State of California
AIR RESOURCES BOARD

PUBLIC HEARING TO CONSIDER PROPOSED AMENDMENTS TO ENHANCED VAPOR RECOVERY REGULATIONS TO STANDARDIZE GAS STATION NOZZLE SPOUT DIMENSIONS TO HELP ADDRESS STORAGE TANK OVERPRESSURE

STAFF REPORT: INITIAL STATEMENT OF REASONS

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ACRONYMS

#	number
”WC	inches water column
Air Districts	Air Pollution Control Districts and Air Quality Management Districts
API	American Petroleum Institute
ASP	authorized service provider
ASTs	aboveground storage tanks
Board	California Air Resources Board
CAPCOA	California Air Pollution Control Officer’s Association
CARB	California Air Resources Board
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CP	certification procedure
EA	environmental analysis
ECO nozzle	enhanced conventional nozzle
EF	emission factor
EOR	enhanced ORVR-vehicle recognition spout assembly
EVR	enhanced vapor recovery
FFS	Franklin Fueling Systems
FSOR	Final Statement of Reasons
GDF	gasoline dispensing facility
GHG	greenhouse gas

ACRONYMS, *continued*

IOM	installation maintenance and operational manual
ISD	in-station diagnostic systems
ISOR	Initial Statement of Reasons (this report)
max	maximum
min	minimum
NACS	National Association of Convenience Stores
NAICS	North American Industry Classification System
OP	overpressure
ORVR	on board refueling vapor recovery
p	probability value
P/V	pressure vacuum vent valve
PWD	pressure increase while dispensing
ROG	reactive organic gas
R	rebuilt nozzle
RVP	Reid Vapor Pressure
SAE	Society of Automotive Engineers
TIR	total indicator reading over seal surface
TPD	tons per day
TPY	tons per year
USTs	underground storage tanks
V/L	vapor to liquid ratio
VST	Vapor Systems Technologies, Inc.
ZEV	zero-emission vehicle

UNITS OF MEASURE

°	degrees
#	number
%	percent
”WC	inches water column
in	inch
kgal	thousand gallons
lbs	pounds
mm	millimeter
TPD	tons per day
TPY	tons per year

EXECUTIVE SUMMARY

Since 1975, the California Air Resources Board (CARB or Board) has had a program in place to control air pollutant emissions from gasoline dispensing facilities (GDF). Gasoline vapors contain reactive organic gases, which can lead to ozone and smog formation, and benzene, which is a toxic air contaminant. In March 2000, CARB approved Enhanced Vapor Recovery (EVR) regulations for GDFs equipped with underground storage tanks (USTs). In June 2007, CARB approved EVR regulations for GDFs equipped with aboveground storage tanks (ASTs). EVR regulations established new standards for vapor recovery systems to reduce emissions during storage and transfer of gasoline and to increase reliability of vapor recovery components.

EVR regulations apply to both new and existing GDFs. Phase-in of EVR standards for GDFs with USTs started in 2001 and completed in 2010. For GDFs equipped with AST, phase-in of EVR standards started in 2009 and will continue beyond 2018. EVR regulation updates completed between 2001 and 2015 improved test procedures for vapor recovery system certifications, modified GDF applicability requirements to improve cost-effectiveness, and modified performance standards and implementation dates to reflect evolving technology. In April 2015, CARB approved new performance standards and specifications for Enhanced Conventional (ECO) nozzles. ECO nozzles are designed for use at non-retail GDFs that have been exempted by Air Districts from requirements to control emissions from refueling vehicles. Such non-retail GDFs are exempt because they fuel a captive fleet of newer vehicles that capture gasoline vapors during vehicle refueling using on board refueling vapor recovery (ORVR) systems. Examples include rental car facilities and new car dealerships.

CARB staff is now proposing EVR regulation amendments that will standardize EVR nozzle spout and bellows dimensions to improve compatibility with newer motor vehicle fill pipes. This compatibility is necessary to reduce air ingestion at the nozzle, which will help reduce pressure driven emissions caused by evaporation of gasoline within the GDF storage tank headspace. Unexpected pressure driven emissions cause GDF vapor recovery systems not to achieve the performance standards and emission reductions anticipated when EVR regulations were adopted.

Emission reductions will result from the statewide implementation of the Healy vacuum assist nozzle with the “Enhanced ORVR-Vehicle Recognition” (EOR) spout assembly at GDFs that use vacuum assist vapor recovery systems. The EOR spout assembly enables a better seal between the nozzle’s vapor collection bellows and ORVR vehicle fill pipe, thereby reducing excess air ingestion at assist equipped GDFs. Approximately 52 percent of California GDFs are equipped with the vacuum assist system and there is only one manufacturer of assist nozzles certified for sale in California. The EOR version of the spout assembly meets the proposed dimensional standards. Based on ORVR recognition test data provided by CARB staff, the manufacturer of the Healy assist nozzle voluntarily developed the improved EOR spout assembly to help reduce air ingestion at the nozzle and no longer manufactures the prior version of the nozzle that

does not meet the proposed dimensions. The remaining 48 percent of California GDFs are equipped with balance system nozzles. All currently certified balance nozzles meet the proposed spout assembly dimensions.

CARB staff estimates that statewide implementation of the assist EOR nozzle will result in a beneficial impact to air quality by reducing gasoline vapor (aka reactive organic gases, or ROG) emissions, which also contain benzene, by about one ton per day. Reducing ROG emissions is an integral part of California's plan for reaching its goal of attaining and maintaining federal and State ozone standards. Reducing benzene emissions is critical for reducing exposure to people who live and work near GDFs. The proposed amendments will preserve emission reductions anticipated to result from statewide implementation of the assist EOR nozzle by preventing the introduction of nozzle designs with dimensions known to result in a poor seal with fill pipes.

In addition, reducing air ingestion at the nozzle is anticipated to substantially reduce the number of In-Station Diagnostic system overpressure alarms at many GDFs with vacuum assist vapor recovery systems. CARB staff estimates that installing the Healy vacuum assist nozzle with the improved EOR spout assembly will reduce alarm response-related GDF operating costs by about $3.47 million. Further, improving compatibility between EVR and ECO nozzles and fill pipes also will make it easier for many customers to fuel their vehicles by reducing the effort needed to insert the nozzle in the fill pipe.

The proposed amendments will preserve the cost savings and other benefits while providing additional certainty to fill pipe and nozzle manufacturers. The nozzle dimensions included in the proposed amendments are the result of extensive deliberations of nozzle, vehicle, and fill pipe manufacturers who participated in a Society of Automotive Engineers task force. Standardization of nozzle spout and bellows dimensions will provide constraint needed by the automotive industry to more effectively design fully compatible fill pipes for future vehicle models. At the same time, all the proposed dimensions have a range of values, rather than a single value, to increase flexibility and allow for innovation among nozzle manufacturers.

CARB staff estimates a total cost increase of about $20,520 for nozzle manufacturers for incorporating additional nozzle dimensions in the CARB certification process. If nozzle manufacturers were to pass on these costs along with an estimated 20 percent markup, this would result in $24,624 in costs to California businesses through 2030. This could result in approximately $5 in additional cost per impacted California business ($24,624 / 5,305 impacted GDFs) over 11 years, which is considered to be negligible.

Recommendation: Staff recommends that the Board adopt amendments to the California Code of Regulations (Appendix A) that incorporate by reference the proposed new and amended definitions and certification procedures (Appendices B through E).

I. INTRODUCTION AND BACKGROUND

California Air Resources Board (CARB) staff is proposing to amend nozzle spout assembly dimensional requirements contained in three existing vapor recovery certification procedures to help address storage tank overpressure conditions at gasoline dispensing facilities equipped with Phase II Enhanced Vapor Recovery (EVR) systems. Gasoline dispensing facilities include retail service stations as well as non-retail fueling facilities that serve rental car fleets, municipal fleets, and auto dealerships.

Phase II EVR systems are certified by CARB to capture and contain at least 95 percent of the available vapor generated during vehicle refueling operations. Due to changes to vehicle fuel system fill pipe design over the last decade and increasing population of vehicles equipped with on board refueling vapor recovery (ORVR) systems, Phase II EVR system efficiency at many GDFs has fallen below 95 percent despite that GDF operators have installed and maintained Phase II EVR systems as required. This loss in efficiency occurs during the fraction of the year when winter blend gasoline is distributed (generally November 1 through February 28) and is due to higher than anticipated pressure driven fugitive and vent line emissions resulting from overpressure conditions within the headspace of the storage tank. CARB staff has determined that primary causes of overpressure are excess air ingestion due to a poor seal at the nozzle and vehicle fill pipe interface and the presence of winter blend gasoline.

In a parallel rulemaking, CARB staff is proposing vehicle regulation amendments to improve the compatibility and seal at the vehicle fill pipe and nozzle interface.[1] The intent of both proposals is to reduce emissions that result from excess air ingestion at the vehicle fill pipe and nozzle interface. As described in the staff report for the fill pipe proposal, CARB staff predicts that the combined benefits of the two proposals would substantially reduce overpressure emissions that result from a poor seal at the interface.

CARB staff does not anticipate that standardizing the nozzle dimensions will solve all the overpressure problems. There are additional factors beyond fill pipe and nozzle interface incompatibilities that cause overpressure. However, CARB staff does anticipate that the combination of vehicle fill pipe improvements and nozzle dimension standardization will improve vapor recovery system performance and reduce the performance decline that has been observed due to a poor seal at the nozzle and fill pipe interface. This will reduce the amount of wintertime pressure driven emissions and it will reduce the frequency of ISD overpressure alarms, which will reduce the frequency and cost of service calls for GDF operators. In addition, improving compatibility

[1] For a description of proposed requirements and estimated benefits of the proposed vehicle fill pipe performance standard, see the CARB staff report, *Initial Statement of Reasons for Rulemaking: Proposed Amendments to California Specifications for Fill Pipes and Openings of Motor Vehicle Fuel Tanks*, September 7, 2018 [CARB, 2018c].

between nozzles and fill pipes will make it easier for customers to fuel their vehicles by reducing the effort needed to insert the nozzle in the fill pipe.

This staff report provides the rationale for the proposed regulatory amendments for standardizing nozzle dimensions, summarizes the regulatory development process, and describes the air quality benefits along with the potential economic and environmental benefits and impacts of the proposed amendments and their alternatives. In early 2020, CARB staff plans to propose a comprehensive menu of potential solutions in a separate rulemaking to address remaining overpressure problems.

A. California's Vapor Recovery Program

Approximately 15 billion gallons of gasoline are consumed annually in California. With each transfer there is a potential to emit gasoline vapors. The hydrocarbons contained in gasoline vapors contribute to air pollution. In the presence of sunlight, hydrocarbons combine with the oxides of nitrogen, another air pollutant that comes primarily from fuel combustion, to form ozone. Ozone is a strong irritant that damages human lung tissue and plant leaves.

The Vapor Recovery Program was first developed for GDFs in the early 1970s to prevent the formation of ozone and was later expanded to control benzene. At a typical GDF, gasoline vapor emissions are controlled during two types of gasoline transfer: Phase I vapor recovery collects vapors when a cargo tank fills the GDF storage tank; Phase II vapor recovery collects vapors during vehicle refueling. There are two types of Phase II vapor recovery systems in California: balance systems and vacuum assist systems (assist systems). Assist systems use a nozzle with dedicated vapor return pathway and remote or dispenser mounted vacuum pump to achieve a controlled collection of vapor from the vehicle fuel tank as gasoline is dispensed from the facility storage tank. Balance systems use nozzles with a dedicated low resistance vapor return pathway and rely on direct displacement to pull vapor from the vehicle fuel tank to the GDF storage tank. Additional controls are designed to contain the vapor in the storage tank by managing storage tank headspace pressure and to limit the volume of liquid spillage from the nozzle during the vehicle refueling process.

Benzene is a constituent of gasoline identified by CARB in 1985 as a toxic air contaminant. In 1988, CARB adopted regulations that mandated Air Districts to adopt rules requiring the installation of Phase I and Phase II vapor recovery systems for retail GDFs to minimize public exposure to benzene. All Air Districts adopted such rules by the early 1990's.

B. CARB Certification Procedures

According to State law, vapor recovery equipment that is required by local Air District rules for the control of hydrocarbon and toxic emissions generated at GDFs must be

certified by CARB (Appendix F). In 1975, CARB adopted the first certification and test procedures for vapor recovery systems installed at GDFs. The certification procedures contain the performance standards and specifications that must be met by equipment manufacturers to obtain CARB certification in the form of an Executive Order. Over the past few decades, CARB has periodically updated the certification procedures to reflect improvements in vapor recovery technologies, to modify requirements for existing installations to achieve additional emission reductions, and to improve cost-effectiveness.

The most recent update occurred in April 2015 and included performance standards that apply to enhanced conventional (ECO) nozzles. ECO nozzles are intended for use at non-retail GDFs that Air Districts exempted from Phase II vapor recovery requirements to control emissions from refueling vehicles. Examples of Phase II exempt operations include rental car facilities, new car dealerships, and corporate vehicle fleets. Such facilities fuel only newer vehicles that capture gasoline vapors during vehicle refueling using ORVR systems. Although ECO nozzles have no vapor recovery pathway, they share many similarities with Phase II vapor recovery nozzles such as spout dimensions, insertion interlocks, and features to control excess liquid releases including spillage, spitting, post fueling drips, and liquid retention.

C. Introduction of ORVR Vehicles

During the refueling process, ORVR systems capture displaced gasoline vapors into a carbon canister within the vehicle. These vapors would otherwise be emitted at the fill pipe and nozzle interface. In 1990, the federal Clean Air Act required the United States Environmental Protection Agency (U.S. EPA) to adopt performance standards for vehicle ORVR systems. As a result, U.S. EPA adopted regulations that mandated the phase-in of ORVR according to the schedule shown in Table 1. Initially, CARB staff considered seeking a waiver to the federal ORVR requirements because California had already implemented Phase II vapor recovery controls. At the June 1995 Board hearing, CARB decided to adopt the federal ORVR requirements and phase-in schedule to promote consistent vehicle design for all 50 states and to reduce the burden for vehicle manufacturers.

Table 1: ORVR Phase-In Schedule for Vehicle Manufacturing

Vehicle Class	40% of Vehicles Manufactured	80% of Vehicles Manufactured	100% of Vehicles Manufactured
Passenger	1998	1999	2000
Light Duty & Medium Duty Vehicles ≤6,000 lbs GVWR	2001	2002	2003
Medium Duty Vehicles 6,001–8,500 lbs GVWR	2004	2005	2006

In the mid 1990's, concerns regarding compatibility of Phase II and ORVR were raised, in particular for previously certified assist systems that rely on active vacuum pumps to collect vapor at the vehicle fill pipe interface. With ORVR vehicles, there is very little vapor available for collection, therefore assist systems ingested excess fresh air into the storage tanks. The excess air volume increases as gasoline in the storage tanks evaporates to form an equilibrated saturated vapor. This vapor volume increase causes pressurization that leads to increased fugitive and vent emissions. This concern was addressed by vapor recovery equipment manufacturers in response to Enhanced Vapor Recovery requirements, as described in the next section.

As of 2018, approximately 83 percent of California's annual gasoline consumption (~12.5 billion gallons) is dispensed into ORVR equipped vehicles [CARB, 2013b, Table I-2]. The remaining 17 percent (approximately ~2.6 billion gallons annually) is dispensed into conventional vehicles. Due to this remaining population of conventional vehicles, Phase II vapor recovery controls ~30 tons per day of hydrocarbon emissions. The population of ORVR equipped vehicles will continue to increase as conventional cars reach the end of their useful life. Over the next decade, CARB staff will continue to assess the effectiveness of Phase II controls in terms of maintaining ambient air quality standards and protecting public health by limiting exposure to benzene.

D. Enhanced Vapor Recovery

To achieve additional reductions and increase the reliability and durability of vapor recovery systems, the Board approved Enhanced Vapor Recovery regulations in March 2000. The EVR regulations were enacted to achieve additional emission reductions and to increase equipment reliability. This resulted in a major change to the certification procedures by increasing testing requirements and adopting nearly 80 new performance standards or specifications. Among the numerous EVR requirements were more stringent controls for Phase II systems such as:

- ORVR vehicle compatibility and pressure management to control emissions lost from storage tank headspace through vent lines, vapor processor exhaust, and fugitive leak sources;
- In-Station Diagnostic (ISD) systems to help maintain in-use effectiveness by identifying problems so that repairs are done more quickly; and
- Standards designed to control the release of liquid gasoline at the nozzle, such as liquid retention, post fueling drips, and spillage.

Currently, there are three Phase II EVR nozzles certified and available for use in California. Two nozzles are designed for use with balance systems, one manufactured by Vapor Systems Technologies, Inc. (VST) and the second by Emco Wheaton Retail. There are two versions of the VST balance nozzle in use throughout California. The first version, Model VST-EVR-NB, is no longer in production nor commercially available, but may be found at a small percentage of existing balance equipped GDFs. The

second version, Model VST-EVR-NB (G2), is currently in production and commercially available and therefore is the only VST nozzle available for new installations and for replacement parts at existing facilities. These balance nozzles may be combined with a variety of hose, vapor processor, and ISD system options to form a complete Phase II system.

The third nozzle, the Healy Model 900, is designed for use with the assist system and is manufactured by Franklin Fueling Systems. This assist nozzle may be combined with one vapor processor and two ISD system options to form a complete Phase II system. There are two versions of the Healy Model 900 assist nozzle in use throughout California. The first version is no longer in production, has limited commercial availability, and is found at the majority of existing assist equipped GDFs. The second version, Model 900 with Enhanced ORVR Recognition spout assembly ("EOR nozzle"), is currently in production and commercially available and therefore is the only Healy nozzle available for new installations and for replacement parts at existing facilities.

All the certified balance and assist nozzles are considered ORVR compatible because they are designed to reduce/restrict the volume of air ingested when refueling ORVR equipped vehicles.

E. Overpressure Issue

While several aspects of the EVR program have been highly successful, the requirement to limit storage tank headspace pressure in order to better contain vapors has proven to be problematic. Shortly after statewide implementation of Phase II EVR requirements in 2009, CARB staff became aware that certain GDFs were experiencing frequent ISD system overpressure alarms, primarily during the wintertime, which indicate exceedance of allowable storage tank headspace pressure criteria. Early CARB staff investigations revealed that these alarms were not associated with any vapor recovery system malfunctions [CARB, 2016c and 2017f] and were likely attributed to the high volatility and evaporation rate of winter blend gasoline [CARB, 2017g].[2]

CARB staff initially assumed ISD overpressure alarms only occurred at GDFs with limited operating hours (overnight shut down) and therefore the efficiency loss resulting from pressure driven emissions were relatively small and did not constitute an air quality concern in wintertime months when ozone formation is minimal. In September 2009, CARB issued Advisory 405, which allows GDF operators to "self clear" pressure related

[2] California's Phase 2 Reformulated Gasoline (CaRFG2) and Phase 3 Reformulated Gasoline (CaRFG3) regulations require refiners to produce gasoline that meets eight specifications to reduce air pollution from the gasoline used in motor vehicles. One of the eight specifications is a standard for Reid Vapor Pressure (RVP) that is designed to reduce evaporative emissions during the summer months when ambient temperatures are their highest. During the wintertime (typically November through February), gasoline RVP is uncontrolled. This is also commonly the time during which "winter blend gasoline" is distributed.

ISD alarms during the wintertime [CARB, 2016b]. The enforcement advisory was envisioned as a temporary mechanism to provide GDF operators with relief from the cost and inconvenience of responding to pressure related ISD alarms and to provide CARB staff the necessary time to develop a regulatory solution.

