

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

Final Draft Staff Report

Rule 4692 (Commercial Charbroiling)

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I. REASONS FOR RULE DEVELOPMENT AND IMPLEMENTATION

The San Joaquin Valley Air Basin (SJVAB) has been classified as a nonattainment area for the state and federal health based ambient ozone standards by the California Air Resources Board (ARB) and the U.S. Environmental Protection Agency (USEPA). The SJVAB, currently classified as severe nonattainment for the National Ambient Air Quality Standards (NAAQS) and is therefore required by the Federal Clean Air Act to attain the one-hour NAAQS for ozone by November 15, 2005.

As part of its ozone attainment strategy, the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD, the District) is required to reduce ozone-forming emissions of volatile organic compounds (VOCs) and oxides of nitrogen (NOx). The 1994 SJVUAPCD Ozone Attainment Demonstration Plan (OADP) commits the District to develop new rules or amend existing rules each year to achieve these emission reductions. Additionally, the California Clean Air Act (CCAA) requires the District to adopt all feasible control measures.

In addition to the ozone standard, the San Joaquin Valley Air Basin (SJVAB) has also been classified as a serious nonattainment area for the federal health based standard for particulate matter ten microns in size and smaller (PM-10). Controls that reduce VOC emissions from chain-driven charbroilers will also reduce PM-10 emissions.

The District committed in the 1994 OADP to control emissions from commercial charbroiling. For this source category, South Coast Air Quality Management District's (SCAQMD) Rule 1138 (Control of Emissions from Restaurants) adopted in 1997 and implemented in November 1999, is the most effective regulatory standard in effect. In keeping with the District's commitments to reduce emissions from this source category, District staff will use the SCAQMD rule as guidance in developing Rule 4692.

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The 1994 OADP indicated that the emissions reductions that might be achieved from regulating all commercial charbroiling is approximately 0.39 tons of VOCs per day. The District has not identified available cost effective controls for charbroiling techniques other than chain-driven charbroilers. District staff has estimated the PM-10 and VOC emission reductions for this project and estimates 0.11 ton per day of PM-10 and 0.033 ton per day of VOC from controlling chain-driven charbroilers. The District will continue to evaluate and assess the feasibility of emission reductions and cost-effective control devices and/or other methods available for the control of emissions from under-fired charbroilers and other commercial restaurant cooking equipment. Please refer to Appendix A of this staff report for further details on the emissions reduction analysis.

II. RULE DEVELOPMENT PROCESS

A scoping meeting was held May 2000 to present the goals of the rulemaking project, to achieve VOC and PM-10 reductions and implement California and federal clean air acts. During the scoping meeting, District staff introduced the feasible control measure for commercial charbroiling and operators of affected sources, consultants, vendors, and trade associations were asked to provide technical feasibility and compliance cost information which would be useful in developing the draft rule. Comments and information received was then used to develop the current draft rule, emission reductions, and cost effectiveness analyses. The resources that District staff used in developing the draft of Rule 4692 (Commercial Charbroiling) are: information received at the scoping meeting, technical documents, analysis conducted for other regulatory agencies, vendor cost data, and South Coast Air Quality Management District (SCAQMD) Rule 1138 (Control of Emissions from Restaurants) adopted November 14, 1997.

On October 9, 2001, the District signed a consent decree with Earthjustice Legal Defense Fund representing the Medical Alliance for Healthy Air, Latino Issues Forum, Center on Race, Poverty and the Environment, and the Sierra Club. The consent decree establishes project schedules for several District rulemaking projects, including this one. Consequently, the project schedule for Rule 4692 is now under court oversight, and calls for the rule to be presented to the District Governing Board in March 2002. This schedule allows time for only one series of public workshops, which will occur in November 2001.

Permitting emission control equipment ensures compliance with the rule requirements and the use and installation of appropriate control equipment. Rule 2020 (Exemptions) would be amended so that appropriate requirements for these units can be established. See Section 6.4.1 of Rule 2020 (Exemptions) for the complete text.

On June 21, 2001, the District revised Rule 2020 in anticipation that the rule and State law would have to be changed in order to obtain USEPA's full approval of the District's Title V operating permit program. Specifically, the District revised Rule 2020 to remove the agricultural source permit exemption required by the California Health and Safety Code (CH&SC) Section 42310(e). However, USEPA (FR 63503, December 7, 2001)

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has recently fully approved the District's Title V program even though the state-wide agricultural exemption remains in effect. Moreover, USEPA has deferred California permit-exempt agricultural sources from Title V requirements for up to three years. That deferral allows the continuation of studies related to agricultural emissions and federal Clean Air Act applicability, and the determination of the extent to which such sources may be major sources subject to Title V.

Removal of the reference to agricultural operations in our exemption rule did not change permitting requirements since the District is still prohibited from permitting such operations by the CH&SC. The removal of that section, however, has created some confusion about our intent and possible conflicts with state law. Therefore, we are proposing to add language explicitly stating that such sources are exempt from permitting to the extent allowed by state law. This amendment is a clarification of current requirements and is neither a relaxation nor strengthening of the rule.

III. BACKGROUND

The purpose of Rule 4692 is to control both VOC and PM-10 emissions from commercial charbroiling. The SCAQMD passed a similar regulation in November 1997, which became effective November 1999 requiring controls on emissions from charbroiling in restaurants.

SCAQMD Rule 1138 (Control of Emissions from Restaurant Operations), applies only to chain driven charbroilers used to cook meat. Only two major fast food chains, Carl's Jr. and Burger King, are known to currently employ chain driven charbroilers. All other commercial restaurant equipment including, but not limited to, under-fired charbroilers, may be subject to future rule provisions pending development of cost-effective control technologies. The application of updated emissions factors from actual testing indicated that under-fired charbroilers contributed a majority of the emissions from restaurants. However, chain-driven charbroilers are currently the best candidates for emissions reductions. The flameless catalytic oxidizer is the most cost effective available method for controlling VOC and PM-10 emissions from new and existing chain-driven charbroilers.

The commercial charbroiling source category includes the operations of direct meat firing grills (charbroilers) at restaurants and fast food facilities. Emissions from this source category include organic gases (mainly aldehydes) and particulate matter (fat, grease, and carbon) which result from the melting and incomplete combustion of fat during charbroiling of meats. Findings from studies completed by the University of California Riverside, College of Engineering, Center for Environmental Research and Technology (CE-CERT) indicate that the type of food cooked and the type of appliance used greatly influence the emissions. A brief description of restaurant cooking appliances follows:

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Chain-driven (conveyorized) charbroiler

This type of broiler has conveyor belts to carry the meat through the flame area. It also may have a belt to carry buns through the appliance. Flames broil the meat on the top and bottom simultaneously. Most chain-driven charbroilers burn natural gas. This appliance normally produces lower PM-10 and VOC emissions than under-fired charbroilers.

Under-fired charbroiler

These appliances consist of three main components: a heating source, a high temperature radiant surface, and a slotted grill. The grill holds the meat or other food while exposing it to the radiant heat. When grease from the meat falls onto the high temperature radiant surface, PM-10 and VOC emissions occur. Most under-fired charbroilers burn natural gas; however, solid fuels, such as charcoal or wood with and without the addition of ceramic stones are sometimes used. This category includes broilers, grill charbroilers, flamebroilers, and direct-fired barbecues.

Deep fat fryers

Fryers use an exposed hot metal surface to heat cooking oil, which is then used to cook the food. Typically, the food is totally immersed in hot melted shortening at about 350°F. The fryers may be either gas-fired or electric with fuel type not affecting emissions. Most of the raw food products have a water content in the range of 10% to 75% by weight prior to deep fat frying. Most of the water at the surface of the product vaporizes during the cooking process causing a carry-over of oil mist and oil distillation, resulting in VOC and PM-10 emissions. Practically all fast-food establishments use deep fat fryers to prepare food in batches.

Griddles

These appliances consist of an exposed metal plate used to cook food. The temperatures on the hot surface are typically lower than those encountered in broiling. Unlike deep fat frying, the food is not immersed in shortening, rather the process is similar to sautéing, and the emissions include light oil particulates and odors. Some griddles are grooved in order to give a "broiled" appearance to the food. Most griddles are gas-fired, although electric griddles are also used. Fuel type does not affect emissions.

A newer griddle type, called a "clam-Shell" employs a two-sided cooking configuration, lowering an upper hot plate on top of the food product to cook the side while a lower plate cooks the bottom of the product. This reduces cooking time and decreases emissions.

IV. CURRENTLY AVAILABLE CONTROL TECHNOLOGIES

The following discussions include proven technologies, and technologies proven in other industries that may be transferable. Reduction of both VOCs and PM-10 is accomplished with catalytic oxidizers, self-cleaning ceramic filters, fiber-bed filters, and incineration (catalytic and thermal). Those technologies reducing only PM-10

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emissions include electrostatic precipitators (ESPs) and wet scrubbers. Activated carbon adsorbers solely reduce VOC emissions.

- **Catalytic Oxidizers (flameless) (PM-10 and VOC control)**

In this process, the exhaust stream containing PM-10 and VOCs is mixed with air before entering the flameless reactor vessel. The air mixture is evenly distributed into a bed of inert ceramic material coated with a metal catalyst. This bed provides complete mixing of the PM-10 and VOC with oxygen. The PM-10 and VOC will oxidize into carbon dioxide and water vapor once the mixture reaches the combustion temperature. The released combustion energy is absorbed by the ceramic bed and is transferred to the exhaust stream leaving the catalytic oxidizer. The temperature control of the system is very important in effective oxidation of VOCs and PM-10. This process is a flameless incineration, as opposed to catalytic incineration, which uses an external fuel source. The catalytic oxidizer uses the heat of the exhaust, the exhaust gas entering the reactor needs to be at least 600°F for proper operation. Testing has shown an overall PM-10 and VOC removal efficiency approaching 85% can be achieved, (83% of PM-10 and 86% of VOCs). The gas outlet temperature of the catalytic reactor may be as high as 1,100°F, depending on the PM-10 and VOC in the gases at the inlet.

Protech Incorporated and Engelhard Corporation have developed and produced catalytic reactors that have been permitted and are operating successfully for PM-10 and VOC removal from the exhaust of chain-driven NIECO charbroilers at several locations in the South Coast Air Basin. Catalytic oxidizers in use at existing restaurants have decreased gas usage (fuel costs) and maintenance (hood and duct cleaning) costs. The exhaust stream from the typical chain-driven charbroiler ranges from 600°F to 700°F and this temperature range is suitable for high emission reduction efficiency. According to catalyst vendors, poisoning of catalyst is not expected at restaurants, and their guaranteed life is about five years with proper cleaning. Some catalysts installed over four years ago in the SCAQMD are still performing satisfactorily in reducing both PM-10 and VOC emissions and are expected to last five years or more.

The catalyst is cleaned by immersion in water for one hour once a month. Catalytic oxidizers for restaurant applications are typically 24 inches in diameter, by 3.5 inches high.

