

Appendix 3.2 Calculation of Construction Dust Emission Sources

Construction Phase

Project

Location	Source	Emission Rates	Unmitigated	Mitigated	Parameters	Remarks
Work Sites of YLSEPP	Construction Activities	Heavy Construction Area Source (g/m ² /s)	TSP 2.08E-04	1.72E-05	Emission Rate = (Emission Factor*10 ⁶ /10000)/(30*No. of Operation hour*60*60)*(Percentage Active/100)*(1-Dust Suppression%) TSP emission factor (Mg/hectare/month of activity) Percentage area actively operating (%) % of dust suppression no. of operation hour (hr) Emission height (m)	2.69 100 91.7 12 0.5 <i>from AP-42, S13.2.3, 1/95 ed.</i> <i>Assume watering once every 2 hours. Refer to the Calculation of Dust Suppression Efficiency by Watering.</i> <i>Assume typical working hours of work site (0700 - 1900)</i>
			RSP 9.82E-05	8.15E-06	RSP emission factor (Mg/hectare/month of activity) % fraction of TSP	1.27237 0.47 <i>from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4</i>
			FSP 1.49E-05	1.24E-06	FSP emission factor (Mg/hectare/month of activity) % fraction of TSP	0.19368 0.07 <i>from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4</i>
	Wind Erosion Area Source (g/m ² /s)	TSP	2.70E-06		Emission Rate = Emission Factor*10 ⁶ /(10000*365*24*60*60)*(Percentage Active/100) TSP emission factor (Mg/hectare/yr) Percentage area actively operating (%) Emission height (m)	0.85 100 0.5 <i>AP-42, 5th ed., Table 11.9.4</i>
		RSP	1.27E-06		RSP emission factor (Mg/hectare/yr) % fraction of TSP	0.40205 0.47 <i>from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4</i>
		FSP	1.94E-07		FSP emission factor (Mg/hectare/yr) % fraction of TSP	0.0612 0.07 <i>from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4</i>
	Src ID: YLSC01 - YLSC10					

Appendix 3.2 Calculation of Construction Dust Emission Sources

Construction Phase

Others

Location	Source	Emission Rates	Parameters	Remarks		
Water Reclamation Facilities	Construction Activities	Heavy Construction Area Source (g/m ² /s)	TSP	1.72E-05	Emission Rate = (Emission Factor*10 ⁶ /10000)/(30*No. of Operation hour*60*60)*(Percentage Active/100)*(1-Dust Suppression%) 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 Suppression Efficiency by Watering. no. of operation hour (hr) 12 Assume typical working hours of work site (0700 - 1900) Emission height (m) 0.5	
			RSP	8.15E-06	RSP emission factor (Mg/hectare/month of activity) 1.27237 % fraction of TSP 0.47 from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4	
			FSP	1.24E-06	FSP emission factor (Mg/hectare/month of activity) 0.19368 % fraction of TSP 0.07 from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4	
			Wind Erosion Area Source (g/m ² /s)	TSP	2.70E-06	Emission Rate = Emission Factor*10 ⁶ /(10000*365*24*60*60)*(Percentage Active/100) 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	1.27E-06	RSP emission factor (Mg/hectare/yr) 0.40205 % fraction of TSP 0.47 from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4	
			FSP	1.94E-07	FSP emission factor (Mg/hectare/yr) 0.0612 % fraction of TSP 0.07 from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4	
		Src ID: WRF01				
		YLS Development Area Road Works	Construction Activities	Heavy Construction Area Source (g/m ² /s)	TSP	1.72E-05
RSP	8.15E-06				RSP emission factor (Mg/hectare/month of activity) 1.27237 % fraction of TSP 0.47 from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4	
FSP	1.24E-06				FSP emission factor (Mg/hectare/month of activity) 0.19368 % fraction of TSP 0.07 from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4	
Wind Erosion Area Source (g/m ² /s)	TSP				2.70E-06	Emission Rate = Emission Factor*10 ⁶ /(10000*365*24*60*60)*(Percentage Active/100) 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			1.27E-06	RSP emission factor (Mg/hectare/yr) 0.40205 % fraction of TSP 0.47 from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4	
	FSP			1.94E-07	FSP emission factor (Mg/hectare/yr) 0.0612 % fraction of TSP 0.07 from USEPA AP-42, 5th ed. 11/06 ed. S13.2.4	
Src ID: P2_104-106, P2_108-P2_111						

