

**Attachment B: Appendix A of the August 2007 Full Fuel Cycle  
Assessment: Well-to-Wheels Energy Inputs, Emissions, and Water Impacts,  
CEC-600-2007-004-REV**

Note: There is an error in Table A-1. GREET-CA Fuel Cycle Cases. The WTT Case ID for Diesel, CA ULSD should be D2.

## APPENDIX A. CALCULATION RESULTS

The following tables and figures document the GREET model and other calculation results that are shown in the figures included in Chapter 3 of this report. Figures that detail the energy inputs, GHG emissions, criteria pollutant emissions, and air toxics emissions in year 2012 are included for each conventional and alternative fuel evaluated and discussed in the report: gasoline, ethanol, biodiesel, natural gas, electricity, GTL fuels, hydrogen, synthetic fuels, and LPG. Following the 2012 results figures for each fuel are figures that document the effects of the scenario years on energy inputs and emissions results for the fuel and vehicle combinations discussed in Chapter 4 of the report. Scenario year effects figures are given for gasoline passenger cars, E-85 passenger cars, CNG passenger cars, PHEV passenger cars, diesel buses, and natural gas derived FTD30 buses.

Each figure contains columns of results data for the vehicle/ fuel/ fuel production pathways illustrated in the bar chart figures in the main body of the report. Each vehicle/ fuel/ production pathway given in the results figures is identified by an identifier termed the WTT Case ID. Table A-1 in the following represents the key that associates each WTT Case ID with the vehicle/ fuel/ production pathway description given in the bars comprising the bar charts that summarize analysis results and discussion in Chapters 3 and 4 of the report.

**Table A-1. GREET-CA Fuel Cycle Cases**

WTT Case ID	Region Code	Description
BD23	1	BD20, MW SoyBean
C1	3	CNG, NA Natural Gas
C2	4	CNG, LNG, Remote NG
D1	4	Diesel, CA ULSD
D6	1	E-Diesel, MW EtOH
DM1	4	DME, Remote NG
e1	3	Electricity, NG/RPS
e2	3	Electricity, Renewable, No Combustion
e3	3	Electricity, Renewable Mix
e4	3	Electricity, H <sub>2</sub> Pet Coke
E10	3	Electricity, NG/RPS, Night
E11	3	Electricity, CA Average
E12	3	Electricity, CA NG CC
E10	4	E-10, Corn, MW EtOH
E71	1	E-85, Corn, MW mix/BR
E72	1	E-85, Corn, MW Coal
E73	1	E-85, Corn, MW NG
E74	1	E-85, Corn, MW NG, Wet Feed
E75	3	E-85, CA Corn, Wet Feed
E76	3	E-85, CA Corn, Wet Digester
E78	3	E-85, CA Poplar, Cellulose
E79	3	E-85, CA Forest Residue
E81	3	E-85, CA Switch Grass
E84	3	E-85, Brazil Sugar Cane
E98	1	E-90, MW mix/BR
F31	4	FTD30, Remote NG
F33	3	FTD30, CA Poplar
F34	3	FTD30, CA Coal
F35	4	FTD100, Remote NG
G0	4	RFG, 0 Oxygen
G1	4	RFG, CA Marginal
G5	4	RFG, Tar Sands
H1	3	H <sub>2</sub> , NG SR, LH <sub>2</sub>
H2	3	H <sub>2</sub> , NG SR, LH <sub>2</sub> , Ren Power
H3	3	H <sub>2</sub> , Coal, Sequestration
H4	3	H <sub>2</sub> , NG SR, Pipeline
H5	3	H <sub>2</sub> , Pet Coke, Pipeline
H6	3	H <sub>2</sub> , Biomass, Pipeline
H7	3	H <sub>2</sub> , Onsite NG SR
H8	3	H <sub>2</sub> , Onsite NG SR, 700 bar
H9	3	H <sub>2</sub> , Onsite NG SR, Ren Power
H10	3	H <sub>2</sub> , Grid Electrolysis
H11	3	H <sub>2</sub> , 70% Renewable, Electrolysis
L1	3	LNG, NA NG, Pipeline Liquefier
L3	4	LNG, Remote NG
M1	4	Methanol, Remote NG
M2	3	Methanol, LFG
P1	4	LPG, Petroleum
P2	1	LPG, Natural Gas

Region Code: 1=U.S., 2=N.E., 3=CA, 4=ROW (nNA)

**Figure A-1. LDA Vehicle Class: All Model Years  
(Gasoline, E10, Diesel, LPG and CNG)**

Scenario Year 2012: LDA Vehicle Class: All Model Years (blend)		G1	G1	G1	G1/e2	G15	G15	G0	E10	E10	D2	P1	P2	C1	C2
WTT Case ID	WTT Description	RFG, Marginal	RFG, Marginal	RFG, Marginal	Electricity, NG/RPS, Night	RFG, Tar Sands	RFG, Tar Sands	RFG,0 Oxygen	E10, Corn, MW E10H	E10, Corn, MW E10H	Diesel, CA ULSD	LPG, Petroleum	LPG, Natural Gas	CNG, NA Natural Gas	CNG, LNG, Remote NG
Vehicle Type	Vehicle Technology	G Av ICE	G FFV	G HEV	PHEV	G new ICEV	G HEV HEV	G new ICEV	G new ICEV	G HEV HEV	ULSD ICEV	LPG ICEV	LPG ICEV	CNG ICEV	CNG ICEV
Fossil	MJ/mi	6.27	6.27	4.65	3.38	7.08	5.25	6.37	6.19	4.59	4.89	5.68	5.49	5.46	6.02
Petroleum	MJ/mi	5.52	5.52	4.09	2.21	5.59	4.14	5.72	5.36	3.97	4.47	5.23	0.08	0.02	0.07
Natural Gas	MJ/mi	0.74	0.74	0.55	1.17	1.25	0.93	0.65	0.80	0.60	0.42	0.45	5.39	5.44	5.96
Coal	MJ/mi	0.02	0.02	0.01	0.01	0.25	0.18	0.00	0.03	0.02	0.00	0.00	0.02	0.00	0.00
Non Fossil	MJ/mi	0.21	0.21	0.16	0.20	0.03	0.02	0.01	0.37	0.27	0.01	0.02	0.00	0.03	0.00
WTT	MJ/mi	1.43	1.43	1.06	1.07	2.06	1.52	1.32	1.51	1.12	0.85	0.79	0.59	0.58	1.12
TTW	MJ/mi	5.05	5.05	3.74	2.51	5.05	3.74	5.05	5.05	3.74	4.04	4.91	4.91	4.91	4.91
GHGs (weighted)															
WTT	g/mi	96	96	71	92	166	123	100	93	69	67	63	54	51	100
TTW	g/mi	377	377	282	153	377	282	377	377	282	309	326	326	280	280
TOTAL	g/mi	473	473	353	245	543	405	477	470	350	375	389	380	331	380
Criteria, Total															
VOC	g/mi	0.394	0.351	0.333	0.042	0.341	0.326	0.345	0.356	0.337	0.220	0.621	0.472	0.176	0.183
CO	g/mi	3.004	2.750	2.719	0.192	2.716	2.693	2.719	2.774	2.736	0.823	2.700	2.701	2.674	2.714
NOx	g/mi	0.557	0.543	0.460	0.142	0.408	0.360	0.524	0.557	0.471	1.685	0.359	0.411	0.254	0.577
PM10 (x10)	g/mi	0.604	0.603	0.533	0.336	0.835	0.705	0.550	0.644	0.563	1.548	0.397	0.409	0.349	0.450
Criteria, Urban															
VOC	g/mi	0.349	0.306	0.300	0.019	---	---	0.306	0.307	0.300	0.191	0.590	0.420	0.143	0.143
CO	g/mi	2.885	2.631	2.631	0.138	---	---	2.631	2.632	2.631	0.758	2.632	2.633	2.632	2.631
NOx	g/mi	0.248	0.234	0.231	0.014	---	---	0.233	0.235	0.232	1.467	0.235	0.244	0.226	0.229
PM10 (x10)	g/mi	0.338	0.337	0.336	0.227	---	---	0.337	0.337	0.336	1.388	0.336	0.338	0.334	0.335
Urban Toxics, (weighted)															
Benzene	g/mi	2.8E-02	2.3E-02	2.3E-02	1.1E-03	---	---	2.3E-02	2.3E-02	2.3E-02	1.7E-02	3.1E-05	5.4E-05	1.0E-04	1.0E-04
1-3 Butadiene	g/mi	3.1E-02	2.6E-02	2.6E-02	8.4E-04	---	---	2.6E-02	2.6E-02	2.6E-02	9.5E-03	1.7E-05	1.5E-04	2.5E-04	2.6E-04
Formaldehyde	g/mi	2.9E-03	2.2E-03	2.2E-03	4.5E-04	---	---	2.2E-03	2.2E-03	2.2E-03	2.6E-02	2.2E-03	2.2E-03	2.8E-03	2.8E-03
Acetaldehyde	g/mi	3.0E-04	2.2E-04	2.2E-04	2.4E-05	---	---	2.2E-04	2.2E-04	2.2E-04	5.8E-03	2.2E-04	2.3E-04	2.5E-04	2.5E-04
Diesel PM	g/mi	2.3E-02	2.3E-02	1.7E-02	9.3E-03	---	---	2.0E-02	2.6E-02	1.9E-02	5.7E+00	7.3E-03	5.1E-02	0.0E+00	1.7E-02

# Figure A-1. LDA Vehicle Class: All Model Years (continued)

## Gasoline, E10, Diesel, LPG and CNG

### Scenario Year 2017: LDA Vehicle Class: All Model Years (blend)

WTT Case ID		G1	G1	G1	G1/e2	G15	G15	G0	E10	E10	D2	P1	P2	C1	C2
WTT Description		RFG, Marginal	RFG, Marginal	RFG, Marginal	Electricity, NG/RPS, Night	RFG, Tar Sands	RFG, Tar Sands	RFG, 0 Oxygen	E10, Com, MWEtOH	E10, Com, MWEtOH	Diesel, CA ULSD	LPG, Petroleum	LPG, Natural Gas	CNG, NA Natural Gas	CNG, LNG, Remote NG
Vehicle Type		G Av ICE	G FFV	G HEV	PHEV	G new ICEV	G HEV HEV	G new ICEV	G new ICEV	G HEV HEV	ULSD ICEV	LPG ICEV	LPG ICEV	CNG ICEV	CNG ICEV
Vehicle Technology		ICEV	FFV	HEV	PHEV	ICEV	HEV	ICEV	ICEV	HEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	5.68	5.68	4.21	3.02	6.39	4.73	5.77	5.61	4.15	4.43	5.14	4.98	4.93	5.45
Petroleum	MJ/mi	5.00	5.00	3.70	2.00	5.06	3.75	5.18	4.86	3.60	4.05	4.74	0.08	0.02	0.06
Natural Gas	MJ/mi	0.67	0.67	0.49	1.01	1.11	0.82	0.59	0.73	0.54	0.38	0.40	4.89	4.91	5.39
Coal	MJ/mi	0.01	0.01	0.01	0.01	0.21	0.16	0.00	0.03	0.02	0.00	0.00	0.02	0.00	0.00
Non Fossil	MJ/mi	0.19	0.19	0.14	0.20	0.02	0.02	0.01	0.33	0.25	0.01	0.01	0.00	0.03	0.00
WTT	MJ/mi	1.29	1.29	0.96	0.93	1.83	1.36	1.20	1.36	1.01	0.77	0.70	0.53	0.52	1.01
TTW	MJ/mi	4.58	4.58	3.39	2.28	4.58	3.39	4.58	4.58	3.39	3.66	4.45	4.45	4.45	4.45
GHGs (weighted)															
WTT	g/mi	86	86	64	80	147	109	90	83	62	60	57	49	46	90
TTW	g/mi	343	343	256	139	343	256	343	342	256	281	296	296	255	255
TOTAL	g/mi	429	429	320	219	490	366	433	426	318	341	353	345	301	344
Criteria, Total															
VOC	g/mi	0.269	0.263	0.247	0.042	0.255	0.241	0.258	0.267	0.250	0.187	0.521	0.386	0.118	0.125
CO	g/mi	1.891	1.857	1.829	0.214	1.827	1.807	1.831	1.878	1.845	0.777	1.813	1.814	1.790	1.826
NOx	g/mi	0.424	0.422	0.349	0.128	0.303	0.261	0.407	0.433	0.357	1.657	0.257	0.305	0.166	0.458
PM10 (x10)	g/mi	0.572	0.572	0.511	0.332	0.772	0.659	0.526	0.607	0.537	1.377	0.390	0.402	0.351	0.442
Criteria, Urban															
VOC	g/mi	0.229	0.224	0.218	0.021	---	---	0.223	0.224	0.218	0.161	0.494	0.340	0.089	0.089
CO	g/mi	1.786	1.752	1.751	0.166	---	---	1.752	1.752	1.751	0.718	1.752	1.753	1.753	1.752
NOx	g/mi	0.149	0.147	0.145	0.014	---	---	0.146	0.148	0.146	1.461	0.148	0.156	0.143	0.145
PM10 (x10)	g/mi	0.340	0.340	0.339	0.237	---	---	0.340	0.340	0.339	1.237	0.339	0.341	0.338	0.339
Urban Toxics, (weighted)															
Benzene	g/mi	1.6E-02	1.6E-02	1.5E-02	1.2E-03	---	---	1.6E-02	1.6E-02	1.5E-02	1.4E-02	1.7E-05	3.7E-05	9.2E-05	9.4E-05
1-3 Butadiene	g/mi	1.7E-02	1.6E-02	1.6E-02	9.9E-04	---	---	1.6E-02	1.6E-02	1.6E-02	8.0E-03	9.5E-06	1.3E-04	2.3E-04	2.4E-04
Formaldehyde	g/mi	1.5E-03	1.4E-03	1.4E-03	4.0E-04	---	---	1.4E-03	1.4E-03	1.4E-03	2.2E-02	1.4E-03	1.4E-03	2.0E-03	2.0E-03
Acetaldehyde	g/mi	1.5E-04	1.3E-04	1.3E-04	2.1E-05	---	---	1.3E-04	1.4E-04	1.3E-04	4.9E-03	1.3E-04	1.5E-04	1.7E-04	1.7E-04
Diesel PM	g/mi	1.9E-02	1.9E-02	1.4E-02	7.4E-03	---	---	1.5E-02	2.1E-02	1.5E-02	5.0E+00	3.5E-03	4.3E-02	0.0E+00	1.5E-02

## Figure A-1. LDA Vehicle Class: All Model Years (continued)

### Gasoline, E10, Diesel, LPG and CNG

#### Scenario Year 2022: LDA Vehicle Class: All Model Years (blend)

WTT Case ID		G1	G1	G1	G1/e2	G15	G15	G0	E10	E10	D2	P1	P2	C1	C2
WTT Description		RFG, Marginal	RFG, Marginal	RFG, Marginal	Electricity, NG/RPS, Night	RFG, Tar Sands	RFG, Tar Sands	RFG, 0 Oxygen	E10, Com, MWEtOH	E10, Com, MWEtOH	Diesel, CA ULSD	LPG, Petroleum	LPG, Natural Gas	CNG, NA Natural Gas	CNG, LNG, Remote NG
Vehicle Type		G Av ICE	G FFV	G HEV	PHEV	G new ICEV	G HEV HEV	G new ICEV	G new ICEV	G HEV HEV	ULSD ICEV	LPG ICEV	LPG ICEV	CNG ICEV	CNG ICEV
Vehicle Technology		ICEV	FFV	HEV	PHEV	ICEV	HEV	ICEV	ICEV	HEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	5.10	5.10	3.78	2.67	5.72	4.24	5.18	5.04	3.73	3.98	4.61	4.48	4.43	4.87
Petroleum	MJ/mi	4.49	4.49	3.33	1.80	4.55	3.37	4.66	4.37	3.23	3.64	4.26	0.07	0.02	0.05
Natural Gas	MJ/mi	0.59	0.59	0.44	0.86	0.98	0.73	0.52	0.65	0.48	0.34	0.35	4.39	4.41	4.81
Coal	MJ/mi	0.01	0.01	0.01	0.01	0.19	0.14	0.00	0.02	0.02	0.00	0.00	0.02	0.00	0.00
Non Fossil	MJ/mi	0.17	0.17	0.13	0.19	0.02	0.01	0.01	0.30	0.22	0.00	0.01	0.00	0.03	0.00
WTT	MJ/mi	1.15	1.15	0.85	0.81	1.63	1.20	1.07	1.22	0.90	0.69	0.62	0.48	0.46	0.87
TTW	MJ/mi	4.12	4.12	3.05	2.05	4.12	3.05	4.12	4.12	3.05	3.29	4.00	4.00	4.00	4.00
GHGs (weighted)															
WTT	g/mi	77	77	57	70	131	97	81	74	55	54	50	44	41	78
TTW	g/mi	309	309	231	125	309	231	309	309	231	253	267	267	230	230
TOTAL	g/mi	386	386	288	195	440	328	390	383	286	307	317	311	271	308
Criteria, Total															
VOC	g/mi	0.205	0.205	0.191	0.042	0.198	0.186	0.200	0.209	0.194	0.138	0.447	0.326	0.085	0.091
CO	g/mi	1.310	1.309	1.284	0.228	1.282	1.264	1.285	1.327	1.298	0.727	1.269	1.271	1.249	1.281
NOx	g/mi	0.342	0.342	0.277	0.115	0.237	0.200	0.330	0.351	0.284	1.628	0.195	0.240	0.115	0.375
PM10 (x10)	g/mi	0.546	0.546	0.492	0.329	0.721	0.622	0.506	0.577	0.515	1.408	0.385	0.397	0.351	0.432
Criteria, Urban															
VOC	g/mi	0.170	0.170	0.165	0.024	---	---	0.170	0.170	0.165	0.115	0.423	0.285	0.059	0.059
CO	g/mi	1.215	1.215	1.214	0.186	---	---	1.215	1.215	1.214	0.675	1.215	1.216	1.216	1.215
NOx	g/mi	0.098	0.098	0.097	0.015	---	---	0.097	0.099	0.097	1.453	0.099	0.106	0.095	0.098
PM10 (x10)	g/mi	0.342	0.342	0.341	0.246	---	---	0.342	0.342	0.342	1.285	0.341	0.343	0.341	0.342
Urban Toxics, (weighted)															
Benzene	g/mi	1.1E-02	1.1E-02	1.1E-02	1.4E-03	---	---	1.1E-02	1.1E-02	1.1E-02	1.0E-02	1.0E-05	2.8E-05	8.2E-05	8.4E-05
1-3 Butadiene	g/mi	1.1E-02	1.0E-02	1.0E-02	1.1E-03	---	---	1.0E-02	1.0E-02	1.0E-02	5.6E-03	5.8E-06	1.2E-04	2.0E-04	2.1E-04
Formaldehyde	g/mi	9.2E-04	9.1E-04	9.1E-04	3.7E-04	---	---	9.1E-04	9.2E-04	9.1E-04	1.5E-02	9.1E-04	9.6E-04	1.5E-03	1.5E-03
Acetaldehyde	g/mi	8.9E-05	8.8E-05	8.7E-05	2.0E-05	---	---	8.7E-05	8.9E-05	8.8E-05	3.4E-03	8.7E-05	9.9E-05	1.2E-04	1.2E-04
Diesel PM	g/mi	1.6E-02	1.6E-02	1.2E-02	6.2E-03	---	---	1.3E-02	1.8E-02	1.3E-02	5.2E+00	1.9E-03	3.8E-02	0.0E+00	1.4E-02

# Figure A-1. LDA Vehicle Class: All Model Years (concluded)

## Gasoline, E10, Diesel, LPG and CNG

**Scenario Year 2030: LDA Vehicle Class: All Model Years (blend)**

WTT Case ID		G1	G1	G1	G1/e2	G15	G15	G0	E10	E10	D2	P1	P2	C1	C2
WTT Description		RFG, Marginal	RFG, Marginal	RFG, Marginal	Electricity, NG/RPS, Night	RFG, Tar Sands	RFG, Tar Sands	RFG, 0 Oxygen	E10, Corn, MWEtOH	E10, Corn, MWEtOH	Diesel, CA ULSD	LPG, Petroleum	LPG, Natural Gas	CNG, NA Natural Gas	CNG, LNG, Remote NG
Vehicle Type		G Av ICE	G FFV	G HEV	PHEV	G new ICEV	G HEV HEV	G new ICEV	G new ICEV	G HEV HEV	ULSD ICEV	LPG ICEV	LPG ICEV	CNG ICEV	CNG ICEV
Vehicle Technology		ICEV	FFV	HEV	PHEV	ICEV	HEV	ICEV	ICEV	HEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	4.57	4.57	3.39	2.37	5.13	3.80	4.64	4.51	3.34	3.56	4.13	4.01	3.97	4.36
Petroleum	MJ/mi	4.03	4.03	2.98	1.61	4.08	3.02	4.17	3.91	2.90	3.26	3.81	0.06	0.02	0.05
Natural Gas	MJ/mi	0.53	0.53	0.39	0.75	0.88	0.65	0.47	0.58	0.43	0.30	0.31	3.94	3.95	4.31
Coal	MJ/mi	0.01	0.01	0.01	0.00	0.17	0.13	0.00	0.02	0.02	0.00	0.00	0.01	0.00	0.00
Non Fossil	MJ/mi	0.15	0.15	0.11	0.19	0.02	0.01	0.01	0.27	0.20	0.00	0.01	0.00	0.03	0.00
WTT	MJ/mi	1.03	1.03	0.77	0.73	1.46	1.08	0.96	1.09	0.81	0.62	0.56	0.43	0.41	0.78
TTW	MJ/mi	3.69	3.69	2.73	1.84	3.69	2.73	3.69	3.69	2.73	2.95	3.58	3.58	3.58	3.58
GHGs (weighted)															
WTT	g/mi	69	69	51	62	117	87	72	66	49	48	45	39	36	70
TTW	g/mi	278	278	208	113	278	208	278	278	208	228	240	240	207	207
TOTAL	g/mi	347	347	259	175	395	295	350	344	257	276	285	280	243	277
Criteria, Total															
VOC	g/mi	0.151	0.151	0.138	0.044	0.144	0.133	0.146	0.154	0.140	0.135	0.383	0.275	0.059	0.064
CO	g/mi	0.891	0.891	0.868	0.243	0.866	0.850	0.869	0.907	0.881	0.513	0.855	0.856	0.837	0.866
NOx	g/mi	0.282	0.282	0.224	0.106	0.188	0.155	0.271	0.290	0.230	1.786	0.150	0.190	0.079	0.311
PM10 (x10)	g/mi	0.525	0.525	0.477	0.328	0.682	0.594	0.489	0.553	0.498	1.395	0.381	0.391	0.351	0.423
Criteria, Urban															
VOC	g/mi	0.119	0.119	0.115	0.028	---	---	0.119	0.120	0.115	0.114	0.362	0.238	0.036	0.035
CO	g/mi	0.806	0.806	0.806	0.206	---	---	0.806	0.806	0.806	0.466	0.806	0.807	0.807	0.807
NOx	g/mi	0.063	0.063	0.062	0.016	---	---	0.062	0.064	0.062	1.629	0.064	0.070	0.061	0.063
PM10 (x10)	g/mi	0.342	0.342	0.342	0.253	---	---	0.342	0.343	0.342	1.284	0.341	0.343	0.342	0.343
Urban Toxics, (weighted)															
Benzene	g/mi	7.2E-03	7.2E-03	7.1E-03	1.7E-03	---	---	7.2E-03	7.2E-03	7.1E-03	1.0E-02	7.2E-06	2.3E-05	7.3E-05	7.5E-05
1-3 Butadiene	g/mi	6.2E-03	6.2E-03	6.2E-03	1.3E-03	---	---	6.2E-03	6.2E-03	6.2E-03	5.6E-03	4.0E-06	1.0E-04	1.8E-04	1.9E-04
Formaldehyde	g/mi	5.6E-04	5.6E-04	5.5E-04	3.4E-04	---	---	5.5E-04	5.6E-04	5.6E-04	1.5E-02	5.5E-04	6.0E-04	1.0E-03	1.1E-03
Acetaldehyde	g/mi	5.2E-05	5.2E-05	5.1E-05	1.9E-05	---	---	5.1E-05	5.3E-05	5.2E-05	3.4E-03	5.1E-05	6.1E-05	8.0E-05	8.2E-05
Diesel PM	g/mi	1.3E-02	1.3E-02	1.0E-02	5.4E-03	---	---	1.1E-02	1.5E-02	1.1E-02	5.2E+00	1.2E-03	3.3E-02	0.0E+00	1.2E-02

