

## Appendix 3.6 Calculation of Vehicular Emission Source

### Estimation of Vehicular Emission for the Study Area with EMFAC-HK model

The major air quality impact arisen by the Project is the stack emission during the operation phase. Open road emission also contribute to the cumulative air quality in the Study Area. As NO<sub>2</sub> and the particulate matters are the key pollutant for the stack emission, the estimation shall also focus on vehicular emission in NO<sub>2</sub> and particulates namely RSP and FSP. EMFAC-HK v3.4 model is adopted to estimate the vehicular emission rates of NO<sub>x</sub> and particulate matters, RSP and FSP. The input parameters and model assumptions made in EMFAC-HK model are summarised as follows.

#### Model Year

EMFAC-HK consider 45 years of model years for the estimation of vehicular emission. The model years start from 45 years preceding the year of interest to the year of interest as the final model year. The following table summarizes the starting and final model years of the assessment years implemented in EMFAC-HK.

*Table 1 Starting and Final model years in EMFAC-HK*

Scenario Year	Starting Model Year	Final Model Year
<b>Year 2020 – 2026 (Phase 1 Construction)</b>		
2021	1976	2021
<b>Year 2026 – 2030 (Phase 1 Operation + Phase 2 Construction)</b>		
2026	1981	2026
2028	1983	2028
2030	1985	2030
<b>Ultimate (Phase 2 Operation)<sup>[1]</sup></b>		
2030	1985	2030

#### Road Grouping

Roads within 500 meters of study area were classified into road category of similar nature and driving pattern. Roads are classified by their speed limits. The detail of the road category adopted in the EMFAC-HK is summarized as below:

*Table 2 Road Category adopted in EMFAC-HK*

Group	Roads	Justification
Group 1	Local road at speed 50 km/hr	Speed limit at 50 km/hr with cold start trips

#### Vehicle Technology fraction

Exhaust technology fraction and evaporative technology fraction in the model are based on the default value.

The “2015 Licensed Vehicle by Age and Technology Group Fractions” provided in EPD’s website, is adopted in this assessment. Since the provided exhaust technology fractions are only up to Year 2015 at the time of the assessment, those after Year 2015 are projected in accordance with EPD’s Guideline on Modelling Vehicle Emissions – Appendix 3 “Implementation Schedule of Vehicle Emission Standards in Hong Kong (updated as at October 2017)” and Appendix 4 “EMFAC-HK Technology Group Indexes (Released in February 2018)”.

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#### Vehicle Population

As recommended in the EPD’s Guideline on Modelling Vehicle Emissions, default vehicle populations forecast in EMFAC-HK was used.

#### Vehicle Accrual

The default accrual rates in EMFAC-HK are estimated from the local mileage data adjusted to reflect the total VKT for each vehicle class. The default value was used.

#### Vehicle Kilometre Travel (VKT)

The “vehicle fleet” refers to all motor vehicles operating on roads within this assessment area. The modelled fleet was broken down into 16 vehicle classes based on the information in the Transport Monthly Digest and vehicle population provided by EPD.

Vehicle-kilometer-travelled (VKT) represents the total distance travelled on a weekday. The VKT is calculated by multiplying the number of vehicles, which based on the highest predicted hourly traffic flow, and the length of road travelled in the assessment area. The diurnal variation of VKT in the assessment area was provided by the traffic consultant, and the input in the model is by vehicle/fuel/hour.

#### Trips

For those roads with cold starts as advised by the traffic consultant, the diurnal variation of daily trips in the assessment area of the Project applied in the EMFAC-HK model were provided by the traffic consultant.

#### Speed Fraction

Speed fraction represents the percentage in different speed ranges of each vehicle type weighted by VKT. The speed limits of existing road were made reference to the Traffic AIDs (plan marked the road marking, traffic sign and speed limits) from TD.

In accordance with the Road Traffic Ordinance, for any road with design speed limit of 70 kph or above, the speed limit for medium goods vehicles, heavy goods vehicles, buses and buses would be limited to not more than 70 kph. Thus, the speeds of medium goods vehicles, heavy goods vehicles and buses from the flow speed or 70 kph, whichever is lower, were adopted. For the public light buses, the speed limit should be limited to speed limit of the carriageway or 80 kph, whichever is lower, were adopted.

#### Temperature and Humidity Profile

Given that Hong Kong is a small city, temperature and humidity are generally similar in various regions of Hong Kong. Therefore default profiles of temperature and humidity in EMFAC-HK were used.

#### Estimation of Composite Vehicular Emission Factor

Referring to the EPD’s Guideline on Modelling Vehicle Emissions, “Burden mode” was used for calculating area-specific emission inventories. It was applied for this Project, since it can provide hourly vehicular emissions, taking into account of ambient conditions and speeds combined with vehicle activity, i.e. the number of vehicles, the kilometres driven per day and the number of daily trips.

### **Appendix 3.6 Calculation of Vehicular Emission Source**

Assuming that NO<sub>x</sub> is comprised of NO and NO<sub>2</sub> only, the hourly emission of NO<sub>x</sub> was split into NO and NO<sub>2</sub> based on the resulting ratio of NO<sub>2</sub> and NO<sub>x</sub> by EMFAC-HK for each vehicle type. The NO<sub>2</sub>-to-NO<sub>x</sub> ratio for each vehicle type extracted from EMFAC-HK is presented in table below in the appendix.

The hourly emissions of NO, NO<sub>2</sub>, RSP and FSP were divided by the number of vehicles and the distance travelled to obtain the emission factors in gram per miles per vehicle. The calculated 24-hour composite emission factors of 16 vehicle classes for each road type were adopted in the subsequent air dispersion modelling.

#### **Vehicular Emission Burden by EMFAC-HK**

For Year 2026 – 2030 Scenario, vehicular emission burden for NOX and RSP were calculated based on the traffic forecast and EMFAC-HK v3.4 model. The results are summarized as below.

*Table 3 Vehicular Emission Burden and VKT of Open Road Source*

<b>Year</b>	<b>NOx (kg/day)</b>	<b>RSP (kg/day)</b>	<b>VKT</b>
2026	2.70	0.14	3343
2028	2.36	0.13	3373
2030	1.89	0.10	3406

According to the results, Year 2026 is selected as the worst affected year by vehicular emission.

## Appendix 3.6 Calculation of Vehicular Emission Source

NO and NO<sub>2</sub> to NO<sub>x</sub> Ratios

Year 2021

YLEPP - Speed Limit - 50kph

Vehicle Class	Sum of NO2	Sum of Nox	NO2/NOx Ratio	NO/NOX Ratio
FBDD	0.053	0.531	0.099	0.901
FBSD	0.005	0.059	0.089	0.911
HGV7	0.086	0.282	0.305	0.695
HGV8	0.162	1.451	0.110	0.890
LGV3	0.000	0.001	0.080	0.920
LGV4	0.008	0.101	0.083	0.917
LGV6	0.029	0.105	0.280	0.720
MC	0.001	0.014	0.050	0.950
NFB6	0.011	0.039	0.280	0.720
NFB7	0.011	0.041	0.271	0.729
NFB8	0.006	0.072	0.076	0.924
PC	0.001	0.019	0.052	0.948
PLB	0.008	0.085	0.098	0.902
PV4	0.002	0.015	0.149	0.851
PV5	0.038	0.152	0.248	0.752
TAXI	0.004	0.162	0.023	0.977