Construction Phase
 Project (Mitigated Scenario)
 AERMOD Source Listing

Source ID	Type	Height (m)	Working Hour	TSP Emission Rate (g/m ² -s)		RSP Emission Rate (g/m ² -s)		FSP Emission Rate (g/m ² -s)	
				Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
YLSC01	AREAPOLY	0.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
YLSC02	AREAPOLY	0.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
YLSC03	AREAPOLY	0.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
YLSC04	AREAPOLY	0.5	07:00 - 19:01	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
YLSC05	AREAPOLY	0.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
YLSC06	AREAPOLY	0.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
YLSC07	AREAPOLY	0.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
YLSC08	AREAPOLY	0.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
YLSC09	AREAPOLY	0.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
YLSC10	AREAPOLY	0.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07

Hourly Profile for AERAPOLY Sources

Hour	TSP	RSP	FSP
Hour 1	0.156	0.156	0.156
Hour 2	0.156	0.156	0.156
Hour 3	0.156	0.156	0.156
Hour 4	0.156	0.156	0.156
Hour 5	0.156	0.156	0.156
Hour 6	0.156	0.156	0.156
Hour 7	0.156	0.156	0.156
Hour 8	1.000	1.000	1.000
Hour 9	1.000	1.000	1.000
Hour 10	1.000	1.000	1.000
Hour 11	1.000	1.000	1.000
Hour 12	1.000	1.000	1.000
Hour 13	1.000	1.000	1.000
Hour 14	1.000	1.000	1.000
Hour 15	1.000	1.000	1.000
Hour 16	1.000	1.000	1.000
Hour 17	1.000	1.000	1.000
Hour 18	1.000	1.000	1.000
Hour 19	1.000	1.000	1.000
Hour 20	0.156	0.156	0.156
Hour 21	0.156	0.156	0.156
Hour 22	0.156	0.156	0.156
Hour 23	0.156	0.156	0.156
Hour 24	0.156	0.156	0.156

Construction Phase
 Project (Unmitigated Scenario)
 AERMOD Source Listing

Source ID	Type	Height (m)	Working Hour	TSP Emission Rate (g/m ² -s)		RSP Emission Rate (g/m ² -s)		FSP Emission Rate (g/m ² -s)	
				Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
YLSC01	AREAPOLY	0.5	07:00 - 19:00	2.08E-04	2.70E-06	9.82E-05	1.27E-06	1.49E-05	1.94E-07
YLSC02	AREAPOLY	0.5	07:00 - 19:00	2.08E-04	2.70E-06	9.82E-05	1.27E-06	1.49E-05	1.94E-07
YLSC03	AREAPOLY	0.5	07:00 - 19:00	2.08E-04	2.70E-06	9.82E-05	1.27E-06	1.49E-05	1.94E-07
YLSC04	AREAPOLY	0.5	07:00 - 19:01	2.08E-04	2.70E-06	9.82E-05	1.27E-06	1.49E-05	1.94E-07
YLSC05	AREAPOLY	0.5	07:00 - 19:00	2.08E-04	2.70E-06	9.82E-05	1.27E-06	1.49E-05	1.94E-07
YLSC06	AREAPOLY	0.5	07:00 - 19:00	2.08E-04	2.70E-06	9.82E-05	1.27E-06	1.49E-05	1.94E-07
YLSC07	AREAPOLY	0.5	07:00 - 19:00	2.08E-04	2.70E-06	9.82E-05	1.27E-06	1.49E-05	1.94E-07
YLSC08	AREAPOLY	0.5	07:00 - 19:00	2.08E-04	2.70E-06	9.82E-05	1.27E-06	1.49E-05	1.94E-07
YLSC09	AREAPOLY	0.5	07:00 - 19:00	2.08E-04	2.70E-06	9.82E-05	1.27E-06	1.49E-05	1.94E-07
YLSC10	AREAPOLY	0.5	07:00 - 19:00	2.08E-04	2.70E-06	9.82E-05	1.27E-06	1.49E-05	1.94E-07

