SOCIOECONOMIC
ANALYSIS
PROPOSED RULE

REGULATION 8, RULE 28: EPISODIC RELEASES FROM PRESSURE RELIEF DEVICES AT PETROLEUM REFINERIES AND CHEMICAL PLANTS

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1. EXECUTIVE SUMMARY

INTRODUCTION

This report describes the socioeconomic impacts of proposed amendments to Regulation 8, Rule 28 in order achieve and maintain state ambient air quality standards for ozone, and reduce episodic releases from atmospheric pressure relief devices in petroleum refineries. Following this summary, the report summarizes the proposed rule requirements and describes the methodology for the socioeconomic analysis. The report also describes the economic characteristics of sites affected by the proposed rule amendments along with the socioeconomic impacts of the proposed amendments. The proposed amendments will assist the BAAQMD in meeting its commitments to improving air quality in the region by improving the clarity and enforceability of Regulation 8, Rule 28.

SUMMARY

The proposed rule affects Pressure Relief Devices (PRD) at the five oil refineries in the San Francisco Bay Area region. It is estimated that the refineries employ about 1,935 workers and provide a total payroll of $557 million per year. The refineries are estimated to generate sales of $9.8 billion per year and to realize net income of about 7 percent of sales, or $689 million per year.

Compliance with the proposed rule amendments would require refineries to submit reports identifying all of their affected equipment and demonstrating that they have the capability to detect and record a Release Event from any of their PRDs. Compliance is expected to cost approximately $65,300 District-wide.

The socioeconomic analysis evaluates the compliance costs in relation to the financial characteristics of the affected facilities to determine the significance of the economic impact of the proposed rule amendments. The compliance cost represents approximately 0.01 percent of profits for the affected

facilities, well below the 10 percent threshold of significance for such impacts. The analysis concludes that the affected refineries should be able to absorb these costs without significant economic dislocation or job losses. The analysis also addresses the issue of potential impacts to small businesses but concludes that the affected refineries do not meet the criteria to be considered small business operations.

2. DESCRIPTION OF PROPOSED RULE

CURRENT STATUS OF THE RULE

Regulation 8, Rule 28, which addresses episodic emissions of both organic and inorganic compounds from Pressure Relief Devices (PRD) located at petroleum refineries and chemical plants, was last amended in 1998. For petroleum refineries, the rule requires that facilities report to the District any releases over 10 pounds from a PRD and that certain substantive measures be taken to reduce the likelihood of releases. For chemical plants, the rule requires only release reporting (releases of 10 pounds or more). The existing rule requirements are summarized below:

1) **New and Modified Sources**: PRDs at new and modified sources at petroleum refineries must vent to a fuel gas recovery system, furnace, or flare with a control efficiency of at least 98 percent

2) **Existing Sources**: Any PRD in organic compound service at an existing source at a petroleum refinery must implement specified prevention procedures to minimize releases.[1]

3) **Releases from PRDs**: Within 90 days of a reportable Release Event a facility must:

    a. Conduct a process hazard analysis including an evaluation of the cost effectiveness and technological feasibility of controls
    b. Implement prevention measures (to the extent they have not already been implemented)
    c. Conduct a failure analysis to discover the cause of the release and prevent recurrences

[1] The prevention measure procedures include: 1) establishing training, equipment, inspection, maintenance and monitoring requirements; and 2) implementing prevention measures such as process flow, temperature, level, and pressure indicators with interlocks; documented and verified routine inspection and maintenance programs; inherently safer design; and deluge systems.

All PRDs on the source that experienced the Release Event must be equipped with a telltale indicator and evaluated for control within 120 days of the Release Event. All PRDs on any source that experiences two or more Release Events within five years must be vented to a control device.

4) **Reporting Requirements for Refineries and Chemical Plants**: Following all Release Events: 1) the Event must be reported by the next working day; 2) the associated PRDs must be inspected within five days; and, 3) a report must be submitted to the District within 30 days.[2]

   The requirement to report this information implies that facilities must monitor PRDs to determine whether a Release Event has occurred and if so, the duration, cause, type and amount of material released. There is no explicit monitoring requirement in the rule, however.