During a public workshop in November 2012, new information became available that indicated the overpressure issue was much more severe and more complex than initially considered. This prompted CARB staff to conduct nine field studies from 2013 to 2017 to better understand the magnitude of the overpressure problem, identify primary causes, and develop effective solutions to address overpressure. Chapter II provides a review of the results of three of these studies and Appendix L provides a brief description of all nine studies. Key findings and conclusions pertaining to nozzle dimensions include the following:

- In addition to winter blend gasoline, excess air ingestion during vehicle refueling is a key contributor to overpressure
- Excess air ingestion results in vapor growth due to increased evaporation within the storage tank headspace that leads to increased vent line and pressure driven fugitive emissions
- Changes in newer vehicle fill pipe designs result in a poor nozzle seal at the vehicle fill pipe interface
- Refinement of existing vapor recovery nozzle and vehicle fill pipe dimension specifications are needed to reduce air ingestion and prevent further decline in system efficiency

F. Formation of Industry Task Force

Once it became evident that an incompatibility existed between the nozzle and certain vehicle fill pipe designs, CARB staff reached out to the automotive industry and vapor recovery nozzle manufacturers and suggested formation of a working group. Over the last two years, CARB staff has participated in over a dozen meetings with the Society of Automotive Engineers (SAE) Fuel Systems J285/J1140 Task Force (SAE Task Force), which is comprised of nozzle, vehicle, and fill pipe manufacturers. The SAE Task Force is charged with developing and testing new dimension specifications to standardize the vapor recovery nozzle and fill pipe interface to improve compatibility. The SAE Task Force has made much progress developing these specifications and anticipates approving the J285/J1140 documents by the end of 2018. The SAE Task Force is including the new specifications in updated versions of these two SAE recommended practice documents:

- J285: Dispenser Nozzle Spouts for Liquid Fuels Intended for Use with Spark Ignition and Compression Ignition Engines
- J1140: Filler Pipes and Openings of Motor Vehicle Fuel Tanks

II. THE PROBLEMS THAT THE PROPOSED REGULATORY AMENDMENTS ARE INTENDED TO ADDRESS

This chapter provides a description of the problem that the proposed amendments to the certification procedures for vapor recovery systems at gasoline dispensing facilities are intended to address, as well as a description of how the proposed amendments resolve the problem. Appendices A through E provide the full text of the proposed regulatory amendments and Chapter XII provides detailed descriptions of the underlying purpose and rationale for each proposed amendment.

A. The Problem: Incompatibility between GDF Nozzles and Vehicle Fill Pipes

CARB staff conducted nine field studies between 2013 and 2017 to determine the magnitude of the overpressure problem, identify primary causes, and develop effective solutions to address overpressure (see Appendix L). Three of these field studies, described in further detail in the paragraphs below, resulted in several key findings that prompted CARB staff to pursue amendment of nozzle spout dimension requirements in existing certification procedures to improve compatibility between nozzles and vehicle fill pipes.

1. 2013/2014 Field Study to Determine the Extent of the Overpressure Problem Occurring at California Gasoline Dispensing Facilities

Throughout the winter of 2013/2014 CARB staff conducted a statewide field study to determine the extent of overpressure conditions (Extent of Overpressure Study) by collecting ISD data and operating characteristic information from nearly 400 GDFs located in nine different geographic regions [CARB, 2017d]. The Extent of Overpressure Study indicated the problem was particularly severe at GDFs with vacuum assist systems. About 70 percent of GDFs with assist systems experienced ISD overpressure alarms; these GDFs averaged about two alarms per month during the winter season. Upon analysis of ISD fueling transaction data, it became evident that assist equipped facilities that exhibit a severe form of overpressure called “pressure increase while dispensing” (PWD) also exhibit an elevated vapor to liquid (V/L) ratio site average when compared to similar assist equipped facilities that did not exhibit PWD.

The V/L ratio is the volume of vapor (when refueling non-ORVR equipped vehicles) or the volume of air (when refueling ORVR equipped vehicles) returned to the GDF storage tank divided by the volume of gasoline dispensed from the nozzle. Upon refueling of non-ORVR equipped vehicles, a V/L ratio of about one (1.0) is desired; for every gallon of gasoline dispensed, a gallon of vapor is displaced from the vehicle tank and is returned to the GDF storage tank. Upon refueling of ORVR equipped vehicles, a V/L ratio of 0.5 or less is desired because the ORVR systems capture at least 95 percent of the displaced gasoline vapors into a carbon canister within the vehicle. With ORVR equipped vehicles, there is very little vapor available for collection at the nozzle and fill pipe interface, so the volume of air returned to the storage tank relative to

the volume of gasoline dispensed must be reduced to suppress vapor growth and pressure driven emissions caused by excess air ingestion.

Under optimal operating conditions, a GDF would have a site average V/L ratio of about 0.6 or lower assuming 83 percent[3] of gasoline is dispensed into ORVR equipped vehicles and the remaining 17 percent of gasoline is dispensed into non-ORVR equipped vehicles. A site average V/L ratio greater than 0.60 indicates there is excess air ingestion at the nozzle.

In December 2013, CARB staff performed analysis on V/L data from 42 sites in the South Coast region, 22 sites in the Bay Area, 20 sites in San Diego, and 16 sites in the San Joaquin Valley [CARB, 2017d]. Each region contained an equal number of PWD and non-PWD sites as well as a similar monthly gasoline throughput at the GDFs. The average V/L ratio at PWD sites was 0.66 while the average V/L ratio at non-PWD sites was 0.61, a difference that is statistically significant ($p<0.001$). The PWD sites exhibited 8.2 percent higher V/L ratio compared to the non-PWD sites. This study provided evidence that a relationship existed between excess air ingestion at the nozzle and severity of overpressure conditions. This study also prompted the development of additional studies to understand what factors contribute to variation observed in V/L ratios.

2. Healy Model 900 Assist Vapor Recovery Nozzle ORVR Vehicle Recognition Study

In January 2015, CARB staff along with staff members from the California Air Pollution Control Officer's Association Vapor Recovery Subcommittee (CAPCOA) conducted the Healy Model 900 Assist Vapor Recovery Nozzle ORVR Vehicle Recognition Study (ORVR Recognition Study) at six retail GDFs in San Diego, California [CARB, 2017a]. The Healy assist nozzle is designed to limit the volume of air return when fueling an ORVR vehicle by generating a V/L ratio less than 0.5. The ability of the Healy assist nozzle to restrict the V/L ratio with ORVR vehicles is a critical design parameter and without it, unacceptable pressure driven emissions would occur. As described in Chapter I, the Healy assist nozzle is the only nozzle certified for use with Phase II assist vapor recovery systems (Executive Orders VR-201 and VR-202), and such systems are employed at approximately half of all retail GDFs statewide (Appendix I).

The ORVR Recognition Study found a mis-identification rate of the Healy assist nozzle of 30 percent. That is, 30 percent of ORVR vehicle fueling events yielded a V/L ratio greater than 0.5. Further analysis revealed two ORVR vehicle fill pipe design features that were most problematic: capless fill pipes and bayonet style fill pipe cap designs.

[3] As noted earlier in this report, approximately 83 percent of California's annual gasoline consumption (~12.5 billion gallons) is currently dispensed into ORVR equipped vehicles [CARB, 2013b, Table I-2]. However, the percentage of ORVR compared to conventional vehicles can vary from GDF to GDF, based on socioeconomic and other regional factors.

Both these design features caused the Healy assist nozzles to mis-identify vehicles with ORVR systems. Of the ORVR vehicles equipped with capless fill pipes, 75 percent yielded a V/L ratio greater than 0.5. Capless fill pipe designs were first introduced in the 2008 model year on a limited number of vehicles. Some capless designs include an open drain path within the fill pipe assembly to allow rainwater or liquid gasoline resulting from customer top-off to drain away. Over 75 percent of ORVR vehicles manufactured by two German companies had V/L ratios greater than 0.5. These vehicles use a bayonet style fill pipe cap with outer ring, which interferes with forming a seal between the fill pipe and nozzle boot.

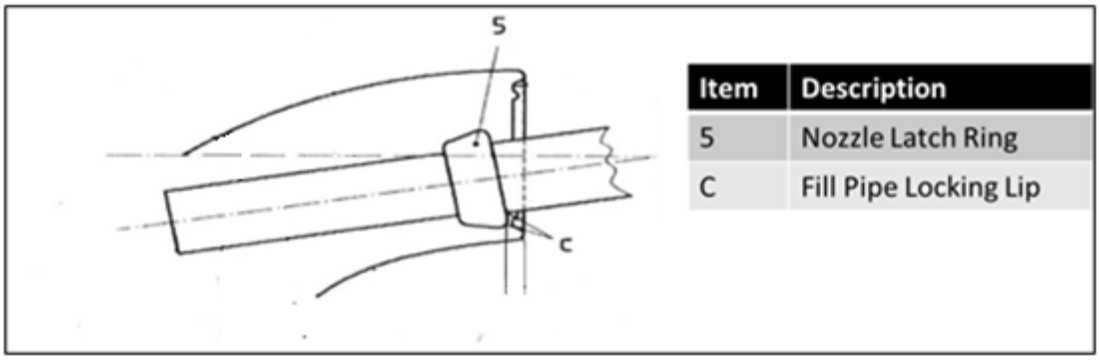
The ORVR Recognition Study indicated that the mis-identification is likely due to a poor seal between the nozzle and vehicle fill pipe. A poor seal allows excess air to be returned to the underground storage tank (UST), resulting in higher evaporation rates and vapor growth in the UST, and leading to excess pressure-driven reactive organic gas (ROG) emissions. These excess emissions cause vapor recovery systems at GDFs to fall short of the performance standards and emission reductions anticipated when the EVR regulations were adopted. In addition, these excess emissions may increase risk of benzene exposure to people who live and work near GDFs.

3. Evaluation of Assist Vapor Recovery Nozzle ORVR Vehicle Recognition Performance under Controlled Fueling Conditions

Throughout the summer of 2015, CARB staff performed a series of controlled vehicle fueling events at a retail GDF equipped with the vacuum assist vapor recovery system (with the Healy assist nozzle) to determine the reason for poor nozzle recognition of ORVR on specific makes and models of vehicles observed in prior studies [Assist Nozzle Controlled Study; CARB, 2017b]. During the refueling process for some vehicles, CARB staff installed a hand held vacuum gauge within the vapor collection boot of the nozzle to determine the leak integrity of the nozzle and vehicle fill pipe interface. CARB staff determined that the variation in ORVR recognition performance for certain vehicles was related to customer behavior. If the nozzle is placed into the vehicle fill pipe in a deliberate, intentional manner, a “secure latch” will be achieved along with a tight seal at the nozzle and vehicle fill pipe interface. However, if the nozzle is not placed deeply into the vehicle fill pipe, a “loose latch” can occur that results in a poor seal at the interface. With ORVR vehicles, a loose latch results in a V/L ratio of about 1.0, which normally occurs with non-ORVR vehicles. Due to the high population of ORVR vehicles (~80 percent statewide), loose latching results in substantial excess air ingestion as the nozzle does not restrict airflow to the UST headspace.

Additionally, CARB staff determined that the occurrence of loose latches on certain vehicles is due in part to the shape of the assist nozzle spout “latch ring” and the mating surface within the vehicle fill pipe called the “locking lip.” A secure latch is depicted in Figure 1, which provides a cross sectional view of a nozzle spout while resting in a vehicle fill pipe.

Figure 1: Cross Sectional View of Nozzle Spout and Vehicle Fill Pipe



Item	Description
S	Nozzle Latch Ring
C	Fill Pipe Locking Lip

Combined, the results of these three field studies highlight the importance of a proper seal at the vapor recovery nozzle and vehicle fill pipe interface. Key study conclusions include the following:

- Certain newer ORVR-equipped vehicles with capless fill pipes include drain holes or rely on injection molded plastic components that contain gaps. Both features create an open path to the atmosphere during fueling events that compromise the ability of the fill pipes to form a vapor-tight seal with the assist nozzle.
- Some vehicles have fill pipes with an overly deep locking lip and small access zone, which prevent nozzles from sealing properly with fill pipes.
- Some vehicle fill pipes have a secondary outer ring design, or other obstructions in the fill pipe access area, that prevent nozzles from sealing properly with fill pipes.
- The design of the Healy assist nozzle had features that increased difficulty in forming a secure latch with vehicle fill pipes in newer vehicles.

As indicated in Chapter I, these findings prompted the establishment of the Society of Automotive Engineers J285/J1140 Fuels System Task Force to update the vehicle fill pipe and nozzle dimension requirements to improve compatibility at their interface.

B. The Proposed Solutions

1. Standardize GDF Nozzle Spout and Bellows Dimensions and Specifications for Vehicle Fill Pipe to Improve their Compatibility

The compatibility between nozzles and vehicle fill pipes needs to be improved to more reliably achieve a secure latch, which in turn will reduce air ingestion at the nozzle and help reduce the frequency and severity of storage tank overpressure and associated emissions. Through the SAE Task Force meetings, CARB staff learned that vehicle manufacturers are willing to make changes to vehicle fill pipe designs to improve

compatibility with nozzles. However, vehicle manufacturers indicated they need better defined, more constrained, nozzle dimensions that will remain consistent into the future so that they can more effectively design compatible fill pipes.

CARB staff is proposing vehicle regulation amendments to improve the compatibility and seal at the vehicle fill pipe and nozzle interface, which is described in a separate staff report.[4] To support the vehicle fill pipe rulemaking, CARB staff also proposes regulatory amendments in this report for standardized spout and bellows specifications for EVR and ECO nozzles. Standardizing these dimensions will help the automotive industry to more effectively improve future vehicle fill pipes by narrowing their design envelope. Both sets of amendments will be proposed to the Board for consideration during the October 2018 Board meeting.

CARB staff proposes amending the dimension requirements and definitions in the following:

- CP-201: Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities, which is referenced in § 94011, Title 17 of the California Code of Regulations
- CP-206: Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities Using Aboveground Storage Tanks, which is referenced in § 94016, Title 17 of the California Code of Regulations
- CP-207: Certification Procedure for Enhanced Conventional (ECO) Nozzles and Low Permeation Conventional Hoses for Use at Gasoline Dispensing Facilities, which is referenced in § 94017, Title 17 of the California Code of Regulations
- D-200: Definitions for Vapor Recovery Procedures, which are referenced in § 94010, Title 17 of the California Code of Regulations

Currently, the above certification procedures specify only three nozzle spout dimensions:

1. The terminal end shall have a straight section of at least 2.5 inches [in] (6.34 centimeters [cm]) in length;
2. The outside diameter of the terminal end shall not exceed 0.840 in (2.134 cm) for the length of the straight section; and
3. The retaining spring or collar shall terminate at least 3.0 in (7.6 cm) from the terminal end.

[4] For a description of proposed requirements and estimated benefits of the proposed vehicle fill pipe performance standard, see the CARB staff report, *Initial Statement of Reasons for Rulemaking: Proposed Amendments to California Specifications for Fill Pipes and Openings of Motor Vehicle Fuel Tanks*, September 7, 2018 [CARB, 2018c].

The above three nozzle spout dimensions are referenced in federal regulations (40 CFR 80.22(f)) and apply to nozzles that dispense unleaded gasoline. These federal regulations were first adopted in the 1970's to prevent mis-fueling with leaded gasoline and to protect catalysts installed on motor vehicles.

CARB staff proposes to refine these three dimensions as well as to include 16 additional dimensions for the:

- Shape and position of the EVR and ECO nozzles' spout and spout latch ring (also called the spout anchor);
- Outside and inside diameter of the vapor collection bellows, face flatness, and contact angle, for EVR assist and balance nozzles; and
- Outside diameter of the insertion interlock device for ECO nozzles.

Table 2 provides the proposed nozzle spout and bellows/insertion interlock dimensions and Figures 2 through 5 illustrate the proposed dimensions. These dimensions are the result of extensive deliberations of nozzle, vehicle, fill pipe manufacturers, and CARB staff who participated in the SAE Task Force. All the proposed dimensions have a range of values, rather than a single value, to increase flexibility and allow for innovation among nozzle manufacturers while at the same time providing the constraint needed for the fill pipe manufacturers. The SAE Task Force considered multiple factors when determining acceptable dimension ranges for EVR and ECO nozzles, including but not limited to the following:

- Ability of a nozzle to fit within a vehicle fill pipe access zone and to form a good seal with a vehicle fill pipe, and customer effort needed to hold the nozzle in place to maintain a good seal (i.e., so that there is not premature auto-shutoff of the gasoline flow throughout the nozzle);
- Compliance with existing regulations, such as those designed to reduce gasoline spills, drips and spitback;
- Customer effort needed to insert the nozzle into the fill pipe and ergonomic concerns, such as whether the customer is forced to lift the nozzle higher to be able to insert the spout into the fill pipe (especially for vehicles with high ground clearance such as pick-up trucks and SUVs); and
- Likelihood of the nozzle becoming caught or "stuck" within the fill pipe "pocket" (the recessed section of body panel that accommodates the fill pipe outlet).

The SAE Task Force concluded that adhering to the dimensions listed in Table 2 will enable EVR assist and balance nozzles and ECO nozzles to achieve a secure latch with future and most existing vehicle fill pipes. In addition, improving compatibility between nozzles and fill pipes will make it easier for many customers to fuel their vehicles by reducing the effort needed to insert the nozzle in the fill pipe.

Table 2: Proposed Standard Nozzle Spout Dimensions for All Phase II EVR and ECO Nozzles

Symbol	Description	Dimension Range (Minimum/Maximum)
D_1	Spout Outside Diameter Minimum Length of D_1 Roundness of D_1	20.12/21.34 mm (0.792/0.840 in) $L_2 - A_1$ Within diameter limits
D_2 [(a)]	Nozzle Anchor Device Outside Diameter [(a)]	25.1/32.1 mm. (0.988/1.264 in) [(a)]
C_t	Spout Tip Chamfer or Radius	2.0 mm max (0.080 in max)
C_α	Spout Tip Chamfer Angle	30° to 45°
A_r	Anchor Radius	1.5 mm max (0.059 in max)
A_α	Anchor minimum angle	45°
A_1	Overall Length of Anchor	6.5/20.2 mm (0.256/0.795 in)
A_2	Length of Anchor without Chamfer	0.5/12.5 mm (0.020/0.500 in)
A_H [(b)]	Anchor Latch Height [(b)]	Maximum for all styles constrained by D_2 [(b)] Minimum for ECO Nozzles: 0.88 mm (0.035 in) Minimum for Balance Nozzles: 2.59 mm (0.102 in) Minimum for Assist Nozzles: 3.50 mm (0.138 in)
S_α [(c)]	Bend Angle of Nozzle Spout [(c)]	19.5° / 26.0° [(c)]
L_1	Length of Straight Part of Nozzle Spout	L_2 + 5.0 mm min (L_2 + 0.197 in min)
L_2	Distance Between Nozzle End and First Anchor Position	85.0/95.0 mm (3.346/3.740 in)
L_3 [(d)]	Distance Between Nozzle End and Aspirator Port Centerline [(d)] *(Aspirator can be in front face of tip)*	18.0 mm max (0.709 in max) [(d)]
L_4	Clearance from Fuel Dispensing End to Spout Connection to Nozzle Body	150 mm min (5.906 in min)

Table 2: Proposed Standard Nozzle Spout Dimensions for All Phase II EVR and ECO Nozzles, *continued*

Symbol	Description	Dimension Range (Minimum/Maximum)
B_1	Nozzle Bellows Face Outer Diameter	77 mm max (3.031 in max)
B_2	Nozzle Bellows Face Inner Diameter	29.0/45.0 mm (1.142/1.772 in)
B_3	Nozzle Bellows Face Flatness	2.5 mm (0.098 in) total indicator reading (TIR) max over seal surface
B_4	Nozzle Bellows Contact Angle	40° maximum angle
P (e)	Aspirator Port Diameter (e)	2.0/4.25 mm (0.079/0.167 in) (e)
H	Calibration Hole (f)	(f)

(a) If an offset anchor is utilized, anchor outside diameter measurement will be the effective length (greatest length) across the anchor surface.