- **Self-cleaning Ceramic Filters (PM-10 and VOC control)**

Self-cleaning ceramic filters may be used alone or in conjunction with catalytic oxidizers, as an integral component of the oxidizers. In certain applications contaminants, such as grease, can coat or mask a monolithic precious metal catalyst. For these types of operations, filters can serve to keep the catalyst clean by preventing blockage or coating of the catalyst, and thereby extending catalyst life and performance. The typical configuration consists of a self-cleaning ceramic filter located downstream of the charbroiler hood and integral impingement grease traps and located ahead of the catalytic oxidizer. Partially cleaned gas from the ceramic filter may be exhausted directly into the atmosphere or may enter a catalytic

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oxidizer, where the VOCs and remaining PM-10 are oxidized to carbon dioxide and water vapor.

The ceramic filter may be operated in two different modes. In the first, the ceramic matrix is periodically heated by a natural gas burner to volatilize organics collected on the matrix. In the second, this heating is conducted continually, and may be used when grease loadings are high. Inorganic material is converted to ash and drops into a chamber located below the filter.

- **Fiber-bed Filters (PM-10 and VOC control)**

Fiber-bed filters use a combination of impaction, interception and Brownian diffusion to remove particulate materials from an air stream. The air flows through the filter bed in a horizontal direction to enhance dropout of collected material to the drain area below the filter. The flow may be routed from the outside of the filter face to the inside or from the opposite direction. The bed is enclosed in a rigid cage-type container.

The dominant mechanism for PM-10 collection may be Brownian motion, a behavior primarily associated with particles less than 0.5 microns in size, which approaches the mean free path of the fluid. When the face velocity is reduced to adequately allow Brownian motion to occur, the particles collide in a random manner with the collecting surface of the fiber bed. Overall, particulate collection is enhanced by the impaction and interception mechanisms occurring at the same time.

For charbroiler emissions, the air stream from the hood with an integral grease trap would pass through the fiber bed container. The filter material is usually selected based on the PM-10 and VOC concentrations and exhaust flow and temperature. Materials available include fiberglass, polyester, polypropylene and even ceramic. The filter is periodically shut down and replaced or washed to remove grease and other materials before returning the equipment to service. At present, there are several fiber media filters located downstream of permitted wet scrubbers at restaurants operating in the South Coast AQMD.

- **Catalytic Incineration (Fuel Assisted) – (PM-10 and VOC control)**

In catalytic incineration (typically, fuel assisted using natural gas), the VOCs and PM-10 in an emission stream are oxidized in the presence of a catalyst. The catalyst will accelerate the VOC oxidation rate while decreasing the oxidation temperature and consequently lowering the fuel usage. Catalytic incinerators are similar to thermal incinerators and consist of a pre-heater section, a combustion chamber housing the catalyst, and often a heat recovery system. Normally, the combustion chamber in a catalytic incinerator is smaller than that for a thermal incinerator. The catalyst commonly used in catalytic incineration is platinum deposited on a porous inert material (substrate). Typical VOC removal efficiencies of up to 98% are achievable, depending on the velocity of the catalyst bed and gas temperature. Metallic oxide catalysts are also used in VOC incineration. Equipment and fuel (natural gas) costs often make this method less favorable than the catalytic oxidizer (flameless incineration).

- **Thermal Incineration (PM-10 and VOC control)**

The most commonly used air pollution control method for destruction of PM-10 and VOCs in an air stream is thermal incineration, wherein the PM-10 and VOCs are oxidized at high temperatures and converted to carbon dioxide and water. High VOC conversion rates (95%-99%) in a safe and clean process is the major advantage of thermal incineration. Thermal incinerators can be divided into two groups: 1) recuperative and 2) regenerative. The thermal recuperative incinerators consist of a gas preheating section (heat exchanger), a combustion chamber, typically equipped with gas burner(s), and a heat recovery section. Regenerative incinerators use a refractory to periodically store and transfer heat between the hot and cold gas streams. PM-10 and VOC conversion efficiencies range from 97% to 99.9% for the recuperative and 95% to 99% for regenerative incinerators. Energy recovery ranges from 45% to 76% for recuperative and 80% to 95% for regenerative incinerators. The PM-10 and VOC removal efficiency is dependent upon temperature, residence time, and mixing inside the incinerator. This option is also less favorable than catalytic oxidizers due to high fuel (natural gas) costs.

- **Activated Carbon Adsorber (VOC control)**

Activated carbon systems rely on physical adsorption to remove VOCs from air streams. In contrast with chemisorption systems, which are the result of chemical interaction with the adsorbent, physical adsorption uses intermolecular (Van der Waals) forces of attraction to tie the adsorbed VOCs to the surface of the activated carbon. The adsorption process is exothermic, releasing heat while removing VOCs from the air stream.

In a typical system, particulate is first removed from the VOC-laden air stream by pre-filtration and then the air stream flows through adsorber vessels containing the activated carbon. A large industrial system treating VOC emissions may consist of multiple adsorber vessels, some of which are in service while other vessels are being regenerated.

Eventually, small amounts of the adsorbed VOCs will begin to “breakthrough” or be released to the air. Automatic controls tied to an on-line analyzer are used to sense breakthrough and remove the module with the longest adsorption time from service, bringing a freshly regenerated module on line.

Typically, regeneration is accomplished by heating the spent carbon to 250°F or higher with steam. The steam and desorbed VOCs then enter a condenser. The condensed vapors enter a separation (decanter) tank, where the insoluble solvent is separated from the water. The recovered VOCs are further treated by thermal oxidation or some other suitable method. In restaurant application, the regeneration would normally be performed off-site since the small amounts of carbon used cannot be economically regenerated on-site.

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V. COST EFFECTIVENESS ANALYSIS

District staff has completed a cost effectiveness analysis pursuant to the Health and Safety Code, as part of the rule development process. Refer to Appendix B for details on the cost effectiveness analysis.

VI. SOCIOECONOMIC IMPACT ANALYSIS

Pursuant to state law, the District is required to analyze the socioeconomic impacts of any proposed rule amendment that affects air quality or strengthens an emission limitation. Proposed Rule 4692 is subject to the socioeconomic analysis mandate. The District's independent contractor, Jack Faucett Associates (JFA), has prepared an analysis of the impacts. The report is provided in Appendix C.

VII. RULE CONSISTENCY ANALYSIS

Pursuant to California Health and Safety Code Section 40727.2, a rule consistency analysis of the proposed Rule 4692 is as follows. No other District rule regulates this source category, and there are no current or proposed federal regulations or guidance on the source category.

VIII. ENVIRONMENTAL IMPACTS

Pursuant to the California Environmental Quality Act (CEQA), staff investigated the possible environmental impacts of the proposed rule. Based on the lack of evidence to the contrary, District staff has concluded that the proposed rule will not have any significant adverse effects on the environment. Staff recommends filing a Notice of Exemption under the provisions of Public Resource Code 15061 (b)(3).

IX. REFERENCES

South Coast Air Quality Management District. "Rule 1138 (Control of Emissions From Restaurant Operations) and Staff Report." Adopted November 14, 1997.

San Joaquin Valley Unified Air Pollution Control District. "1994 Ozone Attainment Demonstration Plan". November 14, 1994.

Pacific Environmental Services, Inc. (PES), Final Report, "A Detailed Survey of Restaurant Operations in the South Coast Air Basin", Dated February 5, 1999.

Final report by University of California Riverside, College of Engineering, Center for Environmental Research and Technology, Further Development of Emission Test Methods and Development of Emission Factors for Various Commercial Cooking Operations, Contract No. 96027, July 1997.

SUMMARY OF SIGNIFICANT COMMENTS

**October 2001, WORKSHOP ON PROPOSED
RULE 4692 (COMMERCIAL CHARBROILING)**

EPA Comments None.

ARB Comments None.

Industry comments

1. Comment: It seems that a configuration like the one proposed for chain-driven charbroiler, would also work for underfired charbroilers except the user would use a long fork or spatula to install the meat and remove from the burning surface. Burners could be installed in the top portion of the canopy below the catalytic oxidizer to increase the temp needed to work the oxidizer if necessary.

Rule 4692 Section 2.0, applicably reads, "This Rule Shall Apply to Any Source That Emits or May Emit Air Contaminants." The 14th Amendment of the Constitution Says Laws Are to Be Equal and Fair to All.

Response: At this time, the rule focuses on chaindriven charbroilers because an effective control device has been proven to work effectively and is currently in use at restaurants. SCAQMD is making progress towards demonstrating controls for underfired charbroiling and once controls for those sources are identified, the District will consider amending Rule 4692 to address these sources.

The District does not test and approve proposed new technology for restaurants and suggests the commentor contact the University of California Riverside, College of Engineering, Center for Environmental Research and Technology (CE-CERT), with regards to your conceptual drawing on a proposed control for underfired charbroilers. CE-CERT is currently reviewing and assessing new technology for underfired charbroiling.

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SUMMARY OF SIGNIFICANT COMMENTS

May 2000, SCOPING MEETING ON PROPOSED RULE 4692 (COMMERCIAL CHARBROILING)

EPA Comments None.

ARB Comments None.

Industry comments

1. Comment: Since charbroiler emissions are such a small part of the emissions inventory for the District, reductions from this rule would not make a significant impact. The cost for the control equipment would be disproportionate to the emissions mitigated. Although catalytic oxidizers are under \$3,000, the retrofit requirements can result in significant cost increases per restaurant. A charbroiler equipped with a catalytic oxidizer and adapter is limited in height by the exhaust hood. This can result in additional retrofit costs reaching \$9,000 for total exhaust hood replacements. Additionally the charbroiler exhaust hood requires a liquid fire suppressant to reach fires originating within the charbroiler. Our retrofit program for 267 restaurants resulted in costing our company almost \$2 million.

Targeting restaurants serving charbroiled meat products desired by the public creates an uneven playing field of competition. Restaurants that are not required to control cooking emissions have an unfair competitive edge over regulated restaurants.

We do not believe regulating chain-driven charbroilers will make any real impact in the District's emission inventory.

Response: The District is being reclassified as a "severe" non-attainment area by the U.S. EPA for not attaining the standard by the attainment date of November 15, 1999. Although the emission reductions may appear small, all reductions of PM-10 and VOC count towards attainment of the ambient air quality standards.

The District committed in the 1994 OADP to control emissions from commercial charbroiling. For this source category, South Coast Air Quality Management District's (SCAQMD) Rule 1138 (Control of Emissions from Restaurants) adopted in 1997 and implemented November 1999, is the most effective and feasible regulatory standard in effect. The California Clean Air Act requires the District to adopt all feasible control measures.

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The cost effectiveness analysis found in Appendix B looks at an average restaurant operating under normal conditions. The analysis shows installing a catalytic oxidizer to be cost effective. It is important to note the analysis is an average and that the compliance cost may vary per restaurant but overall the control appears to be cost effective in reducing both PM-10 and VOC.

