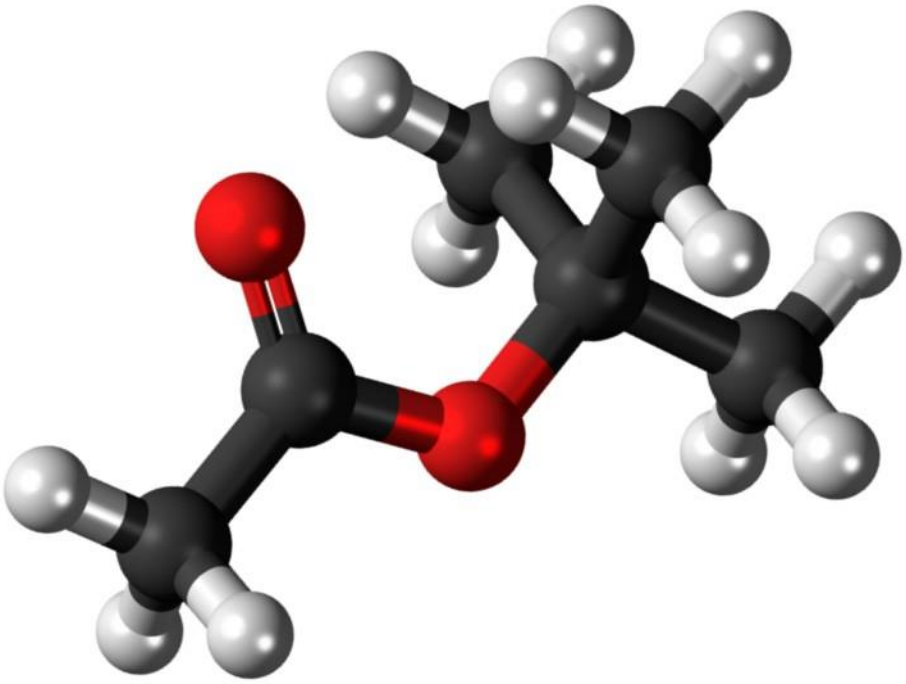
SOUTH COAST
AIR QUALITY
MANAGEMENT DISTRICT

tBAc Assessment White Paper



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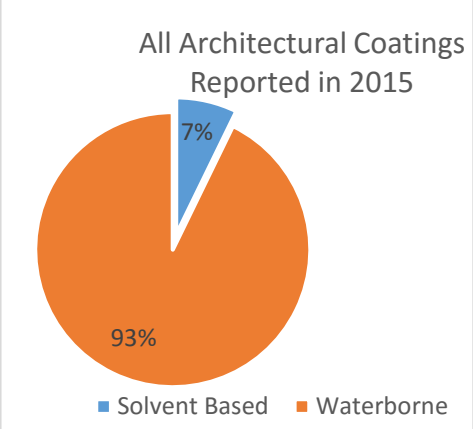
EXECUTIVE SUMMARY

The control of volatile organic compound (VOC) emissions plays a critical role in reducing the formation of ground level ozone, as well as particulate matter (PM) caused by the formation of secondary organic aerosols (SOA). One successful method of control is to replace atmospherically reactive VOC solvents with solvents that the United States Environmental Protection Agency (U.S. EPA) has defined as exempt because of low reactivity, and thus with low ozone and fine particulate matter (PM2.5) formation potential. When considering how these lower reactivity solvents should be regulated, South Coast Air Quality Management District (SCAQMD) staff evaluates potential negative implications (e.g. toxicity, flammability, odor, cost, etc.) to their use. The focus of this paper is to re-examine the partial exemption of tertiary-Butyl Acetate (tBAc) as a VOC in current and proposed SCAQMD rules based on the 2015 health risk assessment (HRA) guidelines and potential action to list tBAc as a carcinogen by the Office of Environmental Health Hazard Assessment (OEHHA).

BACKGROUND

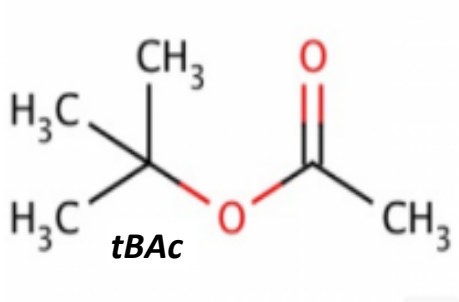
The SCAQMD is the air pollution control agency responsible for all of Orange County and the urban portions of Los Angeles, Riverside, and San Bernardino Counties. The SCAQMD's mission is to provide an environment of clean air and protect public health from the adverse effects of air pollution with sensitivity to businesses and the community. The South Coast Air Basin (Basin) currently has some of the worst air quality in the nation. To protect public health, improve air quality, and attain federal and state ozone and particulate matter (PM) standards, the SCAQMD adopts regulations that limit emissions of VOCs and oxides of nitrogen (NOx). The photochemical reactions of VOCs and NOx form ground level ozone and PM in the atmosphere. The SCAQMD has a long regulatory history of reducing VOCs in area sources such as paint coatings, solvents, and adhesives. The shift to lower emitting VOC products has been accomplished by replacing solvents in high-VOC products with low or near-zero VOC waterborne products, using high solids or reactive chemistries, and/or switching to low-reactivity solvents. Certain VOCs are less reactive in the atmosphere and, therefore, do not contribute significantly to the formation of ozone and/or PM2.5.



Controlling VOCs by exempting solvents with negligible atmospheric reactivity helps the SCAQMD meet air quality goals while allowing manufacturers the flexibility in product formulations to meet strict VOC limits. Industries affected by VOC regulations petition the SCAQMD to exempt compounds from the VOC definition that have been deemed negligibly reactive by the U.S. EPA. For instance, the U.S. EPA's exemption of acetone (1) and parachlorobenzotrifluoride (pCBtF) (2) in 1994, led to successful product reformulations and VOC emission reductions. Although exempt VOCs may not increase ground level ozone formation within the Basin, there is growing concern that some of these VOCs may present additional risks due to their toxicity, odor, flammability, and/or other environmental consequences such as water pollution. The SCAQMD staff evaluates potential adverse environmental or health impacts of

exempt solvents through the preparation of staff reports and Environmental Assessments (EA) in compliance with the California Environmental Quality Act (CEQA) and strives to minimize or mitigate other environmental and/or health impacts.

Regulatory History of tBAc



tBAc is a solvent used to formulate coatings, lubricants, cleaners, degreasers, and adhesives. tBAc is a replacement for conventional solvents, due to its favorable chemical characteristics (e.g. boiling point, evaporation rate, flashpoint and explosive limit, auto-ignition temperatures, and vapor pressure) being similar in range to conventional solvents such as toluene, xylene, and methyl ethyl ketone (MEK) (3). In 1997, a petition was submitted by ARCO Chemical Company to the U.S. EPA to remove tBAc from the regulatory definition of a VOC. In 1998, Lyondell Chemical purchased ARCO Chemical Company and is currently the manufacturer of tBAc. In 2004, the U.S. EPA removed tBAc as a VOC after finding it less reactive than ethane in the atmosphere and not significantly contributing to ozone formation.

A compound is determined to be negligibly reactive by the U.S. EPA by comparing it to the reactivity of ethane. The atmospheric reactivity comparisons are based on three different metrics: reaction rate constant (K_{OH}) with the hydroxyl radical (OH), maximum incremental reactivity (MIR) on a reactivity per unit mass basis and MIR on a reactivity per-mole basis (4). Historically, the U.S. EPA exempted compounds by comparing the K_{OH} value of the compound of interest to the K_{OH} value of ethane. A higher K_{OH} value indicates a compound will initially react more quickly with the OH molecule than ethane. MIR by mass and by mole are more recently developed metrics derived from computer-based photochemical modeling and takes into account more complete ozone forming activity of the compound of interest. The molar-based MIR is more consistent with earlier smog chamber experiments and can be more environmentally protective, but the mass-based MIR is consistent with mass-based VOC regulations. U.S. EPA's 2005 Interim Guidance on the Control of Volatile Organic Compounds in Ozone State Implementation Plans states that a "comparison to ethane on a mass basis strikes the right balance between a threshold that is low enough to capture compounds that significantly affect ozone concentrations and a threshold that is high enough to exempt some compounds that may usefully substitute for more highly reactive compounds" (5). tBAc was exempted because it is less reactive than ethane on a per-mass basis, even though it is more reactive on a per-mole basis (6).

The U.S. EPA initially retained requirements for recordkeeping, emissions reporting, photochemical dispersing modeling, and inventory requirements, because of the concern that compounds such as tBAc, in sufficient quantities or specific locations may form ozone. The recordkeeping and reporting requirements were removed in early 2016 because it was determined the data collected provided no relevant data for the U.S. EPA in regard to tBAc emissions contributing directly to ozone formation (7).

The U.S. EPA's exemption of a compound as a VOC is primarily based on to reducing ground level ozone formation, which results in improved air quality and public health. OEHHA is part of the California EPA and tasked with protecting and enhancing public health and the environment by scientific evaluation of

risks posed by hazardous substances. OEHHA has not identified any studies on the carcinogenicity of tBAc, however, some studies have been conducted on the primary metabolite tertiary-Butyl Alcohol (tBA). Based in part on a study conducted by the National Toxicology Program (NTP) in 1995 with rats and mice exposed to tBA in drinking water (8), OEHHA determined that tBA poses a potential cancer or carcinogenic risk to humans. Since tBA metabolizes from tBAc, OEHHA is now proposing a new inhalation slope factor (ISF) for tBAc. ISF is a term used by OEHHA in the draft risk assessment, which is also known as the cancer potency factor (CPF). For the purpose of this paper, the term CPF is used. Any compound associated with a CPF is considered a carcinogen.

