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Appendix Q: Supporting Documents for SIP Creditability

Q.1 RESOLUTION FOR ENHANCING SIP CREDITABILITY OF INCENTIVE REDUCTIONS

The resolution is available on the District website (www.valleyair.org).

Q.2 SAMPLE EMISSION REDUCTION CALCULATIONS USED IN PROTOCOLS

The SJVAPCD Emission Reduction Incentive Program uses California Air Resources Board (ARB) guidance to develop calculations of emission reductions and cost effectiveness of various projects. ARB guidance can be found at http://www.arb.ca.gov/planning/tsaq/mvrfp/mvrfp.htm and http://www.arb.ca.gov/msprog/moyer/moyer.htm. Below are some examples to illustrate the types of calculations that could be found in a protocol applied to a specific project. These are examples only and may not reflect current District practice for calculating incentive-based emissions reductions.

Signal Coordination

**EXAMPLE**

Traffic Signal Coordination
The City’s master traffic signal controller was replaced with a new controller with expanded capacity. This allowed 25 more intersections to be coordinated.

**Inputs to Calculate Cost-Effectiveness:**

- Funding Dollars (Funding): $200,000
- Effectiveness Period (Life): 5 years
- Days of use/year (D): 250
- Length of congested roadway segment (L): 7.50 miles
- Traffic Volume during congested period (Congested Traffic): 38,400 trips per day
- Before Speed: 28 mph
- After Speed: 33 mph
Emissions Factor Inputs (From Table 4):

<table>
<thead>
<tr>
<th></th>
<th>Before Speed Factor</th>
<th>After Speed Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROG Factor</td>
<td>0.32 grams per mile</td>
<td>0.27 grams per mile</td>
</tr>
<tr>
<td>NOx Factor</td>
<td>1.20 &quot;</td>
<td>1.16 &quot;</td>
</tr>
<tr>
<td>PM10 Factor</td>
<td>0.03 &quot;</td>
<td>0.03 &quot;</td>
</tr>
</tbody>
</table>

Calculations:

Annual Project VMT (VMT) = (D) * (L) * (Congested Traffic) = 250 * 7.50 * 38,400 = 72,000,000 annual miles

Annual Emission Reductions (ROG, NOx, and PM10) in lbs. per year = \[ (.50) \times (VMT) \times (\text{Before Speed Factor} - \text{After Speed Factor}) \]/454 grams per lb.

\[ \begin{align*}
\text{ROG:} & \quad \frac{(0.50 \times 72,000,000) \times (0.32 - 0.27)}{454} = 3,965 \text{ lbs. per year} \\
\text{NOx:} & \quad \frac{(0.50 \times 72,000,000) \times (1.20 - 1.16)}{454} = 3,172 \text{ lbs. per year} \\
\text{PM10:} & \quad \frac{(0.50 \times 72,000,000) \times (0.03 - 0.03)}{454} = 0 \text{ lbs. per year}
\end{align*} \]

Capital Recovery Factor (CRF) = \( \frac{(1 + i)^n}{(1 + i)^n - 1} \) = .22 where \( n = \text{project life (5 years)} \) and \( i = \text{discount rate (3%)} \)

Cost-Effectiveness of Funding Dollars = \( \frac{\text{CRF} \times \text{Funding}}{\text{ROG} + \text{NOx} + \text{PM10}} \) = \[ .22 \times 200,000 \] / 7,137 = $6.16 per lb.

FOR CMAQ PROJECTS ONLY:

Once emissions reductions have been calculated, add them together (9,515 + 3,172 + 793) and convert emissions reductions to kg/day: \( \frac{\text{lbs. reduced per year}}{2.2 \text{ lbs./kg} \times 365 \text{ days/year}} \) = 9 kg/day

\[ \begin{align*}
\text{lbs. reduced per year} & = 7,137 \\
& = 9 \text{ kg/day}
\end{align*} \]
**Bicycle Facilities**

**Class 2 Bikeway Facility**

The new Class 2 bike lanes are a critical link in the city bike system, allowing residents bicycle access to education, employment, shopping, and transit. Within one-quarter mile of the project, there is a college, a shopping center, a light rail station, and an office building. The project includes installation of new pavement, signage, and Class 2 bike lane striping along both sides of 1.13 miles of arterials. This is primarily a college town, with a population of 128,000.

