APPENDIX J

TECHNICAL INFORMATION AND STUDIES

APPENDIX J1
AIR QUALITY

Date	Reference
September 24, 2003	Mobile 6.2.03 Output
N/A	Air Quality Monitoring Data Technical Appendix

MOBILE 6.2.03 OUTPUT

```
************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                           *
* Input file: CCLRT.IN (file 1, run 1).                                *
************************************************************************
*2007, 2014 and 2030 Run for CCLRT

* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2007 CCLRT

* File 1, Run 1, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
            The user supplied arterial average speed of  2.5
            will be used for all hours of the day.  100% of VMT
            has been assigned to the arterial/collector roadway
            type for all hours of the day and all vehicle types.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
              there are no sales for vehicle class HDGV8b

* Reading Ammonia (NH3) Basic Emissiion Rates
* from the external data file PMNH3BER.D

* Reading Ammonia (NH3) Sulfur Deterioration Rates
* from the external data file PMNH3SDR.D
  M111 Warning:
               The input dIesel sulfur level of 500.0 ppm exceeds
               the 2007 HDD Rule diesel sulfur limit of 15 ppm.

                    Calendar Year:  2007
                            Month:  Jan.
                         Altitude:  Low
              Minimum Temperature:   6.2 (F)
              Maximum Temperature:  22.8 (F)
                Absolute Humidity:   75. grains/lb
                 Nominal Fuel RVP:   9.0 psi
                    Weathered RVP:   9.0 psi
              Fuel Sulfur Content:   33. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
                 Reformulated Gas:  No

      Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV
 LDDT      HDDV        MC   All Veh
```

GVWR:	<6000	>6000	(All)			
VMT Distribution:	0.3947	0.3556	0.1213		0.0356	0.0004
0.0019	0.0849	0.0055	1.0000			

Composite Emission Factors (g/mi):

Composite THC :	6.568	6.791	11.316	7.942	9.801	0.802
1.473	1.543	9.06	6.914			
Composite CO :	61.67	69.73	104.57	78.59	80.08	3.587
3.170	12.610	116.35	66.401			
Composite NOX :	1.747	2.324	3.331	2.580	2.864	1.416
1.849	15.850	1.55	3.381			

Non-Exhaust Emissions (g/mi):

Hot Soak Loss:	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000			
Diurnal Loss:	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000			
Resting Loss:	0.071	0.070	0.133	0.086	0.118	0.000
0.000	0.000	0.032	0.073			
Running Loss:	3.857	2.989	4.618	3.404	4.348	0.000
0.000	0.000	0.000	3.301			
Crankcase Loss:	0.008	0.010	0.010	0.010	0.010	0.000
0.000	0.000	0.000	0.008			
Refueling Loss:	0.032	0.056	0.108	0.069	0.181	0.000
0.000	0.000	0.000	0.052			
Total Non-Exhaust:	3.969	3.125	4.870	3.579	4.657	0.000
0.000	0.000	0.032	3.435			

Veh. Type:	HDDV2B	HDDV3	HDDV4	HDDV5	HDDV6	HDDV7
HDDV8A	HDDV8B					
VMT Mix:	0.0092	0.0028	0.0027	0.0013	0.0064	0.0092
0.0111	0.0396					

Composite Emission Factors (g/mi):

Composite THC :	0.677	0.723	0.898	0.940	1.287	1.603
1.567	1.866					
Composite CO :	4.703	5.325	6.130	6.349	7.369	9.283
13.356	16.944					
Composite NOX :	5.945	6.510	8.102	8.509	11.398	14.215
17.059	19.934					

Non-Exhaust Emissions (g/mi):

