

TUNNEL VENTILATION SYSTEM

EMISSION DATA – AIR QUALITY MODELLING

**COMPARISON OF CALCULATED EASTLINK DATA WITH ACTUAL
CITYLINK STACK EMISIONS**

FOR

EastLink

FOR

THIESS JOHN HOLLAND JOINT VENTURE (TJHJV)

DESIGN LOT NUMBER:	VE03
DOCUMENT NUMBER:	AL-M04-RPT-VE03-0003
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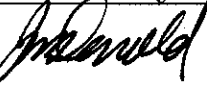
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0.2 Approval Record

FUNCTION	POSITION	NAME	SIGNATURE	DATE
Checked by	Design Manager - Mechanical	K. Dobrich		15/02/06
Reviewed by	Design Manager - Mechanical	K. Dobrich		15/02/06
Approved by	Project Manager	J. McDonald		23/02/06

0.3 Amendment Record

Changes made to this document since its last revision, which affect its scope or sense, are marked in the right margin by a vertical bar (|).

DATE	REV	AMENDMENT DESCRIPTION	BY	INITIALS
08/09/05	A-01	Original Issue	K. Dobrich	KLD
06/12/05	A-02	Minor text revisions	J. Fincher	JGF
13/02/06	A-03	Calculated Eastlink emission data revised	J. Fincher	JGF

0.4 Distribution Record

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0.5 Master Documents

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1.0 PURPOSE

The purpose of this report is to compare the predicted stack emission data prepared for the EastLink tunnels with actual measured data sourced from Transurban for the Burnley and Domain tunnels on the CityLink system.

This comparison has been undertaken as a check on the stack emissions calculated for the EastLink tunnels by comparison with emissions actually measured in operating tunnels that have some similarity with the EastLink tunnels.

2.0 REFERENCE DOCUMENTS AND INFORMATION

The following has been used as the basis of this comparison:

United Report - AL-M04-RPT-VE03-0002-A-06: Tunnel Ventilation System Emission Data - Air Quality Modelling - Normal and Incident Cases.

Burnley and Domain tunnels stack emission data (Supplied by Ecotech Pty. Ltd.)

Burnley and Domain Tunnels traffic volume and mix data (Supplied by Translink Operations Pty. Ltd.)

3.0 METHOD

Ecotech have provided a range of stack emission data for the Burnley and Domain tunnel stacks. Translink Operations have provided traffic volume and mix data covering the same time periods.

From the data provided, stack emissions for the Burnley and Domain tunnels have been derived (in g/hr) for the following:

- Carbon Monoxide (CO);
- Oxides of Nitrogen (NOX);
- Particulates (PM10);
- Particulates (PM2.5).

These figures have been calculated for the Domain Tunnel on 26 November 2004, and for the Burnley tunnel on 16 September 2004. These are days on which high emissions levels were recorded for 2004.

This data has been compared with the estimated stack emission for the Eastlink tunnels for year 2008 (the earliest year calculated)

The following should be noted:

- As detailed in United Report AL-M04-RPT-VE03-0002-A-06 the Eastlink stack emission data is based on vehicle emission factors provided by the EPA and derived from the AusVeh model. The data used for comparison purposes with the CityLink data is for the year 2008 and includes a higher proportion of updated emission standard vehicles in the fleet than for the 2004 measured CityLink stack emission data.
- Apart from an almost identical cross section and lane arrangement in the driven tunnels, neither the Burnley nor the Domain tunnels are geometrically similar to the Eastlink tunnels. The Domain tunnel is of similar length but is flatter in grade; the Burnley tunnel has similar grades but is roughly twice the length.
- The CityLink tunnels carry a 2004 traffic volume roughly similar to that projected for the EastLink tunnels, but with a higher level of heavy commercial vehicles (HCV's). It should be noted that these vehicles contribute the bulk of particulates emissions.
- From the comparisons above, it would be expected that the EastLink tunnels NOX and CO emissions would be considerably lower than for the Burnley Tunnel (perhaps around 50%), and somewhat greater than the Domain tunnel (perhaps by around 25%). Particulates for the EastLink tunnels would be expected to be lower again as these emissions are more directly related to the higher proportion of HCV's using CityLink (perhaps about 25% of the Burnley figures and about equal for Domain).

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Given the above, the data comparison between the CityLink and EastLink tunnels can only be regarded as a general 'order of magnitude' check, but sufficient to provide a good degree of confidence in the data calculated for the EastLink tunnels.

4.0 COMMENTS AND CONCLUSIONS

4.1 Domain Tunnel

Comparison of Domain tunnel emissions and the calculated EastLink emissions shows:

- Total daily CO emissions estimated for the EastLink tunnels are about 63% higher than as measured for the Domain Tunnel;
- Total daily NOX emissions estimated for the EastLink tunnels are about 38% higher than as measured for the Domain Tunnel;
- Total daily particulates (PM10 and PM2.5) emissions estimated for the EastLink tunnels are about 43% of the levels measured for the Domain Tunnel.