## Figure A-2.LDA Vehicle Class: Model Years 2010 and Newer (Gasoline, E10, Diesel, LPG and CNG)

### Scenario Year 2012: LDA Vehicle Class: Model Year Start 2010 (new)

WTT Case ID		G1	G1	G1	G1/e2	G15	G15	G0	E10	E10	D2	P1	P2	C1	C2
WTT Description		RFG, Marginal	RFG, Marginal	RFG, Marginal	Electricity, NGRPS, Night	RFG, Tar Sands	RFG, Tar Sands	RFG, 0 Oxygen	E10, Corn, MW EtOH	E10, Corn, MW EtOH	Diesel, CA ULSD	LPG, Petroleum	LPG, Natural Gas	CNG, NA Natural Gas	CNG, LNG, Remote NG
Vehicle Type		G new	G FFV	G HEV	PHEV	G new	G HEV	G new	G new	G HEV	ULSD	LPG	LPG	CNG	CNG
Vehicle Technology		ICEV	FFV	HEV	PHEV	ICEV	HEV	ICEV	ICEV	HEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	5.70	5.70	4.22	3.08	6.44	4.77	5.79	5.63	4.17	4.44	5.16	4.99	4.96	5.48
Petroleum	MJ/mi	5.01	5.01	3.71	2.01	5.08	3.76	5.20	4.87	3.61	4.06	4.75	0.08	0.02	0.06
Natural Gas	MJ/mi	0.67	0.67	0.50	1.06	1.14	0.84	0.59	0.73	0.54	0.38	0.41	4.90	4.94	5.42
Coal	MJ/mi	0.02	0.02	0.01	0.01	0.22	0.17	0.00	0.03	0.02	0.00	0.00	0.02	0.00	0.00
Non Fossil	MJ/mi	0.19	0.19	0.14	0.18	0.03	0.02	0.01	0.33	0.25	0.01	0.01	0.00	0.02	0.00
WTT	MJ/mi	1.30	1.30	0.96	0.97	1.87	1.39	1.20	1.37	1.02	0.77	0.72	0.54	0.52	1.02
TTW	MJ/mi	4.59	4.59	3.40	2.29	4.59	3.40	4.59	4.59	3.40	3.68	4.46	4.46	4.46	4.46
GHGs (weighted)															
WTT	g/mi	87	87	65	84	151	112	91	84	62	61	57	49	47	91
TTW	g/mi	344	344	257	139	344	257	344	344	257	282	297	297	255	255
TOTAL	g/mi	431	431	322	223	495	369	435	428	319	342	354	346	302	346
Criteria, Total															
VOC	g/mi	0.089	0.089	0.073	0.039	0.080	0.066	0.083	0.094	0.076	---	0.448	0.312	0.044	0.050
CO	g/mi	0.472	0.472	0.443	0.186	0.441	0.420	0.444	0.493	0.459	---	0.426	0.427	0.402	0.439
NOx	g/mi	0.316	0.316	0.241	0.130	0.194	0.150	0.299	0.330	0.251	---	0.149	0.197	0.054	0.347
PM10 (x10)	g/mi	0.488	0.488	0.424	0.325	0.699	0.581	0.440	0.526	0.452	---	0.301	0.312	0.257	0.349
Criteria, Urban															
VOC	g/mi	0.048	0.048	0.042	0.018	---	---	0.048	0.048	0.042	---	0.420	0.266	0.014	0.013
CO	g/mi	0.364	0.364	0.363	0.137	---	---	0.364	0.364	0.363	---	0.364	0.365	0.364	0.364
NOx	g/mi	0.036	0.036	0.033	0.014	---	---	0.035	0.036	0.034	---	0.037	0.045	0.029	0.032
PM10 (x10)	g/mi	0.247	0.247	0.245	0.226	---	---	0.246	0.247	0.245	---	0.246	0.247	0.244	0.245
Urban Toxics, (weighted)															
Benzene	g/mi	2.7E-03	2.7E-03	2.6E-03	1.0E-03	---	---	2.7E-03	2.7E-03	2.6E-03	---	2.8E-05	4.9E-05	9.2E-05	9.4E-05
1-3 Butadiene	g/mi	2.2E-03	2.2E-03	2.2E-03	8.4E-04	---	---	2.2E-03	2.2E-03	2.2E-03	---	1.6E-05	1.4E-04	2.3E-04	2.4E-04
Formaldehyde	g/mi	2.5E-04	2.5E-04	2.4E-04	4.2E-04	---	---	2.5E-04	2.6E-04	2.4E-04	---	2.5E-04	3.1E-04	8.5E-04	8.6E-04
Acetaldehyde	g/mi	2.7E-05	2.7E-05	2.4E-05	2.2E-05	---	---	2.6E-05	2.8E-05	2.5E-05	---	2.6E-05	3.9E-05	5.7E-05	5.8E-05
Diesel PM	g/mi	2.1E-02	2.1E-02	1.6E-02	8.5E-03	---	---	1.8E-02	2.4E-02	1.7E-02	---	6.6E-03	4.7E-02	0.0E+00	1.5E-02



## Figure A-2. LDA Vehicle Class: Model Years 2010 and Newer (continued)

### Gasoline, E10, Diesel, LPG and CNG

**Scenario Year 2017: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		G1	G1	G1	G1/e2	G15	G15	G0	E10	E10	D2	P1	P2	C1	C2
WTT Description		RFG, Marginal	RFG, Marginal	RFG, Marginal	Electricity, NG/RPS, Night	RFG, Tar Sands	RFG, Tar Sands	RFG, 0 Oxygen	E10, Com, MW EtOH	E10, Com, MW EtOH	Diesel, CA ULSD	LPG, Petroleum	LPG, Natural Gas	CNG, NA Natural Gas	CNG, LNG, Remote NG
Vehicle Type		G new	G FFV	G HEV	PHEV	G new	G HEV	G new	G new	G HEV	ULSD	LPG	LPG	CNG	CNG
Vehicle Technology		ICEV	FFV	HEV	PHEV	ICEV	HEV	ICEV	ICEV	HEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	5.13	5.13	3.80	2.72	5.77	4.27	5.21	5.06	3.75	4.00	4.64	4.50	4.46	4.92
Petroleum	MJ/mi	4.51	4.51	3.34	1.81	4.57	3.39	4.68	4.38	3.25	3.65	4.28	0.07	0.02	0.05
Natural Gas	MJ/mi	0.60	0.60	0.45	0.91	1.00	0.74	0.53	0.65	0.49	0.34	0.36	4.41	4.44	4.87
Coal	MJ/mi	0.01	0.01	0.01	0.01	0.19	0.14	0.00	0.02	0.02	0.00	0.00	0.02	0.00	0.00
Non Fossil	MJ/mi	0.17	0.17	0.13	0.18	0.02	0.02	0.01	0.30	0.22	0.00	0.01	0.00	0.03	0.00
WTT	MJ/mi	1.16	1.16	0.86	0.84	1.65	1.22	1.08	1.23	0.91	0.69	0.64	0.48	0.47	0.91
TTW	MJ/mi	4.14	4.14	3.06	2.06	4.14	3.06	4.14	4.14	3.06	3.31	4.02	4.02	4.02	4.02
GHGs (weighted)															
WTT	g/mi	78	78	58	73	133	99	82	75	56	54	51	44	41	81
TTW	g/mi	310	310	232	126	311	232	311	310	232	254	268	268	231	231
TOTAL	g/mi	388	388	290	199	444	331	392	385	288	309	319	312	272	312
Criteria, Total															
VOC	g/mi	0.090	0.090	0.075	0.039	0.082	0.070	0.085	0.094	0.078	---	0.406	0.284	0.042	0.048
CO	g/mi	0.539	0.539	0.514	0.208	0.512	0.494	0.515	0.558	0.528	---	0.499	0.501	0.479	0.512
NOx	g/mi	0.286	0.286	0.220	0.116	0.178	0.140	0.272	0.296	0.227	---	0.137	0.181	0.055	0.319
PM10 (x10)	g/mi	0.487	0.487	0.432	0.322	0.668	0.566	0.446	0.519	0.456	---	0.323	0.334	0.287	0.370
Criteria, Urban															
VOC	g/mi	0.054	0.054	0.049	0.020	---	---	0.054	0.054	0.049	---	0.381	0.243	0.016	0.016
CO	g/mi	0.444	0.444	0.444	0.165	---	---	0.444	0.444	0.444	---	0.444	0.445	0.445	0.445
NOx	g/mi	0.037	0.037	0.036	0.014	---	---	0.037	0.038	0.036	---	0.038	0.046	0.034	0.036
PM10 (x10)	g/mi	0.278	0.278	0.277	0.237	---	---	0.278	0.278	0.277	---	0.277	0.279	0.276	0.277
Urban Toxics, (weighted)															
Benzene	g/mi	3.2E-03	3.2E-03	3.1E-03	1.2E-03	---	---	3.2E-03	3.2E-03	3.1E-03	---	1.5E-05	3.4E-05	8.3E-05	8.5E-05
1-3 Butadiene	g/mi	2.6E-03	2.6E-03	2.6E-03	9.8E-04	---	---	2.6E-03	2.6E-03	2.6E-03	---	8.6E-06	1.2E-04	2.0E-04	2.1E-04
Formaldehyde	g/mi	2.7E-04	2.7E-04	2.7E-04	3.7E-04	---	---	2.7E-04	2.8E-04	2.7E-04	---	2.7E-04	3.2E-04	8.3E-04	8.3E-04
Acetaldehyde	g/mi	2.6E-05	2.6E-05	2.5E-05	2.0E-05	---	---	2.5E-05	2.7E-05	2.5E-05	---	2.5E-05	3.7E-05	5.6E-05	5.7E-05
Diesel PM	g/mi	1.7E-02	1.7E-02	1.2E-02	6.7E-03	---	---	1.4E-02	1.9E-02	1.4E-02	---	3.2E-03	3.9E-02	0.0E+00	1.4E-02

## Figure A-2. LDA Vehicle Class: Model Years 2010 and Newer (continued)

### Gasoline, E10, Diesel, LPG and CNG

**Scenario Year 2022: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		G1	G1	G1	G1/e2	G15	G15	G0	E10	E10	D2	P1	P2	C1	C2
WTT Description		RFG, Marginal	RFG, Marginal	RFG, Marginal	Electricity, NG/RPS, Night	RFG, Tar Sands	RFG, Tar Sands	RFG, 0 Oxygen	E10, Com, MW EtOH	E10, Com, MW EtOH	Diesel, CA ULSD	LPG, Petroleum	LPG, Natural Gas	CNG, NA Natural Gas	CNG, LNG, Remote NG
Vehicle Type		G new	G FFV	G HEV	PHEV	G new	G HEV	G new	G new	G HEV	ULSD	LPG	LPG	CNG	CNG
Vehicle Technology		ICEV	FFV	HEV	PHEV	ICEV	HEV	ICEV	ICEV	HEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	4.84	4.84	3.59	2.53	5.44	4.03	4.92	4.78	3.54	3.78	4.38	4.25	4.20	4.62
Petroleum	MJ/mi	4.27	4.27	3.16	1.71	4.32	3.20	4.42	4.15	3.07	3.46	4.04	0.06	0.02	0.05
Natural Gas	MJ/mi	0.56	0.56	0.42	0.82	0.93	0.69	0.50	0.61	0.46	0.32	0.33	4.17	4.19	4.57
Coal	MJ/mi	0.01	0.01	0.01	0.00	0.18	0.13	0.00	0.02	0.02	0.00	0.00	0.01	0.00	0.00
Non Fossil	MJ/mi	0.16	0.16	0.12	0.18	0.02	0.01	0.01	0.28	0.21	0.00	0.01	0.00	0.03	0.00
WTT	MJ/mi	1.10	1.10	0.81	0.77	1.54	1.14	1.02	1.16	0.86	0.65	0.59	0.46	0.43	0.83
TTW	MJ/mi	3.91	3.91	2.90	1.95	3.91	2.90	3.91	3.91	2.90	3.13	3.80	3.80	3.80	3.80
GHGs (weighted)															
WTT	g/mi	73	73	54	66	124	92	77	70	52	51	48	42	39	74
TTW	g/mi	294	294	220	119	294	220	294	294	220	241	254	254	219	219
TOTAL	g/mi	367	367	274	185	418	312	371	364	272	292	302	296	257	293
Criteria, Total															
VOC	g/mi	0.097	0.097	0.084	0.041	0.090	0.079	0.093	0.101	0.086	---	0.386	0.271	0.043	0.048
CO	g/mi	0.592	0.592	0.569	0.226	0.566	0.550	0.570	0.610	0.582	---	0.554	0.556	0.535	0.566
NOx	g/mi	0.271	0.271	0.210	0.110	0.172	0.136	0.260	0.280	0.216	---	0.131	0.174	0.056	0.302
PM10 (x10)	g/mi	0.497	0.497	0.446	0.324	0.663	0.569	0.459	0.526	0.468	---	0.344	0.355	0.312	0.389
Criteria, Urban															
VOC	g/mi	0.064	0.064	0.059	0.024	---	---	0.064	0.064	0.059	---	0.364	0.232	0.018	0.018
CO	g/mi	0.503	0.503	0.502	0.186	---	---	0.503	0.503	0.503	---	0.503	0.504	0.504	0.503
NOx	g/mi	0.039	0.039	0.038	0.015	---	---	0.039	0.040	0.038	---	0.040	0.047	0.037	0.039
PM10 (x10)	g/mi	0.303	0.303	0.303	0.245	---	---	0.303	0.303	0.303	---	0.302	0.304	0.302	0.303
Urban Toxics, (weighted)															
Benzene	g/mi	3.8E-03	3.8E-03	3.6E-03	1.4E-03	---	---	3.8E-03	3.8E-03	3.6E-03	---	9.9E-06	2.7E-05	7.8E-05	8.0E-05
1-3 Butadiene	g/mi	3.0E-03	3.0E-03	3.0E-03	1.1E-03	---	---	3.0E-03	3.0E-03	3.0E-03	---	5.5E-06	1.1E-04	1.9E-04	2.0E-04
Formaldehyde	g/mi	3.0E-04	3.0E-04	2.9E-04	3.5E-04	---	---	2.9E-04	3.0E-04	3.0E-04	---	2.9E-04	3.5E-04	8.3E-04	8.3E-04
Acetaldehyde	g/mi	2.7E-05	2.7E-05	2.6E-05	1.9E-05	---	---	2.7E-05	2.8E-05	2.7E-05	---	2.6E-05	3.7E-05	5.7E-05	5.8E-05
Diesel PM	g/mi	1.5E-02	1.5E-02	1.1E-02	5.9E-03	---	---	1.2E-02	1.7E-02	1.2E-02	---	1.8E-03	3.6E-02	0.0E+00	1.3E-02

## Figure A-2. LDA Vehicle Class: Model Years 2010 and Newer (concluded)

### Gasoline, E10, Diesel, LPG and CNG

**Scenario Year 2030: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		G1	G1	G1	G1/e2	G15	G15	G0	E10	E10	D2	P1	P2	C1	C2
WTT Description		RFG, Marginal	RFG, Marginal	RFG, Marginal	Electricity, NG/RPS, Night	RFG, Tar Sands	RFG, Tar Sands	RFG, 0 Oxygen	E10, Corn, MWEtOH	E10, Corn, MWEtOH	Diesel, CA ULSD	LPG, Petroleum	LPG, Natural Gas	CNG, NA Natural Gas	CNG, LNG, Remote NG
Vehicle Type		G new	G FFV	G HEV	PHEV	G new	G HEV	G new	G new	G HEV	ULSD	LPG	LPG	CNG	CNG
Vehicle Technology		ICEV	FFV	HEV	PHEV	ICEV	HEV	ICEV	ICEV	HEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	4.55	4.55	3.37	2.36	5.11	3.78	4.62	4.49	3.33	3.55	4.11	3.99	3.95	4.34
Petroleum	MJ/mi	4.01	4.01	2.97	1.61	4.06	3.01	4.16	3.89	2.89	3.25	3.80	0.06	0.02	0.05
Natural Gas	MJ/mi	0.53	0.53	0.39	0.75	0.88	0.65	0.47	0.58	0.43	0.30	0.31	3.92	3.93	4.29
Coal	MJ/mi	0.01	0.01	0.01	0.00	0.17	0.13	0.00	0.02	0.02	0.00	0.00	0.01	0.00	0.00
Non Fossil	MJ/mi	0.15	0.15	0.11	0.19	0.02	0.01	0.01	0.27	0.20	0.00	0.01	0.00	0.03	0.00
WTT	MJ/mi	1.03	1.03	0.76	0.72	1.45	1.07	0.95	1.09	0.80	0.61	0.56	0.43	0.41	0.78
TTW	MJ/mi	3.67	3.67	2.72	1.83	3.67	2.72	3.67	3.67	2.72	2.94	3.57	3.57	3.57	3.57
GHGs (weighted)															
WTT	g/mi	69	69	51	62	117	86	72	66	49	48	45	39	36	70
TTW	g/mi	277	277	207	113	277	208	277	277	207	227	239	239	206	206
TOTAL	g/mi	346	346	258	175	394	294	349	343	256	275	284	278	242	276
Criteria, Total															
VOC	g/mi	0.107	0.107	0.094	0.044	0.101	0.090	0.103	0.110	0.097	---	0.367	0.259	0.045	0.050
CO	g/mi	0.643	0.643	0.621	0.243	0.619	0.603	0.622	0.659	0.633	---	0.607	0.609	0.590	0.618
NOx	g/mi	0.261	0.261	0.203	0.106	0.168	0.134	0.250	0.269	0.209	---	0.129	0.169	0.059	0.290
PM10 (x10)	g/mi	0.508	0.508	0.461	0.327	0.665	0.577	0.473	0.536	0.481	---	0.365	0.375	0.335	0.407
Criteria, Urban															
VOC	g/mi	0.076	0.076	0.071	0.028	---	---	0.076	0.076	0.071	---	0.346	0.223	0.021	0.021
CO	g/mi	0.559	0.559	0.559	0.205	---	---	0.559	0.559	0.559	---	0.559	0.560	0.560	0.560
NOx	g/mi	0.043	0.043	0.042	0.016	---	---	0.042	0.044	0.042	---	0.044	0.050	0.041	0.043
PM10 (x10)	g/mi	0.327	0.327	0.326	0.253	---	---	0.326	0.327	0.326	---	0.326	0.327	0.326	0.327
Urban Toxics, (weighted)															
Benzene	g/mi	4.5E-03	4.5E-03	4.4E-03	1.7E-03	---	---	4.5E-03	4.5E-03	4.4E-03	---	7.1E-06	2.3E-05	7.3E-05	7.4E-05
1-3 Butadiene	g/mi	3.6E-03	3.6E-03	3.6E-03	1.3E-03	---	---	3.6E-03	3.6E-03	3.6E-03	---	4.0E-06	1.0E-04	1.8E-04	1.9E-04
Formaldehyde	g/mi	3.5E-04	3.5E-04	3.4E-04	3.4E-04	---	---	3.4E-04	3.5E-04	3.5E-04	---	3.4E-04	3.9E-04	8.4E-04	8.4E-04
Acetaldehyde	g/mi	3.1E-05	3.1E-05	3.0E-05	1.9E-05	---	---	3.0E-05	3.2E-05	3.1E-05	---	3.0E-05	4.0E-05	5.9E-05	6.0E-05
Diesel PM	g/mi	1.3E-02	1.3E-02	9.9E-03	5.4E-03	---	---	1.1E-02	1.5E-02	1.1E-02	---	1.1E-03	3.3E-02	0.0E+00	1.2E-02

**Figure A-3. LDA Vehicle Class: Model Years 2010 and Newer  
(EVs and PHEVs)**

**Scenario Year 2012: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		e1	e2	e31	e37	e54	e92	G1/e1	G1/e2	G1/e31	G1/e37	G1/e54	G1/e92
WTT Description		Electricity, NG/RPS	Electricity, NG/RPS, Night	Electricity, CA NG SCCT	Electricity, Coal IGCC, CCS	Electricity, Woody Biomass	Electricity, Nuclear	Electricity, NG/RPS	Electricity, NG/RPS, Night	Electricity, CA NG SCCT	Electricity, Coal IGCC, CCS	Electricity, Woody Biomass	Electricity, Nuclear
Vehicle Type		EV	EV	EV	EV	EV	EV	PHEV	PHEV	PHEV	PHEV	PHEV	PHEV
Vehicle Technology		EV	EV	EV	EV	EV	EV	PHEV	PHEV	PHEV	PHEV	PHEV	PHEV
Fossil	MJ/mi	2.00	1.99	4.19	3.13	0.12	0.05	3.08	3.08	3.96	3.53	2.33	2.30
Petroleum	MJ/mi	0.01	0.01	0.02	0.04	0.10	0.00	2.01	2.01	2.01	2.02	2.04	2.01
Natural Gas	MJ/mi	1.99	1.98	4.17	0.01	0.02	0.04	1.07	1.06	1.94	0.27	0.28	0.29
Coal	MJ/mi	0.00	0.00	0.00	3.09	0.00	0.00	0.01	0.01	0.01	1.24	0.01	0.01
Non Fossil	MJ/mi	0.26	0.26	0.00	0.00	3.80	1.22	0.18	0.18	0.08	0.08	1.60	0.57
WTT	MJ/mi	1.14	1.13	3.07	2.02	2.80	0.15	0.98	0.97	1.75	1.33	1.64	0.58
TTW	MJ/mi	1.12	1.12	1.12	1.12	1.12	1.12	2.29	2.29	2.29	2.29	2.29	2.29
GHGs (weighted)													
WTT	g/mi	124	123	259	73	17	3	84	84	138	64	42	36
TTW	g/mi	0	0	0	0	0	0	139	139	139	139	139	139
TOTAL	g/mi	124	123	259	73	17	3	224	223	278	203	181	175
Criteria, Total													
VOC	g/mi	0.012	0.012	0.026	0.028	0.008	0.002	0.039	0.039	0.045	0.046	0.038	0.035
CO	g/mi	0.031	0.031	0.089	0.080	0.284	0.010	0.187	0.186	0.210	0.206	0.288	0.178
NOx	g/mi	0.011	0.011	0.023	0.074	0.056	0.001	0.130	0.130	0.135	0.155	0.148	0.126
PM10 (x10)	g/mi	0.226	0.225	0.248	5.205	0.579	0.207	0.325	0.325	0.334	2.317	0.466	0.318
Criteria, Urban													
VOC	g/mi	0.000	0.000	0.001	0.000	0.003	0.000	0.018	0.018	0.018	0.018	0.020	0.018
CO	g/mi	0.015	0.015	0.056	0.000	0.270	0.000	0.137	0.137	0.154	0.131	0.239	0.131
NOx	g/mi	0.001	0.001	0.002	0.000	0.026	0.000	0.014	0.014	0.014	0.013	0.024	0.013
PM10 (x10)	g/mi	0.220	0.220	0.237	0.205	0.562	0.205	0.226	0.226	0.233	0.220	0.363	0.220
Urban Toxics, (weighted)													
Benzene	g/mi	8.3E-05	8.2E-05	---	---	---	---	1.0E-03	1.0E-03	---	---	---	---
1-3 Butadiene	g/mi	1.0E-04	1.0E-04	---	---	---	---	8.4E-04	8.4E-04	---	---	---	---
Formaldehyde	g/mi	8.2E-04	8.1E-04	---	---	---	---	4.2E-04	4.2E-04	---	---	---	---
Acetaldehyde	g/mi	3.1E-05	3.0E-05	---	---	---	---	2.2E-05	2.2E-05	---	---	---	---
Diesel PM	g/mi	0.0E+00	0.0E+00	---	---	---	---	8.5E-03	8.5E-03	---	---	---	---