In 2006, the California Air Resources Board (CARB) released an Environmental Impact Analysis (EIA) on tBAc (6). The analysis determined the VOC exemption of tBAc was not expected to increase the formation of SOAs, which contribute to PM2.5 formation and global warming, cause stratospheric ozone depletion, have adverse water or soil impacts, or have significant economic impacts. However, CARB's evaluation determined tBAc could pose a potential cancer risk to humans. A substitution analysis was conducted by CARB for compounds that tBAc would potentially replace in different product categories. The product categories studied included consumer products, architectural coatings, degreasing, automotive refinishing, metal furniture and parts/products, and wood furniture. It was estimated the exemption could increase tBAc emissions an additional 33 to 54 tons per day (tpd) statewide and, possibly reduce approximately one percent of the estimated average statewide total ozone formation (6). Three tBAc exposure scenarios (population-weighted health risk, near-source impact, and indoor workplace exposure) and the health benefits from reduction of ozone were evaluated. In the January 2006 EIA, CARB recommended exempting tBAc from the definition of VOC in the California Consumer Products Regulation (CPR) and that individual regulatory agencies perform a more in depth analysis before incorporating the exemption. CARB included an exemption in their automotive refinishing coatings Suggested Control Measure (SCM) which was adopted in October 2005. However, when the SCM for architectural coatings was amended on October 25, 2007, CARB did not include an exemption for tBAc due to the potential toxicity. CARB also did not ultimately include a tBAc exemption in the CPR.

Rule 102

Compounds exempted as a VOC by the U.S. EPA are considered by the SCAQMD for possible inclusion for a full VOC exemption. The SCAQMD uses Rule 102 – Definition of Terms to list VOC exempt compounds. Rule 102 divides exempt compounds into two categories: Group I and Group II. Both groups are exempt as VOCs by the U.S. EPA; however, Group II compounds are considered toxic, potentially toxic, upper-atmosphere ozone depleters and/or cause other environmental impacts (9). Several SCAQMD rules include prohibitions to limit the usage of Group II exempt compounds in excess of 0.1 percent by weight to minimize usage. However, because of limited information on tBAc's toxicity in 2005 and 2006, SCAQMD staff determined that assessments and potential limited exemptions in individual rules would be more a health protective approach and did not list tBAc as an exempt VOC in Rule 102 (10).

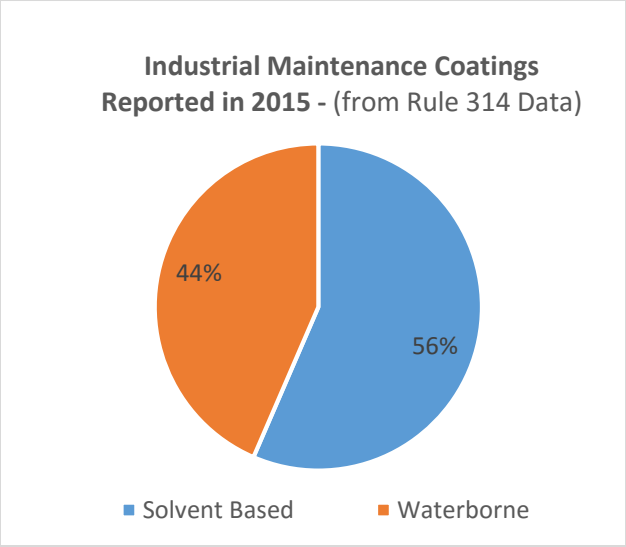
Rule 1151

In 2005, Rule 1151 – Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations was amended to include a limited exemption for tBAc in automotive refinishing coatings, except for color coatings and clear coatings (multi-stage coatings). The tBAc exemption was adopted to be consistent with

CARB's SCM and to provide flexibility in developing low-VOC compliant coatings. The Rule 1151 amendment EA determined that VOC reductions attributed to the limited tBAc exemption would be 0.3 tpd with the assumption that tBAc was the only viable exempt solvent (10). In Rule 1151, a requirement was included for staff to conduct a technical assessment on the use of tBAc as an exempt VOC by July 1, 2007. However, as was noted during the 2014 Rule 1151 amendment, the assessment could not be conducted earlier because no automotive refinishing coatings containing tBAc were commercially available at that time, despite the anticipated need for tBAc to formulate compliant products (11). The technical assessment was postponed to December 31, 2016 to incorporate OEHHA's 2015 HRA guidelines, which was expected to be completed in Spring 2015. This paper serves as the technical assessment for the need and the associated health risk of the partial tBAc exemption in Rule 1151.

Rule 1113

In 2006, Rule 1113 – Architectural Coatings was amended to include a limited exemption for tBAc in industrial maintenance (IM) coatings. The exemption was adopted based on the results of a technological assessment conducted by a committee known as the Essential Public Service Agency (EPSA). EPSA included representatives from the Los Angeles Department of Water and Power, Department of Water Resources, California Department of Transportation, and the Metropolitan Water District of Southern California (MWD). The assessment consisted of three phases and tested approximately 100 IM coatings over a three-year period using a number of ASTM International standard test methods, taking into consideration immersion, atmospheric weathering, mechanical strength, and physical properties (12). The results of the testing showed the availability of high performing, compliant IM immersion coatings, but limited availability of atmospheric exposure coatings able to meet the more stringent VOC limits. Industry expectations for the lifespan of IM coatings are at least seven years once applied and MWD has further stringent performance standards of a 15-year lifespan for coatings exposed to extreme environmental conditions (13). The IM coatings tested with tBAc showed promise in meeting the 100 grams per liter VOC limit (if considered as an exempt solvent) and for meeting the necessary performance standards required for public infrastructure. IM coatings with tBAc were therefore given a limited exemption in Rule 1113 because of the limited availability on the number of compliant atmospheric exposure IM coatings that could provide long-term durability in protecting infrastructure.



The CEQA analysis for the 2006 limited tBAc exemption used a conservative analysis by evaluating the potential toxic impacts using a CPF from scientific literature, as no CPF was available from OEHHA at the time. This analysis did not find a significant increase in toxic impacts on any off-site residential or off-site worker receptors. Some architectural coating manufacturers requested a broader exemption of tBAc for other coating categories; however, the exemption was only included for IM coatings because of the more stringent performance requirements and limited number of coatings available, as well as the expectation

that trained professional workers would use personal protective equipment (PPE) (14). Other coating categories had available compliant coatings without the use of tBAc as an exempt solvent.

Emission Inventory

In 2014, CARB conducted a survey of architectural coatings sold statewide in 2013. The survey required coating manufacturers to provide information on architectural coatings sold in California, including raw materials for products currently using tBAc (15). The preliminary data revealed that approximately 80 IM coatings were reported that meet the Rule 1113 VOC limit, with a range of 0.7 to 33.5 percent tBAc, and a sales weighted average of 10.4 percent tBAc. The CARB SCM for architectural coatings has a higher VOC limit than Rule 1113, and does not exempt tBAc as a VOC. Based on the preliminary data of the IM coatings reported to CARB and the assumption that the IM coatings containing tBAc meeting the 100g/L VOC limit are *all* sold in the Basin, it is estimated that 0.06 tpd of tBAc is emitted from the approximately 40,000 gallons of IM coating reported, which would represent approximately five and a half percent of the total IM coatings sold.

CARB has not conducted a recent survey on automotive refinishing coatings. The last survey was conducted in 2002, before tBAc was exempted, and there was no tBAc reported in that survey (16). Past research, including the 2014 amendment of Rule 1151, found no automotive refinishing coatings containing tBAc commercially available or being applied in the Basin (11), even after nine years of the limited exemption. Recent staff inspections and research also found minimal amounts of tBAc use in automotive refinishing coatings in the Basin (less than half the quantity attributed to IM coatings containing tBAc sold in the Basin) indicating tBAc usage is not as prevalent as previously estimated. The exact quantity of automotive refinishing coatings containing tBAc is considered confidential data as so few manufacturers reported annual sales volumes, thus enabling the identification of competitor sales; therefore, staff cannot release specific sales volumes. Based on an informal survey of automotive coating manufacturers, staff estimates the tBAc emissions for automotive refinishing is approximately 0.01 tpd.

Recent Assessments for tBAc and tBA

The Toxicology Excellence for Risk Assessment (TERA) is a non-profit organization that supports the protection of public health by developing, reviewing and communicating risk assessment values and analyses. In April 2009, TERA presented a report on tBAc and concluded, “all panel members felt that the overall weight of evidence indicates that tBAc is not likely to be genotoxic based on the available battery of studies typically required for hazard screening. Some panel members, however, felt that the data [was] too limited to conclude with certainty that genotoxicity would not play a role in the overall mode of action for potential tumors (34)”. Genotoxicity is the effect of a compound to damage genetic information within a cell causing mutations, which may lead to cancer (35) In August 2015, OEHHA released a new draft CPF for tBAc for public review that is higher (more carcinogenic) than previously estimated in scientific literature, which prompted this analysis. A draft assessment based on the U.S EPA Integrated Risk Information System (IRIS) Program was published in May 2016, by the U.S. EPA, for public comment on the toxicological review of tBA, a primary metabolite of tBAc. IRIS is a human health assessment program that evaluates quantitative and qualitative risk information, including health effects information and toxicity values for health effects that may result from exposure to chemicals found in the environment (17). The draft assessment concluded there is *suggestive evidence of carcinogenic potential* for tBA.

Suggestive evidence of carcinogenic potential is a descriptor indicating the evidence raises "a concern for potential carcinogenic effects in humans" but is not sufficient for a stronger conclusion (17). Although a number of assessments have been conducted, some with different conclusions on the genotoxicity and carcinogenicity of tBAc, the SCAQMD relies on OEHHA for developing CPFs for use in health risk assessments and other SCAQMD programs.

Toxics Symposium

A Toxics Symposium was held on October 29, 2014 by the SCAQMD to allow experts from the regulatory, industrial, academic, and environmental communities to explore the issues of exempting potentially toxic compounds. The objective was to provide SCAQMD staff with expert advice and recommendations on the potential future direction regarding the analysis and mitigation of potential toxic risks associated with alternative VOC compounds. Representatives from industry stated that they were more concerned with immediate hazards such as the risk posed by the use of flammable solvents, such as acetone, than the potential toxic exposure from tBAc. They pointed to the chemical industry's long history of mitigating toxic exposure and expressed confidence in their ability to continue to safely utilize potentially toxic substances. The consensus of the speakers from academia, the regulatory and environmental communities was to use a precautionary approach so that regulatory VOC reductions do not increase the use of chemicals that are known or suspected to be toxic. The following was cited as the best practice to mitigate risk:

1. Eliminate a chemical that is toxic, or substitute one with a less toxic chemical.
2. Use engineering controls where the chemical is removed from the work area (e.g. fume hood), however, one has to be cognizant not to create an exposure issue for a nearby receptor.
3. Administrative controls such as training, labels and rotating jobs.
4. Use of PPE.