In summary, allowing for the items listed under section 3 above and with similar traffic volumes for the CityLink and EastLink tunnels, the EastLink calculated data overestimates CO and NOX and underestimates particulates.

4.2 Burnley Tunnel

Comparison of Burnley tunnel emissions and the calculated EastLink emissions shows:

- Total daily CO emissions estimated for the EastLink tunnels are about 114% of the CO emissions as measured for the Burnley Tunnel;
- Total daily NOX emissions estimated for the EastLink tunnels are about 50% of the NOX emissions as measured for the Burnley Tunnel;
- Total daily particulates (PM10 and PM2.5) emissions estimated for the EastLink tunnels are about 20% of the levels measured for the Burnley Tunnel.

In summary, allowing for the items listed under section 3 above and for the higher traffic volume for the Burnley tunnel (64,000 vehicles compared to 55,000), the EastLink calculated data overestimates CO, is about as expected for NOX and underestimates particulates.

5.0 APPENDICES

The following information is attached:

- Domain Tunnel/EastLink Tunnels Emissions Data
- Chart: CityLink Stack Emissions – Domain Tunnel 26/11/04 (CO & NOX)
- Chart: CityLink Stack Emissions – Domain Tunnel 26/11/04 (PM10 & PM2.5)
- Chart: EastLink Calculated Stack Emissions – 2008 (CO & NOX)
- Chart: EastLink Calculated Stack Emissions – 2008 (PM10 & PM2.5)
- Burnley Tunnel/EastLink Tunnels Emissions Data
- Chart: CityLink Stack Emissions – Burnley Tunnel 04/08/04 (CO & NOX)
- Chart: CityLink Stack Emissions – Burnley Tunnel 04/08/04 (PM10 & PM2.5)
- Chart: EastLink Calculated Stack Emissions – 2008 (CO & NOX)
- Chart: EastLink Calculated Stack Emissions – 2008 (PM10 & PM2.5)

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DOMAIN TUNNEL – 26 November 2004

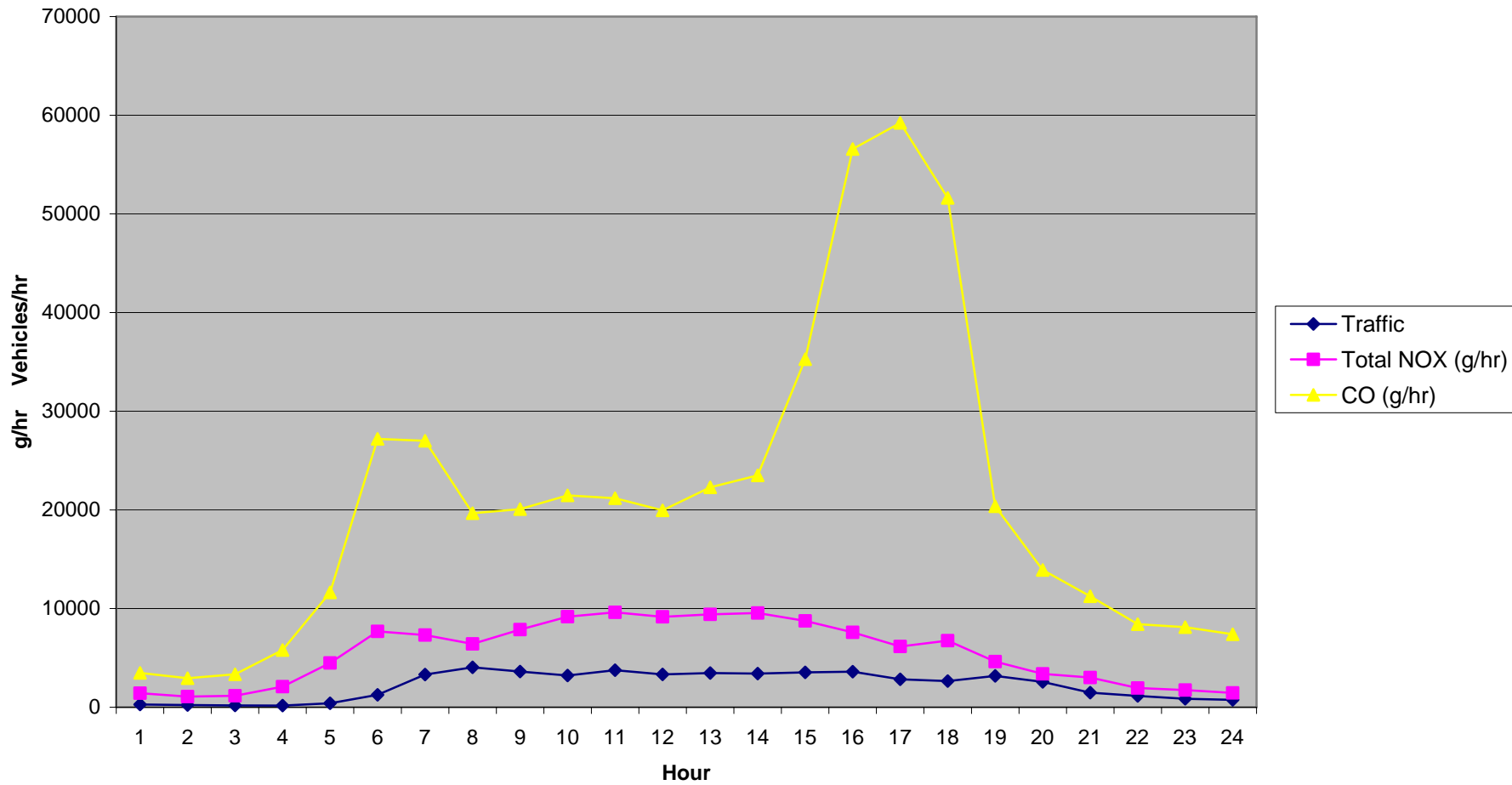
Traffic	Total NOX (g/hr)	CO (g/hr)	PM2.5 (g/hr)	PM10 (g/hr)
279	1415.1	3480.2	50.8	69.6
225	1083.0	2932.6	46.2	109.9
182	1155.7	3340.3	30.5	66.2
163	2083.8	5793.4	76.7	106.0
402	4481.2	11635.7	162.6	201.2
1260	7689.7	27197.1	322.3	488.5
3314	7317.7	26999.0	353.3	542.1
4041	6411.1	19661.9	274.1	406.1
3609	7863.4	20078.1	354.9	586.1
3216	9170.8	21464.6	476.4	633.6
3750	9610.9	21176.7	501.6	677.6
3320	9164.4	19959.5	472.3	666.3
3459	9408.2	22289.7	509.6	694.2
3414	9550.7	23505.2	448.6	613.3
3535	8744.4	35270.8	533.0	654.1
3608	7583.2	56569.5	525.0	638.6
2833	6153.4	59224.4	449.0	548.3
2649	6754.2	51621.9	428.9	520.0
3172	4628.3	20370.3	172.6	245.1
2565	3373.9	13907.8	109.5	166.8
1475	3005.8	11249.5	105.7	166.3
1141	1940.5	8421.1	56.5	84.3
854	1736.0	8115.4	46.7	74.2
743	1449.5	7398.0	36.6	50.9