Hourly Profile for AERAPOLY Sources

Hour	TSP	RSP	FSP
Hour 1	0.013	0.013	0.013
Hour 2	0.013	0.013	0.013
Hour 3	0.013	0.013	0.013
Hour 4	0.013	0.013	0.013
Hour 5	0.013	0.013	0.013
Hour 6	0.013	0.013	0.013
Hour 7	0.013	0.013	0.013
Hour 8	1.000	1.000	1.000
Hour 9	1.000	1.000	1.000
Hour 10	1.000	1.000	1.000
Hour 11	1.000	1.000	1.000
Hour 12	1.000	1.000	1.000
Hour 13	1.000	1.000	1.000
Hour 14	1.000	1.000	1.000
Hour 15	1.000	1.000	1.000
Hour 16	1.000	1.000	1.000
Hour 17	1.000	1.000	1.000
Hour 18	1.000	1.000	1.000
Hour 19	1.000	1.000	1.000
Hour 20	0.013	0.013	0.013
Hour 21	0.013	0.013	0.013
Hour 22	0.013	0.013	0.013
Hour 23	0.013	0.013	0.013
Hour 24	0.013	0.013	0.013

Appendix 3.2 Calculation of Construction Dust Emission Sources

Location of Vertices for AREAPOLY

Source ID	X1	Y1	X2	Y2	X3	Y3	X4	Y4	X5	Y5	X6	Y6	X7	Y7	X8	Y8	X9	Y9
YLSC01	819633.30	830767.01	819703.75	830725.76	819658.15	830647.90	819587.70	830689.15										
YLSC02	819658.15	830647.90	819703.75	830725.76	819771.09	830686.32	819725.49	830608.46										
YLSC03	819587.70	830689.15	819657.02	830648.56	819616.14	830578.75	819543.58	830619.92										
YLSC04	819657.02	830648.56	819725.46	830608.48	819675.85	830523.76	819607.41	830563.83										
YLSC05	819543.58	830619.92	819616.14	830578.75	819607.41	830563.83	819568.18	830575.02	819544.60	830566.52	819516.32	830593.89						
YLSC06	819516.32	830593.89	819544.60	830566.52	819497.04	830531.18	819488.95	830506.35	819476.83	830487.60	819467.14	830510.49	819482.86	830572.10				
YLSC07	819636.25	830546.94	819675.85	830523.76	819672.65	830518.30	819633.06	830541.49										
YLSC08	819638.74	830538.16	819684.40	830511.62	819674.47	830481.39	819630.59	830499.07										
YLSC09	819630.59	830499.07	819674.47	830481.39	819703.09	830458.78	819700.14	830443.16	819676.96	830416.18	819662.51	830407.53	819594.66	830447.76	819614.09	830481.07		
YLSC10	819594.66	830447.76	819662.51	830407.53	819657.95	830403.50	819648.20	830369.52	819635.14	830365.86	819615.16	830377.94	819612.06	830388.79	819574.75	830412.24	819575.03	830434.93

Construction Phase
Water Reclamation Facilities
AERMOD Source Listing

Source ID	Type	Height (m)	Working Hour	TSP Emission Rate (g/m ² -s)		RSP Emission Rate (g/m ² -s)		FSP Emission Rate (g/m ² -s)	
				Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
WRF01	AREAPOLY	0.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07

Location of Vertices for AREAPOLY

Source ID	X1	Y1	X2	Y2	X3	Y3	X4	Y4
WRF1	819655.69	830805.48	819793.58	830724.71	819771.09	830686.32	819633.19	830767.10

Hourly Profile for AERAPOLY Sources

Hour	TSP	RSP	FSP
Hour 1	0.156	0.156	0.156
Hour 2	0.156	0.156	0.156
Hour 3	0.156	0.156	0.156
Hour 4	0.156	0.156	0.156
Hour 5	0.156	0.156	0.156
Hour 6	0.156	0.156	0.156
Hour 7	0.156	0.156	0.156
Hour 8	1.000	1.000	1.000
Hour 9	1.000	1.000	1.000
Hour 10	1.000	1.000	1.000
Hour 11	1.000	1.000	1.000
Hour 12	1.000	1.000	1.000
Hour 13	1.000	1.000	1.000
Hour 14	1.000	1.000	1.000
Hour 15	1.000	1.000	1.000
Hour 16	1.000	1.000	1.000
Hour 17	1.000	1.000	1.000
Hour 18	1.000	1.000	1.000
Hour 19	1.000	1.000	1.000
Hour 20	0.156	0.156	0.156
Hour 21	0.156	0.156	0.156
Hour 22	0.156	0.156	0.156
Hour 23	0.156	0.156	0.156
Hour 24	0.156	0.156	0.156