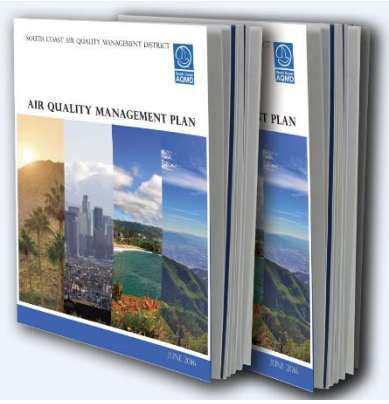
While PPE can be effective when there is a rigorous safety program established, not all organizations have such a program. In the case of respirators, there can be issues of training, fit, and using the proper respiratory equipment. Although PPE and engineering controls can protect the worker while the coatings are applied, there is still the issue of exposure for nearby off-site receptors.

One overarching sentiment expressed by most participants in the symposium was the frustration with the lengthy chemical assessment process. This has led to the uncertainty that has existed in VOC rulemaking in the last several years in regard to certain chemicals that the U.S. EPA has defined as exempt. The following opinions were expressed at the symposium by various participants:

- Legal obligation to comply with requirements of CEQA
- Defer to OEHHA for guidance and methodology in calculating toxic risk
- Rules 1401 - New Source Review of Toxic Air Contaminants and 1402 – Control of Toxic Air Contaminants from Existing Sources may need to be amended when a final decision on risk limits, exposure limits, or CPFs are determined by OEHHA's Scientific Review Panel (SRP)
- Interim policy and guidance from OEHHA is acceptable
- Need to work with CARB/OEHHA for a quicker turnaround of final approval (120 days)

- Use a precautionary approach so that regulatory VOC reductions do not increase the use of chemicals that are known or suspected to be toxic

2016 Air Quality Management Plan (AQMP) and VOC White Paper



As part of the development of the 2016 AQMP, a series of ten White Papers on key topics were developed. The papers provide better integration of major planning issues regarding air quality, climate, energy, transportation, and business needs. The 2016 AQMP Advisory Group members and recommended technical experts voluntarily participated in monthly White Paper Working Group meetings. The development of the papers began in the early summer of 2014 and the last paper was completed in 2015.

The VOC White Paper evaluated the need for additional VOC controls to achieve more stringent PM2.5 and ozone standards in the Basin. It assessed the role of VOCs in forming ozone and PM2.5 to inform policymakers of the most efficient and effective strategies to attain the federal standards that are the subject of the upcoming 2016 AQMP. The current SCAQMD regulatory strategy to reach the PM2.5 and ozone standards focuses on NOx controls with strategic and limited VOC reductions. Recent AQMP modeling shows that achieving the 2022 one-hour ozone standard is more sensitive to VOC controls than the eight-hour ozone standards (18). The future regulatory direction of VOC rulemaking will be to (19):

- Maximize co-benefits from NOx, greenhouse gas reductions, or air toxic controls;
- Promote pollution prevention;
- Incentivize zero and near-zero VOC materials and coatings;
- Maximize reductions from existing regulations through enforcement;
- Prioritize reductions of VOC species that are most reactive;
- Avoid toxic tradeoffs;
- Further evaluate time and place controls; and
- Conduct further studies relative to VOCs.

The 2016 AQMP includes modest VOC reductions in Control Measure CTS-01, with a commitment to reduce two tpd of VOC from coatings, solvents, adhesives, and sealants by 2031 (20, Draft AQMP - Appendix IV-A). The two tpd VOC reductions are projected to be achieved without expanding the current exemptions for tBAc or exempting other solvents. In addition, other VOC reductions will be achieved through co-benefits from other control measures.

RISK ASSESSMENTS

Off-site Analysis

The SCAQMD implements an Air Toxics Program to evaluate the risk of new and existing facilities and their health impact on receptors. The analyses conducted for this program are based on information provided by OEHHA, the agency responsible for updating Proposition 65 and developing guidelines for conducting HRAs. Proposition 65 was created to "protect California citizens and [the] State's drinking water sources from chemicals known to cause cancer, birth defects or other reproductive harm, and to inform citizens about exposures to such chemicals" (21). Under Proposition 65, OEHHA is responsible for annually updating a list of toxic chemicals, including toxic air contaminants (TACs) that are known to cause cancer, birth defects, or other reproductive harm. Currently, tBAc and tBA are not listed. OEHHA is also responsible for establishing guidelines for HRAs under the Air Toxics Hot Spots Act (AB 2588) Health and Safety Code §44360(b) (2). CARB maintains a list of substances (TACs) to be evaluated in HRAs, in accordance with statutory criteria, Health and Safety Code §44321 and available within OEHHA's Air Toxics Hot Spots Program Guidance Manual. These HRA guidelines and TACs are incorporated into SCAQMD's Rules 1401 and 1402. HRAs are used to determine the long-term and short-term health risks (both cancer and non-cancer) associated with the exposure to a toxic substance and are used as part of a CEQA analysis.

For the SCAQMD to define a new compound as an exempt VOC for any purpose, it must amend its existing rules. Rule amendments require the preparation of an EA pursuant to CEQA. Such an analysis entails evaluating the reasonably foreseeable direct and indirect impacts from such an action, such as an increase in toxic impacts. For example, the direct air quality impact from lowering VOC content limits is the benefit from a reduction in emissions. Potential indirect environmental impacts from reformulations or replacements could be the potential adverse health risks, odors, hazards, or water demand from the new formulations. In assessing health risks, potential adverse impacts to off-site residents and off-site workers exposed to the products are evaluated. The health risks are typically evaluated in a HRA, which could involve the use of dispersion modeling to estimate the concentrations that off-site receptors are could be exposed to. The HRA would include the potential short-term (acute) non-cancer risks, long-term (chronic) non-cancer risks, and the long-term cancer risk. The HRA uses parameters such as source characterization for dispersion modeling (e.g. whether the source is an area source or point source), exposure level, duration of exposure, and distance to source.

The incremental cancer risk to a maximally exposed individual is referred to as a "maximum individual cancer risk" or MICR. The risk from carcinogens are expressed as the probability of contracting cancer due to exposure from the identified carcinogens. For example, if the emissions from a facility are estimated to produce a risk of one in a million to the most exposed receptor, this means that a hypothetical individual exposed at that receptor's exposure level (e.g., a resident who lives from age 0 to 30 at that location) will have a one in a million chance of contracting cancer over and above his or her chance of contracting cancer from all other factors (for example, diet, smoking, heredity and other factors). For CEQA, the SCAQMD's significance threshold for off-site carcinogenic impacts is a MICR greater than or equal to 10 in a million (23).

The acute and chronic non-cancer risks are characterized using a hazard index (HI), which is the aggregate effect on a target organ or organ system based on exposure to a compound (22). Acute exposures are

typically over a period of one hour while chronic exposures last eight years or more. A reference exposure level (REL) is a concentration level below which adverse non-cancer health effects are not expected to occur. The HI is the ratio between the pollutant concentration one is exposed to and the REL. An HI below 1.0 indicates that adverse non-cancer health effects are not expected. An HI above 1.0 does not mean that adverse non-cancer health effects will occur, but the odds increase the higher the HI is above 1.0. For CEQA, the SCAQMD's significance thresholds for acute or chronic HIs are greater than or equal to 1.0. OEHHA has not established a non-cancer chronic REL for tBAc or tBA; therefore, no chronic HI can be calculated. The non-cancer acute REL from the CARB EIA was 10,000 µg/m^3, which was used by SCAQMD staff (6).

OEHHA reviews the potential health effects of compounds and develops toxicity values including RELs and CPFs. All toxicity assessments are brought before the independent State SRP for its peer review and approval before any REL or CPF is finalized by OEHHA. SCAQMD relies on these RELs and CPFs for all HRA calculations in its regulatory programs (e.g., Rule 1401, 1402, CEQA, etc.)

Cancer risks are calculated using the CPFs and the risk assessment methods in OEHHA's *Air Toxics Hot Spots Guidance Manual for Preparation of Health Risk Assessments* (2015) (24). CPFs are typically expressed in units of inverse dose, or (mg/kg-day)$^{-1}$. In 1999, OEHHA released a CPF for the tBAc metabolite tBA of 3 x 10^{-3} (mg/kg-day)$^{-1}$ (25). CARB derived a CPF for tBAc of 2.0 x 10^{-3} (mg/kg-day)$^{-1}$ by assuming 100 percent metabolism of tBAc to tBA, and a 0.64 conversion factor to account for the different molecular weights of the two compounds (14). In August 2015, OEHHA released a new draft CPF for public review for tBAc based on an updated analysis (26). The draft CPF for tBAc is 6.7 x 10^{-3} (mg/kg-day)$^{-1}$, which yields cancer risks about 3.3 times higher than the risks calculated using the previously derived value of 2.0 x 10^{-3} (mg/kg-day)$^{-1}$. A higher CPF equates to a higher cancer risk. Table 1 summarizes the history of the CPFs.

Table 1 - History of Cancer Potency Factors for tBAc

	Cancer Potency Factor (mg/kg-day)$^{-1}$
tBA (OEHHA, 1999)	3 x 10^{-3}
tBAc (CARB EIA, 2006)	2 x 10^{-3}
New Draft tBAc (OEHHA, 2015)	6.7 x 10^{-3}

OEHHA's draft analysis was brought before the State SRP in December 2016 and is expected to be finalized in 2017.

