MEMORANDUM

TO: Background Information Document for AP-42 Section 13.5

FROM: Gerri G. Garwood, P.E., EPA/OAR/OAQPS/SPPD/MPG

DATE: December 13, 2016

SUBJECT: Selection of Source Classification Codes (SCCs) for Tables 13.5-1 and 13.5-2

A. BACKGROUND

On April 20, 2015, the EPA finalized a new volatile organic compounds (VOC) emissions factor for flares in AP-42 Section 13.5, in compliance with a consent decree entered into with Air Alliance Houston, Community In-Power and Development Association, Inc., Louisiana Bucket Brigade and Texas Environmental Justice Advocacy Services ("Plaintiffs"). *Air Alliance Houston, et al. v. McCarthy*, No. 1:13-cv-00621-KBJ (D.D.C.)[1]. In response to the final action, on July 10, 2015, Plaintiffs in the original lawsuit filed a petition for judicial review of the final action in the D.C. Circuit Court of Appeals. *Air Alliance Houston, et al.* v. *EPA,* Case No. 15–1210 (D.C. Cir.). EPA and Petitioners entered into discussions to settle the D.C. Circuit litigation, and on October 13, 2016, published notice in the Federal Register of the settlement agreement reached between the parties. 81 Fed. Reg. 70,677.

During the settlement discussions, on May 12, 2016, Petitioners' counsel submitted an email[2] to DOJ and the EPA that included an attached letter concerning revisions to AP-42 Section 13.5. The letter stated Petitioners' belief that the EPA's selection of SCCs was too narrow, and it listed 15 SCCs used to classify flares in a 2009 study of flare emissions from refineries in Houston, Texas[3]. The 2009 study also listed 5 SCCs used to classify flares at olefin production sites. As part of the settlement agreement to resolve the D.C. Circuit litigation, the EPA agreed to review the 20 SCCs listed in the 2009 study[4] to determine if they should be included in the list of SCCs in Tables 13.5-1 and 13.5-2 in AP-42 and, if so, to post any such

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[1] Concurrently with that action, the EPA revised the CO emissions factor for flares in AP-42 Section 13.5.

[2] Eric Schaeffer to Michele Walter and Sparsh Khandeshi, carbon copied to Susan Stahle, Gerri Garwood and Bob Schell. See Attachment A.

[3] *TERC PROJECT No. H-95: Estimating Future Year Emissions and Control Strategy Effectiveness based on Hourly Industrial emissions. Characterization of Flare Emissions from Refineries in Houston, Texas.* The University of Texas at Austin, Center for Energy and Environmental Resources, and ENVIRON International Corporation. August 2009. See Attachment B.

[4] The 20 SCC codes are also listed in Paragraph 2.b. of the settlement agreement.

revisions to Tables 13.5-1 and 13.5-2 by the deadline agreed to in the settlement agreement. Also by that same date, the EPA agreed to post its documentation supporting its decision whether to revise the SCCs in Tables 13.5-1 and 13.5-2 on the AP-42 website. This memorandum documents the EPA's determination.

B. REVIEW PROCESS

Table 1 provides a list of the SCCs that were reviewed under this determination, along with the four level description of each SCC.

Table 1. SCCs Reviewed Under This Determination				
SCC	**Level 1 Description**	**Level 2 Description**	**Level 3 Description**	**Level 4 Description**
30600903	Industrial Processes	Petroleum Industry	Flares	Natural Gas
30600904	Industrial Processes	Petroleum Industry	Flares	Process Gas
30190099	Industrial Processes	Chemical Manufacturing	Fuel Fired Equipment	User Specified
30600999	Industrial Processes	Petroleum Industry	Flares	Not Classified
30600201	Industrial Processes	Petroleum Industry	Catalytic Cracking Units	Fluid Catalytic Cracking Unit
30699998	Industrial Processes	Petroleum Industry	Petroleum Products - Not Classified	Not Classified
30130115	Industrial Processes	Chemical Manufacturing	Chlorobenzene	Atmospheric Distillation Vents
39990022	Industrial Processes	Miscellaneous Manufacturing Industries	Miscellaneous Manufacturing Industries	Residual Oil: Flares
30688801	Industrial Processes	Petroleum Industry	Fugitive Emissions	User Specified
30600401	Industrial Processes	Petroleum Industry	Blowdown Systems	Blowdown System with Vapor Recovery System with Flaring
30601801	Industrial Processes	Petroleum Industry	Hydrogen Generation Unit	General
64420033	MACT Source Categories	Cellulose-based Resins	Carboxymethyl-cellulose Production	Product Finishing: Purification/ Extraction
30601701	Industrial Processes	Petroleum Industry	Catalytic Hydrotreating Unit	General
30600508	Industrial Processes	Petroleum Industry	Wastewater Treatment	Oil/Water Separator
40600240	Petroleum and Solvent Evaporation	Transportation and Marketing of Petroleum Products	Marine Vessels	Gasoline: Barge Loading - Average Tank Condition
30119701	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Ethylene: General
30119741	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Ethylene: Flue Gas Vent
30119705	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Propylene: General
30119709	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Propylene: Fugitive Emissions
30119799	Industrial Processes	Chemical Manufacturing	Butylene, Ethylene, Propylene, Olefin Production	Other Not Classified