At this, time the rule focuses on chain-driven charbroilers because an effective control device has been proven to work effectively. SCAQMD is making strides towards demonstrating controls for underfired charbroiling and once controls for those sources are identified, the District will consider amending Rule 4692 to address these sources.

2. Comment: We strongly opposed any rule that would apply only to chain-driven charbroilers because such a rule will not provide significant emission reductions, would place undue burden on a very small number of restaurants and is not required by U.S.EPA or CARB.

Response: Please refer to the previous response in regards to the emission reductions and a discussion regarding cost effectiveness of the proposed control on chain driven charbroilers.

District staff thanks you for your interpretation of the U.S.EPA and CARB's intention regarding the District's SIP commitment. However, the District is required to fulfill its commitment in the 1994 Ozone Attainment Demonstration Plan, which was fully approved by the U.S.EPA into the SIP. In addition, CARB has identified the SCAQMD Rule 1138 as the "all feasible control measure" for this source category and the District is required to investigate and implement "all feasible control measures" in its strategy to control ozone. This control measure has been successfully in effect in the SCAQMD since 1999. The SCAQMD is currently investigating effective controls for additional restaurant operations, once controls have been identified, the SCAQMD will consider amending Rule 1138 for further reductions. The District will also consider further reductions from this source category once cost effective controls have been identified.

APPENDIX A

Emission Reduction Analysis for Rule 4692 (Commercial Charbroiling)

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District staff estimated the VOC and PM-10 emissions from Commercial Charbroiling Operations by using information from studies done by Riverside College of Engineering - Center for Environmental Research and Technology (CE-CERT) and Pacific Environmental Services, Inc. (PES) for the SCAQMD.

Early in the development process, SCAQMD also contracted with the California Polytechnic University, Pomona, by the Center for Emission Research and Analysis (CERA), to develop PM-10 and VOC test methods and determine emission factors. Most of this testing was performed using hamburger meat patties. Additional testing, initiated in 1995 at CE-CERT, was sponsored by SCAQMD and the California Restaurant Association. The focus of these recent efforts was to develop a more suitable VOC test method and to determine emission factors for various combinations of appliances and food. Testing has encompassed a combination of four types of cooking equipment: under-fired charbroilers, chain-driven charbroilers (with and without a catalytic oxidizer), flat griddles, and deep fat fryers. Five types of food were tested: hamburger patties, steaks, chicken, fish, and potatoes.

The work done by CE-CERT significantly improved the reliability and acceptability of test methods and refined the understanding of emission characteristics and the relative contributions of the various restaurant-cooking operations. The final results on the PM-10 and VOC emission factors completed by UC Riverside CE-CERT for chain-driven charbroilers cooking hamburger meat patties are as follows:

Table #1 Chain-Driven Charbroiler Emission Factors for Hamburger Patties		
	PM-10 (lbs PM-10/1000 lbs Meat Cooked)	VOC (lbs VOC/1000 lbs Meat Cooked)
Uncontrolled Chain-driven Charbroilers	7.42 lbs PM-10	2.27 lbs VOC
Controlled Chain-driven Charbroilers	1.29 lbs PM-10	0.32 lb VOC
Pounds of Emissions Reduced	6.13 lbs PM-10 reduced	1.95 lbs VOC reduced
% Reductions from Uncontrolled Levels	83%	86%

The application of a catalyst to the chain-driven charbroiler significantly reduces both the PM-10 and VOC emissions.

To determine the number of restaurants within the District's eight county region, staff contacted the Health Departments of each county and were provided with lists of permitted restaurants. The list was further refined and it was determined that there are

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approximately 150 restaurants within the District that may operate a chain-driven charbroiler.

To estimate the baseline emissions inventory for chain-driven charbroilers the average amount of meat cooked by a restaurant is needed. Three sources were used and an average amount was determined. The following three sources reported these amounts as the average lbs of meat cooked either by day or week:

Table #2	
Average Pounds of Meat Cooked Per Restaurant	
Source	Average pound of Meat Cooked/Restaurant
SCAQMD Staff Report for Rule 1138 (Control of Emissions from Restaurant Operations) Dated October 10, 1997	233 lbs/day
EIIP Volume III - Area Source Category Method Abstract Dated December 2000	1,160 lbs/week
PES Detailed Study of Restaurant Operations, for SCAQMD Dated Feb 1999	2,093 lbs/week
Overall Average Pounds of Meat Cooked/Week (averaging all three sources)	1,628 lbs/week
Average Pounds Meat Cooked/Day	233 lbs/day

To estimate the baseline emissions inventory, staff applied the uncontrolled emission factors for chain-driven charbroilers to the 150 restaurants using the estimated average pounds of meat cooked per restaurant per day. Table #3 shows the results.

Table #3		
Total PM-10 and VOC Emissions Reductions from Rule 4692		
	PM -10 (ton/day)	VOC (ton/day)
Uncontrolled Chain-driven Charbroilers	0.13	0.039
Controlled Chain-driven Charbroilers	0.02	0.006
Emissions Reductions from all 150 Restaurants	0.11	0.033

APPENDIX B

Cost Effectiveness Analysis for Rule 4692 (Commercial Charbroiling)

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**APPENDIX B
COST EFFECTIVENESS ANALYSIS
FOR RULE 4692 (COMMERCIAL CHARBROILING)**

I. INTRODUCTION

The California Health and Safety Code Section 40920.6(a) requires the San Joaquin Valley Unified Air Pollution Control District (District) to conduct a cost effectiveness analysis of the proposed control option prior to the adoption of the proposed rule. The purpose of conducting a cost effectiveness analysis is to evaluate the economic reasonableness of the pollution control measure or rule. The analysis also serves a guideline in developing the control requirements of a rule.

II. SUMMARY AND CONCLUSION

A. Cost Effectiveness Analysis of Proposed Control

Absolute cost effectiveness of a control option is the added annual cost (in \$/year) of the control technology or technique, divided by the emission reduction achieved (in tons/year). The costs include capital equipment costs, engineering design costs, installation costs, and any cost savings from decreased gas usage (fuel cost savings) and maintenance (hood and duct cleaning) costs.

The preliminary analysis shows that the proposed rule to control PM-10 and VOC emissions from chain-driven charbroilers is approximately \$3,000 per ton of PM-10 and VOC reduced. Rule 4692 would require facility operators of chain-driven charbroilers to install flameless catalytic oxidizers. The rule is also structured to allow flexibility in complying with the rule requirements through testing of other control devices to ensure the control device is as effective as the proposed control. District staff believe the likely method of compliance would be to use a flameless catalytic oxidizer currently used at facilities in the South Coast Air District.

Attachment #1 illustrates the total compliance and cost effectiveness calculations of installing a flameless catalytic oxidizers.

B. Cost Effectiveness of a Possible Alternative Control Option

As an alternate method of compliance, operators who elect to use a control device other than a flameless catalytic oxidizer, as specified in the rule, would need to operate an approved VOC emission control system which met the appropriate testing requirements specified in Section 6.4 of the rule with at least the same efficiency as the required catalyst.

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The next more effective control for Rule 4692 would be thermal incineration which also controls both PM-10 and VOCs by oxidizing the waste stream at a high temperature and converting the waste to carbon dioxide and water. PM-10 and VOC conversion efficiencies range from 97% to 99.9% for recuperative incineration and 95% to 99% for regenerative incinerators.

Attachment #1 illustrates the total compliance cost and cost effectiveness calculations for installing thermal incinerators. As shown in table #5, staff recognizes that at this time, it may be impractical to impose a requirement for a thermal incinerator considering the cost and the additional burden of higher fuel usage costs.

III. SOURCES OF COST DATA

District staff used available cost information published in technical reports and information provided by control equipment vendors to conduct the cost effectiveness analysis of the proposed rule requirements. The analysis in Appendix A will be refined when additional regulatory compliance cost data is received as part of the rule development process. The following data sources were used in the analysis.

- South Coast Air Quality Management District Staff Reports for Rule 1138 – Control of Emissions from Restaurant Operations, dated July 1997 and October 10, 1997.
- Staff E-mail Correspondence with Alan Bouney of Engelhard Corp., dated December 1999.
- Staff discussions with Ron Reynders, Vice President of Sales and Manufacturing for Marshall Air, October 2001.
- Staff E-mail Correspondence with Ethan Altman of UC Riverside CE-CERT, dated December 1999.

IV. COST EFFECTIVENESS ANALYSIS PROCEDURE

Following is the procedure used by District staff in conducting the cost effectiveness analysis of a rule: (1) identify typical equipment settings affected by the rule; (2) identify the control technologies or control option that can achieve the proposed emission limits; (3) estimate the average annualized cost of each control option; (4) calculate the average emissions reduction of each control option; and (5) calculate the average cost effectiveness of a given control option of a given equipment setting.

The cost effectiveness of a control technology is then calculated by dividing the annualized cost of a control technique with the annual emission reduction achieved by the control technique. The cost effectiveness is expressed in dollars per ton of pollutant reduced per year (\$/ton).

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V. ASSUMPTIONS USED IN CALCULATING COST EFFECTIVENESS

Following are assumptions used by District staff in conducting the cost effectiveness analysis for Rule 4692:

1. There are approximately 150 restaurants operating a chain-driven charbroiler. With 0.11 ton/day of PM-10 emissions reduced and 0.033 ton/day of VOC emissions reduced from all 150 restaurants. (See Table #3 in Appendix A)
2. The analysis uses a 10-year project life with replacement of the catalyst in 5 years at a 10% interest rate.
3. The catalytic oxidizer reduces 83% of the PM-10 and 86% of the VOC emissions for an overall combined control efficiency of 83%.
4. The thermal incinerator reduces an average 97% of both PM-10 and VOC emissions.

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

**ATTACHMENT 1
COST EFFECTIVENESS CALCULATION**

In calculating the cost effectiveness for proposed Rule 4692, District staff assumed that the total compliance cost consists of the cost of equipment, installation, annual operation and maintenance, and any cost savings.

Flameless Catalytic Oxidizer

- Equipment Capital Costs: Range provided to staff from vendor \$1,500 - \$4,500. The South Coast staff report used \$4,000 for the capital cost. Staff will use the average from the vendor quote of \$3,000 averaged with the South Coast cost of \$4,000 for an average Capital Equipment Cost of \$3,500.
- Installation Costs: Range provided to staff from vendor \$500 - \$1000. The South Coast staff report used \$1,000 for installation costs. For this analysis, staff will use \$1,000.
- Replacement Cost for the catalyst after 5 years: \$3,500.
- Annual Operation and Maintenance Cost (soaking of the catalyst): \$500
- Exhaust Stack Cleaning: (less cleaning required with the catalyst, catalyst reduces soot buildup

	in the exhaust stack)		
Without the Catalyst	4 times/year x \$250 =	\$1,000	
With Catalyst	<u>Once/year x \$250 =</u>	<u>\$ 250</u>	
	Cost Savings	\$ 750	

Estimated Cost Effectiveness for an Average Facility: \$/ton reduced.