On-site Analysis

When the tBAc exemption was considered for amendments to Rules 1113 and 1151, the analysis was conducted for off-site exposure. This analysis is similar to a Rule 1401 risk assessment; it considers environmental exposure to individuals who are unaware of the potential risks. SCAQMD staff has a well-established methodology and an adopted CEQA significance threshold to determine what the acceptable risk should be for off-site residents and off-site workers (MICR less than 10 in a million, total chronic and

acute HI less than 1) (29). An issue that arose during several recent rule amendments considering the exemption of compounds is how to address occupational exposure (on-site exposure of workers). The evaluation of occupational exposure typically falls under the purview of federal and state Occupational Safety and Health Administration (OSHA) who sets enforceable permissible exposure limits (PELs), based on eight-hour time-weighted averages, to protect workers from the health effects of exposure to hazardous substances. The PEL set by OSHA for tBAc is 200 parts per million as an eight-hour time weighted average concentration (27). When tBAc was being considered for a VOC exemption in Proposed Amended Rules (PAR) 1107 – Coating of Metal Parts and Products and 1168 – Adhesives and Sealants, the working group suggested an on-site worker exposure analysis was also necessary. However, without an approved methodology or CEQA significance threshold for on-site workers, the analysis was not finalized. Neither PAR 1107 or 1168 have been amended due to the uncertainty of tBAc and the on-site analysis.

Staff recognized that applying the same significance thresholds of 10 in one million established for off-site exposures (considered "involuntary risk") to on-site exposures (considered "voluntary risk" associated with the work environment) might not be appropriate. For example, if a TAC is used at a business, a worker can be made aware of the chemical and their inherent risk from exposure, and health risks can be reduced by proper training, use of appropriate PPE and/or engineering controls. This is unlike an off-site exposure where residents may be unaware of a nearby source of emissions and the associated risk.

Amendments to SCAQMD rules 1107 and 1168 have not yet been proposed to the Governing Board in part because a standard methodology and threshold has not been approved for determining if increased risks are significant for on-site worker exposures. Staff consulted OEHHA's Hot Spot Guidelines for insight concerning an on-site analysis; it states the following regarding on-site worker exposure:

> *Onsite workers are protected by CAL OSHA and typically are not evaluated under the Hot Spots program. Exceptions may include a worker who also lives on the facility property such as at prisons, military bases, and universities that have worker housing within the facility. Another scenario where the District may require assessment of onsite worker exposure and risk is when a facility (e.g., airport) has multiple businesses owned by different entities within the facility/property (e.g., rental car agencies, restaurants, etc.). In these situations the evaluation of onsite cancer risks, and/or acute, 8-hour, and chronic non-cancer hazard indices is appropriate under the Hot Spots program* (22)

The OEHHA guidelines suggest on-site worker risks are not typically evaluated when identifying localized impacts from stationary sources.

CURRENT ASSESSMENTS

Based on stakeholder input leading up to the February 5, 2016 amendment to Rule 1113, SCAQMD staff included a resolution to review the existing limited exemption for tBAc and analyze the health risks using the draft inhalation CPF provided by OEHHA in August 2015. One objective of the resolution was to inform the coating industry of potential changes to the tBAc exemption that could be proposed after the completion of OEHHA's assessment. In addition, this analysis serves as the technical assessment required in Rule 1151(c)(32):

> *The Executive Officer shall conduct a technical assessment on the use of TBAc as a non-VOC by December 31, 2016. In conducting the technical assessment, the Executive Officer shall consider all information available to the SCAQMD on TBAc including, toxicity, carcinogenic and health risk assessment studies. The Executive Office shall report to the Governing Board as to the appropriateness of maintaining TBAc as a non-VOC*.

In addition to the updated draft CPFs, the analyses conducted for this paper include updated usage assumptions, dispersion factors from the most current air dispersion models as well as using updated risk assessment guideline procedures from OEHHA. For the most recently approved risk assessment guidelines, please see SCAQMD's Risk Assessment Procedures for Rules 1401 and 212 (29).

Rule 1151

Following CARB's CPR recommendation and CARB's EIA for tBAc, CARB staff conducted a HRA for automotive refinishing coatings. CARB's HRA resulted in exempting tBAc for the SCM for automotive refinishing coatings. SCAQMD staff conducted a HRA during the 2005 PAR 1151 process, which was similar to CARB's HRA, but with localized SCAQMD-specific parameters, including using annual emission inventory data from facilities in the SCAQMD, default modeling parameters, and conservative meteorological data (10). Consistent with the CARB analysis, staff assumed tBAc would replace 50 percent of the xylene, toluene, and MEK in current compliant coating formulations. Because pCBtF and acetone were already exempt solvents used to lower VOC content, SCAQMD staff also assumed that 100 percent of the pCBtF and acetone usage would be replaced with tBAc. SCAQMD staff used toxicity factors for tBA from scientific literature as a surrogate to tBAc, which was also consistent with the approach used by CARB in its EIA.

In the original analysis conducted in 2005, a risk greater than 10 in a million was estimated if tBAc was defined as an exempt compound for all coatings and substituted with xylene, toluene, MEK, acetone and pCBtF (26 in a million). At the time, compliant water-based and/or pCBtF-based color and clear coats were available or expected to be available by the January 1, 2009 VOC limit effective date. Together, color and clear coats comprise the topcoat category, which staff estimated as comprising 80 percent of the PAR 1151 coating categories. Since multi-stage clear and color coating meeting the proposed VOC limits were available, staff proposed not to allow the tBAc exemption for those coating categories (i.e., allowing tBAc exemption for all categories except clear and color coatings) (10).

Based on the limited VOC exemption proposed for inclusion in PAR 1151, the conservatively estimated carcinogenic risk to a residential receptor was five in a million, which is below the significance threshold of 10 in a million. The acute HI was estimated to be less than the significance threshold of 1.0. Therefore, PAR 1151 with the limited VOC exemption was considered less than significant for both carcinogenic and non-carcinogenic risk.

For the current analysis, staff calculated the health risks using the new draft CPF, updated dispersion modeling, and with the previously calculated usage. In addition, staff updated the usage assumptions. In the original analysis, the VOC usage was assumed to be 10,528 pounds per year and the exempt usage of 3,402 pounds per year. For this analysis, staff conducted site visits of Rule 1151 facilities, an internet search for automotive refinishing coatings containing tBAc, consulted with coating manufacturers, and reviewed the coatings reported by Rule 1151 facilities in their Annual Emissions Reports. Staff concluded

that the quantity of automotive refinishing coatings containing tBAc being used in the Basin by any one facility is lower than previously estimated. Based on information provided by a distributor of automotive refinishing coatings containing tBAc, they supplied approximately 250 gallons of products containing tBAc to all their facilities in 2015. As a conservative estimate, staff assumed all 250 gallons were used at one facility and that these coatings contain 15 percent tBAc, which is based on manufacturers' responses to staff's inquiries. This equated to 270 pounds per year of tBAc used at a facility. Overall, staff found compliant coatings without the use of tBAc in all categories for Rule 1151; tBAc formulated coatings were found to make up only a small fraction of coatings used at Rule 1151 facilities.

A summary of maximum carcinogenic and non-carcinogenic risk related to the limited Rule 1151 tBAc exemption is presented in Table 2. Assumptions and calculations used to conduct the updated risk assessment (new draft CPF and updated usage estimates) can be found in Appendix A. In addition, a detailed discussion of the health risk analysis and calculations for the original analysis can be found in Appendix B of the final EA for the 2005 PAR 1151 (3).

Table 2 - Health Risks from tBAc Usage for Rule 1151

Risk Value	Cancer Risk	Non-cancer Acute HI*
Original Analysis (2005)	5 in a million	**0.02**
Using OEHHA's New Draft Cancer Potency Factor, Updated Dispersion Modeling, and Original Usage Estimates	60 in a million	**0.02**
Using OEHHA's New Draft Cancer Potency Factor, Updated Dispersion Modeling and Usage Estimates	3 in a million	**0.001**
CEQA Significance Threshold	**10 in a million**	**1.0**

**The non-cancer acute risks are calculated using the REL, which has not changed since the original analysis. The current analysis was reassessed using the updated dispersion modeling and usage estimates. The acute risk is the aggregate effect on a target organ or organ system based on the short-term exposure to a compound.*

Based on staff's best estimate of what is being used in the field, the off-site health risk for the partial tBAc exemption is below the CEQA significance threshold of 10 in a million at this time. Previous analyses of the exemption in Rule 1151 found no coatings containing tBAc being sold in the Basin. Staff does not believe that tBAc usage will significantly increase considering the exemption has been in place for over a decade. However, recent research staff conducted for this assessment found potentially non-compliant use of tBAc in coating categories that were not included in the original exemption (clear and color coatings), which will be addressed through appropriate enforcement actions. Staff will conduct outreach and further site visits to Rule 1151 facilities to address potential non-compliant usage and further assess the quantity of coatings containing tBAc currently in use.

Rule 1113

A limited exemption for tBAc was adopted in 2006 in Rule 1113 based on the technology assessment for

IM coatings conducted by the EPSA committee. The health risks from the use of tBAc were evaluated using the estimated risk factors for tBA from scientific literature as a surrogate for tBAc to conservatively estimate the potential cancer risk and non-cancer (acute) effects. The EA analyzed potential health risks based on painting a large storage tank using an IM coating with tBAc. Due to the long service life for IM coatings, long-term exposure is not expected in most cases. However, testimony provided at the public workshop for PAR 1113 indicated that certain large facilities employ a full-time painting department to apply IM coatings to various equipment on-site throughout the year, increasing the length of exposure to the surrounding community. A conservative assessment of long-term cancer risks (MICR) were performed for a sewage treatment plant in Carson, a refinery in El Segundo, and a water/power facility in La Verne using actual information in 2006 regarding IM coating practices at these facilities (14).All the assumptions and the methodology in calculating the MICR from tBAc exposure at each of the specific facility types using large amounts of IM coatings for the original analysis can be found in Appendix D of the Final EA (28).