## Appendix 3.6 Calculation of Vehicular Emission Source

Year 2021

YLEPP - Speed Limit -50kph

Emission Factor (gm/mile/vehicle) in Caline Format - NO

Hour	MC	PC	Taxi	NFB6	NFB7	NFB8	PV4	PV5	LGV3	LGV4	LGV6	HGV7	HGV8	FBSD	FBDD	PLB
0:00 - 1:00	0.79990	0.26554	0.49587	1.98346	3.02264	4.03084	0.00000	0.00000	0.83241	0.71274	1.40553	1.83197	3.30777	4.42541	4.19897	0.00000
1:00 - 2:00	0.93539	0.28027	0.49601	1.98226	3.02082	4.02842	0.00000	0.00000	0.83253	0.71235	1.40468	1.83092	3.30578	4.42276	4.19644	0.00000
2:00 - 3:00	0.45286	0.27986	0.49765	1.98578	3.02618	4.03556	0.00000	0.00000	0.83482	0.71350	1.40717	1.83457	3.31164	4.43060	4.20388	0.00000
3:00 - 4:00	0.85161	0.29908	0.50347	1.99577	3.04140	4.05586	0.00000	0.00000	0.83992	0.71677	1.41425	1.84505	3.32830	0.00000	4.22503	0.00000
4:00 - 5:00	0.76573	0.22368	0.50130	1.99329	3.03763	4.05083	0.51795	0.91220	0.83462	0.71595	1.41250	1.84241	3.32417	0.00000	4.21979	0.00000
5:00 - 6:00	0.68975	0.21299	0.50288	1.99622	3.04209	4.05678	0.51892	1.80727	0.83735	0.71691	1.41457	1.84545	3.32905	4.45389	4.22599	0.00000
6:00 - 7:00	0.93805	0.20772	0.50203	1.99263	3.03661	4.04948	0.51821	2.06422	0.83785	0.71575	1.41203	1.84207	3.32306	4.44588	4.21838	0.00000
7:00 - 8:00	0.66690	0.21038	0.50317	2.00015	3.04808	4.07021	0.93440	1.61276	0.84198	0.76053	1.41915	1.85252	3.35515	4.46883	4.24049	1.15820
8:00 - 9:00	0.70993	0.20986	0.51146	2.07668	3.16470	4.28181	0.76985	1.64023	0.86017	0.77421	1.44765	1.89440	3.49629	4.69420	4.45764	1.18985
9:00 - 10:00	0.72200	0.21623	0.51570	2.08532	3.17788	4.29963	0.74458	1.24613	0.86402	0.77677	1.45367	1.90220	3.51045	4.71374	4.47619	1.19551
10:00 - 11:00	0.71158	0.21666	0.50476	2.00024	3.04821	4.06936	0.72484	1.19539	0.84222	0.72090	1.41903	1.85037	3.34228	0.00000	4.24102	1.15321
11:00 - 12:00	0.73504	0.21750	0.50716	2.01540	3.07131	4.11228	0.72177	1.25216	0.84800	0.76141	1.42758	1.86293	3.39390	4.51148	4.28159	0.00000
12:00 - 13:00	0.90740	0.21564	0.49892	1.98648	3.02725	4.04137	0.72961	1.27790	0.83617	0.71638	1.40927	1.83591	3.31929	0.00000	4.21185	0.00000
13:00 - 14:00	0.79536	0.25684	0.49803	1.98240	3.02103	4.02869	0.76320	1.32509	0.83347	0.71234	1.40478	1.82863	3.30601	0.00000	4.19673	0.00000
14:00 - 15:00	0.44640	0.26135	0.49779	1.98260	3.02134	4.02911	0.77721	1.36982	0.83312	0.71241	1.40493	1.82900	3.30635	0.00000	4.19717	0.00000
15:00 - 16:00	0.44673	0.26307	0.49843	1.98363	3.02291	4.03120	0.73767	1.37043	0.83313	0.71274	1.40565	1.82997	3.30806	0.00000	4.19934	0.00000
16:00 - 17:00	0.80572	0.26465	0.49492	1.97713	3.01300	4.01798	0.50905	1.42911	0.83045	0.71063	1.40105	1.82355	3.29722	0.00000	4.18557	0.00000
17:00 - 18:00	0.74846	0.26194	0.50044	2.01109	3.06475	4.10654	0.72707	1.66805	0.85243	0.73623	1.43547	1.87449	3.46131	4.54385	4.31301	1.17287
18:00 - 19:00	0.77584	0.26548	0.50178	2.03840	3.10637	4.18411	0.75230	1.71364	0.86453	0.78054	1.45462	1.90337	3.53332	4.62839	4.39456	1.19144
19:00 - 20:00	0.71935	0.26895	0.49789	1.98456	3.02431	4.03307	0.69859	1.70732	0.83374	0.71308	1.40631	1.83247	3.30960	4.42787	4.20130	1.14584
20:00 - 21:00	0.69552	0.27424	0.49459	1.97964	3.01682	4.02309	0.51226	0.90476	0.83115	0.71148	1.40282	1.82754	3.30141	4.41690	4.19089	1.14099
21:00 - 22:00	0.76891	0.27424	0.49523	1.98290	3.02179	4.02971	0.51449	0.90638	0.83263	0.71255	1.40513	1.83109	3.30684	0.00000	4.19779	1.14506
22:00 - 23:00	0.77486	0.27889	0.49477	1.97936	3.01640	4.02252	0.00000	0.00000	0.83041	0.71141	1.40263	1.82780	3.30094	4.41628	4.19030	0.00000
23:00 - 0:00	0.83548	0.27400	0.49304	1.97872	3.01542	4.02121	0.52618	0.90471	0.83115	0.71119	1.40217	1.82700	3.29987	0.00000	4.18893	1.14155
daily	0.73458	0.24176	0.50295	2.01882	3.07653	4.12380	0.72782	1.40725	0.84552	0.74081	1.42462	1.86042	3.38957	4.57549	4.27471	1.17753

Emission Factor (gm/mile/vehicle) in Caline Format - NO2

Hour	MC	PC	Taxi	NFB6	NFB7	NFB8	PV4	PV5	LGV3	LGV4	LGV6	HGV7	HGV8	FBSD	FBDD	PLB
0:00 - 1:00	0.04191	0.01471	0.01186	0.77134	1.12513	0.33179	0.00000	0.00000	0.07271	0.06477	0.54659	0.80276	0.41667	0.43166	0.46321	0.00000
1:00 - 2:00	0.04901	0.01553	0.01187	0.77088	1.12446	0.33159	0.00000	0.00000	0.07272	0.06473	0.54627	0.80230	0.41642	0.43140	0.46294	0.00000
2:00 - 3:00	0.02373	0.01551	0.01191	0.77225	1.12645	0.33218	0.00000	0.00000	0.07292	0.06483	0.54723	0.80390	0.41716	0.43216	0.46376	0.00000
3:00 - 4:00	0.04462	0.01657	0.01205	0.77613	1.13212	0.33385	0.00000	0.00000	0.07337	0.06513	0.54999	0.80849	0.41926	0.00000	0.46609	0.00000
4:00 - 5:00	0.04012	0.01239	0.01199	0.77517	1.13071	0.33343	0.09041	0.30076	0.07290	0.06506	0.54930	0.80733	0.41874	0.00000	0.46551	0.00000
5:00 - 6:00	0.03614	0.01180	0.01203	0.77631	1.13237	0.33392	0.09058	0.59586	0.07314	0.06514	0.55011	0.80867	0.41935	0.43444	0.46619	0.00000
6:00 - 7:00	0.04915	0.01151	0.01201	0.77491												









## Appendix 3.6 Calculation of Vehicular Emission Source

## Summary of Composite Vehicular Emission Factors for CALINE4

Open Road 24 hour FSP Emission and Traffic Profile (Year 2021)

## Appendix 3.6 Calculation of Vehicular Emission Source

NO and NO<sub>2</sub> to NO<sub>x</sub> Ratios

Year 2026

YLEPP - Speed Limit - 50kph

Vehicle Class	Sum of NO2	Sum of Nox	NO2/NOx Ratio	NO/NOX Ratio
FBDD	0.018	0.439	0.041	0.959
FBSD	0.004	0.039	0.111	0.889
HGV7	0.073	0.244	0.300	0.700
HGV8	0.138	1.094	0.110	0.890
LGV3	0.000	0.001	0.080	0.920
LGV4	0.007	0.092	0.079	0.921
LGV6	0.023	0.084	0.280	0.720
MC	0.001	0.013	0.050	0.950
NFB6	0.011	0.040	0.280	0.720
NFB7	0.009	0.032	0.271	0.729
NFB8	0.004	0.036	0.105	0.895
PC	0.001	0.010	0.054	0.946
PLB	0.008	0.063	0.133	0.867
PV4	0.002	0.016	0.148	0.852
PV5	0.036	0.146	0.248	0.752
TAXI	0.005	0.175	0.027	0.973