**Inputs to Calculate Cost-Effectiveness:**

- **Funding Dollars (Funding):**
  - $48,000
- **Effectiveness Period (Life):** 15 years
- **Days (D):** 200
- **Average Length (L) of bicycle trips:** 1.8 miles
- **Annual Average Daily Traffic (ADT):** 20,000
- **Adjustment (A) on ADT for auto trips replaced by bike trips from the bike facility:** 0.0109
- **Credit (C) for Activity Centers near the project:** 0.002

**Emissions Factors (From Table 3, for a 15-year Life):**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Auto Trip End Factor</th>
<th>Auto VMT Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROG Factor</td>
<td>1.210 grams/trip</td>
<td>0.321 grams/mile</td>
</tr>
<tr>
<td>NOx Factor</td>
<td>0.533</td>
<td>0.397</td>
</tr>
<tr>
<td>PM10 Factor</td>
<td>0.015</td>
<td>0.219</td>
</tr>
</tbody>
</table>

**Calculations:**

\[
\text{Annual Auto Trip Reduced} = (D) \times (ADT) \times (A + C) \\
= (200) \times (20,000) \times (0.0109 + 0.002)
\]
Annual Auto VMT Reduced = (Auto Trips) * (L)
= (51,600) * (1.8)
= 92,880

Annual Emission Reductions (ROG, NOx and PM10) in lbs. per year

\[
\text{Annual Emission Reductions} = \left[\frac{(\text{Annual Auto Trips Reduced}) \times (\text{Auto Trips End Factor}) + (\text{Annual Auto VMT Reduced}) \times (\text{Auto VMT Factor})}{454}\right]
\]

\[
\text{ROG:} \quad \left[\frac{51,600 \times 1.210 + 92,880 \times 0.321}{454}\right] = 203 \text{ lbs. per year}
\]

\[
\text{NOx:} \quad \left[\frac{51,600 \times 0.533 + 92,880 \times 0.397}{454}\right] = 142 \text{ lbs. per year}
\]

\[
\text{PM10:} \quad \left[\frac{51,600 \times 0.015 + 92,880 \times 0.219}{454}\right] = 47 \text{ lbs. per year}
\]

Capital Recovery Factor (CRF): \(= 0.08\)  \(\text{Where n = project life (15 years)}\)
\[
\left(1 + \frac{3}{100}\right)^{15}(1+i)^n = 0.08
\]
\[
\text{Cost-Effectiveness of Funding Dollars:} \quad \frac{(\text{CRF} \times \text{Funding})}{(\text{ROG} + \text{NOx} + \text{PM10})}
\]
\[
= \frac{0.08 \times 48,000}{203 + 142 + 47} = \frac{3,840}{392} = 9.79 \text{ per lb.}
\]

**FOR CMAQ PROJECTS ONLY:**
Once emissions reductions have been calculated, add them together (203 + 142 + 47 = 392)
and convert lbs. of emissions reductions per year to kg/day:

\[
\text{lbs. reduced per year} = 392 = \frac{1 \text{ kg/day}}{2.2 \text{ lbs./kg} \times 365 \text{ days/year}}
\]

\[
= \frac{2.2}{365}
\]
Telecommunications

County Probation Videophone Project
A videophone-interviewing project is implemented by the County Probation Department. Videophone equipment is installed for $40,000 at the branch probation offices and two detention centers. Videophone interviewing of 5,000 inmates per year saves 200 one-way trips per week to and from detention centers (a distance of 29 miles on average).

Inputs to calculate cost-effectiveness:
- Funding Dollars (Funding): $40,000
- Effectiveness Period (Life): 5 years
- One-Way Auto Trips Eliminated Per Week (T): 200
  Length (L) of Auto Trips Eliminated: 29 miles one-way
- Weeks (W): 50 weeks
- New Auto Trips (New T): 0
- New Auto Trip Length (New L): not applicable

Emissions Factors for Auto Travel (From Table 3):

<table>
<thead>
<tr>
<th></th>
<th>Auto Trip End</th>
<th>Auto VMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROG Factor</td>
<td>1.736 grams per trip</td>
<td>0.479 grams per mile</td>
</tr>
<tr>
<td>NOx Factor</td>
<td>0.727</td>
<td>0.620</td>
</tr>
<tr>
<td>PM10 Factor</td>
<td>0.014</td>
<td>0.219</td>
</tr>
</tbody>
</table>

Note: 1-5 year emission factors are used since project life is 5 years, and "Commute" auto trip end factors are used since this project reduces commute trips.