In the preliminary draft assessment, staff calculated the health risk using the new draft CPF, updated dispersion modeling, the original usage assumptions from the 2006 rule amendment, and a higher tBAc content. The analysis relied on the estimated quantity of IM coatings containing tBAc that could be used annually at a facility that has a large coating operation (three facilities were considered with the following annual usage: 889, 600, and 269 gallons) for the preliminary draft. Staff further updated this analysis, as reflected in Table 3, after being notified that coatings containing tBAc were not applied at the facility originally estimated to have the highest cancer risk. Staff relied on the facility with the next highest estimated risk, which was the facility with the lowest estimated coating usage. The increased cancer risk at that facility resulted from the meteorological conditions and the distance to the nearest receptor. Feedback from that facility indicated that their actual coating usage increased from the estimated 269 gallons to 569 gallons with a maximum tBAc concentration of 20%. Table 3 provides a summary of the maximum health risk expected from the scenarios mentioned above, from both the 2006 amendment to Rule 1113 and SCAQMD staff's updated analysis. Using conservative tBAc emissions for usage limited to IM coatings, the updated analysis concluded that both carcinogenic and non-carcinogenic acute risk are less than significant. Assumptions and calculations used to conduct the updated risk assessment (new draft CPF and updated usage) can be found in Appendix B.

Table 3 - Health Risks from tBAc Usage in Rule 1113

Risk Value	Annual Gallons Used	Cancer Risk	Non-Cancer Acute HI*
Original Analysis (2006)	889	2 in a million	**0.4**
Using OEHHA's New Draft Cancer Potency Factor, Updated Dispersion Modeling, and Original Usage Estimates	889	4.7 in a million	**0.2**
OEHHA's New Draft Cancer Potency Factor, Updated Dispersion Modeling and Usage Estimates	569	3.8 in a million	**0.4**
CEQA Significance Threshold	-	**10 in a million**	**1.0**

**The non-cancer acute risks are calculated using the REL, which has not changed since the original analysis. The current analysis was reassessed using the updated dispersion modeling and usage estimates. The acute risk is the aggregate effect on a target organ or organ system based on the short-term exposure to a compound; therefore, the calculated risk is based on one large tank painting project with estimated use at 4 gallons per hour. The use assumptions for non-cancer risk were not changed for this analysis.*

During the 2016 Rule 1113 amendment, public comments indicated IM coatings containing tBAc could be applied on bathroom floors, in schools, or at theme parks and would potentially affect workers applying the coatings. The original risk assessment did not analyze occupational (on-site worker) exposure; however, because it was assumed workers handling and applying IM coatings use PPE; thereby minimizing exposure. According to OSHA, PPE is used to minimize exposure to serious workplace injuries and illnesses and may include gloves, safety glasses and shoes, earplugs, hard hats, respirators, coveralls, vests, and/or full body suits. Typically in IM coatings scenarios, PPE would include all of the above; however, not all coating operations or applications utilize a high level of PPE. PPE can be an effective way to mitigate exposure, but only if there is a rigorous program in place to ensure the appropriate PPE is used and that the proper fit and training is available. Adding PPE requirements in SCAQMD rules has been suggested as one approach; however, this would be difficult for SCAQMD staff to enforce, because the jurisdiction for this kind of requirement typically falls under federal and state OSHAs. The SCAQMD staff is not equipped to properly identify if PPE is being used correctly and does not have the authority to issue violations based on OSHA's regulations. However, SCAQMD staff could work with Federal and State OSHA to mitigate potential worker risk.

Rule 1107

During the 2012 PAR 1107 rule development process (the amendment was never adopted or brought before the Board), staff evaluated a potential 100 g/L VOC limit and sought to take advantage of the technology transfer from IM coatings in Rule 1113 that already met this limit. Stakeholders agreed to this approach provided an exemption for tBAc was included; they also sought an exemption for Dimethyl Carbonate (DMC). During the rule development process, SCAQMD staff modeled emissions from two facilities from four volume usage categories (less than 100 gallons per year, less than 1,000 gallons per year, less than 2,000 gallons per year and greater than 2,000 gallons per year) to estimate the potential health risks from a limited exemption (32). Facility-specific parameters were used including building configurations, stack location, receptor distance, and meteorological data. The estimates at the time indicated that some facilities using tBAc could pose an unacceptably high risk to nearby receptors in certain high volume situations. In some high volume scenarios involving DMC, off-site worker exposure risk was high enough to warrant concern about allowing a limited exemption.

To keep off-site health risks below CEQA off-site thresholds, it was determined that up to 560 pounds per year of tBAc and 180,000 pounds of DMC could be used by a facility. Preliminary data and assumptions are summarized and can be found in Appendix C. With the new draft CPF, the same usage for tBAc would have to be reduced to approximately 80 pounds per year of tBAc. At the time staff was prepared to move forward with a limited exemption, but the issue regarding on-site worker exposure was raised. An analysis of potential on-site risks to workers was conducted using the mass balance (box model) approach used by CARB for their EIA of tBAc. For the Rule 1107 analysis, staff found that the on-site risks far exceeded the 10 in a million CEQA significance threshold for off-site receptors, which is a questionable threshold to use

for on-site worker receptors. However, staff analysis was limitedby the lack of an approved methodology and established significance threshold for the on-site worker risk analyses and the uncertainty of tBAc's toxicity, and as a result, PAR 1107 was put on hold.

Rule 1168

In 2013, staff began working on an amendment to Rule 1168, with proposed VOC reductions to many sealant and adhesive categories. Industry stakeholders requested a limited exemption for both tBAc and DMC to achieve VOC reductions in the roofing adhesives category (30). Since roofing activities at a particular location occurs infrequently, health risks to off-site receptors would be limited to acute non-carcinogenic impacts. The preliminary analysis found an off-site acute HI to be 17 for tBAc (5.8 for DMC) based on 500 gallons per day usage of an adhesive containing 50 percent tBAc (35 percent DMC) on a 10,000 square foot area source elevated 35 feet and located 25 meters from the receptor (31). The concentrations used for the analysis were based on measured outdoor air sampling from a roofing project.

During the original analysis, staff back-calculated the allowable usage and percent formulation such that the exemption would not potentially lead to an exceedance of the acute HI. The allowable usage was inversely related to the percentage of tBAc used in the formulation. For example, that analysis showed a formulation of 60 percent tBAc would have an allowable usage of only 0.05 gallon per day for the applicator or if 500 gallons per day were used by the applicator, only 0.006 percent tBAc would be allowed in the formulation (33). The percent formulations with tBAc or allowable usage amounts are not practical in real roofing applications. Based on its potential to be a human carcinogen, staff removed the proposed tBAc exemption. With the new higher draft OEHHA CPF, the allowable usage and percent formulations would be even less. Preliminary data and assumptions are summarized and can be found in Appendix D of this assessment.

In the preliminary draft HRA, staff also made an effort to conduct an on-site cancer risk analysis for roofing adhesives containing tBAc, which estimated a cancer risk of greater than 1,000 in a million. Due to uncertainties in tBAc's toxicity and on-site exposure modeling methodologies, the rule amendment was put on hold.

DISCUSSION

On-site Analysis

At this time, the SCAQMD staff is unable to perform an on-site worker risk analysis. The SCAQMD does not have the authority to regulate or enforce worker safety (e.g. require PPE or engineering controls) as OSHA is the regulatory agency responsible for worker protection. In addition, the SCAQMD does not currently possess the expertise, resources, and methodology to perform an on-site risk analysis. In the future, an on-site evaluation may be conducted if an approved methodology is developed that can estimate the risk to the workers. However, SCAQMD staff could work with Federal and State OSHA to mitigate potential worker risk.

Consideration of Future Exempt Compounds

Consistent with the VOC white paper, staff will use a precautionary approach when considering future exempt compounds to ensure regulatory VOC reductions do not encourage the use of chemicals that have a known or suspected toxic profile. A toxic profile is an air pollutant which may cause or contribute to an increase in mortality or serious illness, or which may pose a present or potential hazard to human health. A compound has a known toxic profile if, for example, it has an established CPF or REL. A compound may have a suspected toxic profile if there exists peer-reviewed journal articles or scientific studies documenting its toxicity. Any compound defined by the U.S. EPA as exempt from the VOC definition that has no known or suspected toxic profile may be considered for exemption in future rules or categories where VOC reductions are needed. Unless otherwise directed by the Governing Board, staff does not intend to propose an exemption for any compound in SCAQMD rules or from the VOC definition that has a known or suspected toxic profile. However, in certain circumstances, the benefits of an exemption may be considered (e.g. the compound in question replaces the use of a compound with a higher toxic profile in addition to a significant reduction of harmful ozone and PM2.5 concentrations). In such circumstances staff will present such trade-offs to the Governing Board for consideration. When evaluating potential exempt compounds, staff will consider:

- Usage of the products (interior versus exterior),
- Training of the end user,
- Protective equipment used by the end user,
- Upper range concentration of the chemical in the product,
- Exposure to sensitive receptors,
- Potential to decrease toxicity of the chemical it is replacing,
- Overall known or suspected toxic profile, and
- Other potential environmental hazards.

If the SRP finalizes a CPF for tBAc, staff would recommend moving forward with the amendments in Rules 1107 and 1168 without including a tBAc exemption. Staff will also propose to keep the existing VOC limits in Rules 1107 and 1168 where stakeholders indicated tBAc or DMC was necessary for reformulation, unless alternative low-VOC products can be identified. If the SRP determines tBAc is not a potential carcinogen and does not adopt a CPF, staff will consider including tBAc as an exempt compound.

Future Status of Exempts in Current Rules

If a previously VOC exempted compound, as defined by the SCAQMD rules, is newly determined to have a known toxic profile based on OEHHA's findings, and reviewed and approved by the SRP, staff will reassess the exemption in a similar manner as tBAc was reassessed in this paper. Staff will conduct a HRA to consider the new known cancer and non-cancer risks, and consider potential replacement solvents, as well as the benefits of the VOC exemption (i.e. reduction in ozone and PM2.5 concentrations). Amending an existing exemption is more complicated than omitting a compound as exempt in the future. Thus, the decision to remove an existing exemption should be weighed carefully. Manufacturers have invested resources and made good faith efforts to reformulate products using SCAQMD approved exempt solvents for previous rule amendments. Frequently, exempt solvents are not the first choice of formulators, because there are often trade-offs (e.g. odor, cost, evaporation profile) that must be overcome. Formulators use exempt solvents almost exclusively to meet regulatory VOC limits. As such,

manufacturers with coatings containing exempt compounds need sufficient time to reformulate new compliant products if existing VOC limits remain the same. Manufacturers who reformulated without exempt compounds may object to increasing the VOC limit after they invested resources to reformulate their products to comply with previous rule amendments. In addition, the trend of coating manufacturers is to formulate to lower the toxic profile, which reduces other regulatory hurdles and increases potential marketability.