Capital Costs:

catalyst	\$3,500
replacement catalyst	\$3,500
installation costs	<u>\$1,000</u>
Total Capital Costs	\$8,000

1. Annualized Capital Costs	\$8,000 x 0.163 = approximately	\$ 1,300
2. Annual Operations and Maintenance Costs		\$ 500
<u>3. Annual Cost Savings from less cleaning of ductwork</u>		<u>-\$ 750</u>
Total Annual Cost/Facility		\$1,050

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Flameless Catalytic Oxidizer
Total Compliance Costs and Cost Effectiveness

Total Annual Cost/Facility \$1,050

Total Compliance for Rule 4692 \$1050 x 150 facilities = \$157,500

Total PM-10 emissions reductions 0.11 ton/day x 365 days/yr = 40.15 tons/yr PM-10

Total VOC emissions reductions 0.033 ton/day x 365 days/yr = 12.05 tons/yr VOC

Overall Rule Cost Effectiveness:

\$157,500 / 52.20 tons reduced (VOC & PM-10 combined)/year =

\$3,017/ton reduced of PM-10 & VOC

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Alternative Control Option - Thermal or Direct-fired Incineration

- Equipment Capital Costs: \$20,000.
- Installation Costs: \$5,000
- Annual Operation (estimated natural gas costs: 26 therms gas usage/hr x 16 hrs/day x 365 days/yr x \$0.60/therm = 91,100): \$91,100
- Annual Maintenance Costs (stack cleaning 4 times/year x \$250): \$1,000

Estimated Cost Effectiveness for an Average Facility: \$/ton reduced.

Capital Costs:

Incinerator	\$20,000
installation costs	<u>\$ 5,000</u>
Total Capital Costs	\$25,000

1. Annualized Capital Costs \$25,000 x 0.163 = approximately \$ 4,075

2. Annual Operations and Maintenance Costs	<u>\$ 92,100</u>
Total Annual Cost/Facility	\$96,175

The thermal incinerator reduces an average 97% of both PM-10 and VOC emissions. Using uncontrolled baseline levels from Table #3 for PM-10 and VOC and applying the 97% control for both PM-10 and VOC the expected reductions would be as follows:

Uncontrolled PM-10 Baseline - 0.13 ton/day x 0.97 = 0.126 ton/day reduction
 Uncontrolled VOC Baseline - 0.39 ton/day x 0.97 = 0.038 ton/day reduction

Thermal or Direct-fired Incineration
Total Compliance Costs and Cost Effectiveness

Total Annual Cost/Facility \$96,175
 Total Compliance for Rule 4692 \$96,175 x 150 facilities = \$14,426,250
 Total PM-10 emissions reductions 0.126 ton/day x 365 days/yr = 45.99 tons/yr PM-10
 Total VOC emissions reductions 0.038 ton/day x 365 days/yr = 13.87 tons/yr VOC

Overall Rule Cost Effectiveness:

\$14,426,250 / 59.86 tons reduced (VOC & PM-10 combined)/year =

\$241,000/ton reduced of PM-10 & VOC

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Incremental Cost Effectiveness Analysis (ICE)

Flameless Catalytic Oxidizer

- Total Compliance Cost: \$157,500
- Total VOC & PM-10 Emission Reductions: 52.20 tons/year (tpy)

Thermal or Direct-fired Incineration

- Total Compliance Costs: \$14,426,250
- Total VOC & PM-10 Emission Reductions: 59.86 tons/year (tpy)

$$\frac{(\$14,426,250 - \$157,500)/\text{year}}{59.86 \text{ tpy} - 52.20 \text{ tpy}} = \frac{\$14,269,000/\text{year}}{7.66 \text{ tpy}}$$

ICE = \$1,862,800/ton (rounded up to the next 100.)

APPENDIX C

Socioeconomic Analysis Report for Rule 4692 (Commercial Charbroiling)

February 21, 2002

SOCIOECONOMIC IMPACT ANALYSIS

OF

RULE 4692

(Commercial Charbroiling)

Draft

JACKFAU-01-581

Prepared for:

**San Joaquin Valley Unified
Air Pollution Control District**

January 2002

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Executive Summary

This report presents the results of a socioeconomic impact analysis of the San Joaquin Valley Unified Air Pollution Control District's (SJVUAPCD, the District) draft Rule 4692 (Commercial Charbroiling) dated October 27, 2001. The proposed rule seeks to limit emissions of volatile organic compounds (VOCs) and particulate matter ten microns in size and smaller (PM-10) from commercial chain-driven charbroilers.

While Rule 4692 has been designed to achieve air quality benefits for the District, there will be costs borne by affected industries (direct impacts) and these impacts will spread throughout the regional economy (indirect and induced impacts). The socioeconomic impact analysis is conducted in order to consider these industry sectors and regional economic impacts in the rule making process. This report should not be considered the product of exact science, although it does provide information on the rule's potential impacts on local business and the regional economy which decision makers should find useful. This study incorporates all available, relevant information and data in the analysis.

The principal industry affected by this rule is the restaurant industry (SIC 58). The majority of potentially affected restaurants can be identified as limited-service (NAICS 722211) or fast-food restaurants. While the District estimated the number of the potentially affected entities to be around 150, JFA used its own estimate of 175 in analyzing potential impacts.

According to the District, Rule 4692's most cost effective compliance option could cost each potentially affected restaurant \$1,050 per year. The total compliance cost for the potentially affected industry sector is calculated to be \$183,750 ($\$1,050 \times 175$ potentially affected restaurants). Following the District's guidance for conducting socioeconomic impact analyses, this report is primarily concerned with the rule's potential impacts on local businesses and the regional economy of the San Joaquin Valley (the Valley).

The IMPLAN input-output model was used to assess socioeconomic impacts from the proposed Rule 4692. While the economic impact analysis should not be considered a product of exact science, the analysis presents reasonable estimates of potential impacts from the rule to the extent feasible.

On balance, the net impacts from the proposed amendments to the rule are estimated to be an employment loss of six jobs in the Valley. Measured in changes in output, the net impacts from the proposed rule are estimated to be \$96,200 lost in the Valley.

Considering all positive, negative, direct, indirect and induced impacts of the rule, compliance costs for the proposed rule appear to have modest consequences for the regional economy of the San Joaquin Valley.

Chapter 1 Introduction

This report presents the results of a socioeconomic impact analysis of the San Joaquin Valley Unified Air Pollution Control District's (SJVUAPCD, the District) proposed new Rule 4692 (Commercial Charbroiling), dated October 27, 2001. This rule limits emissions of volatile organic compounds (VOCs) and particulate matter ten microns in diameter and smaller (PM-10) by requiring all commercial chain-driven charbroilers to install a catalytic oxidizer or other approved emissions control device. This analysis examines the direct economic impacts that the rule is likely to have on affected industries, and any indirect socioeconomic impacts the rule may have on the regional economy.

1.1 Background

Under provisions of federal and state law, air pollution control districts have been given authority to promulgate regional rules and regulations in order to comply with ambient air quality standards as specified in the Federal Clean Air Act (as amended, 1990) and the California Clean Air Act. To attain the state and federal health-based ambient air pollution standards, the District combines efforts with the United States Environmental Protection Agency (EPA), the California Air Resources Board (ARB), and local and county agencies to reduce the emissions that cause air pollution. The EPA and ARB are directly responsible for regulating emissions from on-road motor vehicles, and the District has primary responsibility for controlling emissions from stationary sources, such as industrial and commercial facilities. Counties and cities are responsible for land use planning and transportation programs in the San Joaquin Valley (the Valley).

Currently, the Valley does not meet the federal health-based standards for ozone, a criteria pollutant under the Clean Air Act. The region was classified as a *serious* non-attainment area for ozone and, as such, Section 189(b)(1)(B) of the 1990 Federal Clean Air Act Amendments (CAA) requires the region to reduce ozone-forming pollution. Because the Valley did not attain the National Ambient Air Quality Standards (NAAQS) federally mandated deadline of November 15, 1999, the region was recently re-classified by the EPA as a *severe* non-attainment area for ozone.

While the attainment of clean air standards confers many benefits, these benefits do not come without costs. Therefore, the development of effective air quality management strategies must consider the social and economic costs of regulation as well as the air quality benefits. Recognizing this, the California state legislature adopted AB 2061 (Polanco) in 1991. This legislation requires air pollution control districts with populations of 500,000 or more to perform socioeconomic impact assessments of their rules and to consider these impacts in the rule adoption, amendment, or repeal process. The socioeconomic impact analysis is used in the rule adoption process to determine if the measures under consideration are equitable, and justifiable given the regional economic impacts. The District Governing Board actively considers the socioeconomic impact report and makes a good faith effort to minimize any potential adverse socioeconomic impacts. This process gives affected entities means for participation and input into the rule making process, thus laying a foundation to address and consider industry concerns.

In April 1994, the Governing Board of the District adopted a revised set of procedures for conducting socioeconomic impact analyses. These procedures were designed to consider the costs of compliance with regulation, the business responses of affected parties in order to address these regulatory costs, the direct impacts of these responses on employment, output, and income of the affected parties, and the overall impacts on regional employment, output, and income. In addition, the procedures were developed to assess important impacts on affected parties and the regional economy that may be difficult to quantify. The procedures anticipated significant input from industry through workshops, surveys, and/or consultations with industry associations. The results contained in this report are from a socioeconomic impact analysis conducted in conformance with these procedures.

1.2 Benefits of Clean Air

Despite years of effort and some improvements, air pollution is still a serious problem for the Valley. Historically, the San Joaquin Valley Air Basin has not attained the California or the NAAQS for ozone and particulate matter. The obvious goal of the District is to attain the health-based standards that have been established by the state and federal governments, while accommodating a reasonable and inevitable level of growth.

Section 40728.5 of the California Health and Safety Code requires the District to analyze the economic impacts of certain rules, but limits the analysis to costs borne by industry in complying with the rule. A more complete cost analysis would include an evaluation of the health benefits and business savings realized by reducing air pollution. Although the District is mandated by law to analyze only the regulatory compliance costs, the following discussion of air pollution costs is vital information for District decision makers.

Under Section 812 of the Clean Air Act Amendments, the EPA is required to conduct periodic assessments of the effects of the Clean Air Act Amendments of 1990 on the United States economy, public health and environment. The second study in the series, released in November 1999, indicates that benefits from the Clean Air Act Amendments will exceed costs by a margin of four to one. The EPA estimates that in 2010, the benefits of the Clean Air Act programs will total approximately \$110 billion. This estimate is based on the value of illnesses and premature deaths that would have occurred if the Amendments were not enacted. In contrast, a detailed analysis reveals that the costs of achieving these benefits are only about \$27 billion.