**Figure A-3. LDA Vehicle Class: Model Years 2010 and Newer (continued)**

**EVs and PHEVs**

**Scenario Year 2017: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		e1	e2	e31	e37	e54	e92	G1/e1	G1/e2	G1/e31	G1/e37	G1/e54	G1/e92
WTT Description		Electricity, NG/RPS	Electricity, NG/RPS, Night	Electricity, CA NG SCCT	Electricity, Coal IGCC, CCS	Electricity, Woody Biomass	Electricity, Nuclear	Electricity, NG/RPS	Electricity, NG/RPS, Night	Electricity, CA NG SCCT	Electricity, Coal IGCC, CCS	Electricity, Woody Biomass	Electricity, Nuclear
Vehicle Type		EV	EV	EV	EV	EV	EV	PHEV	PHEV	PHEV	PHEV	PHEV	PHEV
Vehicle Technology		EV	EV	EV	EV	EV	EV	PHEV	PHEV	PHEV	PHEV	PHEV	PHEV
Fossil	MJ/mi	1.69	1.68	3.61	2.79	0.10	0.03	2.73	2.72	3.50	3.17	2.09	2.06
Petroleum	MJ/mi	0.01	0.01	0.01	0.03	0.09	0.00	1.81	1.81	1.81	1.82	1.84	1.81
Natural Gas	MJ/mi	1.68	1.68	3.60	0.01	0.02	0.03	0.91	0.91	1.68	0.24	0.25	0.25
Coal	MJ/mi	0.00	0.00	0.00	2.75	0.00	0.00	0.01	0.01	0.01	1.11	0.01	0.01
Non Fossil	MJ/mi	0.27	0.27	0.00	0.00	3.42	1.10	0.18	0.18	0.07	0.07	1.44	0.51
WTT	MJ/mi	0.95	0.94	2.60	1.79	2.52	0.12	0.85	0.84	1.51	1.18	1.47	0.51
TTW	MJ/mi	1.01	1.01	1.01	1.01	1.01	1.01	2.06	2.06	2.06	2.06	2.06	2.06
GHGs (weighted)													
WTT	g/mi	105	104	223	65	16	2	73	73	121	57	38	32
TTW	g/mi	0	0	0	0	0	0	126	126	126	126	126	126
TOTAL	g/mi	105	104	223	65	16	2	199	199	247	183	164	158
Criteria, Total													
VOC	g/mi	0.010	0.010	0.022	0.025	0.005	0.001	0.039	0.039	0.043	0.044	0.037	0.035
CO	g/mi	0.026	0.026	0.076	0.072	0.253	0.009	0.208	0.208	0.228	0.227	0.299	0.201
NOx	g/mi	0.009	0.009	0.019	0.066	0.034	0.001	0.116	0.116	0.121	0.139	0.126	0.113
PM10 (x10)	g/mi	0.223	0.222	0.242	4.661	0.532	0.207	0.322	0.322	0.330	2.098	0.446	0.316
Criteria, Urban													
VOC	g/mi	0.000	0.000	0.000	0.000	0.002	0.000	0.020	0.020	0.021	0.020	0.021	0.020
CO	g/mi	0.013	0.013	0.049	0.000	0.242	0.000	0.165	0.165	0.179	0.160	0.257	0.160
NOx	g/mi	0.001	0.001	0.002	0.000	0.015	0.000	0.014	0.014	0.014	0.014	0.020	0.014
PM10 (x10)	g/mi	0.218	0.218	0.233	0.206	0.522	0.206	0.237	0.237	0.243	0.232	0.358	0.232
Urban Toxics, (weighted)													
Benzene	g/mi	7.0E-05	6.9E-05	---	---	---	---	1.2E-03	1.2E-03	---	---	---	---
1-3 Butadiene	g/mi	8.6E-05	8.5E-05	---	---	---	---	9.8E-04	9.8E-04	---	---	---	---
Formaldehyde	g/mi	6.9E-04	6.9E-04	---	---	---	---	3.8E-04	3.7E-04	---	---	---	---
Acetaldehyde	g/mi	2.6E-05	2.6E-05	---	---	---	---	2.0E-05	2.0E-05	---	---	---	---
Diesel PM	g/mi	0.0E+00	0.0E+00	---	---	---	---	6.7E-03	6.7E-03	---	---	---	---

### Figure A-3. LDA Vehicle Class: Model Years 2010 and Newer (continued)

#### EVs and PHEVs

**Scenario Year 2022: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		e1	e2	e31	e37	e54	e92	G1/e1	G1/e2	G1/e31	G1/e37	G1/e54	G1/e92
WTT Description		Electricity, NG/RPS	Electricity, NG/RPS, Night	Electricity, CA NG SCCT	Electricity, Coal IGCC, CCS	Electricity, Woody Biomass	Electricity, Nuclear	Electricity, NG/RPS	Electricity, NG/RPS, Night	Electricity, CA NG SCCT	Electricity, Coal IGCC, CCS	Electricity, Woody Biomass	Electricity, Nuclear
Vehicle Type		EV	EV	EV	EV	EV	EV	PHEV	PHEV	PHEV	PHEV	PHEV	PHEV
Vehicle Technology		EV	EV	EV	EV	EV	EV	PHEV	PHEV	PHEV	PHEV	PHEV	PHEV
Fossil	MJ/mi	1.50	1.49	3.26	2.61	0.10	0.02	2.54	2.53	3.24	2.98	1.98	1.95
Petroleum	MJ/mi	0.01	0.01	0.01	0.03	0.08	0.00	1.71	1.71	1.71	1.72	1.74	1.71
Natural Gas	MJ/mi	1.49	1.48	3.25	0.01	0.02	0.02	0.82	0.82	1.53	0.23	0.23	0.23
Coal	MJ/mi	0.00	0.00	0.00	2.57	0.00	0.00	0.00	0.00	0.00	1.03	0.00	0.00
Non Fossil	MJ/mi	0.29	0.29	0.00	0.00	3.20	1.04	0.18	0.18	0.07	0.07	1.35	0.48
WTT	MJ/mi	0.83	0.83	2.31	1.66	2.35	0.11	0.77	0.77	1.36	1.10	1.38	0.48
TTW	MJ/mi	0.95	0.95	0.95	0.95	0.95	0.95	1.95	1.95	1.95	1.95	1.95	1.95
GHGs (weighted)													
WTT	g/mi	93	92	202	60	15	1	66	66	110	53	35	30
TTW	g/mi	0	0	0	0	0	0	119	119	119	119	119	119
TOTAL	g/mi	93	92	202	60	15	1	186	185	230	173	155	149
Criteria, Total													
VOC	g/mi	0.009	0.009	0.020	0.023	0.004	0.001	0.041	0.041	0.045	0.046	0.039	0.038
CO	g/mi	0.023	0.023	0.069	0.067	0.236	0.008	0.226	0.226	0.244	0.244	0.311	0.220
NOx	g/mi	0.008	0.007	0.016	0.062	0.022	0.001	0.110	0.110	0.114	0.132	0.116	0.107
PM10 (x10)	g/mi	0.220	0.220	0.238	4.367	0.505	0.207	0.324	0.324	0.331	1.983	0.438	0.319
Criteria, Urban													
VOC	g/mi	0.000	0.000	0.000	0.000	0.001	0.000	0.024	0.024	0.024	0.024	0.024	0.024
CO	g/mi	0.012	0.011	0.044	0.000	0.226	0.000	0.186	0.186	0.199	0.181	0.271	0.181
NOx	g/mi	0.001	0.001	0.002	0.000	0.009	0.000	0.015	0.015	0.015	0.014	0.018	0.014
PM10 (x10)	g/mi	0.217	0.217	0.230	0.206	0.499	0.206	0.245	0.245	0.251	0.241	0.358	0.241
Urban Toxics, (weighted)													
Benzene	g/mi	6.2E-05	6.2E-05	---	---	---	---	1.4E-03	1.4E-03	---	---	---	---
1-3 Butadiene	g/mi	7.6E-05	7.6E-05	---	---	---	---	1.1E-03	1.1E-03	---	---	---	---
Formaldehyde	g/mi	6.1E-04	6.1E-04	---	---	---	---	3.5E-04	3.5E-04	---	---	---	---
Acetaldehyde	g/mi	2.3E-05	2.3E-05	---	---	---	---	1.9E-05	1.9E-05	---	---	---	---
Diesel PM	g/mi	0.0E+00	0.0E+00	---	---	---	---	5.9E-03	5.9E-03	---	---	---	---

### Figure A-3. LDA Vehicle Class: Model Years 2010 and Newer (concluded)

#### EVs and PHEVs

Scenario Year 2030: LDA Vehicle Class: Model Year Start 2010 (new)

WTT Case ID		e1	e2	e31	e37	e54	e92	G1/e1	G1/e2	G1/e31	G1/e37	G1/e54	G1/e92
WTT Description		Electricity, NG/RPS	Electricity, NG/RPS, Night	Electricity, CA NG, SCCT	Electricity, Coal IGCC, CCS	Electricity, Woody Biomass	Electricity, Nuclear	Electricity, NG/RPS	Electricity, NG/RPS, Night	Electricity, CA NG, SCCT	Electricity, Coal IGCC, CCS	Electricity, Woody Biomass	Electricity, Nuclear
Vehicle Type		EV	EV	EV	EV	EV	EV	PHEV	PHEV	PHEV	PHEV	PHEV	PHEV
Vehicle Technology		EV	EV	EV	EV	EV	EV	PHEV	PHEV	PHEV	PHEV	PHEV	PHEV
Fossil	MJ/mi	1.36	1.35	3.07	2.45	0.09	0.02	2.36	2.36	3.05	2.80	1.86	1.83
Petroleum	MJ/mi	0.01	0.01	0.01	0.03	0.08	0.00	1.61	1.61	1.61	1.62	1.63	1.61
Natural Gas	MJ/mi	1.35	1.35	3.05	0.01	0.02	0.02	0.75	0.75	1.43	0.21	0.22	0.22
Coal	MJ/mi	0.00	0.00	0.00	2.41	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00
Non Fossil	MJ/mi	0.32	0.32	0.00	0.00	3.01	0.98	0.19	0.19	0.06	0.06	1.27	0.45
WTT	MJ/mi	0.78	0.78	2.17	1.56	2.21	0.10	0.72	0.72	1.28	1.03	1.29	0.45
TTW	MJ/mi	0.90	0.90	0.90	0.90	0.90	0.90	1.83	1.83	1.83	1.83	1.83	1.83
GHGs (weighted)													
WTT	g/mi	87	86	190	57	14	1	62	62	103	50	33	28
TTW	g/mi	0	0	0	0	0	0	113	113	113	113	113	113
TOTAL	g/mi	87	86	190	57	14	1	175	175	216	163	146	141
Criteria, Total													
VOC	g/mi	0.008	0.008	0.018	0.022	0.003	0.001	0.044	0.044	0.048	0.049	0.042	0.041
CO	g/mi	0.021	0.021	0.065	0.063	0.221	0.008	0.243	0.243	0.261	0.260	0.323	0.238
NOx	g/mi	0.007	0.007	0.015	0.058	0.019	0.001	0.106	0.106	0.109	0.126	0.110	0.103
PM10 (x10)	g/mi	0.219	0.219	0.236	4.115	0.487	0.207	0.327	0.327	0.334	1.885	0.434	0.322
Criteria, Urban													
VOC	g/mi	0.000	0.000	0.000	0.000	0.001	0.000	0.028	0.028	0.028	0.028	0.028	0.028
CO	g/mi	0.011	0.011	0.041	0.000	0.212	0.000	0.206	0.205	0.218	0.201	0.286	0.201
NOx	g/mi	0.001	0.001	0.002	0.000	0.008	0.000	0.016	0.016	0.016	0.016	0.019	0.016
PM10 (x10)	g/mi	0.216	0.216	0.229	0.205	0.481	0.206	0.253	0.253	0.258	0.249	0.359	0.249
Urban Toxics, (weighted)													
Benzene	g/mi	5.4E-05	5.4E-05	---	---	---	---	1.7E-03	1.7E-03	---	---	---	---
1-3 Butadiene	g/mi	6.6E-05	6.6E-05	---	---	---	---	1.3E-03	1.3E-03	---	---	---	---
Formaldehyde	g/mi	5.4E-04	5.3E-04	---	---	---	---	3.4E-04	3.4E-04	---	---	---	---
Acetaldehyde	g/mi	2.0E-05	2.0E-05	---	---	---	---	1.9E-05	1.9E-05	---	---	---	---
Diesel PM	g/mi	0.0E+00	0.0E+00	---	---	---	---	5.4E-03	5.4E-03	---	---	---	---

**Figure A-4. LDA Vehicle Class: Model Years 2010 and Newer  
(Hydrogen)**

**Scenario Year 2012: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		H2	H2	H3	H4c	H5	H7	H11	H13	H22	H23
WTT Description		H2, NG SR, LH2	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestrati on	H2, NG SR, Pipeline	H2, Biomass, Pipeline	H2, Onsite NG SR	H2, Onsite NG SR, Ren Power	H2, Grid Electrolysis	H2, 70% Renewable, Electrolysis
Vehicle Type		H2ICE	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV
Vehicle Technology		ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV
Fossil	MJ/mi	9.31	5.04	2.93	3.74	3.26	0.61	3.34	2.88	4.97	2.00
Petroleum	MJ/mi	0.06	0.03	0.02	0.05	0.01	0.09	0.01	0.01	0.01	0.03
Natural Gas	MJ/mi	9.25	5.01	2.90	0.55	3.24	0.51	3.32	2.87	4.95	1.97
Coal	MJ/mi	0.00	0.00	0.00	3.13	0.00	0.00	0.00	0.00	0.00	0.00
Non Fossil	MJ/mi	0.51	0.28	1.29	0.07	0.05	3.75	0.06	0.28	0.86	2.26
WTT	MJ/mi	6.29	3.41	2.30	1.90	1.39	2.44	1.48	1.25	3.91	2.35
TTW	MJ/mi	3.53	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91
GHGs (weighted)											
WTT	g/mi	568	308	177	96	200	40	198	170	319	161
TTW	g/mi	8	0	0	0	0	0	0	0	0	0
TOTAL	g/mi	576	308	177	96	200	40	198	170	319	161
Criteria, Total											
VOC	g/mi	0.062	0.032	0.019	0.032	0.020	0.011	0.021	0.018	0.032	0.021
CO	g/mi	0.187	0.062	0.029	0.029	0.032	0.033	0.032	0.024	0.079	0.036
NOx	g/mi	0.089	0.034	0.023	0.074	0.019	0.031	0.019	0.016	0.029	0.058
PM10 (x10)	g/mi	0.298	0.254	0.232	5.229	0.232	0.229	0.225	0.220	0.258	0.266
Criteria, Urban											
VOC	g/mi	0.004	0.001	0.000	0.000	0.000	0.003	0.000	0.000	0.001	0.004
CO	g/mi	0.104	0.017	0.001	0.004	0.004	0.016	0.006	0.002	0.040	0.012
NOx	g/mi	0.031	0.003	0.002	0.001	0.001	0.026	0.002	0.002	0.003	0.004
PM10 (x10)	g/mi	0.239	0.221	0.205	0.209	0.208	0.222	0.216	0.212	0.244	0.217
Urban Toxics, (weighted)											
Benzene	g/mi	2.1E-04	1.2E-04	4.8E-05	---	2.6E-05	---	2.6E-05	1.1E-05	2.0E-04	7.7E-05
1-3 Butadiene	g/mi	2.3E-04	1.3E-04	4.3E-05	---	4.1E-05	---	4.1E-05	2.2E-05	2.5E-04	9.4E-05
Formaldehyde	g/mi	1.5E-03	7.9E-04	1.3E-04	---	2.2E-04	---	2.2E-04	7.6E-05	2.0E-03	7.6E-04
Acetaldehyde	g/mi	7.6E-05	4.1E-05	1.7E-05	---	9.4E-06	---	9.4E-06	3.9E-06	7.4E-05	2.8E-05
Diesel PM	g/mi	1.6E-02	8.8E-03	8.8E-03	---	0.0E+00	---	0.0E+00	0.0E+00	0.0E+00	0.0E+00



**Figure A-4. LDA Vehicle Class: Model Years 2010 and Newer (continued)**

**Hydrogen**

**Scenario Year 2017: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		H2	H2	H3	H4c	H5	H7	H11	H13	H22	H23
WTT Description		H2, NG SR, LH2	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestration	H2, NG SR, Pipeline	H2, Biomass, Pipeline	H2, Onsite NG SR	H2, Onsite NG SR, Ren Power	H2, Grid Electrolysis	H2, 70% Renewable, Electrolysis
Vehicle Type		H2ICE	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV
Vehicle Technology		ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV
Fossil	MJ/mi	7.55	4.09	2.62	3.26	2.89	0.48	2.91	2.58	4.09	1.72
Petroleum	MJ/mi	0.05	0.03	0.02	0.05	0.01	0.08	0.01	0.01	0.01	0.03
Natural Gas	MJ/mi	7.49	4.06	2.60	0.44	2.88	0.41	2.90	2.57	4.08	1.69
Coal	MJ/mi	0.00	0.00	0.00	2.77	0.00	0.00	0.00	0.00	0.00	0.00
Non Fossil	MJ/mi	0.43	0.24	0.95	0.07	0.05	3.04	0.05	0.21	0.87	2.00
WTT	MJ/mi	4.80	2.60	1.85	1.61	1.22	1.80	1.24	1.07	3.24	1.99
TTW	MJ/mi	3.18	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72	1.72
GHGs (weighted)											
WTT	g/mi	459	249	158	82	178	32	172	152	265	141
TTW	g/mi	8	0	0	0	0	0	0	0	0	0
TOTAL	g/mi	468	249	158	82	178	32	172	152	265	141
Criteria, Total											
VOC	g/mi	0.050	0.025	0.017	0.028	0.017	0.007	0.018	0.016	0.026	0.018
CO	g/mi	0.177	0.048	0.025	0.025	0.028	0.024	0.027	0.022	0.065	0.031
NOx	g/mi	0.077	0.025	0.017	0.065	0.015	0.019	0.015	0.014	0.022	0.050
PM10 (x10)	g/mi	0.281	0.243	0.228	4.655	0.229	0.222	0.222	0.219	0.249	0.259
Criteria, Urban											
VOC	g/mi	0.004	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.001	0.004
CO	g/mi	0.111	0.012	0.001	0.003	0.003	0.011	0.005	0.002	0.033	0.010
NOx	g/mi	0.035	0.002	0.001	0.001	0.001	0.014	0.002	0.001	0.002	0.003
PM10 (x10)	g/mi	0.233	0.217	0.206	0.209	0.208	0.215	0.215	0.212	0.238	0.216
Urban Toxics, (weighted)											
Benzene	g/mi	1.6E-04	8.7E-05	3.0E-05	---	2.3E-05	---	2.3E-05	9.8E-06	1.7E-04	6.8E-05
1-3 Butadiene	g/mi	1.9E-04	1.0E-04	3.1E-05	---	3.6E-05	---	3.6E-05	2.0E-05	2.1E-04	8.3E-05
Formaldehyde	g/mi	1.2E-03	6.6E-04	9.9E-05	---	1.9E-04	---	1.9E-04	6.8E-05	1.7E-03	6.7E-04
Acetaldehyde	g/mi	5.8E-05	3.1E-05	1.0E-05	---	8.2E-06	---	8.2E-06	3.5E-06	6.3E-05	2.5E-05
Diesel PM	g/mi	7.8E-03	4.2E-03	4.2E-03	---	0.0E+00	---	0.0E+00	0.0E+00	0.0E+00	0.0E+00

**Figure A-4. LDA Vehicle Class: Model Years 2010 and Newer (continued)**

**Hydrogen**

**Scenario Year 2022: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		H2	H2	H3	H4c	H5	H7	H11	H13	H22	H23
WTT Description		H2, NG SR, LH2	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestration	H2, NG SR, Pipeline	H2, Biomass, Pipeline	H2, Onsite NG SR	H2, Onsite NG SR, Ren Power	H2, Grid Electrolysis	H2, 70% Renewable, Electrolysis
Vehicle Type		H2ICE	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV
Vehicle Technology		ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV
Fossil	MJ/mi	6.60	3.58	2.44	3.00	2.68	0.42	2.64	2.40	3.45	1.54
Petroleum	MJ/mi	0.05	0.02	0.02	0.04	0.01	0.07	0.01	0.01	0.01	0.03
Natural Gas	MJ/mi	6.55	3.55	2.42	0.38	2.67	0.35	2.63	2.39	3.44	1.52
Coal	MJ/mi	0.00	0.00	0.00	2.58	0.00	0.00	0.00	0.00	0.00	0.00
Non Fossil	MJ/mi	0.40	0.22	0.79	0.07	0.05	2.74	0.05	0.16	0.89	1.83
WTT	MJ/mi	4.00	2.16	1.60	1.45	1.11	1.53	1.06	0.94	2.71	1.74
TTW	MJ/mi	3.01	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
GHGs (weighted)											
WTT	g/mi	401	217	147	74	165	28	156	142	225	128
TTW	g/mi	8	0	0	0	0	0	0	0	0	0
TOTAL	g/mi	410	217	147	74	165	28	156	142	225	128
Criteria, Total											
VOC	g/mi	0.044	0.022	0.015	0.026	0.016	0.005	0.016	0.015	0.022	0.016
CO	g/mi	0.175	0.041	0.023	0.022	0.026	0.020	0.024	0.020	0.056	0.028
NOx	g/mi	0.072	0.020	0.014	0.061	0.014	0.013	0.013	0.012	0.018	0.046
PM10 (x10)	g/mi	0.273	0.237	0.225	4.346	0.227	0.218	0.220	0.217	0.242	0.255
Criteria, Urban											
VOC	g/mi	0.004	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.003
CO	g/mi	0.117	0.009	0.001	0.003	0.003	0.010	0.004	0.002	0.028	0.009
NOx	g/mi	0.038	0.002	0.001	0.001	0.001	0.008	0.001	0.001	0.002	0.002
PM10 (x10)	g/mi	0.231	0.214	0.206	0.208	0.208	0.211	0.213	0.212	0.233	0.215
Urban Toxics, (weighted)											
Benzene	g/mi	1.3E-04	7.2E-05	2.2E-05	---	2.1E-05	---	2.1E-05	9.3E-06	1.5E-04	6.3E-05
1-3 Butadiene	g/mi	1.6E-04	8.8E-05	2.6E-05	---	3.3E-05	---	3.3E-05	1.9E-05	1.9E-04	7.7E-05
Formaldehyde	g/mi	1.1E-03	5.8E-04	8.4E-05	---	1.8E-04	---	1.8E-04	6.4E-05	1.5E-03	6.2E-04
Acetaldehyde	g/mi	4.8E-05	2.6E-05	7.8E-06	---	7.4E-06	---	7.4E-06	3.3E-06	5.6E-05	2.3E-05
Diesel PM	g/mi	4.4E-03	2.4E-03	2.4E-03	---	0.0E+00	---	0.0E+00	0.0E+00	0.0E+00	0.0E+00