In reviewing the SCCs, the EPA looked at Tables 13.5-1 and 13.5-2 of AP-42 individually due to the differences in the data sets used to create these emissions factors. Table 13.5-1 contains the original nitrogen oxides (NOx), total hydrocarbons (THC) and soot emissions factors. These factors were developed based on flare efficiency studies commissioned by the EPA in 1983 and conducted at a flare test site. Two flares, one air-assisted and one steam-assisted, burned a mixture of 80% propylene-20% propane for fuel. The objective of the study was to determine combustion efficiency under a wide range of operating conditions in which heat content of the fuel, fuel flow rate and assist flow rates varied. Table 13.5-2 contains the new VOC and revised carbon monoxide (CO) emissions factors finalized in April 2015. The EPA used the 1983 flare report in the data set for the CO emissions factor, but that report did not contain data on VOC emissions. For both of these factors, the EPA used emissions test data collected from a number of more recent flare studies during the development of an analysis of proper flare operating conditions[5]. This data included (1) tests conducted at test sites; (2) studies that resulted from enforcement actions related to flare performance issues; and (3) data from a DIAL study in the Houston area. The data set represented both steam-assisted and air-assisted flares, and the majority of the flares burned a variety of actual flare gas from refineries and chemical plants.

An emissions factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of the pollutant (e.g. pounds of pollutant per million british thermal units of fuel burned). Generally, an emissions factor represents a particular process, as the emissions profiles vary from process to process. Because different processes are represented by different SCCs, in reviewing the SCCs in Table 1 to determine which SCCs should be added to Tables 13.5-1 and 13.5-2 of AP-42, the EPA based its review on two main criteria:

(1) Is the SCC specific enough to determine what process is being controlled, such that a determination could be made as to whether the process was similar to the process used in the development of the emissions factors?

[5] *Parameters for Properly Designed and Operated Flares.* Prepared for U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. April 2012. Available at: http://www.epa.gov/airtoxics/flare/2012flaretechreport.pdf

(2) Would a flare controlling the process described by the SCC have a fuel stream similar to the fuel that was burned by the flares that were used in developing the factors in AP-42 Section 13.5, such that the emissions profile for that SCC would be represented by the emissions factor?

Table 2 provides a summary of the EPA's determinations as to which SCCs should be included in Tables 13.5-1 and 13.5-2 of AP-42.[6]

[6] In its November 11, 2016 comments on the proposed settlement agreement, the American Petroleum Institute (API) stated that the EPA should clarify that the inclusion of SCCs in Tables 13.5-1 and 13.5-2 is not an implied requirement for sources with those SCCs to use the factors and that the use of the factors is not limited to the SCCs referenced. We have not included this statement in Section 13.5. The Introduction to AP-42 is clear on the intended uses of emissions factors. "Emission factors in AP-42 are neither EPA-recommended emission limits…nor standards…" Additionally, the Introduction is clear that the intended use of emissions factors is area wide inventories, not for source-specific permitting or compliance demonstrations. Thus, we do not see the need to restate these views in Section 13.5. AP-42 does not mandate when users must or must not use emissions factors. AP-42 provides emissions factors, and users should make educated decisions on the appropriateness of the factor for their situation based on the information provided on a case-by-case basis.