(b) Measurement of anchor latch height (A_H) taken from spout to virtual sharp.

(c) If spout bend angle (S_α) is out of the recommended range, full nozzle review is mandatory in the vehicle fill pipe clearance zone described in the SAE recommended practice document J1140.

(d) If L_3 is greater than 18.0 mm (0.709 in) the distance difference between L_2 and L_3 must be greater than 69 mm (2.72 in), and L_3 can be no greater than 25.4 mm (1.000 in).

(e) Reference only dimension. Aspirator (sensor) placement can be in spout end or along bottom of spout.

(f) Reference only dimension. Calibration holes may be present in nozzle bellows to avoid premature shutoff caused by excess vacuum during the refueling of ORVR equipped vehicles. Such holes shall be blocked/sealed during V/L ratio nozzle adjustments.

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Figure 2: Phase II EVR Nozzle Spout Dimensions as Specified by Table 2

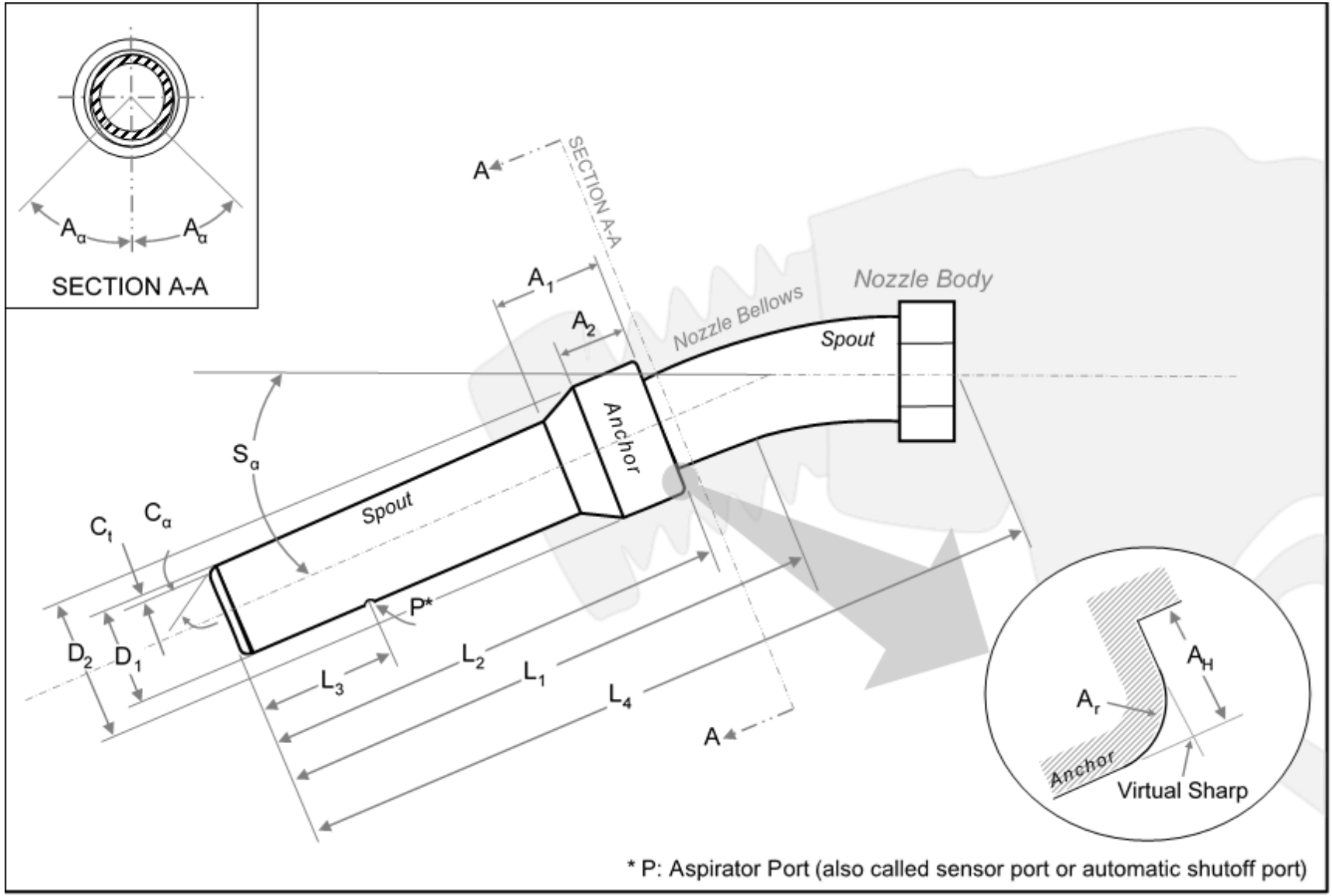


Figure 3: Phase II EVR Nozzle Bellows Dimensions as Specified by Table 2

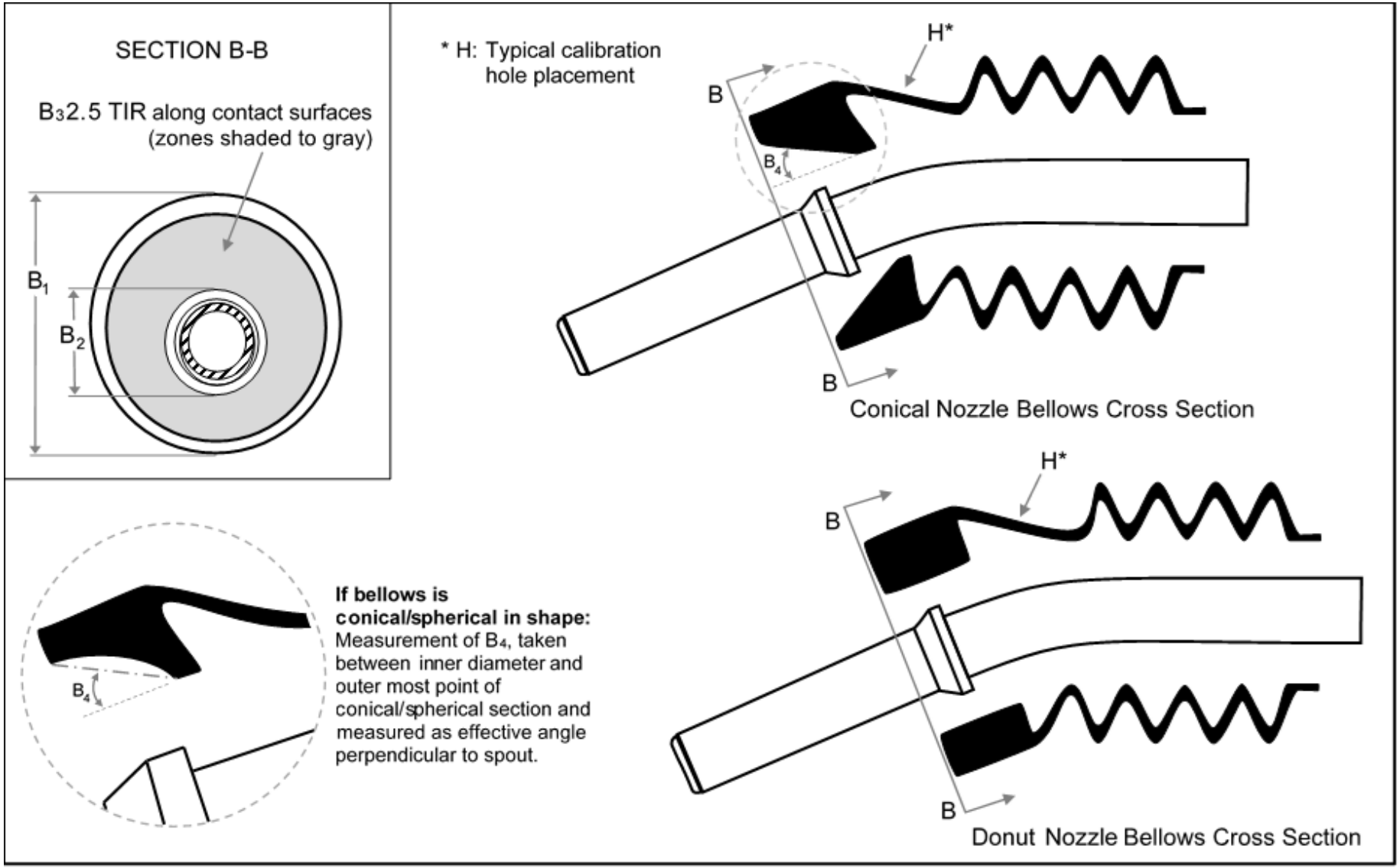


Figure 4: ECO Nozzle Spout Dimensions as Specified by Table 2

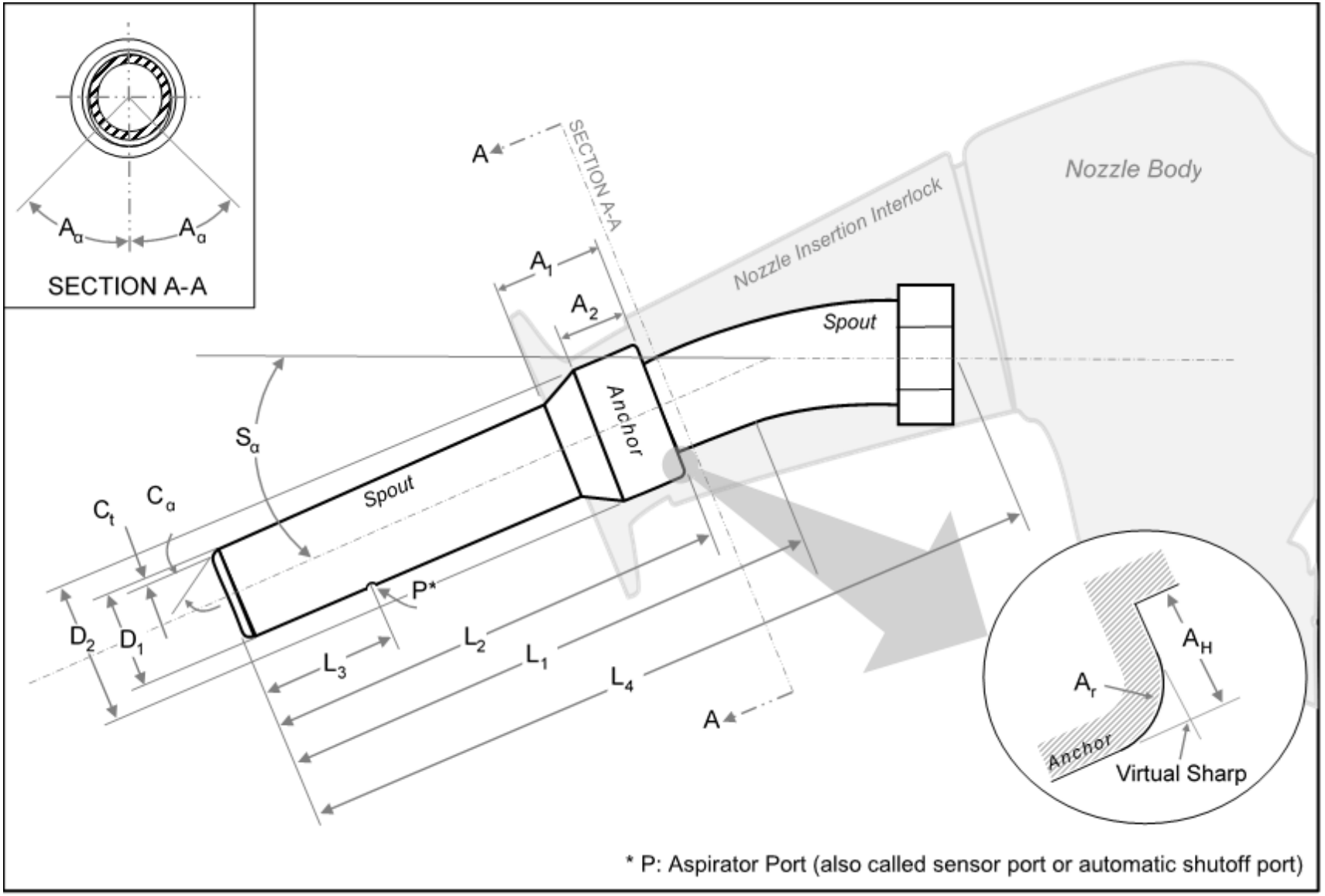
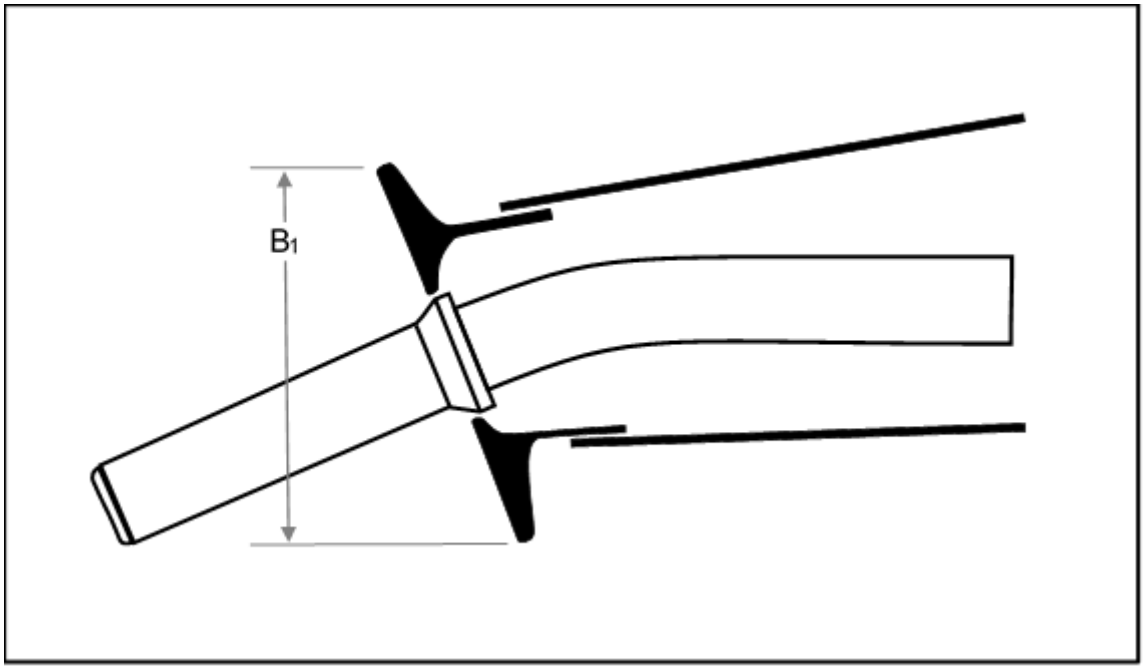


Figure 5: ECO Nozzle Insertion interlock Dimensions as Specified by Table 2



Nozzle manufacturers requesting re-certification of currently certified nozzles, and certification of new nozzles, would need to comply with the proposed dimension requirements after the regulatory amendment adoption date, which is anticipated to be mid- to late-2019.

As described in Chapter I, currently there are three vapor recovery nozzles certified (approved) by CARB and commercially available for use in California. Two are balance nozzles (VST Model VST-EVR-NB (G2) and Emco Model A4005-EVR) and one is an assist nozzle (Healy Model 900). The two certified balance nozzles comply with the proposed spout dimensions listed in Table 2; consequently, CARB staff does not anticipate any changes to be needed for the balance nozzles.

There are currently two versions of the Healy assist nozzle, one with and one without the “Enhanced ORVR-Vehicle Recognition” (EOR) spout assembly. As described in more detail in the next section, both are certified for use in California but only the version with the EOR spout assembly complies with the proposed spout dimensions listed in Table 2. Although CARB staff does not anticipate certification of additional assist system nozzles, it is important to amend nozzle dimensions, in particular those associated with the latch ring, in the event certification is requested in the future.

Currently, there are no enhanced conventional (ECO) nozzles certified for use in California. CARB staff is conducting certification tests of two ECO nozzles and is reviewing an application submitted by a third ECO nozzle manufacturer. The design

specifications for the three prototypes indicate they comply with the proposed dimensions.

2. Implement the EOR Spout Assembly for Assist Nozzles

In September of 2015, in response to the results of the ORVR Recognition Study, Franklin Fueling Systems (the manufacturer of the Healy assist nozzle) voluntarily developed a spout assembly called “Enhanced ORVR-Vehicle Recognition” (EOR) designed for Healy assist nozzles. The EOR spout assembly is equipped with a more pronounced latch ring and a slightly shorter insertion interlock rod within the bellows, which helps improve the seal between the nozzle spout assembly and vehicle fill pipe during fueling events. Figure 6 provides an image of the EOR nozzle spout and Figure 7 provides an image of the spout without the EOR features. As depicted in Figure 6, the latch ring (anchor) of the currently certified spout is more pronounced than the previously certified version depicted in Figure 7.

Figure 6: Currently Certified Assist EOR Nozzle Spout Assembly
(Improved Latch Ring)

Figure 7: Previously Certified Assist Nozzle Spout Assembly
(Prone to Loose Latching)

A CARB field study found that use of the EOR nozzle reduced PWD by 55 percent and reduced average site V/L and improved the ORVR identification rate by approximately 14 percent at the six GDFs where EOR spout assemblies were installed [EOR Study; CARB, 2018b; see also Appendix G in this report]. In addition, the EOR Study found that use of the EOR nozzle reduced the ISD overpressure alarm frequency at five of the

six (80 percent) study sites; these five sites experienced an average alarm frequency reduction of approximately 46 percent [CARB, 2018b, Table VI-4]. Because of these improvements, CARB staff proposes spout dimensions for assist nozzles in Table 2 that incorporate the dimensions of the EOR spout assembly, specifically the anchor latch height (symbol A_H in Table 2 and Figure 2), to help more reliably enable a secure latch between the Healy assist nozzle and vehicle fill pipe.

CARB staff proposes that the new dimension requirements described in the prior section apply to: (a) assist nozzles at new GDFs constructed after the regulatory amendment adoption date and (b) replacement parts installed for assist nozzles at existing GDFs after the proposed regulatory amendment adoption date. During routine nozzle replacement caused by normal wear and tear, catastrophic failures from drive-off or vandalism, and exceedance of useful life, existing facilities would replace previously certified assist nozzles with nozzles that include the currently certified EOR spout assembly.

Even without the proposed amendments for dimension requirements, CARB staff expects that most assist nozzles will be replaced with the EOR version within the next several years. To encourage voluntary early replacement, in December 2017 FFS began offering eligible station owners a "Double Core Credit" incentive program and plans to continue the program until December 31, 2018. This incentive program is anticipated to increase the typical nozzle replacement rate. Staff predicts that more than half of the previously certified assist nozzles will be replaced by the end of 2020, and about 90 percent or more will be replaced by the end of 2023. (See Chapter V.B and Appendices H and J for a review of assist nozzle age distribution and implications for the timing of emission benefits.) Even so, the proposed amendments serve the purpose of codifying dimensions that improve compatibility with vehicle fill pipes in case manufacturers consider developing new assist nozzles in the future. Further, the proposed amendments provide standardized spout dimensions for balance and ECO nozzles, in addition to the dimensions for assist nozzles, that will enable the automotive industry to more effectively design compatible fill pipes for future vehicle models.

