Appendix 3.2 Calculation of Construction Dust Emission Source

Construction Phase

Location	Source	Emission Rates		Unmitigated	Mitigated	Parameters		*Remarks*
HSKEPP	**Construction Activities**	Heavy Construction				Emission Rate = (Emission Factor*10^6/10000)/(30*No. of Operation hour*60*60)*(Percentage Active/100)*(1-Dust Suppression%)		
		Area Source ($g/m^2/s$)	TSP	**2.076E-04**	**1.723E-05**	TSP emission factor (Mg/hectare/month of activity)	2.69	*from AP-42, S13.2.3, 1/95 ed.*
						Percentage area actively operating (%)	100	
						% of dust suppression	91.7	*Assume watering once every 2 hours. Refer to the Calculation of Dust Supression Efficiency by Watering.*
						no. of operation hour (hr)	12	*Assume typical working hours of work site (0700 - 1900)*
						Emission height (m)	0.5	
			RSP	**9.818E-05**	**8.149E-06**	RSP emission factor (Mg/hectare/month of activity)	1.27237	
						% fraction of TSP	0.473	*from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4*
			FSP	**1.494E-05**	**1.240E-06**	FSP emission factor (Mg/hectare/month of activity)	0.19368	
						% fraction of TSP	0.072	*from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4*
		Wind Erosion				Emission Rate = Emission Factor*10^6/(10000*365*24*60*60)*(Percentage Active/100)		
		Area Source ($g/m^2/s$)	TSP	**2.695E-06**		TSP emission factor (Mg/hectare/yr)	0.85	*AP-42, 5th ed., Table 11.9.4*
						Percentage area actively operating (%)	100	
						Emission height (m)	0.5	
			RSP	**1.275E-06**		RSP emission factor (Mg/hectare/yr)	0.40205	
						% fraction of TSP	0.473	*from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4*
			FSP	**1.941E-07**		FSP emission factor (Mg/hectare/yr)	0.0612	
						% fraction of TSP	0.072	*from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4*

Appendix 3.2 Calculation of Construction Dust Emission Source

Emission Source Listing in AERMOD

Mitigated Construction Dust Emission Sources

							TSP Emission Rate (g/m^2-s)		RSP Emission Rate (g/m^2-s)		FSP Emission Rate (g/m^2-s)	
Source	Type	X1	Y1	Height (mAG)	No. of Vertices	Working Hour	Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
HSKEPP_1	AREAPOLY	816156	834253	0.5	9	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
HSKEPP_2	AREAPOLY	816325	834175	0.5	10	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07
HSKEPP_3	AREAPOLY	816307	834201	0.5	4	07:00 - 19:00	1.723E-05	2.695E-06	8.149E-06	1.275E-06	1.240E-06	1.941E-07

Location of Vertices for AREAPOLY

	Vertice 1		Vertice 2		Vertice 3		Vertice 4		Vertice 5	
Source ID	X	Y	X	Y	X	Y	X	Y	X	Y
HSKEPP_1	816156	834253	816158	834186	816185	834167	816254	834168	816309	834203
HSKEPP_2	816325	834175	816281	834139	816285	834100	816364	834033	816447	833986
HSKEPP_3	816307	834201	816322	834175	816316	834168	816299	834196	-	-

	Vertice 6		Vertice 7		Vertice 8		Vertice 9		Vertice 10	
Source ID	X	Y	X	Y	X	Y	X	Y	X	Y
HSKEPP_1	816309	834210	816292	834210	816294	834250	816274	834253	-	-
HSKEPP_2	816513	833868	816524	833999	816545	834117	816504	834162	816379	834201
HSKEPP_3	-	-	-	-	-	-	-	-	-	-