Table 2. Summary of Determinations			
SCC	**Description**	**Included in Table**	
		13.5-1?	**13.5-2?**
30119701	Industrial Processes; Chemical Manufacturing; Butylene, Ethylene, Propylene, Olefin Production; Ethylene: General	√	√
30119705	Industrial Processes; Chemical Manufacturing; Butylene, Ethylene, Propylene, Olefin Production; Propylene: General	√	√
30119709	Industrial Processes; Chemical Manufacturing; Butylene, Ethylene, Propylene, Olefin Production; Propylene: Fugitive Emissions	√	√
30119741	Industrial Processes; Chemical Manufacturing Butylene, Ethylene, Propylene, Olefin Production; Ethylene: Flue Gas Vent	√	√
30119799	Industrial Processes; Chemical Manufacturing; Butylene, Ethylene, Propylene, Olefin Production; Other Not Classified		√
30130115	Industrial Processes; Chemical Manufacturing; Chlorobenzene; Atmospheric Distillation Vents		√
30190099	Industrial Processes; Chemical Manufacturing; Fuel Fired Equipment; User Specified	√	√
30600201	Industrial Processes; Petroleum Industry; Catalytic Cracking Units Fluid' Catalytic Cracking Unit		√
30600401	Industrial Processes; Petroleum Industry; Blowdown Systems; Blowdown System with Vapor Recovery System with Flaring		√
30600508	Industrial Processes; Petroleum Industry; Wastewater Treatment; Oil/Water Separator		√
30600903	Industrial Processes; Petroleum Industry; Flares; Natural Gas		√
30600904	Industrial Processes; Petroleum Industry; Flares; Process Gas		√
30600999	Industrial Processes; Petroleum Industry; Flares; Not Classified		√
30601701	Industrial Processes; Petroleum Industry; Catalytic Hydrotreating Unit; General		√
30601801	Industrial Processes; Petroleum Industry; Hydrogen Generation Unit; General		√
30688801	Industrial Processes; Petroleum Industry; Fugitive Emissions; User Specified		√
30699998	Industrial Processes; Petroleum Industry; Petroleum Products - Not Classified; Not Classified		
39990022	Industrial Processes; Miscellaneous Manufacturing Industries; Miscellaneous Manufacturing Industries; Residual Oil: Flares		
40600240	Petroleum and Solvent Evaporation; Transportation and Marketing of Petroleum Products; Marine Vessels Gasoline: Barge Loading - Average Tank Condition		√
64420033	MACT Source; Categories Cellulose-based Resins; Carboxymethyl-cellulose Production; Product Finishing: Purification/ Extraction		

C. RATIONALE FOR SCCs INCLUDED IN TABLE 13.5-1

Currently, Table 13.5-1 of AP-42 Section 13.5 lists the SCC 30190099. Based on the above criteria, the EPA determined that it was appropriate to add the following SCCs to Table 13.5-1: 30119705, 30119709, 30119701 and 30119741.

The emissions factors in Table 13.5-1 are based on a test flare burning propane and propylene. Therefore, for these factors it is appropriate to add the SCCs characterizing propylene production, 30119705 and 30119709[7]. Additionally, the SCCs 30119701 and 30119741 are for ethylene production. Because ethylene and propylene are closely related and have similar molecular stability, it is likely that the emissions profiles of ethylene flares would be similar to that of propylene flares.

D. RATIONALE FOR SCCs EXCLUDED FROM TABLE 13.5-1

Upon reviewing the 20 SCCs in Table 1, the EPA determined it was not appropriate to include 15 of the SCCs in Table 13.5-1. The rationale for excluding each of these SCCs is presented below.

SCCs 30699998, 30600904[8], 30600201, 30688801, 30600401, 30601801, 30601701, 30600508, 30600999 and 30600903 all characterize processes at petroleum refineries. Refinery streams are generally rich in benzene and other aromatics. These compounds are much harder to destroy than propane and propylene, and as such, the emissions profile of these flares is expected to differ from the emissions factors presented in Table 13.5-1 of AP-42. Even the emissions profile for flares described by SCC 30600903, which is used to characterize natural gas burning flares, is expected to differ from flares burning propane and propylene. As natural gas is primarily methane, which is extremely easy to burn, one would generally expect less emissions from a natural gas flare than a flare burning other material.

Similarly, SCCs 40600240 and 30130115, describe processes with vent streams rich in aromatics[9]. As described above, the emissions profiles of these flares are expected to differ from the emissions factors presented in Table 13.5-1 of AP-42.

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[7] While in general fugitive emissions are uncontrolled, certain fugitive emissions can be routed to a control device, such as emissions from pressure relief devices, dual mechanical pumps and compressor seals. Flares are one type of control device that can be used to control these emissions when they are routed through a closed vent system.

[8] In its November 11, 2016 comments on the proposed settlement agreement, API stated that the EPA should add this SCC to Table 13.5-1. For the reasons discussed in this paragraph, this SCC is not being added to Table 13.5-1.

[9] Gasoline is made up of a myriad of complex compounds, and atmospheric distillation vents from chlorobenzene production are primarily composed of benzene.

The EPA excluded SCC 30119799 from inclusion in Table 13.5-1 due to lack of specificity. Although this SCC describes olefin production, which can include processes such as ethylene and propylene production, this SCC's final descriptor is "other not classified", meaning that it is not limited to these lighter compounds. Heavier olefin compounds would be harder to destroy than ethylene and propylene, and as such, the emissions factors in Table 13.5-1 of AP-42 will not necessarily reflect the emissions for a flare under this SCC.

For SCC 39990022, the EPA determined that this SCC should be eliminated, as it does not make sense for a flare to be burning residual oil. Because the SCC should be eliminated, it is not appropriate to assign the SCC to an emissions factor for flaring operations.

