Appendix 3-9

Calculation of Dust Suppression Efficiency

Appendix 3-9A Calculation of Dust Supression Efficiency of this Project

Methodology:

The same methodology adopted in the approved "Liantang / Heung Yuen Wai Boundary Control Point and Associated Works EIA report"[1] for estimating construction dust supression efficiency (both short-term and long-term) on the “cut and cover area”, “construction of connecting road”, and “slope stabilization” by watering, has also been adopted for this Project in view of similar types of construction activities.

According to the above-mentioned approved EIA report, dust supression rates can be estimated based on Equation 3-2 provided in the Control of Open Fugitive Dust Sources Final Report [(2)], which is also referenced in the AP-42.
Equation 3-2 is shown below:

$$C = 100 - \frac{0.8\ p\ d\ t}{i} \qquad (3\text{-}2)$$

where: C = average control efficiency, percent
P = potential average hourly daytime evaporation rate, mm/h
d = average hourly daytime traffic rate, (h^{-1})
i = application intensity, L/m^2
t = time between applications, h

Estimates of the potential average hourly daytime evaporation rate may be obtained from:

P = 0.0049 x evaporation for annual conditions

Assumptions:

P value in Equation 3-2 is calculated based on information from Hong Kong Observatory's (HKO) website (http://www.weather.gov.hk/cis/normal/1981_2010/normals_e.htm). According to HKO, the recorded annual total evaporation was 1227.3mm, which is equivalent to 48.3188 inch.
Thus, the P value is calcuated by 0.0049 x 48.3188 = 0.2368 mm/hr according to Equation 3-2 above.

d is the maximum no. of vehicles generated per hour during peak construction period according to Section 3.7.1.3 of this EIA Report (i.e. 8 vehicles/ hr)

i is the Application Intensity = 0.20 L/m2 . (Note: The Project construction site is only accessible from Kam Pok Road with limited amount of construction vehicles (8 vehlcles/hr). Also, higher watering frequency is proposed to suppress dust emission. Thus relatively lower application intensity is required in order to achieve the dust supression rate in accordance with the above equation.)

t is the time between application. Assuming the construction works are undertaken 10 hours a day from 0800 to 1800 hours as stated in Section 3.7.1.3 of this EIA report. For a water spraying frequency of 8 times a day, t = 10/8 = 1.25 hour.
(Note: water spraying of 8 times a day has been specified in Section 3.9.1 of this EIA Report, and will be included in the contract with Contractor).

Hence,
By applying the above Equation 3-2 and the assumptions, the dust supression efficiency is estimated as followings:

Dust supression efficiency (C) = 100 - (0.8 x 0.2368 x 8 x 1.25/0.19)

= **90.5%**

Acccording to the "*Gregory E. Muleski, Chatten Cowherd Jr. & John S. Kinsey (2005): Particulate Emissions from Construction Activities, Journal of the Air & Waste Management Association, 55:6, 772-783"* , (also available at: http://www.tandfonline.com/doi/abs/10.1080/10473289.2005.10464669), the published control efficiency of particulate emissions by applying water, is reportly to reach over 90%. Thus, the above calculated dust supression control efficiency is achievable.

A dust supression efficiency of 90% is assumed in the current assessment.

Remark:

(1) Appendix 3.1f, 3.1a, and 3.1b, Agreement No. CE 45/2008 (CE) Liantang / Heung Yuen Wai Boundary Control Point and Associated Works, Environmental Impact Assessment Report (EIA-190/2010)

(2) C. Cowherd, Jr., et al., Control Of Open Fugitive Dust Sources - Final Report, EPA-450/3-88-008, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1988.