EASTLINK TUNNELS – 2008

Traffic volume	Total NOX (g/hr)	Total CO (g/hr)	Total PM2.5 (g/hr)	Total PM10 (g/hr)
632	2232.0	10133.4	32.4	57.4
319	1339.5	5774.8	21.0	43.2
199	1018.9	4082.0	17.0	38.3
146	882.5	3364.4	15.7	36.7
177	1004.6	3799.9	18.1	39.9
370	2013.0	7847.5	35.6	78.9
1308	4829.0	21050.1	75.9	130.4
3006	10263.6	45014.9	160.0	239.4
3675	12002.2	54130.9	177.0	259.1
2355	8070.3	35820.8	124.0	192.8
2177	7316.7	32697.9	113.0	169.3
2334	7781.2	34902.3	119.0	177.5
2511	8265.8	37374.8	125.0	184.6
2648	8666.2	39289.2	130.0	191.6
3043	9989.5	44816.3	151.0	218.6
4203	13918.0	61521.6	210.0	302.0
5052	16585.2	73282.3	247.0	350.5
5644	17805.2	81273.6	251.0	352.0
4618	14718.3	66980.9	209.0	298.1
3212	10214.1	47471.1	143.0	213.3
2093	6465.9	30562.4	88.7	128.1
1926	6001.2	28202.7	82.5	120.4
1769	5556.8	25981.2	76.6	113.1
1394	4447.0	20757.1	61.5	94.0