Appendix 3.2 Calculation of Construction Dust Emission Sources

Construction Phase
 YLS DA Works
 AERMOD Source Listing

Source ID ^[1]	Type ^[1]	Height (m)	X1 ^[1]	Y1 ^[1]	X2 ^[1]	Y2 ^[1]	Angle ^[1]	Working Hour	TSP Emission Rate (g/m ² -s)		RSP Emission Rate (g/m ² -s)		FSP Emission Rate (g/m ² -s)	
									Working hours	Non-working hours	Working hours	Non-working hours	Working hours	Non-working hours
P2_108	AREA	0.5	819843	830775	62.2	298.0	30.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
P2_109	AREA	0.5	819986	831036	71.0	241.9	30.5	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
P2_111	AREA	0.5	819668	830472	62.9	349.5	30	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
P2_110	AREA	0.5	819722	830450	52.3	25	32.8	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
P2_104	AREA	0.5	819762	830429	26.4	26.5	51.4	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
P2_105	AREA	0.5	819773	830413	39.9	24.1	64.2	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07
P2_106	AREA	0.5	819790	830375	43.3	35.6	50.7	07:00 - 19:00	1.72E-05	2.70E-06	8.15E-06	1.27E-06	1.24E-06	1.94E-07

Remarks:

1. Extracted from AEIAR-215/2017 - Housing Sites in Yuen Long South, Appendix 4.1

Hourly Profile for AERAPOLY Sources

Hour	TSP	RSP	FSP
Hour 1	0.156	0.156	0.156
Hour 2	0.156	0.156	0.156
Hour 3	0.156	0.156	0.156
Hour 4	0.156	0.156	0.156
Hour 5	0.156	0.156	0.156
Hour 6	0.156	0.156	0.156
Hour 7	0.156	0.156	0.156
Hour 8	1.000	1.000	1.000
Hour 9	1.000	1.000	1.000
Hour 10	1.000	1.000	1.000
Hour 11	1.000	1.000	1.000
Hour 12	1.000	1.000	1.000
Hour 13	1.000	1.000	1.000
Hour 14	1.000	1.000	1.000
Hour 15	1.000	1.000	1.000
Hour 16	1.000	1.000	1.000
Hour 17	1.000	1.000	1.000
Hour 18	1.000	1.000	1.000
Hour 19	1.000	1.000	1.000
Hour 20	0.156	0.156	0.156
Hour 21	0.156	0.156	0.156
Hour 22	0.156	0.156	0.156
Hour 23	0.156	0.156	0.156
Hour 24	0.156	0.156	0.156

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/m²

t = time between applications in hour (t = 1)

The following assumptions are made for assessment purpose:

Assumption 1:

Potential average hourly daytime evaporation rate p can be estimated by $0.0049 \cdot e$, 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 1991 - 2020 is 1204.1 mm¹. Therefore $p = 0.0049 \cdot (1204.1 \text{ mm}) = 0.0049 \cdot (47.4055118 \text{ inches}) = 0.2323$.

Assumption 2:

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

Assumption 3:

Assume watering application intensity as 0.9 L/m². (i = 0.9)