## Appendix 3.6 Calculation of Vehicular Emission Source

Year 2026

YLEPP - Speed Limit -50kph

Emission Factor (gm/mile/vehicle) in Caline Format - NO

Hour	MC	PC	Taxi	NFB6	NFB7	NFB8	PV4	PV5	LGV3	LGV4	LGV6	HGV7	HGV8	FBSD	FBDD	PLB
0:00 - 1:00	0.71689	0.14469	0.52071	1.99017	2.27035	1.87142	0.00000	0.00000	0.66572	0.62851	1.09573	1.55749	2.42090	2.83024	3.68316	0.00000
1:00 - 2:00	0.83876	0.14424	0.52085	1.98897	2.26899	1.87030	0.00000	0.00000	0.66530	0.62816	1.09507	1.55658	2.41945	2.82854	3.68094	0.00000
2:00 - 3:00	1.07760	0.16463	0.52257	1.99250	2.27301	1.87362	0.00000	0.00000	0.66705	0.62917	1.09701	1.55959	2.42374	2.83355	3.68747	0.00000
3:00 - 4:00	0.76770	0.15393	0.52869	2.00252	2.28445	1.88304	0.00000	0.00000	0.66964	0.63202	1.10253	1.56820	2.43593	0.00000	3.70602	0.00000
4:00 - 5:00	0.70414	0.11410	0.52641	2.00004	2.28161	1.88071	0.54341	1.89802	0.66950	0.63131	1.10116	1.56604	2.43291	0.00000	3.70142	0.00000
5:00 - 6:00	0.63878	0.11454	0.52807	2.00297	2.28496	1.88347	0.54550	1.66653	0.67020	0.63215	1.10278	1.56854	2.43648	2.84845	3.70686	0.00000
6:00 - 7:00	0.87001	0.11087	0.52717	1.99937	2.28085	1.88008	0.54372	1.89880	0.66921	0.63113	1.10080	1.56569	2.43210	2.84333	3.70019	0.00000
7:00 - 8:00	0.61545	0.10913	0.52827	2.00692	2.28946	1.89263	0.98844	1.49097	0.67507	0.66255	1.10715	1.57534	2.45849	2.85835	3.71992	0.81086
8:00 - 9:00	0.65471	0.10856	0.53786	2.09948	2.39506	2.04620	0.81404	1.52434	0.71212	0.69985	1.14636	1.63492	2.66880	3.08717	4.02038	0.86484
9:00 - 10:00	0.65814	0.11289	0.54034	2.09240	2.38697	2.02936	0.78506	1.16128	0.70287	0.68838	1.13769	1.62117	2.58662	3.01847	3.93007	0.84890
10:00 - 11:00	0.64427	0.11350	0.52995	2.00701	2.28956	1.89168	0.76366	1.17706	0.67482	0.63724	1.10693	1.57381	2.44885	0.00000	3.72035	0.80839
11:00 - 12:00	0.66236	0.11646	0.53224	2.02222	2.30692	1.91810	0.76015	1.16524	0.68255	0.66794	1.11472	1.58563	2.49049	2.88629	3.75661	0.00000
12:00 - 13:00	0.80814	0.11385	0.52383	1.99321	2.27382	1.87867	0.76824	1.18795	0.67042	0.63327	1.09931	1.56193	2.43211	0.00000	3.69476	0.00000
13:00 - 14:00	0.71214	0.13644	0.52298	1.98911	2.26914	1.87043	0.80391	1.23052	0.66599	0.62817	1.09514	1.55521	2.41961	0.00000	3.68119	0.00000
14:00 - 15:00	0.92588	0.13863	0.52272	1.98931	2.26938	1.87062	0.81872	1.27096	0.66598	0.62823	1.09526	1.55548	2.41987	0.00000	3.68158	0.00000
15:00 - 16:00	0.91245	0.13604	0.52339	1.99034	2.27055	1.87159	0.77674	1.27155	0.66625	0.62852	1.09583	1.55630	2.42112	0.00000	3.68348	0.00000
16:00 - 17:00	0.72349	0.14064	0.51971	1.98382	2.26311	1.86546	0.53414	1.32436	0.66416	0.62666	1.09223	1.55094	2.41318	0.00000	3.67141	0.00000
17:00 - 18:00	0.67491	0.13259	0.52513	2.01790	2.30198	1.91706	0.76613	1.54106	0.69074	0.67836	1.12237	1.59710	2.54012	2.90773	3.78490	0.83181
18:00 - 19:00	0.69774	0.14030	0.52612	2.04531	2.33326	1.96490	0.79257	1.58289	0.70746	0.69521	1.13977	1.62392	2.60690	2.96319	3.85779	0.85134
19:00 - 20:00	0.64768	0.14294	0.52283	1.99127	2.27161	1.87246	0.73588	1.57598	0.66645	0.62881	1.09634	1.55803	2.42225	2.83181	3.68520	0.80303
20:00 - 21:00	0.62831	0.14456	0.51936	1.98634	2.26598	1.86783	0.53819	0.85069	0.66482	0.62740	1.09362	1.55394	2.41625	2.82480	3.67607	0.79951
21:00 - 22:00	0.69035	0.14571	0.52003	1.98961	2.26971	1.87090	0.53544	0.85225	0.66585	0.62834	1.09542	1.55683	2.42023	0.00000	3.68213	0.80207
22:00 - 23:00	0.69826	0.14804	0.51955	1.98606	2.26566	1.86756	0.00000	0.00000	0.66458	0.62733	1.09347	1.55404	2.41591	2.82440	3.67555	0.00000
23:00 - 0:00	0.75360	0.14693	0.51773	1.98541	2.26493	1.86695	0.53735	0.85267	0.66436	0.62715	1.09311	1.55341	2.41512	0.00000	3.67436	0.80034
daily	0.68658	0.12691	0.52802	2.02817	2.31369	1.92988	0.76681	1.32319	0.68233	0.65750	1.11378	1.58570	2.50018	2.94918	3.76057	0.83885

Emission Factor (gm/mile/vehicle) in Caline Format - NO2

Hour	MC	PC	Taxi	NFB6	NFB7	NFB8	PV4	PV5	LGV3	LGV4	LGV6	HGV7	HGV8	FBSD	FBDD	PLB
0:00 - 1:00	0.03757	0.00822	0.01436	0.77395	0.84412	0.21930	0.00000	0.00000	0.05770	0.05400	0.42612	0.66600	0.34931	0.35366	0.15924	0.00000
1:00 - 2:00	0.04396	0.00820	0.01437	0.77349	0.84362	0.21917	0.00000	0.00000	0.05767	0.05397	0.42586	0.66561	0.34910	0.35345	0.15915	0.00000
2:00 - 3:00	0.05647	0.00936	0.01442	0.77486	0.84511	0.21956	0.00000	0.00000	0.05782	0.05406	0.42662	0.66690	0.34972	0.35407	0.15943	0.00000
3:00 - 4:00	0.04023	0.00875	0.01458	0.77876	0.84936	0.22066	0.00000	0.00000	0.05804	0.05430	0.42876	0.67058	0.35148	0.00000	0.16023	0.00000
4:00 - 5:00	0.03690	0.00649	0.01452	0.77779	0.84831	0.22039	0.09437	0.62708	0.05803	0.05424	0.42823	0.66966	0.35104	0.00000	0.16003	0.00000
5:00 - 6:00	0.03348	0.00651	0.01457	0.77893	0.84956	0.22071	0.09474	0.55060	0.05809	0.05431	0.42886	0.67073	0.35156	0.35593	0.16027	0.00000
6:00 - 7:00	0.04559	0.00630	0.01454	0.77753												