Hourly Profile

Hour	**TSP**	**RSP**	**FSP**
Hour 1	0.1565	0.1565	0.1565
Hour 2	0.1565	0.1565	0.1565
Hour 3	0.1565	0.1565	0.1565
Hour 4	0.1565	0.1565	0.1565
Hour 5	0.1565	0.1565	0.1565
Hour 6	0.1565	0.1565	0.1565
Hour 7	0.1565	0.1565	0.1565
Hour 8	1.0000	1.0000	1.0000
Hour 9	1.0000	1.0000	1.0000
Hour 10	1.0000	1.0000	1.0000
Hour 11	1.0000	1.0000	1.0000
Hour 12	1.0000	1.0000	1.0000
Hour 13	1.0000	1.0000	1.0000
Hour 14	1.0000	1.0000	1.0000
Hour 15	1.0000	1.0000	1.0000
Hour 16	1.0000	1.0000	1.0000
Hour 17	1.0000	1.0000	1.0000
Hour 18	1.0000	1.0000	1.0000
Hour 19	1.0000	1.0000	1.0000
Hour 20	0.1565	0.1565	0.1565
Hour 21	0.1565	0.1565	0.1565
Hour 22	0.1565	0.1565	0.1565
Hour 23	0.1565	0.1565	0.1565
Hour 24	0.1565	0.1565	0.1565

Appendix 3.2 Calculation of Construction Dust Emission Source

Emission Source Listing in AERMOD

Unmitigated Construction Dust Emission Sources

							TSP Emission Rate (g/m^2-s)		RSP Emission Rate (g/m^2-s)		FSP Emission Rate (g/m^2-s)	
Source	Type	X1	Y1	Height (mAG)	No. of Vertices	Working Hour	Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
HSKEPP_1	AREAPOLY	816156	834253	0.5	9	07:00 - 19:00	2.076E-04	2.695E-06	9.818E-05	1.275E-06	1.494E-05	1.941E-07
HSKEPP_2	AREAPOLY	816325	834175	0.5	10	07:00 - 19:00	2.076E-04	2.695E-06	9.818E-05	1.275E-06	1.494E-05	1.941E-07
HSKEPP_3	AREAPOLY	816307	834201	0.5	10	07:00 - 19:00	2.076E-04	2.695E-06	9.818E-05	1.275E-06	1.494E-05	1.941E-07

Location of Vertices for AREAPOLY

	Vertice 1		Vertice 2		Vertice 3		Vertice 4		Vertice 5	
Source ID	X	Y	X	Y	X	Y	X	Y	X	Y
HSKEPP_1	816156	834253	816158	834186	816185	834167	816254	834168	816309	834203
HSKEPP_2	816325	834175	816281	834139	816285	834100	816364	834033	816447	833986
HSKEPP_3	816307	834201	816322	834175	816316	834168	816299	834196	-	-

	Vertice 6		Vertice 7		Vertice 8		Vertice 9		Vertice 10	
Source ID	X	Y	X	Y	X	Y	X	Y	X	Y
HSKEPP_1	816309	834210	816292	834210	816294	834250	816274	834253	-	-
HSKEPP_2	816513	833868	816524	833999	816545	834117	816504	834162	816379	834201
HSKEPP_3	-	-	-	-	-	-	-	-	-	-

Hourly Profile

Hour	**TSP**	**RSP**	**FSP**
Hour 1	0.0130	0.0130	0.0130
Hour 2	0.0130	0.0130	0.0130
Hour 3	0.0130	0.0130	0.0130
Hour 4	0.0130	0.0130	0.0130
Hour 5	0.0130	0.0130	0.0130
Hour 6	0.0130	0.0130	0.0130
Hour 7	0.0130	0.0130	0.0130
Hour 8	1.0000	1.0000	1.0000
Hour 9	1.0000	1.0000	1.0000
Hour 10	1.0000	1.0000	1.0000
Hour 11	1.0000	1.0000	1.0000
Hour 12	1.0000	1.0000	1.0000
Hour 13	1.0000	1.0000	1.0000
Hour 14	1.0000	1.0000	1.0000
Hour 15	1.0000	1.0000	1.0000
Hour 16	1.0000	1.0000	1.0000
Hour 17	1.0000	1.0000	1.0000
Hour 18	1.0000	1.0000	1.0000
Hour 19	1.0000	1.0000	1.0000
Hour 20	0.0130	0.0130	0.0130
Hour 21	0.0130	0.0130	0.0130
Hour 22	0.0130	0.0130	0.0130
Hour 23	0.0130	0.0130	0.0130
Hour 24	0.0130	0.0130	0.0130

Appendix 3.2 Calculation of Construction Dust Emission Source

Calculation of Dust Suppression Efficiency from Watering

Dust suppression efficiency is assumed to be 91.7%. Assumptions are stated as below.