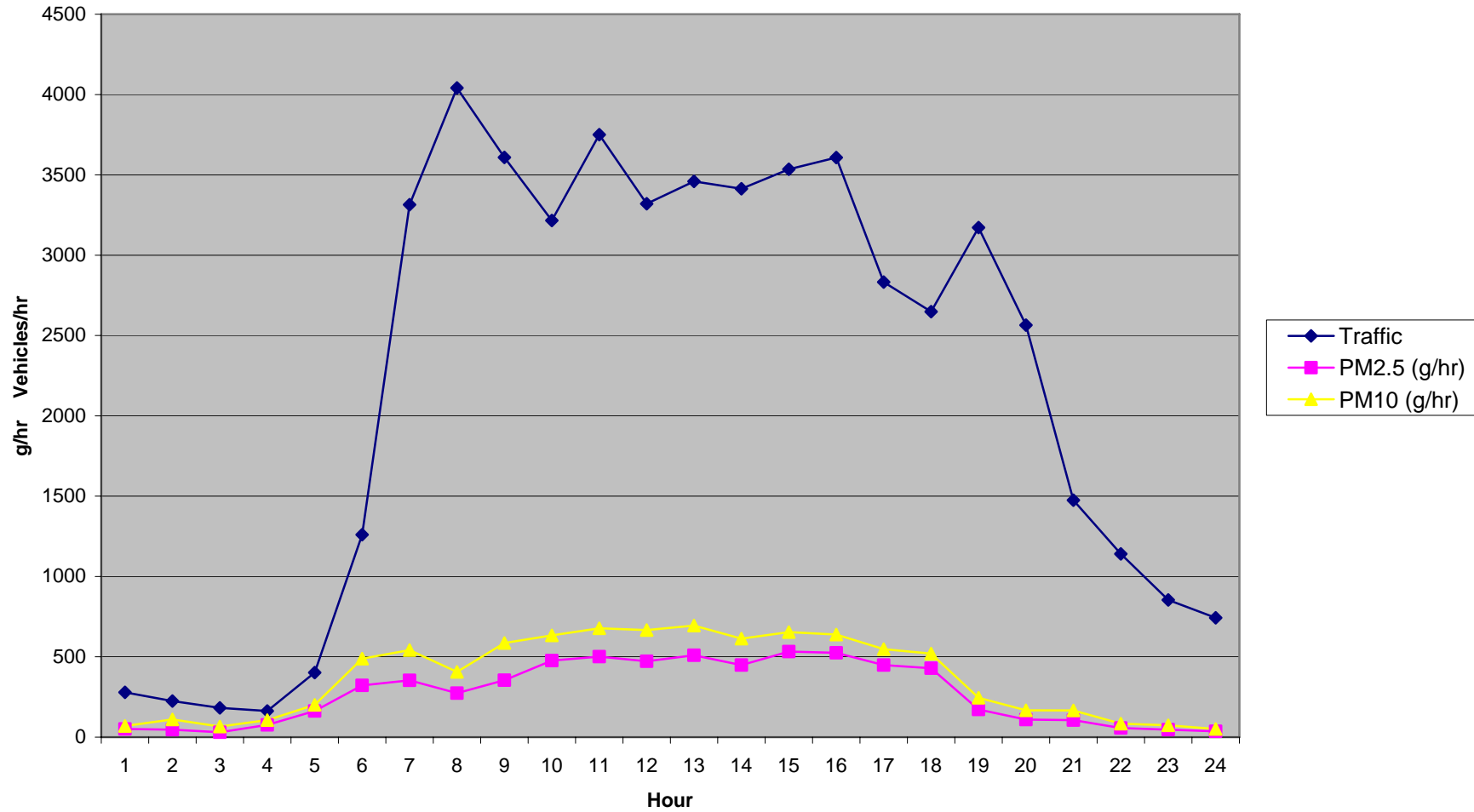
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CityLink Stack Emissions - Domain Tunnel 26/11/04