The Governing Board directed staff in the last Rule 1113 amendment to assess the current tBAc exemption assuming that the new draft CPF was finalized (the SRP's final review of the new draft CPF is expected to be completed by mid-2017). Based on this assessment, staff has developed the following three options for the tBAc exemptions in SCAQMD Rules 1151 and 1113:

Option 1: Leave the existing limited tBAc exemptions and continue to monitor sales to ensure limited usage

Option 2: Remove the existing tBAc exemptions from Rules 1113 and 1151

Option 3: Remove the existing tBAc exemptions from Rules 1113 and 1151 and include a prohibition on the use of tBAc

Based on the analyses using updated dispersion modeling, current usage assumptions, and the new draft CPF, the risk from the tBAc exemptions are below the significance threshold for off-site residential and off-site worker risk. Option 1 will leave the current exemptions in place and staff will continue monitoring the sales and use of coatings containing tBAc in Rules 1113 and 1151 through CARB surveys, SCAQMD Rule 314 database, and ongoing facility inspections. If the sales of coatings containing tBAc increase such that the cancer risk exceeds the CEQA significance threshold, the exemptions can be re-assessed and, if deemed necessary by the Governing Board, amended. Amending rule language may include, but not be limited to, facility usage limits, reporting and recordkeeping requirements, and/or removal of the tBAc exemption.

In addition, once the SRP finalizes the CPF, tBAc will be included in the Air Toxics Hot Spots Information and Assessment Act (AB 2588) quadrennial reporting which requires stationary sources to report the types and quantities of toxic substances released into the air. The goals of AB2588 are to collect emission data, to identify facilities having localized impacts, to ascertain health risks, to notify nearby residents if risks are above District thresholds, and to reduce risks if they are above District action levels. tBAc will also be included in Rule 1401 – New Source Review of Toxic Air Contaminates and Rule 1402 Control of Toxic Air Contaminates from Existing Sources and will have the same safe guards in place as other air toxics. As mentioned earlier in this assessment, long-term off-site exposure is not typically a concern for architectural coating usage other than certain large facilities that conduct year-round coating projects. All known large facilities that use tBAc in this manner are already providing quadrennial reports through AB2588. Any autobody coating shops that might use tBAc will also be addressed in AB2588 as an "industry-wide source" of emissions. For industry-wide sources, the SCAQMD develops the emission inventory and risk assessment to provide a cost-effective and uniform method for calculating facility emissions and estimating toxic risks. Further, automotive coating facilities are required to have permits in the Basin. Once tBAc is included in Rule 1401, new and modified application submittals will be evaluated through health risk assessments to ensure coating operation usage does not exceed Rule 1401 health risk thresholds. Permitting conditions and inspection staff will ensure compliance.

Removing the existing tBAc exemptions in Option 2 may require an increase in VOC limits, if staff concludes it is infeasible to meet the current VOC limit without the use of tBAc. As such, if VOC limits are increased, manufacturers could continue to sell the same coatings containing tBAc (tBAc would now be counted as a VOC) which would not necessarily lead to a reduction in tBAc usage. Alternatively, if the existing tBAc exemptions were removed with the VOC limits remaining the same, tBAc usage will likely be reduced under Option 2. Option 3 is the most restrictive, as it would prohibit the current and future use of tBAc in Rules 1113 and 1151. Option 2 or 3 may lead to backsliding in VOC emission reduction commitments if it is determined during the rule amendment process that VOC limits need to be increased. In Rule 1113, if the VOC limit for IM coatings is raised from the current 100 g/L to the previous limit of 250 g/L (before 2006) the VOC emission increase is expected to be two tpd. If VOC limits for coating categories other than multi-stage clear and color coats in Rule 1151 are increased to the previous limits, the VOC emission increase is expected to be 0.3 tpd. Thus, if State Implementation Plan approved VOC emission reductions are foregone, staff may have to seek further reductions to offset the loss. If the Governing Board decides tBAc should be removed from both rules (Option 2 or 3), the CEQA analysis will consider the coatings containing tBAc as the baseline and evaluate the potential change in and impact to the environment (e.g. toxicity) by substituting other solvents for tBAc (e.g. xylene, toluene, MEK, pCBtF, acetone) which could generate increased health risk impacts to off-site residents and off-site workers.

Staff cannot make a final recommendation on the potential need to increase the VOC limits upon removal of tBAc exemptions without the comprehensive stakeholder input that is obtained through the rule amendment process; however, there is sufficient information to draw some preliminary conclusions. During the 2005 technology assessment for Rule 1113, immersion IM coatings were found to meet the 100 g/L VOC limit without using tBAc; the exemption was included to address insufficient availability of atmospheric IM coatings at 100 g/L. In addition, the preliminary data from the 2014 CARB architectural survey indicates approximately 94.5 percent of IM coatings used within the Basin meet the VOC limit without tBAc, including atmospheric IM coatings. Therefore, staff does not anticipate that the VOC limits will need to be raised for the entire IM coating category; however, there may be niche applications where insufficient alternatives exist that may require a new higher-VOC subcategory.

For Rule 1151, staff did not identify any coatings containing tBAc for almost a decade after the exemption was adopted. Initial estimates of the substitution of solvents with tBAc were overestimated. Further, a recent field survey found minimal coatings containing tBAc being used at automotive coating shops or supplied by distributors. Thus, staff does not anticipate having to increase VOC limits in Rule 1151 if the tBAc exemption is eliminated; however, further research and stakeholder input is needed.

Discussions with some manufacturers and end users about the potential removal of the tBAc exemption have resulted in a range of responses. Some of these responses include concerns regarding the time needed for reformulation, a lack of replacement coatings, costs associated with reformulation, and the unfavorable characteristics and cost of some substitute solvents. Other responses include a manufacturer acknowledging tBAc is being phased out of their products over the next couple of years, and an end user confirming they have other IM coating products they can use. Thus, if directed by the Governing Board to implement Options 2 or 3, staff will work closely with the manufacturers and end users during the rule amendment process to determine if removal of the exemption or a prohibition of tBAc will require higher-VOC coating subcategories in Rules 1113 or 1151. In addition, staff will work with manufacturers on the

time necessary for reformulation and testing of replacement coatings. Staff will not initiate changes to the existing limited exemptions until the SRP finalizes the CPF.

CONCLUSIONS

SCAQMD staff will not conduct an on-site worker health risk assessment at this time, but will rely on OSHA for enforcing occupational exposure. In the future, if an approved on-site health risk assessment methodology and significance threshold is developed, occupational risk could be conducted as per Governing Board direction. Going forward, a precautionary approach will be used when considering exempt compounds. Unless otherwise specifically directed by the Governing Board, staff will not propose any potential increases in health risks to achieve VOC reductions. Therefore, if the SRP finalizes a CPF for tBAc, defining it as a carcinogen, further VOC exemptions for tBAc will not be considered.

The following summarizes suggestions for Governing Board actions on how to proceed with current exemptions for Rules 1113 and 1151, if the SRP finalizes a CPF for tBAc. The following summarizes staff's suggestions on how the Governing Board can address the current tBAc exemptions in Rules 1113 and 1151:

- Leave the existing limited tBAc exemptions and continue to monitor sales to ensure limited usage, or
- Remove the existing tBAc exemptions from Rules 1113 and 1151, or
- Remove the existing tBAc exemptions from Rules 1113 and 1151 and include a prohibition of use for tBAc.

Staff's recommendations are to follow the precautionary approach for all future applications and remove current tBAc exemptions when the rules are next amended (Option 2). The current exemptions are being used at low levels resulting in low risk, thus the time to amend would not be an immediate priority particularly because of the staff resources necessary to amend. If the final SRP findings determine tBAc to have no CPF, tBAc exemptions may be reassessed and/or expanded as per Governing Board direction. Staff will continue to collaborate with OEHHA, OSHA, CARB, the U.S. EPA, and stakeholders regarding tBAc and other compounds that could be potentially exempted from the definition of VOC.

Appendix A: Rule 1151 Off-site Cancer Risk (MICR) and Non-Cancer Risk (HI)

New Draft CPF and Updated Usage Estimates

Carcinogenic Risk Estimates

ISCST3 Estimated Unit Emission Rate Annual Concentrations

Facility	Unit Emission Rate Annual Conc. (ug/m3)/(g/s)	Receptor Location	Distance to Receptor with Highest Conc. (m)	Operation Schedule
F1	6	30, 70	76	M-F, 8-12 pm and 1-5 pm
F2	11	20, 50	54	M-F, 8-12 pm and 1-5 pm
F3	225	0, 10	10	M-F, 8-12 pm and 1-5 pm
F4	199	0, 10	10	M-Sun, 24 hr
Maximum concentration modeled	225			

2016 Assumptions - (maximum usage at one facility)	
Usage (gal/yr)	250
tBAc in coating	15%
tBAc usage (gal/yr)	37.5
Emission (lb/yr)	**270**

VOC Emission Rates

VOC to Be Replaced	VOC Usage (1b/yr)	Weight Fraction of Compound in VOC	Fraction Substitution with Tab	Tab Emissions (tons/yr)	Tab Emissions (lb/yr)	Emission Rate 8h/d, 5 d/w (g/s)	Emission Rate 24 h/d, 7 d/w (g/s)
Xylene	10,528	0.12	0.5	0.32	632	0.038	0.009
Toluene	10,528	0.11	0.5	0.29	579	0.035	0.008
MEK	10,528	0.04	0.5	0.11	211	0.013	0.003

VOC usage, lb/yr from SCAQMD Annual Emissions Inventory
Wt fraction of compound in VOC and fraction substitution with Tab from ARB Proposed SCM for Automotive Coatings, September 2005.
Emission rate, ton/yr = VOC usage, lb/yr x wt fraction of compound in VOC x fraction Tab substitution x 1/2,000 lb
Emission rate, lb/yr = VOC usage, lb/yr x wt fraction of compound in VOC x fraction Tab substitution
Emission rate 8 h/d, 5 d/w, g/s = emission rate, lb/yr x 453.59 g/lb x year/52 weeks x week/5 days x day/8 hours x hour/3,600 secs
Emission rate 24 h/d, 7 d/w, g/s = emission rate, lb/yr x 453.59 g/lb x year/52 weeks x week/7 days x day/24 hours x hour/3,600 sec

