



2012 Area Source Emissions Inventory Methodology

540- Asphalt Paving

I. Purpose

Imperial County Air Pollution Control District (ICAPCD) has reviewed the volatile organic compounds (VOC) emissions under the 2016 Ozone SIP Baseline Emissions Projections for the 540 - Asphalt Paving category. It is evident that the emissions estimates under this category are based on an anomaly year of emissions. ICAPCD has determined to revisit this category and provide a new emissions estimate based on much realistic or average year of emissions. The purpose of this document is to describe the methodology used to determined revised 2012 emissions for the 540 - Asphalt Paving category.

II. History

Between the years 1996 and 2002 the California Transportation Department (Caltrans) was expanding State Route 86 from a two lane highway to a four lane divided highway from Westmoreland to the Imperial/Riverside county line. This highway expansion project was done on approximately 40 miles which lie within Imperial County. The assumption has been made that past emissions estimated were made during this time period, which would result in higher than normal emissions for the cutback asphalts category. The higher than normal emissions would have been attributed to the increase application of tack coats (cutback asphalt) a necessary part of the highway expansion project. Therefore, ICAPD has determined to revisit this category and provide new emissions estimate based on the methodology described in section IV below and a 2012 base year.

III. 540-Asphalt Paving Description

The 540-Asphalt Paving area source includes the following operations describe below;

Table I. Operations with EiC code within 540 Category

EiC	Description
540-560-0400-0000	Cutback Asphalts
540-562-0400-0000	Road Oils (Slow Cure)
540-564-0400-0000	Hot Mix Asphalt
540-566-0400-0000	Emulsified Asphalt

Product-Definitions -

Cutback Asphalt (slow, medium, or rapid curing): Asphalt products produced by blending an asphalt with solvents such as naphtha, kerosene, No. 2 fuel oil, diesel oil or other volatile solvents. Upon exposure to the atmosphere, the volatile product evaporates leaving the asphalt. Also included under this heading are road oils, including residual asphalt oils, used as a dust palliative or other surface treatments of pavement. Cutback asphalt is also used in tack and seal coats. Tack Coats are applied to existing surface or roadbed to provide a bond between the existing surface and the new hot mix asphalt application.

Road Oils: Slow cure asphalts

Hot Mix Asphalt: is a combination of approximately 95% aggregate bound together by asphalt cement. The hot mix asphalt is mixed at a hot mixed asphalt plant, where asphalt cement is heated and mixed with heated aggregate.

Emulsified Asphalt: is produced by emulsifying the asphalt in water with a surfactant (soap) prior to mixing with the aggregate. While emulsified, the asphalt is easy to work and compact. When the water evaporates, the emulsified asphalt will harden. Emulsified asphalts have lower VOC emissions than cutback asphalts since they have little or no diluents.

IV. Methodology

Asphalt consumption for Modified Asphalt Cement, Cutback Asphalt and Emulsified Asphalt for the state of California in the year 2012 has been obtained from the Asphalt Institute 2012 Asphalt Usage Survey.

Table 2, State of California 2012 consumption from Asphalt Institute

Asphalt Type	Tons/year
Modified asphalt	70,510
Cutback asphalt	30,904
Emulsified asphalt	66,211

Statewide and County of Imperial maintained public road miles for the year 2012 were obtained from the Caltrans Highway Performance Monitoring System (HPMS), 2012 California Public Road Data. The total miles include maintained public roads from city, county, state highway and federal agencies. The maintained public road miles will be used as a surrogate to distribute the amount of modified, cutback and emulsified asphalts

used within Imperial County from the State's total. The ratio has been calculated in table below. - - -

Table 3, 2012 Statewide and Imperial County maintained public roads

Entity	Miles
Imperial County (IC)	3,444
Statewide	175,544
Ratio (IC to Statewide)	1.96%

The amount of modified, cutback and emulsified asphalts applied within Imperial County are calculated in Table 4 below using the 1.96% ratio from table 3.

Table 4, 2012 Imperial County Asphalt consumption

Asphalt Type	Statewide Tons/yr	Ratio	Imperial County Tons/yr
Modified asphalt	70,510	1.96%	1383
Cutback asphalt	30,904	1.96%	606
Emulsified asphalt	66,211	1.96%	1299

Road Oils are classified as slow curing cutback asphalt. ICAPD will assume that 95% of the cutback asphalt consumed within Imperial County is slow curing and 5% is medium curing. The slow curing cutback asphalt will be reported under the category of road oils.

Table 5, Cutback asphalt and Road Oils Distribution

Asphalt Type	% Distribution	Tons/year
Cutback asphalt (100%)	100%	606
Cutback asphalt (Medium Cure)	5%	30
Road Oils (Slow Cure cutback asphalt)	95%	576

An asphalt cement may be modified through the addition of rubbers, plastics, fillers, extenders, fibers, oxidants, antioxidants or hydrocarbons and combinations to improve performance. ICAPCD will include the tons per year of modified asphalts in the district's Hot Mix Asphalt category. ICAPCD obtained the processing quantities of Hot Mix asphalt from yearly production reports submitted by permitted stationary sources within the Air District.

Table 6, 2012 Hot Mix Asphalt consumption

Asphalt Type	Tons/year
Modified asphalts	1,299
Hot mix asphalt	183,625
Total Hot Mix Asphalt	184,924

*Includes both asphalt cement and aggregate

V. Emission Factors

Asphalt paving emission factors are summarized in table 5, below.

Table 7, Asphalt paving emission factors

Description	VOE EF (lb/ton)	Source
Cutback Asphalts	268.3	Sonoma Technology, Inc (2003)
Road Oils	70.4	Sonoma Technology, Inc (2003)
Hot Mix Asphalt	0.002	KVB (1978)
Emulsified Asphalt	17.9	Sonoma Technology, Inc (2003)

VI. Emissions

Following are revised 2012 emissions for the 540-Asphalt Paving category.

Table 8, Total 2012 Imperial County emissions for asphalt paving

EiC	Description	Consumption (tons/yr)	VOCEF (lb/ton)	Emissions (tons/year)
540-560-0400-0000	Cutback Asphalts	30	268.3	4.02
540-562-0400-0000	Road Oils	576	70.4	20.28
540-564-0400-0000	Hot Mix Asphalt	184,924	0.002	0.18
540-566-0400-0000	Emulsified Asphalt	1299	17.9	11.63