Hot Soak Loss:	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000					
Diurnal Loss:	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000					
Resting Loss:	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000					
Running Loss:	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000					
Crankcase Loss:	0.000	0.000	0.000	0.000	0.000	0.000

```
0.000     0.000
     Refueling Loss:     0.000     0.000     0.000     0.000     0.000     0.000
0.000     0.000
  Total Non-Exhaust:     0.000     0.000     0.000     0.000     0.000     0.000
0.000     0.000

-------------------------------------------------------------------------------
---------------------------------
**************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                             *
* Input file: CCLRT.IN (file 1, run 2).                                  *
**************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2007 CCLRT

* File 1, Run 2, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
            The user supplied arterial average speed of 30.0
            will be used for all hours of the day.  100% of VMT
            has been assigned to the arterial/collector roadway
            type for all hours of the day and all vehicle types.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
              there are no sales for vehicle class HDGV8b
  M111 Warning:
               The input dIesel sulfur level of 500.0 ppm exceeds
               the 2007 HDD Rule diesel sulfur limit of 15 ppm.

                    Calendar Year:  2007
                            Month:  Jan.
                         Altitude:  Low
              Minimum Temperature:   6.2 (F)
              Maximum Temperature:  22.8 (F)
                Absolute Humidity:   75. grains/lb
                 Nominal Fuel RVP:   9.0 psi
                    Weathered RVP:   9.0 psi
              Fuel Sulfur Content:   33. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
                 Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV
```

```
 LDDT      HDDV        MC    All Veh
               GVWR:              <6000     >6000     (All)
                          ------    ------    ------    ------    ------    ------
------    ------    ------    ------
   VMT Distribution:    0.3947    0.3556    0.1213              0.0356    0.0004
0.0019    0.0849    0.0055    1.0000

-------------------------------------------------------------------------------
---------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :      1.040     1.373     2.415     1.638     1.106    0.364
0.653     0.497      1.88     1.285
     Composite CO  :     23.76     27.71     36.79     30.02     14.46     1.140
1.023     2.529     15.85    24.516
     Composite NOX :      0.920     1.235     1.803     1.379     3.683    0.734
0.956     8.248      1.64     1.864

-------------------------------------------------------------------------------
---------------------------------
*******************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                                  *
* Input file: CCLRT.IN (file 1, run 3).                                       *
*******************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # #
* 2014 CCLRT

* File 1, Run 3, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
             The user supplied arterial average speed of  2.5
             will be used for all hours of the day.  100% of VMT
             has been assigned to the arterial/collector roadway
             type for all hours of the day and all vehicle types.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
               there are no sales for vehicle class HDGV8b
  M 48 Warning:
               there are no sales for vehicle class LDDT12

                     Calendar Year:  2014
                             Month:  Jan.
                          Altitude:  Low
               Minimum Temperature:   6.2 (F)
               Maximum Temperature:  22.8 (F)
                 Absolute Humidity:   75. grains/lb
```

```
                Nominal Fuel RVP:   9.0 psi
                   Weathered RVP:   9.0 psi
              Fuel Sulfur Content:   30. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
                 Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV
 LDDT      HDDV        MC   All Veh
            GVWR:                <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------
------    ------    ------    ------
   VMT Distribution:    0.3142    0.4149    0.1415              0.0358    0.0003
0.0021    0.0861    0.0052    1.0000

-------------------------------------------------------------------------------------------
-----------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :      2.971     3.105     5.851     3.803     4.446    0.254
0.761     0.993      8.30     3.339
     Composite CO  :     45.24     44.65     63.21     49.37     50.21     2.302
1.830     4.258    116.35    44.455
     Composite NOX :      0.905     1.187     2.147     1.431     1.088    0.302
0.772     6.361      1.55     1.677

-------------------------------------------------------------------------------------------
-----------------------------------
*****************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                                *
* Input file: CCLRT.IN (file 1, run 4).                                     *
*****************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # #
* 2014 CCLRT

* File 1, Run 4, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
            The user supplied arterial average speed of 30.0
            will be used for all hours of the day.  100% of VMT
            has been assigned to the arterial/collector roadway
            type for all hours of the day and all vehicle types.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
```

there are no sales for vehicle class HDGV8b
M 48 Warning:
there are no sales for vehicle class LDDT12

Calendar Year: 2014
Month: Jan.
Altitude: Low
Minimum Temperature: 6.2 (F)
Maximum Temperature: 22.8 (F)
Absolute Humidity: 75. grains/lb
Nominal Fuel RVP: 9.0 psi
Weathered RVP: 9.0 psi
Fuel Sulfur Content: 30. ppm

Exhaust I/M Program: No
Evap I/M Program: No
ATP Program: No
Reformulated Gas: No

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC
GVWR:	All Veh	<6000	>6000	(All)					
VMT Distribution:	0.3142	0.4149	0.1415		0.0358	0.0003	0.0021	0.0861	0.0052
	1.0000								

Composite Emission Factors (g/mi):

Composite VOC :	0.544	0.690	1.276	0.839	0.532	0.107	0.328	0.324	1.86
	0.695								
Composite CO :	18.54	19.20	25.87	20.90	9.06	0.689	0.564	0.854	15.85
	17.934								
Composite NOX :	0.477	0.647	1.200	0.788	1.400	0.156	0.399	3.295	1.64
	0.931								

****
* MOBILE6.2.03 (24-Sep-2003) *
* Input file: CCLRT.IN (file 1, run 5). *
****

* #
* 2030 CCLRT

* File 1, Run 5, Scenario 1.
* #
M583 Warning:
The user supplied arterial average speed of 2.5
will be used for all hours of the day. 100% of VMT
has been assigned to the arterial/collector roadway
type for all hours of the day and all vehicle types.

* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

```
* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
              there are no sales for vehicle class HDGV8b
  M 48 Warning:
              there are no sales for vehicle class LDDT12

                    Calendar Year:  2030
                            Month:  Jan.
                         Altitude:  Low
              Minimum Temperature:   6.2 (F)
              Maximum Temperature:  22.8 (F)
                Absolute Humidity:   75. grains/lb
                 Nominal Fuel RVP:   9.0 psi
                    Weathered RVP:   9.0 psi
              Fuel Sulfur Content:   30. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
                 Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV
 LDDT      HDDV        MC   All Veh
             GVWR:               <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------
------    ------    ------    ------
   VMT Distribution:    0.2790    0.4400    0.1500              0.0363    0.0003
0.0022    0.0872    0.0050    1.0000

-------------------------------------------------------------------------------------------
-----------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :      2.128     2.255     3.419     2.551     2.466    0.116
0.280     0.745      8.30     2.296
     Composite CO  :     38.94     36.09     45.04     38.37     46.24     1.869
1.139     1.145    116.35    35.869
     Composite NOX :      0.499     0.712     1.139     0.820     0.153    0.045
0.209     1.032      1.55     0.727

-------------------------------------------------------------------------------------------
-----------------------------------
**************************************************************************
* MOBILE6.2.03 (24-Sep-2003)                                             *
* Input file: CCLRT.IN (file 1, run 6).                                  *
**************************************************************************

* # # # # # # # # # # # # # # # # # # # # # # # #
* 2030 CCLRT

* File 1, Run 6, Scenario 1.
* # # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
            The user supplied arterial average speed of 30.0
            will be used for all hours of the day.  100% of VMT
            has been assigned to the arterial/collector roadway
```

type for all hours of the day and all vehicle types.

```
* Reading PM Gas Carbon ZML Levels
* from the external data file PMGZML.CSV

* Reading PM Gas Carbon DR1 Levels
* from the external data file PMGDR1.CSV

* Reading PM Gas Carbon DR2 Levels
* from the external data file PMGDR2.CSV

* Reading PM Diesel Zero Mile Levels
* from the external data file PMDZML.CSV

* Reading the First PM Deterioration Rates
* from the external data file PMDDR1.CSV

* Reading the Second PM Deterioration Rates
* from the external data file PMDDR2.CSV
  M 48 Warning:
              there are no sales for vehicle class HDGV8b
  M 48 Warning:
              there are no sales for vehicle class LDDT12

                    Calendar Year:  2030
                            Month:  Jan.
                         Altitude:  Low
              Minimum Temperature:   6.2 (F)
              Maximum Temperature:  22.8 (F)
                Absolute Humidity:   75. grains/lb
                 Nominal Fuel RVP:   9.0 psi
                    Weathered RVP:   9.0 psi
              Fuel Sulfur Content:   30. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
                 Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV
 LDDT      HDDV        MC   All Veh
                GVWR:               <6000     >6000     (All)
                          ------    ------    ------    ------    ------    ------
------    ------    ------    ------
   VMT Distribution:    0.2790    0.4400    0.1500              0.0363    0.0003
0.0022    0.0872    0.0050    1.0000

-------------------------------------------------------------------------------
---------------------------------
 Composite Emission Factors (g/mi):
     Composite VOC :      0.365     0.452     0.679     0.509     0.256    0.048
0.114     0.243      1.86     0.442
     Composite CO  :     16.69     15.30     18.12     16.02      8.35     0.550
0.324     0.230     15.85    14.509
     Composite NOX :      0.261     0.377     0.612     0.436     0.196    0.023
0.107     0.520      1.64     0.391

-------------------------------------------------------------------------------
---------------------------------
```

Air Quality Monitoring Data

Monitored Nitrogen Dioxide (NO_2) in Ramsey County, MN[a]

Year	No. of 1-Hour Observations	Annual (ppm)	NAAQS/ Minnesota AAQS (ppm)
2005	8,388	0.012	0.053
2006	8,352	0.011	
2007	5,560	0.011	

Footnotes:

[a] No NO2 monitors are located in Ramsey County. Monitored results shown are at the monitor of highest concentration in the four counties (Hennepin, Anoka, Washington, Dakota) adjacent to Ramsey county. For 2005, the monitor is located at 2289 County Road J in Blaine, Anoka County. For 2006 and 2007, the monitor is located at 12821 Pine Bend Trail in Rosemount, Dakota County.