3. Structure of Proposed Amendments

CARB staff proposes to amend the certification procedures to reference the updated version of the SAE recommended practice document called *J285: Dispenser Nozzle Spouts for Liquid Fuels Intended for Use with Spark Ignition and Compression Ignition Engines* (SAE J285), rather than listing the additional nozzle spout and bellows dimensions in the certification procedures. By referencing SAE J285, the certification procedures will effectively require nozzle manufacturers who wish to market their product in the State of California to meet the specifications. In other words, SAE J285 will now describe the required practice, rather than a recommended practice, for gasoline nozzles sold in California. Both nozzle manufacturers and automotive industry representatives endorsed this option because they prefer to have all dimension

requirements consolidated in a single standards document rather than to reference several documents from various sources.

SAE J285 was first issued in June 1972 and last revised in April 2007. The 2007 version of SAE J285 does not include all nozzle spout and bellows dimensions currently recommended by the SAE Task Force and CARB staff. However, the updated version of SAE J285 has not yet completed the SAE approval process. Consequently, for initial public review, CARB staff inserted the proposed nozzle dimensions in the certification procedures. Once the SAE approval process has finished, CARB staff will update the certification procedures to reference SAE J285, at which time the public will have an opportunity for review and comment.

The proposed nozzle dimensions in this report and in the draft version of SAE J285 reference another SAE recommended practice document called *J1140: Filler Pipes and Openings of Motor Vehicle Fuel Tanks*. The draft updated version of SAE J1140 has not yet completed the SAE approval process. For a review of proposed J1140 updates, see the CARB staff report, *Initial Statement of Reasons for Rulemaking: Proposed Amendments to California Specifications for Fill Pipes and Openings of Motor Vehicle Fuel Tanks*, September 7, 2018 [CARB, 2018c].

III. SUMMARY OF RECOMMENDED BOARD ACTION

This chapter provides a summary of CARB staff's recommendations for Board action. Staff recommends that the Board approve the proposal to amend California Code of Regulations, Title 17 § 94010, § 94011, § 94016, and § 94017. These amendments would be incorporated in the following documents, which are referenced in aforementioned Title 17 sections, respectively:

- CARB D-200, Definitions for Vapor Recovery Procedures
- CARB Certification Procedure 201 – Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities
- CARB Certification Procedure 206 – Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities using Aboveground Storage Tanks
- CARB Certification Procedure 207 – Certification Procedure for Enhanced Conventional (ECO) Nozzles and Low Permeation Hoses for Use at Gasoline Dispensing Facilities

By approving the proposed amendments, the Board would adopt new standardized dimensions for EVR and ECO nozzle spouts, EVR nozzle bellows, and ECO nozzle insertion interlocks that improve compatibility with newer motor vehicle fill pipes. This compatibility is necessary to reduce air ingestion at the nozzle, which will help reduce pressure driven emissions caused by evaporation of gasoline within the GDF storage tank headspace. Further, improving compatibility between nozzles and fill pipes also

will make it easier for many customers to fuel their vehicles by reducing the effort needed to insert the nozzle in the fill pipe.

In addition, the proposed amendments to CP-201, CP-206 and CP-207 will incorporate by reference the following document:

> Society of Automotive Engineers (SAE). Surface Vehicle Recommended Practice SAE J285: Dispenser Nozzle Spouts for Liquid Fuels Intended for Use with Spark Ignition and Compression Ignition Engines. [Update to be issued.]

The updated SAE J285 is anticipated to incorporate by reference the following SAE document:

> Society of Automotive Engineers (SAE). Recommended Practice SAE J1140: Filler Pipes and Openings of Motor Vehicle Fuel Tanks. [Update to be issued.]

The updated SAE J285 and SAE J1140 have not yet completed the SAE approval process. Consequently, for initial public review, CARB staff inserted the proposed SAE J285 nozzle dimensions in the certification procedures. For a review of proposed J1140 updates, see the CARB staff report, *Initial Statement of Reasons for Rulemaking: Proposed Amendments to California Specifications for Fill Pipes and Openings of Motor Vehicle Fuel Tanks*, September 7, 2018 [CARB, 2018c].

Once the SAE approval process has finished, CARB staff will update the certification procedures to reference SAE J285 and SAE J1140 and provide notice of an opportunity for public review and comment for the updated certification procedures, SAE J285, and SAE J1140.

Appendices A through E provide the full text of the proposed regulatory amendments for nozzle spout and bellows dimensions. Chapter XII provides detailed descriptions of the underlying purpose and rationale for each proposed amendment.

IV. BENEFITS ANTICIPATED FROM THE REGULATORY ACTION

The proposed amendments will preserve emission reductions anticipated to result from statewide implementation of the recently certified Healy Model 900 assist nozzle with EOR spout assembly (EOR nozzle). CARB staff estimates that implementation of the assist EOR nozzle will result in a beneficial impact to air quality by reducing gasoline vapor (aka reactive organic gases, or ROG) emissions from GDFs, which also contain benzene (a toxic air contaminant), by about 0.94 tons per day on a statewide, annualized basis. The majority of emission reductions will occur during the winter blend gasoline period (typically November through February), with a seasonal, statewide emission reduction of about 2.85 tons per day. The Healy Model 900 nozzle EOR spout assembly enables a better seal between the nozzle vapor collection bellows and ORVR vehicle fill pipe, thereby reducing excess air ingestion and reducing pressure driven

emissions caused by evaporation of gasoline within the storage tank headspace. Reducing ROG emissions is an integral part of California reaching its goal of attaining and maintaining federal and State ozone standards. Reducing emissions is critical for reducing health risk from benzene for people who live and work near gasoline dispensing facilities. For more details on the anticipated air quality benefits of implementing the assist EOR nozzle, refer to Chapter V of this report.

In addition, reducing excess air ingestion at the nozzle will reduce the frequency and severity of ISD overpressure alarms, which will reduce the frequency and cost of service calls for GDF operators. CARB staff estimates a 50 percent reduction in overpressure alarm frequency for Healy equipped sites once the EOR nozzle is fully implemented.

Also, standardizing dimensions for nozzles will help the automotive industry to more effectively design fully compatible fill pipes for future vehicle models by narrowing their design envelope. Improving compatibility between nozzles and fill pipes will improve vapor recovery system performance and reduce the performance decline that has been observed due to a poor seal at the nozzle and fill pipe interface. This will further reduce gasoline vapor emissions from GDFs so that vapor recovery systems come closer to achieving the performance standards and emission reductions anticipated when EVR regulations were adopted. As explained in Chapter 1, CARB staff anticipates proposing a comprehensive solution to the overpressure problem in early 2020. As an ancillary benefit, improved compatibility will make it easier for many customers to fuel their vehicles by reducing the effort needed to insert the nozzle in the fill pipe. For a review of the vehicle fill pipe rulemaking, refer to section II.B.1 of this report.

V. AIR QUALITY

The proposed amendments will preserve emission reductions anticipated to result from statewide implementation of the recently certified Healy Model 900 assist nozzle with EOR spout assembly. This chapter describes the expected emissions benefits associated with implementation of the improved assist nozzle. The following discussion provides a summary overview of the calculated emissions benefits. For a detailed explanation of how CARB staff calculated the emissions benefits, refer to Appendix G. For an explanation of estimated emissions benefits of the proposed vehicle fill pipe improvements, see the CARB staff report, *Initial Statement of Reasons for Rulemaking: Proposed Amendments to California Specifications for Fill Pipes and Openings of Motor Vehicle Fuel Tanks*, September 7, 2018 [CARB, 2018c].

Emission reductions will result from the statewide implementation of the recently certified Healy Model 900 nozzle EOR spout assembly at assist equipped GDFs. The EOR spout assembly enables a better seal between the assist nozzle vapor collection bellows and ORVR vehicle fill pipe, thereby reducing excess air ingestion and reducing pressure driven emissions caused by evaporation of gasoline within the storage tank

headspace. CARB staff calculated the anticipated reduction in pressure driven emissions by comparing data collected at GDFs equipped with the non-EOR version of the Healy assist nozzle to data collected at GDFs quipped with the EOR version.

A. Baseline Emissions

CARB staff collected UST pressure data at GDFs equipped with the non-EOR version of the Healy spout assembly throughout the winters of 2013/2014, 2014/2015, and 2015/2016 ["PWD Emission Study"; CARB, 2017c]. For this report, winter is defined as November 1 through February 28, which is when "winter blend gasoline" is typically distributed. The Reid Vapor Pressure of winter blend gasoline is uncontrolled. Consequently, winter is when most overpressure conditions occur.

Collection of UST pressure enables CARB staff to determine the magnitude of pressure driven emissions by calculating fugitive and vent line volume emissions. CARB staff calculated emission factors, expressed as pounds (lbs) of reactive organic gas (ROG) per thousand gallons (kgal) of gasoline dispensed, based on data collected at the four GDFs that exhibited pressure while dispensing (PWD). The emission factors for the four GDFs ranged from 0.39 lbs/kgal to 2.25 lbs/kgal and averaged 1.37 lbs/kgal.

CARB staff calculated statewide baseline emissions using the average emission factor along with Equation 1 and the following information:

- Winter gasoline throughput in 2016 according to the *California Retail Fuel Outlet Annual Report* [5,092,932 kgal; CEC, 2017a and 2018].
- Percentage of GDFs equipped with the Healy assist Phase II vapor recovery systems in California [52 percent; Appendix I of this report].
- Percentage of GDFs equipped with the Healy assist Phase II vapor recovery systems in California that exhibited PWD during the *2013/2014 Field Study to Determine the Extent of the Overpressure Issue* [34.2 percent; CARB, 2017d].
- Total number of days in the winter period (120 days).
- Conversion factor from pounds to tons (2,000 lbs/ton)

Use of Equation 1 (next page) results in a statewide baseline emission estimate of 5.17 tons per day (TPD) during the winter for GDFs with vacuum assist vapor recovery systems equipped with the non-EOR version of the Healy Model 900 nozzle. Appendix G and CARB staff's 2017 technical study report, *Estimate of Pressure Driven Emissions Occurring at GDF Equipped with the Assist Phase II Enhanced Vapor Recovery System* [CARB, 2017c], provide detailed descriptions of the data collection and emission factor and statewide baseline calculation methods and assumptions.

Equation 1:

Wintertime Emission Calculation for GDFs Equipped with Non-EOR Version of Healy Model 900 Nozzle

$$\frac{(1.37 \text{ lbs/kgal}) * (5{,}092{,}932 \text{ kgal}) * (52\%) * (34.2\%)}{(120 \text{ days} * 2{,}000 \text{ lbs/ton})} = \textbf{5.17 TPD}$$

B. Projected Emissions Benefits

During the winter of 2016/2017, CARB staff, with the assistance of Franklin Fueling Services (FFS) and CAPCOA, evaluated the performance of the EOR spout assembly installed at six retail GDFs that had previously exhibited PWD and a high frequency of ISD overpressure alarms in 2013, 2014 and 2015 ["EOR Nozzle Study"; CARB, 2018b].[5] The performance evaluation found the following improvements as a result of the EOR spout assembly installation:

- Pressure while dispensing was reduced by 55 percent;
- The average site V/L was lowered and the ORVR identification rate was improved by ~14 percent; and
- The wintertime emission factor was reduced to 0.61 lbs/kgal.

The reduction in the site V/L and improved ORVR identification rate indicate less air ingestion at the nozzle/fill pipe interface during vehicle refueling. This tighter seal reduces excess air ingestion, which in turn causes less vapor growth in the UST and results in less overall emissions.

Using the same calculation approach described in the prior section, CARB estimated wintertime ROG emissions of 2.32 TPD with full statewide implementation of the EOR spout assembly. Compared to baseline (5.17 TPD during the four-month winter period), this represents a 2.85 TPD (55 percent) reduction in wintertime emissions at GDFs with assist vapor recovery systems. This equates to a total annual reduction of about 342 tons (~684,000 pounds) of ROG emissions.[6] Appendix G and CARB staff's 2018

[5] The six GDFs evaluated in the EOR Nozzle Study do not include any of the GDFs evaluated in the prior PWD Emission Study because the PWD Emission Study sites were no longer available for study (e.g., because some converted to balance vapor recovery systems).

[6] The total annual reduction of 342 tons is estimated by multiplying the wintertime daily emission reduction of 2.85 TPD by 120 days. An annualized daily emission reduction can be estimated by multiplying the wintertime daily emission reduction of 2.85 TPD by 120 days (the typical number of days in the four-month winter period, November to February) and dividing by 365 (the typical number of days in a year), to obtain 0.94 TPD.

technical study report, *Evaluation of Healy Model 900 Assist Vapor Recovery Nozzle with Enhanced On-Board Refueling Vapor Recovery (ORVR) Vehicle Recognition Feature during the Winter of 2016/2017* [CARB, 2018b], provide detailed descriptions of the data collection, emission factor, and emission reduction calculation methods and assumptions.

Baseline ROG emissions are projected to decrease on a year-to-year basis from 2018 to 2026, with an estimated ROG emission reduction of 308 tons per year by the end of 2023, and an additional reduction of 34 tons per year by the end of 2026, for a total emission reduction of about 342 tons per year after 2026. This decrease is driven by the replacement of assist nozzles that include the recently certified EOR version. Staff predicts that more than half of the previously certified assist nozzles will be replaced by the end of 2020, about 90 percent will be replaced by the end of 2023, and the rest by the end of 2026, for the following reasons:

- The proposed amendments specify that existing GDFs that operate on or before the amendment date will not be required to replace their nozzles to comply with the new nozzle spout and bellows dimension requirements, which the EOR spout assembly meets, until the end of the useful nozzle life.
- FFS is the only manufacturer of certified assist nozzles. In August 2017, FFS received CARB certification of the Healy assist nozzle with EOR spout assembly, and in December 2017 FFS ceased production and distribution of the prior, non-EOR equipped model. CARB staff's recent survey of 7 parts distributors and 19 service contractors indicates that most no longer carry the non-EOR equipped model, and those that do will deplete their inventory by the end of 2018 or sooner [CARB, 2018a].
- To encourage voluntary early replacement of existing assist nozzles with EOR nozzles, FFS will continue to offer eligible station owners a "Double Core Credit" incentive program until December 31, 2018, which is anticipated to increase the nozzle replacement rate.
- CARB staff's evaluation of Healy assist nozzle age data collected before the FFS incentive program indicates more than half of assist nozzles are replaced within three years, the rest are typically replaced within eight years, and about a tenth of all assist nozzles statewide may have a useful life that extends between 2024 and 2026. Staff's nozzle age data analyses and nozzle replacement rate assumptions are described in Appendices H and J.

As detailed in Table 3, CARB staff predicts implementation of the newly certified assist nozzle with EOR spout assembly will reduce statewide ROG emissions by nearly two thousand tons by 2026, and more than three thousand tons by 2030.

Table 3: Calculations and Assumptions for Estimating Long-Term ROG Emission Reductions

Implementation Period	**Percent Reduction**	**Tons per Day in Winter** [Annualized Tons per Day^]	**Tons per Year** (Winter TPD x 120 days)	**Pounds per Year** (TPY x 2,000)
Estimated winter emission reduction rate by the end of 2026	100%	2.85 [0.937]	342	684,000
Estimated winter emission reduction rate by the end of 2023	90%	2.565 [0.843]	308	615,600
Estimated <u>additional</u> emission reduction between 2024 and 2026	10%	0.285 [0.094]	34	68,400

^ Annualized Tons per Day = Winter Tons per Day x 120 days *(typical # of days in winter season)* ÷ 365 days *(typical # of days in a year)*

Implementation Period	**Calculation Period** (Years)	**Average Tons per Day in Winter for Calculation Period**	**Tons per Period** (Average Winter TPD x 120 days x # of Years)	**Pounds per Period** (Tons per Period x 2,000)
Emission reduction between 2018 and 2023 *(assumes year-to-year reduction from 0 to 2.565 TPD, averaging 1.28 TPD)*	6	1.28	922	1,844,000
Emission reduction between 2024 and 2026 *(assumes year-to-year reduction from 2.565 to 2.85 TPD, averaging 2.71 TPD)*	3	2.71	976	1,952,000
Emission reduction between 2027 and 2030 *(assumes continued EOR nozzle implementation maintains 2.85 TPD emission reduction)*	4	2.85	1,368	2,736,000
Total ROG Emission Reduction by 2030:			**3,266 tons (6,532,000 lbs)**	

The majority of ROG emission benefits will occur in the Air Districts that have the most GDFs with assist systems: South Coast (~39 percent), San Francisco Bay Area (~16 percent), and San Joaquin Valley (~15 percent).[7]

The ROG emission benefits anticipated from implementation of assist nozzles that include the EOR spout assembly are in addition to benefits associated with implementation of the proposed vehicle regulation amendments [CARB, 2018c].[8]

Further, the SAE Task Force concluded that adhering to the dimensions listed in Table 2 will enable EVR balance nozzles and ECO nozzles—not just EVR assist nozzles—to achieve a secure latch with future and most existing vehicle fill pipes, as well as to maintain compliance with existing regulations, such as those designed to reduce gasoline spills, drips and spitback and their associated emissions. Also, providing defined, more constrained, nozzle dimensions that will remain consistent into the future will enable vehicle manufacturers to more effectively design compatible fill pipes with better seals with nozzles.

C. Health Impacts

1. Benefits to Individuals

Staff expects implementation of the proposed regulatory amendments will result in a statewide reduction of approximately 342 tons per year (~684,000 pounds per year) of ROG emissions by the end of 2026. ROG emissions can lead to increased health risk through two primary mechanisms: First, ROG emissions lead to the formation of ground level ozone, which can cause adverse health effects, particularly in children and individuals with respiratory conditions. Second, gasoline vapors contain benzene, which is a toxic air contaminant and known carcinogen. Reducing ROG emissions will benefit the health and welfare of California residents by reducing ambient ground level ozone and benzene exposure.

2. Benefits to California Businesses

To meet the requirements of the proposed amendments, GDF operators would replace assist nozzles at the end of their useful life with assist nozzles that have the improved

[7] Appendix I provides the results of a 2018 survey of the number of GDFs with assist and balance Phase II EVR systems in these three Air Districts. Because not all Air Districts responded to the survey, the percentages provided in the text are based on comparisons to the total number of GDFs in 2016 (10,202) estimated by the California Energy Commission [CEC, 2017a and 2018].

[8] As noted in section II.A.3 of this report, certain newer ORVR-equipped vehicles with capless fill pipes include a drain hole in the fill pipes and injection molded components that contain gaps. Both of these vehicle fill pipe features create an open path to the atmosphere during fueling events that compromise the ability of fill pipes to form a vapor-tight seal with any EVR nozzle, even those assist nozzles that include the EOR spout assembly. CARB staff's proposed vehicle regulation amendments would address emissions that currently result from these fill pipe features.

EOR spout assembly. This will reduce ROG emissions at GDFs with assist systems that previously experienced pressure while dispensing, which will reduce occupational exposure to gasoline vapor and benzene for GDF employees.

VI. ENVIRONMENTAL ANALYSIS

This chapter provides an environmental analysis for the proposed regulatory amendments for nozzle dimensions specifications. Based on CARB's review, CARB staff has determined that the proposed regulatory amendments are exempt from the requirements of the California Environmental Quality Act (CEQA). The following sections provide a brief explanation of this determination.