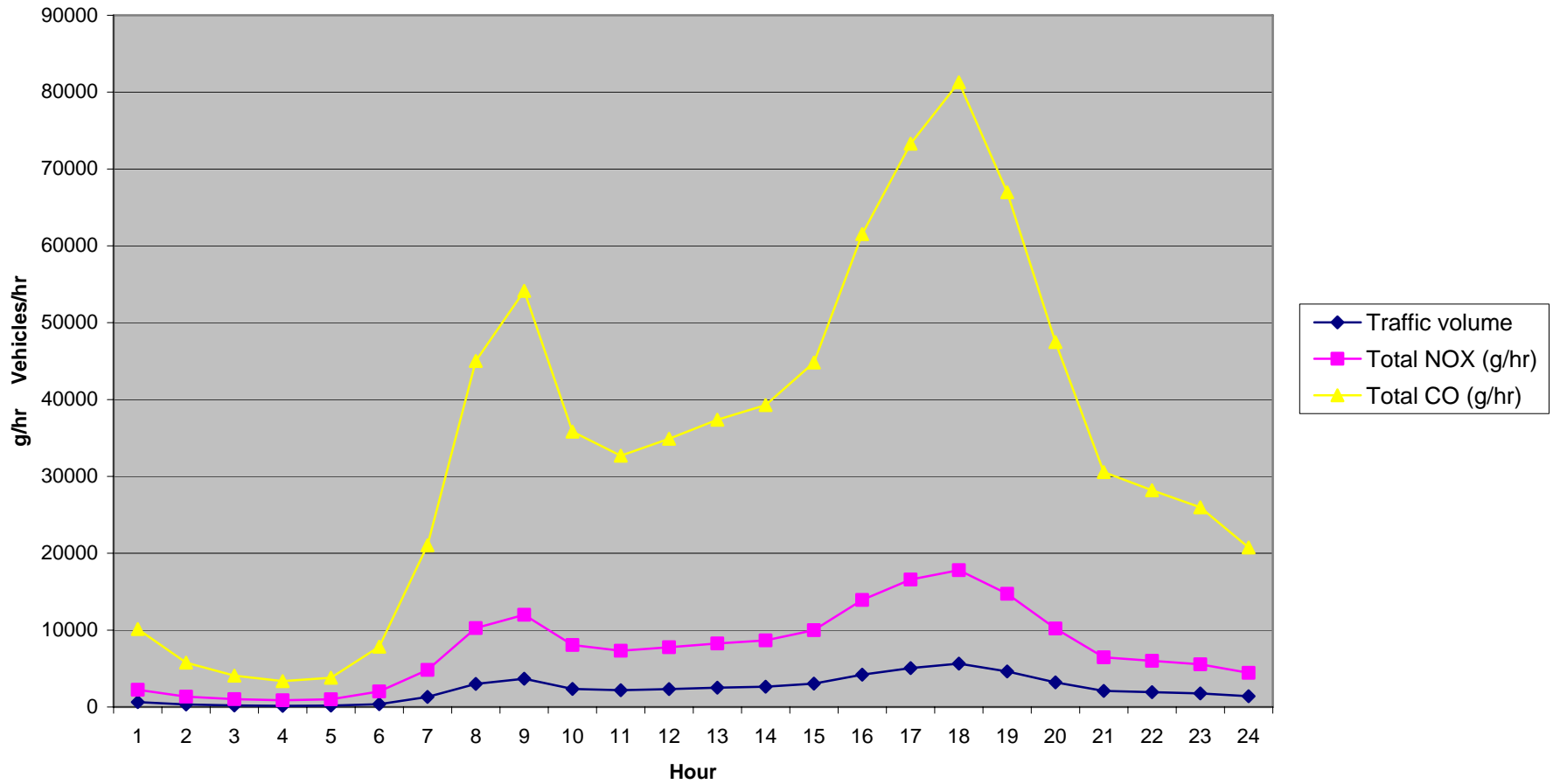
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CityLink Stack Emissions - Domain Tunnel 26/11/04