Nationwide, air pollution costs private citizens and industry at least \$50 billion in health care and lost productivity every year according to the American Lung Association's "Survey of Studies on The Health Costs of Air Pollution". This study cites a report entitled "The Benefits of Air Pollution Control in California" (1986 ARB Report). The ARB Report estimated that air pollution could result in \$8.1 billion more in annual health care costs in four regions of California if current regulations were not in place. It was also reported that \$1.2 billion in annual health costs were projected to be saved as a result of the installation of additional air pollution controls by 1987. The ARB Report analyzed the health effects of PM-10, sulfur dioxide, nitrogen oxides, and ozone in the San Diego, San Joaquin Valley, South Coast, and Bay Area air basins. It is important to note that health cost assessments focus on those effects that can be most clearly correlated with exposure to air pollution.

Some air pollutants that pose health problems are directly emitted into the air. Others are formed in the atmosphere through chemical reactions among polluting gases that are triggered by sunlight. Some chemical substances are so common and widespread that they build up in the air and become a hazard to human health. The EPA has developed health-based national air quality standards for the following air pollutants as explained in the ARB pamphlet on "Facts About Air Pollution and Health," published in 1991.

Particulate matter

Particulate matter is 10 microns or less in diameter, about one-seventh the size of a human hair, and is known as PM-10. Even though all particles of ten microns or less are a health problem, they affect different parts of the respiratory tract depending on their size. Concern for these particles is based on their ability to bypass the body's natural filtering system, posing a threat to the respiratory tract. Particles from 2.5 to 10 microns in diameter tend to collect in the upper portion of the respiratory system, affecting the bronchial tubes, nose and throat. Particles 2.5 microns and smaller in diameter can infiltrate deeper portions of the lung and remain there longer, increasing risks of long-term disease.

Short-term exposures can lead to coughing and throat irritation, which often leads to asthma. The smaller airborne products are unhealthy because they invade the deepest recesses of the lungs, causing or aggravating asthma and other respiratory conditions. Particulate matter is known to exacerbate respiratory and other chronic pulmonary illnesses, especially in children. In fact, asthma is the leading cause of hospital admissions and school absentee rates for children living in the Valley. Longer exposures can increase susceptibility to bronchial disease. Particulate matter is also associated with other health risks. Some of the directly emitted particulate, such as diesel soot and wood smoke, can be carriers for other toxic compounds including benzene and dioxin, increasing potential cancer risks. In addition, the American Heart Association published a study closely correlating increased risks of heart attacks – up to 62 percent – with higher levels of fine particulate matter.

Particulate matter can be emitted directly into the air, such as the case with diesel soot, wood burning, wind blown dust, or as the result of agricultural or construction operations. It can also be produced through photochemical reactions among polluting gases, primarily sulfur oxides, resulting in corrosive sulfate or nitrate particles. This process is known as secondary formation of particulate matter and is mostly composed of fine particulate matter in the 2.5 micron or smaller range. Although all particles can pose a potential health problem, the greatest concern is for microscopic, invisible particles because they pose the greatest health threat.

Ozone

Ozone is the chief component of urban smog and is a highly reactive compound. Short-term exposure can cause constriction of the body's airways, forcing the respiratory system to work harder in order to provide oxygen, thereby adding stress to the body. Chronic exposure to ozone levels above the state and federal ambient standards can damage the alveoli, the individual air sacs in the lungs where oxygen and carbon dioxide are exchanged. Over time, this membranous, filmy tissue is permanently damaged, reducing its ability to function and accelerating the natural loss of lung capacity.

Ozone is formed through chemical reactions of hydrocarbons and nitrogen oxides (NO_x). Hydrocarbons, a type of Volatile Organic Compound (VOC), are released into the air by incomplete combustion of organic materials. Sources of hydrocarbon emissions include fuel combustion in motor vehicles and stationary sources, organic solvent evaporation, industrial processes, and solid waste disposal. Similarly, NO_x is discharged into the air from combustion devices located in motor vehicle engines, power plants, co-generation plants, stationary internal combustion engines and boilers.

Carbon monoxide

Carbon monoxide is a byproduct of incomplete combustion, primarily from motor vehicle exhaust. Carbon monoxide is readily absorbed into the body from the lungs, where it binds with hemoglobin, which reduces the ability of this protein to carry oxygen. The result is reduced levels of oxygen reaching the heart, brain and other tissues. This can be critical for people with heart disease, chronic lung disease or anemia, as well as for unborn children. Even healthy people who are exposed to excessive carbon monoxide can experience headaches, fatigue, slowed reflexes and dizziness.

In addition to the health care problems, the ARB's pamphlet on "Facts About Smog and California Crops" has identified that air pollutants interfere with photosynthesis, causing damage to agricultural crops, trees harvested for lumber, ornamental plants, and natural vegetation. In many crops, air pollutants stunt growth, reduce yields, and cause aesthetic damage, which lowers the market value of the crop. An economic assessment conducted by the University of California, Davis in 1984 estimated that damage to crops caused by ozone in California totaled almost \$333 million; about 90 percent of this damage was located in the Valley.

The remainder of this report is organized as follows:

- regulatory context and discussion of the rule (expected air quality benefits, specific rule requirements and affected parties and benefits)
- overview of the socioeconomic impact analysis methodology
- description of socioeconomic background, identification of affected parties, their economic characteristics, and associated regulatory costs
- net economic impacts
- conclusions

Chapter 2 Rule 4692 Commercial Charbroiling

This report is prepared for draft Rule 4692, dated October 27, 2001. The draft rule and staff report for Rule 4692 can be obtained from the District web page (www.valleyair.org) or by contacting the District office:

San Joaquin Valley Unified Air Pollution Control District
Central Office
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
(559) 230-6000

2.1 Regulatory Context

The purpose of the proposed Rule 4692 is to control VOC and PM-10 emissions from commercial charbroiling activities. This rule applies to owners and operators of chain-driven charbroilers used to cook meat. Other commercial restaurant equipment, including under-fired charbroilers, may be subject to future rule provisions when cost-effective technologies are identified. The following is a brief summary of the requirements for the proposed rule. The draft of Rule 4692 provides a more detailed description.

- One year from the rule adoption date, all existing chain-driven charbroilers in operation will be equipped with a catalytic oxidizer control device and tested in accordance to the SCAQMD protocol. Other control devices may be used if certified for use in the SCAQMD, or found to be more effective than the catalytic oxidizer in reducing VOC and PM-10 emissions.
- After the rule adoption date, all new chain-driven charbroilers will be equipped with a catalytic oxidizer control device and tested in accordance to the SCAQMD protocol. Other control devices may be used if certified for use in the SCAQMD, or found to be more effective than the catalytic oxidizer in reducing VOC and PM-10 emissions.
- Catalytic oxidizers or other control devices will be operated, cleaned and maintained in accordance to manufacturer's specifications.
- Owners and operators will record the date of installation or changing, cleaning and maintenance of the catalyst or approved control device. The records will be retained for at least five years and made available to District staff upon request.
- Alternative record keeping methods may be used if approved by the APCO and EPA.

2.1.1 Exemptions

The following activities will be exempt from the provisions of Rule 4692:

- Chain-driven charbroilers used to cook 875 pounds or less of meat per week.
- Chain-driven charbroilers used to cook more than 875 pounds of meat per week but emit less than one pound per day of any criteria air contaminants.

Owners and operators of chain-driven charbroilers exempt from provisions of the proposed rule will be required to maintain weekly records of the amount of meat cooked and monthly records of the amount of meat purchased. These records will be retained for at least five years at the restaurant location and must be made available to District staff upon request.

Chapter 3 Socioeconomic Impact Analysis Methodology

There are several steps in developing the socioeconomic impact analysis.

1. The rule is evaluated to determine what compliance actions are required and the specific technologies and options which are approved for compliance under different circumstances.
2. The potentially affected industries, entities or groups of industries are identified with the guidance of the District staff.
3. Costs associated with implementing the compliance option are estimated and reviewed by the District staff.
4. The compliance case scenarios and associated costs for the affected industries/institutions are made.
5. Economic characteristics and other relevant economic/business data pertaining to the affected industries are examined. Different control options and compliance scenarios correlated with the affected industries are analyzed and compared with available economic characteristics of the affected industry groups. Then the direct economic impacts stemming from the anticipated regulatory costs for full compliance are determined.
6. A regional input-output model is used to estimate indirect and induced impacts on the region's economy. These impacts are expressed in terms of changes in output and employment.

For this socioeconomic impact assessment, compliance cost estimates are based on data reported by the District staff. The District collected compliance costs to the rule by contacting various industry representatives and convening workshops.

3.1 Identification of Affected Parties

The rule is expected to affect owners and operators of commercial cooking operations using chain-driven charbroilers to prepare meat for human consumption. The affected entities are restaurants, categorized in Eating and Drinking Places under Standard Industrial Classification (SIC) 58. According to the new industry classification system, the North American Industry Classification System (NAICS), restaurants are classified under NAICS 722, Food Services and Drinking Places. Fast food restaurants belong to a subcategory NAICS 722211, Limited-Service Restaurants, where customers order and pay for food items before eating. The majority of restaurants potentially affected by the rule in the Valley are two fast food chains: Burger King and Carl's Jr. These two chains are estimated to account for approximately 80% of total restaurants potentially affected by the proposed rule in the Valley. For the purpose of this report, the remaining 20 percent of the potentially affected restaurants will be referred to as Other Restaurants. This category of Other Restaurants includes, but is not limited to, full-service restaurants, limited-service/fast food restaurants (except Burger King and Carl's Jr.) and various cafeterias. Table 1 provides JFA's estimates of the potentially affected entities.

Table 1: Types of Restaurants Using Chain-driven Charbroilers in the Valley

Restaurant Type	Number of Chain-driven Charbroilers	Percentage of Affected Chain-driven Charbroilers
Burger King	70	40%
Carl's Jr.	70	40%
Other Restaurants	35	20%
Total	175	100%

Source: Industry Representatives (Telephone correspondence and interviews, 2001)

3.2 Compliance Scenarios

In complying with the rule, all affected entities are required to control VOC and PM-10 emissions by installing a catalytic converter or other approved emissions control device. In addition, owners and operators will be required to complete the following maintenance and administrative tasks:

- Adopt appropriate methods of cleaning and maintaining the emissions control device.
- Maintain records including dates of installation and changing, cleaning and maintenance of the control device. These records will be retained for at least five years and made available to District staff upon request.

Owners and operators of chain-driven charbroilers are exempt if either of the following criteria apply:

- Limit the amount of meat cooked on chain-driven charbroilers to less than 875 pounds per week by accepting a permit condition.
- Provide evidence determined by a specified test method that emissions from the chain-driven charbroilers are less than one pound per day of any criteria air pollutant.

Owners and operators applying for exemption are also expected to keep records of the amount of meat cooked and the amount of meat purchased. These records will be retained at the restaurant location for at least five years and made available to District staff upon request. More detailed information on administrative, record keeping and test method requirements is outlined in draft Rule 4692, dated October 27, 2001.