PROPOSED RULE AMENDMENTS

In 2005, building upon the District's 2002 audit of PRDs located at the five refineries located in the San Francisco Bay Area (Bay Area), District staff evaluated the rule and developed a set of recommendations to improve its effectiveness. Based upon those recommendations, staff is proposing the following amendments to the Rule:

1. Require facilities to ensure that they have the capability to detect and quantify all release events, including small releases of 10 pounds (the reporting threshold), and require facilities to demonstrate this capability to the District;
2. Require data recording and recordkeeping for venting and emissions verification;

[2] The report must include: 1) date, time, and duration of Release Event; 2) device that experienced the Event; 3) District-assigned release number; 4) type and size of device; 5) type and amount of material released; 6) information used to estimate duration and amount released; 7) cause of release; 8) schedule prevention of re-occurrence action; and, 9) results of fugitive emission inspection.

3. Clearly define the equipment subject to the rule as the process unit to ensure that the original intent of the rule – to regulate all PRDs on an individual source (i.e., process unit) in the same manner – is clarified;
4. Require facilities to report to the District their analysis of the root causes and potential corrective actions after each PRD release event;
5. Make minor, non-substantive changes to the rule such as deleting obsolete references to "turnarounds," moving requirements where appropriate, and clarifying various sections of the rule.

EMISSIONS REDUCTIONS

Since the 1998 amendments took effect, there have been 42 Release Events reported by the five Bay Area refineries according to Release Event Reports submitted to the District. These 42 Release Events vented 125 tons of VOC emissions, according to the refineries' calculations. The 125 tons of reported VOC emissions translates to average emissions of approximately 17.9 tons per year.

Ensuring that facilities are using comprehensive monitoring systems will ensure that facilities are fully aware of release events, which will allow operators to better target their release prevention and mitigation efforts and will ensure that repeat-release "bad actors" and identified and subjected to additional control requirements. These effects, in turn, are expected to lead to fewer release events and reduced emissions.

US EPA has estimated from time to time in various rulemakings that enhanced monitoring can result in a ten to twenty percent emissions reduction. Here, staff believes that the proposal to add an explicit monitoring requirement should more appropriately to use a five percent emissions reduction factor, because many PRDs are already subject some form of monitoring and it appears that most releases – and especially the larger ones – are being detected.

Using the 17.9 tons-per-year average emissions figures from the period 1998-2005, a 5% reduction would result in approximately 0.9 fewer tons of emissions per year.

3. IMPACT OF PROPOSED RULE AMENDMENTS

This section of the socioeconomic analysis describes demographic and economic trends in the San Francisco Bay Area (Bay Area) region. Following an overview of the methodology for the socioeconomic analysis, the first part of this section compares the Bay Area against California and provides a context for understanding demographic and economic changes that have occurred within the Bay Area between 1994 and 2004. After an overview of Bay Area industries, we focus on SIC 2911, Petroleum Refining (NAICS 32411) and how the proposed changes to Rule 8-28 concerning episodic releases from pressure relief devices (PRDs) would impact the refineries in the Bay Area. For the purposes of this report, the Bay Area region is defined as Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties.

3.1 METHODOLOGY

The socioeconomic analysis of the proposed rule amendments concerning episodic releases of PRDs involves the use of information provided directly by BAAQMD, as well as secondary data used to describe the industries affected by the proposed rule amendments.

Based on conversations with BAAQMD staff, ADE determined that the impacts would affect the oil refineries in the BAAQMD region: Chevron, Shell, Conoco Phillips, Valero, and Tesoro.

With this information we began to prepare an economic description of the industry groups of which the affected sites are part, as well as to analyze data on the number of jobs, sales levels, the typical profit ratios and other economic indicators for Bay Area oil refineries. ADE also reviewed and summarized documents available to the public such as annual reports for publicly traded companies.

With the annual reports and data from the US Economic Census, ADE was able to estimate revenues and profit ratios for many of the sites affected by the proposed PRD rule

amendments. In calculating aggregate revenues generated by Bay Area refineries, ADE first estimated an average revenue figure for a refinery based on revenues generated over the four-year period between 2000 and 2003. Using annual reports and publicly available data, ADE calculated ratios of profit per dollar of sales for the refineries. To estimate employment, ADE used employment data from Dun & Bradstreet.

The result of the socioeconomic analysis shows what proportion of profit the compliance costs represent. Based on a given threshold of significance, ADE discusses in the report whether the affected sites are likely to reduce jobs as a means of recouping the cost of compliance or as a result of reducing business operations. To the extent that such job losses appear likely, the indirect multiplier effects of the job losses area estimated using a regional IMPLAN input-output model.

