried out using the same assessment methodology as for Scheme 1. In particular, the same emission factors and background concentrations of NO_2 and RSP have been adopted in the calculations, apart from the traffic flows which have been revised as a result of a minor change in the road configuration and the development intensity and population. The revised traffic flows in the Study Area together with the traffic mix for year 2022 and the emission factors for year 2011 are shown in Appendix 4.1. Sample computer outputs are given in Appendix 4.2. Two options of Route 7 have been considered.

Depressed Option

Table 4.2 shows the predicted concentration of NO_2 and RSP at representative ASRs due to Road D1, Road D2, Northern Access Road, Southern Access Road and the depressed Route 7. One-hour average NO_2 concentrations are predicted to be no higher than 240 $\mu g/m^3$ and the 24-hr average Respirable Suspended Particulate concentrations are predicted to be no higher than 150 $\mu g/m^3$. The worst affected receiver is located at ASR 12, which is close to Route 7. As compared with the at-grade option below, pollutant concentrations resulting from Scheme 2 are expected to be slightly lower at ASR near the depressed section, while slightly higher at ASR beyond the depressed section of Route 7. In any case, these concentrations are well within the Air Quality Objectives (AQO) in respect of these two pollutants. In the calculations, side effects due to the presence of the proposed vertical barriers and cantilevered barriers at the roadside or central divider identified in Chapter 5 below were excluded. In view of the predicted air quality results, it is unlikely that these proposed structures would cause exceedance of the AQO.

Table 4.2 Predicted Concentrations of NO_2 & RSP at Air Sensitive Receivers (Depressed Option)

ASR	1-hr Ave NO_2, µg/m3	24-hr Ave RSP, µg/m3
1	122	92
2	136	98
3	162	110
4	156	107
5	194	125
6	190	119
7	192	123
8	112	83

ASR	1-hr Ave. NO_2, µg/m3	24-hr Ave RSP, µg/m3
9	104	84
10	119	92
11	185	126
12	240	150
13	224	144
14	180	123
15	173	118
16	174	118
17	130	99
18	162	108
19	132	95
20	116	92

Figure 4.2 shows contours of hourly average nitrogen dioxide concentrations in $\mu g/m^3$ at 1.5m above ground and Figure 4.3 shows contours of the corresponding 24-hour average respirable suspended particulate concentrations in $\mu g/m^3$. As can been seen, the contours of AQO limits are located in the non-building area.

At-grade Route 7

Table 4.3 shows the predicted NO_2 and RSP concentrations at representative ASRs due to Road D1, Road D2, Northern Access Road, Southern Access Road and the at-grade Route 7. One-hour average NO_2 concentrations are predicted to be no higher than 235 $\mu g/m^3$ and the 24-hr average Respirable Suspended Particulate concentrations are predicted to be no higher than 147 $\mu g/m^3$. The worst affected receiver is also located at ASR 12, which is close to Route 7. These concentrations comply with the AQO in respect of these two pollutants.

Table 4.3 Predicted Concentrations of NO_2 & RSP at Air Sensitive Receivers (At-Grade Option)

ASR	1-hr Ave. NO_2, $\mu g/m^3$	24-hr Ave. RSP, $\mu g/m^3$
1	122	93
2	143	100
3	176	116
4	162	109
5	211	132
6	194	121
7	200	126
8	112	84
9	111	87

ASR	1-hr Ave. NO_2, $\mu g/m^3$	24-hr Ave. RSP, $\mu g/m^3$
10	127	97
11	178	122
12	235	147
13	211	136
14	184	124
15	185	123
16	195	127
17	128	98
18	165	109
19	135	97
20	118	94

Figures 4.5 and 4.6 show contours of hourly average nitrogen dioxide concentrations and 24-hour average respirable suspended particulate concentrations in $\mu g/m^3$ at 1.5m above ground. No encroachment of the AQO limits on sensitive area is identified.

4.7.1.2 Mitigation Measures and Residual Impact

In view of the above assessment results, no mitigation measures for vehicle emissions are required and no residual air quality impacts from road traffic are anticipated.

