Appendix 4-9A

Calculation of Construction Noise Impact Assessment (Mitigated Scenario with QPMEs, Movable Noise Barriers, and Temporary Fixed Construction Noise Barriers)

Appendix 4-9A-1 Summary Table of Calculated Construction Noise Level at NSRs (Mitigated Scenario with QPMEs, Movable Noise Barriers, and Fixed. Temporary Noise Barriers)

NSR Label	Descriptions	Construction Noise Level from Each Work Group						Cumulative Construction Noise Due to Concurrent Works				Highest Noise Level, dB(A)	Noise Criteria, dB(A)
		A	B	C	D	E	F	A+F	B+D	B+E	C+E		
		Site Formation, Filling and Excavation	Construction of Underground Services and Utilities	Road works	Foundation	Superstructure	Dump Trucks Travelling on Haul Road						
Existing NSRs													
N1	Fairview Park	55	52	52	53	55	50	56	56	57	57	**57**	75
N2	Fairview Park	55	52	52	53	55	50	56	56	57	57	**57**	75
N3	Fairview Park	60	57	57	58	60	53	61	61	62	62	**62**	75
N4	Fairview Park	61	58	58	59	61	53	62	62	63	63	**63**	75
N8	Bethel High School	58	55	55	56	58	52	59	59	60	60	**60**	70 (65 during examination)
N15	Hang Fook Garden	57	54	54	55	57	51	58	58	59	59	**59**	75
N16	Ha San Wai	57	54	54	55	57	51	58	58	59	59	**59**	75
N17	Ha San Wai	56	53	53	54	56	51	57	57	58	58	**58**	75
Planned NSRs													
V1P	Village Zone Development	67	64	64	65	67	56	67	68	69	69	**69**	75
V3P	Planned R(D) Zone	65	62	62	63	65	55	65	66	67	67	**67**	75
V4P	Planned "V" Zone	70	67	67	68	70	58	70	71	72	72	**72**	75

Appendix 4-9A-2 Plant Inventory and Calculated SWLs for Construction Noise Impact Assessment for Planned Kam Pok Road Site (QPMEs, Movable Noise Barriers and Temp. Fixed Noise Barriers)