3.2 REGIONAL DEMOGRAPHIC TRENDS

The Bay Area experienced moderate population growth from 1994 to 2004. Between 1994 and 1999, the nine-county region increased by 7 percent, from 6.2 million in 1994 to 6.6 million in 1999. From 1994 to 2004, the population increase was from 6.2 million to 6.8 million for an increase of 11 percent. At the same time, California had population growth of 14 percent.

Within the Bay Area, the greatest percentage increase occurred in Contra Costa County. From 1994 to 2004 Contra Costa increased its population by 18 percent. All other Bay Area counties had population increases equal to, or slower than, the State. The smallest percentage increase occurred in Marin and San Mateo Counties where population grew 5 percent from 1994 to 2004. Table 1 shows the population changes that have occurred in the Bay Area and California from 1994 to 2004.

TABLE 1
Population Growth: San Francisco Bay Area

	Population			Percent Change		
	1994	1999	2004	94 – 99	99 – 04	94 – 04
California	30,889,182	32,971,834	35,300,654	7%	7%	14%
Bay Area	6,189,000	6,646,167	6,865,370	7%	3%	11%
Alameda County	1,302,462	1,406,046	1,470,456	8%	5%	13%
Contra Costa County	844,076	914,645	992,608	8%	9%	18%
Marin County	228,718	236,955	239,209	4%	1%	5%
Napa County	111,083	118,088	126,283	6%	7%	14%
San Francisco County	729,024	771,122	772,985	6%	0%	6%
San Mateo County	667,218	712,376	702,017	7%	-1%	5%
Santa Clara County	1,544,523	1,672,977	1,701,831	8%	2%	10%
Solano County	356,652	377,601	399,826	6%	6%	12%
Sonoma County	405,244	436,357	460,155	8%	5%	14%

Source: Applied Development Economics, based on household population estimates from The California Department of Finance

3.3 REGIONAL ECONOMIC TRENDS

The Bay Area is one of the world's greatest regional economies. It benefits from pre-eminent knowledge-based industries, with competitive strength flowing from an unmatched culture of entrepreneurship, world-leading research institutions, and some of the nation's best educated and most highly skilled workforce. With these remarkable advantages, it has led through innovation in a wide range of research and industrial fields.

Many of the Bay Area's most prominent industries are manufacturing related. Bay Area manufacturers are often high profile companies with world-renowned recognition. From small to large, Bay Area industry has been dynamic, creating wealth and jobs in both the export sector and local serving industries.

The economic base is typically comprised of export industries within the manufacturing, minerals-resource extraction, and agricultural sectors. There are also the "local support industries" such as retail or service sectors, the progress of which is a function of the economic base and demographic changes, and more so the latter than the former. As population increases in a given area, demand for services –

such as realtors, teachers, healthcare – increases, as does demand for basic retail items like groceries, gas for commuting, or clothing at the local apparel shops.

The industries affected by the proposed PRD rule amendments are a prominent part of the region's economic base. Mainly engaged in export related business, the oil refineries are classified as manufacturers. In the Bay Area, manufacturing jobs have decreased over the last decade. In 1994, manufacturing accounted for 14 percent of all Bay Area employment. By 2004, manufacturing declined 11 percent to account for 11 percent of all Bay Area employment.

As of 2004, the professional and business services sector was the largest employer in the region, at 520,200 jobs or 16 percent of all private and public sector jobs. This is a change from 1994 when professional and business services accounted for 15 percent of all Bay Area employment. During the same period, professional and business services increased 17 percent. The next largest industry in the Bay Area is public service, or government, with 460,300 jobs. In 2004, government accounted for 14 percent of all Bay Area employment. From 1994 to 2004, government had one of the lowest growth rates of all industries at 4 percent. Two other industries came close to manufacturing in total employment. Retail trade and education & health care both made up 11 percent of total employment and had only a few hundred or few thousand jobs less than manufacturing. Unlike manufacturing, both retail trade and education & health care had significant job gains from 1994 to 2004. All other industries made up less than manufacturing in total employment in 2004. Table 2 shows Bay Area industry sectors and their trends from 1994 to 2004.