For the purpose of this analysis, JFA relied upon the District's assessments of the most likely compliance options and respective costs. The District collected extensive data and information from industry representatives to generate an analysis of available technologies. Such technologies include catalytic oxidizers, self-cleaning ceramic filters, fiber-bed filters, and incineration (catalytic and thermal). Through a cost effectiveness analysis, the District estimated that the flameless catalytic oxidizer is the most cost effective available method for controlling VOC and PM-10 emissions from chain-driven charbroilers. As a result, JFA's impact analysis is based on installation of the flameless catalytic oxidizer since it is considered the most likely option for meeting the rule's requirements.

3.3 Development of Direct Impact Estimates

JFA anticipates that potential direct impacts from the rule will be concentrated in the restaurant sector of the Valley. The District staff provided JFA with information regarding the two major fast food chains using chain-driven charbroilers: Burger King and Carl's Jr. JFA consulted with representatives from these two fast food chains to identify the number of Burger King and Carl's Jr. restaurants currently operating in the Valley. In order to determine if there are other restaurants in the Valley using chain-driven charbroilers, JFA consulted with representatives from the catalyst and broiler industries. After consulting with the industry representatives, JFA determined that there are restaurants other than Burger King and Carl's Jr. that could potentially be affected by the rule. From information gathered, JFA approximated the size of this Other Restaurants group. With an estimate of the number of potentially affected entities, JFA used compliance costs provided by the District to determine direct impacts in terms of changes in industry output levels and employment.

JFA conducted Internet and literature searches in developing the socioeconomic analysis of the proposed rule on the Valley. Demographic and economic information about the Valley was gathered from the following online sites: Department of Finance, United States Census Bureau, Bureau of Economic Analysis, and California Employment Development Department. Sources for statistics, trends and recent developments in the restaurant and fast food industry include the following websites: Nation's Restaurant News, Restaurants and Institutions, National Restaurant Association (NRA), and California Restaurant Association (CRA). References for information about the fast food industry also include the 2001 Directory of High Volume Independent Restaurants, Directory of Chain Restaurant Operators 2000, and 1997-1998 Northern and Southern California Business Directories.

It should be noted that for this analysis, JFA used NAICS 722211, Limited-Service Restaurants, as a profile for fast food restaurants. The CRA uses data collected under NAICS 7222, Limited-Service Eating Places, to describe the fast food industry. NAICS 7222 is further categorized into three NAICS groups: Limited-Service Restaurants, Cafeterias, and Snack and Nonalcoholic Beverage Bars. As NAICS 722211 provides a more accurate description of fast food restaurants than NAICS 7222, JFA used statistics gathered under this subcategory to describe fast food restaurants. Other types of restaurants included under NAICS 722211 are take out eating places, pizza delivery shops, delicatessens, and drive-in restaurants. In compliance with CRA terminology, JFA also used Eating and Drinking Places (SIC 58) to describe the restaurant industry as a whole.

This study utilizes a regional input-output model using information from the District staff and sources listed above. The input-output model used in this study is the IMPLAN input-output economic modeling system, originally developed for the U.S. Forest Service and currently maintained by the Minnesota IMPLAN Group. The IMPLAN provides estimates of economic activities associated with changes in activity level. The model represents the economy in terms of 528 industrial sectors, roughly corresponding to a combination of 3- and 4- digit SIC industries. One of the principal advantages of the model is its ability to construct multi-county regional models using county level economic data. In this study, costs associated with

complying with many of the requirements from the rule represent the changes in economic activity level. Direct effects from expenditures associated with the rule are estimated through the IMPLAN model.

Furthermore, full consideration was given to any potential positive direct impacts stemming from the rule. These impacts were estimated in the model by determining the costs associated with compliance actions, and allocating the dollar amount into the relevant economic sectors of the regional economy that would be expected to benefit from the increased output.

Both positive and negative direct impacts are simulated in the model concurrently, resulting in estimated net direct impacts.

3.4 Indirect and Induced Impacts

Actions and costs associated with compliance to the rule will not only impact those industries directly affected by the rule, but also impact many others in the region. Indirect impacts tend to be multiplied and spread throughout the regional economy. Some of the indirect impacts include inter-industry impacts. For example, if an industry reduces its output, then other industries providing supplies and services to that industry will experience a reduction in their sales. A second type of indirect impact (or induced impact) results from the loss of personal consumption expenditures. This results when employees who lose jobs reduce their spending in accordance to their reduced income and thus their purchasing power. This is also possible when small business owners incur additional expenditure due to compliance actions, and reduce their profit margins. The amount of spending lost in the community is assumed to be the total dollar amount of costs incurred minus 40 percent taken out for taxes and savings.

To determine these indirect and induced effects, the IMPLAN input-output model is used. The results of the model show the total change in output and employment for the regional economy as a whole, as well as the changes in output and employment for specific regional industries. The model's results show which industries experience the greatest indirect and induced impacts from the adoption of the rule.

Chapter 4 Socioeconomic Background & Affected Industries

Population

The Valley has a population of 3.3 million people, approximately 10 percent of California's total population. While the average growth rate for the Valley slowed down to 1.7 percent during the latter 1990s, 1999-2000 data shows an increased rate of 2.86 percent. According to the Department of Finance (DOF), the annual growth rate for the Valley for the next 20 years will be 2.24 percent. Historically, annual population growth has been higher in the Valley than in the rest of California. Projected annual growth for the Valley will continue to surpass that of the state throughout the next four decades. Table 2 provides average annual growth rates for both the Valley and California.

Table 2: Average Annual Growth Rate of Population

Region	1990-1995	1995-2000	2000-2020	2020-2040
Valley	2.05%	1.70%	2.24%	1.77%
California	1.01%	1.47%	1.48%	1.29%

Source: US Census Bureau, Census 2000

Around 10.44 percent of the Valley's population, or 344,700 people, are between the ages of 18 to 24. This age group also accounts for approximately 10 percent of California's total population.

Unemployment and Per Capita Income

While population growth rate of the Valley exceeds that of California, the unemployment rate of the Valley is historically 6 percent above that of the California average. In 2000, the unemployment rate for the Valley was 12.3 percent while the rate for California was 4.9 percent.

Historically, per capita income for the Valley is lower than that of California and that of the United States. As seen in Table 3 below, the annual rate of growth in per capita income of the Valley is also slower than that of the rest of the country.

Table 3: Per Capita Income (in dollars) and Annual Growth Rate

Region	1990	1995	1999	Annual growth 90-95	Annual growth 95-99
Valley	16,455	17,926	20,324	1.7%	3.2%
California	21,889	24,496	29,856	2.3%	5.1%
USA	19,584	23,562	28,546	3.8%	4.9%

Source: Bureau of Economic Analysis, 2001

Industry

Employment in the Valley's industries can be broadly categorized as 18 percent farm and 82 percent nonfarm. Nearly half of California's farm employment resides in the Valley.

Government (20%), services (20%), and trade (20%) dominate the Valley's nonfarm industries. Other nonfarm industries in the Valley include manufacturing (10%), construction and mining (6%), transportation and public utilities (4%) and finance, insurance and real estate (2%). While

the largest shares of the nonfarm industries' employment are in government, services and trade sectors, the greatest 1999-2000 growth rates are in construction and mining (7.6%), government (4.1%), and services (3.8%). Retail trade accounts for 80 percent of total trade in the Valley, with an average growth rate of 1.5 percent from 1990-2000. Retail trade experienced a higher than average growth of 3.08 percent from 1999-2000. Table 4 provides a comparison of different industry growth rates throughout the latter 1990s.

Table 4: Annual Growth Rate of Industries in the Valley (March 2000 Benchmark)

Title	1994	1995	1996	1997	1998	1999	2000
All Industries	2.14%	2.42%	3.03%	1.86%	1.75%	2.16%	3.18%
Retail Trade	1.15%	1.52%	1.84%	0.99%	0.84%	2.24%	3.08%
Eat Drink	1.60%	3.57%	3.27%	-0.45%	0.42%	3.48%	3.78%

Source: Employment Development Department, 2001

During the 1990s, eating and drinking places (SIC 58) have consistently constituted 35 percent of retail trade employment, or 5.5 percent of total employment in the Valley. The eating and drinking places sector for the year 2000 employed nearly 67,000 workers. This sector also experienced an increased growth rate of 3.78 percent from 1999-2000, compared to its lower average annual growth rate throughout the 1990s.

Eating and Drinking Places

According to the NRA, California's eating-place sales volume is expected to grow over 5 percent in 2001. With projected sales of \$39.6 billion, California is expected to have the largest eating-place sector in the nation. According to the CRA, the Valley's restaurants account for 8 percent of total restaurants in the state while the Valley's restaurant workers account for a comparable 7.2 percent of total restaurant employees in California. In year 2000, there were approximately 5,900 restaurants employing 67,000 employees in the Valley. The Board of Equalization's 1999 Annual Report states taxable sales of restaurants are \$2.1 billion in the Valley and \$32.5 billion for the state of California. Table 5 below provides a profile of Eating and Drinking Places in the Valley, and California.

Table 5: Profile of Eating and Drinking Places

Region	Establishments	Sales (\$1,000)	Paid Employees
San Joaquin Valley	5,894	\$2,1330,000	66,090
California	73,850	\$32,500,000	918,400
Percent of California	8%	6.6%	7.2%

Source: 1997 Economic Census

Fast Food Restaurants

There were approximately 20,765 fast food restaurants in California in 1997. Fast food restaurants accounted for 28 percent of total eating and drinking places in California. In 1997, total fast food sales in California were approximately \$11.8 billion while the total number of employees was about 321,000. As previously noted, JFA used NAICS 722211, Limited-Service Restaurants, as a profile for fast food restaurants.

Unlike projected growth of eating and drinking places sales, fast food sales are expected to slow in 2001. Adjusting for inflation, increase in sales will grow 1.8 percent in 2001, compared to 2.1 percent in 2000 and 2.3 percent in 1999. The growth in the number of fast food restaurants has also decreased to 1.3 percent in 2000, from 1.6 percent in 1999 and 7 percent in 1996. The NRA attributes this projected slowdown in sales to increased competition and a weaker domestic economy. According to the NRA's 2000 Consumer Survey, demand for convenience in meals is increasing among consumers. As a result, foodservice providers such as grocery stores and convenience stores are offering a larger selection of takeout food. Increased competition among providers of takeout food, along with a slowdown in growth due to a weaker national economy, has contributed to decreased demand for fast food takeout. The slowdown in the growth of fast food establishments is a result of corporations selling company-operated establishments to franchisees, as well as a growing trend towards dual-concept restaurants in which two brands of food are sold in one restaurant.

According to the NRA's 2000 Quickservice Operator Survey, the biggest challenge for fast food restaurants in 2001 is recruiting and retaining employees. Two-thirds of the operators surveyed reported difficulty in maintaining an adequately staffed restaurant. As a result, operators are planning to spend more money on training programs that build employee loyalty and emphasize fast food employment as a career rather than a temporary job. In addition, two-thirds of operators surveyed stated their intent to increase sales by introducing new food items.