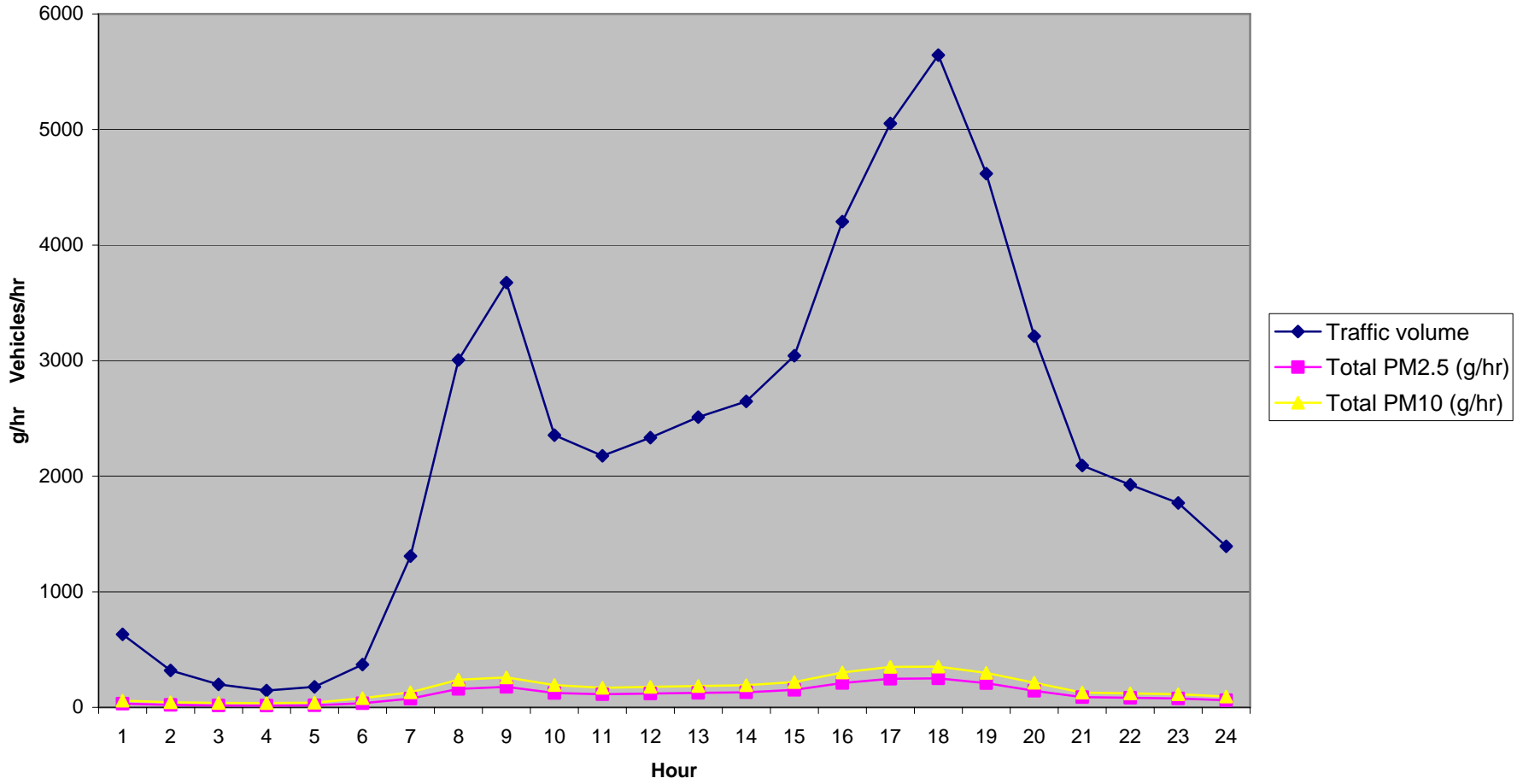
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EastLink Calculated Stack emissions - 2008