Table 2
Employment Profile of the San Francisco Bay Area, 1994 - 2004

Industry	1994	1999	2004	% of Total Employment in 2004
Farm	25,800	28,600	21,300	1%
Natural Resources & Mining	4,300	3,600	2,300	0%
Construction	109,300	171,400	181,000	6%
Manufacturing	405,400	459,400	359,700	11%
Wholesale Trade	118,500	107,100	121,900	4%
Retail Trade	300,200	339,000	337,900	11%
Transportation & Warehousing & Utilities	115,500	124,700	102,900	3%
Information	89,200	122,100	111,600	3%
Financial Activities	193,300	197,400	209,800	7%
Professional and Business Services	445,400	626,100	520,200	16%
Education & Health Care	293,800	335,000	359,200	11%
Leisure and Hospitality	250,000	289,500	304,400	10%
Other Services	100,100	108,800	109,700	3%
Government	444,500	449,800	460,300	14%
Total	**2,895,300**	**3,362,500**	**3,202,200**	**100%**

Source: Applied Development Economics from data supplied by the Labor Market Information Division of the California Employment Development Department

3.4 DESCRIPTION OF AFFECTED INDUSTRIES

The proposed PRD rule amendments affect industries in SIC 2911, Oil Refining (NAICS 32411 – oil refineries). What follows is a description of this industry, along with economic trends for oil refineries in the Bay Area, and it provides a comparison between 2001 and 2004. Data in Table 3 are for all sources, not just the five major oil refineries in the Bay Area. As shown in Table 3, employment in oil refineries increased by 2 percent in the four years from 2001 to 2004. This is at the same time that Bay Area manufacturing jobs decreased 22 percent. In California, oil refineries declined 5 percent during the same period and manufacturing jobs declined 14 percent.

Table 3
Employment Trends: Industries Affected by Proposed Amendments, 2001 - 2004

	2001	2002	2003	2004	Change from 2001 to 2004	% Change from 2001 to 2004
San Francisco Bay Area						
Manufacturing	460,992	402,895	362,089	357,385	-103,607	-22%
Petroleum refineries	7,086	7,271	7,248	7,196	110	2%
California						
Manufacturing	1,780,544	1,633,958	1,532,287	1,536,787	-243,757	-14%
Petroleum refineries	13,447	12,878	13,149	12,776	-671	-5%

Source: Applied Development Economics from data supplied by the Labor Market Information Division of the California Employment Development Department

Table 4 identifies the economic characteristics of the refineries affected by the proposed PRD rule amendments. This table shows that the refineries are estimated to employ 1,935 workers. These sites have an estimated aggregate payroll of $172 million, and estimated revenues of $9.8 billion. In calculating aggregate revenues generated by Bay Area refineries, the consultant estimated an average revenue figure per refinery based on revenues generated by that refinery in 2004 using annual reports. Then, the consultant summed the refineries' estimated revenue to arrive at the aggregate amount of $9.8 billion.

Table 4
Economic Characteristics of Impacted Oil Refineries in the San Francisco Bay Area

No. of Oil Refineries	Estimated Sales	Estimated Employment	Estimated Payroll
5	$9,837,599,000	1,935	$172,194,000

Source: U.S. Economic Census 2002; California Employment Development Department Quarterly Census of Employment and Wages

As Table 5 shows, the affected sources represent 27 percent of all employment within their respective industry in the Bay Area. Overall, there are an estimated 7,196 petroleum refining employees in the Bay Area. Of the 7,196 workers, 1,935 work in the affected refineries, or 27 percent. In all of California, there were 12,776 workers in SIC 2911 (NAICS

32411), meaning that the affected Bay Area refineries equal 15 percent of the state oil refinery workforce.

Table 5
Employment at Impacted Sites Relative to the Bay Area as a Whole

No. of Oil Refineries	Estimated Employment	Affected Oil Refineries as a % of Bay Area Total	Affected Oil Refineries as a % of California Total
5	1,935	27%	15%

Source: Calculations by Applied Development Economics

3.5 COMPLIANCE COSTS

The proposed rule amendments require that each affected refinery prepare and submit to the District a "Monitoring System Demonstration Report." This report would provide information that would demonstrate that the refineries have adequate monitoring systems in place for all of their atmospheric PRDs subject to the rule. Section 8-28-407 is proposed to require facilities to submit a monitoring demonstration report that will enable staff to enforce the monitoring requirements. The report will require descriptions of the monitoring equipment, operating parameters and engineering calculations used to quantify emissions releases. District Staff have estimated that preparing the needed information for inclusion in the report for each PRD would take about two man-hours per PRD. (Most of this information if already available and must be utilized in the event of a release event and the subsequent report to the District.) The hour labor cost is estimated to be approximately $100 per hour. Because there are 324 PRDs in total at the five Bay Area refineries, the District estimates that the total one time cost of this provision to be about $64,800.