**Figure A-4. LDA Vehicle Class: Model Years 2010 and Newer (concluded)**

**Hydrogen**

**Scenario Year 2030: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		H2	H2	H3	H4c	H5	H7	H11	H13	H22	H23
WTT Description		H2, NG SR, LH2	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestration	H2, NG SR, Pipeline	H2, Biomass, Pipeline	H2, Onsite NG SR	H2, Onsite NG SR, Ren Power	H2, Grid Electrolysis	H2, 70% Renewable, Electrolysis
Vehicle Type		H2ICE	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV
Vehicle Technology		ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV
Fossil	MJ/mi	6.20	3.36	2.29	2.82	2.52	0.40	2.48	2.26	3.16	1.45
Petroleum	MJ/mi	0.04	0.02	0.02	0.04	0.01	0.06	0.01	0.01	0.01	0.02
Natural Gas	MJ/mi	6.16	3.33	2.27	0.35	2.51	0.33	2.47	2.25	3.15	1.42
Coal	MJ/mi	0.00	0.00	0.00	2.43	0.00	0.00	0.00	0.00	0.00	0.00
Non Fossil	MJ/mi	0.38	0.21	0.74	0.07	0.05	2.58	0.04	0.15	0.92	1.72
WTT	MJ/mi	3.75	2.03	1.50	1.36	1.04	1.44	0.99	0.88	2.55	1.63
TTW	MJ/mi	2.83	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53
GHGs (weighted)											
WTT	g/mi	377	204	138	70	155	26	147	133	212	121
TTW	g/mi	8	0	0	0	0	0	0	0	0	0
TOTAL	g/mi	386	204	138	70	155	26	147	133	212	121
Criteria, Total											
VOC	g/mi	0.042	0.021	0.014	0.024	0.015	0.005	0.015	0.014	0.021	0.015
CO	g/mi	0.182	0.038	0.022	0.021	0.024	0.019	0.022	0.019	0.052	0.026
NOx	g/mi	0.073	0.019	0.013	0.057	0.013	0.011	0.013	0.011	0.017	0.043
PM10 (x10)	g/mi	0.271	0.235	0.224	4.095	0.225	0.217	0.219	0.216	0.239	0.251
Criteria, Urban											
VOC	g/mi	0.005	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.003
CO	g/mi	0.128	0.009	0.001	0.003	0.003	0.009	0.004	0.002	0.026	0.008
NOx	g/mi	0.043	0.002	0.001	0.001	0.001	0.007	0.001	0.001	0.002	0.002
PM10 (x10)	g/mi	0.233	0.214	0.206	0.208	0.208	0.211	0.213	0.211	0.231	0.214
Urban Toxics, (weighted)											
Benzene	g/mi	1.1E-04	6.2E-05	1.8E-05	---	1.9E-05	---	1.9E-05	8.7E-06	1.3E-04	5.9E-05
1-3 Butadiene	g/mi	1.4E-04	7.7E-05	2.3E-05	---	3.0E-05	---	3.0E-05	1.8E-05	1.6E-04	7.2E-05
Formaldehyde	g/mi	9.3E-04	5.0E-04	7.5E-05	---	1.6E-04	---	1.6E-04	6.0E-05	1.3E-03	5.8E-04
Acetaldehyde	g/mi	4.1E-05	2.2E-05	6.3E-06	---	6.7E-06	---	6.7E-06	3.1E-06	4.8E-05	2.2E-05
Diesel PM	g/mi	2.8E-03	1.5E-03	1.5E-03	---	0.0E+00	---	0.0E+00	0.0E+00	0.0E+00	0.0E+00

**Figure A-5. LDA Vehicle Class: All Model Years  
(E85)**

**Scenario Year 2012: LDA Vehicle Class: All Model Years (blend)**

WTT Case ID		Et1	Et2	Et3	Et4	Et74	Et77	Et21	Et23
WTT Description		Ethanol, Corn, MW Ave	Ethanol, Corn, MW Coal	Ethanol, Corn, MW NG	Ethanol, Corn, MW NG, Wet Feed	Ethanol, CA Corn, Wet Feed	Ethanol, Brazil Sugar Cane	Ethanol, CA Poplar, Cellulose	Ethanol, CA Switch Grass
Vehicle Type		E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV
Vehicle Technology		FFV	FFV	FFV	FFV	FFV	FFV	FFV	FFV
Fossil	MJ/mi	4.33	4.59	4.24	3.69	3.48	1.53	1.32	1.74
Petroleum	MJ/mi	1.59	1.63	1.61	1.61	1.49	1.38	1.49	1.44
Natural Gas	MJ/mi	2.08	0.62	2.30	1.75	1.98	0.15	-0.17	0.29
Coal	MJ/mi	0.65	2.35	0.34	0.34	0.01	0.00	0.01	0.01
Non Fossil	MJ/mi	3.95	3.95	3.95	3.95	3.92	10.77	10.86	9.58
WTT	MJ/mi	3.37	3.64	3.28	2.73	2.50	7.39	7.28	6.41
TTW	MJ/mi	4.91	4.91	4.91	4.91	4.91	4.91	4.91	4.91
GHGs (weighted)									
WTT	g/mi	43	184	14	-19	-57	-207	-228	-164
TTW	g/mi	360	360	360	360	360	360	360	360
TOTAL	g/mi	402	544	373	340	302	153	132	195
Criteria, Total									
VOC	g/mi	0.447	0.480	0.474	0.470	0.463	---	0.416	0.444
CO	g/mi	3.277	3.421	3.321	3.304	3.223	---	3.082	3.028
NOx	g/mi	0.920	1.150	0.884	0.863	0.548	---	0.967	0.926
PM10 (x10)	g/mi	2.369	6.635	1.586	1.567	0.970	---	1.463	1.353
Criteria, Urban									
VOC	g/mi	0.312	0.312	0.312	0.312	0.312	---	0.317	0.322
CO	g/mi	2.633	2.634	2.634	2.634	2.635	---	2.664	2.684
NOx	g/mi	0.250	0.251	0.253	0.252	0.234	---	0.308	0.338
PM10 (x10)	g/mi	0.339	0.340	0.340	0.340	0.339	---	0.372	0.393
Urban Toxics, (weighted)									
Benzene	g/mi	2.3E-02	2.3E-02	2.3E-02	2.3E-02	---	---	---	---
1-3 Butadiene	g/mi	2.6E-02	2.6E-02	2.6E-02	2.6E-02	---	---	---	---
Formaldehyde	g/mi	2.4E-03	2.4E-03	2.4E-03	2.4E-03	---	---	---	---
Acetaldehyde	g/mi	2.6E-04	2.6E-04	2.6E-04	2.6E-04	---	---	---	---
Diesel PM	g/mi	9.7E-02	9.7E-02	9.7E-02	9.7E-02	---	---	---	---

**Figure A-5. LDA Vehicle Class: All Model Years (continued)**

**E85**

**Scenario Year 2017: LDA Vehicle Class: All Model Years (blend)**

WTT Case ID		Et1	Et2	Et3	Et4	Et74	Et77	Et21	Et23
WTT Description		Ethanol, Corn, MW Ave	Ethanol, Corn, MW Coal	Ethanol, Corn, MW NG	Ethanol, Corn, MWNG, Wet Feed	Ethanol, CA Corn, Wet Feed	Ethanol, Brazil Sugar Cane	Ethanol, CA Poplar, Cellulose	Ethanol, CA Switch Grass
Vehicle Type		E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV
Vehicle Technology		FFV	FFV	FFV	FFV	FFV	FFV	FFV	FFV
Fossil	MJ/mi	3.90	4.15	3.83	3.33	3.12	1.39	1.18	1.46
Petroleum	MJ/mi	1.44	1.47	1.46	1.45	1.35	1.25	1.33	1.26
Natural Gas	MJ/mi	1.89	0.56	2.08	1.58	1.76	0.13	-0.16	0.20
Coal	MJ/mi	0.57	2.11	0.29	0.29	0.01	0.00	0.01	0.01
Non Fossil	MJ/mi	3.57	3.58	3.57	3.57	3.56	9.76	8.93	6.71
WTT	MJ/mi	3.03	3.28	2.95	2.45	2.23	6.70	5.66	3.73
TTW	MJ/mi	4.45	4.45	4.45	4.45	4.45	4.45	4.45	4.45
GHGs (weighted)									
WTT	g/mi	34	162	8	-22	-57	-188	-210	-168
TTW	g/mi	327	327	327	327	327	327	327	327
TOTAL	g/mi	360	489	335	305	270	139	117	159
Criteria, Total									
VOC	g/mi	0.343	0.371	0.366	0.362	0.356	---	0.313	0.329
CO	g/mi	2.315	2.443	2.352	2.337	2.265	---	2.115	2.028
NOx	g/mi	0.713	0.870	0.689	0.670	0.386	---	0.706	0.610
PM10 (x10)	g/mi	2.086	5.734	1.416	1.399	0.887	---	1.274	1.123
Criteria, Urban									
VOC	g/mi	0.229	0.229	0.229	0.229	0.228	---	0.230	0.231
CO	g/mi	1.754	1.754	1.754	1.754	1.754	---	1.774	1.785
NOx	g/mi	0.162	0.162	0.163	0.163	0.146	---	0.185	0.194
PM10 (x10)	g/mi	0.342	0.342	0.343	0.342	0.341	---	0.355	0.362
Urban Toxics, (weighted)									
Benzene	g/mi	1.5E-02	1.5E-02	1.5E-02	1.5E-02	---	---	---	---
1-3 Butadiene	g/mi	1.6E-02	1.6E-02	1.6E-02	1.6E-02	---	---	---	---
Formaldehyde	g/mi	1.5E-03	1.5E-03	1.5E-03	1.5E-03	---	---	---	---
Acetaldehyde	g/mi	1.6E-04	1.6E-04	1.6E-04	1.6E-04	---	---	---	---
Diesel PM	g/mi	8.1E-02	8.1E-02	8.1E-02	8.1E-02	---	---	---	---

**Figure A-5. LDA Vehicle Class: All Model Years (continued)**

**E85**

**Scenario Year 2022: LDA Vehicle Class: All Model Years (blend)**

WTT Case ID		Et1	Et2	Et3	Et4	Et74	Et77	Et21	Et23
WTT Description		Ethanol, Corn, MW Ave	Ethanol, Corn, MW Coal	Ethanol, Corn, MW NG	Ethanol, Corn, MWNG, Wet Feed	Ethanol, CA Corn, Wet Feed	Ethanol, Brazil Sugar Cane	Ethanol, CA Poplar, Cellulose	Ethanol, CA Switch Grass
Vehicle Type		E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV
Vehicle Technology		FFV	FFV	FFV	FFV	FFV	FFV	FFV	FFV
Fossil	MJ/mi	3.50	3.72	3.43	2.98	2.77	1.24	1.05	1.30
Petroleum	MJ/mi	1.29	1.32	1.31	1.31	1.21	1.12	1.18	1.12
Natural Gas	MJ/mi	1.69	0.50	1.87	1.42	1.55	0.12	-0.14	0.17
Coal	MJ/mi	0.51	1.89	0.26	0.25	0.01	0.00	0.01	0.01
Non Fossil	MJ/mi	3.21	3.21	3.21	3.21	3.21	8.78	7.59	5.75
WTT	MJ/mi	2.71	2.93	2.64	2.19	1.98	6.02	4.64	3.05
TTW	MJ/mi	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
GHGs (weighted)									
WTT	g/mi	27	143	4	-23	-55	-169	-190	-153
TTW	g/mi	295	295	295	295	295	295	295	295
TOTAL	g/mi	322	437	299	272	240	126	105	141
Criteria, Total									
VOC	g/mi	0.277	0.300	0.295	0.292	0.286	--	0.246	0.260
CO	g/mi	1.719	1.832	1.750	1.736	1.671	--	1.521	1.450
NOx	g/mi	0.577	0.699	0.558	0.541	0.286	--	0.551	0.479
PM10 (x10)	g/mi	1.876	5.090	1.285	1.269	0.819	--	1.140	1.018
Criteria, Urban									
VOC	g/mi	0.175	0.175	0.175	0.175	0.174	--	0.174	0.175
CO	g/mi	1.217	1.216	1.217	1.217	1.217	--	1.232	1.241
NOx	g/mi	0.112	0.112	0.113	0.112	0.097	--	0.118	0.124
PM10 (x10)	g/mi	0.344	0.344	0.344	0.344	0.343	--	0.347	0.351
Urban Toxics, (weighted)									
Benzene	g/mi	1.1E-02	1.1E-02	1.1E-02	1.1E-02	--	--	--	--
1-3 Butadiene	g/mi	1.1E-02	1.1E-02	1.1E-02	1.1E-02	--	--	--	--
Formaldehyde	g/mi	1.0E-03	1.0E-03	1.0E-03	1.0E-03	--	--	--	--
Acetaldehyde	g/mi	1.1E-04	1.1E-04	1.1E-04	1.1E-04	--	--	--	--
Diesel PM	g/mi	7.0E-02	7.0E-02	7.0E-02	7.0E-02	--	--	--	--

**Figure A-5. LDA Vehicle Class: All Model Years (concluded)**

**E85**

**Scenario Year 2030: LDA Vehicle Class: All Model Years (blend)**

WTT Case ID		Et1	Et2	Et3	Et4	Et74	Et77	Et21	Et23
WTT Description		Ethanol, Corn, MW Ave	Ethanol, Corn, MW Coal	Ethanol, Corn, MW NG	Ethanol, Corn, MW NG, Wet Feed	Ethanol, CA Corn, Wet Feed	Ethanol, Brazil Sugar Cane	Ethanol, CA Poplar, Cellulose	Ethanol, CA Switch Grass
Vehicle Type		E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV
Vehicle Technology		FFV	FFV	FFV	FFV	FFV	FFV	FFV	FFV
Fossil	MJ/mi	3.14	3.33	3.07	2.67	2.48	1.11	0.94	1.16
Petroleum	MJ/mi	1.16	1.19	1.17	1.17	1.09	1.01	1.06	1.01
Natural Gas	MJ/mi	1.52	0.45	1.67	1.27	1.39	0.11	-0.13	0.15
Coal	MJ/mi	0.46	1.70	0.23	0.23	0.01	0.00	0.00	0.00
Non Fossil	MJ/mi	2.88	2.88	2.87	2.87	2.87	7.86	6.80	5.15
WTT	MJ/mi	2.43	2.63	2.37	1.96	1.78	5.40	4.15	2.73
TTW	MJ/mi	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
GHGs (weighted)									
WTT	g/mi	24	128	3	-21	-49	-151	-170	-137
TTW	g/mi	265	265	265	265	265	265	265	265
TOTAL	g/mi	289	393	268	244	216	114	95	128
Criteria, Total									
VOC	g/mi	0.215	0.235	0.231	0.228	0.223	---	0.187	0.200
CO	g/mi	1.257	1.358	1.285	1.273	1.215	---	1.079	1.017
NOx	g/mi	0.489	0.599	0.473	0.457	0.229	---	0.465	0.402
PM10 (x10)	g/mi	1.715	4.595	1.186	1.172	0.768	---	1.056	0.947
Criteria, Urban									
VOC	g/mi	0.124	0.124	0.124	0.124	0.123	---	0.123	0.123
CO	g/mi	0.808	0.808	0.808	0.808	0.808	---	0.821	0.830
NOx	g/mi	0.076	0.075	0.076	0.076	0.062	---	0.080	0.085
PM10 (x10)	g/mi	0.344	0.344	0.344	0.344	0.343	---	0.347	0.350
Urban Toxics, (weighted)									
Benzene	g/mi	6.9E-03	6.9E-03	6.9E-03	6.9E-03	---	---	---	---
1-3 Butadiene	g/mi	6.4E-03	6.4E-03	6.4E-03	6.4E-03	---	---	---	---
Formaldehyde	g/mi	6.5E-04	6.5E-04	6.5E-04	6.5E-04	---	---	---	---
Acetaldehyde	g/mi	7.3E-05	7.3E-05	7.3E-05	7.3E-05	---	---	---	---
Diesel PM	g/mi	6.1E-02	6.1E-02	6.1E-02	6.1E-02	---	---	---	---

**Figure A-6. LDA Vehicle Class: Model Years 2010 and Newer  
(E85)**

**Scenario Year 2012: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		Et1	Et2	Et3	Et4	Et74	Et77	Et21	Et23
WTT Description		Ethanol, Corn, MW Ave	Ethanol, Corn, MW Coal	Ethanol, Corn, MW NG	Ethanol, Corn, MW NG, Wet Feed	Ethanol, CA Corn, Wet Feed	Ethanol, Brazil Sugar Cane	Ethanol, CA Poplar, Cellulose	Ethanol, CA Switch Grass
Vehicle Type		E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV
Vehicle Technology		FFV	FFV	FFV	FFV	FFV	FFV	FFV	FFV
Fossil	MJ/mi	3.93	4.17	3.86	3.35	3.16	1.39	1.20	1.58
Petroleum	MJ/mi	1.45	1.48	1.46	1.46	1.36	1.25	1.36	1.31
Natural Gas	MJ/mi	1.89	0.56	2.09	1.59	1.80	0.13	-0.16	0.27
Coal	MJ/mi	0.59	2.14	0.31	0.30	0.01	0.00	0.01	0.01
Non Fossil	MJ/mi	3.59	3.59	3.59	3.59	3.57	9.79	9.87	8.71
WTT	MJ/mi	3.06	3.31	2.98	2.48	2.27	6.72	6.62	5.83
TTW	MJ/mi	4.46	4.46	4.46	4.46	4.46	4.46	4.46	4.46
GHGs (weighted)									
WTT	g/mi	39	167	12	-17	-52	-188	-207	-149
TTW	g/mi	328	328	328	328	328	328	328	328
TOTAL	g/mi	367	495	340	310	276	140	120	178
Criteria, Total									
VOC	g/mi	0.176	0.206	0.200	0.197	0.191	---	0.147	0.173
CO	g/mi	0.951	1.082	0.991	0.975	0.902	---	0.773	0.725
NOx	g/mi	0.659	0.868	0.627	0.607	0.321	---	0.702	0.665
PM10 (x10)	g/mi	2.094	5.971	1.382	1.364	0.822	---	1.270	1.170
Criteria, Urban									
VOC	g/mi	0.053	0.053	0.054	0.054	0.053	---	0.058	0.062
CO	g/mi	0.366	0.366	0.366	0.366	0.367	---	0.393	0.412
NOx	g/mi	0.050	0.052	0.053	0.052	0.036	---	0.103	0.130
PM10 (x10)	g/mi	0.248	0.249	0.249	0.249	0.248	---	0.278	0.297
Urban Toxics, (weighted)									
Benzene	g/mi	2.3E-03	2.3E-03	2.3E-03	2.3E-03	---	---	---	---
1-3 Butadiene	g/mi	2.4E-03	2.4E-03	2.4E-03	2.4E-03	---	---	---	---
Formaldehyde	g/mi	4.2E-04	4.2E-04	4.2E-04	4.2E-04	---	---	---	---
Acetaldehyde	g/mi	6.2E-05	6.2E-05	6.2E-05	6.2E-05	---	---	---	---
Diesel PM	g/mi	8.8E-02	8.8E-02	8.8E-02	8.8E-02	---	---	---	---



**Figure A-6. LDA Vehicle Class: Model Years 2010 and Newer (continued)**

**E85**

**Scenario Year 2017: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		Et1	Et2	Et3	Et4	Et74	Et77	Et21	Et23
WTT Description		Ethanol, Corn, MW Ave	Ethanol, Corn, MW Coal	Ethanol, Corn, MW NG	Ethanol, Corn, MW NG, Wet Feed	Ethanol, CA Corn, Wet Feed	Ethanol, Brazil Sugar Cane	Ethanol, CA Poplar, Cellulose	Ethanol, CA Switch Grass
Vehicle Type		E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV
Vehicle Technology		FFV	FFV	FFV	FFV	FFV	FFV	FFV	FFV
Fossil	MJ/mi	3.52	3.74	3.46	3.00	2.81	1.25	1.06	1.32
Petroleum	MJ/mi	1.30	1.33	1.31	1.31	1.22	1.13	1.20	1.13
Natural Gas	MJ/mi	1.70	0.51	1.88	1.43	1.59	0.12	-0.14	0.18
Coal	MJ/mi	0.52	1.91	0.26	0.26	0.01	0.00	0.01	0.01
Non Fossil	MJ/mi	3.23	3.23	3.23	3.23	3.22	8.81	8.06	6.06
WTT	MJ/mi	2.74	2.96	2.67	2.21	2.02	6.05	5.11	3.36
TTW	MJ/mi	4.02	4.02	4.02	4.02	4.02	4.02	4.02	4.02
GHGs (weighted)									
WTT	g/mi	30	146	7	-20	-51	-170	-189	-151
TTW	g/mi	296	296	296	296	296	296	296	296
TOTAL	g/mi	326	442	303	276	245	126	107	145
Criteria, Total									
VOC	g/mi	0.162	0.188	0.183	0.179	0.174	---	0.135	0.149
CO	g/mi	0.952	1.069	0.987	0.973	0.907	---	0.772	0.694
NOx	g/mi	0.549	0.691	0.527	0.510	0.253	---	0.542	0.456
PM10 (x10)	g/mi	1.855	5.149	1.250	1.234	0.772	---	1.121	0.985
Criteria, Urban									
VOC	g/mi	0.059	0.059	0.059	0.059	0.059	---	0.060	0.061
CO	g/mi	0.446	0.446	0.446	0.446	0.446	---	0.464	0.474
NOx	g/mi	0.051	0.051	0.052	0.052	0.037	---	0.072	0.080
PM10 (x10)	g/mi	0.280	0.280	0.280	0.280	0.279	---	0.291	0.298
Urban Toxics, (weighted)									
Benzene	g/mi	2.8E-03	2.8E-03	2.8E-03	2.8E-03	---	---	---	---
1-3 Butadiene	g/mi	2.8E-03	2.8E-03	2.8E-03	2.8E-03	---	---	---	---
Formaldehyde	g/mi	4.0E-04	4.0E-04	4.0E-04	4.0E-04	---	---	---	---
Acetaldehyde	g/mi	5.3E-05	5.3E-05	5.3E-05	5.3E-05	---	---	---	---
Diesel PM	g/mi	7.3E-02	7.3E-02	7.3E-02	7.3E-02	---	---	---	---