## Appendix 3.6 Calculation of Vehicular Emission Source

Year 2026

YLEPP - Speed Limit - 50kph

Emission Factor (gm/mile/vehicle) in Caline Format - RSP

Hour	MC	PC	Taxi	NFB6	NFB7	NFB8	PV4	PV5	LGV3	LGV4	LGV6	HGV7	HGV8	FBSD	FBDD	PLB
0:00 - 1:00	0.00996	0.01056	0.00000	0.08032	0.06211	0.18256	0.00000	0.00000	0.01891	0.01855	0.05763	0.05618	0.18295	0.20389	0.26387	0.00000
1:00 - 2:00	0.01158	0.01126	0.00000	0.08032	0.06211	0.18256	0.00000	0.00000	0.01891	0.01855	0.05763	0.05618	0.18295	0.20389	0.26387	0.00000
2:00 - 3:00	0.01633	0.01542	0.00000	0.08032	0.06211	0.18256	0.00000	0.00000	0.01896	0.01855	0.05763	0.05618	0.18295	0.20389	0.26387	0.00000
3:00 - 4:00	0.01092	0.01301	0.00000	0.08032	0.06211	0.18256	0.00000	0.00000	0.01888	0.01855	0.05763	0.05618	0.18295	0.00000	0.26387	0.00000
4:00 - 5:00	0.01195	0.01376	0.00000	0.08032	0.06211	0.18256	0.02564	0.04759	0.01895	0.01855	0.05763	0.05618	0.18295	0.00000	0.26387	0.00000
5:00 - 6:00	0.01089	0.01546	0.00000	0.08032	0.06211	0.18256	0.02565	0.04756	0.01893	0.01855	0.05763	0.05618	0.18295	0.20389	0.26387	0.00000
6:00 - 7:00	0.01752	0.01416	0.00000	0.08032	0.06211	0.18256	0.02564	0.04757	0.01894	0.01855	0.05763	0.05618	0.18295	0.20389	0.26387	0.00000
7:00 - 8:00	0.00997	0.01323	0.00000	0.08056	0.06236	0.18318	0.05366	0.04771	0.01914	0.01977	0.05779	0.05662	0.18406	0.20455	0.26473	0.02396
8:00 - 9:00	0.01051	0.01150	0.00000	0.08357	0.06537	0.19074	0.04252	0.04949	0.02052	0.02078	0.05881	0.05949	0.19303	0.21449	0.27770	0.02523
9:00 - 10:00	0.00934	0.00985	0.00000	0.08310	0.06490	0.18956	0.03831	0.04921	0.02010	0.02023	0.05850	0.05861	0.18924	0.21112	0.27331	0.02481
10:00 - 11:00	0.00845	0.00904	0.00000	0.08051	0.06231	0.18306	0.03494	0.04768	0.01911	0.01873	0.05776	0.05655	0.18358	0.00000	0.26462	0.02402
11:00 - 12:00	0.00852	0.00857	0.00000	0.08106	0.06286	0.18443	0.03454	0.04801	0.01940	0.01952	0.05798	0.05717	0.18543	0.20578	0.26635	0.00000
12:00 - 13:00	0.01072	0.00794	0.00000	0.08051	0.06231	0.18306	0.03409	0.04768	0.01911	0.01873	0.05776	0.05655	0.18359	0.00000	0.26462	0.00000
13:00 - 14:00	0.00909	0.00911	0.00000	0.08032	0.06211	0.18256	0.03531	0.04756	0.01893	0.01855	0.05763	0.05618	0.18295	0.00000	0.26387	0.00000
14:00 - 15:00	0.01257	0.00958	0.00000	0.08032	0.06211	0.18256	0.03626	0.04756	0.01893	0.01855	0.05763	0.05618	0.18295	0.00000	0.26387	0.00000
15:00 - 16:00	0.01276	0.00949	0.00000	0.08032	0.06211	0.18256	0.03482	0.04756	0.01892	0.01855	0.05763	0.05618	0.18295	0.00000	0.26387	0.00000
16:00 - 17:00	0.00964	0.01025	0.00000	0.08032	0.06211	0.18256	0.02565	0.04756	0.01893	0.01855	0.05763	0.05618	0.18295	0.00000	0.26387	0.00000
17:00 - 18:00	0.00909	0.01020	0.00000	0.08120	0.06300	0.18479	0.03572	0.04809	0.01981	0.01997	0.05828	0.05800	0.18791	0.20721	0.26820	0.02464
18:00 - 19:00	0.00908	0.00978	0.00000	0.08221	0.06400	0.18731	0.03654	0.04868	0.02047	0.02049	0.05877	0.05937	0.19095	0.20987	0.27168	0.02513
19:00 - 20:00	0.00777	0.00969	0.00000	0.08032	0.06211	0.18256	0.03278	0.04756	0.01893	0.01855	0.05763	0.05618	0.18295	0.20389	0.26387	0.02395
20:00 - 21:00	0.00761	0.01063	0.00000	0.08032	0.06211	0.18256	0.02566	0.04757	0.01894	0.01855	0.05763	0.05618	0.18295	0.20389	0.26387	0.02389
21:00 - 22:00	0.00856	0.01027	0.00000	0.08032	0.06211	0.18256	0.02562	0.04757	0.01894	0.01855	0.05763	0.05618	0.18295	0.00000	0.26387	0.02389
22:00 - 23:00	0.00927	0.01170	0.00000	0.08032	0.06211	0.18256	0.00000	0.00000	0.01892	0.01855	0.05763	0.05618	0.18295	0.20389	0.26387	0.00000
23:00 - 0:00	0.01093	0.01262	0.00000	0.08032	0.06211	0.18256	0.02565	0.04776	0.01894	0.01855	0.05763	0.05618	0.18295	0.00000	0.26387	0.02398
daily	0.00983	0.01051	0.00000	0.08134	0.06314	0.18514	0.03544	0.04800	0.01948	0.01940	0.05803	0.05736	0.18609	0.20870	0.26692	0.02471

Emission Factor (gm/mile/vehicle) in Caline Format - FSP

Hour	MC	PC	Taxi	NFB6	NFB7	NFB8	PV4	PV5	LGV3	LGV4	LGV6	HGV7	HGV8	FBSD	FBDD	PLB
0:00 - 1:00	0.00834	0.00979	0.00000	0.07389	0.05714	0.16795	0.00000	0.00000	0.01738	0.01707	0.05302	0.05169	0.16831	0.18758	0.24276	0.00000
1:00 - 2:00	0.00974	0.01045	0.00000	0.07389	0.05714	0.16795	0.00000	0.00000	0.01738	0.01707	0.05302	0.05169	0.16831	0.18758	0.24276	0.00000
2:00 - 3:00	0.01380	0.01431	0.00000	0.07389	0.05714	0.16795	0.00000	0.00000	0.01742	0.01707	0.05302	0.05169	0.16831	0.18758	0.24276	0.00000
3:00 - 4:00	0.00917	0.01207	0.00000	0.07389	0.05714	0.16795	0.00000	0.00000	0.01736	0.01707	0.05302	0.05169	0.16831	0.00000	0.24276	0.00000
4:00 - 5:00	0.00998	0.01277	0.00000	0.07389	0.05714	0.16795	0.02371	0.04378	0.01742	0.01707	0.05302	0.05169	0.16831	0.00000	0.24276	0.00000
5:00 - 6:00	0.00910	0.01434	0.00000	0.07389	0.05714	0.16795	0.02372	0.04376	0.01740	0.01707	0.05302	0.05169	0.16831	0.18758	0.24276	0.00000
6:00 - 7:00	0.01458	0.01314	0.00000	0.07389												









## Appendix 3.6 Calculation of Vehicular Emission Source

NO and NO<sub>2</sub> to NO<sub>x</sub> Ratios

Year 2045

YLEPP - Speed Limit - 50kph

Vehicle Class	Sum of NO2	Sum of Nox	NO2/NOx Ratio	NO/NOX Ratio
FBDD	0.020	0.070	0.290	0.710
FBSD	0.001	0.005	0.290	0.710
HGV7	0.014	0.041	0.328	0.672
HGV8	0.058	0.184	0.110	0.890
LGV3	0.000	0.001	0.054	0.946
LGV4	0.004	0.067	0.054	0.946
LGV6	0.004	0.014	0.280	0.720
MC	0.001	0.012	0.050	0.950
NFB6	0.011	0.041	0.280	0.720
NFB7	0.006	0.023	0.278	0.722
NFB8	0.003	0.009	0.326	0.674
PC	0.000	0.007	0.054	0.946
PLB	0.008	0.058	0.142	0.858
PV4	0.002	0.016	0.151	0.849
PV5	0.035	0.142	0.250	0.750
TAXI	0.005	0.167	0.027	0.973