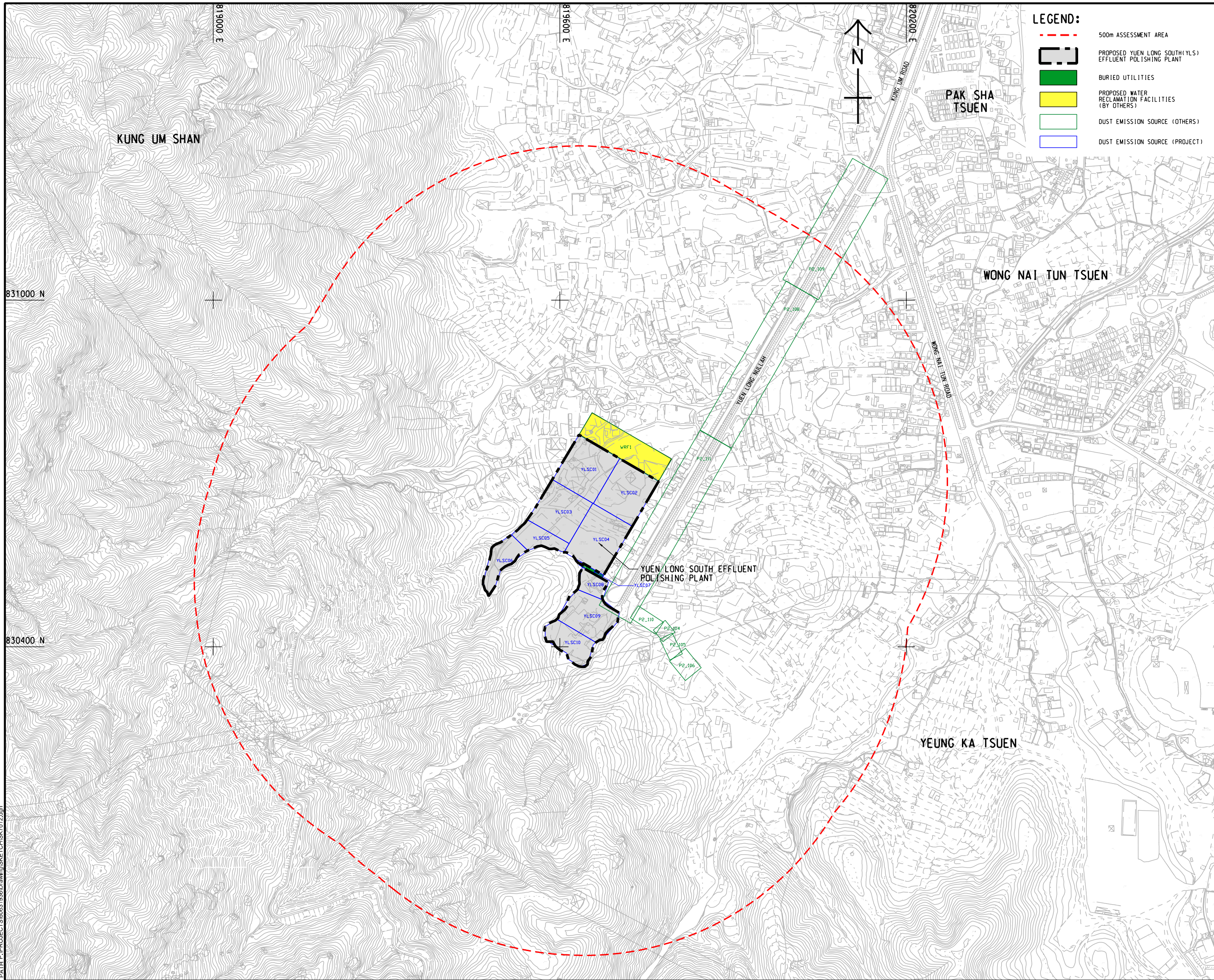
Assumption 4:

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

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

$$C = 100 - 0.8 \cdot (0.2323) \cdot (20) \cdot (2) / 0.9 = \mathbf{91.7\%}$$

¹ The Hong Kong's Observatory evaporation recorded at King's Park between 1991 to 2020 is taken from http://www.weather.gov.hk/en/cis/normal/1991_2020/normals.htm#



LEGEND:

- 500m ASSESSMENT AREA
- PROPOSED YUEN LONG SOUTH (YLS) EFFLUENT POLISHING PLANT
- BURIED UTILITIES
- PROPOSED WATER RECLAMATION FACILITIES (BY OTHERS)
- DUST EMISSION SOURCE (OTHERS)
- DUST EMISSION SOURCE (PROJECT)

AECOM

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

CLIENT
 渠務署
 Drainage Services Department

CONSULTANT
 AECOM Asia Company Ltd.
 www.aecom.com

SUB-CONSULTANTS

ISSUE/REVISION

IR	DATE	DESCRIPTION	CHK.

STATUS

SCALE **DIMENSION UNIT**
 A1 1 : 3000 METRES

KEY PLAN

PROJECT NO. **CONTRACT NO.**
 60631936 CE 6/2019 (DS)

SHEET TITLE
 CONSTRUCTION DUST EMISSION
 SOURCE

SHEET NUMBER
 60631936/SK7012

This drawing has been prepared for the use of AECOM's client. It may not be used, modified, reproduced or relied upon by third parties, except as agreed by AECOM or as required by law. AECOM accepts no responsibility, and denies any liability whatsoever, for any part, that is used or relied on in this drawing without AECOM's express written consent. Do not scale this document. All measurements must be obtained from the stated dimensions.