Approximately 7 percent of fast food restaurants in California are located in the Valley. Sales in fast food restaurants for five of the eight counties in the Valley total \$832.8 million with the number of paid employees approaching 26,000. Information for the three other counties, Madera, Merced and Tulare, was not included. Although the reason for exclusion is unknown, a possible explanation is that data from these three counties was not released as to protect the proprietors' rights due to the small number of establishments in the counties. Table 6 provides 1997 profiles for fast food restaurants in the Valley and California.

Table 6: Profile of Fast food Restaurants (NAICS 722211 Limited-service Restaurants)

Region	Establishments	Sales (\$1000)	Annual Payroll (\$1000)	Paid Employees
Fresno	450	\$260,699	\$63,021	8,152
Kern	411	\$219,053	\$53,008	6,865
Kings	61	\$37,665	\$8,968	1,135
San Joaquin	289	\$168,348	\$39,515	4,949
Stanislaus	254	\$147,009	\$35,573	4,612
San Joaquin Valley*	1,465	\$832,774	\$200,085	25,713
CA	20,765	\$11,843,402	\$2,808,005	321,176
Percent of CA	7.06%	7.03%	7.13%	8.01%

* excluding the following counties: Madera, Merced, Tulare

Source: 1997 Economic Census

According to an industry representative, McDonalds has the most fast food restaurants locations in the Valley followed by Carl's Jr., Jack in the Box and Burger King, in that order.

Burger King Corporation owns the second largest fast food chain in the nation, with approximately 8,300 domestic locations; 8 percent of the Burger King locations are company-operated and 92 percent are owned by franchisees. According to an industry representative, average annual sales volume for Burger King restaurants in the Valley is \$900,000. Recent publications have reported Burger King's difficulty with animal rights groups protesting the company suppliers' alleged maltreatment of animals. Burger King has responded by creating and implementing more specific requirements regarding supplier treatment of animals. Burger King has also introduced new food items including appetizers, to allure customers. The company plans to increase its use of technology in order to reduce costs while maintaining high quality customer service. Such improvements include an online employee training program, electronic order boards at drive-thrus, and increased acceptance of ATM/credit cards. To increase customer loyalty, Burger King joined with eBay in November 2001 to form the first Internet-based loyalty program in the fast food industry. Under this program, Burger King customers are awarded "points" that can be used to bid on rewards posted on a co-branded Burger King and eBay site. According to an August 2001 article in *Restaurants and Institutions*, Burger King plans to install a new broiler, which costs \$21,000 to \$27,000, in all stores by June 2003. This broiler is designed to cook a variety of food at different temperatures and different lengths of time. Given the implementation of Rule 1138 in November 1999, it is assumed that these chain-driven charbroilers will be equipped with an approved emissions control device.

Carl's Jr. restaurants are owned and franchised by CKE Restaurants, Inc. There are currently 945 Carl's Jr. restaurants in the nation, with locations concentrated in the western United States. CKE also owns two other fast-food chains. CKE's primary east coast fast-food chain is called Hardee's, with approximately 2,526 domestic locations. The other fast-food chain CKE owns is Taco Bueno, which has 125 domestic locations. Of the total Carl's Jr. restaurants, 51 percent are company-operated, 46 percent are franchised, and 3 percent are internationally franchised. Approximately 33 percent of company-operated (160) and 11 percent of franchised (50) restaurants are dual-brand with Green Burrito. As the addition of Green Burrito food items is aimed at supplementing sales, the amount of meat charbroiled should be the same in both single and dual-brand restaurants. Annual average sales for company-operated Carl's Jr. restaurants is \$1.078 million. In its Annual Report 2001, CKE reported a growth strategy focused on reducing leverage, revitalizing Hardee's, and maintaining a strong brand image for Carl's Jr. by introducing new food items. In an effort to reduce debt and generate cash, CKE is selling company-operated units to new and existing franchisees. During the second quarter 2001, the company sold 23 restaurants to franchisees and closed four restaurants while franchisees opened four restaurants. Four more company-operated units were sold to franchisees during the third quarter, and 5-10 new franchised stores are expected to open in the fourth quarter. In fiscal year 2001, CKE also increased its payroll and employee benefits by 2 percent from 29 percent of company-operated revenues in an effort to attract and retain employees. Of CKE's 35,000 total employees, over 90 percent are paid based on hourly wages while under 10 percent are salaried.

Number of Locations

According to the District and industry representatives, Burger King and Carl's Jr. are the two major fast food chains affected by the proposed rule. To determine the total number of restaurants affected by the rule, the District contacted County Environmental Health Departments to gather lists of permitted restaurants in the Valley. According to these lists, there are a total of 80 Burger King restaurants and 54 Carl's Jr. restaurants located within the Valley. The District estimated an additional 16 restaurants using chain-driven charbroilers to arrive at a total estimate of 150 restaurants with chain-driven charbroilers in the Valley. According to a Carl's Jr. representative, there are 70 Carl's Jr. locations in the Valley: 22 company-operated and 48 franchised. Nine of the company-operated and thirteen of the franchised restaurants are dual-brand with Green Burrito. According to a Burger King representative, there are approximately 70 Burger King restaurants in the Valley. All Burger King units in California are franchised; 20 of these franchised units are engaged in a unique partnership agreement with the company. With 70 Carl's Jr. restaurants and 70 Burger King restaurants, JFA is approximating 140 major fast food restaurants with chain-driven charbroilers. Possible explanations for why the estimated number of locations for these two chains in the San Joaquin Valley is the same while the number of domestic locations differ from 8,300 Burger King restaurants to 945 Carl's Jr. restaurants can be attributed to each company's structure and origination. While Burger King is the only fast-food chain owned by the Burger King Corporation, Carl's Jr. is one of three fast-food brands owned by CKE Restaurants, Inc. The other two CKE brands, Hardee's and Taco Bueno, have approximately 2,650 locations. In addition, Carl's Jr. originated in Los Angeles in 1945 and expanded into the northern part of the state after establishing locations in Southern California. On the other hand, Burger King originated in Miami, Florida in 1954 and began its expansion throughout Florida and the Southeast. Table 7 below provides a distribution of Carl's Jr. and Carl's Jr./Green Burrito restaurants in the Valley.

Table 7: Distribution of Carl's Jr. and Carl's Jr./Green Burrito Restaurants in the Valley

San Joaquin Valley Counties	Ownership Type		Brand Type	
	Company Restaurants	Franchised Restaurants	Carl's Jr. Restaurants	Carl's Jr. /Green Burrito Restaurants
Fresno	3	18	16	5
Kings	2	0	1	1
Kern	12	0	8	4
Madera	0	3	1	2
Merced	0	4	2	2
San Joaquin	0	10	7	3
Stanislaus	0	10	8	2
Tulare	5	1	3	3
San Joaquin Valley	22	46	46	22

Source: Carl's Jr. Representative (Telephone interview, 2001)

In order to determine how many other restaurants in the Valley besides the two aforementioned restaurants use chain-driven charbroilers, JFA contacted distributors and vendors of catalyts

used on chain-driven charbroilers. One industry representative approximates 80 percent of restaurants with chain-driven charbroilers belong to Burger King and Carl's Jr. Another industry representative says that given 150 Carl's Jr. and Burger King restaurants, there are at most 50 more restaurants with chain-driven charbroilers. According to these estimates, approximately 20 – 25 percent of restaurants with chain-driven charbroilers are not Carl's Jr. or Burger King. Therefore, there are at most 35 to 46 restaurants that can be categorized under Other Restaurants. Assuming there are 140 Carl's Jr. and Burger King restaurants in the Valley, JFA estimates 35 Other Restaurants with chain-driven charbroilers. JFA is using the more conservative estimate because it is likely that a portion of these restaurants would be exempt from the rule because they do not cook over 875 pounds of meat per week or emit more than one pound per day of any criteria air contaminant. It is important to note that the total possible number of chain-driven charbroilers in the Valley range from 140 to 186.

Employment

According to fast food industry representatives, there are approximately 30 employees per Carl's Jr. and Burger King establishment. Information in the 1997-1998 Northern California Business Directory confirms the representative's estimate: 87 percent of Carl's Jr. and Burger King restaurants have between 20-49 employees, 8 percent have between 10-19, 4 percent have between 50-99 and 1 percent have between 5-9. The proportion of full-time to part-time employees differs for each restaurant location. A Burger King representative estimated that 80 percent of employees are part-time and 20 percent are full-time. Factors affecting full-time and part-time employment include location of restaurant, number of customers, and labor pool. Most locations consist of crewmembers (food preparation and serving workers), shift leaders, and a general manager. The majority of shift leaders and general managers are full-time employees. An industry representative estimated approximately 60 percent of Burger King employees earn minimum wage. Currently, minimum wage in California is \$6.25 per hour. As of January 2002, wage rates will increase to \$6.75 per hour. As a result, labor costs will increase considering a significant portion of fast food workers earn approximately minimum wage.

Response to Rule

A catalyst manufacturer estimated that none of the affected restaurants are currently in compliance with the proposed rule. The advent of Rule 4692 is not a surprise for most of the affected restaurants considering a similar rule (SCAQMD Rule 1138) was recently implemented in the South Coast Air Basin. Negative reactions are expected from both company and franchise operators due to additional compliance costs within an increasingly competitive industry. Industry representatives identified escalating costs and competition as the two major concerns facing the fast food industry. While costs associated with owning a restaurant in California – labor, employee benefits, commodities, utilities, business insurance - are rising, increasing competition is preventing owners from raising prices to meet these additional costs.

It is difficult to determine how restaurant operators will meet the compliance costs. Some fast food representatives mentioned that increased costs could impact labor, especially because it is a controllable cost, unlike the cost of utilities or business insurance. Other plausible responses are postponing planned retrofits, or absorbing the additional cost. Representatives anticipate greater reaction among franchisees because they usually do not have as many resources and support as company-owned units. Franchisees will most likely seek loans from the Small Business

Administration to cover the costs of retrofitting in accordance to the proposed rule. An industry representative familiar with the effects of SCAQMD Rule 1138 believes that most restaurants in the South Coast Basin have been able to absorb the additional costs associated with Rule 1138 without directly impacting employee wages. Another industry representative also believes that owners will absorb compliance costs because the costs are not that significant; since restaurants are already operating with the minimum number of employees needed for operation, layoffs would be unlikely.

It is also difficult to determine if Rule 4692 will deter potential franchisees. Fast food corporations do provide workshops to all interested franchisees to inform them of regulations considering that franchisees are responsible for costs associated with regulation compliance.