			PMEs Inventory - Mitigated (with QPMEs, Movable Noise Barriers and Fix. Temp. Noise Barriers)										
Construction Activity	**Sub. Work Group**		**Powered Mechanical Equipment**	**Reference**	**SWL per unit**	**Qty**	**Total, SWL**	**Total SWL, dB(A)**	**At-source Noise Mitigation Measure**	**Noise Barrier Effect ****	**Total SWL (Mitigated)**	**Total SWL, dB(A)**	**Highest SWL of Each Construction Activity, dB(A) @**
(A) Site Formation, Filling and Excavation	A1	Excavation and Filling	Air Compressor	CNP001	100	2	103	119	Movable noise barrier	-10	93	110	110
			Breaker, mini-robot mounted	EPD *	115	2	118		Movable noise barrier and Installation of commercially made sound proof hammer bracket # & ##	-10	108		
			Excavator, wheeled/tracked	KATO model HD820V (EPD-01233)	99	3	104		Movable noise barrier	-5	99		
			Generator, super silenced	CNP103	95	3	100		Movable noise barrier	-10	90		
			Dump Truck (5.5 tonne < Gross vehicle weight <= 38 tonne)	EPD *	105	2	108		Fixed Noise Barrier	-5	103		
	A2	Ground Compression	Roller, vibratory	SAKAI model SW250-1 (EPD-00509)	95	2	98	106	Fixed Noise Barrier	-5	93	101	
			Bulldozer	Komatsu modelled D21A-8	102	2	105		Fixed Noise Barrier	-5	100		
(B) Construction of Underground Services and Utilities	B1	Earthwork	Breaker, mini-robot mounted	EPD *	115	1	115	116	Movable noise barrier and Installation of commercially made sound proof hammer bracket # & ##	-10	105	107	107
			Dump Truck (5.5 tonne < Gross vehicle weight <= 38 tonne)	EPD *	105	2	108		Fixed Noise Barrier	-5	103		
			Excavator, mini-robot mounted	EPD *	94	2	97		Movable noise barrier	-5	92		
						0				0			
	B2	Utilities laying	Air Compressor	CNP001	100	2	103	108	Movable noise barrier	-10	93	101	
			Generator, super silenced	CNP103	95	2	98		Movable noise barrier	-10	88		
			Lorry (5.5 tonne < Gross vehicle weight <= 38 tonne)	EPD *	105	1	105		Fixed Noise Barrier	-5	100		
			Water Pump, Submersible(electric)	CNP283	85	2	88		Movable noise barrier	-10	78		
	B3	Ground reinstatement	Concrete Lorry Mixer	CNP044	109	1	109	112	Movable noise barrier and Fixed Temp. Noise Barrier	-10	99	102	
			Power rammer (petrol)	Dynapac model LT700 (EPD-00536)	107	1	107		Movable noise barrier	-10	97		
			Poker, vibratory, hand-held (electric)	EPD *	102	1	102		Movable noise barrier	-10	92		
			Roller, vibratory	SAKAI model SW250-1 (EPD-00509)	95	1	95		Fixed Noise Barrier	-5	90		
(C) Road Works	C1	Earthwork	Dump Truck (5.5 tonne < Gross vehicle weight <= 38 tonne)	EPD *	105	2	108	109	Fixed Noise Barrier	-5	103	104	107
			Excavator, wheeled/tracked	KATO model HD820V (EPD-01233)	99	1	99		Movable noise barrier	-5	94		
	C2	Concreting Works	Concrete Lorry Mixer	CNP044	109	2	112	113	Movable noise barrier and Fixed Temp. Noise Barrier	-10	102	103	
			Generator, super silenced	CNP103	95	2	98		Movable noise barrier	-10	88		
			Poker, vibratory, hand-held (electric)	EPD *	102	2	105		Movable noise barrier	-10	95		
	C3	Road Finishing	Air Compressor	CNP001	100	2	103	113	Movable noise barrier	-10	93	107	
			Asphalt Paver	VOLVO model. No. ABG5770 (EPD-01226)	104	2	107		Fixed Noise Barrier	-5	102		
			Generator, super silenced	CNP103	95	2	98		Movable noise barrier	-10	88		
			Lorry (5.5 tonne < Gross vehicle weight <= 38 tonne)	EPD *	105	2	108		Fixed Noise Barrier	-5	103		
			Power rammer (petrol)	Dynapac model LT700 (EPD-00536)	107	1	107		Movable noise barrier	-10	97		
			Road roller	HITACHI model CP220-3 (EPD-01183)	97	1	97		Fixed Noise Barrier	-5	92		
(D) Foundation	D1	General foundation construction	Air Compressor	CNP001	100	5	107	117	Movable noise barrier	-10	97	108	108
			Bar bender and cutter (electric)	CNP021	90	5	97		Movable noise barrier	-10	87		
			Mobile Crane	Hitachi Sumitomo SCX700, 132kW	101	3	106		Movable noise barrier and Fixed Temp. Boundary Noise Barrier	-10	96		
			Generator, super silenced	CNP103	95	4	101		Movable noise barrier	-10	91		
			Lorry (5.5 tonne < Gross vehicle weight <= 38 tonne)	EPD *	105	2	108		Fixed Noise Barrier	-5	103		
			Drill/grinder, hand-held (electric)	CNP065	98	4	104		Movable noise barrier	-10	94		
			Excavator, wheeled/tracked	KATO model HD820V (EPD-01233)	99	3	104		Movable noise barrier	-5	99		
			Saw, circular, wood	CNP201	108	4	114		Movable noise barrier	-10	104		
			Water pump, submersible (electric)	CNP283	85	4	91		Movable noise barrier	-10	81		

			PMEs Inventory - Mitigated (with QPMEs, Movable Noise Barriers and Fix. Temp. Noise Barriers)										
Construction Activity	**Sub. Work Group**		**Powered Mechanical Equipment**	**Reference**	**SWL per unit**	**Qty**	**Total, SWL**	**Total SWL, dB(A)**	**At-source Noise Mitigation Measure**	**Noise Barrier Effect ****	**Total SWL (Mitigated)**	**Total SWL, dB(A)**	**Highest SWL of Each Construction Activity, dB(A) @**
	D2	Piling works	Generator, super silenced	CNP103	95	4	101	118	Movable noise barrier	-10	91	108	
			Non-percussive pilng machine	@@	115	2	118		Fixed Temp. Noise Barrier, and provision of Acoustic Shielding material	-10	108		
	D3	Concreting Works	Concrete Lorry Mixer	CNP044	109	3	114	115	Movable noise barrier and Fixed Temp. Noise Barrier	-10	104	105	
			Generator, super silenced	CNP103	95	4	101		Movable noise barrier	-10	91		
			Poker, vibratory, hand-held (electric)	EPD *	102	3	107		Movable noise barrier	-10	97		
(E) Superstructure	E1	General construction works	Air Compressor	CNP001	100	6	108	118	Movable noise barrier	-10	98	108	110
			Bar bender and cutter (electric)	CNP021	90	9	100		Movable noise barrier	-10	90		
			Mobile Crane	Hitachi Sumitomo SCX700, 132kW	101	3	106		Movable noise barrier and Fixed Temp. Boundary Noise Barrier	-10	96		
			Drill/grinder, hand-held (electric)	CNP065	98	10	108		Movable noise barrier	-10	98		
			Generator, super silenced	CNP103	95	4	101		Movable noise barrier	-10	91		
			Saw, circular, wood	CNP201	108	7	116		Movable noise barrier	-10	106		
						0							
	E2	Concreting works	Concrete Lorry Mixer	CNP044	109	8	118	120	Movable noise barrier and Fixed Temp. Noise Barrier	-10	108	110	
			Concrete Pump	CNP047	109	4	115		Movable noise barrier	-10	105		
			Generator, super silenced	CNP103	95	4	101		Movable noise barrier	-10	91		
			Poker, vibratory, hand-held (electric)	EPD *	102	7	110		Movable noise barrier	-10	100		
(F) Dump Trucks Travelling on Haul Road During Site Formation	F	Dump Trucks Travelling on Haul Road	Dump Truck (5.5 tonne < Gross vehicle weight <= 38 tonne)	EPD *	105	8	114	114	Fixed Noise Barrier	-5	109	109	109