## Appendix 3.6 Calculation of Vehicular Emission Source

Year 2045

YLEPP - Speed Limit -50kph

Emission Factor (gm/mile/vehicle) in Caline Format - NO

Hour	MC	PC	Taxi	NFB6	NFB7	NFB8	PV4	PV5	LGV3	LGV4	LGV6	HGV7	HGV8	FBSD	FBDD	PLB
0:00 - 1:00	0.66377	0.09588	0.48921	1.98739	1.60202	0.33614	0.00000	0.00000	0.42031	0.45525	0.16986	0.23960	0.35500	0.29001	0.43256	0.00000
1:00 - 2:00	0.77661	0.09538	0.48935	1.98619	1.60106	0.33593	0.00000	0.00000	0.41969	0.45498	0.16976	0.23945	0.35479	0.28983	0.43230	0.00000
2:00 - 3:00	0.99971	0.10849	0.49097	1.98972	1.60389	0.33653	0.00000	0.00000	0.42080	0.45578	0.17006	0.23988	0.35542	0.29035	0.43307	0.00000
3:00 - 4:00	0.71386	0.10173	0.49671	1.99973	1.61196	0.33822	0.00000	0.00000	0.42451	0.45808	0.17092	0.24111	0.35721	0.00000	0.43525	0.00000
4:00 - 5:00	0.66512	0.07544	0.49457	1.99724	1.60996	0.33780	0.52987	1.74292	0.42228	0.45752	0.17071	0.24080	0.35676	0.00000	0.43471	0.00000
5:00 - 6:00	0.60700	0.07565	0.49613	2.00018	1.61233	0.33830	0.53102	1.53654	0.42135	0.45818	0.17096	0.24116	0.35729	0.29187	0.43534	0.00000
6:00 - 7:00	0.82652	0.07330	0.49529	1.99658	1.60943	0.33769	0.52985	1.74385	0.42116	0.45736	0.17065	0.24073	0.35664	0.29135	0.43456	0.00000
7:00 - 8:00	0.64453	0.07445	0.49630	2.00412	1.61551	0.34227	0.93697	1.38011	0.42912	0.47473	0.17450	0.24510	0.36527	0.29349	0.43775	0.73891
8:00 - 9:00	0.61834	0.07295	0.50450	2.09094	1.68549	0.39504	0.77678	1.40975	0.47490	0.52253	0.19660	0.27003	0.42027	0.32177	0.47993	0.78581
9:00 - 10:00	0.61777	0.07697	0.50751	2.08950	1.68433	0.39089	0.75164	1.08736	0.46605	0.51305	0.19218	0.26520	0.40556	0.31589	0.47117	0.77694
10:00 - 11:00	0.60165	0.07659	0.49789	2.00421	1.61558	0.34166	0.73153	1.09907	0.42851	0.46494	0.17399	0.24452	0.36243	0.00000	0.43769	0.73691
11:00 - 12:00	0.61634	0.07871	0.50001	2.01940	1.62782	0.35158	0.72857	1.08895	0.43899	0.48513	0.17925	0.25043	0.37587	0.29748	0.44370	0.00000
12:00 - 13:00	0.74449	0.07719	0.49213	1.99042	1.60446	0.33931	0.73579	1.10843	0.42488	0.46173	0.17279	0.24282	0.35981	0.00000	0.43468	0.00000
13:00 - 14:00	0.65926	0.09285	0.49134	1.98633	1.60116	0.33596	0.76843	1.23129	0.41941	0.45500	0.16977	0.23944	0.35481	0.00000	0.43233	0.00000
14:00 - 15:00	0.85074	0.09423	0.49110	1.98654	1.60133	0.33599	0.78225	1.18260	0.41941	0.45505	0.16979	0.23946	0.35485	0.00000	0.43238	0.00000
15:00 - 16:00	0.83793	0.09267	0.49174	1.98757	1.60216	0.33617	0.74361	1.23679	0.41931	0.45528	0.16988	0.23959	0.35503	0.00000	0.43260	0.00000
16:00 - 17:00	0.67079	0.09312	0.48827	1.98105	1.59691	0.33506	0.52011	1.23005	0.41799	0.45379	0.16932	0.23880	0.35387	0.00000	0.43118	0.00000
17:00 - 18:00	0.63057	0.08920	0.49557	2.03462	1.64009	0.36384	0.73591	1.43308	0.46399	0.51199	0.19133	0.26396	0.40302	0.30499	0.45490	0.77023
18:00 - 19:00	0.64787	0.09502	0.49420	2.04248	1.64642	0.37070	0.75832	1.46320	0.47578	0.52414	0.19730	0.27061	0.41643	0.30904	0.46095	0.78061
19:00 - 20:00	0.60231	0.09601	0.49121	1.98849	1.60291	0.33632	0.70602	1.45548	0.41985	0.45550	0.16996	0.23972	0.35520	0.29017	0.43280	0.73198
20:00 - 21:00	0.58608	0.09788	0.48794	1.98357	1.59894	0.33549	0.52303	2.30217	0.41825	0.45437	0.16954	0.23912	0.35432	0.28945	0.43173	0.72874
21:00 - 22:00	0.64003	0.09643	0.48858	1.98683	1.60157	0.33604	0.52947	0.80766	0.41930	0.45512	0.16982	0.23952	0.35490	0.00000	0.43244	0.73100
22:00 - 23:00	0.64918	0.09789	0.48813	1.98329	1.59871	0.33544	0.00000	0.00000	0.41737	0.45431	0.16951	0.23910	0.35427	0.28941	0.43167	0.00000
23:00 - 0:00	0.70151	0.09712	0.48642	1.98264	1.59819	0.33533	0.52364	0.80774	0.41805	0.45416	0.16946	0.23902	0.35415	0.00000	0.43153	0.72960
daily	0.64795	0.08544	0.49606	2.02610	1.63322	0.35677	0.73458	1.25708	0.44097	0.48273	0.18024	0.25184	0.37951	0.30611	0.44460	0.76653

Emission Factor (gm/mile/vehicle) in Caline Format - NO2

Hour	MC	PC	Taxi	NFB6	NFB7	NFB8	PV4	PV5	LGV3	LGV4	LGV6	HGV7	HGV8	FBSD	FBDD	PLB
0:00 - 1:00	0.03479	0.00543	0.01373	0.77287	0.61539	0.16225	0.00000	0.00000	0.02408	0.02580	0.06606	0.11695	0.16462	0.11845	0.17668	0.00000
1:00 - 2:00	0.04070	0.00540	0.01373	0.77241	0.61502	0.16215	0.00000	0.00000	0.02405	0.02579	0.06602	0.11688	0.16452	0.11838	0.17657	0.00000
2:00 - 3:00	0.05239	0.00614	0.01378	0.77378	0.61611	0.16244	0.00000	0.00000	0.02411	0.02583	0.06614	0.11709	0.16482	0.11859	0.17689	0.00000
3:00 - 4:00	0.03741	0.00576	0.01394	0.77767	0.61921	0.16326	0.00000	0.00000	0.02432	0.02596	0.06647	0.11769	0.16565	0.00000	0.17778	0.00000
4:00 - 5:00	0.03486	0.00427	0.01388	0.77671	0.61844	0.16306	0.09394	0.58063	0.02419	0.02593	0.06639	0.11754	0.16544	0.00000	0.17756	0.00000
5:00 - 6:00	0.03181	0.00428	0.01392	0.77785	0.61935	0.16330	0.09415	0.51187	0.02414	0.02597	0.06648	0.11772	0.16568	0.11922	0.17782	0.00000
6:00 - 7:00	0.04332	0.00415	0.01390	0.77645												