BURNLEY TUNNEL – 16 September 2004

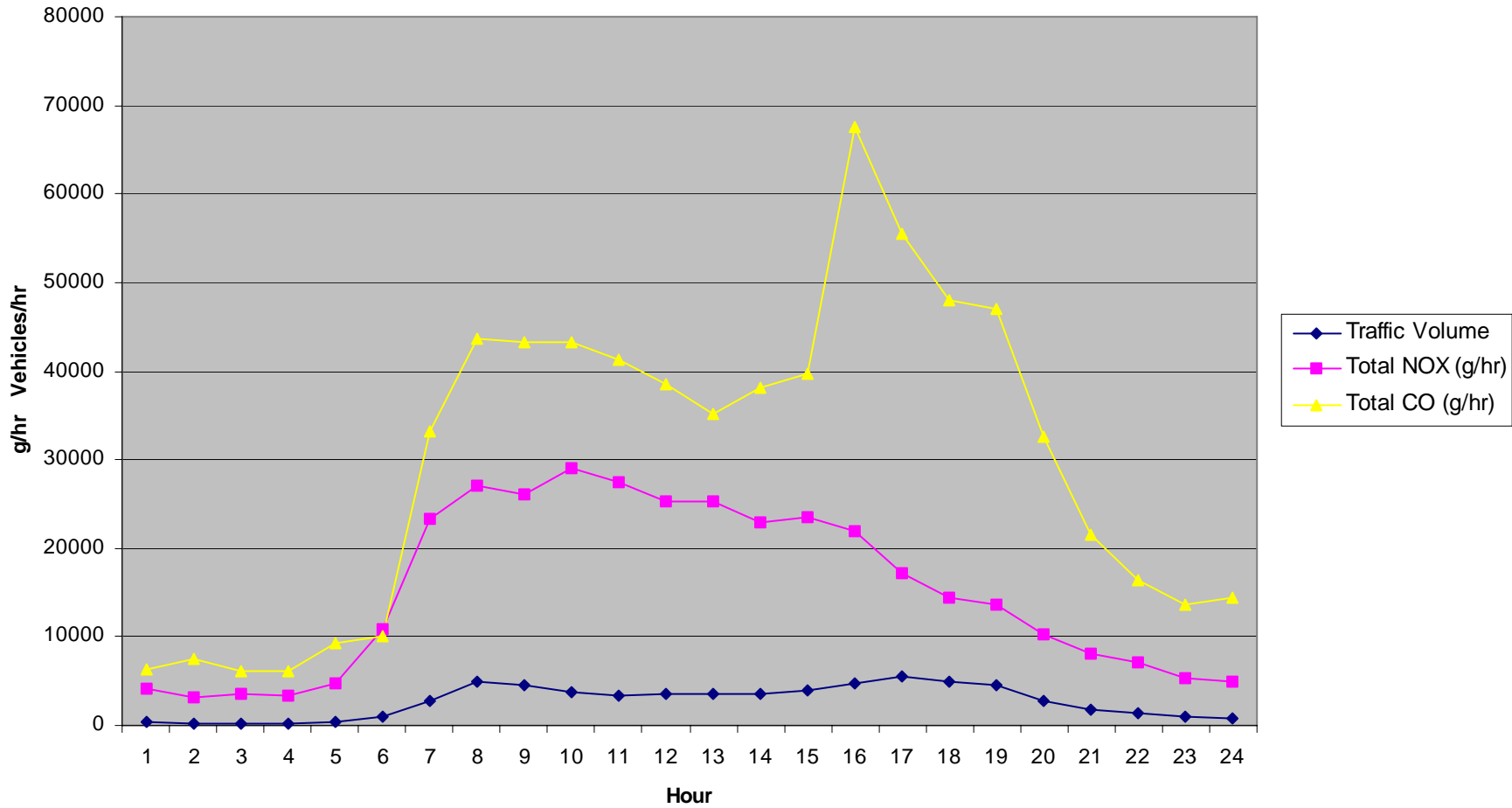
EASTLINK TUNNELS - 2008

Traffic Volume	Total NOX (g/hr)	Total CO (g/hr)	Total PM2.5 (g/hr)	Total PM10 (g/hr)
477	4106.5	6237.6	134.8	169.3
272	3255.1	7575.3	89.9	126.8
253	3493.3	6174.4	93.1	136.2
232	3438.5	6156.9	95.1	132.1
336	4767.8	9312.4	164.0	205.2
938	10891.7	9998.5	348.9	420.0
2859	23268.8	33176.6	831.5	979.4
4863	27025.5	43653.1	1258.0	1426.3
4463	26144.2	43311.0	1264.9	1438.1
3809	28960.8	43171.0	1445.4	1666.8
439	27548.7	41213.5	1379.1	1586.6
3476	25350.7	38430.5	1231.2	1397.8
3512	25290.3	35253.8	1193.8	1351.0
3513	22858.1	38111.7	1093.9	1203.0
3914	23421.8	39659.6	1062.1	1180.7
4771	21979.1	67460.1	968.8	1102.7
5474	17204.8	55469.5	642.6	773.2
5037	14442.4	47947.1	471.7	562.5
4503	13572.1	46980.7	482.4	566.7
2798	10262.8	32504.3	275.5	356.8
1746	8097.8	21453.2	214.1	257.6
1433	7145.4	16451.6	233.6	286.8
1048	5417.6	13667.5	138.2	158.5
719	5001.7	14435.5	155.5	202.2