Note: Noise levels of the above construction plants are based on the "Technical Memorandum on Noise From Construction Work Other Than Percussive Piling" and EPD's QPMEs database (available at: http://www.epd.gov.hk/cgi-bin/npg/qpme/index.pl?lang=eng)

* EPD website: http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

** According to EIAO Guidance Note No. 9/2010, with provision of noise barriers, a 5dB(A) noise reduction for movable plant, 10 dB(A) for stationary plant and 15 dB(A) for enclosed ones can be assumed.

According to "A Practical Guide for the Reduction of Noise from Construction Works" (page 11), published by HKSAR Gov. Environmental Protection Department, July 1989, excavated-mounted breaker with sound proof hammer bracket installed could achieve a noise reduction up to 10dB(A).

According to the "Best Practice Guide for Environmental Protection on Construction Sites", page 6-9, published by Hong Kong Construction Association, January 2009, excavator-mounted breaker with sound proof hammer bracket can achieve a noise reduction of up to 10dB(A). (Doc. Available at: http://www.hkca.com.hk/front/20090306bpg.pdf)

@ The highest SWL calculated for each Construction Activity for construction noise impact assessment. Each Construction Activity has been divided into several sub. work groups based on the sequence of construction works. Construction activities of respective sub-work groups under each Construction Activity will not overlap with one another.

@@ Non-percussive type piling machine will be used, subject to the detailed design stage the exact type of non-percussive piling machine will proposed. To be conservative, noise level of commonly used non-percussive piling machines according to the Technical Memorandum on Noise From Construction Work Other Than Percussive Piling, has been used for noise calculation

The above plant inventory has been based on assumption and plant inventory of similar development project.

Appendix 4-9A-3 Calculation of Construction Noise Level (Mitigated Scenario with QPMEs, Movable Noise Barrier and Fixed Temp. Noise Barriers)