A. Environmental Review Process

CARB's regulatory program, which involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans for the protection and enhancement of the State's ambient air quality, has been certified by the California Secretary for Natural Resources under Public Resources Code § 21080.5 of CEQA (14 CCR 15251(d)). Public agencies with certified regulatory programs are exempt from certain CEQA requirements, including but not limited to, preparing environmental impact reports, negative declarations, and initial studies. CARB, as a lead agency, prepares a substitute environmental document (referred to as an "Environmental Analysis" or "EA") as part of the Staff Report prepared for a proposed action to comply with CEQA (17 CCR 60000–60008). The resource areas from the CEQA Guidelines Environmental Checklist are used as a framework for assessing the potential for significant impacts (17 CCR 60005(b)).

B. Analysis of Proposed Regulatory Action

CARB staff has determined that the proposed regulatory amendments are categorically exempt from CEQA under the "Class 8" exemption (14 CCR 15308) because they are actions taken by a regulatory agency for the protection of the environment.

The proposed regulatory amendments will standardize nozzle spout and bellows dimensions to improve compatibility with newer motor vehicle fill pipes. This compatibility is necessary to reduce air ingestion at the nozzle, which will help reduce pressure driven emissions caused by evaporation of gasoline within the GDF storage tank headspace. Unexpected pressure driven emissions cause GDF vapor recovery systems not to achieve the performance standards and emission reductions anticipated when EVR regulations were adopted.

Compliance with the proposed regulatory amendments will result in a beneficial impact to air quality. The proposed amendments will preserve emission reductions anticipated

to result from statewide implementation of the recently certified Healy assist nozzle with EOR spout assembly (EOR nozzle) by preventing the introduction of new nozzles with dimensions known to be incompatible with newer vehicle fill pipes. CARB staff estimates that assist EOR nozzle implementation will reduce gasoline vapor emissions, which contain ROG and benzene, by about one ton per day statewide. The assist EOR nozzle enables a better seal between the nozzle's vapor collection bellows and ORVR vehicle fill pipe, thereby reducing excess air ingestion. Reducing ROG emissions is an integral part of California reaching its goal of attaining and maintaining federal and State ozone standards. Reducing benzene emissions is critical for reducing exposure to people who live and work near GDFs. In addition, standardization of spout dimensions will also enable the automotive industry to more effectively design fully compatible fill pipes for future vehicle models.

As described in Chapter I, currently there are three vapor recovery nozzles certified (approved) by CARB and commercially available for use in California. Two are balance nozzles (VST Model EVR-NB (G2), and Emco Model A4005-EVR) and one is an assist nozzle (Healy Model 900). The two certified balance nozzles comply with the proposed spout dimensions; consequently, CARB staff does not anticipate any changes to be needed for the balance nozzles. There are currently two versions of the Healy assist nozzle, one with and one without the EOR spout assembly. Only the EOR nozzle complies with the proposed spout dimensions. Currently, there are no ECO nozzles certified for use in California although three manufacturers have applied for certification.

Under the proposed regulatory amendments, nozzle manufacturers are expected to design spouts and bellows for future EVR nozzles, and spouts and insertion interlocks for future ECO nozzles, that meet the new dimension specifications. Those nozzles would be evaluated by CARB staff, and nozzles passing the evaluation would be certified for use in California. In addition, new GDFs with assist EVR systems constructed after the regulatory amendment approval date would be required to install assist nozzles that include spout assemblies that comply with the new dimension specifications, such as the EOR nozzle. Currently the EOR nozzle is the only assist nozzle sold; consequently, new GDFs with assist systems constructed after 2018 would have to install the EOR nozzle. Even so, the proposed regulations will ensure only nozzles that meet the new dimension specifications will be sold after the amendment approval date. Existing GDFs with assist EVR systems would be required to replace the old assist nozzles with improved nozzles when the old nozzles reach the end of their useful life. Thus, the proposed action constitutes an action taken by a regulatory agency, as authorized by state law, to assure the maintenance, restoration, enhancement, or protection of the environment, as contemplated by the Class 8 exemption.

Compliance with the proposed regulatory amendments does not require the construction of any new nozzle manufacturing facilities nor replacement of existing nozzle components before the end of their useful life. Consequently, compliance with

the proposed regulatory amendments does not involve or result in any adverse physical changes to the existing environment, such as new development, modifications to existing buildings or facilities, or new land use designations. It is not reasonably foreseeable that there will be any adverse impacts on the environment because the proposed requirements would not require any action by regulated parties that could affect these resources.

The proposed actions are designed to protect the environment and CARB staff found no substantial evidence indicating the proposal could adversely affect air quality or any other environmental resource area, or that any of the exceptions to the exemption applies (14 CCR 15300.2). Therefore, this activity is exempt from CEQA.

VII. ENVIRONMENTAL JUSTICE

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Government Code § 65040.12, subdivision (c)). CARB is committed to making environmental justice an integral part of its activities. The Board approved its Environmental Justice Policies and Actions (Policies) on December 13, 2001, to establish a framework for incorporating environmental justice into CARB's programs consistent with the directives of State law [CARB, 2001]. These policies set a baseline that applies to all communities in California, recognizing that low-income communities and communities of color continue to bear a disproportionate environmental burden.

The proposed amendments to the EVR regulations would apply to nozzles at gasoline dispensing facilities in all regions of the State, and would serve to reduce gasoline vapor releases, and thus reduce ROG and benzene emissions. Reducing ROG emissions is an integral part of California reaching its goal of attaining and maintaining federal and State ozone standards. Reducing benzene emissions is critical for reducing exposure to people who live and work near GDFs, who tend to belong to lower-income communities. Consequently, all communities, including disadvantaged low-income communities and communities of color, will benefit from the air quality improvements associated with this proposal. Alternatives to the proposed recommendations, such as not implementing the proposal, would affect all communities throughout the State.

The proposed amendments are consistent with CARB’s environmental justice policy of reducing exposure to air pollutants and reducing adverse health impacts from toxic air contaminants in all California communities, especially those bearing disproportionate environmental burdens.

VIII. ECONOMIC IMPACTS ASSESSMENT

This chapter provides an economic impact assessment for the proposed regulatory amendments for nozzle dimensions specifications. These dimensions provide certainty to manufacturers of nozzles and fill pipes, help ensure continued nozzle compatibility with new vehicle fuel pipes, and preserve emission reductions anticipated for statewide assist EOR nozzle implementation by preventing the introduction of nozzle designs with dimensions to result in a poor seal with fill pipes.

Staff estimates the proposed regulations will result in a small cost increase of $20,520 over the potential project life (through 2030) for nozzle manufacturers. In addition, the proposed regulations will preserve ongoing cost savings anticipated with statewide assist EOR nozzle implementation. Staff estimates that installing the assist EOR nozzle will reduce alarm response-related operating costs by about $3.47 million through 2030 for GDF owners.

This chapter provides the background information, calculation methods, and assumptions for assessing potential economic impacts and benefits associated with the proposed amendments. The next chapter provides an evaluation of alternatives to the proposed amendments, and Appendix H provides additional information needed to assess their potential costs and benefits.

A. Legal Requirements

Government Code §§11346.2, 11346.3, and 11346.5 require state agencies to assess the potential adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. In addition to providing estimates of the dollar amounts of costs and savings associated with complying with the regulatory proposal, the assessment must assess whether and to what extent the regulatory proposal will affect:

- The creation or elimination of jobs within the state;
- The creation of new businesses or the elimination of existing businesses within the state;
- The expansion of businesses currently doing business within the state;
- The benefits of the regulation to the health and welfare of California residents, worker safety, and the state's environment.

State agencies are also required to estimate the cost of savings of any state or local agency and school districts in accordance with instructions adopted by the Department of Finance. This estimate is to include any nondiscretionary costs or savings to local agencies and the costs or savings in federal funding to the state.

Health and Safety Code § 57005 requires CARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major rule. A major rule is defined as a rule that will have a potential cost to California business enterprises in an amount exceeding ten million dollars in any single year. The proposed regulations do not exceed this threshold. Therefore, this proposal is not a major regulation as defined by Health and Safety Code § 57005. Nonetheless, a review of potential costs of the alternatives is provided in Appendix H because the costs affected CARB staff's selection of a preferred option. Attendees of the May 2018 public workshop and earlier workshops and meetings did not propose any alternatives to those that CARB staff identified. (See Chapter XI for a description of the public workshops.)

B. Lifetime of Proposed Regulatory Amendments

CARB staff must estimate the lifetime of the proposed regulatory amendments to be able to estimate the total costs and cost-savings associated with their implementation.

CARB staff anticipates the lifetime of the proposed regulatory amendments to extend eleven years, from 2020 through 2030. This 11-year lifetime was selected to encompass potential impacts of the proposed amendments through the likely timeframe of amendments to the regulation. This lifetime is based on two assumptions:

- Start Date. The start date will be the amendment effective date, which is the date that CARB adopts the proposed amendments, which is expected to be before the end of 2019.
- End Date. The end date is based on the assumption that the Phase II vapor recovery regulations and associated requirements for gas station ISD systems and vapor recovery nozzles are in place until no longer needed on a widespread basis. CARB staff estimated 2030 as a potential end date based on several state goals, regulations, and predictions that indicate there may be a substantial reduction in the amount of gasoline dispensed in California and associated GDF emissions by 2030. CARB staff expects to evaluate the Phase II vapor recovery regulations during the mid-2020s after assessment of the progress towards these goals and predictions:
    - In his January 2015 inaugural address, Governor Brown identified six key climate change strategy "pillars" for furthering the vision of California's Global Warming Solutions Act (Assembly Bill 32) and meeting the 2030 greenhouse gas (GHG) emissions target. One of the pillars includes reducing petroleum use in cars and trucks by up to 50 percent (CARB, 2016a).
    - CARB's zero-emission vehicle (ZEV) regulations require that 22 percent of new cars sold in California by 2025 be plug-in electric or fuel cell vehicles (CCR § 1962.2(b)(1)(A)). State agencies are pursuing nearly 200 actions to support the electric car market, as identified in the Governor's 2016

ZEV Action Plan (GIWG-ZEV, 2016). CARB's *Midterm Review of Advanced Clean Cars Program* report's evaluation of the California passenger vehicle market and current zero-emission vehicle technology found that the GHG emission standards currently in place for light-duty vehicle model years 2022-2025 are readily feasible at or below the costs estimated in 2012, when the regulations were adopted (CARB, 2017e).

- CARB staff estimates that by 2030 approximately 95 percent of gasoline sold in California will be dispensed to vehicles equipped with an on board refueling vapor recovery system (ORVR) [CARB, 2013b, Table I-2]. At that time, CARB may consider selectively decommissioning certain aspects such as vapor collection by the Phase II vapor recovery systems at certain gas stations in areas where emissions do not pose unacceptable health risks. However, any decommissioning of Phase II vapor recovery systems would likely include a rule that would require the installation of ECO nozzles and conventional low permeation hoses.

Some aspects of the implementation of the proposed regulatory amendments may begin on a voluntary basis before OAL approves the proposed amendments. The following sections and Appendix H identify these cases.

C. Description of Businesses

1. Number and Description of Potentially Affected Businesses

As described in the following sections, CARB staff determined the number of businesses potentially affected by the proposed amendments (5,311) based on the number of nozzle manufacturers (6) and the number of statewide GDFs with assist vapor recovery systems (5,305).

Nozzle Manufacturers

The proposed amendments directly affect nozzle manufacturers. There are currently six manufacturers that either produce vapor recovery (balance and assist) nozzles already certified by CARB for sale in California, submitted applications for nozzle certification, or indicated to CARB staff that they are considering developing nozzles. These include VST, Emco Wheaton Retail, Franklin Fueling Systems, OPW Retail Fueling, Husky Fueling Products, and Veeder-Root (Catlow) (NAICS codes 333914, 335312 and 339999). Of these, five manufacturers currently produce certified nozzles or have submitted nozzle prototypes for certification. None is based in California though they have sales offices in California or other western states.

Nozzle manufacturers may have a small increase in initial nozzle certification costs and certification renewal costs associated with the additional time needed for CARB certification staff to evaluate compliance with an increased number of nozzle dimensions, from three dimensions to 19 dimensions for assist and balance vapor

recovery nozzles, and 16 dimensions for ECO nozzles. Please refer to section D in this chapter for a summary of cost calculations, information sources, and assumptions.

Gasoline Dispensing Facilities

The proposed amendments have direct benefits (cost-savings) for gas dispensing facilities (NAICS codes 447110, 447190, 424720) with assist systems and In-Station Diagnostic (ISD) systems that have experienced frequent ISD overpressure alarms. Based on field study results where use of the EOR nozzle reduced the ISD overpressure alarm frequency at five of the six (80 percent) study sites (see Chapter II), CARB staff predicts that about 80 percent of these GDFs will experience substantially fewer overpressure alarms once they install an improved assist nozzle. Because some GDF operators pay authorized service providers to respond to every ISD overpressure alarm, rather than self-clear the alarms, reducing the number of overpressure alarms will result in reduced GDF operating costs. The next two sections, C.2 and C.3, describe the GDF size categories and how many may experience an economic benefit from implementation of the improved assist EOR nozzle. Section E and Table 5 summarize the information sources and calculations CARB staff used to predict how many GDFs may experience an economic benefit.

The proposed amendments also have an indirect effect on GDFs with assist systems that may not experience a direct economic benefit from installation of improved assist nozzles. About 5,305 GDFs throughout California have assist systems. Table 5 summarizes the information sources and calculations CARB staff used to estimate the total statewide number of GDFs with assist systems. The proposed amendments require all GDFs with assist systems to replace the old version of the Healy Model 900 that does not have the improved EOR spout assembly. However, this proposed requirement has no cost impact for two reasons. First, Franklin Fueling Systems, the manufacturer of the Healy assist nozzle, no longer manufactures nor distributes the old model, and CARB staff's survey of parts distributors and service contractors indicates their stock of the old model nozzle will be depleted by the end of 2018 (before the proposed amendments would become effective) [CARB, 2018a]. Second, the proposed amendments provide an exception that allows GDF operators to use the old model nozzles until the end of their useful life, even if the useful life extends beyond four years. State law (Health and Safety Code § 41954.1) and CARB certification procedures CP-201 and CP-206 currently specify that vapor recovery systems installed before the effective or operative date of additional or amended standards may remain in use for the remainder of their useful life or for up to four years after the effective date of the new standard, whichever is shorter.

2. Percentage of Small, Mid-Sized, and Large Businesses

For the purpose of undertaking an economic impact assessment, Government Code § 11346.3, subdivision (a)(4)(B), defines a small business as a business that is all of the following:

(i) Independently owned and operated.
(ii) Not dominant in its field of operation.
(iii) Has fewer than 100 employees.

Company profile information available for the six nozzle manufacturers indicates none of them meets the definition of small business and none is based in California.

CARB staff estimated that about 86 percent of California GDFs with assist systems are small businesses, about 10 percent are mid-sized businesses, and about 4 percent are large businesses based on the following:

- Large businesses: For the purpose of this economic impact assessment, CARB staff defines large businesses as major oil companies and "hypermarkets."
    - When a GDF displays a particular major oil company's brand, it does not mean that the company owns or operates the GDF. Most branded GDFs are owned and operated by independent retailers licensed to represent that brand. Nationwide industry surveys indicate major oil companies such as Chevron, ExxonMobil, Shell, BP, and ConocoPhillips have been exiting the retail business to focus more on resource production and refining operations and own less than 1 percent of GDFs nationwide [API, 2017; NACS, 2018; CEC, 2017b]. Based on this information, CARB staff assumes major oil companies own and operate about 1 percent of California GDFs.
    - Conversely, nationwide industry surveys indicate the number of hypermarkets has been increasing. Hypermarkets are big-box grocery stores and mass merchandising stores such as Costco, Sam's Club, Walmart, and Safeway/Vons. These sites accounted for an estimated 14.5 percent of gasoline purchased in the United States in 2016 and have sales volumes roughly double that of traditional retailers [NACS, 2018]. CARB staff estimates about 4 percent of retail GDFs in California are owned by hypermarkets (those that dispense ≥600,000 gallons/month) based on a 2013/14 CARB field survey of 396 GDFs selected to be representative of statewide GDFs [CARB, 2017d, Appendix 5]. In 2014, the California Energy Commission estimated that about 2 percent of GDFs in California dispense ≥600,000 gallons/month. Based on this information, CARB staff assumes about 3 percent of GDFs are hypermarkets.
- Mid-sized businesses: CARB staff defines mid-sized businesses as those independent businesses that own tens to hundreds of GDFs but are not major oil companies. Examples include G&M Oil Company, Au Energy, United Oil, and World Oil. CARB estimates these constitute about 10 percent of GDFs based on their field visits.
- Small businesses: By subtraction, small businesses own the majority—about 86 percent—of California GDFs. The following information supports this estimate:

- Nationwide surveys indicate more than 80 percent of GDFs are convenience stores, and about 60 percent of convenience stores are single-store operators [API, 2017; NACS, 2018].
- Census Bureau statistics indicate gas stations in California had on average eight employees between 2011 and 2015 [U.S. Census Bureau, 2018].

- Assumption: CARB staff assumes that nationwide and statewide trends for GDF ownership apply to the percentage of GDFs with assist systems and ISDs.

3. Number of Businesses That May Experience Cost-Savings

Installation of the improved assist EOR nozzle will have direct benefits (cost-savings) for gas dispensing facilities with assist systems and ISD systems that have experienced frequent ISD overpressure alarms. CARB field studies indicate about 70 percent of GDFs with assist systems and ISD experience on average about two alarms per month during the winter season [CARB, 2017d], and about 80 percent of these GDFs will experience on average a 45 percent reduction in alarm frequency once they install an improved assist nozzle [CARB, 2018b, Table VI-4].

To provide relief from the cost of responding to ISD overpressure alarms when no equipment failure is found, CARB Advisory 405-D [CARB, 2016b] currently allows GDF operators to "self-clear" wintertime ISD overpressure alarms. However, many operators still require an authorized service provider (ASP) response to these alarms, which results in additional expense. Because some GDF operators pay ASPs to respond to every ISD overpressure alarm, rather than self-clear the alarms, reducing the number of overpressure alarms will result in reduced GDF operating costs.

CARB staff's field experience indicates:

- All GDFs owned by large businesses require ASPs to respond to ISD overpressure alarms. As noted in earlier in section A.3.b, staff estimates that large businesses own about 4 percent of statewide GDFs. Consequently, if about 4 percent of all GDFs with assist systems and ISD are owned by large businesses, then 4 percent will experience cost savings when they implement improved assist nozzles.
- About half of GDFs owned by mid-sized businesses require ASPs to respond to ISD overpressure alarms. Consequently, if about 10 percent of all GDFs with assist systems and ISD are owned by mid-sized businesses, then 5 percent will experience cost savings when they implement improved assist nozzles.
- Many small businesses self-clear the ISD overpressure alarms. Consequently, staff assumes only about a tenth of the GDFs with assist systems and ISD that are owned by small businesses (about 5% of all California GDFs) will experience a cost saving when they implement improved assist nozzles.

D. Compliance Costs

No cost increases are anticipated for any California-based businesses. As noted earlier, nozzle manufacturers—all of which are based out of state—may have a small increase in initial nozzle certification costs and certification renewal costs associated with the additional time needed for CARB certification staff to evaluate compliance with an increased number of nozzle dimensions and to prepare certification documents. Health and Safety Code § 41954(e) states that CARB shall charge a reasonable fee for certification not to exceed the actual cost. CARB certification evaluation costs, including any cost increases resulting from amended or new standards and specifications such as those proposed for nozzle dimensions, are invoiced to and paid by the nozzle manufacturers seeking CARB certification to sell their products in California. The fee revenue is deposited into the Air Pollution Control Fund/Vapor Recovery, which reimburses the cost of CARB staff's billable time.