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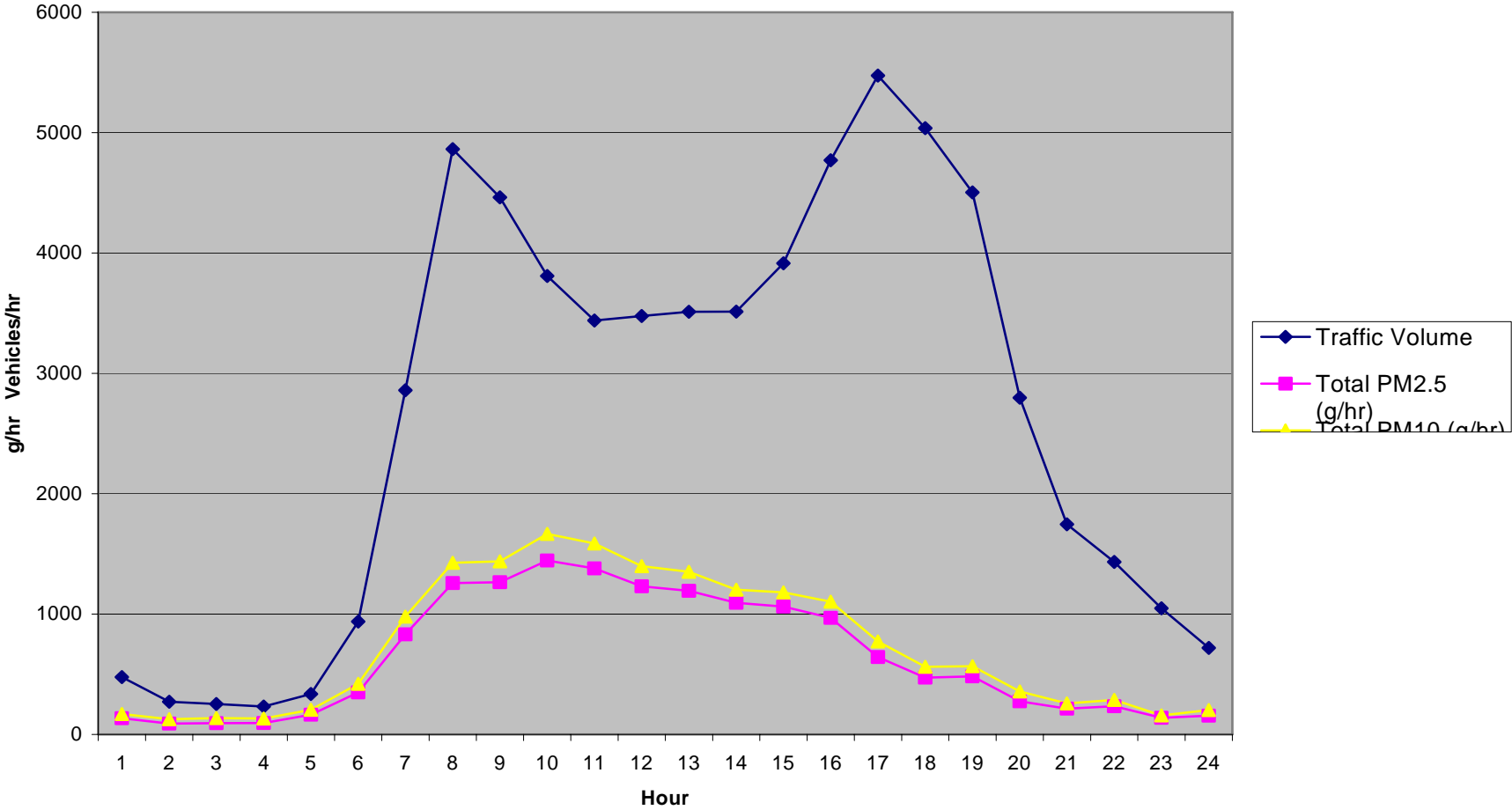
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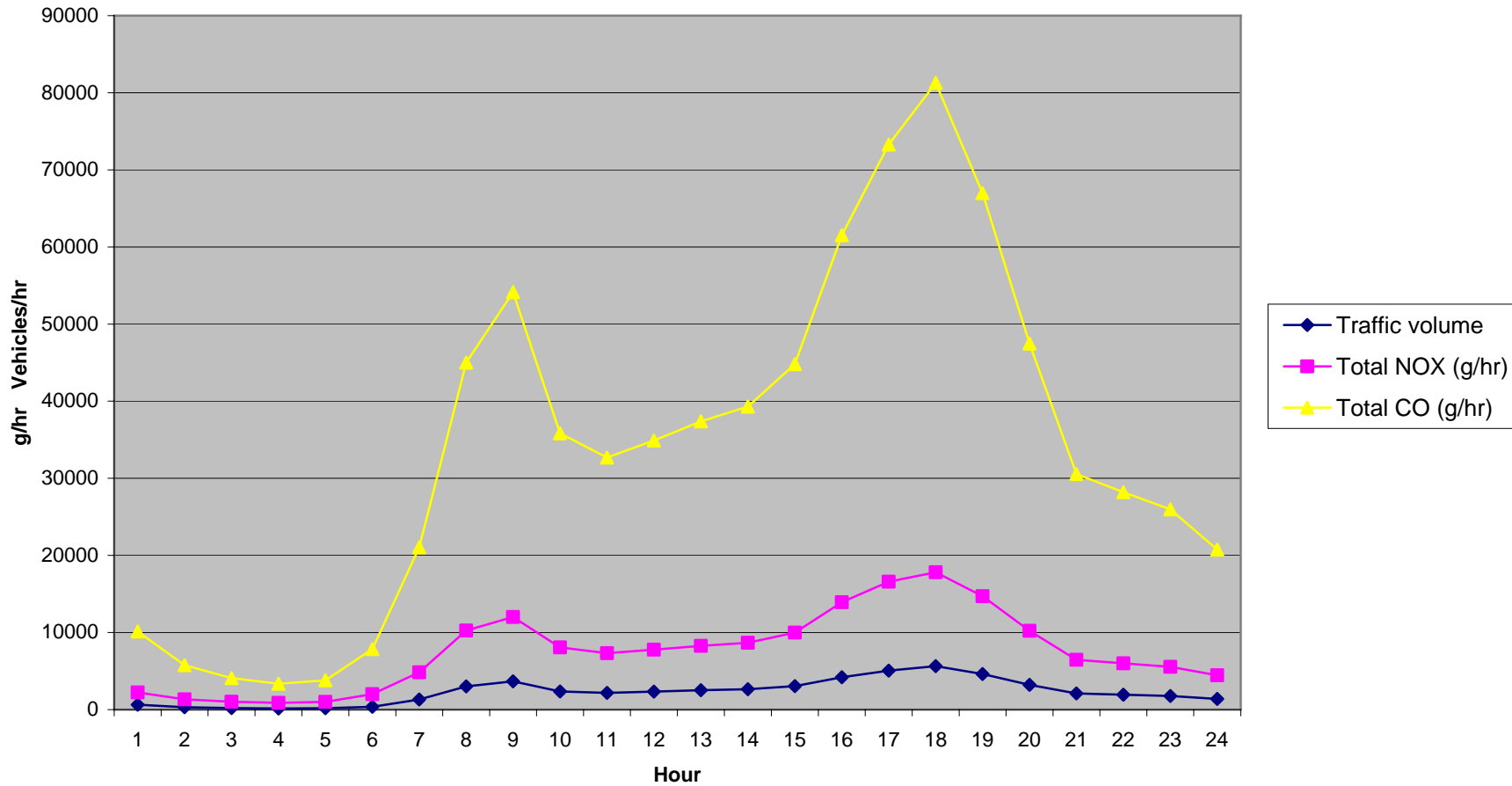
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