NSR		Construction Activity	Total SWL, dB(A)	Dist. (NSR to Site Boundary) (A), m **	Dist. (Site Boundary to Notional Source) (B), m ** & #	Horz. Distance (= A+B), m **	Dist. Corr., dB(A)	Façade Corr., dB(A)	CNL, dB(A)
N1	A	Site Formation, Filling and Excavation	110	272	43	315	-57.9	3.0	55
	B	Construction of Underground Services and Utilities	107	272	43	315	-57.9	3.0	52
	C	Road works	107	272	43	315	-57.9	3.0	52
	D	Foundation	108	272	43	315	-57.9	3.0	53
	E	Superstructure	110	272	43	315	-57.9	3.0	55
N2	A	Site Formation, Filling and Excavation	110	286	42	328	-58.3	3.0	55
	B	Construction of Underground Services and Utilities	107	286	42	328	-58.3	3.0	52
	C	Road works	107	286	42	328	-58.3	3.0	52
	D	Foundation	108	286	42	328	-58.3	3.0	53
	E	Superstructure	110	286	42	328	-58.3	3.0	55
N3	A	Site Formation, Filling and Excavation	110	130	50	180	-53.1	3.0	60
	B	Construction of Underground Services and Utilities	107	130	50	180	-53.1	3.0	57
	C	Road works	107	130	50	180	-53.1	3.0	57
	D	Foundation	108	130	50	180	-53.1	3.0	58
	E	Superstructure	110	130	50	180	-53.1	3.0	60
N4	A	Site Formation, Filling and Excavation	110	112	50	162	-52.2	3.0	61
	B	Construction of Underground Services and Utilities	107	112	50	162	-52.2	3.0	58
	C	Road works	107	112	50	162	-52.2	3.0	58
	D	Foundation	108	112	50	162	-52.2	3.0	59
	E	Superstructure	110	112	50	162	-52.2	3.0	61
N8	A	Site Formation, Filling and Excavation	110	163	50	213	-54.5	3.0	58
	B	Construction of Underground Services and Utilities	107	163	50	213	-54.5	3.0	55
	C	Road works	107	163	50	213	-54.5	3.0	55
	D	Foundation	108	163	50	213	-54.5	3.0	56
	E	Superstructure	110	163	50	213	-54.5	3.0	58
N15	A	Site Formation, Filling and Excavation	110	202	50	252	-56.0	3.0	57
	B	Construction of Underground Services and Utilities	107	202	50	252	-56.0	3.0	54
	C	Road works	107	202	50	252	-56.0	3.0	54
	D	Foundation	108	202	50	252	-56.0	3.0	55
	E	Superstructure	110	202	50	252	-56.0	3.0	57
N16	A	Site Formation, Filling and Excavation	110	194	50	244	-55.7	3.0	57
	B	Construction of Underground Services and Utilities	107	194	50	244	-55.7	3.0	54
	C	Road works	107	194	50	244	-55.7	3.0	54
	D	Foundation	108	194	50	244	-55.7	3.0	55
	E	Superstructure	110	194	50	244	-55.7	3.0	57
N17	A	Site Formation, Filling and Excavation	110	221	48	269	-56.6	3.0	56
	B	Construction of Underground Services and Utilities	107	221	48	269	-56.6	3.0	53
	C	Road works	107	221	48	269	-56.6	3.0	53
	D	Foundation	108	221	48	269	-56.6	3.0	54
	E	Superstructure	110	221	48	269	-56.6	3.0	56
V1P	A	Site Formation, Filling and Excavation	110	32	50	82	-46.3	3.0	67
	B	Construction of Underground Services and Utilities	107	32	50	82	-46.3	3.0	64
	C	Road works	107	32	50	82	-46.3	3.0	64
	D	Foundation	108	32	50	82	-46.3	3.0	65
	E	Superstructure	110	32	50	82	-46.3	3.0	67
V3P	A	Site Formation, Filling and Excavation	110	52	50	102	-48.2	3.0	65
	B	Construction of Underground Services and Utilities	107	52	50	102	-48.2	3.0	62
	C	Road works	107	52	50	102	-48.2	3.0	62
	D	Foundation	108	52	50	102	-48.2	3.0	63
	E	Superstructure	110	52	50	102	-48.2	3.0	65
V4P	A	Site Formation, Filling and Excavation	110	26	30	56	-42.9	3.0	70
	B	Construction of Underground Services and Utilities	107	26	30	56	-42.9	3.0	67
	C	Road works	107	26	30	56	-42.9	3.0	67
	D	Foundation	108	26	30	56	-42.9	3.0	68
	E	Superstructure	110	26	30	56	-42.9	3.0	70

Remark: ** Distance is based on shortest horizontal distance.

The notional noise source location is assumed based on the methodology listed in the statutory Technical Memorandum on Noise from Construction work other than Percussive Piling and that used in the approved EIA report for Wo Shan Wai. It has been assumed that all PME items are operating and gathered within a worksite for a conservative assessment.

Calculation of Noise Level Due to Travelling of Dump Truck within the Project Construction Area During Site Formation, Filling and Excavation Stage

NSR		Construction Activity	No. of Trucks/ hr.	SWL per Unit, dB(A)	Horz. Distance From NSR, m	Average Speed, km/hr	Calculated LAeq Due to Travelling of Dump Truck, dB(A) @
N1	F	Dump Trucks Travelling on Haul Road	8	109	315	10	50
N2	F	Dump Trucks Travelling on Haul Road	8	109	328	10	50
N3	F	Dump Trucks Travelling on Haul Road	8	109	180	10	53
N4	F	Dump Trucks Travelling on Haul Road	8	109	162	10	53
N8	F	Dump Trucks Travelling on Haul Road	8	109	213	10	52
N15	F	Dump Trucks Travelling on Haul Road	8	109	252	10	51
N16	F	Dump Trucks Travelling on Haul Road	8	109	244	10	51
N17	F	Dump Trucks Travelling on Haul Road	8	109	269	10	51
V1P	F	Dump Trucks Travelling on Haul Road	8	109	82	10	56
V3P	F	Dump Trucks Travelling on Haul Road	8	109	102	10	55
V4P	F	Dump Trucks Travelling on Haul Road	8	109	56	10	58

Remark: * According to information available at EPD website: http://www.epd.gov.hk/epd/english/application_for_licences/guidance/files/OtherSWLe.pdf

@ Based on equation in the British Standard "Noise Control on Construction and Open Sites, BS 5228: Part 1: 2009": LAeq = SWL – 33 + 10log10 Q – 10 Log10 V – 10log10d

Where,

SWL = Sound Power Level of the dump truck

Q is the number of vehicles per hour

V is the average speed (10 km/hr)

D is the distance of receiver position from the haul road (m) (the horizontal distance between the receiver position and the construction notional noise source is taken in this noise assessment)