**Figure A-6. LDA Vehicle Class: Model Years 2010 and Newer (continued)**

**E85**

**Scenario Year 2022: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		Et1	Et2	Et3	Et4	Et74	Et77	Et21	Et23
WTT Description		Ethanol, Corn, MW Ave	Ethanol, Corn, MW Coal	Ethanol, Corn, MW NG	Ethanol, Corn, MW NG, Wet Feed	Ethanol, CA Corn, Wet Feed	Ethanol, Brazil Sugar Cane	Ethanol, CA Poplar, Cellulose	Ethanol, CA Switch Grass
Vehicle Type		E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV
Vehicle Technology		FFV	FFV	FFV	FFV	FFV	FFV	FFV	FFV
Fossil	MJ/mi	3.32	3.53	3.26	2.83	2.63	1.18	1.00	1.23
Petroleum	MJ/mi	1.23	1.26	1.24	1.24	1.15	1.07	1.12	1.07
Natural Gas	MJ/mi	1.61	0.48	1.77	1.35	1.48	0.11	-0.13	0.16
Coal	MJ/mi	0.49	1.80	0.24	0.24	0.01	0.00	0.00	0.00
Non Fossil	MJ/mi	3.05	3.05	3.05	3.05	3.05	8.34	7.21	5.46
WTT	MJ/mi	2.58	2.79	2.51	2.08	1.88	5.72	4.40	2.90
TTW	MJ/mi	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
GHGs (weighted)									
WTT	g/mi	26	135	4	-22	-52	-160	-180	-146
TTW	g/mi	280	280	280	280	280	280	280	280
TOTAL	g/mi	306	416	284	259	228	120	100	135
Criteria, Total									
VOC	g/mi	0.165	0.187	0.182	0.179	0.174	---	0.136	0.149
CO	g/mi	0.982	1.089	1.011	0.998	0.937	---	0.793	0.726
NOx	g/mi	0.494	0.610	0.476	0.460	0.218	---	0.469	0.401
PM10 (x10)	g/mi	1.760	4.813	1.199	1.184	0.756	---	1.061	0.945
Criteria, Urban									
VOC	g/mi	0.068	0.068	0.069	0.069	0.068	---	0.067	0.068
CO	g/mi	0.505	0.504	0.505	0.505	0.505	---	0.519	0.528
NOx	g/mi	0.053	0.052	0.053	0.053	0.039	---	0.058	0.064
PM10 (x10)	g/mi	0.305	0.305	0.305	0.305	0.304	---	0.308	0.312
Urban Toxics, (weighted)									
Benzene	g/mi	3.4E-03	3.4E-03	3.4E-03	3.4E-03	---	---	---	---
1-3 Butadiene	g/mi	3.2E-03	3.2E-03	3.2E-03	3.2E-03	---	---	---	---
Formaldehyde	g/mi	4.1E-04	4.1E-04	4.1E-04	4.1E-04	---	---	---	---
Acetaldehyde	g/mi	5.0E-05	5.0E-05	5.0E-05	5.0E-05	---	---	---	---
Diesel PM	g/mi	6.6E-02	6.6E-02	6.6E-02	6.6E-02	---	---	---	---

**Figure A-6. LDA Vehicle Class: Model Years 2010 and Newer (concluded)**

**E85**

**Scenario Year 2030: LDA Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		Et1	Et2	Et3	Et4	Et74	Et77	Et21	Et23
WTT Description		Ethanol, Corn, MW Ave	Ethanol, Corn, MW Coal	Ethanol, Corn, MW NG	Ethanol, Corn, MW NG, Wet Feed	Ethanol, CA Corn, Wet Feed	Ethanol, Brazil Sugar Cane	Ethanol, CA Poplar, Cellulose	Ethanol, CA Switch Grass
Vehicle Type		E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV	E85 FFV
Vehicle Technology		FFV	FFV	FFV	FFV	FFV	FFV	FFV	FFV
Fossil	MJ/mi	3.12	3.32	3.06	2.66	2.47	1.11	0.94	1.16
Petroleum	MJ/mi	1.15	1.18	1.17	1.16	1.08	1.00	1.06	1.00
Natural Gas	MJ/mi	1.51	0.45	1.67	1.27	1.39	0.11	-0.12	0.15
Coal	MJ/mi	0.46	1.69	0.23	0.23	0.01	0.00	0.00	0.00
Non Fossil	MJ/mi	2.86	2.87	2.86	2.86	2.86	7.83	6.77	5.13
WTT	MJ/mi	2.42	2.62	2.36	1.95	1.77	5.37	4.14	2.72
TTW	MJ/mi	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57
GHGs (weighted)									
WTT	g/mi	24	127	3	-20	-49	-151	-169	-137
TTW	g/mi	264	264	264	264	264	264	264	264
TOTAL	g/mi	288	391	267	244	215	113	95	127
Criteria, Total									
VOC	g/mi	0.171	0.191	0.187	0.184	0.179	---	0.143	0.156
CO	g/mi	1.008	1.108	1.036	1.023	0.965	---	0.831	0.768
NOx	g/mi	0.468	0.577	0.451	0.436	0.208	---	0.444	0.381
PM10 (x10)	g/mi	1.694	4.562	1.167	1.153	0.751	---	1.037	0.929
Criteria, Urban									
VOC	g/mi	0.080	0.080	0.080	0.080	0.080	---	0.079	0.080
CO	g/mi	0.560	0.560	0.561	0.561	0.561	---	0.574	0.582
NOx	g/mi	0.056	0.055	0.056	0.056	0.042	---	0.059	0.065
PM10 (x10)	g/mi	0.328	0.328	0.329	0.328	0.327	---	0.331	0.334
Urban Toxics, (weighted)									
Benzene	g/mi	4.2E-03	4.2E-03	4.2E-03	4.2E-03	---	---	---	---
1-3 Butadiene	g/mi	3.8E-03	3.8E-03	3.8E-03	3.8E-03	---	---	---	---
Formaldehyde	g/mi	4.4E-04	4.4E-04	4.4E-04	4.4E-04	---	---	---	---
Acetaldehyde	g/mi	5.2E-05	5.2E-05	5.2E-05	5.2E-05	---	---	---	---
Diesel PM	g/mi	6.1E-02	6.1E-02	6.1E-02	6.1E-02	---	---	---	---

**Figure A-7. LDA Vehicle Class: All Model Years  
(Biodiesel Blends, Renewable Diesel Blends and XTL Blends)**

**Scenario Year 2012: LDA Vehicle Class: All Model Years (blend)**

WTT Case ID		D2	D6	BD1	BD3	BD4	BD5	BD23	F1	F3	F5
WTT Description		Diesel, CA ULSD	E-Diesel, Ave. MW EtOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	BTL, CA Poplar	CTL, Coal CCS
Vehicle Type		ULSD	ULSD	BD20	BD20	BD20	FTD 30	FTD 30	FTD 30	FTD 30	FTD 30
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	4.89	4.82	4.31	4.37	4.48	3.64	3.64	5.48	3.53	5.88
Petroleum	MJ/mi	4.47	4.29	3.71	3.76	3.79	3.17	3.17	3.19	3.21	3.20
Natural Gas	MJ/mi	0.42	0.42	0.60	0.62	0.69	0.46	0.46	2.30	0.31	0.42
Coal	MJ/mi	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.26
Non Fossil	MJ/mi	0.01	0.22	0.76	0.77	0.77	1.22	1.22	0.00	2.05	0.02
WTT	MJ/mi	0.85	1.00	1.03	1.10	1.20	0.81	0.81	1.44	1.54	1.86
TTW	MJ/mi	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04
GHGs (weighted)											
WTT	g/mi	67	72	16	21	27	-6	-2	87	-31	87
TTW	g/mi	309	309	310	310	310	305	305	305	305	305
TOTAL	g/mi	375	381	326	331	337	299	303	392	274	392
Criteria, Total											
VOC	g/mi	0.220	0.227	0.286	0.297	0.362	---	---	0.178	0.168	0.181
CO	g/mi	0.823	0.861	0.856	1.056	1.139	---	---	0.705	0.700	0.693
NOx	g/mi	1.685	1.751	1.711	1.739	1.748	---	---	1.618	1.587	1.600
PM10 (x10)	g/mi	1.548	1.789	1.438	1.461	1.463	---	---	1.444	1.441	5.027
Criteria, Urban											
VOC	g/mi	0.191	0.191	0.153	0.153	0.154	---	---	0.145	0.147	0.145
CO	g/mi	0.758	0.758	0.679	0.679	0.681	---	---	0.637	0.643	0.638
NOx	g/mi	1.467	1.468	1.509	1.509	1.516	---	---	1.395	1.408	1.394
PM10 (x10)	g/mi	1.388	1.388	1.279	1.279	1.282	---	---	1.298	1.305	1.298
Urban Toxics, (weighted)											
Benzene	g/mi	1.7E-02	---	---	---	---	---	---	1.3E-02	---	---
1-3 Butadiene	g/mi	9.5E-03	---	---	---	---	---	---	7.1E-03	---	---
Formaldehyde	g/mi	2.6E-02	---	---	---	---	---	---	2.0E-02	---	---
Acetaldehyde	g/mi	5.8E-03	---	---	---	---	---	---	4.4E-03	---	---
Diesel PM	g/mi	5.7E+00	---	---	---	---	---	---	5.2E+00	---	---

## Figure A-7. LDA Vehicle Class: All Model Years (continued)

### Biodiesel Blends, Renewable Diesel Blends and XTL Blends

#### Scenario Year 2017: LDA Vehicle Class: All Model Years (blend)

WTT Case ID		D2	D6	BD1	BD3	BD4	BD5	BD23	F1	F3	F5
WTT Description		Diesel, CA ULSD	E-Diesel, Ave. MW ETOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	BTL, CA Poplar	CTL, Coal CCS
Vehicle Type		ULSD	ULSD	BD20	BD20	BD20	FTD 30	FTD 30	FTD 30	FTD 30	FTD 30
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	4.43	4.37	3.90	3.95	4.05	3.29	3.29	4.94	3.19	5.32
Petroleum	MJ/mi	4.05	3.89	3.36	3.40	3.43	2.88	2.88	2.89	2.91	2.90
Natural Gas	MJ/mi	0.38	0.39	0.54	0.55	0.62	0.42	0.42	2.05	0.28	0.38
Coal	MJ/mi	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.04
Non Fossil	MJ/mi	0.01	0.20	0.69	0.69	0.70	1.11	1.11	0.00	1.86	0.02
WTT	MJ/mi	0.77	0.90	0.93	0.98	1.08	0.73	0.73	1.28	1.39	1.67
TTW	MJ/mi	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66
GHGs (weighted)											
WTT	g/mi	60	65	14	19	24	-6	-2	76	-28	78
TTW	g/mi	281	281	282	282	282	277	277	277	277	277
TOTAL	g/mi	341	346	296	301	305	272	275	353	249	356
Criteria, Total											
VOC	g/mi	0.187	0.194	0.247	0.254	0.311	---	---	0.152	0.142	0.155
CO	g/mi	0.777	0.810	0.796	0.968	1.038	---	---	0.664	0.658	0.653
NOx	g/mi	1.657	1.714	1.676	1.695	1.699	---	---	1.589	1.553	1.573
PM10 (x10)	g/mi	1.377	1.587	1.278	1.295	1.295	---	---	1.287	1.279	4.534
Criteria, Urban											
VOC	g/mi	0.161	0.161	0.129	0.129	0.130	---	---	0.123	0.124	0.123
CO	g/mi	0.718	0.718	0.642	0.642	0.643	---	---	0.603	0.608	0.604
NOx	g/mi	1.461	1.462	1.497	1.497	1.501	---	---	1.389	1.397	1.388
PM10 (x10)	g/mi	1.237	1.237	1.140	1.140	1.141	---	---	1.158	1.162	1.159
Urban Toxics, (weighted)											
Benzene	g/mi	1.4E-02	---	---	---	---	---	---	1.1E-02	---	---
1-3 Butadiene	g/mi	8.0E-03	---	---	---	---	---	---	6.0E-03	---	---
Formaldehyde	g/mi	2.2E-02	---	---	---	---	---	---	1.6E-02	---	---
Acetaldehyde	g/mi	4.9E-03	---	---	---	---	---	---	3.7E-03	---	---
Diesel PM	g/mi	5.0E+00	---	---	---	---	---	---	4.6E+00	---	---

## Figure A-7. LDA Vehicle Class: All Model Years (continued)

### Biodiesel Blends, Renewable Diesel Blends and XTL Blends

**Scenario Year 2022: LDA Vehicle Class: All Model Years (blend)**

WTT Case ID		D2	D6	BD1	BD3	BD4	BD5	BD23	F1	F3	F5
WTT Description		Diesel, CA ULSD	E-Diesel, Ave. MW ETOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	BTL, CA Poplar	CTL, Coal CCS
Vehicle Type		ULSD	ULSD	BD20	BD20	BD20	FTD 30	FTD 30	FTD 30	FTD 30	FTD 30
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	3.98	3.93	3.50	3.55	3.63	2.96	2.96	4.41	2.87	4.77
Petroleum	MJ/mi	3.64	3.50	3.02	3.06	3.08	2.59	2.59	2.60	2.62	2.61
Natural Gas	MJ/mi	0.34	0.35	0.48	0.49	0.55	0.37	0.37	1.82	0.25	0.33
Coal	MJ/mi	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.84
Non Fossil	MJ/mi	0.00	0.18	0.62	0.62	0.63	0.99	0.99	0.00	1.67	0.02
WTT	MJ/mi	0.69	0.81	0.83	0.88	0.97	0.66	0.66	1.12	1.25	1.50
TTW	MJ/mi	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
GHGs (weighted)											
WTT	g/mi	54	58	12	17	21	-5	-2	67	-25	70
TTW	g/mi	253	253	254	254	254	250	250	250	250	250
TOTAL	g/mi	307	312	267	271	275	245	248	317	225	320
Criteria, Total											
VOC	g/mi	0.138	0.144	0.198	0.203	0.254	---	---	0.114	0.104	0.117
CO	g/mi	0.727	0.757	0.740	0.893	0.955	---	---	0.621	0.615	0.612
NOx	g/mi	1.628	1.678	1.644	1.657	1.658	---	---	1.559	1.522	1.546
PM10 (x10)	g/mi	1.408	1.594	1.303	1.316	1.314	---	---	1.316	1.306	4.235
Criteria, Urban											
VOC	g/mi	0.115	0.115	0.092	0.092	0.093	---	---	0.088	0.089	0.088
CO	g/mi	0.675	0.675	0.602	0.602	0.603	---	---	0.567	0.571	0.567
NOx	g/mi	1.453	1.454	1.486	1.487	1.489	---	---	1.381	1.385	1.381
PM10 (x10)	g/mi	1.285	1.285	1.181	1.181	1.182	---	---	1.202	1.204	1.202
Urban Toxics, (weighted)											
Benzene	g/mi	1.0E-02	---	---	---	---	---	---	7.5E-03	---	---
1-3 Butadiene	g/mi	5.6E-03	---	---	---	---	---	---	4.2E-03	---	---
Formaldehyde	g/mi	1.5E-02	---	---	---	---	---	---	1.1E-02	---	---
Acetaldehyde	g/mi	3.4E-03	---	---	---	---	---	---	2.6E-03	---	---
Diesel PM	g/mi	5.2E+00	---	---	---	---	---	---	4.8E+00	---	---

## Figure A-7. LDA Vehicle Class: All Model Years (concluded)

### Biodiesel Blends, Renewable Diesel Blends and XTL Blends

#### Scenario Year 2030: LDA Vehicle Class: All Model Years (blend)

WTT Case ID		D2	D6	BD1	BD3	BD4	BD5	BD23	F1	F3	F5
WTT Description		Diesel, CA ULSD	E-Diesel, Ave. MW EtOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	BTL, CA Poplar	CTL, Coal CCS
Vehicle Type		ULSD	ULSD	BD20	BD20	BD20	FTD 30	FTD 30	FTD 30	FTD 30	FTD 30
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	3.56	3.52	3.13	3.18	3.26	2.65	2.65	3.95	2.57	4.28
Petroleum	MJ/mi	3.26	3.13	2.71	2.74	2.76	2.32	2.32	2.33	2.35	2.33
Natural Gas	MJ/mi	0.30	0.31	0.43	0.44	0.49	0.33	0.33	1.63	0.22	0.30
Coal	MJ/mi	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.65
Non Fossil	MJ/mi	0.00	0.16	0.56	0.56	0.56	0.89	0.89	0.00	1.50	0.02
WTT	MJ/mi	0.62	0.73	0.74	0.79	0.86	0.59	0.59	1.00	1.12	1.34
TTW	MJ/mi	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95
GHGs (weighted)											
WTT	g/mi	48	52	11	15	19	-5	-2	60	-23	63
TTW	g/mi	228	228	229	229	229	225	225	225	225	225
TOTAL	g/mi	276	280	240	244	247	220	223	285	202	288
Criteria, Total											
VOC	g/mi	0.135	0.140	0.185	0.190	0.236	---	---	0.110	0.101	0.113
CO	g/mi	0.513	0.539	0.539	0.677	0.732	---	---	0.440	0.435	0.431
NOx	g/mi	1.786	1.831	1.807	1.818	1.819	---	---	1.708	1.674	1.696
PM10 (x10)	g/mi	1.395	1.562	1.289	1.301	1.299	---	---	1.304	1.294	3.919
Criteria, Urban											
VOC	g/mi	0.114	0.114	0.091	0.091	0.092	---	---	0.087	0.088	0.087
CO	g/mi	0.466	0.466	0.416	0.416	0.417	---	---	0.391	0.395	0.392
NOx	g/mi	1.629	1.630	1.665	1.665	1.667	---	---	1.549	1.552	1.548
PM10 (x10)	g/mi	1.284	1.285	1.181	1.181	1.181	---	---	1.202	1.203	1.202
Urban Toxics, (weighted)											
Benzene	g/mi	1.0E-02	---	---	---	---	---	---	7.5E-03	---	---
1-3 Butadiene	g/mi	5.6E-03	---	---	---	---	---	---	4.2E-03	---	---
Formaldehyde	g/mi	1.5E-02	---	---	---	---	---	---	1.1E-02	---	---
Acetaldehyde	g/mi	3.4E-03	---	---	---	---	---	---	2.6E-03	---	---
Diesel PM	g/mi	5.2E+00	---	---	---	---	---	---	4.8E+00	---	---

**Figure A-8. Urban Buses: All Model Years  
(Diesel, Biodiesel Blends, Renewable Diesel Blends and XTL Blends)**

Scenario Year 2012: UB Vehicle Class: All Model Years (blend)

WTT Case ID	WTT Description	Vehicle Type	Vehicle Technology	D2	D2	D6	D6	BD1	BD3	BD4	BD5	BD23	F1	F1	F3	F3	F5	F5	
				Diesel, CA ULSD	Diesel, CA ULSD	E-Diesel, Ave. MW EtOH	E-Diesel, Ave. MW EtOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GT <sub>L</sub> , Remote NG	GT <sub>L</sub> , Remote NG	BT <sub>L</sub> , CA Poplar	BT <sub>L</sub> , CA Poplar	CT <sub>L</sub> , Coal CCS	CT <sub>L</sub> , Coal CCS	
				ULSD	ULSD HEV	ULSD	ULSD HEV	BD20	BD20	BD20	FTD 30	FTD 30	FTD 30	FT100	FTD 30	FT100	FTD 30	FT100	
				ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi			43.67	34.93	43.05	34.44	38.50	39.07	40.01	32.49	32.49	48.98	60.04	31.49	1.97	52.52	71.80	
Petroleum	MJ/mi			39.89	31.92	38.34	30.67	33.13	33.55	33.82	28.35	28.35	28.47	0.78	28.72	1.62	28.57	1.11	
Natural Gas	MJ/mi			3.77	3.02	3.79	3.03	5.36	5.51	6.18	4.14	4.14	20.52	59.27	2.77	0.35	3.80	3.74	
Coal	MJ/mi			0.00	0.00	0.93	0.74	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	20.16	66.94	
Non Fossil	MJ/mi			0.05	0.04	1.97	1.58	6.83	6.84	6.85	10.90	10.90	0.04	0.01	18.34	60.80	0.18	0.48	
WTT	MJ/mi			7.60	6.08	8.90	7.12	9.21	9.79	10.74	7.26	7.26	12.90	24.99	13.72	27.70	16.58	37.21	
TTW	MJ/mi			36.12	28.90	36.12	28.90	36.12	36.12	36.12	36.12	36.12	36.12	35.07	36.12	35.07	36.12	35.07	
GHGs (weighted)																			
WTT	g/mi			595	476	648	518	143	190	239	-55	-21	776	1178	-276	-2313	778	1184	
TTW	g/mi			2692	2157	2692	2157	2704	2704	2704	2659	2659	2658	2501	2658	2501	2658	2501	
TOTAL	g/mi			3287	2633	3340	2675	2846	2894	2942	2603	2638	3434	3678	2382	188	3436	3685	
Criteria, Total																			
VOC	g/mi			1.199	1.121	1.264	1.172	1.952	2.043	2.626	---	---	1.016	1.248	0.923	0.941	1.042	1.335	
CO	g/mi			4.257	4.137	4.596	4.408	4.889	6.682	7.417	---	---	3.697	4.323	3.649	4.163	3.587	3.959	
NOx	g/mi			20.889	20.489	21.479	20.961	21.239	21.491	21.570	---	---	20.000	21.016	19.722	20.094	19.838	20.477	
PM10 (x10)	g/mi			4.861	4.571	7.013	6.293	4.577	4.783	4.798	---	---	4.488	4.435	4.455	4.326	36.490	110.716	
Criteria, Urban																			
VOC	g/mi			0.934	0.909	0.938	0.912	0.760	0.761	0.770	---	---	0.723	0.898	0.738	0.947	0.722	0.896	
CO	g/mi			3.672	3.669	3.674	3.670	3.308	3.309	3.330	---	---	3.089	3.677	3.146	3.868	3.096	3.700	
NOx	g/mi			18.942	18.932	18.952	18.940	19.435	19.436	19.499	---	---	18.007	18.970	18.123	19.357	17.999	18.944	
PM10 (x10)	g/mi			3.433	3.429	3.435	3.431	3.156	3.156	3.181	---	---	3.181	3.448	3.241	3.650	3.184	3.461	
Urban Toxics, (weighted)																			
Benzene	g/mi			7.8E-02	7.8E-02	---	---	---	---	---	---	---	5.9E-02	7.8E-02	---	---	---	---	
1-3 Butadiene	g/mi			4.4E-02	4.4E-02	---	---	---	---	---	---	---	3.3E-02	4.4E-02	---	---	---	---	
Formaldehyde	g/mi			1.2E-01	1.2E-01	---	---	---	---	---	---	---	8.9E-02	1.2E-01	---	---	---	---	
Acetaldehyde	g/mi			2.7E-02	2.7E-02	---	---	---	---	---	---	---	2.0E-02	2.7E-02	---	---	---	---	
Diesel PM	g/mi			1.6E+01	1.6E+01	---	---	---	---	---	---	---	1.5E+01	1.6E+01	---	---	---	---	



## Figure A-8. Urban Buses: All Model Years (continued)

### Diesel, Biodiesel Blends, Renewable Diesel Blends and XTL Blends

Scenario Year 2017: UB Vehicle Class: All Model Years (blend)