4.7.2 Odour Emissions

4.7.2.1 Impact Assessment and Prediction

The proposed Preliminary Sewage Treatment (PST) works and the Chemically Enhanced Primary Sewage Treatment (CEPT) works at the former G/IC will be potential sources of odour and nuisance to the nearby sensitive receivers until the commissioning of the SSDS in about 2006 or later. Thereafter, the CEPT works will be decommissioned and will cease to be a potential source of odour and nuisance, though the PST would continue to be a potential source of odour. For odour control, all process units would be covered and the sewage treatment works would be enclosed within structure and the pump sump, channels, screens and grit removal units would be covered with lightweight lids. The ventilated flows would be conveyed to an odour removal system to reduce odour to an acceptable level before discharging to the atmosphere. Further details of the STW are given in Chapter 6 of this Report.

As a worst case scenario, odour emissions from both the PST and CEPT works have been considered. It has been assumed a deodourizing system is operating for both PST and CEPT such that odour is discharged from a short stack at 3m above the plant structure located at the northwest corner of the plant. The service apartments and the Cyber Mall are the nearest ASR to the STW.

The assessment methodology of the odour impact is similar to that for Scheme 1 and has been fully described in Section 4.7.2.2 in Volume 1 of this Report. In essence, Hydrogen Sulphide gas was used as an indicator gas of odour and a worst case wind speed of 1m/s at emission height was assumed.

A backward, iterative calculation has shown that in order to achieve 5 Odour Units (OU) over a 5-second averaging period at the identified ASR under day and night conditions, the odour emission rate at the discharge stack should be no greater than 200 OU/s. Air turbulence from vehicle movements on Route 7 should be able to quickly disperse the odour.

Table 4.4 below gives the predicted odour concentrations at various elevations of the identified ASRs likely to be worst affected by the proposed STW. Appendix 4.3 gives sample computer output of ISCST3 used for the odour assessment.

Table 4.4 Predicted Odour Concentrations at Worst-Affected Air Sensitive Receivers

ASR	Elevation (mPD)	Predicted 1-hour Odour Concentration (OU)		5-second Odour Concentration (OU)	
		Day time	Night time	Class D	Class F
2	12.5	0.25595	0.53762	2.3	4.4
2	13.5	0.25542	0.53579	2.3	4.4
2	14.5	0.25382	0.53030	2.3	4.4
2	15.5	0.25117	0.52108	2.3	4.3
2	16.5	0.24751	0.50806	2.3	4.2
2	17.5	0.24287	0.49121	2.2	4.1
2	18.5	0.23733	0.47057	2.2	3.9
2	19.5	0.23093	0.44631	2.1	3.7
3	12.5	0.29622	0.57278	2.7	4.7
3	13.5	0.29550	0.57119	2.7	4.7
3	14.5	0.29335	0.56630	2.7	4.7
3	15.5	0.28981	0.55783	2.6	4.6
3	16.5	0.28492	0.54536	2.6	4.5
3	17.5	0.27875	0.52848	2.5	4.4
3	18.5	0.27137	0.50689	2.5	4.2
3	19.5	0.26289	0.48051	2.4	4.0

4.7.2.2 Mitigation Measures and Residual Impact

Odour control will be required for the STW for Scheme 2 in order to reduce the odour emission rate to less than 200 OU/sec. This would require that the removal efficiency of hydrogen sulphide in the plant should be better than 99%. In general, this efficiency should

be achievable with standard deodorization systems. An outline of the proposed deodorization system for Scheme 1, which will be similar to that for Scheme 2, has been described in Section 4.7.4.2 in Volume 1 of this Report.

With this deodorization system and other odour control measures as described in Chapter 6 of this Report, no residual impact is anticipated.

After decommissioning of the CEPT, the site would be used for amenity use which is non-air sensitive.

4.7.3 Air Quality within the PTI

The ventilation system will be designed and operated to meet air quality guidelines as recommended in the ProPECC PN 1/98 on Control of Air Pollution in Semi-confined Public Transport Interchanges. The exhaust air should be easy to disperse so that it will not cause any air nuisance to the nearby air sensitive receivers.

4.8 Conclusions and Recommendations

A re-assessment of the likely air quality impacts on Scheme 2 has arrived at similar conclusions and recommendations as those for Scheme 1 and these are described in details in Section 4.8 in Volume 1 of this Report. Both options of Route 7 assessed in this Report would produce no adverse air quality impacts from vehicle emissions.