## Appendix 3.6 Calculation of Vehicular Emission Source

Year 2045

YLEPP - Speed Limit - 50kph

Emission Factor (gm/mile/vehicle) in Caline Format - RSP

Hour	MC	PC	Taxi	NFB6	NFB7	NFB8	PV4	PV5	LGV3	LGV4	LGV6	HGV7	HGV8	FBSD	FBDD	PLB
0:00 - 1:00	0.00537	0.01030	0.00000	0.07987	0.05336	0.05117	0.00000	0.00000	0.00732	0.00789	0.01773	0.03229	0.04166	0.01478	0.02138	0.00000
1:00 - 2:00	0.00652	0.01098	0.00000	0.07987	0.05336	0.05117	0.00000	0.00000	0.00732	0.00789	0.01773	0.03229	0.04166	0.01478	0.02138	0.00000
2:00 - 3:00	0.00955	0.01503	0.00000	0.07987	0.05336	0.05117	0.00000	0.00000	0.00732	0.00789	0.01773	0.03229	0.04166	0.01478	0.02138	0.00000
3:00 - 4:00	0.00607	0.01269	0.00000	0.07987	0.05336	0.05117	0.00000	0.00000	0.00734	0.00789	0.01773	0.03229	0.04166	0.00000	0.02138	0.00000
4:00 - 5:00	0.00631	0.01342	0.00000	0.07987	0.05336	0.05117	0.02401	0.04752	0.00732	0.00789	0.01773	0.03229	0.04166	0.00000	0.02138	0.00000
5:00 - 6:00	0.00576	0.01507	0.00000	0.07987	0.05336	0.05117	0.02401	0.04753	0.00730	0.00789	0.01773	0.03229	0.04166	0.01478	0.02138	0.00000
6:00 - 7:00	0.00897	0.01381	0.00000	0.07987	0.05336	0.05117	0.02401	0.04753	0.00731	0.00789	0.01773	0.03229	0.04166	0.01478	0.02138	0.00000
7:00 - 8:00	0.00619	0.01325	0.00000	0.08012	0.05356	0.05136	0.05093	0.04768	0.00739	0.00803	0.01778	0.03248	0.04195	0.01485	0.02149	0.02452
8:00 - 9:00	0.00563	0.01130	0.00000	0.08294	0.05588	0.05365	0.04005	0.04935	0.00787	0.00854	0.01811	0.03359	0.04383	0.01580	0.02286	0.02565
9:00 - 10:00	0.00517	0.00979	0.00000	0.08264	0.05564	0.05341	0.03613	0.04918	0.00776	0.00841	0.01804	0.03333	0.04329	0.01557	0.02253	0.02538
10:00 - 11:00	0.00473	0.00893	0.00000	0.08007	0.05353	0.05133	0.03290	0.04765	0.00738	0.00796	0.01778	0.03245	0.04185	0.00000	0.02147	0.02457
11:00 - 12:00	0.00478	0.00847	0.00000	0.08061	0.05397	0.05177	0.03252	0.04797	0.00749	0.00812	0.01785	0.03272	0.04232	0.01499	0.02168	0.00000
12:00 - 13:00	0.00587	0.00785	0.00000	0.08007	0.05353	0.05133	0.03209	0.04765	0.00737	0.00796	0.01778	0.03245	0.04185	0.00000	0.02147	0.00000
13:00 - 14:00	0.00508	0.00906	0.00000	0.07987	0.05336	0.05117	0.03325	0.04753	0.00731	0.00789	0.01773	0.03229	0.04166	0.00000	0.02138	0.00000
14:00 - 15:00	0.00696	0.00953	0.00000	0.07987	0.05336	0.05117	0.03417	0.04753	0.00731	0.00789	0.01773	0.03229	0.04166	0.00000	0.02138	0.00000
15:00 - 16:00	0.00690	0.00945	0.00000	0.07987	0.05336	0.05117	0.03279	0.04753	0.00731	0.00789	0.01773	0.03229	0.04166	0.00000	0.02138	0.00000
16:00 - 17:00	0.00537	0.00999	0.00000	0.07987	0.05336	0.05117	0.02401	0.04753	0.00731	0.00789	0.01773	0.03229	0.04166	0.00000	0.02138	0.00000
17:00 - 18:00	0.00512	0.01010	0.00000	0.08134	0.05457	0.05235	0.03412	0.04840	0.00777	0.00842	0.01804	0.03334	0.04328	0.01527	0.02209	0.02541
18:00 - 19:00	0.00515	0.00969	0.00000	0.08175	0.05491	0.05269	0.03442	0.04865	0.00790	0.00856	0.01813	0.03366	0.04376	0.01544	0.02233	0.02571
19:00 - 20:00	0.00451	0.00955	0.00000	0.07987	0.05336	0.05117	0.03084	0.04753	0.00731	0.00789	0.01773	0.03229	0.04166	0.01478	0.02138	0.02450
20:00 - 21:00	0.00447	0.01056	0.00000	0.07987	0.05336	0.05117	0.02401	0.04755	0.00730	0.00789	0.01773	0.03229	0.04166	0.01478	0.02138	0.02444
21:00 - 22:00	0.00496	0.01001	0.00000	0.07987	0.05336	0.05117	0.02401	0.04748	0.00731	0.00789	0.01773	0.03229	0.04166	0.00000	0.02138	0.02444
22:00 - 23:00	0.00527	0.01141	0.00000	0.07987	0.05336	0.05117	0.00000	0.00000	0.00729	0.00789	0.01773	0.03229	0.04166	0.01478	0.02138	0.00000
23:00 - 0:00	0.00603	0.01230	0.00000	0.07987	0.05336	0.05117	0.02401	0.04763	0.00730	0.00789	0.01773	0.03229	0.04166	0.00000	0.02138	0.02453
daily	0.00550	0.01037	0.00000	0.08092	0.05422	0.05201	0.03340	0.04798	0.00753	0.00814	0.01788	0.03281	0.04247	0.01529	0.02175	0.02526

Emission Factor (gm/mile/vehicle) in Caline Format - FSP

Hour	MC	PC	Taxi	NFB6	NFB7	NFB8	PV4	PV5	LGV3	LGV4	LGV6	HGV7	HGV8	FBSD	FBDD	PLB
0:00 - 1:00	0.00491	0.00955	0.00000	0.07348	0.04909	0.04707	0.00000	0.00000	0.00674	0.00726	0.01631	0.02971	0.03833	0.01360	0.01967	0.00000
1:00 - 2:00	0.00597	0.01019	0.00000	0.07348	0.04909	0.04707	0.00000	0.00000	0.00673	0.00726	0.01631	0.02971	0.03833	0.01360	0.01967	0.00000
2:00 - 3:00	0.00875	0.01395	0.00000	0.07348	0.04909	0.04707	0.00000	0.00000	0.00674	0.00726	0.01631	0.02971	0.03833	0.01360	0.01967	0.00000
3:00 - 4:00	0.00556	0.01177	0.00000	0.07348	0.04909	0.04707	0.00000	0.00000	0.00675	0.00726	0.01631	0.02971	0.03833	0.00000	0.01967	0.00000
4:00 - 5:00	0.00576	0.01245	0.00000	0.07348	0.04909	0.04707	0.02221	0.04372	0.00673	0.00726	0.01631	0.02971	0.03833	0.00000	0.01967	0.00000
5:00 - 6:00	0.00526	0.01399	0.00000	0.07348	0.04909	0.04707	0.02221	0.04373	0.00672	0.00726	0.01631	0.02971	0.03833	0.01360	0.01967	0.00000
6:00 - 7:00	0.00819	0.01282	0.00000	0.07348												



## Appendix 3.6 Calculation of Vehicular Emission Source

Summary of Composite Vehicular Emission Factors for CALINE4

Open Road 24 hour NO<sub>2</sub> Emission and Traffic Profile (Year 2045)