Calculations:

Annual Auto Trips Reduced = (W)*[(T) - (New T)]
= 50 * (200 - 0) = 10,000

Annual Auto VMT Reduced = (W)*[(T)*(L) - (New T)*(New L)]
= (50)*[(200)*(29) - 0] = 290,000
Annual Emission Reductions (ROG, NOx, and PM10)
\[ = \left[ \left( \text{Annual Auto Trips Reduced} \right) \times \left( \text{Auto Trip End Factor} \right) + \left( \text{Annual Auto VMT Reduced} \right) \times \left( \text{Auto VMT Factor} \right) \right]/454 \]

**ROG:** \[
\frac{\left(10,000 \times 1.736\right) + \left(290,000 \times 0.479\right)}{454} = 344 \text{ lbs. per year}
\]

**NOx:** \[
\frac{\left(10,000 \times 0.727\right) + \left(290,000 \times 0.620\right)}{454} = 412 \text{ lbs. per year}
\]

**PM10:** \[
\frac{\left(10,000 \times 0.014\right) + \left(290,000 \times 0.219\right)}{454} = 140 \text{ lbs. per year}
\]

**EXAMPLE**

Capital Recovery Factor (CRF) = \[
\frac{\left(1 + i\right)^n}{i} = 0.22 \quad \text{where } n = \text{project life (5 years)}
\]

\[
\text{(From Table 8)} \quad \frac{(1 + i)^n - 1}{i}
\]

\[
\text{Cost-Effectiveness of Funding Dollars} = \frac{\text{CRF} \times \text{Funding}}{\text{ROG} + \text{NOx} + \text{PM10}}
\]

\[= \frac{0.22 \times 40,000}{(344 + 412 + 140)} = \$9.82 \text{ per lb.}
\]

**FOR CMAQ PROJECTS ONLY:**

Once emissions reductions have been calculated, add them together (344 + 412 + 140 = 896) and convert emissions reductions to kg/day:

\[
\frac{\text{lbs. reduced per year}}{1 \text{ kg/day}} = \frac{896}{2.2 \text{ lbs./kg} \times 365 \text{ days/year}} = \frac{2.2 \times 365}{2.2} = \text{1 kg/day}
\]
Ridesharing

**Example**

**Counties Trip Reduction Program**
A county conducts a comprehensive employee trip reduction program, which includes vanpool and carpool programs, telecommuting, compressed work schedules, and guaranteed emergency transportation.

**Inputs to Calculate Cost-Effectiveness:**
- Funding Dollars (Funding): $140,000
- Effectiveness Period (Life): 1 year

**One-Way Auto Trips Eliminated Per Week (T) Using Optional Method 1:**
\[ T = 2 \text{ trips/day} \times 5 \text{ days/week} \times \text{peak period employees} \times \left[ \frac{1}{\text{Baseline AVR}} - \frac{1}{\text{New AVR}} \right] \]
where baseline AVR is 1.13, new AVR is 1.19, and there are 15,750 peak period employees.
Therefore, \[ T = 2 \text{ trips/day} \times 5 \text{ days/week} \times 15,750 \text{ peak period employees} \times \left[ \frac{1}{1.13} - \frac{1}{1.19} \right] = 6300 \text{ trips} \]

Length (L) of Auto Trips Eliminated: 16 miles

Weeks (W) = 52 weeks

Adjustment (A): 0.7 For auto access trips to transit, vanpools, and carpools

**Emissions Factors for Auto Travel (From Table 3):**

<table>
<thead>
<tr>
<th>Auto Trip End Factor</th>
<th>Auto VMT Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROG Factor 2.030 grams per trip</td>
<td>0.587 grams per mile</td>
</tr>
<tr>
<td>NOx Factor 0.821</td>
<td>0.785</td>
</tr>
<tr>
<td>PM10 Factor 0.014</td>
<td>0.218</td>
</tr>
</tbody>
</table>

Note: 1-5 year emission factors are used since project life is 1 year, and "Commute" auto trip end factors are used since this project reduces commute trips.