With reference to the Equation (5-4) of USEPA's Control of Open Fugitive Dust Sources (EPA-450/3-98-008), dust suppression efficiency can be estimated by:

$$C = 100 - \frac{0.8 \cdot p \cdot d \cdot t}{i}$$

where

C = average control efficiency, in percent

p = potential average hourly daytime evaporation rate in mm/hour

d = average hourly daytime traffic rate in vehicles per hour

i = application intensity in L/m^2

t = time between applications in hour

The following assumptions are made for assessment purpose:

Assumption 1:

Potential average hourly daytime evaporation rate p can be estimated by 0.0049 * e, where e is the mean annual average evaporation rate (inches). From past measurement data in Hong Kong's Observatory, evaporation recorded at King's Park between 1992 - 2021 is 1205.1 mm[1]. Therefore p = 0.0049 * (1205.1 mm) = 0.0049 * (47.442939 inches) = 0.2325.

Assumption 2:

Estimate average hourly daytime traffic rate in vehicles per hour = 20. $(d = 20)$[2]

Assumption 3:

Assume watering application intensity as 0.90 L/m^2. (i = 0.90)

Assumption 4:

Assumes watering frequency as once every 2 hours. (t = 2)

With the above assumptions, dust suppression efficiency is calculated as below:

C = 100 – 0.8*(0.2325)*(20)*(2) / 0.90 = **91.7%**

[1] The Hong Kong's Observatory evaporation recorded at King's Park between 1992 to 2021 is taken from https://www.hko.gov.hk/en/cis/monthlyElement.htm?ele=EVAPO

[2] The average hourly daytime traffic rate in vehicles per hour is provided by the Engineer.

ISO A1 594mm x 841mm

Approved:

Checked:

Designer:

Project Management Initials:

815400 E

816000 E

816600 E

834600 N

834000 N

833400 N

LEGEND:

500m ASSESSMENT AREA

PROPOSED HUNG SHUI KIU (HSK) EFFLUENT POLISHING PLANT

PROPOSED UTILITY TUNNEL

HSKEPP_1 CONSTRUCTION DUST EMISSION SOURCE

N

HSKEPP_1

HSKEPP_2

HSKEPP

HSKEPP_3

HA TSUEN

OU (PBU +SWU)

OU (PBU+SWU)

OU (LF)

OU (RTS)

OU (STW)

OU (LF cum EFTS Depot)

OU (E+TP)

GB

A

DO

LO

RO

G

V

Plot File by: ZHUZC 2022/4/26
PATH: P:\PROJECTS\60631936\Drawing\REPORT\HSK\HSK_732.dgn

AECOM

PROJECT
項目

HUNG SHUI KIU EFFLUENT POLISHING PLANT AND YUEN LONG SOUTH EFFLUENT POLISHING PLANT - INVESTIGATION

CLIENT
客戶

渠務署
Drainage Services Department

CONSULTANT
工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分判工程顧問公司

ISSUE/REVISION
修訂

I/R 修訂	DATE 日期	DESCRIPTION 內容摘要	CHK. 核核

STATUS
階段

SCALE 比例
A1 1 : 3000

DIMENSION UNIT 尺寸單位
METRES

KEY PLAN
索引圖

PROJECT NO. 項目編號
60631936

CONTRACT NO. 合約編號
CE 6/2019 (DS)

SHEET TITLE
圖紙名稱

LOCATION OF CONSTRUCTION DUST EMISSION SOURCE

SHEET NUMBER
圖紙編號

60631936/APPENDIX 3.2.1

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