District	Source ID	Link No.	Road Type	X-Start	Y-Start	X-End	Y-End	Height	Width	Hour 01		Hour 02		Hour 03		Hour 04		Hour 05		Hour 06		Hour 07		Hour 08		Hour 09		Hour 10		Hour 11		Hour 12		Hour 13		Hour 14		Hour 15		Hour 16		Hour 17		Hour 18		Hour 19		Hour 20		Hour 21		Hour 22		Hour 23		Hour 24	
										Length	Flow	Em <sup>f</sup>																																													
YLEP	1001	3	1	820818.0	836320.4	820823.7	836271.8	0.0	14.0	49.0	1	0.044	0	0.048	0	0.062	4	0.103	6	0.095	6	0.108	19	0.076	46	0.083	32	0.106	23	0.112	26	0.131	19	0.105	4	0.135	3	0.143	4	0.152	3	0.132	13	0.024	3	0.105	2	0.097	1	0.069	1	0.031	1	0.035			
YLEP	1002	21	1	821270.4	83594.2	821189.5	836040.7	0.0	10.0	127.3	3	0.037	2	0.041	1	0.052	2	0.104	4	0.097	4	0.109	12	0.075	19	0.087	11	0.094	13	0.117	9	0.084	8	0.103	6	0.110	8	0.139	5	0.070	12	0.090	15	0.099	10	0.094	5	0.065	4	0.035	4	0.029					
YLEP	1003	1	1	821007.1	83686.5	820983.7	837122.3	0.0	0.022	0	0.017	0	0.017	0	0.009	0	0.091	0	0.104	1	0.055	2	0.057	2	0.067	1	0.080	1	0.112	1	0.051	1	0.101	1	0.106	1	0.114	1	0.045	1	0.070	2	0.080	1	0.084	1	0.051	1	0.017								
YLEP	1004	1	1	820942.4	836507.9	820895.2	837122.3	0.0	0.022	0	0.017	0	0.017	0	0.009	0	0.091	0	0.104	1	0.055	2	0.057	2	0.067	1	0.080	1	0.112	1	0.051	1	0.101	1	0.106	1	0.114	1	0.045	1	0.070	2	0.080	1	0.084	1	0.051	1	0.017								
YLEP	1005	19	1	820818.0	836324.4	820823.7	836454.7	0.0	14.0	49.0	1	0.044	0	0.048	0	0.062	4	0.103	6	0.095	6	0.108	19	0.076	46	0.083	32	0.106	23	0.112	26	0.131	19	0.105	4	0.135	3	0.143	4	0.152	3	0.132	13	0.024	3	0.105	2	0.097	1	0.069	1	0.031	1	0.035			
YLEP	1006	5	1	820814.9	836315.3	820802.3	836456.3	0.0	14.0	49.0	14	0.073	2	0.078	9	0.080	9	0.093	16	0.113	25	0.126	27	0.119	79	0.079	104	0.097	68	0.099	75	0.123	53	0.070	16	0.118	24	0.128	32	0.086	19	0.083	19	0.062	18	0.049	19	0.052									
YLEP	1007	15	1	820856.2	836699.3	820818.0	836320.4	0.0	14.0	49.0	9	0.103	6	0.098	4	0.103	5	0.114	8	0.123	14	0.116	16	0.128	48	0.096	73	0.110	62	0.110	36	0.108	42	0.120	28	0.098	16	0.129	13	0.113	40	0.120	26	0.113	10	0.093	8	0.058	9	0.081							
YLEP	1008	9	1	820825.8	836531.1	820817.1	835794.5	0.0	14.0	49.0	8	0.035	3	0.039	2	0.049	10	0.102	16	0.094	17	0.106	51	0.074	67	0.082	45	0.088	48	0.115	33	0.068	13	0.103	10	0.110	13	0.140	8	0.068	24	0.097	16	0.093	6	0.023	6	0.028									
YLEP	1009	13	1	820817.1	835794.5	820842.0	835760.6	0.0	20.0	42.0	22	0.060	16	0.069	11	0.074	26	0.114	43	0.119	136	0.118	92	0.090	56	0.105	43	0.113	54	0.140	36	0.076	83	0.096	107	0.104	71	0.099	32	0.073	26	0.044	26	0.034	26	0.045											
YLEP	1010	11	1	820788.0	835778.4	820817.1	835794.5	0.0	18.5	33.2	18	0.067	12	0.064	9	0.068	9	0.079	14	0.114	22	0.107	24	0.119	72	0.084	108	0.096	60	0.098	68	0.118	46	0.087	38	0.107	30	0.113	39	0.143	24	0.071	60	0.093	76	0.101	51	0.099	25	0.075	20	0.042	21	0.033	21	0.049	
YLEP	1011	17	1	820517.5	835900.5	820850.9	836040.7	0.0	18.0	125.3	4	0.037	3	0.040	2	0.038	2	0.051	6	0.102	9	0.095	10	0.107	29	0.115	20	0.072	10	0.103	8	0.110	10	0.139	7	0.069	15	0.089	19	0.093	6	0.065	5	0.024	5	0.029											
YLEP	1012	7	1	820517.5	835900.5	820456.0	835856.0	0.0	18.0	83.5	15	0.081	11	0.082	8	0.084	9	0.097	15	0.114	24	0.107	26	0.119	79	0.088	108	0.103	69	0.103	78	0.122	54	0.093	45	0.110	33	0.119	41	0.139	30	0.095	78	0.097	95	0.119	61	0.108	21	0.085	17	0.066					
YLEP	1013	7	1	820653.8	836009.3	820517.5</td																																																			

## Appendix 3.6 Calculation of Vehicular Emission Source

Summary of Composite Vehicular Emission Factors for CALINE4

Open Road 24 hour RSP Emission and Traffic Profile (Year 2045)

District	Source ID	Link No.	Road Type	X-Start	Y-Start	X-End	Y-End	Height	Width	Hour 01	Hour 02	Hour 03	Hour 04	Hour 05	Hour 06	Hour 07	Hour 08	Hour 09	Hour 10	Hour 11	Hour 12	Hour 13	Hour 14	Hour 15	Hour 16	Hour 17	Hour 18	Hour 19	Hour 20	Hour 21	Hour 22	Hour 23	Hour 24																					
YLEPP	1001	3	1	820818.0	836320.4	820823.7	836271.8	0.0	14.0	49.0	1	0.013	0	0.015	0	0.015	0	0.017	4	0.019	6	0.021	19	0.017	46	0.021	32	0.024	23	0.025	26	0.028	19	0.026	4	0.032	3	0.034	4	0.034	3	0.034	13	0.012	2	0.021	1	0.016	1	0.012	1	0.011		
YLEPP	1002	21	1	821270.4	835942.4	821189.5	836040.7	0.0	10.0	127.3	3	0.011	2	0.013	1	0.013	2	0.020	4	0.020	12	0.019	19	0.019	17	0.021	11	0.024	9	0.020	8	0.020	6	0.022	8	0.025	5	0.018	12	0.019	15	0.020	10	0.019	5	0.015	4	0.013	4	0.010	4	0.010		
YLEPP	1003	1	1	821007.4	836865.9	836974.7	836981.0	0.0	10.0	110.8	0	0.007	0	0.008	0	0.008	0	0.016	0	0.018	1	0.013	2	0.012	1	0.015	1	0.019	1	0.011	1	0.016	1	0.018	1	0.021	1	0.011	1	0.016	1	0.014	2	0.014	1	0.014	1	0.007						
YLEPP	1004	1	1	820942.4	837075.9	820910.7	837122.3	0.0	10.0	56.3	0	0.007	0	0.007	0	0.006	0	0.016	0	0.018	1	0.013	2	0.012	2	0.013	1	0.015	1	0.019	1	0.011	1	0.016	1	0.014	1	0.012	1	0.008	1	0.007												
YLEPP	1005	19	1	820451.3	836099.2	836106.3	836120.3	0.0	10.0	110.3	8	0.006	4	0.008	2	0.019	3	0.019	3	0.021	9	0.018	14	0.018	13	0.019	9	0.020	10	0.023	6	0.019	20	0.017	16	0.019	21	0.021	12	0.013	30	0.015	38	0.015	26	0.015	13	0.013	11	0.009	12	0.008		
YLEPP	1006	5	1	820617.9	836211.3	820615.3	836082.3	0.0	14.0	129.0	16	0.016	12	0.017	8	0.017	9	0.019	16	0.018	25	0.018	27	0.021	79	0.017	136	0.019	106	0.020	53	0.024	36	0.026	44	0.027	32	0.023	82	0.021	98	0.024	64	0.023	23	0.018	19	0.016	14	0.014				
YLEPP	1007	15	1	820856.2	836099.2	836105.6	835831.5	0.0	14.0	33.3	9	0.016	4	0.017	5	0.018	4	0.018	14	0.021	73	0.022	36	0.023	42	0.026	28	0.023	16	0.021	16	0.022	16	0.021	12	0.022	16	0.021	26	0.021	10	0.017	8	0.015	26	0.021	11	0.014						
YLEPP	1008	9	1	820653.8	836090.3	820871.1	835945.4	0.0	14.0	26.9	4	0.011	3	0.012	2	0.013	10	0.018	17	0.020	51	0.016	67	0.017	48	0.022	33	0.016	13	0.020	10	0.022	13	0.024	8	0.018	19	0.019	24	0.019	16	0.019	6	0.012	6	0.010	6	0.010						
YLEPP	1009	13	1	820818.0	836240.4	820823.7	835760.6	0.0	20.0	42.0	22	0.013	16	0.014	11	0.014	22	0.020	44	0.020	43	0.020	47	0.022	136	0.019	204	0.020	185	0.022	119	0.022	137	0.025	92	0.021	56	0.020	43	0.022	54	0.025	36	0.018	83	0.020	107	0.020	32	0.016	26	0.011	26	0.011
YLEPP	1010	11	1	82078.8	83577.4	820817.1	835945.4	0.0	18.5	33.2	18	0.012	9	0.013	9	0.014	14	0.020	22	0.020	72	0.019	108	0.021	60	0.022	68	0.024	46	0.021	38	0.019	30	0.021	39	0.023	24	0.016	60	0.018	51	0.018	25	0.015	20	0.012	21	0.011						
YLEPP	1011	17	1	820517.5	836000.5	836451.3	836570.9	0.0	14.0	18.5	3	0.011	15	0.013	2	0.016	3	0.016	4	0.016	16	0.018	43	0.016	36	0.019	29	0.023	20	0.020	10	0.020	5	0.024	15	0.012	5	0.012	5	0.010	5	0.010												
YLEPP	1012	3	1	820515.8	836000.5	836005.1	836579.5	0.0	14.0	14.4	11	0.016	8	0.018	15	0.016	24	0.020	14	0.018	26	0.020	69	0.021	45	0.021	33	0.026	40	0.020	30	0.023	78	0.021	65	0.024	61	0.023	21	0.016	16	0.015												
YLEPP	1013	1	1	82097.4	836853.1	820818.0	835324.0	0.0	14.0	32.7	1	0.013	0	0.015	0	0.015	0	0.017	4	0.019	6	0.019	21	0.021	32	0.024	20	0.026	19	0.026	4	0.034	13	0.012	2	0.021	1	0.014	1	0.013	1	0.011												
YLEPP	1014	3	1	82091.0	836353.1	820832.0	835915.8	0.0	14.0	44.0	1	0.013	4	0.017	6	0.017	21	0.021	46	0.021	22	0.024	2	0.026	19	0.026	4	0.034	11	0.012	2	0.021	1	0.014	1	0.013	1	0.011																
YLEPP	1015	15	1	820823.2	836271.8	820832.0	836141.0	0.0	14.0	13.1	1	0.013	0	0.016	0	0.016	0	0.017	4	0.018	6	0.021	23	0.022	62	0.023	36	0.023	22	0.024	16	0.022	16	0.022	16	0.021	8	0.015	8	0.014	9	0.014												
YLEPP	1016	15	1	82091.0	836456.4	820897.4	835862.0	0.0	14.0	17.8	16	0.016	12	0.017	8	0.017	9	0.019	16	0.018	25	0.018	79	0.017	136	0.019	106	0.021	53	0.024	36	0.026	44	0.027	32	0.023	82	0.021	98	0.024	64	0.023	23	0.018	19	0.016	14	0.014						
YLEPP	1017	1	1	82097.4	836456.4	820897.4	836374.3	0.0	10.0	24.0	9	0.007	0	0.008	0	0.016	0	0.018	1	0.013	2</td																																	