The proposed amendments also require each affected refinery to provide a listing of each process unit equipped with atmospheric PRDs and the associated PRDs. This information is already generally available and would not require any additional man-hours to generate. Preparation of the report for submission should take no longer than an hour for each refinery. District Staff have therefore estimated the

cost associated with this provision to be approximately $100 per refinery; this translates to $500 District-wide.

District staff have also recognized that some facilities may have to install additional monitoring equipment to be able to demonstrate that they can detect releases as required by the rule, which could cost approximately $1,500 per PRD. The requirement to have such equipment is already an implied requirement of the existing rule, however. The current proposal simply makes the requirement explicit and establishes minimum standards for such equipment. As such, any costs facilities will incur for new equipment are not attributable to the proposed amendments. Moreover, District staff expect these costs to be relatively small, as few PRDs will need additional equipment.

Therefore, the total one time compliance cost that would result from the proposed amendments would be approximately $65,300.

3.6 BUSINESS RESPONSE TO COMPLIANCE COSTS

Sites impacted by the proposed PRD rule amendments may respond in a variety of ways when faced with new regulatory costs. These responses may range from simply absorbing the costs and accepting a lower rate of return to shutting down the business operation all together. Businesses may also seek to pass the costs on to their customers in the form of higher prices, although, in general, throughout the oil industry prices are set in global markets and individual producers or refineries are not in a position to affect prices. More likely, they may renew efforts to increase productivity and reduce costs elsewhere in their operation in order to recoup the regulatory costs and maintain profit levels.

3.7 IMPACT ANALYSIS

The businesses' responses to increased compliance costs hinge on the effect of the costs on the profits generated at the affected sites. An impact on estimated profits greater than 10 percent implies that the source would experience serious economic effects because of the compliance cost. When

compliance costs are greater than 10 percent of estimated profits, companies typically respond to the impact by laying off some workers, closing parts of manufacturing facilities or, in the most drastic case, possibly closing the manufacturing facility.

Using the cost estimates developed for the proposed PRD rule amendments, ADE calculated the socioeconomic impacts of the proposed actions. In calculating impacts on profits, ADE used return on sales ratios identified by media reports and in annual reports of companies directly affected by the proposal. Based on this information, we estimate that the affected refineries generated a combined profit of $688 million on $9.8 billion in revenues.

Table 7 compares the estimated costs of the proposed PRD rule amendments and their impact on profits. Affected refineries will incur an initial cost of approximately $**65,300.** This cost represents an estimated **0.01** percent of profits for the oil refineries affected by the proposed PRD rule amendments. This cost impact is far below the 10% of profits above which facilities would experience serious economic effects.

Table 6
Impact of Proposed Changes on Estimated Profits at Bay Area Oil Refineries

Impacted Refineries	Estimated Profits Generated	Cost of Compliance	Cost as a % of profits
5	$688,632,000	$65,300	0.01

Source: Calculations by ADE, based on a 7 percent profit margin for oil refiners

Furthermore, even if facilities had to incur costs for installing additional monitoring equipment of 5 times this cost, and these costs were considered to be required by the proposed amendments rather than required under the current rule, the cost of compliance would still be only **0.05** percent of profits. Even under this conservative assumption, the impact would still be far below the 10% significant impact threshold.

3.8 IMPACT ON SMALL BUSINESSES

In addition to analyzing the employment impacts the proposed PRD rule amendments, state legislation requires

that the socioeconomic analysis assess whether small businesses are disproportionately affected by air quality rules.

For purposes of qualifying small businesses for bid preferences on state contracts and other benefits, the State of California defines small businesses in the following manner:

- Must be independently owned and operated;
- Cannot be dominant in its field of operation;
- Must have its principal office located in California
- Must have its owners (or officers in the case of a corporation) domiciled in California; and,
- Together with its affiliates, be either:
    - A business with 100 or fewer employees, and an average gross receipts of $10 million or less over the previous tax years, or
    - A manufacturer with 100 or fewer employees

The refineries that are affected by the proposed PRD rule amendments are not independently-owned and operated businesses. These refineries are owned by publicly-traded global corporations whose headquarters are generally outside of California. In addition, each of the refineries that are affected by the proposed PRD rule amendments employ, on average, 387 workers (and far more when affiliates are included), and their average revenue is approximately $1.9 billion. Thus, by the standards established by the State of California, these sources are not small businesses. Based on this discussion, it is determined that the proposed PRD rule amendments do not disproportionately affect small businesses because the sources impacted by the proposed changes do not meet California's definition of small business.