WTT Case ID	WTT Description	Vehicle Type Vehicle Technology	D2	D2	D6	D6	BD1	BD3	BD4	BD5	BD23	F1	F1	F3	F3	F5	F5
			Diesel, CA ULSD	Diesel, CA ULSD	E-Diesel, Ave. MW EtOH	E-Diesel, Ave. MW EtOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	GTL, Remote NG	BTL, CA Poplar	BTL, CA Poplar	CTL, Coal CCS	CTL, Coal CCS
			ULSD ICEV	ULSD HEV ICEV	ULSD ICEV	ULSD HEV ICEV	BD20 ICEV	BD20 ICEV	BD20 ICEV	FTD 30 ICEV	FTD 30 ICEV	FTD 30 ICEV	FT100 ICEV	FTD 30 ICEV	FT100 ICEV	FTD 30 ICEV	FT100 ICEV
Fossil	MJ/mi		42.99	34.39	42.42	33.93	37.85	38.40	39.31	31.99	31.99	47.96	58.24	31.01	1.93	51.66	70.52
Petroleum	MJ/mi		39.31	31.45	37.77	30.22	32.64	33.05	33.31	27.93	27.93	28.05	0.76	28.30	1.60	28.15	1.10
Natural Gas	MJ/mi		3.68	2.95	3.77	3.01	5.21	5.35	6.00	4.06	4.06	19.91	57.48	2.71	0.33	3.65	3.46
Coal	MJ/mi		0.00	0.00	0.88	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.86	65.96
Non Fossil	MJ/mi		0.05	0.04	1.93	1.55	6.74	6.74	6.76	10.74	10.74	0.04	0.01	18.07	59.91	0.20	0.55
WTT	MJ/mi		7.45	5.96	8.76	7.01	9.00	9.56	10.48	7.13	7.13	12.41	23.70	13.49	27.29	16.27	36.51
TTW	MJ/mi		35.59	28.47	35.59	28.47	35.59	35.59	35.59	35.59	35.59	35.59	34.55	35.59	34.55	35.59	34.55
GHGs (weighted)																	
WTT	g/mi		584	467	634	507	136	183	229	-56	-22	735	1068	-273	-2280	761	1153
TTW	g/mi		2653	2125	2653	2125	2664	2664	2664	2620	2620	2619	2464	2619	2464	2619	2464
TOTAL	g/mi		3237	2593	3287	2633	2801	2847	2893	2564	2598	3354	3532	2346	184	3380	3617
Criteria, Total																	
VOC	g/mi		1.138	1.062	1.198	1.110	1.861	1.926	2.483	---	---	0.965	1.181	0.865	0.852	0.993	1.275
CO	g/mi		3.857	3.741	4.180	4.000	4.452	6.122	6.804	---	---	3.355	3.915	3.297	3.720	3.250	3.565
NOx	g/mi		18.935	18.550	19.494	18.997	19.181	19.363	19.400	---	---	18.134	19.044	17.783	17.878	17.984	18.545
PM10 (x10)	g/mi		4.497	4.223	6.530	5.849	4.210	4.376	4.367	---	---	4.156	4.102	4.076	3.837	35.692	108.837
Criteria, Urban																	
VOC	g/mi		0.882	0.857	0.886	0.860	0.714	0.715	0.722	---	---	0.683	0.846	0.692	0.877	0.682	0.844
CO	g/mi		3.287	3.285	3.289	3.286	2.953	2.953	2.967	---	---	2.764	3.292	2.813	3.455	2.771	3.313
NOx	g/mi		17.037	17.032	17.047	17.039	17.444	17.445	17.481	---	---	16.196	17.065	16.266	17.299	16.188	17.039
PM10 (x10)	g/mi		3.134	3.132	3.136	3.134	2.865	2.865	2.879	---	---	2.904	3.150	2.938	3.260	2.908	3.160
Urban Toxics, (weighted)																	
Benzene	g/mi		7.3E-02	7.3E-02	---	---	---	---	---	---	---	5.5E-02	7.4E-02	---	---	---	---
1-3 Butadiene	g/mi		4.1E-02	4.1E-02	---	---	---	---	---	---	---	3.1E-02	4.1E-02	---	---	---	---
Formaldehyde	g/mi		1.1E-01	1.1E-01	---	---	---	---	---	---	---	8.4E-02	1.1E-01	---	---	---	---
Acetaldehyde	g/mi		2.5E-02	2.5E-02	---	---	---	---	---	---	---	1.9E-02	2.5E-02	---	---	---	---
Diesel PM	g/mi		1.5E+01	1.5E+01	---	---	---	---	---	---	---	1.4E+01	1.5E+01	---	---	---	---

## Figure A-8. Urban Buses: All Model Years (continued)

### Diesel, Biodiesel Blends, Renewable Diesel Blends and XTL Blends

Scenario Year 2022: UB Vehicle Class: All Model Years (blend)

WTT Case ID		D2	D2	D6	D6	BD1	BD3	BD4	BD5	BD23	F1	F1	F3	F3	F5	F5
WTT Description		Diesel, CA ULSD	Diesel, CA ULSD	E-Diesel, Ave. MW EIOH	E-Diesel, Ave. MW EIOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	GTL, Remote NG	BTL, CA Poplar	BTL, CA Poplar	CTL, Coal CCS	CTL, Coal CCS
Vehicle Type		ULSD	ULSD HEV	ULSD	ULSD HEV	BD20	BD20	BD20	FTD 30	FTD 30	FTD 30	FT100	FTD 30	FT100	FTD 30	FT100
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	42.43	33.94	41.90	33.52	37.33	37.88	38.77	31.57	31.57	47.08	56.64	30.60	1.90	50.94	69.44
Petroleum	MJ/mi	38.83	31.06	37.31	29.85	32.24	32.64	32.90	27.59	27.59	27.70	0.75	27.95	1.58	27.80	1.08
Natural Gas	MJ/mi	3.60	2.88	3.73	2.98	5.09	5.23	5.86	3.98	3.98	19.38	55.89	2.65	0.32	3.52	3.21
Coal	MJ/mi	0.00	0.00	0.86	0.69	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	19.62	65.15
Non Fossil	MJ/mi	0.05	0.04	1.90	1.52	6.66	6.67	6.68	10.60	10.60	0.04	0.01	17.85	59.18	0.22	0.61
WTT	MJ/mi	7.33	5.86	8.65	6.92	8.84	9.39	10.30	7.02	7.02	11.97	22.52	13.30	26.95	16.00	35.92
TTW	MJ/mi	35.15	28.12	35.15	28.12	35.15	35.15	35.15	35.15	35.15	35.15	34.13	35.15	34.13	35.15	34.13
GHGs (weighted)																
WTT	g/mi	574	459	624	499	131	176	222	-57	-24	715	1025	-272	-2252	745	1126
TTW	g/mi	2620	2099	2620	2099	2632	2632	2632	2588	2588	2587	2434	2587	2434	2587	2434
TOTAL	g/mi	3194	2559	3244	2598	2763	2808	2854	2530	2564	3302	3459	2315	182	3332	3560
Criteria, Total																
VOC	g/mi	1.075	1.001	1.135	1.049	1.792	1.846	2.391	---	---	0.914	1.114	0.812	0.775	0.944	1.213
CO	g/mi	3.572	3.459	3.891	3.714	4.171	5.804	6.469	---	---	3.111	3.622	3.049	3.417	3.009	3.284
NOx	g/mi	17.376	17.001	17.917	17.433	17.554	17.688	17.700	---	---	16.646	17.470	16.253	16.164	16.505	17.002
PM10 (x10)	g/mi	4.235	3.969	6.216	5.554	3.949	4.087	4.065	---	---	3.915	3.856	3.806	3.496	35.065	107.309
Criteria, Urban																
VOC	g/mi	0.826	0.802	0.830	0.805	0.668	0.669	0.675	---	---	0.640	0.790	0.646	0.810	0.640	0.789
CO	g/mi	3.013	3.011	3.014	3.013	2.702	2.703	2.713	---	---	2.534	3.018	2.578	3.167	2.539	3.037
NOx	g/mi	15.515	15.512	15.525	15.520	15.871	15.871	15.896	---	---	14.749	15.543	14.791	15.684	14.741	15.517
PM10 (x10)	g/mi	2.913	2.911	2.915	2.913	2.655	2.655	2.664	---	---	2.700	2.928	2.716	2.982	2.702	2.937
Urban Toxics, (weighted)																
Benzene	g/mi	6.8E-02	6.8E-02	---	---	---	---	---	---	---	5.1E-02	6.8E-02	---	---	---	---
1-3 Butadiene	g/mi	3.8E-02	3.8E-02	---	---	---	---	---	---	---	2.9E-02	3.8E-02	---	---	---	---
Formaldehyde	g/mi	1.0E-01	1.0E-01	---	---	---	---	---	---	---	7.8E-02	1.0E-01	---	---	---	---
Acetaldehyde	g/mi	2.3E-02	2.3E-02	---	---	---	---	---	---	---	1.8E-02	2.3E-02	---	---	---	---
Diesel PM	g/mi	1.4E+01	1.4E+01	---	---	---	---	---	---	---	1.3E+01	1.4E+01	---	---	---	---

## Figure A-8. Urban Buses: All Model Years (concluded)

### Diesel, Biodiesel Blends, Renewable Diesel Blends and XTL Blends

**Scenario Year 2030: UB Vehicle Class: All Model Years (blend)**

WTT Case ID	WTT Description	Vehicle Type Vehicle Technology	D2	D2	D6	D6	BD1	BD3	BD4	BD5	BD23	F1	F1	F3	F3	F5	F5
			Diesel, CA ULSD	Diesel, CA ULSD	E-Diesel, Ave. MW EtOH	E-Diesel, Ave. MW EtOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	GTL, Remote NG	BTL, CA Poplar	BTL, CA Poplar	CTL, Coal CCS	CTL, Coal CCS
			ULSD ICEV	ULSD HEV ICEV	ULSD ICEV	ULSD HEV ICEV	BD20 ICEV	BD20 ICEV	BD20 ICEV	FTD 30 ICEV	FTD 30 ICEV	FTD 30 ICEV	FT100 ICEV	FTD 30 ICEV	FT100 ICEV	FTD 30 ICEV	FT100 ICEV
Fossil	MJ/mi		41.96	33.57	41.43	33.15	36.92	37.46	38.34	31.22	31.22	46.56	56.01	30.26	1.88	50.37	68.67
Petroleum	MJ/mi		38.39	30.72	36.89	29.51	31.88	32.28	32.54	27.28	27.28	27.39	0.74	27.64	1.56	27.49	1.07
Natural Gas	MJ/mi		3.56	2.85	3.69	2.95	5.03	5.17	5.80	3.94	3.94	19.16	55.27	2.62	0.32	3.48	3.17
Coal	MJ/mi		0.00	0.00	0.85	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.40	64.43
Non Fossil	MJ/mi		0.05	0.04	1.88	1.50	6.59	6.59	6.61	10.49	10.49	0.04	0.01	17.65	58.52	0.21	0.60
WTT	MJ/mi		7.24	5.80	8.55	6.84	8.74	9.29	10.19	6.94	6.94	11.83	22.27	13.15	26.65	15.82	35.52
TTW	MJ/mi		34.76	27.81	34.76	27.81	34.76	34.76	34.76	34.76	34.76	34.76	33.75	34.76	33.75	34.76	33.75
GHGs (weighted)																	
WTT	g/mi		568	454	617	493	129	174	219	-57	-23	707	1013	-269	-2227	737	1113
TTW	g/mi		2591	2076	2591	2076	2603	2603	2603	2559	2559	2559	2407	2559	2407	2559	2407
TOTAL	g/mi		3159	2530	3208	2570	2732	2777	2822	2502	2536	3265	3420	2290	180	3295	3520
Criteria, Total																	
VOC	g/mi		0.970	0.897	1.029	0.944	1.698	1.752	2.290	---	---	0.834	1.009	0.732	0.671	0.863	1.106
CO	g/mi		2.935	2.823	3.250	3.075	3.592	5.206	5.863	---	---	2.575	2.984	2.512	2.774	2.474	2.650
NOx	g/mi		14.215	13.844	14.748	14.270	14.326	14.458	14.467	---	---	13.641	14.307	13.245	12.992	13.502	13.845
PM10 (x10)	g/mi		3.800	3.538	5.759	5.105	3.554	3.691	3.667	---	---	3.514	3.426	3.404	3.059	34.318	105.728
Criteria, Urban																	
VOC	g/mi		0.724	0.700	0.728	0.703	0.586	0.587	0.593	---	---	0.563	0.688	0.569	0.707	0.562	0.687
CO	g/mi		2.382	2.381	2.384	2.382	2.138	2.138	2.147	---	---	2.004	2.387	2.047	2.531	2.009	2.406
NOx	g/mi		12.375	12.372	12.384	12.380	12.657	12.658	12.678	---	---	11.765	12.402	11.803	12.529	11.757	12.377
PM10 (x10)	g/mi		2.493	2.492	2.495	2.494	2.272	2.273	2.279	---	---	2.313	2.508	2.327	2.556	2.315	2.517
Urban Toxics, (weighted)																	
Benzene	g/mi		5.9E-02	5.9E-02	---	---	---	---	---	---	---	4.4E-02	5.9E-02	---	---	---	---
1-3 Butadiene	g/mi		3.3E-02	3.3E-02	---	---	---	---	---	---	---	2.5E-02	3.3E-02	---	---	---	---
Formaldehyde	g/mi		8.9E-02	8.9E-02	---	---	---	---	---	---	---	6.7E-02	8.9E-02	---	---	---	---
Acetaldehyde	g/mi		2.0E-02	2.0E-02	---	---	---	---	---	---	---	1.5E-02	2.0E-02	---	---	---	---
Diesel PM	g/mi		1.2E+01	1.2E+01	---	---	---	---	---	---	---	1.1E+01	1.2E+01	---	---	---	---

**Figure A-9. Urban Buses: Model Years 2010 and Newer  
(Diesel, Biodiesel Blends, Renewable Diesel Blends and XTL Blends)**

**Scenario Year 2012: UB Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID	WTT Description	Vehicle Type	Vehicle Technology	D2	D2	D6	D6	BD1	BD3	BD4	BD5	BD23	F1	F1	F3	F3	F5	F5
				Diesel, CA ULSD	Diesel, CA ULSD	E-Diesel, Ave. MW EtOH	E-Diesel, Ave. MW EtOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	GTL, Remote NG	BTL, CA Poplar	BTL, CA Poplar	CTL, Coal CCS	CTL, Coal CCS
				ULSD	ULSD HEV	ULSD	ULSD HEV	BD20	BD20	BD20	FTD 30	FTD 30	FTD 30	FT100	FTD 30	FT100	FTD 30	FT100
Fossil	MJ/mi			43.23	34.59	42.63	34.10	38.12	38.68	39.61	32.16	32.16	48.50	59.45	31.18	1.95	52.00	71.09
Petroleum	MJ/mi			39.50	31.60	37.96	30.37	32.81	33.22	33.48	28.06	28.06	28.18	0.77	28.44	1.61	28.28	1.10
Natural Gas	MJ/mi			3.73	2.99	3.75	3.00	5.31	5.46	6.12	4.10	4.10	20.31	58.68	2.75	0.34	3.76	3.70
Coal	MJ/mi			0.00	0.00	0.92	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.96	66.28
Non Fossil	MJ/mi			0.05	0.04	1.95	1.56	6.76	6.77	6.78	10.79	10.79	0.04	0.01	18.16	60.20	0.18	0.47
WTT	MJ/mi			7.52	6.02	8.81	7.05	9.12	9.69	10.63	7.19	7.19	12.77	24.74	13.58	27.43	16.42	36.84
TTW	MJ/mi			35.76	28.61	35.76	28.61	35.76	35.76	35.76	35.76	35.76	35.76	34.72	35.76	34.72	35.76	34.72
GHGs (weighted)																		
WTT	g/mi			589	471	641	513	141	188	236	-55	-20	768	1166	-273	-2290	770	1172
TTW	g/mi			2666	2136	2665	2135	2677	2677	2677	2632	2632	2632	2476	2632	2476	2632	2476
TOTAL	g/mi			3255	2607	3307	2648	2818	2865	2913	2578	2612	3400	3642	2359	186	3402	3648
Criteria, Total																		
VOC	g/mi			0.430	0.353	0.494	0.404	1.336	1.426	2.002	---	---	0.438	0.479	0.346	0.175	0.464	0.565
CO	g/mi			1.479	1.361	1.815	1.629	2.406	4.181	4.910	---	---	1.363	1.545	1.315	1.386	1.254	1.185
NOx	g/mi			2.641	2.245	3.225	2.712	2.626	2.876	2.954	---	---	2.663	2.766	2.388	1.854	2.502	2.233
PM10 (x10)	g/mi			2.090	1.803	4.221	3.509	2.088	2.292	2.307	---	---	1.942	1.668	1.909	1.561	33.627	106.897
Criteria, Urban																		
VOC	g/mi			0.168	0.143	0.172	0.146	0.155	0.156	0.166	---	---	0.148	0.132	0.162	0.181	0.147	0.130
CO	g/mi			0.901	0.898	0.902	0.899	0.841	0.842	0.862	---	---	0.761	0.906	0.818	1.094	0.768	0.928
NOx	g/mi			0.714	0.704	0.723	0.711	0.840	0.841	0.903	---	---	0.689	0.741	0.804	1.124	0.681	0.715
PM10 (x10)	g/mi			0.677	0.673	0.679	0.674	0.681	0.682	0.706	---	---	0.648	0.692	0.708	0.891	0.651	0.704
Urban Toxics, (weighted)																		
Benzene	g/mi			4.3E-03	4.3E-03	---	---	---	---	---	---	---	3.3E-03	4.3E-03	---	---	---	---
1-3 Butadiene	g/mi			2.5E-03	2.4E-03	---	---	---	---	---	---	---	1.9E-03	2.5E-03	---	---	---	---
Formaldehyde	g/mi			6.6E-03	6.5E-03	---	---	---	---	---	---	---	5.0E-03	6.6E-03	---	---	---	---
Acetaldehyde	g/mi			1.5E-03	1.5E-03	---	---	---	---	---	---	---	1.1E-03	1.5E-03	---	---	---	---
Diesel PM	g/mi			2.3E+00	2.2E+00	---	---	---	---	---	---	---	2.1E+00	2.3E+00	---	---	---	---

## Figure A-9. Urban Buses: Model Years 2010 and Newer (continued)

### Diesel, Biodiesel Blends, Renewable Diesel Blends and XTL Blends

Scenario Year 2017: UB Vehicle Class: Model Year Start 2010 (new)

WTT Case ID	WTT Description	Vehicle Type	Vehicle Technology	D2	D2	D6	D6	BD1	BD3	BD4	BD5	BD23	F1	F1	F3	F3	F5	F5
				Diesel, CA ULSD	Diesel, CA ULSD	E-Diesel, Ave. MW EIOH	E-Diesel, Ave. MW EIOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	GTL, Remote NG	BTL, CA Poplar	BTL, CA Poplar	CTL, Coal CCS	CTL, Coal CCS
				ULSD ICEV	ULSD HEV ICEV	ULSD ICEV	ULSD HEV ICEV	BD20 ICEV	BD20 ICEV	BD20 ICEV	FTD 30 ICEV	FTD 30 ICEV	FTD 30 ICEV	FT100 ICEV	FTD 30 ICEV	FT100 ICEV	FTD 30 ICEV	FT100 ICEV
Fossil	MJ/mi			42.35	33.88	41.79	33.43	37.29	37.83	38.73	31.51	31.51	47.25	57.38	30.55	1.91	50.89	69.47
Petroleum	MJ/mi			38.73	30.98	37.21	29.77	32.16	32.56	32.82	27.51	27.51	27.63	0.75	27.88	1.58	27.73	1.08
Natural Gas	MJ/mi			3.63	2.90	3.71	2.97	5.13	5.27	5.91	4.00	4.00	19.62	56.63	2.67	0.33	3.59	3.41
Coal	MJ/mi			0.00	0.00	0.87	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.57	64.98
Non Fossil	MJ/mi			0.05	0.04	1.90	1.52	6.64	6.64	6.66	10.58	10.58	0.04	0.01	17.81	59.02	0.20	0.54
WTT	MJ/mi			7.34	5.87	8.63	6.90	8.87	9.42	10.32	7.03	7.03	12.22	23.35	13.29	26.88	16.03	35.97
TTW	MJ/mi			35.06	28.05	35.06	28.05	35.06	35.06	35.06	35.06	35.06	35.06	34.04	35.06	34.04	35.06	34.04
GHGs (weighted)																		
WTT	g/mi			576	461	625	500	134	180	226	-55	-21	724	1052	-269	-2246	749	1136
TTW	g/mi			2614	2094	2614	2094	2625	2625	2625	2581	2581	2581	2428	2581	2428	2581	2428
TOTAL	g/mi			3189	2555	3238	2594	2759	2805	2850	2526	2560	3305	3480	2312	182	3330	3564
Criteria, Total																		
VOC	g/mi			0.416	0.341	0.475	0.389	1.277	1.341	1.890	---	---	0.422	0.459	0.324	0.134	0.449	0.551
CO	g/mi			1.538	1.424	1.857	1.679	2.373	4.018	4.690	---	---	1.406	1.595	1.348	1.403	1.302	1.251
NOx	g/mi			2.492	2.113	3.043	2.553	2.411	2.590	2.627	---	---	2.511	2.600	2.165	1.451	2.363	2.108
PM10 (x10)	g/mi			2.010	1.740	4.013	3.342	1.976	2.139	2.131	---	---	1.871	1.620	1.792	1.360	32.938	104.798
Criteria, Urban																		
VOC	g/mi			0.164	0.140	0.168	0.143	0.147	0.149	0.156	---	---	0.144	0.128	0.153	0.159	0.143	0.127
CO	g/mi			0.977	0.975	0.978	0.976	0.896	0.897	0.910	---	---	0.824	0.982	0.872	1.142	0.830	1.002
NOx	g/mi			0.623	0.617	0.632	0.625	0.700	0.701	0.737	---	---	0.601	0.650	0.671	0.881	0.594	0.624
PM10 (x10)	g/mi			0.667	0.665	0.669	0.667	0.651	0.652	0.665	---	---	0.638	0.682	0.671	0.792	0.641	0.693
Urban Toxics, (weighted)																		
Benzene	g/mi			4.2E-03	4.2E-03	---	---	---	---	---	---	---	3.2E-03	4.2E-03	---	---	---	---
1-3 Butadiene	g/mi			2.4E-03	2.4E-03	---	---	---	---	---	---	---	1.9E-03	2.4E-03	---	---	---	---
Formaldehyde	g/mi			6.4E-03	6.4E-03	---	---	---	---	---	---	---	4.9E-03	6.5E-03	---	---	---	---
Acetaldehyde	g/mi			1.4E-03	1.4E-03	---	---	---	---	---	---	---	1.1E-03	1.5E-03	---	---	---	---
Diesel PM	g/mi			2.2E+00	2.2E+00	---	---	---	---	---	---	---	2.1E+00	2.3E+00	---	---	---	---

## Figure A-9. Urban Buses: Model Years 2010 and Newer (continued)

### Diesel, Biodiesel Blends, Renewable Diesel Blends and XTL Blends

Scenario Year 2022: UB Vehicle Class: Model Year Start 2010 (new)

WTT Case ID		D2	D2	D6	D6	BD1	BD3	BD4	BD5	BD23	F1	F1	F3	F3	F5	F5
WTT Description		Diesel, CA ULSD	Diesel, CA ULSD	E-Diesel, Ave. MW EIOH	E-Diesel, Ave. MW EIOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	GTL, Remote NG	BTL, CA Poplar	BTL, CA Poplar	CTL, Coal CCS	CTL, Coal CCS
Vehicle Type		ULSD	ULSD HEV	ULSD	ULSD HEV	BD20	BD20	BD20	FTD 30	FTD 30	FTD 30	FT100	FTD 30	FT100	FTD 30	FT100
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi	41.90	33.52	41.38	33.10	36.87	37.40	38.28	31.18	31.18	46.49	55.94	30.22	1.88	50.30	68.58
Petroleum	MJ/mi	38.34	30.67	36.84	29.47	31.84	32.24	32.49	27.24	27.24	27.36	0.74	27.60	1.56	27.45	1.07
Natural Gas	MJ/mi	3.56	2.85	3.68	2.95	5.03	5.16	5.79	3.93	3.93	19.14	55.20	2.61	0.32	3.47	3.17
Coal	MJ/mi	0.00	0.00	0.85	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.37	64.34
Non Fossil	MJ/mi	0.05	0.04	1.88	1.50	6.58	6.58	6.60	10.47	10.47	0.04	0.01	17.63	58.44	0.21	0.60
WTT	MJ/mi	7.23	5.79	8.54	6.83	8.73	9.28	10.17	6.93	6.93	11.82	22.24	13.13	26.61	15.80	35.47
TTW	MJ/mi	34.71	27.77	34.71	27.77	34.71	34.71	34.71	34.71	34.71	34.71	33.70	34.71	33.70	34.71	33.70
GHGs (weighted)																
WTT	g/mi	567	453	616	493	129	174	219	-57	-23	706	1012	-269	-2224	736	1112
TTW	g/mi	2588	2073	2588	2073	2599	2599	2599	2556	2556	2555	2404	2555	2404	2555	2404
TOTAL	g/mi	3155	2527	3204	2566	2728	2773	2818	2499	2532	3261	3416	2286	180	3291	3516
Criteria, Total																
VOC	g/mi	0.408	0.335	0.467	0.382	1.254	1.307	1.846	---	---	0.412	0.446	0.311	0.111	0.442	0.544
CO	g/mi	1.535	1.423	1.849	1.675	2.346	3.957	4.614	---	---	1.398	1.584	1.337	1.381	1.298	1.250
NOx	g/mi	2.407	2.036	2.941	2.463	2.288	2.419	2.431	---	---	2.423	2.499	2.035	1.210	2.284	2.037
PM10 (x10)	g/mi	1.969	1.707	3.925	3.272	1.915	2.052	2.029	---	---	1.834	1.595	1.727	1.239	32.596	103.757
Criteria, Urban																
VOC	g/mi	0.162	0.138	0.166	0.141	0.144	0.145	0.151	---	---	0.142	0.127	0.148	0.146	0.141	0.125
CO	g/mi	0.982	0.981	0.984	0.982	0.895	0.895	0.905	---	---	0.828	0.987	0.872	1.134	0.834	1.006
NOx	g/mi	0.569	0.566	0.579	0.573	0.625	0.626	0.650	---	---	0.550	0.597	0.592	0.736	0.542	0.571
PM10 (x10)	g/mi	0.663	0.662	0.665	0.664	0.637	0.638	0.646	---	---	0.634	0.678	0.650	0.732	0.636	0.687
Urban Toxics, (weighted)																
Benzene	g/mi	4.2E-03	4.2E-03	---	---	---	---	---	---	---	3.2E-03	4.2E-03	---	---	---	---
1-3 Butadiene	g/mi	2.4E-03	2.4E-03	---	---	---	---	---	---	---	1.8E-03	2.4E-03	---	---	---	---
Formaldehyde	g/mi	6.4E-03	6.4E-03	---	---	---	---	---	---	---	4.8E-03	6.4E-03	---	---	---	---
Acetaldehyde	g/mi	1.4E-03	1.4E-03	---	---	---	---	---	---	---	1.1E-03	1.4E-03	---	---	---	---
Diesel PM	g/mi	2.2E+00	2.2E+00	---	---	---	---	---	---	---	2.1E+00	2.2E+00	---	---	---	---