Table 4 provides a summary of cost calculations, information sources, and assumptions. Based on CARB staff's review of the historical frequency of certification applications and conversations with nozzle manufacturers, eight nozzles are anticipated to go through the certification process during the lifetime of the proposed amendments. CARB staff estimated a total cost of about $17,100 for re-certifying the three currently certified balance and assist vapor recovery nozzles that are still sold in California,[9] and the three ECO nozzles that might be certified before the effective date of the proposed amendments. CARB staff estimated a total potential cost of $2,280 for incorporating additional dimensions in the review of these six nozzles when nozzle manufacturers apply for certification renewal. The combined costs for re-certification and certification renewal equate to an additional cost of about $3,230 per nozzle. CARB staff estimated a total potential cost of about $1,140 for incorporating additional dimensions in the review of potential future prototype nozzles when nozzle manufacturers apply for initial certification and certification renewal. These costs sum to about $20,520 over the 11-year lifetime of the proposed regulations.

CARB staff contacted design engineers at the five nozzle manufacturers that currently produce CARB-certified nozzles or have submitted certification applications for prototype nozzles. They said they already incorporate the proposed nozzle spout and bellows dimensions in their design specifications review process and therefore would not have any increase in development process costs.

If nozzle manufacturers were to pass on any certification cost increases along with an estimated 20 percent markup, this would result in up to $24,624 ($20,520 x 1.2) in costs to California businesses over the 11-year lifetime of the proposed regulations. This

[9] Two balance nozzles (VST-EVR-NB (G2) and Emco Model A4005-EVR) and one assist nozzle (Healy Model 900 with the improved EOR spout assembly) are sold in California. VST no longer sells the Model EVR-NBBK nozzle in California, and Franklin Fueling Systems discontinued manufacturing the version of the Healy Model 900 without the EOR spout assembly.

could result in approximately $5 in additional cost per impacted California business ($24,624 ÷ 5,305 impacted GDFs) over 11 years, which is considered to be negligible.

E. Cost-Savings

As noted earlier in this chapter, statewide implementation of the assist EOR nozzle will have direct benefits (cost-savings) for GDFs with assist systems that have experienced frequent ISD overpressure alarms, particularly those that require ASPs to respond to every ISD overpressure alarm, rather than self-clear the alarms.

Table 5 provides a summary of cost-savings calculations, information sources, and assumptions. CARB staff estimated an annual cost savings of about $962 per facility, for those facilities that require ASPs to respond to ISD overpressure alarms and replace their old assist nozzles with nozzles that comply with the proposed dimensions. The cost-savings sum to about $3.47 million in cost-savings over the 11-year lifetime of the proposed regulations, with about $1.24 million for small businesses and $2.23 million for mid-sized and large businesses. GDFs with assist systems owned by small businesses that pay ASPs to respond to every ISD overpressure alarm, rather than self-clear the alarms, are expected to have on average the same cost-savings, per facility, as larger businesses.

F. Health and Welfare of California Residents, Worker Safety, and the State's Environment

Government Code §11346.3(b)(1) requires state agencies to assess the benefits of proposed regulations to the health and welfare of California residents, worker safety, and the state's environment. Staff expects the proposed regulations will result in preserving a statewide ROG emissions reduction of approximately 3,300 tons, and cost savings of approximately $3.47 million for GDF owners, through 2030.

ROG emissions can lead to increased health risk through two primary mechanisms. First, ROG emission lead to the formation of ground level ozone, which can cause adverse health effects, particularly in children and individuals with respiratory conditions. Second, gasoline vapors contain benzene, which is a toxic air contaminant and known carcinogen. Maintaining ROG emission reductions will benefit the health and welfare of California residents by reducing ambient ground level ozone and benzene exposure.

Although the regulation will not directly affect worker safety, workers at GDFs with assist vapor recovery systems may experience reduced occupational exposure to benzene at GDFs after the improved nozzles are installed.

Reducing ROG ambient ground level ozone also helps to reduce smog, which is a benefit for the state's environment.

Table 4: Cost Estimates

Calculations and assumptions for estimating potential increases in initial nozzle certification costs and certification renewal costs associated with the additional time needed for CARB certification staff to evaluate compliance with an increased number of nozzle dimensions^

Description	
One-time cost: CARB certification staff time needed to amend Executive Orders to re-certify three currently certified nozzles still sold in California (1 assist nozzle and 2 balance nozzles [(a)]), and three ECO nozzles that might be certified before the effective date of the proposed nozzle dimension requirements (assumes all six nozzles will be re-certified in 2020). = 30 hours/nozzle x 6 nozzles x $95/hour	$17,100
Potential ongoing cost: CARB certification staff time needed to incorporate additional dimensions in four-year certification renewal process for six nozzles (assumes three vapor recovery nozzles and three ECO nozzles will have two certification renewals each before 2030, e.g., in 2024 and 2028) = 2 hours/nozzle x 6 nozzles x $95/hour x 2 renewals/nozzle	$2,280
Total cost estimated per nozzle for (a) three currently-sold vapor recovery nozzles and (b) three ECO nozzles that might be certified before the proposed nozzle dimension requirements become effective = ($17,100 + $2,280) ÷ 6	**$3,230**
Potential ongoing cost: CARB certification staff time needed to incorporate additional dimensions in certification application process, and four-year certification renewal process, for future prototype nozzles (assumes there might be two new nozzle prototypes submitted for certification review by the end of 2022, and two renewals each, in 2026 and 2030) = 2 hours/nozzle x 2 nozzles x $95/hour x 3 (1 certification + 2 renewals)	$1,140
Total cost for 11 years (2020-2030) = $17,100 + $2,280 + $1,140	**$20,520**
Total cost for FY2019/2020: Assumes three vapor recovery nozzles and three ECO nozzles will be re-certified = 30 hours/nozzle x 6 nozzles x $95/hour	$17,100
Total cost for FY2020/2021: Assumes one new nozzle prototype will be certified = 2 hours/nozzle x 1 nozzle x $95/hour	$190
Total cost for FY2021/2022: Assumes one new nozzle prototype will be certified = 2 hours/nozzle x 1 nozzle x $95/hour	$190
Total cost for first 3 years (through FY 2021/2022)	**$17,480**

^ CARB certification evaluation costs, including any cost increases resulting from amended or new standards and specifications such as those proposed for nozzle dimensions, are billed to the nozzle manufacturers seeking CARB certification to sell their products in California.

Table 5: Cost-Savings Estimates

Information Sources, Calculations and Assumptions for Estimating How Many GDFs May Experience an Economic Benefit and Potential Cost-Savings from Implementation of Improved Assist Vapor Recovery Nozzles

Description [Reference [(a)]]	
Estimated # of retail GDFs statewide in 2016 [CEC, 2017a & 2018]	10,202
% of retail GDFs statewide with assist systems in 2018 [see Appendix I]	52%
Estimated # of retail GDFs statewide with assist systems in 2018 = 10,202 x 52%	5,305
% of retail GDFs statewide with both assist systems and ISD in 2018 [ISOR Appendix I]	39%
Estimated # of retail GDFs statewide with assist systems and ISD in 2018 = 10,202 x 39%	3,979
Estimated % of GDFs with assist/ISD that have overpressure alarms [CARB, 2017d, Figure V-1]	71%
Estimated # of GDFs with assist/ISD that have overpressure alarms = 3,979 x 71%	2,825
Average # of OP alarms per winter month at GDFs with assist/ISD [CARB, 2017d]	2.0
Average # of OP alarms per winter season at GDFs with assist/ISD = 4 months x 2.0 alarms/winter month	8.0
% of GDF study sites with assist/ISD that experienced a reduction in OP alarms after EOR nozzle installation [CARB, 2018b, Table VI-4]	83%
Estimated # of GDFs with assist/ISD predicted to have a reduction in OP alarms after installing improved nozzles = 2,825 x 83%	2,345
Average % reduction in OP alarms after EOR nozzle implementation at the GDF study sites with assist/ISD that experienced a reduction [CARB, 2018b, Table VI-4]	46%
Predicted reduction in average # of OP alarms per year at GDFs with assist/ISD after installing improved nozzles = 8 alarms/year x 46% reduction	3.7
% of GDFs with assist/ISD owned by large (4%) and mid-sized (5%) businesses predicted to have a reduction in OP alarm response costs after installing improved assist nozzles [see explanation in sections VIII.C.2 and VIII.C.3 of this report]	9%
Estimated # of GDFs with assist/ISD owned by large (4%) and mid-sized (5%) businesses predicted to have a reduction in OP alarm response costs after installing improved assist nozzles = 2,345 x 9%	211

Table 5: Cost-Savings Estimates, *continued*

Information Sources, Calculations and Assumptions for Estimating How Many GDFs May Experience an Economic Benefit and Potential Cost-Savings

Description [Reference [(a)]]	
% of GDFs with assist/ISD owned by small businesses predicted to have a reduction in OP alarm response costs after installing improved nozzles	5%
Estimated # of GDFs with assist/ISD owned by small businesses predicted to have a reduction in OP alarm response costs after installing improved nozzles = 2,345 x 5%	117
Average cost of ASP service call assuming 1 hour onsite, 1.5 hour travel-time for 60 miles round trip, $85/hour and $0.75/mile [cost estimates based on information provided by 16 service contractors; CARB, 2018a] = (2.5 hours x $85/hour) + (60 miles x $0.75/mile) = $257.50, rounded to $260	$260
Annual cost savings per facility = $260 (cost per alarm response) x 3.7 (predicted reduction in average # of OP alarms)	**$962**
Annual cost savings statewide for small businesses = $962 x 117 GDFs owned by small businesses	$112,554
Cost savings over 11 years (2020 to 2030) for small businesses	$1,238,094
Annual cost savings statewide for mid-sized and large businesses = $962 x 211 GDFs owned by mid/large businesses	$202,982
Cost savings over 11 years (2020 to 2030) for mid-sized and large businesses	$2,232,802
Annual cost savings statewide = $962 x 328 GDFs	**$315,536**
Cost savings over 11 years (2020 to 2030) [(b)]	**$3,470,896**

(a) Full citations for each reference are provided in Chapter XIII References.

(b) The 11-year cost-savings estimate assumes that the full amount of the predicted annual savings will begin in 2020 based on the following assumptions and findings:

- Assumption: GDFs with assist systems that pay authorized service providers (ASPs) to respond to frequent ISD overpressure alarms will be among the first to install the improved Healy assist nozzle that includes the EOR spout assembly in order to reduce their response costs as soon as possible.
- Assumption: The improved Healy assist nozzle that includes the EOR spout assembly will be the only model available for sale in California by the end of 2018. This assumption is based on the following findings described earlier in section VIII.B:
  - o In December 2017, FFS ceased its distribution of the Healy nozzle that does not have the EOR spout assembly.
  - o CARB staff's recent survey of 7 parts distributors and 19 service contractors indicates that most no longer carry the old model, and those that do will deplete their inventory by the end of 2018 or sooner.

G. Potential Private Sector Cost Impacts and Benefits

1. Potential Costs and Benefits to a Small Business

No direct cost impacts were identified for GDFs throughout California, more than 80 percent of which are likely to be small businesses (see section VIII.C). Cost impacts were identified for nozzle manufacturers, but company profile information available for the five nozzle manufacturers active[10] in California indicates none meets the definition of small business and none is based in California. It is possible manufacturers could pass on $20,520 in certification cost increases to GDFs in California. (See section VIII.D for a description of certification cost estimates.) If nozzle manufacturers were to pass on all costs along with an estimated 20 percent markup, this would result in $24,624 ($20,520 x 1.2) in costs to California businesses over the 11-year lifetime of the regulation. This could result in approximately $5 in additional cost per impacted California small business ($24,624 ÷ 5,305 impacted GDFs) over the 11-year lifetime, which is considered to be negligible.

GDFs owned by small businesses that pay ASPs to respond to every ISD overpressure alarm, rather than self-clear the alarms, are expected to have cost-savings of about $962 per year per GDF with implementation of the improved assist EOR nozzle. CARB staff estimates there are more than 100 GDFs that are owned by small businesses predicted to have this cost-savings (see Table 5). The cost-savings sum to about $1.24 million over the 11-year lifetime of the proposed regulations for small businesses. The proposed amendments would ensure that such cost savings are preserved by preventing the introduction of nozzle designs with dimensions known to increase air ingestion and ISD alarm frequency.

2. Potential Costs and Benefits to a Typical Business

No direct cost increases are anticipated for any California-based businesses, including GDFs owned by small and mid-sized businesses, which make up more than 80% of the California retail fuel market. In addition, no direct cost increases are anticipated for gas station parts distributors and service contractors.

Nozzle manufacturers, all of which are based out of state, may have small increases in initial nozzle certification costs and certification renewal costs associated with the additional time needed for CARB certification staff to evaluate compliance with an increased number of nozzle dimensions. CARB staff estimated a total cost of about $17,100 for re-certifying the three currently certified balance and assist vapor recovery nozzles that are still sold in California and the three ECO nozzles that might be certified before the effective date of the proposed amendments. CARB staff estimated a potential cost of $3,420 for incorporating additional dimensions in certification renewal review for these six nozzles, and certification application and renewal reviews for

[10] These include the five nozzle manufacturers that currently produce CARB-certified nozzles or have submitted certification applications for prototype nozzles.

potential future prototype nozzles. (This includes the ECO nozzles currently being tested or under review.) These costs sum to about $20,520 over the 11-year lifetime of the proposed regulations. This estimated cost is negligible over 11 years and CARB staff assumes nozzle manufacturers will absorb this cost without any increase to nozzle prices for their customers (GDFs, parts distributors and service contractors). Also, nozzle manufacturers already incorporate the proposed nozzle spout and bellows dimensions in their design specifications review process and therefore would not have any increase in development and certification process costs to pass on to their customers.

If nozzle manufacturers were to pass on the increase in certification costs along with an estimated 20 percent markup, this would result in $24,624 ($20,520 x 1.2) in costs to California businesses over the 11-year lifetime of the proposed regulations. This could result in approximately $5 in additional cost per impacted California business ($24,624 ÷ 5,305 impacted GDFs) over 11 years, which is considered to be negligible.

GDFs that pay ASPs to respond to every ISD overpressure alarm, rather than self-clear the alarms, are expected to have cost-savings of about $962 per year per GDF with implementation of the improved assist EOR nozzle (see section E and Table 5).

3. Potential Costs and Benefits to Individuals

No direct costs or benefits are anticipated for individuals (i.e., non-businesses). In addition, no indirect or induced costs or benefits for individuals, such as costs or savings being passed on to consumers, are anticipated. Cost-savings are anticipated for GDFs; consequently, no cost increases are expected to be passed to GDF customers. At the same time, the cost-savings for each GDF are likely to be relatively small, about $962 per year per GDF; consequently, CARB staff does not anticipate a noticeable reduction in the price of gasoline at the pump for customers.

Also, nozzle manufacturers already incorporate the proposed nozzle spout and bellows dimensions in their design specifications review process and therefore would not have any increase in development and certification process costs to pass on to their customers. The small estimated increase in CARB certification process costs is negligible over 11 years and CARB staff assumes nozzle manufacturers will absorb this cost without any increase to nozzle prices for their customers (GDFs, parts distributors and service contractors). As described in earlier sections, even if nozzle manufacturers were to pass on the increase in certification costs along with an estimated 20 percent markup, this would result in a negligible cost increase to GDF owners of about $5 over 11 years.

4. Potential Impact on Jobs, Business Competitiveness, and Business Creation, Elimination, or Expansion

No creation or elimination of jobs within California is expected from implementation of the proposed regulatory amendments because:

- The potential certification cost increase predicted for nozzle manufacturers is too small to affect the number and salary of employees (~$3,230 per nozzle manufacturer, for one-time certification cost and two renewals); and
- The potential cost to GDF owners if the nozzle manufacturers were to pass on the certification cost increase, about $5 per GDF over 11 years, is too small to affect the number and salary of employees.

The proposed regulatory amendments are not expected to result in the creation, elimination, or expansion of nozzle manufacturers, GDFs or other business in California for the same reasons. Similarly, the proposed amendments are expected to have no noticeable effect on the ability of California businesses to compete with businesses in other states.

H. Fiscal Impact to State and Local Agencies

No fiscal impacts to state and local agencies are anticipated. As described earlier in section D, the proposed regulatory amendments could entail additional CARB certification staff time and associated cost (~$17,480 in 2020-2022 and ~$20,520 over the 11-year project lifetime) to evaluate additional dimensions during each nozzle certification process. Health and Safety Code § 41954(e) states that CARB shall charge a reasonable fee for certification not to exceed the actual cost. However, all certification costs are invoiced to and paid by the nozzle manufacturers. The fee that is paid is deposited into the Air Pollution Control Fund/Vapor Recovery, which reimburses the cost of CARB staff's billable time. Consequently, there is no cost increase to the State, but only nozzle certification invoice revenue from the nozzle manufacturers collected by CARB. Further, the estimated increase in labor and cost is negligible and absorbable and will not affect the number of CARB certification staff positions needed to complete anticipated certification reviews. No additional CARB staff will need to be hired to implement the proposed amendments.

IX. EVALUATION OF REGULATORY ALTERNATIVES

Government Code § 11346.2, subdivision (b)(4) requires CARB to consider and evaluate reasonable alternatives to the proposed regulatory action and provide reasons for rejecting those alternatives. This chapter describes alternatives evaluated and provides reasons why these alternatives were not included in the proposal. As explained below, no alternative proposed was found to be less burdensome and equally effective in achieving the purposes of the regulation in a manner that ensures full compliance with the authorizing law. The Board has not identified any reasonable alternatives that would lessen any adverse impact on small business. Attendees of the May 2018 public workshop and earlier workshops and meetings did not propose any alternatives to those that CARB staff identified. (See Chapter XI for a description of the public workshops.)

Alternative 1: Do Not Change Existing Nozzle Dimensional Specifications

Staff considered not adopting any new dimension specifications for EVR and ECO nozzles (i.e., the "no action alternative"). This alternative would permit future nozzle manufacturers to design and sell nozzles with dimensions known to form a poor latch with some vehicles' fill pipes at GDFs with assist systems, which results in excess air ingestion at the nozzle, which in turn contributes to overpressure conditions in GDF storage tanks and associated emissions. In addition, this alternative would not support vehicle manufacturer efforts to effectively design compatible fill pipes. This compatibility is necessary to further reduce air ingestion at the nozzle and make it easier for many customers to fuel their vehicles. CARB staff rejected this alternative because it is not as effective as the proposed rule in maintaining emission reductions anticipated from implementation of the improved assist EOR nozzle, and could result in more public exposure to air pollutants. In addition, while this alternative would avoid potential increases in certification costs for nozzle manufacturers, it would not preserve cost savings and emission reductions anticipated for GDF owners through implementation of the improved assist EOR nozzle.

Alternative 2: Require Installation of EOR Spout Assembly within Four Years of Amendment Effective Date

Health and Safety Code § 41956.1 and CARB certification procedures CP-201 and CP-206 currently specify that vapor recovery systems installed before the effective or operative date of additional or amended standards may remain in use for the remainder of their useful life or for up to four years after the effective date of the new standard, whichever is shorter. CARB staff's proposed regulatory amendments include an exception to this requirement that would allow existing GDFs to continue to use their nozzles until the end of the useful nozzle life, even if the period of usefulness extends beyond four years. As an alternative, staff considered not including this exception. This alternative would require GDFs with assist systems to replace any remaining non-EOR

assist nozzles within four years of the effective date of the proposed amendments, the earliest date provided. As described in Appendix H, this alternative would require about 10 percent of assist nozzles throughout the state to be replaced one to three years earlier than expected based on the typical life span of assist nozzles. Such an implementation schedule would more quickly accomplish the 2.85 TPD wintertime emission reduction anticipated for full implementation of the EOR nozzles, by the end of 2023 rather than 2026, and result in total emission reductions through 2030 that are about five percent (316,000 pounds) greater than the proposed amendments (Appendix H, Tables H-1 and H-2). However, CARB staff rejected this alternative because of the economic burden it would place on GDFs, most of which are small businesses.