Monitored Ozone (O_3) in Ramsey County, MN[a]

Year	No. of Days with Data	8-Hour Highest 4th High (ppm)	NAAQS/ Minnesota AAQS (ppm) [b]
2005	183	0.077	0.075/0.08
2006	183	0.072	
2007	177	0.077	

Footnotes:

[a] No ozone monitors are located in Ramsey County. Monitored results shown are at the monitor of highest concentration in the four counties (Hennepin, Anoka, Washington, Dakota) adjacent to Ramsey county. For 2005 and 2006, the monitor is located at 2660 Fawn Road in East Bethel, Anoka County. For 2007, the monitor is located at 11660 Myeron Road North in Washington County.

[b] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. This standard is effective May 27, 2008, however, the 1997 standard (0.08) – and the implementation rules for that standard – will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard

Monitored Particulate Matter under 10 Microns in Diameter (PM_{10}) in Ramsey County, MN[a]

Year	No. of 24-Hour Observations	24-Hour Highest (µg/m^3)	NAAQS/ Minnesota AAQS (µg/m^3) [b]	Annual (µg/m^3)	Minnesota AAQS (µg/m^3) [c]
2005	58	83	150	29	50
2006	56	76		28	
2007	57	129		29	

[a] Four PM_{10} monitors are located in Ramsey County. Monitored results shown are at the monitor of highest concentration, which is located at 1450 Red Rock Road in St. Paul for all three years and both averaging periods.

[b] Not to be exceeded more than once per year on average over 3 years. As a conservative representation, the highest monitored 24-hour values are shown.

[c] A Minnesota standard only.

Monitored Particulate Matter under 2.5 Microns in Diameter ($PM_{2.5}$) in Ramsey County, MN[a]

Year	No. of 24-Hour Observations	24-Hour ($\mu g/m^3$) 98th %	NAAQS/ Minnesota AAQS ($\mu g/m^3$) [b]	Annual ($\mu g/m^3$)	NAAQS/ Minnesota AAQS ($\mu g/m^3$)
2005	119	31.2	65	12.24	15
2006	58	30.9		10.75	
2007	111	27.4		10.86	

[a] Three $PM_{2.5}$ monitors are located in Ramsey County. Monitored results shown are at the monitor of highest concentration, which, for both averaging periods, is located at 1450 Red Rock Road in St. Paul for 2005 and 2007, and at 555 Cedar Street in St. Paul for 2006.

[b] The 24-hour NAAQS value for $PM_{2.5}$ is compared to the 98th percentile value for determining compliance with the NAAQS.

Monitored Sulfur Dioxide (SO_2) in the Ramsey County, MN[a]

Year	No. of 1-Hour Obs.	1-Hour H2H (ppm)	MN AAQS (ppm) [b]	3-Hour H2H (ppm)	NAAQS/ MN AAQS (ppm) [c]	24-Hour H2H (ppm)	NAAQS/ MN AAQS (ppm) [c]	Annual (ppm)	NAAQS/ MN AAQS (ppm)
2005	8,655	0.095	0.5	0.065	0.5/0.35	0.025	0.14	0.003	0.03
2006	8,694	0.060		0.052		0.030		0.002	
2007	8,273/7,932	0.039		0.027		0.011		0.002	

[a] No SO_2 monitors are located in Ramsey County. Monitored results shown are at the monitor of highest concentration in the four counties (Hennepin, Anoka, Washington, Dakota) adjacent to Ramsey county. For 2005 and 2006, the monitor is located at 528 Hennepin Avenue in Minneapolis, Hennepin County. For 2007, the monitor for the 1-hour and annual concentrations (8,273 observations) shown is located at 2289 Country Road J in Blaine, Anoka County, and the monitor for the 3-hour and 24-hour concentrations (7,932 observations) shown is located at 528 Hennepin Avenue in Hennepin County.

[b] One exceedance of the 0.5 ppm level and 0.35 ppm level is allowed per year.

[c] One exceedance of the 3-hour and 24-hour standard is allowed per year.