**Calculations:**
- Annual Auto Trips Reduced = \( W \times (T) \times (A) \)
  \[ = 52 \times 6300 \times 0.7 = 229,320 \]
- Annual Auto VMT Reduced = \( W \times (T) \times (L) \)
  \[ = 52 \times 6300 \times 16 \text{ miles} = 5,241,600 \text{ annual VMT reduced} \]
Annual Emission Reductions (ROG, NOx, and PM10)

= \left[ \left( \text{Annual Auto Trips Reduced} \right) \times \text{Auto Trip End Factor} \right] \left[ \left( \text{Annual Auto VMT Reduced} \right) \times \text{Auto VMT Factor} \right] / 454

\text{ROG:} \quad \frac{\left(229,320 \times 2.030\right) + \left(5,241,600 \times 0.587\right)}{454} = 7,803 \text{ lbs. per year}

\text{NOx:} \quad \frac{\left(229,320 \times 0.821\right) + \left(5,241,600 \times 0.785\right)}{454} = 9,478 \text{ lbs. per year}

\text{PM10:} \quad \frac{\left(229,320 \times 0.014\right) + \left(5,241,600 \times 0.219\right)}{454} = 2,524 \text{ lbs. per year}

\text{Capital Recovery Factor (CRF) =} \quad \left(1 + i\right)^n \times i = 1.03

\quad (1 + i)^n - 1 \quad \text{where} \quad n = \text{project life (1 year)}

\quad \text{and} \quad i = \text{discount rate (3%)}

\text{Cost-Effectiveness of Funding Dollars =} \quad \frac{\text{CRF} \times \text{Funding}}{\left(\text{ROG} + \text{NOx} + \text{PM10}\right)}

\quad = \frac{1.03 \times 140,000}{7,803 + 9,478 + 2,524} = 7.28 \text{ per lb.}

\text{FOR CMAQ PROJECTS ONLY:}

\text{Once emissions reductions have been calculated, add them together}

\quad \left(7,803 + 9,478 + 2,524 = 19,804\right) \text{ and convert emissions reductions to kg/day:}

\quad \frac{\text{lbs. reduced per year}}{2.2 \text{ lbs./kg} \times 365 \text{ days/year}}

\quad = \frac{251 \text{ kg/day}}{2.2 \times 365}
Q.3 HEAVY-DUTY PROGRAM ANNUAL REPORT SAMPLE

HEAVY-DUTY PROGRAM ANNUAL REPORT

Please submit your first annual report one-year after placing the engine(s)/vehicle(s) into service. When returning the annual report please attach a copy of evidence of insurance for the engine/vehicle.

<table>
<thead>
<tr>
<th>Date:</th>
<th>Project Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization:</td>
<td></td>
</tr>
<tr>
<td>Primary Contact Name:</td>
<td></td>
</tr>
<tr>
<td>Street/Mailing Address:</td>
<td></td>
</tr>
<tr>
<td>City:</td>
<td>State:</td>
</tr>
<tr>
<td>Phone Number:</td>
<td>Fax Number:</td>
</tr>
<tr>
<td>Email:</td>
<td></td>
</tr>
</tbody>
</table>

PLEASE PROVIDE INFORMATION FOR EACH ENGINE/VEHICLE

<table>
<thead>
<tr>
<th>Engine/Vehicle Address:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine/Vehicle Make:</td>
</tr>
<tr>
<td>Engine Serial Number:</td>
</tr>
<tr>
<td>Vehicle Miles Traveled During the Last Year:</td>
</tr>
<tr>
<td>Percent of Vehicles Miles Traveled or Hours of Operation within CA:</td>
</tr>
<tr>
<td>Percent of Vehicles Miles Traveled or Hours of Operation within the Boundaries of the SJVAPCD:</td>
</tr>
<tr>
<td>Amount of Fuel Consumed During the Last Year:</td>
</tr>
<tr>
<td>Identify any Maintenance Performed on the Engine/Vehicle:</td>
</tr>
<tr>
<td>Identify any conditions that significantly affected the usage:</td>
</tr>
<tr>
<td>Other Comments:</td>
</tr>
</tbody>
</table>

Please return this form to: Charlene Cano  
San Joaquin Valley Air Pollution Control District  
1990 East Gettysburg Avenue  
Fresno, CA 93726-0244