## Figure A-9. Urban Buses: Model Years 2010 and Newer (concluded)

### Diesel, Biodiesel Blends, Renewable Diesel Blends and XTL Blends

**Scenario Year 2030: UB Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID	WTT Description	Vehicle Type	Vehicle Technology	D2	D2	D6	D6	BD1	BD3	BD4	BD5	BD23	F1	F1	F3	F3	F5	F5	
				Diesel, CA ULSD	Diesel, CA ULSD	E-Diesel, Ave. MW EIOH	E-Diesel, Ave. MW EIOH	BD, Canola	BD, MW SoyBean	BD, CA Mustard	Ren. Diesel Canola	Ren. Diesel Palm Oil	GTL, Remote NG	GTL, Remote NG	BTL, CA Poplar	BTL, CA Poplar	CTL, Coal CCS	CTL, Coal CCS	
				ULSD	ULSD HEV	ULSD	ULSD HEV	BD20	BD20	BD20	FTD 30	FTD 30	FTD 30	FT100	FTD 30	FT100	FTD 30	FT100	
				ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV
Fossil	MJ/mi			41.49	33.19	40.97	32.77	36.50	37.03	37.91	30.87	30.87	46.03	55.38	29.92	1.86	49.80	67.90	
Petroleum	MJ/mi			37.96	30.37	36.48	29.18	31.53	31.92	32.17	26.97	26.97	27.08	0.73	27.33	1.55	27.18	1.06	
Natural Gas	MJ/mi			3.52	2.82	3.65	2.92	4.98	5.11	5.73	3.89	3.89	18.95	54.65	2.59	0.31	3.44	3.14	
Coal	MJ/mi			0.00	0.00	0.84	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.18	63.70	
Non Fossil	MJ/mi			0.05	0.04	1.86	1.49	6.51	6.52	6.54	10.37	10.37	0.04	0.01	17.45	57.86	0.21	0.60	
WTT	MJ/mi			7.16	5.73	8.45	6.76	8.65	9.18	10.07	6.87	6.87	11.70	22.02	13.00	26.35	15.64	35.12	
TTW	MJ/mi			34.37	27.50	34.37	27.50	34.37	34.37	34.37	34.37	34.37	34.37	33.37	34.37	33.37	34.37	33.37	
GHGs (weighted)																			
WTT	g/mi			561	449	610	488	128	172	217	-56	-23	699	1002	-266	-2202	729	1101	
TTW	g/mi			2562	2053	2562	2053	2573	2573	2573	2531	2531	2530	2380	2530	2380	2530	2380	
TOTAL	g/mi			3124	2502	3172	2541	2701	2746	2790	2474	2508	3229	3382	2264	178	3259	3481	
Criteria, Total																			
VOC	g/mi			0.385	0.313	0.444	0.360	1.226	1.279	1.812	---	---	0.394	0.423	0.293	0.089	0.423	0.520	
CO	g/mi			1.556	1.445	1.867	1.694	2.353	3.949	4.598	---	---	1.415	1.604	1.352	1.396	1.315	1.274	
NOx	g/mi			2.393	2.026	2.920	2.448	2.270	2.400	2.410	---	---	2.409	2.485	2.017	1.184	2.271	2.027	
PM10 (x10)	g/mi			1.997	1.737	3.933	3.286	1.936	2.072	2.048	---	---	1.859	1.626	1.750	1.263	32.317	102.777	
Criteria, Urban																			
VOC	g/mi			0.141	0.118	0.145	0.121	0.126	0.127	0.133	---	---	0.126	0.106	0.131	0.125	0.125	0.105	
CO	g/mi			1.009	1.008	1.010	1.009	0.915	0.916	0.924	---	---	0.850	1.014	0.893	1.156	0.856	1.032	
NOx	g/mi			0.573	0.571	0.583	0.578	0.620	0.621	0.640	---	---	0.554	0.601	0.592	0.727	0.546	0.575	
PM10 (x10)	g/mi			0.704	0.703	0.706	0.705	0.669	0.670	0.676	---	---	0.671	0.719	0.685	0.766	0.674	0.727	
Urban Toxics, (weighted)																			
Benzene	g/mi			2.3E-03	2.3E-03	---	---	---	---	---	---	---	1.8E-03	2.3E-03	---	---	---	---	
1-3 Butadiene	g/mi			1.4E-03	1.3E-03	---	---	---	---	---	---	---	1.1E-03	1.4E-03	---	---	---	---	
Formaldehyde	g/mi			3.6E-03	3.5E-03	---	---	---	---	---	---	---	2.7E-03	3.6E-03	---	---	---	---	
Acetaldehyde	g/mi			8.0E-04	7.9E-04	---	---	---	---	---	---	---	6.1E-04	8.0E-04	---	---	---	---	
Diesel PM	g/mi			2.4E+00	2.4E+00	---	---	---	---	---	---	---	2.3E+00	2.5E+00	---	---	---	---	

## Figure A-10. Urban Buses: All Model Years (Natural Gas, DME, Methanol, and Hydrogen)

Scenario Year 2012: UB Vehicle Class: All Model Years (blend)

WTT Case ID	C1	C2	L3	L1	DM1	DM3	DM5	M1	M3	M5	H2	H3	H4c	H11	H23	
WTT Description	CNG, NA Natural Gas	CNG, LNG, Remote NG	LNG, Remote NG	LNG, Pipeline Liquefier	DME, Remote NG	DME, CA Poplar	DME, Coal CCS	Methanol, Remote NG	Methanol, CA Poplar	Methanol, Coal CCS	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestration	H2, Onsite NG SR	H2, 70% Renewable, Electrolysis	
Vehicle Type	CNG	CNG	LNG	LNG	DME	DME	DME	Methanol	Methanol	Methanol	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	
Vehicle Technology	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	
Fossil MJ/mi	42.73	47.17	46.90	44.95	56.21	2.23	70.80	45.01	29.44	51.51	63.46	36.85	47.02	41.98	25.21	
Petroleum MJ/mi	0.17	0.52	0.52	0.18	1.10	1.85	1.20	1.10	1.38	0.90	0.41	0.31	0.68	0.16	0.40	
Natural Gas MJ/mi	42.57	46.66	46.38	44.78	55.10	0.38	3.69	43.91	28.07	30.47	63.05	36.54	6.94	41.82	24.81	
Coal MJ/mi	0.00	0.00	0.00	0.00	0.00	0.00	65.91	0.00	0.00	20.13	0.00	0.00	39.40	0.00	0.00	
Non Fossil MJ/mi	0.21	0.03	0.02	0.03	0.01	65.92	0.47	0.01	20.14	0.34	3.46	16.22	0.91	0.75	28.49	
WTT MJ/mi	4.52	8.78	8.89	6.96	20.10	32.03	35.15	17.24	21.80	24.07	42.85	28.99	23.85	18.65	29.62	
TTW MJ/mi	38.43	38.43	38.02	38.02	36.12	36.12	36.12	27.78	27.78	27.78	24.08	24.08	24.08	24.08	24.08	
GHGs (weighted)																
WTT g/mi	403	782	750	611	964	-2198	1082	808	-1759	838	3869	2222	1210	2492	2027	
TTW g/mi	2136	2136	2166	2166	2409	2409	2409	1902	1902	1902	0	0	0	0	0	
TOTAL g/mi	2540	2919	2916	2776	3373	211	3492	2710	143	2739	3869	2222	1210	2492	2027	
Criteria, Total																
VOC g/mi	1.071	1.128	1.157	1.073	3.205	0.957	1.332	0.615	0.272	0.544	0.403	0.239	0.401	0.259	0.265	
CO g/mi	4.007	4.322	4.366	4.046	4.500	4.219	3.813	1.430	1.091	0.964	0.778	0.369	0.359	0.396	0.458	
NOx g/mi	19.130	21.659	22.114	19.133	21.527	20.445	19.806	6.728	4.567	4.961	0.432	0.284	0.937	0.234	0.726	
PM10 (x10) g/mi	3.547	4.336	4.346	3.567	3.282	3.143	59.816	1.973	0.610	77.025	0.809	0.533	63.395	0.448	0.968	
Criteria, Urban																
VOC g/mi	0.813	0.812	0.814	0.810	2.857	2.911	0.809	0.311	0.350	0.309	0.008	0.005	0.001	0.005	0.052	
CO g/mi	3.678	3.676	3.668	3.662	3.692	3.898	3.685	0.762	0.912	0.778	0.214	0.009	0.054	0.074	0.151	
NOx g/mi	18.916	18.939	18.972	18.907	19.025	19.437	18.897	3.899	4.189	3.863	0.036	0.021	0.011	0.023	0.049	
PM10 (x10) g/mi	3.429	3.440	3.427	3.416	1.867	2.078	1.833	0.256	0.401	0.250	0.402	0.200	0.250	0.332	0.355	
Urban Toxics, (weighted)																
Benzene g/mi	7.9E-04	8.1E-04	2.0E-04	1.0E-03	3.3E-04	---	---	3.3E-04	---	---	1.4E-03	6.1E-04	---	3.3E-04	9.7E-04	
1-3 Butadiene g/mi	2.0E-03	2.1E-03	2.0E-04	2.0E-03	3.0E-04	---	---	2.9E-04	---	---	1.6E-03	5.4E-04	---	5.1E-04	1.2E-03	
Formaldehyde g/mi	1.2E-01	1.2E-01	1.2E-01	1.3E-01	1.2E-01	---	---	2.4E-02	---	---	1.0E-02	1.7E-03	---	2.8E-03	9.5E-03	
Acetaldehyde g/mi	2.7E-02	2.7E-02	2.7E-02	2.7E-02	2.7E-02	---	---	5.5E-03	---	---	5.2E-04	2.1E-04	---	1.2E-04	3.6E-04	
Diesel PM g/mi	1.6E+01	1.6E+01	1.6E+01	1.6E+01	8.3E+00	---	---	2.2E-01	---	---	1.1E-01	1.1E-01	---	0.0E+00	0.0E+00	



## Figure A-10. Urban Buses: All Model Years (continued)

### Natural Gas, DME, Methanol, and Hydrogen

Scenario Year 2017: UB Vehicle Class: All Model Years (blend)

WTT Case ID		C1	C2	L3	L1	DM1	DM3	DM5	M1	M3	M5	H2	H3	H4c	H11	H23
WTT Description		CNG, NA Natural Gas	CNG, LNG, Remote NG	LNG, Remote NG	LNG, Pipeline Liquefier	DME, Remote NG	DME, CA Poplar	DME, Coal CCS	Methanol, Remote NG	Methanol, CA Poplar	Methanol, Coal CCS	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestrati on	H2, Onsite NG SR	H2, 70% Renewable, Electrolysis
Vehicle Type		CNG	CNG	LNG	LNG	DME	DME	DME	Methanol	Methanol	Methanol	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV
Fossil	MJ/mi	42.01	46.40	46.20	44.28	54.99	2.19	69.54	42.79	29.01	50.59	56.27	36.05	44.92	40.03	23.65
Petroleum	MJ/mi	0.16	0.51	0.51	0.17	1.09	1.82	1.18	1.08	1.36	0.89	0.38	0.30	0.66	0.15	0.39
Natural Gas	MJ/mi	41.85	45.89	45.69	44.11	53.90	0.37	3.42	41.71	27.65	29.86	55.89	35.75	6.06	39.88	23.26
Coal	MJ/mi	0.00	0.00	0.00	0.00	0.00	0.00	64.95	0.00	0.00	19.84	0.00	0.00	38.20	0.00	0.00
Non Fossil	MJ/mi	0.24	0.04	0.02	0.03	0.01	64.95	0.54	0.01	19.85	0.39	3.24	13.13	0.98	0.73	27.53
WTT	MJ/mi	4.39	8.58	8.75	6.85	19.41	31.56	34.49	15.42	21.47	23.60	35.78	25.46	22.17	17.03	27.45
TTW	MJ/mi	37.86	37.86	37.46	37.46	35.59	35.59	35.59	27.38	27.38	27.38	23.73	23.73	23.73	23.73	23.73
GHGs (weighted)																
WTT	g/mi	391	764	739	601	926	-2167	1054	770	-1734	816	3425	2174	1132	2374	1942
TTW	g/mi	2105	2105	2134	2134	2374	2374	2374	1874	1874	1874	0	0	0	0	0
TOTAL	g/mi	2496	2869	2873	2735	3300	207	3428	2644	140	2689	3425	2174	1132	2374	1942
Criteria, Total																
VOC	g/mi	1.014	1.070	1.083	1.014	3.110	0.862	1.270	0.583	0.228	0.525	0.351	0.228	0.385	0.244	0.249
CO	g/mi	3.617	3.927	3.946	3.652	4.079	3.766	3.421	1.312	0.961	0.873	0.659	0.350	0.338	0.368	0.429
NOx	g/mi	17.229	19.718	19.963	17.198	19.539	18.179	17.869	6.215	3.911	4.529	0.340	0.234	0.901	0.210	0.687
PM10 (x10)	g/mi	3.243	4.018	4.020	3.261	3.078	2.766	58.798	1.900	0.444	75.873	0.701	0.496	61.451	0.416	0.925
Criteria, Urban																
VOC	g/mi	0.764	0.763	0.764	0.761	2.775	2.808	0.760	0.296	0.320	0.294	0.007	0.005	0.001	0.005	0.050
CO	g/mi	3.298	3.296	3.286	3.282	3.302	3.478	3.303	0.677	0.804	0.691	0.164	0.008	0.047	0.064	0.140
NOx	g/mi	17.032	17.055	17.068	17.020	17.100	17.346	17.013	3.485	3.655	3.450	0.032	0.020	0.010	0.022	0.036
PM10 (x10)	g/mi	3.138	3.149	3.136	3.127	1.702	1.814	1.683	0.234	0.308	0.227	0.347	0.194	0.238	0.315	0.336
Urban Toxics, (weighted)																
Benzene	g/mi	7.8E-04	8.0E-04	1.3E-04	9.3E-04	2.1E-04	---	---	2.1E-04	---	---	1.2E-03	4.2E-04	---	3.1E-04	9.3E-04
1-3 Butadiene	g/mi	1.9E-03	2.0E-03	1.6E-04	1.9E-03	2.3E-04	---	---	2.2E-04	---	---	1.4E-03	4.3E-04	---	4.9E-04	1.1E-03
Formaldehyde	g/mi	1.2E-01	1.2E-01	1.1E-01	1.2E-01	1.1E-01	---	---	2.3E-02	---	---	9.0E-03	1.4E-03	---	2.7E-03	9.2E-03
Acetaldehyde	g/mi	2.5E-02	2.5E-02	2.5E-02	2.5E-02	2.5E-02	---	---	5.1E-03	---	---	4.3E-04	1.4E-04	---	1.1E-04	3.4E-04
Diesel PM	g/mi	1.5E+01	1.5E+01	1.5E+01	1.5E+01	7.5E+00	---	---	1.8E-01	---	---	5.8E-02	5.8E-02	---	0.0E+00	0.0E+00

## Figure A-10. Urban Buses: All Model Years (continued)

### Natural Gas, DME, Methanol, and Hydrogen

Scenario Year 2022: UB Vehicle Class: All Model Years (blend)

WTT Case ID		C1	C2	L3	L1	DM1	DM3	DM5	M1	M3	M5	H2	H3	H4c	H11	H23
WTT Description		CNG, NA Natural Gas	CNG, LNG, Remote NG	LNG, Remote NG	LNG, Pipeline Liquefier	DME, Remote NG	DME, CA Poplar	DME, Coal CCS	Methanol, Remote NG	Methanol, CA Poplar	Methanol, Coal CCS	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestrati on	H2, Onsite NG SR	H2, 70% Renewable, Electrolysis
Vehicle Type		CNG	CNG	LNG	LNG	DME	DME	DME	Methanol	Methanol	Methanol	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV
Fossil	MJ/mi	41.40	45.51	45.36	43.48	53.18	2.16	68.48	41.67	28.64	49.82	51.41	35.11	43.18	37.97	22.17
Petroleum	MJ/mi	0.16	0.50	0.50	0.17	1.07	1.80	1.16	1.06	1.34	0.88	0.36	0.30	0.63	0.15	0.38
Natural Gas	MJ/mi	41.24	45.00	44.86	43.31	52.12	0.36	3.17	40.61	27.30	29.35	51.05	34.82	5.41	37.83	21.79
Coal	MJ/mi	0.00	0.00	0.00	0.00	0.00	0.00	64.15	0.00	0.00	19.59	0.00	0.00	37.13	0.00	0.00
Non Fossil	MJ/mi	0.27	0.04	0.02	0.04	0.01	64.16	0.60	0.01	19.60	0.44	3.15	11.30	1.05	0.66	26.26
WTT	MJ/mi	4.27	8.15	8.37	6.51	18.05	31.16	33.93	14.64	21.20	23.21	31.12	22.97	20.80	15.20	24.99
TTW	MJ/mi	37.40	37.40	37.00	37.00	35.15	35.15	35.15	27.04	27.04	27.04	23.43	23.43	23.43	23.43	23.43
GHGs (weighted)																
WTT	g/mi	381	733	713	578	848	-2141	1030	750	-1713	796	3127	2118	1071	2249	1848
TTW	g/mi	2080	2080	2108	2108	2345	2345	2345	1851	1851	1851	0	0	0	0	0
TOTAL	g/mi	2460	2813	2821	2686	3193	204	3375	2601	138	2647	3127	2118	1071	2249	1848
Criteria, Total																
VOC	g/mi	0.955	1.007	1.013	0.952	3.017	0.783	1.207	0.560	0.198	0.507	0.317	0.219	0.372	0.229	0.237
CO	g/mi	3.338	3.636	3.643	3.367	3.775	3.458	3.142	1.236	0.880	0.808	0.584	0.335	0.323	0.341	0.403
NOx	g/mi	15.706	18.132	18.282	15.659	17.946	16.438	16.327	5.837	3.443	4.195	0.289	0.208	0.872	0.191	0.661
PM10 (x10)	g/mi	3.017	3.772	3.771	3.032	2.928	2.512	57.973	1.855	0.340	74.924	0.633	0.471	59.726	0.388	0.891
Criteria, Urban																
VOC	g/mi	0.710	0.709	0.709	0.707	2.695	2.716	0.706	0.282	0.297	0.280	0.007	0.005	0.001	0.005	0.049
CO	g/mi	3.025	3.023	3.013	3.010	3.025	3.186	3.030	0.618	0.735	0.631	0.134	0.008	0.042	0.055	0.129
NOx	g/mi	15.520	15.543	15.546	15.507	15.569	15.714	15.501	3.166	3.262	3.131	0.029	0.020	0.010	0.021	0.030
PM10 (x10)	g/mi	2.920	2.930	2.918	2.909	1.582	1.633	1.570	0.221	0.250	0.213	0.312	0.188	0.227	0.299	0.318
Urban Toxics, (weighted)																
Benzene	g/mi	7.7E-04	7.8E-04	8.9E-05	8.8E-04	1.4E-04	---	---	1.4E-04	---	---	1.0E-03	3.2E-04	---	3.0E-04	9.0E-04
1-3 Butadiene	g/mi	1.9E-03	2.0E-03	1.4E-04	1.9E-03	1.9E-04	---	---	1.9E-04	---	---	1.3E-03	3.8E-04	---	4.7E-04	1.1E-03
Formaldehyde	g/mi	1.1E-01	1.1E-01	1.0E-01	1.1E-01	1.0E-01	---	---	2.1E-02	---	---	8.3E-03	1.2E-03	---	2.5E-03	8.9E-03
Acetaldehyde	g/mi	2.4E-02	2.4E-02	2.3E-02	2.4E-02	2.3E-02	---	---	4.7E-03	---	---	3.8E-04	1.1E-04	---	1.1E-04	3.3E-04
Diesel PM	g/mi	1.4E+01	1.4E+01	1.4E+01	1.4E+01	7.0E+00	---	---	1.7E-01	---	---	3.4E-02	3.4E-02	---	0.0E+00	0.0E+00

## Figure A-10. Urban Buses: All Model Years (concluded)

### Natural Gas, DME, Methanol, and Hydrogen

Scenario Year 2030: UB Vehicle Class: All Model Years (blend)

