

### ***Appendix 11.3.3***

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### ***Derivation of Failure Frequencies***

### Appendix 11.3.3 Calculation of Failure Event frequencies

**Table.1 Derivation of Failure Event Frequencies without Knock-on Effect**

DG	Vehicle Type	Release Description	Likelihood per veh.yr (A)	no. of deliveries (C )	per [time]	no deliveries per year (D)	Time presence (min) (F)	Time fraction for presence Note 2 (G)	Failure freq. per year (H) = (A) * (D) * (G)
Explosive	Explosive Truck(a)	Fire/Explosion	1.00E-05	56	per year	56	25	4.76E-05	2.67E-08
Explosive	Explosive Truck(b)	Fire/Explosion	1.00E-05	3	per day	936 Note 1	25	4.76E-05	4.46E-07
LPG	Road tanker	BLEVE	1.35E-08	22	per day	8030	25	4.76E-05	5.16E-09
LPG	Road tanker	Cold rupture	5.35E-08	22	per day	8030	25	4.76E-05	2.04E-08
LPG	Road tanker	Large (50mm) leak (liquid)	4.95E-08	22	per day	8030	25	4.76E-05	1.89E-08
LPG	Road tanker	Large (50mm) leak (vapour)	4.95E-08	22	per day	8030	25	4.76E-05	1.89E-08
LPG	Road tanker	Medium (25mm) leak (liquid)	4.95E-08	22	per day	8030	25	4.76E-05	1.89E-08
LPG	Cylinder Wagon	Multiple BLEVE	1.35E-08	22	per day	8030	25	4.76E-05	5.16E-09
LPG	Cylinder Wagon	Rupture	6.81E-06	22	per day	8030	25	4.76E-05	2.60E-06
Petrol	Road tanker	Medium (25mm) leak (liquid)	4.95E-08	21	per day	7665	25	4.76E-05	1.80E-08
Petrol	Road tanker	Large (100mm) leak (liquid)	4.95E-08	21	per day	7665	25	4.76E-05	1.80E-08
Petrol	Road tanker	Fireball explosion	1.35E-08	21	per day	7665	25	4.76E-05	4.92E-09
Petrol	Road tanker	Fire (Rupture)	5.35E-08	21	per day	7665	25	4.76E-05	1.95E-08
Diesel	Road tanker	Medium (25mm) leak (liquid)	4.95E-08	21	per day	7665	25	4.76E-05	1.80E-08
Diesel	Road tanker	Large (100mm) leak (liquid)	4.95E-08	21	per day	7665	25	4.76E-05	1.80E-08
Diesel	Road tanker	Fireball explosion	1.35E-08	21	per day	7665	25	4.76E-05	4.92E-09
Diesel	Road tanker	Fire (Rupture)	5.35E-08	21	per day	7665	25	4.76E-05	1.95E-08
Chlorine	cylinder *	Medium (7.5mm) leak (liquid)	5.70E-05	24	per year	24	25	4.76E-05	6.51E-08
Chlorine	cylinder *	Medium (7.5mm) leak (vapour)	6.31E-06	24	per year	24	25	4.76E-05	7.21E-09
Chlorine	cylinder *	Rupture	6.81E-06	24	per year	24	25	4.76E-05	7.78E-09
Chlorine	cylinder #	Medium (7.5mm) leak (liquid)	5.70E-05	15	per year	15	25	4.76E-05	4.07E-08
Chlorine	cylinder #	Medium (7.5mm) leak (vapour)	6.31E-06	15	per year	15	25	4.76E-05	4.50E-09
Chlorine	cylinder #	Rupture	6.81E-06	15	per year	15	25	4.76E-05	4.86E-09

(a) delivery by other parties other than CEDD Mines

(b) delivery by CEDD Mines

\* delivery to WTW in HK Island

# delivery to Silvermine Bay WTW

Note 1 - 6 day per week and 52 weeks per year

Note 2 - (G) = (F)/(60\*24\*365)

(A) - contribution from earthquake event, 1.35E-8/yr, has been added;