## Appendix 3.6 Calculation of Vehicular Emission Source

Summary of Composite Vehicular Emission Factors for CALINE4

Open Road 24 hour FSP Emission and Traffic Profile (Year 2045)

District	Source ID	Link No.	Road Type	X-Start	Y-Start	X-End	Y-End	Height	Width	Hour 01	Hour 02	Hour 03	Hour 04	Hour 05	Hour 06	Hour 07	Hour 08	Hour 09	Hour 10	Hour 11	Hour 12	Hour 13	Hour 14	Hour 15	Hour 16	Hour 17	Hour 18	Hour 19	Hour 20	Hour 21	Hour 22	Hour 23	Hour 24																							
										Length	Flow	Em <sup>f</sup>																																												
YLEP	1001	3	1	820818.0	836320.4	820823.7	836271.8	0.0	14.0	49.0	1	0.012	0	0.014	0	0.013	0	0.015	4	0.017	6	0.019	19	0.016	46	0.019	32	0.022	23	0.023	26	0.026	19	0.024	4	0.029	3	0.031	4	0.032	3	0.031	13	0.012	3	0.020	2	0.019	1	0.015	1	0.013	1	0.011	1	0.011
YLEP	1002	21	1	821270.4	835942.4	821189.5	836040.7	0.0	10.0	127.3	3	0.010	2	0.012	1	0.013	2	0.018	4	0.020	12	0.017	19	0.018	11	0.020	13	0.022	9	0.019	8	0.019	6	0.021	8	0.023	5	0.017	12	0.018	15	0.018	10	0.018	5	0.014	4	0.012	4	0.009						
YLEP	1003	1	1	821007.1	836865.9	820982.3	837122.3	0.0	0.001	0	0.007	0	0.007	0	0.005	0	0.015	0	0.015	0	0.017	1	0.012	2	0.011	1	0.014	1	0.010	1	0.015	1	0.011	1	0.008	1	0.007																			
YLEP	1004	1	1	820942.4	836457.4	820823.7	836271.8	0.0	10.0	108.3	8	0.003	0	0.003	0	0.003	0	0.003	0	0.003	1	0.013	3	0.010	1	0.016	1	0.016	1	0.016	1	0.016	1	0.016	1	0.016	1	0.016	1	0.016	1	0.016														
YLEP	1005	19	1	820818.0	836320.4	820823.7	836271.8	0.0	10.0	110.8	8	0.003	0	0.003	0	0.003	0	0.003	0	0.003	1	0.013	3	0.010	1	0.016	1	0.016	1	0.016	1	0.016	1	0.016	1	0.016	1	0.016																		
YLEP	1006	5	1	820816.9	836320.5	820823.7	836271.8	0.0	14.0	114.3	14	0.014	8	0.014	9	0.017	16	0.017	25	0.017	27	0.019	79	0.016	68	0.019	75	0.017	53	0.018	18	0.022	44	0.025	32	0.021	33	0.022	64	0.021	23	0.016	19	0.015												
YLEP	1007	15	1	820956.2	836099.3	820818.0	836320.4	0.0	14.0	133.3	9	0.015	6	0.015	4	0.018	8	0.020	14	0.019	16	0.021	42	0.024	28	0.021	16	0.022	11	0.017	29	0.019	40	0.020	26	0.019	10	0.015	8	0.015	9	0.013														
YLEP	1008	9	1	820845.2	836099.3	820818.0	836320.4	0.0	14.0	269.8	4	0.010	3	0.013	2	0.012	10	0.016	16	0.016	17	0.018	51	0.015	76	0.016	45	0.017	48	0.020	33	0.015	13	0.018	10	0.015	6	0.009	6	0.009																
YLEP	1009	13	1	820817.1	835794.5	820842.0	835760.6	0.0	20.0	42.0	22	0.012	16	0.013	11	0.014	26	0.019	43	0.019	47	0.021	136	0.018	204	0.019	185	0.020	137	0.023	92	0.020	56	0.019	43	0.021	54	0.023	36	0.017	83	0.018	107	0.019	71	0.018	32	0.014	26	0.016	26	0.019				
YLEP	1010	11	1	820818.0	835778.4	820817.1	835794.5	0.0	18.5	33.2	18	0.011	12	0.012	9	0.013	14	0.018	22	0.017	24	0.018	72	0.018	108	0.018	95	0.019	60	0.020	68	0.022	46	0.019	38	0.017	30	0.019	39	0.021	24	0.015	60	0.016	76	0.016	51	0.016	25	0.014	20	0.011	21	0.010		
YLEP	1011	17	1	820517.5	835900.5	820580.9	836045.0	0.0	18.0	125.3	4	0.010	3	0.011	2	0.013	6	0.017	9	0.019	15	0.015	39	0.017	27	0.018	43	0.015	20	0.016	7	0.017	15	0.018	13	0.018	6	0.014	5	0.009	5	0.009														
YLEP	1012	7	1	820517.5	835900.5	820580.9	836045.0	0.0	18.0	83.5	15	0.015	11	0.016	8	0.016	15	0.018	24	0.018	26	0.020	79	0.017	68	0.021	71	0.024	54	0.020	45	0.022	33	0.024	41	0.026	30	0.022	78	0.020	95	0.022	61	0.021	21	0.017	17	0.014								
YLEP	1013	7	1	820653.8	836099.3	820517.5	835900.5	0.0	18.0	174.4	15	0.015	11	0.016	8	0.018	15	0.018	26	0.020	79	0.017	137	0.019	108	0.020	69	0.021	78	0.024	54	0.020	45	0.022	33	0.024	41	0.026	30	0.022	78	0.020	95	0.022	61	0.021	21	0.017	17	0.014						
YLEP	1014	3	1	820819.0	835351.1	820818.0	836320.4	0.0	14.0	32.7	1	0.012	0	0.014	0	0.013	4	0.017	6	0.017	16	0.019	46	0.019	32	0.023	24	0.026	16	0.019	3	0.031	3	0.031	1	0.013	1	0.011	1	0.011																
YLEP	1015	15	1	820823.7	836271.8	820832.8	836141.0	0.0	14.0	131.6	9	0.015	4	0.015	5	0.016	8	0.020	14	0.019	16	0.021	48	0.024	28	0.021	16	0.019	73	0.020	62	0.021	16	0.022	11	0.017	29	0.019	40	0.020	26	0.019	10	0.015	8	0.014	9	0.013								
YLEP	1016	15	1	820823.8	836141.0	820832.8	8																																																	

## Appendix 3.6 Locations of Vehicular Emission Sources