WTT Case ID		C1	C2	L3	L1	DM1	DM3	DM5	M1	M3	M5	H2	H3	H4c	H11	H23
WTT Description		CNG, NA Natural Gas	CNG, LNG, Remote NG	LNG, Remote NG	LNG, Pipeline Liquefier	DME, Remote NG	DME, CA Poplar	DME, Coal CCS	Methanol, Remote NG	Methanol, CA Poplar	Methanol, Coal CCS	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestrati on	H2, Onsite NG SR	H2, 70% Renewable, Electrolysis
Vehicle Type		CNG	CNG	LNG	LNG	DME	DME	DME	Methanol	Methanol	Methanol	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV
Fossil	MJ/mi	40.94	45.00	44.85	43.00	52.59	2.13	67.72	41.21	28.32	49.26	50.84	34.72	42.70	37.55	21.92
Petroleum	MJ/mi	0.16	0.49	0.50	0.17	1.06	1.78	1.15	1.05	1.33	0.87	0.36	0.29	0.63	0.15	0.37
Natural Gas	MJ/mi	40.78	44.50	44.36	42.83	51.54	0.35	3.13	40.16	27.00	29.02	50.48	34.43	5.35	37.40	21.55
Coal	MJ/mi	0.00	0.00	0.00	0.00	0.00	0.00	63.43	0.00	0.00	19.38	0.00	0.00	36.72	0.00	0.00
Non Fossil	MJ/mi	0.27	0.04	0.02	0.04	0.01	63.44	0.59	0.01	19.38	0.43	3.11	11.17	1.04	0.65	25.97
WTT	MJ/mi	4.23	8.06	8.28	6.44	17.84	30.82	33.55	14.48	20.97	22.95	30.78	22.72	20.57	15.03	24.72
TTW	MJ/mi	36.98	36.98	36.59	36.59	34.76	34.76	34.76	26.74	26.74	26.74	23.17	23.17	23.17	23.17	23.17
GHGs (weighted)																
WTT	g/mi	376	725	705	571	838	-2117	1018	742	-1694	787	3092	2095	1059	2224	1827
TTW	g/mi	2057	2057	2085	2085	2319	2319	2319	1830	1830	1830	0	0	0	0	0
TOTAL	g/mi	2433	2782	2790	2656	3158	202	3337	2572	137	2617	3092	2095	1059	2224	1827
Criteria, Total																
VOC	g/mi	0.851	0.904	0.905	0.848	2.890	0.678	1.100	0.534	0.175	0.482	0.313	0.216	0.367	0.227	0.234
CO	g/mi	2.705	2.999	3.001	2.733	3.132	2.813	2.509	1.101	0.743	0.678	0.576	0.330	0.319	0.337	0.398
NOx	g/mi	12.567	14.966	15.075	12.515	14.774	13.257	13.174	5.173	2.786	3.548	0.280	0.199	0.862	0.189	0.651
PM10 (x10)	g/mi	2.598	3.345	3.342	2.613	2.697	2.273	57.130	1.825	0.319	74.082	0.618	0.458	59.056	0.378	0.875
Criteria, Urban																
VOC	g/mi	0.610	0.608	0.608	0.606	2.571	2.591	0.605	0.260	0.274	0.258	0.007	0.005	0.001	0.005	0.048
CO	g/mi	2.396	2.394	2.383	2.381	2.393	2.549	2.400	0.490	0.602	0.502	0.132	0.008	0.042	0.054	0.127
NOx	g/mi	12.383	12.406	12.405	12.369	12.424	12.554	12.364	2.531	2.617	2.496	0.028	0.020	0.010	0.021	0.027
PM10 (x10)	g/mi	2.502	2.512	2.500	2.491	1.365	1.410	1.357	0.210	0.235	0.202	0.302	0.180	0.219	0.290	0.308
Urban Toxics, (weighted)																
Benzene	g/mi	7.5E-04	7.7E-04	7.1E-05	8.5E-04	1.1E-04	---	---	1.1E-04	---	---	9.3E-04	2.7E-04	---	2.8E-04	8.9E-04
1-3 Butadiene	g/mi	1.9E-03	2.0E-03	1.3E-04	1.8E-03	1.7E-04	---	---	1.7E-04	---	---	1.2E-03	3.5E-04	---	4.5E-04	1.1E-03
Formaldehyde	g/mi	9.4E-02	9.4E-02	8.9E-02	9.5E-02	8.9E-02	---	---	1.8E-02	---	---	7.6E-03	1.1E-03	---	2.4E-03	8.8E-03
Acetaldehyde	g/mi	2.0E-02	2.0E-02	2.0E-02	2.0E-02	2.0E-02	---	---	4.0E-03	---	---	3.4E-04	9.6E-05	---	1.0E-04	3.3E-04
Diesel PM	g/mi	1.2E+01	1.2E+01	1.2E+01	1.2E+01	5.9E+00	---	---	1.6E-01	---	---	2.3E-02	2.3E-02	---	0.0E+00	0.0E+00

## Figure A-11. Urban Buses: Model Years 2010 and Newer (Natural Gas, DME, Methanol, and Hydrogen)

Scenario Year 2012: UB Vehicle Class: Model Year Start 2010 (new)

WTT Case ID	C1	C2	L3	L1	DM1	DM3	DM5	M1	M3	M5	H2	H3	H4c	H11	H23	
WTT Description	CNG, NA Natural Gas	CNG, LNG, Remote NG	LNG, Remote NG	LNG, Pipeline Liquefier	DME, Remote NG	DME, CA Poplar	DME, Coal CCS	Methanol, Remote NG	Methanol, CA Poplar	Methanol, Coal CCS	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestration	H2, Onsite NG SR	H2, 70% Renewable, Electrolysis	
Vehicle Type	CNG	CNG	LNG	LNG	DME	DME	DME	Methanol	Methanol	Methanol	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	
Vehicle Technology	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	
Fossil MJ/mi	42.31	46.71	46.43	44.51	55.65	2.21	70.10	44.57	29.15	51.00	62.83	36.48	46.55	41.57	24.96	
Petroleum MJ/mi	0.16	0.51	0.51	0.17	1.09	1.83	1.19	1.09	1.36	0.89	0.41	0.30	0.67	0.16	0.39	
Natural Gas MJ/mi	42.15	46.19	45.92	44.33	54.55	0.38	3.65	43.47	27.79	30.17	62.43	36.18	6.87	41.41	24.56	
Coal MJ/mi	0.00	0.00	0.00	0.00	0.00	0.00	65.26	0.00	0.00	19.93	0.00	0.00	39.01	0.00	0.00	
Non Fossil MJ/mi	0.21	0.03	0.02	0.03	0.01	65.27	0.47	0.01	19.94	0.34	3.43	16.06	0.90	0.74	28.20	
WTT MJ/mi	4.48	8.70	8.80	6.89	19.90	31.72	34.80	17.07	21.58	23.83	42.42	28.70	23.61	18.47	29.32	
TTW MJ/mi	38.04	38.04	37.64	37.64	35.76	35.76	35.76	27.51	27.51	27.51	23.84	23.84	23.84	23.84	23.84	
GHGs (weighted)																
WTT g/mi	399	774	743	605	954	-2177	1072	800	-1741	829	3831	2200	1198	2468	2007	
TTW g/mi	2115	2115	2144	2144	2386	2386	2386	1883	1883	1883	0	0	0	0	0	
TOTAL g/mi	2515	2890	2887	2749	3340	209	3457	2683	141	2712	3831	2200	1198	2468	2007	
Criteria, Total																
VOC g/mi	0.304	0.360	0.389	0.306	2.416	0.190	0.562	0.457	0.117	0.387	0.399	0.236	0.397	0.257	0.262	
CO g/mi	1.232	1.544	1.587	1.270	1.720	1.442	1.041	0.868	0.533	0.408	0.771	0.365	0.355	0.393	0.453	
NOx g/mi	0.900	3.404	3.854	0.902	3.272	2.201	1.569	3.053	0.913	1.304	0.428	0.281	0.928	0.232	0.718	
PM10 (x10) g/mi	0.790	1.571	1.581	0.809	1.907	1.770	57.881	1.992	0.642	76.301	0.839	0.566	62.805	0.482	0.996	
Criteria, Urban																
VOC g/mi	0.048	0.047	0.049	0.045	2.071	2.125	0.044	0.156	0.195	0.154	0.008	0.005	0.001	0.005	0.051	
CO g/mi	0.907	0.905	0.897	0.891	0.920	1.125	0.913	0.208	0.356	0.223	0.212	0.008	0.054	0.073	0.150	
NOx g/mi	0.687	0.710	0.743	0.679	0.795	1.203	0.668	0.252	0.539	0.216	0.035	0.021	0.011	0.023	0.049	
PM10 (x10) g/mi	0.672	0.683	0.670	0.660	0.506	0.715	0.473	0.291	0.435	0.286	0.436	0.236	0.286	0.367	0.390	
Urban Toxics, (weighted)																
Benzene g/mi	7.9E-04	8.1E-04	2.0E-04	1.0E-03	3.3E-04	---	---	3.3E-04	---	---	1.4E-03	6.0E-04	---	3.2E-04	9.6E-04	
1-3 Butadiene g/mi	1.9E-03	2.0E-03	2.0E-04	2.0E-03	3.0E-04	---	---	2.9E-04	---	---	1.6E-03	5.4E-04	---	5.1E-04	1.2E-03	
Formaldehyde g/mi	1.2E-02	1.2E-02	6.6E-03	1.3E-02	6.8E-03	---	---	1.8E-03	---	---	9.9E-03	1.7E-03	---	2.8E-03	9.5E-03	
Acetaldehyde g/mi	1.7E-03	1.8E-03	1.5E-03	1.8E-03	1.5E-03	---	---	4.0E-04	---	---	5.1E-04	2.1E-04	---	1.2E-04	3.5E-04	
Diesel PM g/mi	2.1E+00	2.2E+00	2.3E+00	2.2E+00	1.3E+00	---	---	2.2E-01	---	---	1.1E-01	1.1E-01	---	0.0E+00	0.0E+00	

## Figure A-11. Urban Buses: Model Years 2010 and Newer (continued)

### Natural Gas, DME, Methanol, and Hydrogen

Scenario Year 2017: UB Vehicle Class: Model Year Start 2010 (new)

WTT Case ID		C1	C2	L3	L1	DM1	DM3	DM5	M1	M3	M5	H2	H3	H4c	H11	H23
WTT Description		CNG, NA Natural Gas	CNG, LNG, Remote NG	LNG, Remote NG	LNG, Pipeline Liquefier	DME, Remote NG	DME, CA Poplar	DME, Coal CCS	Methanol, Remote NG	Methanol, CA Poplar	Methanol, Coal CCS	H <sub>2</sub> , NG SR, LH <sub>2</sub>	H <sub>2</sub> , NG SR, LH <sub>2</sub> , Ren Power	H <sub>2</sub> , Coal, Sequestrati on	H <sub>2</sub> , Onsite NG SR	H <sub>2</sub> , 70% Renewable, Electrolysis
Vehicle Type		CNG	CNG	LNG	LNG	DME	DME	DME	Methanol	Methanol	Methanol	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV
Fossil	MJ/mi	41.38	45.71	45.51	43.62	54.17	2.16	68.51	42.15	28.57	49.84	55.43	35.51	44.25	39.44	23.30
Petroleum	MJ/mi	0.16	0.50	0.50	0.17	1.07	1.80	1.16	1.06	1.34	0.88	0.37	0.30	0.65	0.15	0.38
Natural Gas	MJ/mi	41.22	45.21	45.01	43.45	53.10	0.36	3.37	41.09	27.24	29.42	55.06	35.22	5.97	39.28	22.91
Coal	MJ/mi	0.00	0.00	0.00	0.00	0.00	0.00	63.98	0.00	0.00	19.54	0.00	0.00	37.63	0.00	0.00
Non Fossil	MJ/mi	0.24	0.04	0.02	0.03	0.01	63.99	0.53	0.01	19.55	0.38	3.19	12.94	0.96	0.72	27.12
WTT	MJ/mi	4.32	8.45	8.62	6.75	19.12	31.09	33.98	15.20	21.15	23.25	35.25	25.08	21.84	16.78	27.04
TTW	MJ/mi	37.30	37.30	36.91	36.91	35.06	35.06	35.06	26.97	26.97	26.97	23.37	23.37	23.37	23.37	23.37
GHGs (weighted)																
WTT	g/mi	385	753	728	592	912	-2135	1039	759	-1708	803	3374	2142	1115	2338	1913
TTW	g/mi	2074	2074	2103	2103	2339	2339	2339	1846	1846	1846	0	0	0	0	0
TOTAL	g/mi	2460	2827	2830	2694	3251	204	3378	2605	138	2649	3374	2142	1115	2338	1913
Criteria, Total																
VOC	g/mi	0.294	0.349	0.362	0.294	2.359	0.145	0.546	0.433	0.084	0.376	0.345	0.224	0.379	0.240	0.246
CO	g/mi	1.302	1.607	1.626	1.336	1.757	1.449	1.109	0.840	0.494	0.407	0.649	0.344	0.333	0.363	0.423
NOx	g/mi	0.812	3.264	3.504	0.781	3.087	1.748	1.442	2.890	0.621	1.229	0.335	0.231	0.888	0.207	0.677
PM10 (x10)	g/mi	0.775	1.538	1.540	0.792	1.845	1.537	56.736	1.917	0.482	74.789	0.735	0.534	60.581	0.454	0.956
Criteria, Urban																
VOC	g/mi	0.048	0.047	0.047	0.044	2.028	2.061	0.043	0.151	0.174	0.149	0.007	0.005	0.001	0.005	0.049
CO	g/mi	0.987	0.985	0.976	0.972	0.991	1.165	0.993	0.215	0.340	0.228	0.162	0.008	0.047	0.063	0.138
NOx	g/mi	0.618	0.640	0.653	0.606	0.684	0.927	0.599	0.201	0.368	0.166	0.031	0.020	0.010	0.022	0.036
PM10 (x10)	g/mi	0.671	0.682	0.669	0.660	0.489	0.599	0.471	0.275	0.348	0.269	0.387	0.236	0.279	0.355	0.376
Urban Toxics, (weighted)																
Benzene	g/mi	7.7E-04	7.9E-04	1.2E-04	9.1E-04	2.0E-04	---	---	2.0E-04	---	---	1.2E-03	4.1E-04	---	3.1E-04	9.2E-04
1-3 Butadiene	g/mi	1.9E-03	2.0E-03	1.6E-04	1.9E-03	2.2E-04	---	---	2.2E-04	---	---	1.4E-03	4.3E-04	---	4.8E-04	1.1E-03
Formaldehyde	g/mi	1.2E-02	1.2E-02	6.5E-03	1.2E-02	6.6E-03	---	---	1.6E-03	---	---	8.9E-03	1.3E-03	---	2.6E-03	9.1E-03
Acetaldehyde	g/mi	1.7E-03	1.7E-03	1.4E-03	1.8E-03	1.5E-03	---	---	3.6E-04	---	---	4.2E-04	1.4E-04	---	1.1E-04	3.4E-04
Diesel PM	g/mi	2.1E+00	2.2E+00	2.3E+00	2.1E+00	1.2E+00	---	---	1.8E-01	---	---	5.7E-02	5.7E-02	---	0.0E+00	0.0E+00

# Figure A-11. Urban Buses: Model Years 2010 and Newer (continued)

## Natural Gas, DME, Methanol, and Hydrogen

Scenario Year 2022: UB Vehicle Class: Model Year Start 2010 (new)

WTT Case ID	C1	C2	L3	L1	DM1	DM3	DM5	M1	M3	M5	H2	H3	H4c	H11	H23	
WTT Description	CNG, NA Natural Gas	CNG, LNG, Remote NG	LNG, Remote NG	LNG, Pipeline Liquefier	DME, Remote NG	DME, CA Poplar	DME, Coal CCS	Methanol, Remote NG	Methanol, CA Poplar	Methanol, Coal CCS	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestrati on	H2, Onsite NG SR	H2, 70% Renewable, Electrolysis	
Vehicle Type	CNG	CNG	LNG	LNG	DME	DME	DME	Methanol	Methanol	Methanol	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV	
Vehicle Technology	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	
Fossil MJ/mi	40.88	44.94	44.79	42.94	52.52	2.13	67.62	41.15	28.28	49.20	50.77	34.67	42.64	37.50	21.89	
Petroleum MJ/mi	0.16	0.49	0.49	0.17	1.05	1.78	1.15	1.05	1.32	0.87	0.35	0.29	0.63	0.15	0.37	
Natural Gas MJ/mi	40.72	44.44	44.30	42.77	51.47	0.35	3.13	40.10	26.96	28.98	50.41	34.38	5.35	37.35	21.52	
Coal MJ/mi	0.00	0.00	0.00	0.00	0.00	0.00	63.35	0.00	0.00	19.35	0.00	0.00	36.67	0.00	0.00	
Non Fossil MJ/mi	0.27	0.04	0.02	0.04	0.01	63.36	0.59	0.01	19.36	0.43	3.11	11.16	1.04	0.65	25.93	
WTT MJ/mi	4.22	8.05	8.27	6.43	17.82	30.77	33.50	14.46	20.94	22.92	30.74	22.69	20.54	15.01	24.68	
TTW MJ/mi	36.93	36.93	36.54	36.54	34.71	34.71	34.71	26.70	26.70	26.70	23.14	23.14	23.14	23.14	23.14	
GHGs (weighted)																
WTT g/mi	376	724	704	571	837	-2114	1017	741	-1691	786	3088	2092	1057	2221	1825	
TTW g/mi	2054	2054	2082	2082	2316	2316	2316	1828	1828	1828	0	0	0	0	0	
TOTAL g/mi	2430	2778	2786	2653	3153	202	3333	2569	136	2614	3088	2092	1057	2221	1825	
Criteria, Total																
VOC g/mi	0.289	0.341	0.347	0.287	2.326	0.119	0.539	0.422	0.065	0.370	0.313	0.216	0.367	0.226	0.234	
CO g/mi	1.303	1.597	1.605	1.332	1.735	1.422	1.110	0.822	0.470	0.400	0.577	0.331	0.319	0.337	0.398	
NOx g/mi	0.757	3.153	3.302	0.711	2.969	1.480	1.371	2.814	0.450	1.192	0.286	0.205	0.861	0.189	0.653	
PM10 (x10) g/mi	0.766	1.512	1.511	0.781	1.810	1.399	56.169	1.881	0.386	74.040	0.675	0.515	59.032	0.433	0.930	
Criteria, Urban																
VOC g/mi	0.048	0.046	0.046	0.044	2.007	2.028	0.043	0.148	0.163	0.146	0.007	0.005	0.001	0.005	0.048	
CO g/mi	0.994	0.993	0.983	0.980	0.994	1.154	0.999	0.212	0.327	0.224	0.132	0.008	0.042	0.054	0.127	
NOx g/mi	0.574	0.596	0.599	0.561	0.622	0.766	0.555	0.176	0.271	0.141	0.028	0.020	0.010	0.021	0.030	
PM10 (x10) g/mi	0.670	0.681	0.668	0.660	0.480	0.531	0.469	0.268	0.297	0.260	0.358	0.236	0.274	0.345	0.364	
Urban Toxics, (weighted)																
Benzene g/mi	7.6E-04	7.7E-04	8.8E-05	8.7E-04	1.4E-04	---	---	1.4E-04	---	---	1.0E-03	3.2E-04	---	2.9E-04	8.9E-04	
1-3 Butadiene g/mi	1.9E-03	2.0E-03	1.4E-04	1.8E-03	1.9E-04	---	---	1.8E-04	---	---	1.2E-03	3.7E-04	---	4.7E-04	1.1E-03	
Formaldehyde g/mi	1.2E-02	1.2E-02	6.4E-03	1.2E-02	6.5E-03	---	---	1.5E-03	---	---	8.2E-03	1.2E-03	---	2.5E-03	8.8E-03	
Acetaldehyde g/mi	1.7E-03	1.7E-03	1.4E-03	1.8E-03	1.5E-03	---	---	3.3E-04	---	---	3.7E-04	1.1E-04	---	1.1E-04	3.3E-04	
Diesel PM g/mi	2.1E+00	2.2E+00	2.3E+00	2.1E+00	1.2E+00	---	---	1.6E-01	---	---	3.4E-02	3.4E-02	---	0.0E+00	0.0E+00	

## Figure A-11. Urban Buses: Model Years 2010 and Newer (concluded)

### Natural Gas, DME, Methanol, and Hydrogen

**Scenario Year 2030: UB Vehicle Class: Model Year Start 2010 (new)**

WTT Case ID		C1	C2	L3	L1	DM1	DM3	DM5	M1	M3	M5	H2	H3	H4c	H11	H23
WTT Description		CNG, NA Natural Gas	CNG, LNG, Remote NG	LNG, Remote NG	LNG, Pipeline Liquefier	DME, Remote NG	DME, CA Poplar	DME, Coal CCS	Methanol, Remote NG	Methanol, CA Poplar	Methanol, Coal CCS	H2, NG SR, LH2	H2, NG SR, LH2, Ren Power	H2, Coal, Sequestrati on	H2, Onsite NG SR	H2, 70% Renewable, Electrolysis
Vehicle Type		CNG	CNG	LNG	LNG	DME	DME	DME	Methanol	Methanol	Methanol	H2FCV	H2FCV	H2FCV	H2FCV	H2FCV
Vehicle Technology		ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	ICEV	FCV	FCV	FCV	FCV	FCV	FCV	FCV	FCV
Fossil	MJ/mi	40.48	44.49	44.35	42.51	52.00	2.11	66.95	40.75	28.00	48.71	50.27	34.33	42.22	37.13	21.68
Petroleum	MJ/mi	0.16	0.49	0.49	0.17	1.04	1.76	1.14	1.04	1.31	0.86	0.35	0.29	0.62	0.14	0.37
Natural Gas	MJ/mi	40.32	44.00	43.86	42.35	50.96	0.35	3.10	39.70	26.69	28.69	49.91	34.04	5.29	36.98	21.31
Coal	MJ/mi	0.00	0.00	0.00	0.00	0.00	0.00	62.72	0.00	0.00	19.16	0.00	0.00	36.31	0.00	0.00
Non Fossil	MJ/mi	0.26	0.04	0.02	0.04	0.01	62.73	0.59	0.01	19.17	0.43	3.08	11.04	1.03	0.64	25.67
WTT	MJ/mi	4.18	7.97	8.19	6.37	17.64	30.47	33.17	14.32	20.73	22.70	30.43	22.46	20.34	14.86	24.44
TTW	MJ/mi	36.56	36.56	36.18	36.18	34.37	34.37	34.37	26.44	26.44	26.44	22.91	22.91	22.91	22.91	22.91
GHGs (weighted)																
WTT	g/mi	372	717	697	565	829	-2093	1007	734	-1675	778	3057	2071	1047	2199	1807
TTW	g/mi	2034	2034	2061	2061	2293	2293	2293	1810	1810	1810	0	0	0	0	0
TOTAL	g/mi	2406	2751	2759	2626	3122	200	3300	2543	135	2588	3057	2071	1047	2199	1807
Criteria, Total																
VOC	g/mi	0.268	0.319	0.321	0.264	2.284	0.096	0.514	0.414	0.058	0.362	0.309	0.213	0.363	0.224	0.231
CO	g/mi	1.328	1.619	1.620	1.355	1.750	1.435	1.134	0.819	0.466	0.401	0.569	0.326	0.316	0.334	0.393
NOx	g/mi	0.764	3.136	3.244	0.712	2.946	1.446	1.364	2.782	0.423	1.176	0.277	0.197	0.852	0.187	0.644
PM10 (x10)	g/mi	0.808	1.546	1.544	0.822	1.815	1.396	55.635	1.862	0.373	73.306	0.668	0.510	58.450	0.431	0.922
Criteria, Urban																
VOC	g/mi	0.029	0.027	0.027	0.025	1.968	1.988	0.024	0.142	0.156	0.140	0.007	0.005	0.001	0.005	0.048
CO	g/mi	1.022	1.020	1.010	1.007	1.019	1.173	1.027	0.215	0.326	0.227	0.131	0.008	0.041	0.053	0.125
NOx	g/mi	0.582	0.604	0.603	0.568	0.622	0.751	0.563	0.170	0.255	0.136	0.028	0.019	0.009	0.020	0.027
PM10 (x10)	g/mi	0.713	0.723	0.711	0.702	0.498	0.542	0.490	0.265	0.289	0.257	0.356	0.236	0.274	0.344	0.362
Urban Toxics, (weighted)																
Benzene	g/mi	7.4E-04	7.6E-04	7.1E-05	8.4E-04	1.1E-04	---	---	1.1E-04	---	---	9.2E-04	2.7E-04	---	2.8E-04	8.8E-04
1-3 Butadiene	g/mi	1.8E-03	1.9E-03	1.3E-04	1.8E-03	1.7E-04	---	---	1.7E-04	---	---	1.1E-03	3.5E-04	---	4.5E-04	1.1E-03
Formaldehyde	g/mi	8.6E-03	8.7E-03	3.6E-03	9.4E-03	3.6E-03	---	---	8.9E-04	---	---	7.6E-03	1.1E-03	---	2.4E-03	8.7E-03
Acetaldehyde	g/mi	1.1E-03	1.1E-03	8.0E-04	1.1E-03	8.2E-04	---	---	2.0E-04	---	---	3.3E-04	9.5E-05	---	1.0E-04	3.2E-04
Diesel PM	g/mi	2.3E+00	2.5E+00	2.5E+00	2.3E+00	1.3E+00	---	---	1.6E-01	---	---	2.3E-02	2.3E-02	---	0.0E+00	0.0E+00