### Appendix 11.3.3 Calculation of Failure Event frequencies

Table.2 Derivation of Failure Event Frequencies with Knock-on Effect

DG	Vehicle Type	Release Description	Likelihood (base) (A1)	Likelihood (escalation) (A2)	Likelihood per veh.yr (A') = (A1) + (A2)	no. of deliveries / [time] (C )	no deliveries per year (D)	Time presence (min) (F)	Time fraction for presence Note 2 (G)	Failure freq. per year (H) = (A') * (D) * (G)
Explosive	Explosive Truck (a)	Fire/Explosion	1.00E-05	4.72E-07	1.05E-05	56 /year	56	25	4.76E-05	2.79E-08
Explosive	Explosive Truck (b)	Fire/Explosion	1.00E-05	4.72E-07	1.05E-05	3 /day	936 Note 1	25	4.76E-05	4.67E-07
LPG	Road tanker	BLEVE	1.35E-08	6.91E-08	8.26E-08	22 /day	8030	25	4.76E-05	3.16E-08
LPG	Road tanker	Cold rupture	5.35E-08	6.91E-08	1.23E-07	22 /day	8030	25	4.76E-05	4.68E-08
LPG	Road tanker	Large (50mm) leak (liquid)	4.95E-08	6.91E-08	1.19E-07	22 /day	8030	25	4.76E-05	4.53E-08
LPG	Road tanker	Large (50mm) leak (vapour)	4.95E-08	6.91E-08	1.19E-07	22 /day	8030	25	4.76E-05	4.53E-08
LPG	Road tanker	Medium (25mm) leak (liquid)	4.95E-08	6.91E-08	1.19E-07	22 /day	8030	25	4.76E-05	4.53E-08
LPG	Cylinder Wagon	Multiple BLEVE	1.35E-08	6.91E-08	8.26E-08	22 /day	8030	25	4.76E-05	3.16E-08
LPG	Cylinder Wagon	Rupture	6.81E-06	6.91E-08	6.88E-06	22 /day	8030	25	4.76E-05	2.63E-06
Petrol	Road tanker	Medium (25mm) leak (liquid)	4.95E-08	6.91E-08	1.19E-07	21 /day	7665	25	4.76E-05	4.33E-08
Petrol	Road tanker	Large (100mm) leak (liquid)	4.95E-08	6.91E-08	1.19E-07	21 /day	7665	25	4.76E-05	4.33E-08
Petrol	Road tanker	Fireball explosion	1.35E-08	6.91E-08	8.26E-08	21 /day	7665	25	4.76E-05	3.01E-08
Petrol	Road tanker	Fire (Rupture)	5.35E-08	6.91E-08	1.23E-07	21 /day	7665	25	4.76E-05	4.47E-08
Diesel	Road tanker	Medium (25mm) leak (liquid)	4.95E-08	6.91E-08	1.19E-07	21 /day	7665	25	4.76E-05	4.33E-08
Diesel	Road tanker	Large (100mm) leak (liquid)	4.95E-08	6.91E-08	1.19E-07	21 /day	7665	25	4.76E-05	4.33E-08
Diesel	Road tanker	Fireball explosion	1.35E-08	6.91E-08	8.26E-08	21 /day	7665	25	4.76E-05	3.01E-08
Diesel	Road tanker	Fire (Rupture)	5.35E-08	6.91E-08	1.23E-07	21 /day	7665	25	4.76E-05	4.47E-08
Chlorine	cylinder *	Medium (7.5mm) leak (liquid)	5.70E-05	6.91E-08	5.71E-05	24 /year	24	25	4.76E-05	6.52E-08
Chlorine	cylinder *	Medium (7.5mm) leak (vapour)	6.31E-06	6.91E-08	6.38E-06	24 /year	24	25	4.76E-05	7.29E-09
Chlorine	cylinder *	Rupture	6.81E-06	6.91E-08	6.88E-06	24 /year	24	25	4.76E-05	7.86E-09
Chlorine	cylinder #	Medium (7.5mm) leak (liquid)	5.70E-05	6.91E-08	5.71E-05	15 /year	15	25	4.76E-05	4.07E-08
Chlorine	cylinder #	Medium (7.5mm) leak (vapour)	6.31E-06	6.91E-08	6.38E-06	15 /year	15	25	4.76E-05	4.55E-09
Chlorine	cylinder #	Rupture	6.81E-06	6.91E-08	6.88E-06	15 /year	15	25	4.76E-05	4.91E-09

(a) delivery by other parties other than CEDD Mines

(b) delivery by CEDD Mines

\* delivery to WTW in HK Island

# delivery to Silvermine Bay WTW

Note 1 - 6 day per week and 52 weeks per year

Note 2 - (G) = (F)/(60\*24\*365)

(A2) - likelihood (escalation) for explosive truck = 2.67E-08 + 4.46E-07

(A2) - likelihood (escalation) for other DG vehicles = (5.16E-09 + 4.92E-09 + 4.92E-09) + (0.9\*2.04E-08) + (0.05\*0.1\*5.67E-08) + 0.9\*(1.95E-08 + 1.95E-08) + 0.05\* 0.1\*(3.61E-08 + 3.61E-08)