Alternative 3: Delay the Adoption of New Nozzle Dimensional Specifications

Staff considered delaying the proposed regulatory amendments until the full menu of overpressure solutions is available. This alternative would delay by about a year the nominal cost of nozzle manufacturers and CARB certification staff assessing additional dimensions for prototype nozzles as part of the CARB certification process. At the same time, this alternative would increase uncertainty for nozzle and fill pipe manufacturers in the early stages of designing new products. Consequently, CARB staff rejected this alternative.

Alternative 4: Reduce the Number of New Nozzle Dimensional Specifications

Staff considered proposing fewer new nozzle dimensions. This alternative would result in very small cost savings to nozzle manufacturers by reducing the number of dimensions for prototype nozzles that need to be assessed as part of the CARB certification process. However, this alternative would counter the findings of nozzle and fill pipe manufacturers and others who participated in the SAE Task Force who endeavored to identify nozzle and fill pipe specifications that would improve their compatibility. As described in section II.A earlier in this report, the SAE Task Force considered multiple factors when determining appropriate dimensions, including ability to form a good seal between the nozzle and fill pipe, as well as compliance with other CARB regulations, customer effort needed for fueling vehicles, and likelihood of the nozzle becoming caught within the fill pipe pocket. Further, this alternative is counterintuitive, since all certified nozzles comply with the proposed requirements. CARB staff rejected this alternative because it is not as effective as the proposed rule in maintaining emission reductions and it would increase uncertainty for nozzle and fill pipe manufacturers.

Alternative 5: Adopt Nozzle Performance Standards only, without Prescriptive New Nozzle Dimensional Specifications

The proposal may be viewed as both a prescriptive and a performance standard. It prescribes nozzle dimensional standards as a range of values, therefore preserving to the manufacturers some design flexibility. Pursuant to Government Code § 11346.2(b)(4), staff considered the alternative of not specifying the prescriptive dimensional standards. However, specific dimensional standards are necessary to meet the regulation's stated goals and to address the overpressure problem. Nozzle dimensional standards will help ensure that future nozzles coming to the market are shaped to optimally interface with vehicle fill pipes in order to reduce: gasoline spills, fresh air ingestion during fueling events, overpressure conditions in the gasoline storage tank, and excess hydrocarbon emissions. The proposed dimensional specifications have been developed after extensive discussions involving all interested stakeholders including nozzle manufacturers, therefore staff believes the proposed changes are necessary and will not be unnecessarily burdensome. This alternative was therefore rejected.

Health and Safety Code § 57005 Major Regulation Alternatives

Health and Safety Code § 57005 requires CARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major rule. A major rule is defined as a rule that will have a potential cost to California business enterprises of an amount exceeding ten million dollars in any single year. The proposed regulations will not result in a total economic impact on state businesses of more than $10 million in one or more years of implementation. Therefore, this proposal is not a major regulation as defined by Health and Safety Code § 57005.

X. JUSTIFICATION FOR ADOPTION OF REGULATIONS DIFFERENT FROM FEDERAL REGULATIONS

Government Code § 11346.2(b)(6) requires CARB to (a) describe its efforts to avoid unnecessary duplication and conflicts with federal regulations contained in the Code of Federal Regulations that address the same issues and (b) justify the adoption of any regulations that differ from existing federal regulations.

The three nozzle spout dimensions currently specified in CARB certification procedures CP-201, CP-206, and CP-207 are referenced in 40 CFR 80.22(f), where they are applied to nozzles that dispense unleaded gasoline. CARB staff proposes to refine these three dimensions as well as to include 16 additional dimensions for the:

- Shape and position of the EVR and ECO nozzles' spout and spout latch ring;
- Outside and inside diameter of the vapor collection bellows, face flatness, and contact angle, for EVR assist and balance nozzles; and

- Outside diameter of the insertion interlock device for ECO nozzles.

However, there are no federal programs comparable to California's EVR Program, and there are no federal regulations establishing dimension specifications for EVR and ECO nozzles, as would be required by the proposed regulatory amendments. California's existing EVR regulations already exceed federal requirements; as described in Chapter I of this document, such California-specific regulations include:

- ORVR compatibility and pressure management to control emissions lost from USTs through vent lines, vapor processor exhaust, and fugitive leak sources;
- In-Station Diagnostics requirements that help maintain in-use effectiveness;
- Stringent standards for specially designed nozzles, such as the ECO nozzle, that reduce emissions from liquid retention, drips, and spills; and
- Further emission reductions from low permeation fuel hose standards.

Further, the existing nozzle dimension specifications have not been updated since the 1970's, when the federal government and industry agreed to dimensions for nozzles that dispense unleaded gasoline (Federal Register, 1973). Evolving technologies, such as the proliferation of ORVR, and changes to fill pipe construction, such as capless fill pipes, warrants an update to the nozzle specifications to improve their compatibility with newer motor vehicle fill pipes. This compatibility is necessary to reduce air ingestion at the nozzle, which will help reduce pressure driven emissions caused by evaporation of gasoline within the GDF storage tank headspace. Unexpected pressure driven emissions causes by incompatible technologies have caused GDF vapor recovery systems not to achieve the performance standards and emission reductions anticipated when EVR regulations were adopted. As described in Chapter I of this report, California has critical need for reduction of smog-forming emissions such as ROG in gasoline vapors and exposure to air toxics such as benzene. The benefits of reducing ROG emissions and protecting public health by reducing benzene exposure justify the cost of adopting regulations that differ from existing federal regulations.

XI. PUBLIC PROCESS FOR DEVELOPMENT OF THE PROPOSED REGULATORY AMENDMENTS (PRE-REGULATORY INFORMATION)

Consistent with Government Code § 11346, subdivision (b), and § 11346.45, subdivision (a), and with the Board's long-standing practice, CARB staff held public workshops and had other meetings with interested persons during the development of the proposed regulatory amendments. These informal pre-rulemaking discussions provided staff with useful information that they considered during development of the regulatory amendments that are now being proposed for formal public comment.

Between 2012 and 2017, CARB staff held multiple public workshops in northern and southern California about GDF storage tank overpressure problems, study designs and results, and potential solutions:

- 2012 – October 31 (Sacramento), November 2 (Diamond Bar), and November 7 (Fresno): Early concepts for potential regulatory solutions
- 2013 – September 20 (Sacramento): Planning for statewide data collection project
- 2014 – March 7 (Sacramento) and March 14 (Diamond Bar): Results of statewide data collection project, preliminary emission impact
- 2015 – November 6 (Sacramento) and November 10 (Diamond Bar): Results of nozzle related field studies, plan for second statewide data collection project
- 2017 – December 12 (Diamond Bar) and December 13 (Sacramento): Results of second statewide data collection project, proposed menu of options, including potential changes to GDF nozzle and vehicle fill pipe specifications
- 2018 – May 23 (Diamond Bar): Specific proposed regulatory amendments to GDF nozzle and vehicle fill pipe specifications

A toll-free conference call number or webcast was available for every workshop for those who wished to attend remotely. These workshops engaged representatives from nozzle, fill pipe, and automotive manufacturers; GDF owners and operators; service contractors and consultants; petroleum refineries and distributors; Air Districts; Tribes; environmental consultants; farm bureaus; and air quality agencies from outsides of California.

Following each workshop and throughout the regulatory development process, staff worked extensively with stakeholders on the proposed amendments to the EVR regulations. Staff created a public webpage where related workshop materials and technical support documents were posted to keep stakeholders up to date on the latest developments in the regulatory process and distributed announcements and workshop materials through the CARB list serves that, based on individual subscribers to the list serves, reach more than 4,000 individuals. Staff sent out multiple emails providing announcements to upcoming workshops, a description of the proposed amendments, and contact information for relevant staff. Appendix K provides the notice for the most recent workshop in May 2018, which focused specifically on the proposed regulatory amendments to nozzle and vehicle fill pipe specifications, and the CARB staff email that notified stakeholders when a draft version of the proposed regulatory amendments to nozzle specifications were available for public review via the CARB website.

XII. THE SPECIFIC PURPOSE OF AND RATIONALE SUPPORTING EACH AMENDMENT

This chapter provides the specific purpose of each proposed amendment and the rationale for CARB staff's determination of why the proposed amendments are reasonably necessary to carry out the purpose of the provisions of law they are implementing and to address the problems described in Chapter II. Appendices A through E provide the full text of the proposed regulatory amendments.

A. California Code of Regulations Title 17, Division 3, Chapter 1, Subchapter 8, Article 1

This section provides a summary and rationale for proposed amendments to §§ 94011, 94016, 94017, and 94010, which incorporate by reference CARB's certification procedures CP-201, CP-206, and CP-207, and their supporting definitions in D-200, respectively. Appendix A provides the full proposed regulatory language of these sections.

§ 94010. Definitions

Summary and Purpose of § 94010 Amendment. Section 94010 incorporates by reference the definitions listed in D-200, *Definitions for Vapor Recovery Procedures*, which describe common terms and acronyms used in the certification and test procedures specified in §§ 94011, 94012, 94013, 94014, 94015, 94016, and 94017. The proposed amendment changes the last amended date of "November 9, 2015" to the proposed amendment date (likely to be in 2019).

Rationale for § 94010 Amendment. This change is necessary to incorporate by reference the new and expanded definitions proposed by CARB staff, which will provide necessary clarification for nozzle spout and bellows dimensions proposed for certification procedures 201, 206 and 207.

§ 94011. Certification of Vapor Recovery Systems of Dispensing Facilities

Summary and Purpose of § 94011 Amendment. Section 94011 incorporates by reference CARB's CP-201, *Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities*. The proposed amendment changes the last amended date of "November 9, 2015" to the proposed amendment date (likely to be in 2019).

Rationale for § 94011 Amendment. This change is necessary to incorporate by reference the new and expanded nozzle spout and bellows dimensions that CARB staff proposes for CP-201, which will provide standardization necessary to improve compatibility with newer motor vehicle fill pipes. This compatibility is necessary to reduce air ingestion at the nozzle, which will help reduce pressure driven emissions caused by evaporation of gasoline within the GDF storage tank headspace.

§ 94016. Certification of Vapor Recovery Systems at Gasoline Dispensing Facilities Using Aboveground Storage Tanks

Summary and Purpose of § 94016 Amendment. Section 94016 incorporates by reference CARB's CP-206, *Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities Using Aboveground Storage Tanks*. The proposed amendment changes the last amended date of "November 9, 2015" to the proposed amendment date (likely to be in 2019).

Rationale for § 94016 Amendment. This change is necessary to incorporate by reference the new and expanded nozzle spout and bellows dimensions that CARB staff proposes for CP-206, which will provide standardization necessary to improve compatibility with newer motor vehicle fill pipes. This compatibility is necessary to reduce air ingestion at the nozzle, which will help reduce pressure driven emissions caused by evaporation of gasoline within the GDF storage tank headspace.

§ 94017. Certification of Enhanced Conventional Nozzles and Low Permeation Hoses at Gasoline Dispensing Facilities

Summary and Purpose of § 94017 Amendment. Section 94017 incorporates by reference CARB's CP-207, *Certification Procedure for Enhanced Conventional (ECO) Nozzles and Low Permeation Conventional Hoses at Gasoline Dispensing Facilities*, which was adopted on November 9, 2015. The proposed amendment adds an amended date (likely to be in 2019).

Rationale for § 94017 Amendment. This change is necessary to incorporate by reference the new and expanded nozzle spout and insertion interlock dimensions that CARB staff proposes for CP-207, which will provide standardization necessary to improve compatibility with newer motor vehicle fill pipes.

B. CARB Certification Procedure 201 – Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities

The following is a summary of the specific regulatory amendments proposed for CP-201. The amendments are necessary to maintain compatibility between Phase II EVR nozzles and motor vehicle fill pipes. Appendix B provides the full proposed regulatory language of CP-201, shown in strike and add format.

§ 2. Performance Standards and Specifications

§ 2.4. Additional or Amended Performance Standards or Performance Specifications: § 2.4.8 and Table 2-1 Effective and Operative Dates for Phase I and Phase II Vapor Recovery Performance Standards and Specifications

Summary and Purpose of § 2.4.8 Amendment and Table 2-1 Amendment. Section 2 provides definitions of performance standards and specifications. Standards and

specifications are listed in Table 2.1 for reference, along with their associated effective and operative dates. Section 2.4 specifies the certification period for certified systems for which additional and amended standards and performance specifications are adopted. In particular, the first paragraph of § 2.4 specifies that "Systems installed before the operative date of additional or amended standards may remain in use for the remainder of their useful life or for up to four years after the effective date of the new standard, whichever is shorter, provided the requirements of section 19 are met."

The proposed amendment to Table 2-1 defines the effective and operative dates of the proposed dimensions as "Date when first nozzle type is certified." (The proposed dimensions are described later in § 4.7.3 and Table 4-2.) The proposed addition of the new § 2.4.8 provides an exception to the first paragraph of § 2.4. The proposed § 2.4.8 text explicitly specifies that existing GDFs that operate on or before the amendment date will not be required to replace their nozzles to comply with the new nozzle requirements until the end of the useful nozzle life. (See section XII.E of this report for a description of the proposed amendment to the definition "useful life" in D-200.) This proposed amendment—in combination with the proposed amendment to the definition of "useful life" in D-200—allows GDFs to use their existing nozzles longer than four (4) years so long as the nozzles can be maintained and operated per manufacturer's specifications and as certified by CARB regulations, standards, and specifications. This amendment specifies that all replacement nozzles must comply with the nozzle requirements (described later in § 4.7.3), which will be after the first nozzle type is certified by CARB as meeting the new dimensions.

Rationale for § 2.4.8 Amendment. The change to Table 2-1 is required for consistency with existing standards and specifications, and because it is necessary for all standards and specifications to have well-defined effective and operative dates to provide clarity for implementation and enforcement. The proposed § 2.4.8 is necessary to provide an exception to the general requirement that nozzles be replaced within four years with new nozzles that meet the new dimension requirements. This exception is necessary to address the concern that it is not cost effective to replace the Healy Model 900 nozzles without the EOR spout before the end of their useful life, which has the potential to extend beyond four years. (See Appendix J for information about the typical useful lifespan of Healy Model 900 nozzles, Chapters VIII and IX for reviews of cost estimates for different regulatory alternatives, and Appendix H for cost estimate calculation methods.)

§ 4. Phase II Performance Standards and Specifications Applicable to All Phase II Vapor Recovery Systems

Table 4-1. Phase II Performance Standards and Specifications Applicable to All Phase II Vapor Recovery Systems

Summary and Purpose of Table 4-1 Amendment. Section 4 contains the performance standards and specifications that Phase II EVR systems, including nozzles, are subject

to. Table 4-1 summarizes the performance standards and specifications, identifies the CP-201 subsections in § 4 that describes each, and identifies the relevant CARB test procedures for each. The proposed amendment to Table 4-1 adds the new spout dimensions as specifications (versus performance standards), identifies their location in § 4.7, and identifies the relevant testing method as "direct measurement."

Rationale for Table 4-1 Amendment. The change to Table 4-1 is required for consistency with existing standards and specifications, and because it is necessary for all standards and specifications to have testing methods identified to provide clarity for implementation and enforcement.

§ 4.7. Nozzle Criteria (global change)

Summary and Purpose of § 4.7 Amendments. Section 4.7 provides the performance standards and specifications required for Phase II EVR nozzles. The proposed amendments to § 4.7 change "vapor recovery nozzle" to "Phase II EVR nozzle" throughout this section.

Rationale for § 4.7 Amendment. This change is necessary for consistency with the new term and acronym proposed for D-200, "phase II enhanced vapor recovery (EVR) nozzle." (See section XII.E of this report for the proposed addition of this term to D-200.)

§ 4.7. Nozzle Criteria: §4.7.2

Summary and Purpose of § 4.7.2 Amendment. Section 4.7.2 provides the requirement that Phase II EVR nozzles shall be dripless, the definition of dripless, and the relevant testing method, *TP-201.2D Post-Fueling Drips from Nozzles*. The proposed amendment relocates the text, "A minimum of 10 nozzles must be tested for determination of post fueling drips," from § 4.7.5 to § 4.7.2. This amendment does not create a new requirement; this requirement is already included in TP-201.2D, and the same text was previously included as § 4.7.5.

Rationale for § 4.7.1 Amendment. This change is necessary to improve organization and clarity by grouping certification procedure language related to dripless requirements in one section.

§ 4.7. Nozzle Criteria: § 4.7.3

Summary and Purpose of § 4.7.3 Amendments. The proposed amendments to § 4.7.3 remove the text describing the existing dimension requirements and replaces it with a reference to the dimension requirements in proposed Table 4-2. The proposed Table 4-2 revises the definition of the three existing dimension requirements and adds 16 new dimensions for Phase II EVR nozzle spouts and bellows. The proposed Table 4-2 refers to the proposed Figures 4A and 4B to illustrate the dimensions. The purpose of these amendments is to standardize the dimensions of Phase II EVR nozzle spouts and bellows. As reviewed in detail in Chapters I and II of this report, this

standardization is designed to maintain the compatibility between nozzles and vehicle fill pipes, which is needed to more reliably achieve a secure latch, which in turn will reduce air ingestion at the nozzle and help reduce the frequency and severity of storage tank overpressure and associated emissions. In addition, improving compatibility between nozzles and fill pipes will make it easier for many customers to fuel their vehicles by reducing the effort needed to insert the nozzle in the fill pipe.

The proposed dimensions are the result of extensive deliberations of nozzle, vehicle, and fill pipe manufacturers who participated in the SAE Task Force. All the proposed dimensions have a range of values, rather than a single value, to increase flexibility and allow for innovation among nozzle manufacturers while at the same time providing the constraint needed for the fill pipe manufacturers. (See section II.B.1 of this report for additional information about the factors considered when determining appropriate ranges for the proposed dimensions.)

CARB staff proposes to replace the above amendments to § 4.7.3, including the table and figures, with a reference to the following document once it has completed the SAE approval process:

> Society of Automotive Engineers (SAE). Surface Vehicle Recommended Practice SAE J285: Dispenser Nozzle Spouts for Liquid Fuels Intended for Use with Spark Ignition and Compression Ignition Engines. [Update to be issued.]

The reference will cite the SAE J285 document sections specific to Phase II EVR nozzle spouts and bellows.

Rationale for § 4.7.3 Amendment. The proposed changes are necessary for improving compatibility between nozzles and fill pipes for multiple reasons. First, the standardization of nozzle spout and bellows dimensions is needed to support CARB staff's proposed vehicle regulation amendments, which is described in a separate staff report. Standardizing dimensions for nozzles will help the automotive industry to more effectively design fully compatible fill pipes for future vehicle models by narrowing their design envelope.

Second, the proposed amendments serve the purpose of codifying EVR and ECO nozzle spout and bellows dimensions that improve compatibility with vehicle fill pipes in case manufacturers consider developing additional nozzles in the future. As described in section II.B.2, the recently certified EOR spout assembly has dimensions that improve the seal between the Healy Model 900 assist nozzle and vehicle fill pipe during fueling events, which significantly reduces pressure increase while dispensing and associated emissions at GDFs that use vacuum assist vapor recovery systems. Because of these improvements, CARB staff proposes spout dimensions for EVR assist nozzles in Table 4-2 that incorporate the dimensions of the improved EOR spout assembly.