Exempt Compound Emission Rates

Exempt Compound to Be Replaced	Exempt Compound Usage (1b/yr)	Weight Fraction of Compound in Exempt Solvent	Fraction Substitution with Tab	Tab Emissions (tons/yr)	Tab Emissions (lb/yr)	Emission Rate 8h/d, 5 d/w (g/s)	Emission Rate 24 h/d, 7 d/w (g/s)
PCBTF	3,402	0.35	1.0	0.60	1,204	0.073	0.017
Acetone	3,402	0.65	1.0	1.10	2,196	0.133	0.032
2016 tBAc Assumptions	270	1.00	1.0	0.14	270	0.016	0.004

Exempt compound usage, lb/yr estimated from SCAQMD Annual Emissions Inventory using ratio of VOC solvents to exempt solvents in the ARB Draft 2002 Survey of Automotive Refinish Coatings Report, March 2005
Weight fraction of exempt compound and fraction substitution with Tab from ARB Proposed SCM for Automotive Coatings, September 2005.
Emission rate, ton/yr = exempt compound usage, lb/yr x wt fraction of exempt compound x fraction Tab substitution x 1/2,000 lb
Emission rate, lb/yr = exempt compound usage, lb/yr x wt fraction of exempt compound x fraction Tab substitution
Emission rate 8 h/d, 5 d/w, g/s = emission rate, lb/yr x 453.59 g/lb x year/52 weeks x week/5 days x day/8 hours x hour/3,600 seconds
Emission rate 24 h/d, 7 d/w, g/s = emission rate, lb/yr x 453.59 g/lb x year/52 weeks x week/7 days x day/24 hours x hour/3,600 seconds

Carcinogenic Risk Completely Delisting Tab

Replacements	Maximum Unit Emission Rate Annual Conc. (ug/m3)/(g/s)	Tab to TBA Metabolization Rate	Emission Rate 8h/d, 5 d/w (g/s)	TEAC URF (ug/m3)-1	TEAC Inhalation Slope Factor (mg/kg-day)-1	Combined Exposure Factor (L/kg body weight-day) (L/kg body weight-day)	Conversion (mg-m3)/ (ug-l)	MP	MWAF	TBA MICR	TBA Risk in a Million
Xylene, Toluene, and MEK	225	1	0.086	1.90E-06	6.70E-03	677	1.00E-06	1.00	1.00	8.79E-05	88
Xylene, Toluene, MEK, and PCBTF	225	1	0.159	1.90E-06	6.70E-03	677	1.00E-06	1.00	1.00	1.62E-04	162
Xylene, Toluene, MEK, PCBTF and Acetone	225	1	0.292	1.90E-06	6.70E-03	677	1.00E-06	1.00	1.00	2.98E-04	298
2016 tBAc Assumptions	225	1	0.016	1.90E-06	6.70E-03	677	1.00E-06	1.00	1.00	1.67E-05	17

Maximum unit emission rate annual conc., (ug/m3)/(g/s) was estimated modeling a unit emission rate of one gram per sec at four facilities using ISCST3
Tab to TBA metabolization rate from ARB SCM for Automotive Coatings, September 2005.
Compound emission rate, g/s estimated in tables above.
Xylene, toluene and MEK Emission rate, g/s = 0.038 + 0.035 + 0.013 = 0.086
Xylene, toluene, MEK, and PCBTF Emission rate, = g/s 0.038 + 0.035 + 0.013 + 0.073 = 0.159
Xylene, toluene, MEK, PCBTF and acetone Emission rate, = g/s 0.038 + 0.035 + 0.013 + 0.073 + 0.133 = 0.292
TBA cancer potency with fractional absorption of 70 percent is equivalent to the unit risk factor of 4.00E-07 used by ARB in the Proposed SCM for Automotive Coatings, September 2005.
Daily breathing rate, exposure factor are standard SCAQMD parameters for risk assessment
Exposure factor = (exposure frequency, day/year x exposure duration, year)/exposure averaging time, day = (350 days/year x 70 years)/25,550 days = 0.96 for residential receptors

Carcinogenic risk = maximum unit emission rate conc.(ug/m3)/(g/s) x emission rate (g/s) x cancer potency factor, (mg/kg-day)-1 x exposure factor x conversion factor, (mg-m3)/(ug-l) x mp x fractional absorption

Carcinogenic Risk Delisting Tab non-Topcoat

Replacements	TBA Risk in a Million	Wt Percent Topcoat	TBA Risk in a Million w/o Topcoat
Xylene, Toluene, and MEK	88	0.8	18
Xylene, Toluene, MEK, and PCBTF	162	0.8	32
Xylene, Toluene, MEK, PCBTF and Acetone	298	0.8	60
2016 tBAc Assumptions	17	0.8	3

TBA Risk in a Million w/o Top Coat = TBA Risk in a Million x (1 - Wt Percent Topcoat)

Non-carcinogenic Acute Risk Estimates

ISCST3 Estimated Unit Emission Rate 1-Hour Concentrations

Facility	Unit Emission Rate 1-Hour Conc. (ug/m3)/(g/s)	Receptor Location	Distance to Receptor with Highest Conc. (m)	Operation Schedule
F1	383	40, 0	40	M-F, 8-12 pm and 1-5 pm
F2	992	-10 20	22	M-F, 8-12 pm and 1-5 pm
F3	6,877	-20, 0	20	M-F, 8-12 pm and 1-5 pm
F4	1,920	0, -20	20	M-Sun, 24 hr
Maximum	6,877			

VOC Emission Rates

VOC to Be Replaced	VOC Usage (1b/yr)	Possible VOC to Be Substituted	Percentage Substitution with TBAc	VOC Emissions (tons/yr)	VOC Emissions (lb/yr)	VOC Emission Rate 8h/d, 5 d/w (g/s)	VOC Emission Rate 24 h/d, 7 d/w (g/s)	TBAc Emission Rate 8h/d, 5 d/w (g/s)	TBAc Emission Rate 24 h/d, 7 d/w (g/s)
Xylene	10,528	0.12	0.50	0.63	1,263	0.077	0.018	0.038	0.009
Tolune	10,528	0.11	0.50	0.58	1,158	0.070	0.017	0.035	0.008
MEK	10,528	0.04	0.50	0.21	421	0.026	0.006	0.013	0.003

VOC usage, lb/yr from SCAQMD Annual Emissions Inventory
Wt fraction of compound in VOC and fraction substitution with TBAc from ARB Proposed SCM for Automotive Coatings, September 2005.
Emission rate, ton/yr = VOC usage, lb/yr x wt fraction of compound in VOC x fraction TBAc substitution x 1/2,000 lb
Emission rate, lb/yr = VOC usage, lb/yr x wt fraction of compound in VOC x fraction TBAc substitution
Emission rate 8 h/d, 5 d/w, g/s = emisison rate, lb/yr x 453.59 g/lb x year/52 weeks x week/5 days x day/8 hours x hour/3,600 seconds
Emission rate 24 h/d, 7 d/w, g/s = emisison rate, lb/yr x 453.59 g/lb x year/52 weeks x week/7 days x day/24 hours x hour/3,600 seconds

Exempt Compound Emission Rates

Exempt Compound to Be Substituted	Exempt Compound Usage (1b/yr)	Weight Fraction of Compound in Exempt Solvent	Percentage Substitution with TBAc	VOC Emissions (tons/yr)	VOC Emissions (lb/yr)	NonVOC Emission Rate 8h/d, 5 d/w (g/s)	NonVOC Emission Rate 24 h/d, 7 d/w (g/s)	TBAc Emission Rate 8h/d, 5 d/w (g/s)	TBAc Emission Rate 24 h/d, 7 d/w (g/s)
PCBTF	3,402	0.65	1.00	1.10	2,196	0.133	0.032	0.133	0.032
Acetone	3,402	0.16	1.00	0.27	544	0.033	0.008	0.033	0.008
2016 tBAc Assumptions	270	1.00	1.00	0.14	270	0.016	0.004	0.016	0.004

Exempt compound usage, lb/yr from SCAQMD Annual Emissions Inventory
Wt fraction of exempt compound and fraction substitution with TBAc from ARB Proposed SCM for Automotive Coatings, September 2005.
Emission rate, ton/yr = exempt compound usage, lb/yr x wt fraction of exempt compound x fraction TBAc substitution x 1/2,000 lb
Emission rate, lb/yr = exempt compound usage, lb/yr x wt fraction of exempt compound x fraction TBAc substitution
Emission rate 8 h/d, 5 d/w, g/s = emission rate, lb/yr x 453.59 g/lb x year/52 weeks x week/5 days x day/8 hours x hour/3,600 seconds
Emission rate 24 h/d, 7 d/w, g/s = emisison rate, lb/yr x 453.59 g/lb x year/52 weeks x week/7 days x day/24 hours x hour/3,600 seconds

Individual Acute Hazard Indices from Existing Coating VOCs

Component	Maximum Unit Emission Rate 1-Hour Conc. (ug/m3)/(g/s)	Emission Rate 8h/d, 5 d/w (g/s)	Acute REL	Acute HI
Xylene	6,877	0.08	2.20E+04	2.39E-02
Tolune	6,877	0.07	3.70E+04	1.30E-02
MEK	6,877	0.03	1.30E+04	1.35E-02

Maximum unit emission rate 1-hour conc., (ug/m3)/(g/s) was estimated modeling a unit emission rate of one gram per sec at four facilities using ISCST3
Acute HI = (maximum unit emission rate 1-hour conc., (ug/m3)/(g/s) x emission rate, g/s)/(acute REL, ug/m3)

Total Acute Hazard Index from Existing Coating VOCs

Component	AL	CV	DEV	EYE	HEM	IMM	NS	REP	RESP	SKIN
Xylene				2.39E-02					2.39E-02	
Tolune			1.30E-02	1.30E-02			1.30E-02	1.30E-02	1.30E-02	
MEK				1.35E-02				1.35E-02		
			1.30E-02	5.05E-02			1.30E-02	2.65E-02	3.70E-02	