Chapter 5 Impacts on Affected Industries

As noted earlier, the analysis in this report utilizes a regional input-output model using information from the District staff and other relevant sources mentioned in the methodology section. The IMPLAN input-output economic modeling system provides estimates of economic activities associated with changes in activity levels of the potentially affected industries. In this study, compliance costs associated with many of the requirements from the proposed rule represent changes in economic activity levels. The IMPLAN model simulation results in estimated direct, indirect and induced effects from the expenditures associated with the rule.

This section presents an analytical framework that can be used in assessing impacts of the proposed rule. The approach used in this draft considers effects from compliance costs on all industry sectors simultaneously. The model takes potentially affected restaurants and their compliance expenditures into consideration at the same time, and assesses impacts on their respective industries as well as those on the local economy. JFA concurrently analyzed any potential positive influence on the regional economy from additional activities stemming from the affected restaurants' compliance actions. This framework is presented in section 5.1.

5.1. Affected Industries' Impacts Considered Simultaneously

As the affected businesses undertake compliance measures in order to meet the requirements of the proposed rule, they incur additional expenditures. The modeling of any impacts from the proposed rule requires estimated compliance costs. For this analysis, the District staff provided JFA with a set of estimated compliance costs. Under the analytical approach used here, JFA constructed and studied a model for assessing any negative and positive impacts the additional business expenditures may have on the affected industry itself, as well as other industries in the regional economy.

The IMPLAN model presented in this section takes these expenditure elements and provides estimates of economic activity associated with different activities or changes in their activity levels. The IMPLAN model translates the estimates of the affected industries' economic activities with respect to the compliance costs, and any changes in activity level within the sector and within the regional economy, into changes in terms of employment and output.

The District provided its estimated compliance costs. Two cases were examined as potential options for complying with the proposed Rule 4692. The first case uses flameless catalytic oxidizers, and the second compliance option uses thermal or direct-fired incineration technology. Annual costs for the catalytic oxidizer are \$1,050 per facility while annual costs for incineration are at \$96,175 per facility. JFA estimated the number of affected facilities to be around 175. Assuming that the affected businesses would opt for the cheaper of the two options, JFA multiplied the number of facilities by the total annual cost per facility for installing and maintaining the flameless catalytic oxidizer (\$1,050).

The District's estimated compliance costs include the cost of equipment, installation, annual operation and maintenance, and any cost savings. Other rule requirements include testing for emissions and record keeping. It is assumed that the affected owners and operators of chain-

driven charbroilers may incur additional costs from testing pursuant to specified test methods, if additional testing is necessary. Owners who apply for exemption must provide evidence that emissions from chain-driven charbroilers are less than one pound per day of any criteria air contaminant, while owners with chain-driven charbroilers equipped with an emissions control device must provide evidence that emissions reduction is achieved. It is assumed that tests will be conducted periodically to ensure that emission limits are maintained. In terms of record keeping requirements, it is assumed that most restaurants currently satisfy the proposed record keeping requirements simply by maintaining their accounting systems which track sales and inventory of meat products. Since the affected entities already comply with the record keeping requirements, there will not be additional costs associated with the record keeping requirements.

The District's estimate of \$1,050 includes cost savings from less cleaning due to reduced grease buildup in air ducts and hoods. However, the estimate does not include potential cost savings from reduced use of natural gas. According to researchers at the College of Engineering-Center for Environmental Research and Technology (CE-CERT), University of California, Riverside, catalytic converters provide the additional benefit of reduced natural gas consumption by 5 to 10 percent. With escalating natural gas prices higher in California than the rest of the nation, reduced consumption might offer some relief to operators and owners of restaurants. As a result, compliance costs may actually be lower than estimated.

However, for the purpose of this report, JFA will use the District's compliance cost figure. With an estimate of \$1,050 per facility, the resulting total compliance JFA used in the input-output model is \$183,750 a year for the potentially affected 175 restaurants in the Valley. The industry sector used in the model, Eating and Drinking Places, includes, but is not limited to, full-service restaurants, limited-service restaurants (including fast-food), cafeterias, and snack and beverage bars. The total annualized compliance costs are applied to the 175 businesses in this sector, with a profile of these businesses described previously in the report.

While it is not certain how exactly each individual business affected by the proposed rule would respond to added compliance costs, some industry representatives provided non-specific responses for their industries as it is difficult to assess hypothetical scenarios in terms of business practices. Some of the industry representatives' responses are noted in Chapter 4.

Here, it must be noted that the IMPLAN model does not take each individual business response into consideration when analyzing impacts. Therefore, a job gain/loss expressed in a model may not be realized in the real world. An affected business entity experiencing negative impacts may absorb all impacts and may not reduce employment. However, data on impacts provided in this section allow a generally reasonable estimate of the impacts and their magnitude with respect to other industry groups and with respect to the rest of the regional economy.

In addition to labor force reductions, compliance actions required by the proposed rule can also yield some positive impacts. Positive impacts include increased local demand for various goods and services that the affected industry groups require in order for them to comply with the rule requirements. Such goods and services include, but are not limited to, catalytic converters, components of catalytic oxidizers, emissions testing, and related maintenance and repair services. Producers of catalytic converters are part of SIC 2899, Chemical and Chemical

Preparations, Not Elsewhere Classified (N.E.C.). According to the 1997 Economic Census, there are approximately 1,150 establishments in SIC 2899 with total value of shipments approaching \$12.8 billion. Other general increased spending derived from compliance measures can spur economic activities in the Valley as well. Not all of the positive effects, however, are captured inside the Valley economy because some goods and services needed to meet the rule requirements may be purchased from outside the Valley. The IMPLAN model used in this draft found some positive gains in various industry groups. However, the estimated positive impacts stemming from the rule appear to be minimal.

Further, indirect and induced effects having both positive and negative influences are considered in the IMPLAN model before producing final results. Numerous industries not necessarily associated with restaurants affected by the proposed rule are impacted, which in turn, impacts other industries in complex interactions within the Valley's regional economy. Various industries in retail and wholesale trade, as well as health care industries are indirectly affected by various compliance actions, including expenditures associated with the proposed rule. Seemingly unrelated sectors in the economy could reap benefits (or costs) as additional spending takes place in the model of the regional economy.

Net impacts are estimated after assessing all positive, negative, direct, indirect and induced impacts from the rule. Output figures are represented in dollars for calendar year 2001. Tables presenting the net impacts show both the affected restaurant industry sector and the rest of the Valley economy.

Table 8 shows net impacts expressed in terms of employment. With an annual total compliance cost of \$183,750, the overall outcome is negative, but not considerable both in terms of absolute and relative values. As noted in Chapter 4, the potentially affected fast-food sector employs more than 25,000 workers in the Valley. The IMPLAN model yielded an employment change of five job losses in the Eating and Drinking Places sector. The job losses are assumed to take place in the fast-food sector in the Valley. The five job losses estimated in the model would represent 0.02 percent of the applied sector's total employment, which would not be considered statistically significant. The total compliance cost applied in the model does not appear to be enough to produce significant impacts, especially when the affected sector produces a much larger amount in terms of business output. Some of the positive gains in jobs can be found in sectors making mechanical measuring devices and other industrial catalyst-related parts as complying with proposed Rule 4692 would require the installation of emissions control systems to chain-driven charbroilers. Additional testing and other requirements may also encourage positive job gains in industries that manufacture, service and maintain emissions control devices.

Table 8: Estimated NET Impacts from Compliance Cost on the Affected Industries measured as changes in Employment.

Industries	Direct	Indirect	Induced	Total
Eating & Drinking	-4.5	0	-0.1	-4.6
Chemical Preparations- N.E.C	0.1	0	0	0.1
Rest of the Valley Economy	0	-0.4	-0.4	-0.8
Total	-4.4	-0.4	-0.5	-5.3

In summary, net impacts in terms of employment appear to be small. According to the model, net estimated employment impacts are a loss of five to six jobs in the Valley.

Output changes show similar trends shown in the employment impacts. Considering that the affected sector accounts for hundreds of millions of dollars in output, the overall estimated impacts expressed in terms of output appear to be modest (less than \$100,000 in the Valley as a whole). Relatively modest impacts may in part be caused by the relatively small total annual compliance cost to the affected sector. The compliance cost when compared to the affected sector's overall output, which is over \$800 million a year, represents about 0.02 percent of the overall output. Because the additional expenditures faced by the affected entities are relatively small with respect to the affected group's economic strength, the rule's resulting impacts are estimated to be minimal as well. The IMPLAN model yielded an output change of \$96,200 lost in the Eating and Drinking Places sector. The output losses are assumed to take place in the fast-food sector in the Valley. The estimated loss of \$96,200 in the model would represent about 0.02 percent of the applied sector's total output, which would not be considered statistically significant. Table 9 displays changes in output stemming from the anticipated expenditures associated with compliance actions.

Table 9: Estimated NET Impacts from Compliance Cost on the Affected Industries measured as changes in Output

Industries	Direct	Indirect	Induced	Total
Eating & Drinking	-\$165,400	-\$1,600	-\$2,300	-\$169,300
Chemical Preparations- N.E.C	\$30,200	\$0	\$0	\$30,200
Rest of the Valley Economy	\$123,500	-\$40,100	-\$40,600	\$42,800
Total	-\$11,700	-\$41,700	-\$42,900	-\$96,200

Note: Impacts were rounded to the nearest \$100.

The IMPLAN analysis used in this report conducts concurrent assessments of positive, negative, direct, indirect and induced impacts. The analytical framework demands simultaneous consideration of all major affected sectors as well as the rest of the Valley economy. While the rest of the Valley economy sees positive gains in terms of direct impacts, it faces overall negative impacts when induced and indirect impacts are considered. Some of the negative impacts may be part of the ripple effect originating from negative direct impacts on the restaurant industry. Based on both the analysis and the industry representatives' input, the overall impacts stemming from the proposed rule's requirements appear to be small.

Chapter 6 Conclusion

Socioeconomic impacts of the proposed Rule 4692 are concentrated in the restaurant industry sector of the Valley economy. While there may be impacts in several other industry sectors, the greatest impacts will be experienced in the restaurant industry, specifically in limited-service restaurants.

The analysis involved the assessment of the affected restaurants, which include both Burger King and Carl's Jr. chains, and the rest of the Valley economy with compliance cost estimates provided by the District. The magnitude of impacts estimated and shown in this draft are dependent on the level of costs as estimated and processed in the IMPLAN input-output model. The total annualized compliance cost considered in the model is about \$183,750. JFA considered the affected sector and compliance costs simultaneously in an aggregate fashion as changing economic activity levels spread ripple effects throughout the regional economy.

On balance, the net impacts from the proposed rule are estimated to be a modest employment loss of six jobs in the Valley. Measured in changes in output, the net impacts from Rule 4692 are estimated to be about \$96,200 lost in the Valley. However, it must be noted that the order of magnitude in impacts appears to be not significant considering the overall size of the affected industries.

Based on the best available information and analysis using the IMPLAN model, JFA estimated socioeconomic impacts of the proposed rule. Adoption of the proposed Rule 4692 will result in small employment and output impacts in the Valley.