In addition, ultimately incorporating the proposed nozzle spout and bellows dimensions by referencing the updated SAE J285 document will enable the consolidation of dimension requirements in industry standards documents. This will reduce the effort needed for manufacturers to locate and compile CARB requirements along with other recommended practices.

C. CARB Certification Procedure 206 – Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities using Aboveground Storage Tanks

The following is a summary of the specific regulatory amendments proposed for CP-206. The amendments are necessary to maintain compatibility between Phase II EVR nozzles used at GDFs with aboveground storage tanks and motor vehicle fill pipes. Appendix C provides the full proposed regulatory language of CP-206, shown in strike and add format.

Most of the regulatory amendments proposed for CP-206 are identical to those proposed for CP-201, though the section numbers may be different. For completeness, all of the CP-206 sections with proposed amendments are listed in this section. For simplicity and consistency, the proposed CP-206 amendments that are identical to proposed CP-201 amendments are identified, and a hyperlinked reference to the earlier CP-201 section in this chapter is provided.

§ 2. Performance Standards and Specifications

§ 2. Table 2-1 Effective and Operative Dates for Standing Loss Control, Phase I, and Phase II Performance Standards

Summary and Purpose of Table 2-1 Amendment. Section 2 provides definitions of performance standards and specifications. Standards and specifications are listed in Table 2-1 for reference, along with their associated effective and operative dates. The proposed amendment to Table 2-1 defines the effective and operative dates of the proposed dimensions as “Date when first nozzle type is certified.” The proposed amendment to Table 2-1 is identical to the proposed amendment to CP-201 Table 2-1; please refer to section XII.B § 2.4 of this report for review.

Rationale for Table 2-1 Amendment. The change to Table 2-1 is required for the same reasons as the proposed change to CP-201 Table 2-1; please refer to section XII.B § 2.4 of this report for review.

§ 2.4.10 in § 2.4. Additional or Amended Performance Standards or Performance Specifications

Summary and Purpose of § 2.4.10 Amendment. Section 2.4 specifies the certification period for certified systems for which additional and amended standards and performance specifications are adopted. The proposed § 2.4.10 text explicitly specifies

that existing GDFs that operate on or before the amendment date will not be required to replace their nozzles to comply with the new nozzle requirements until the end of the useful nozzle life. The proposed addition of § 2.4.10 is identical to the proposed addition of § 2.4.8 in CP-201; please refer to section XII.B § 2.4 of this report for review.

Rationale for § 2.4.10 Amendment. The addition of § 2.4.10 to CP-206 is required for the same reasons as the proposed addition of § 2.4.8 to CP-201; please refer to section XII.B § 2.4 of this report for review.

§ 5. Phase II Performance Standards and Specifications Applicable to AST Phase II Vapor Recovery Systems

Table 5-1. Phase II Performance Standards and Specifications Applicable to AST Phase II Vapor Recovery Systems

Summary and Purpose of Table 5-1 Amendment. Section 5 contains the performance standards and specifications that AST Phase II EVR systems, including nozzles, are subject to. Table 5-1 summarizes the performance standards and specifications, identifies the CP-206 subsections in § 5 that describes each, and identifies the relevant CARB test procedures for each. The first proposed amendment to Table 5-1 adds the new spout dimensions as specifications (versus performance standards), identifies their location in § 5.7, and identifies the relevant testing method as "direct measurement." This proposed amendment to Table 5-1 is identical to the proposed amendment to CP-201 Table 4-1; please refer to section XII.B § 4 Table 4-1 of this report for review. The second proposed amendment to Table 5-1 changes the "Coaxial Hose Routing Configurations" references to Figures 5A, 5B, and 5C to Figures 5C, 5D, and 5E to accommodate the addition of two new figures (as reviewed later in this chapter).

Rationale for Table 5-1 Amendment. The first change to Table 5-1 is required for the same reasons as the proposed change to CP-201 Table 4-1; please refer to section XII.B § 4 Table 4-1 of this report for review. The second change is needed for figure numbering consistency.

§ 5.7. Nozzle Criteria (global change)

Summary and Purpose of § 5.7 Amendments. Section 5.7 provides the performance standards and specifications required for Phase II EVR nozzles. The proposed amendments to § 5.7 change "vapor recovery nozzle" to "Phase II EVR nozzle" throughout this section. The proposed global change to § 5.7 is identical to the proposed global change to § 4.7 in CP-201.

Rationale for § 5.7 Amendment. This change is necessary for consistency with the new term and acronym proposed for D-200, "phase II enhanced vapor recovery (EVR) nozzle." (See section XII.E of this report for the proposed addition of this term to D-200.)

§ 5.7. Nozzle Criteria: § 5.7.3

Summary and Purpose of § 5.7.3 Amendments. The proposed amendments to § 5.7.3 remove the text describing the existing dimension requirements and replaces it with a reference to the dimension requirements in proposed Table 5-2. The proposed Table 5-2 revises the definition of the three existing dimension requirements and adds 16 new dimensions for Phase II EVR nozzle spouts and bellows. The proposed Table 5-2 refers to the proposed Figures 5A and 5B to illustrate the dimensions. The purpose of these amendments is to standardize the dimensions of Phase II EVR nozzle spouts and bellows. These proposed amendments are identical to the proposed amendments to CP-201 § 4.7.3; please refer to section XII.B § 4.7.3 of this report for review.

CARB staff proposes to replace the above amendments to § 5.7.3, including the table and figures, with a reference to the before-mentioned SAE J285 document once it has completed the SAE approval process. The reference will cite the SAE J285 document sections specific to Phase II EVR nozzle spouts and bellows.

Rationale for § 5.7.3 Amendment. The proposed changes are necessary for maintaining compatibility between nozzles and fill pipes for multiple reasons. The changes to § 5.7.3 are required for the same reasons as the proposed changes to CP-201 § 4.7.3; please refer to section XII.B § 4.7.3 of this report for review.

In addition, ultimately incorporating the proposed nozzle spout and bellows dimensions by referencing the updated SAE J285 document will enable the consolidation of dimension requirements in industry standards documents. This will reduce the effort needed for manufacturers to locate and compile CARB requirements along with other recommended practices.

D. CARB Certification Procedure 207 – Certification Procedure for Enhanced Conventional (ECO) Nozzles and Low Permeation Hoses for Use at Gasoline Dispensing Facilities

The following is a summary of the specific regulatory amendments proposed for CP-207. The amendments are necessary to maintain compatibility between ECO nozzles and motor vehicle fill pipes. Appendix D provides the full proposed regulatory language of CP-207, shown in strike and add format.

Most of the regulatory amendments proposed for CP-207 are identical to those proposed for CP-201, though the section numbers may be different. For completeness, all of the CP-207 sections with proposed amendments are listed in this section. For simplicity and consistency, the proposed CP-207 amendments that are identical to proposed CP-201 amendments are identified, and a hyperlinked reference to the earlier CP-201 section in this chapter is provided.

§ 1. General Information, Applicability, and Other Regulatory Requirements

§ 1. Introductory Paragraph

Summary and Purpose of § 1 Amendment. Section 1 provides a general description of the purpose of CP-207 and the intended use of ECO nozzles. The proposed amendment adds new text, "to improve compatibility with fill pipe dimensional requirements and," that expands the scope of CP-207 from its previous focus on preventing excessive liquid gasoline spillage and hose permeation during refueling operations.

Rationale for § 1 Amendment. The proposed change is necessary to provide internal consistency with other proposed amendments for later sections in the certification procedure. This certification procedure was recently adopted in 2015 and has not yet had any amendments. Consequently, its introductory text is more focused in scope than CP-201 and CP-206.

§ 1.1. Applicability: §§ 1.1.1 and 1.1.2

Summary and Purpose of §§ 1.1.1 and 1.1.2 Amendments. These sections provide the effective dates of CP-207 performance standards. The proposed amendment deletes these sections; their contents are included later in a new Table 2-1.

Rationale for §§ 1.1.1 and 1.1.2 Amendments. Certification procedure CP-207 was recently adopted in 2015 and has not yet had any amendments. Consequently, it has a very simple structure that differs from CP-201 and CP-206. The proposed changes make the structure of CP-207 comparable to the structure of CP-201 and CP-206.

§ 2. Performance Standards and Specifications

§ 2.3. Additional or Amended Performance Standards or Performance Specifications

Summary and Purpose of § 2.3 Amendment. Section 2 provides definitions of performance standards and specifications. Section 2.3 specifies the certification period for certified systems for which additional and amended standards and performance specifications are adopted. The proposed amendments update the text in § 2.3 to include more detailed requirements for the certification period that are identical to those in CP-201, including a new table (Table 2-1) that lists standards and specifications for reference, along with their associated effective and operative dates, as is done in CP-201. The proposed new Table 2-1 also defines the effective and operative dates of the proposed dimensions as "Date when first ECO Nozzle meeting the spout and bellows dimensional specifications is certified," which is substantially the same as the proposed amendment to CP-201 Table 2-1; please refer to section XII.B § 2.4 of this report for review.

Rationale for § 2.3 Amendment. Certification procedure CP-207 was recently adopted in 2015 and has not yet had any amendments. Consequently, it has a simpler structure than CP-201 and CP-206. When it was developed, CARB intended that the certification process for ECO nozzles should be essentially the same as the process used for EVR systems [CARB, 2015, page 32]. Consequently, for simplicity and consistency, the proposed amendments to the CP-207 certification period requirements specified in CP-207 § 2.3—specifically, the new text in the opening paragraphs and in §§ 2.3.1 through 2.3.4—are based on existing CP-201 § 2.4, which applies to EVR systems for USTs and accounts for the addition of new amendments. These proposed amendments to CP-207 § 2.3 are substantially the same as the existing CP-201. Differences in proposed amendments for CP-207 § 2.3 (shown in Appendix E) are limited to substituting the term "system" with "ECO Nozzle or low permeation conventional hose" and, in some cases, amending language slightly to address the fact that CP-207 focuses on certifying only two components (ECO nozzles and low permeation hoses) rather than a complete vapor recovery system.

Rationale for the proposed amendments to CP-207 § 2.3 that are substantially the same as CP-201 § 2.4 is not provided within this staff report. That information can be found within the staff reports that were prepared for the adoption and subsequent amendment of CP-201, which are available online at http://www.arb.ca.gov/regact/regact.htm. The text in the new Table 2-1 in CP-207 that defines the effective and operative dates of the proposed dimensions is required for the same reasons as the proposed change to CP-201 Table 2-1; please refer to section XII.B § 2.4 of this report for review.

§ 2.3.5 in § 2.3. Additional or Amended Performance Standards or Performance Specifications

Summary and Purpose of § 2.3.5 Amendment. The proposed amendment to the opening paragraph of Section 2.3 described above specifies that "ECO Nozzles or low permeation conventional hoses installed before the operative date of additional or amended standards may remain in use for the remainder of their useful life or for up to four years after the effective date of the new standard, whichever is shorter, provided the requirements of section 13 are met." The proposed § 2.3.5 text explicitly specifies that existing GDFs that operate on or before the amendment date will not be required to replace their ECO nozzles to comply with the new nozzle requirements until the end of the useful nozzle life. The proposed addition of § 2.5.3 is identical to the proposed addition of § 2.4.8 in CP-201; please refer to section XII.B § 2.4 of this report for review.

Rationale for § 2.4.10 Amendment. The addition of § 2.3.5 to CP-206 is required for the same reasons as the proposed addition of § 2.4.8 to CP-201; please refer to section XII.B § 2.4 of this report for review.

§ 3. Performance Standards and Specifications for ECO Nozzles and Low Permeation Hoses

Table 3-1. ECO Nozzle and Low Permeation Hose Standards and Specifications

Summary and Purpose of Table 3-1 Amendment. Section 3 contains the performance standards and specifications that ECO nozzles and low permeation hoses are subject to. Table 3-1 summarizes the performance standards and specifications, identifies the CP-207 subsections in § 3 that describes each, and identifies the relevant CARB test procedures for each. The proposed amendment to Table 3-1 adds the new spout dimensions as specifications (versus performance standards), identifies their location in § 3.5, and identifies the relevant testing method as "direct measurement." This proposed amendment to Table 3-1 is identical to the proposed amendment to CP-201 Table 4-1; please refer to section XII.B § 4 Table 4-1 of this report for review.

Rationale for Table 3-1 Amendment. The proposed change to Table 3-1 is required for the same reasons as the proposed change to CP-201 Table 4-1; please refer to section XII.B § 4 Table 4-1 of this report for review.

§ 3.5. Nozzle Criteria: § 3.5.2

Summary and Purpose of § 3.5.2 Amendments. The proposed amendments to § 3.5.2 remove the text describing the existing ECO nozzle dimensional requirements and replaces it with a reference to the dimensional requirements in proposed Table 3-2. The proposed Table 3-2 revises the definition of the three existing dimensional requirements and adds 13 new dimensions for ECO nozzle spouts and insertion interlocks. The proposed Table 3-2 refers to the proposed Figures 3A and 3B to illustrate the dimensions. The purpose of these amendments is to standardize the dimensions of ECO nozzle spouts and insertion interlocks. These proposed amendments are identical to the proposed amendments to CP-201 § 4.7.3 with only three exceptions. CARB staff proposes only one dimension specification for the ECO nozzle insertion interlock: the outside diameter. CARB staff does not propose the other three dimensions proposed for the bellows on vapor recovery nozzles—inside diameter, contact angle, and face flatness—because these three dimensions are not relevant for the insertion interlock device given it does not need to create a seal with the vehicle fill pipe. Please refer to section XII.B § 4.7.3 of this report for additional review.

CARB staff proposes to replace the above amendments to § 3.5.2, including the table and figures, with a reference to the SAE J285 document once it has completed the SAE approval process. The reference will cite the SAE J285 document sections specific to ECO nozzle spouts and insertion interlocks.

Rationale for § 3.5.2 Amendments. The proposed changes are necessary for maintaining compatibility between nozzles and fill pipes for multiple reasons. The changes to § 3.5.2 are required for the same reasons as the proposed changes to CP-201 § 4.7.3; please refer to section XII.B § 4.7.3 of this report for review.

In addition, ultimately incorporating the proposed ECO nozzle spout and insertion interlock dimensions by referencing the updated SAE J285 document will enable the consolidation of dimensional requirements in industry standards documents. This will reduce the effort needed for manufacturers to locate and compile CARB requirements along with other recommended practices.

E. CARB D-200, Definitions for Vapor Recovery Procedures

The following is a summary of the specific regulatory amendments that are proposed for D-200. The added and expanded definitions are necessary to define terms used in proposed amendments to CP-201, CP-206, and CP-207. Appendix E provides the full proposed regulatory language of D-200, shown in strike and add format.

Aspirator Port, Nozzle Anchor, Calibration Holes, and Total Indication Reading

Definitions are added to define these terms as used in the proposed dimensional figures and tables included in the proposed amendments to CP-201 § 4.7.3, CP-206 § 5.7.3, and CP-207 § 3.5.2, and ultimately the updated SAE J285 document. Once the updated SAE J285 document has completed the SAE approval process, CARB staff proposes to incorporate the proposed nozzle spout and bellows/insertion interlock dimensions into the certification procedures by referencing the updated SAE J285 document. Defining the terms and identifying their synonyms is necessary because they are critical elements of the dimensions in the proposed tables and figures. In addition, the definitions provide clarification and certainty needed because the updated SAE J285 document will be referenced by manufacturers throughout the United States and world that use different words to describe these elements.

Conventional Nozzle, Enhanced Conventional (ECO) Nozzle, Enhanced Vapor Recovery (EVR), Phase II Nozzle, Phase II EVR Nozzle, Insertion Interlock

These commonly used terms are already used throughout existing text in CP-201, CP-206, and CP-207, as well as the updated SAE J285 document. Conventional nozzles and Phase II nozzles are not certified for use in California but are used elsewhere in the United States. Enhanced conventional (ECO) nozzles and Phase II EVR nozzles with insertion interlock mechanisms can be sold and used in California after CARB certifies them. Consequently, definitions for these terms are necessary in D-200 and ultimately the SAE J285 document to provide clarification for manufacturers and their customers throughout the country and world who will reference the SAE J285 document.

Society of Automotive Engineers (SAE)

This definition is added to define the term as it will be used in CP-201 § 4.7.3, CP-206 § 5.7.3, and CP-207 § 3.5.2. This definition is necessary because once the updated SAE J285 document has completed the SAE approval process, CARB staff

proposes to incorporate the proposed nozzle spout and bellows/insertion interlock dimensions into the certification procedures by referencing the updated SAE J285 document.

Useful Life

This definition is amended to clarify the term as used throughout CP-201, CP-206, and CP-207 by further defining the end of useful life. The current D-200 definition of "useful life" is: "the period of time during which a vapor recovery system or component can be used as intended, conforms to manufacturer's specifications, and complies with all applicable CARB regulations, standards, and specifications." The proposed amendment does not change this definition. Instead, additional text is proposed that states, "the end of useful life occurs when the vapor recovery system or component can no longer be maintained or operated per manufacturer's specifications and as certified by CARB regulations, standards, and specifications." The additional text is in keeping with the intent of the original definition when it was adopted in 2015. Although CARB did not provide a definition of "end of useful life" in the 2015 addition of the "useful life" definition to D-200, CARB staff gave the following rationale and examples that support the above-proposed definition:

> "A vapor recovery system or component is only considered to <be> within its useful life if it is operating as intended. For example, a nozzle that does not dispense fuel when the lever is actuated has reached the end of its useful life. The definition of useful life also states that the system or component must conform to manufacturer's specifications. If manufacturer's instructions specify that a hose must be free from cracks and visible defects then a hose with cracks or visible defects has reached the end of its useful life. Finally, the definition of useful life states that the system or component must comply with all applicable ARB regulations, standards, and specifications. If a component fails an ARB compliance test then it has reached the end of its useful life."
> (CARB, 2015, page 47)

The proposed amendment that defines "end of useful life" is necessary because the phrases "end of the useful life" and "remainder of useful life" are used throughout CP-201, CP-206, and CP-207. In particular, the phrase "end of the useful nozzle life" is a key implementation timeline element included in the proposed amendments to CP-201 § 2.4.8, CP-206 § 2.4.10, and CP-207 § 2.3.5. These amendments would allow existing GDFs that operate on or before the amendment effective date to continue to use their nozzles until the end of the useful nozzle life even if (a) the nozzles do not comply with the proposed dimensional amendments to CP-201 § 4.7.3, CP-206 § 5.7.3, and CP-207 § 3.5.2, and (b) the useful life extends beyond four years, so long as the nozzles can be maintained or operated per manufacturer's specifications and as certified by CARB regulations, standards, and specifications.

F. Global Acronym Change from ARB to CARB in Certification Procedures and Definitions

Summary and Purpose of Amendment. CARB staff proposes amending the acronym "ARB" to "CARB" throughout all three certification procedures (CP-201, CP-206, and CP-207) and the definitions (D-200).

Rationale for Amendment. This amendment reflects the California Air Resources Board's recent change to, and preferred use of, the acronym "CARB" versus the prior acronym, "ARB."

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XIV. APPENDICES

A. Proposed Regulation Order Amended Certification Procedures for Vapor Recovery Systems at Gasoline Dispensing Facilities

B. Proposed Amendments to CP-201: Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities

C. Proposed Amendments to CP-206: Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities Using Aboveground Storage Tanks

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