Indivdual Acute Hazard Index from TBAc Substitution without the Topcoat Category

Component	Acute HI	Wt Percent Topcoat	Acute HI w/o Topcoat Category
TBAc	7.88E-02	0.8	1.58E-02
2016 tBAc Assumptions	5.11E-03	0.8	1.02E-03

Acute HI w/o Top Coat Category = Acute HI x (1 - Wt Percent Topcoat)

Total Acute Hazard Index from TBAc Substitution without the Topcoat Category

Component	AL	CV	DEV	EYE	HEM	IMM	NS	REP	RESP	SKIN
TBA									1.58E-02	
2016 tBAc Assumptions									1.02E-03	

Appendix B: Rule 1113 Off-site Cancer Risk (MICR) and Non-Cancer Risk (HI)

New Draft CPF and Updated Usage

Carcinogenic Risk

TBAc Emissions Inventory:

Coating	Usage, gal/yr	Specific Gravity	Density, lb/gal	Mix Ratio	TBAc Weight Fraction	Coating Emission Rate, lb/yr	TBAc Emission Rate (Q), lb/yr	TBAc Emission Rate (Q), lb/hr
Topcoat resin	569	1.37	11.43	0.75	0.2000	4,879	976	
Topcoat cure	569	1.13	9.43	0.25	0.0000	1,341	0	
Topcoat total						6,220	976	0.111

Equation:

TBAC Emission Rate, lb/yr = Usage, gal/yr x Density, lb/gal x Mix Ratio x TBAc Weight Fraction

Emissions w/ X/Q - Resident	
0.487888339	Q or Emission Rate
ton/yr	Emission Rate Units
1.7	X/Q (annual) - Resident
µg/m^3 per ton/yr	X/Q Units
0.829410176	X (µg/m3)

Emissions w/ X/Q - Worker	
0.487888339	Q or Emission Rate
ppm	Emission Rate Units
1.7	X/Q (annual) - Worker
µg/m^3 per ppm	X/Q Units
0.829410176	X (µg/m3)

Cancer - Resident Risk Calculation	
tBAC	Pollutant
6.70E-03	CP (mg/kg-day^{-1})
677.40	CEF_R (L/kg body weight-day)
1	MP_R
1.0	MWAF
1.00E-06	
3.76E-06	Cancer Risk for Residents
3.76	Cancer Risk (in one million)

Cancer - Worker Risk Calculation	
tBAC	Pollutant
6.70E-03	CP (mg/kg-day^{-1})
55.86	CEF_W (L/kg body weight-day)
1	MP_W
1.0	MWAF
1.00E-06	
4.2	WAF
1.30E-06	Cancer Risk for Residents
1.30	Cancer Risk (in one million)

Distance Range to Nearest Receptor *(varies depending on location of coating operation)*

Downwind Distances ft	Downwind Distances meter	
300 - 3960	91-1207	Obtained from SCAQMD Inspector; verified with Thomas Guide

Equations:

Cair = Qtons x X/Q x AFann x MET

DI = Cair x DBR x EVF x 10^{-6}

MICR = CP x DI x MP

Assumptions

- IM coating usage based on actual facility data and actual location meteorological data
- Weight fraction TBAc - reported from SDS submitted by facility
- TBAc Cancer Potency - Budroe, et. al, Acute Toxicity and Cancer Risk Assessment Values for Tert-Butyl Acetate, 2015.

Key

Dispersion factor	X/Q
Annual concentration adjustment factor	AFann
Meterological correction factor	MET
Cancer potency	CP
Daily Breathing Rate	DBR
Exposure Value Factor	EVF
Multi-pathway factor	MP
Concentration in air	Cair
Dose through inhalation	DI
Maximum Individual Cancer Risk	MICR

TBAc Acute Non-carcinogenic Health Risk Analysis for Rule 1113

Tank Diameter and Approximate Footprint Area:

Tank Diameter, m	Tank Footprint Area, m^2	Effective Length, m	Height, m	Release Height, m
22.00	380	19.50	9.75	4.88

- Effective length, m = (tank footprint area, m^2)$^{1/2}$

Determination of the Highest TBAc Mass Emission Rate:

Description	Usage, gal/hr	Specific Gravity	Density, lb/gal	Mix Ratio	TBAc Weight Fraction	Coating Emission Rate, lb/hr	TBAc Emission Rate, lb/hr	Adjusted TBAc Weight Fraction	TBAc Emission Rate, g/s
Primer resin	4		9.96	0.1808	0.2620	7.2021	1.89		0.24
Primer cure	4		7.62	0.0599	0.3800	1.8251	0.69		0.09
Primer powder	4		58.80	0.7593	0.0000	178.5874	0.00		0.00
Primer total						187.61	2.58	0.01	0.33
Intermediate resin	4		12.78	0.5000	0.0000	25.5538	0.00		0.00
Intermediate cure	4		11.75	0.5000	0.1090	23.5000	2.56		0.32
Intermediate total						49.05	2.56	0.05	0.32
Topcoat resin	4	1.37	11.43	0.7500	0.2121	34.2980	7.27		0.92
Topcoat cure	4	1.13	9.43	0.2500	0.0000	9.4299	0.00		0.00
Topcoat total						43.7278	7.27	0.17	0.92
				Max TBAc emissions			**7.27**		**0.92**

Notes:
- Coating emissions , lb/hr = usage, gal/hr x density, lb/gal x mix ratio
- TBAc emissions , lb/hr = usage, gal/hr x density, lb/gal x mix ratio x TBAc weight fraction
- Adjusted TBAc weight fraction =(TBAc emission rate, lb/hr)/(Coating emission rate, lb/hr)
- TBAc Emissions, g/s = (TBAc emissions, lb/hr x 454 g/lb)/(3,600 sec/hr)

Mass Emission Rate Coating:

Description	Usage, gal/hr	Specific Gravity	Density, lb/gal	Mix Ratio	Emission Rate, lb/hr	Emission Rate, g/s
Topcoat resin	4	1.37	11.43	0.7500	34.30	4.32
Topcoat cure	4	1.13	9.43	0.2500	9.43	1.19
Topcoat total					**43.73**	**5.51**

- Coating emissions , lb/hr = usage, gal/hr x density, lb/gal x mix ratio
- Coatng Emissions, g/s = (coating emissions, lb/hr x 454 g/lb)/(3,600 sec/hr)

Acute HI for TBAc

Component	Maximum Unit Emission Rate Conc. (ug/m3)	Mass Rate, g/s	TBAc Weight Fraction	Acute REL, ug/m3	Acute HI
TBAc	4,277	5.51	0.17	1.00E+04	**0.4**

- Maximum unit emission rate conc., ug/m3 estimated using ISCST3
- Weight fraction TBAc - highest concentration reported by Ameron
- Acute REL - Budroe, et. al, Acute Toxicity and Cancer Risk Assessment Values for Tert-Butyl Acetate, 2004.
- HI = (maximum unit emission rate conc., (ug/m3)/(g/s) x coating mass rate, g/s x TBAc weight fraction)/(REL, ug/m3)

Updated Acute HI for TBAc

Component	Maximum Unit Emission Rate Conc. (ug/m3)	Mass Rate, g/s	TBAc Weight Fraction	Acute REL, ug/m3	Acute HI
TBAc	2,396	5.51	0.17	1.00E+04	**0.2**

*Updated unitized concentration w/ AERMOD v. 15181, and corrected REL

Updated Acute HI for TBAc

Component	Maximum Unit Emission Rate Conc. (ug/m3)	Mass Rate, g/s	TBAc Weight Fraction	Acute REL, ug/m3	Acute HI
2016 tBAc Assumptions	2,396	5.51	0.34	1.00E+04	**0.4**

*Updated unitized concentration w/ AERMOD v. 15181, and corrected REL

Assumptions

- 25 meters from tank to property boundry per Rules 1401/212 HRA Guidance shortest distance to receptor
- Tank modeled as a volume source with an volume equivalent to the volume of the cylindrical tank
- Initial release height is half the height of the tank
- West LA metrological data
- 10 meter receptor grid beginning 25 meters from tank
- Coating parameters (mix ratios, TBAc weight fraction and density) from three part Ameron coating system
- Since only one coating can be sprayed at a time, the coating with the highest amount of TBAc emissions was used.
- TBAc acute REL - Budroe, et. al, Acute Toxicity and Cancer Risk Assessment Values for Tert-Butyl Acetate, 2004
- Weight fraction conventional - highest concentration from review of MSDSs of IM coatings

Appendix C: Rule 1107 Environmental Assessment Assumptions

Please Note: ***Analyses conducted for Rules 1107 and 1168 were draft preliminary calculations and were not finalized in the Final Environmental Assessment***

Rule 1107 - Coatings of Metal Parts and Products

2012 Assumptions	
Meteorological Data	West LA
Number of Hours	>12 hours per day
Receptor Distance (meter)	25

	Cancer	Non-Cancer Acute	Non-Cancer Chronic
	(mg/kg-day)-1	µg/m^3	
tBAc	2×10^{-3}	10,000	n/a
DMC	n/a	18,000	5,500

Future Exempt Compound	CEQA Significance Threshold	Annual Emission Limit (lb/year)
tBAc	Cancer Risk = 10 in a million	560
DMC	Acute or Chronic Risk = 1	180,000

Appendix D: Rule 1168 Environmental Assessment Assumptions

***Please Note*: Analyses conducted for Rules 1107 and 1168 were draft preliminary calculations and were not finalized in the Final Environmental Assessment**

Rule 1168 - Adhesives and Sealants

2014 Assumptions	
Meteorological Data	Redlands
Usage (gal/day)	500
Area Source (square foot)	10,000
Elevation (feet)	35
Receptor Distance (meter)	25

Single-Ply Adhesive	
Baseline Compound	Percent (%)
Ethylbenzene	0.5
Toluene	10
Hexane	10
Methyl Ethyl Ketone	5

Future Compound Reformulation	**Percent (%)**	**Acute HI**
tBAc	50	17
DMC	35	5.8

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