### Misc Non-Road Mobile - TONS PER YEAR

<table>
<thead>
<tr>
<th>County</th>
<th>FIPs</th>
<th>CO</th>
<th>NOx</th>
<th>SO2</th>
<th>VOC</th>
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<td>4.44</td>
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<td>928.80</td>
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<td>17.38</td>
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<td>111.90</td>
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<td>12.55</td>
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<tr>
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<td>17.69</td>
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<td>1,776.00</td>
<td>96.90</td>
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<td>22.00</td>
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<td>9,916.41</td>
<td>1,300.71</td>
<td>1,229.46</td>
</tr>
</tbody>
</table>

### PM10

- **Beaver**: 209.30
- **Box Elder**: 6,016.00
- **Cache**: 3,709.00
- **Carbon**: 886.20
- **Daggett**: 543.60
- **Davis**: 7,869.00
- **Duchesne**: 1,204.00
- **Emery**: 391.20
- **Garfield**: 2,151.00
- **Grand**: 3,127.00
- **Iron**: 1,270.00
- **Juab**: 679.60
- **Kane**: 2,136.00
- **Millard**: 1,541.00
- **Morgan**: 205.70
- **Piute**: 102.70
- **Rich**: 1,776.00
- **Salt Lake**: 34,980.00
- **San Juan**: 1,602.00
- **Sanpete**: 976.00
- **Sevier**: 1,725.00
- **Summit**: 2,754.00
- **Tooele**: 2,277.00
- **Uintah**: 1,562.00
- **Utah**: 11,633.00
- **Wasatch**: 1,313.00
- **Washington**: 6,476.00
- **Wayne**: 756.00
- **Weber**: 7,260.00

**Total PM10**: 107,131.30 TONS PER YEAR

### PM2.5

- **Beaver**: 51.77
- **Box Elder**: 681.70
- **Cache**: 476.60
- **Carbon**: 131.90
- **Daggett**: 22.31
- **Davis**: 928.80
- **Duchesne**: 111.20
- **Emery**: 111.90
- **Garfield**: 84.41
- **Grand**: 74.56
- **Iron**: 193.70
- **Juab**: 68.87
- **Kane**: 83.15
- **Millard**: 221.50
- **Morgan**: 34.23
- **Piute**: 17.69
- **Rich**: 96.90
- **Salt Lake**: 2,805.00
- **San Juan**: 102.90
- **Sanpete**: 107.90
- **Sevier**: 202.20
- **Summit**: 227.10
- **Tooele**: 251.70
- **Uintah**: 161.50
- **Utah**: 1,340.00
- **Wasatch**: 125.80
- **Washington**: 573.10
- **Wayne**: 35.22
- **Weber**: 592.80

**Total PM2.5**: 9,916.41 TONS PER YEAR
Notes
1. VOC emissions are shown as follows:
   a. "VOC including refuel" means VOC exhaust + VOC evap, where VOC evap includes,
as a sub-component, VOC refueling emissions.
   b. "VOC refueling emissions" are defined as VOC evaporative emissions that are released
    when individual vehicles refuel at gasoline stations.
    VOC refueling emissions have traditionally been reported in the Area Source (Non-point)
    inventory, and are not considered part of the on-road mobile source inventory.
    However, VOC refueling emissions are computed by the MOVES2010b model.
   c. On-road mobile source emissions are shown above as "VOC LESS Refuel" emissions.
   d. The ratio (VOC refuel/VOC ORMS) is a statewide average of 0.0926, or 9.26%.
    This means that VOC refueling emissions are about 9.26% as large as on-road mobile source VOC emissions.
    Refueling emissions are released to atmosphere when fresh gasoline enters the gasoline tank.
    Fresh gasoline displaces vaporous gasoline emissions.
    Vehicles equipped with "On-board Refueling Vapor Recovery"
canisters capture about 98% of refueling emissions.
    ORVR phase-in began with the 1998 model year in light-duty passenger vehicles.
    ORVR on light-duty trucks began to phase in with the 2001 model year, and on heavy-duty
   e. Refueling emissions are relatively high in counties showing the following:
      1) Older vehicles
      2) Large fractions of light-duty gasoline trucks II (6,000 to 8,500 lb GVWR) and larger fractions of
         heavy-duty gasoline vehicles (> 8,500 lb GVWR).

2. Vehicle Miles Traveled
Vehicle Miles Traveled were reported for calendar year 2011 by UT Department of Transportation.
Units are Average Annual Daily Traffic (AADT), or simply average daily traffic, i.e., the average daily traffic over
the 365 days in calendar year 2011.

3. Greenhouse Gases
The major greenhouse gas in terms of mass is CO2.
However, in terms of global warming potential, methane (CH4) and nitrous oxide (N2O) each have a much higher
"global warming potential":

4. Global Warming Potential (GWP)
"Global warming potential" is defined as follows:
"Global Warming Potential (GWP) is intended as a quantified measure of the globally averaged relative
radiative forcing impacts of a particular greenhouse gas. It is defined as the cumulative radiative forcing--
both direct and indirect effects--integrated over a period of time from the emission of a unit mass of gas
relative to some reference gas (IPCC 1996). Carbon dioxide (CO2) was chosen as this reference gas." (7)

<table>
<thead>
<tr>
<th>Compound</th>
<th>GWP (20-yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>1.00</td>
</tr>
<tr>
<td>CH4</td>
<td>56</td>
</tr>
<tr>
<td>N2O</td>
<td>280</td>
</tr>
</tbody>
</table>
5. CO2 and CO2 Equivalents
CO2 emissions are comprised of carbon dioxide emissions only. CO2 equivalents include emissions of CO2, methane (CH4) and nitrous oxide (N2O). CH4 and N2O emissions are converted to "equivalent" CO2 emissions based on their higher global warming potentials. For example, 1 ton of methane has approximately the same effect on global warming as 56 tons of CO2, based on its 20-year global warming potential (GWP). One ton of nitrous oxide has about the same effect on global warming as 280 tons of CO2 (based on the 20-yr GWP).

References


2. MOVES Technical Background  
(numerous documents)  
http://www.epa.gov/otaq/models/moves/movesback.htm

3. Tools for MOVES  
MOBILE6 to MOVES converter tools, VMT tools, etc.

http://www.epa.gov/otaq/models/moves/420b10023.pdf

5. EPA Office of Transportation and Air Quality, "Commonly asked questions about ORVR",  
http://www.epa.gov/oms/regs/Id-hwy/onboard/orvrq-a.txt

http://www.theicct.org/sites/default/files/publications/ORVR_v4_0.pdf


http://tax.utah.gov/esu/mv-registrations

9. Western Regional Climate Center, "Climatological Data Summaries", Utah, Monthly Temperature Listings (Average Minimum and Average Maximum by Station, Year and Month).  
http://www.wrcc.dri.edu/summary/Climsmut.html

10. University of Utah, Department of Atmospheric Sciences/Mines and Earth Sciences/, MESOWEST, Current Weather Summaries for Utah by Station and Date (24-hour profiles).  
http://mesowest.utah.edu/index.html


12. Mountainland Association of Governments (MAG), PM2.5 SIP emission inventories

13. Cache MPO (CMPO), PM2.5 SIP emission inventories