For SCC 64420033, the EPA determined that the process was not similar to a flare burning propylene and propane. The main pollutants of concern in cellulose ether production are methanol, methyl chloride, ethylene oxide and propylene oxide. The emissions factors in Table 13.5-1 of AP-42 are not likely to reflect the emissions for a flare classified by this SCC.

E. RATIONALE FOR SCCs INCLUDED IN TABLE 13.5-2

Currently, Table 13.5-2 of AP-42 Section 13.5 includes the SCCs 30190099 and 30600904[10]. Based on the criteria in section B of this memo, the EPA determined that it was appropriate to add the following SCCs to Table 13.5-2 of Section 13.5.

Most refinery streams are similar to the types of fuel streams that were burned by the flares during the testing used in the development of the Table 13.5-2 emissions factors. As such, it is appropriate to add the other refinery flare SCCs from Table 1, 30600903 and 30600999, to the list of SCCs in Table 13.5-2. Additionally, where other refinery operations are controlled by a flare, the fuel streams to the flares are likely to be similar enough to the flares used to develop the emissions factors in Table 13.5-2 to have a similar emissions profile. As such, the EPA has determined that it appropriate to also add SCCs 30600201, 30688801, 30600401, 30601801, 30601701 and 30600508 to Table 13.5-2.[11]

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[10] The reason for the selection of SCCs 30600904 and 30190099 is documented in the *Background Information for Final Emissions Factors Development for Flares and Certain Refinery Operations and Final Determination for No Changes to VOC Emissions Factors for Tanks and Wastewater Treatment Systems: Summary of Public Comments and Responses*. U.S. EPA. Research Triangle Park, NC. April 2015. Available at: https://www3.epa.gov/ttn/chief/consentdecree/response_to_comments.pdf.

[11] In its November 11, 2016 comments on the proposed settlement agreement, API stated it was unnecessary to include SCCs 30600201, 30601801, 3061701 separately in the table as the vent gases from these processes could also be represented as process gases included in SCC 30600904. While the EPA concurs that facilities may be representing emissions from these processes with SCC 30600904, some facilities use the more specific process

In looking at the chemical manufacturing SCCs, many of the flares used in the development of the emissions factors in Table 13.5-2 burned streams that were rich in olefins. As such, the EPA has determined that it appropriate to add SCCs 30119701, 30119741, 30119705, 30119709 and 30119799 to Table 13.5-2. Additionally, in reviewing information on emissions from atmospheric distillation vents from chlorobenzene production, the EPA determined that the major component of the vent stream is benzene. Because benzene was also a component of most of the vent streams for the flares used in the development of the emissions factors in Table 13.5-2, the EPA determined that where a process characterized by SCC 30130115 is controlled by a flare[12], the Table 13.5-2 emissions factors would be appropriate for that flare.

Finally, for SCC 40600240, the vent stream for gasoline loading is likely to be similar to many of the vent streams found at a refinery. As such, the EPA determined that where processes characterized by SCC 40600240 are controlled by a flare, the emissions factors in Table 13.5-2 would be appropriate for that flare.

F. RATIONALE FOR SCCs EXCLUDED FROM TABLE 13.5-2

Upon reviewing the 20 SCCs in Table 1, the EPA determined it was not appropriate to include 3 of the SCCs in Table 13.5-2. The rationale for excluding each of these SCCs is presented below.

For SCC 30699998, the EPA determined that this classification is overly broad, and there is too much uncertainty as to what process is described by this SCC. Whereas a number of the SCCs in Table 1 have a fourth level description of “not classified” or “general”, this SCC has both a third and fourth level description of “not classified”. With a three-level description, the process can be narrowed down fairly well, such as the hydrogen generation unit or catalytic hydrotreating unit at a refinery. In the case of SCC 30699998, the user only knows that the process is part of the petroleum industry. Additionally, as previously discussed, the EPA determined that SCC 39990022 should be eliminated. For these reasons, it is not appropriate to assign these SCCs to an emissions factor for flaring operations.

For SCC 64420033, the EPA determined that this process is not similar to the processes of the flares used in the development of the emissions factors in Table 13.5-2 of AP-42, and as

SCCs to characterize their flares. Therefore, we are retaining the individual process SCCs in the table.

[12] Processes characterized by this SCC are most often controlled by carbon adsorption.

such, it is unlikely that the vent gas profile, and thus the flare emissions profile, would be similar to the flares used in the development of the Table 13.5-2 factors. The main pollutants of concern in cellulose ether production are methanol, methyl chloride, ethylene oxide and propylene oxide. None of these compounds were found in the vent gas streams of the flares used in the development of the Table 13.5-2 factors.