PLANNING FOR SUSTAINABLE PROSPERITY

SOCIO-ECONOMIC ANALYSIS OF PROPOSED REGULATION 12, RULE 15: PETROLEUM REFINING EMISSIONS TRACKING AND REGULATION 12, RULE 16: PETROLEUM REFINING EMISSIONS LIMITS AND RISK THRESHOLDS

Prepared for:

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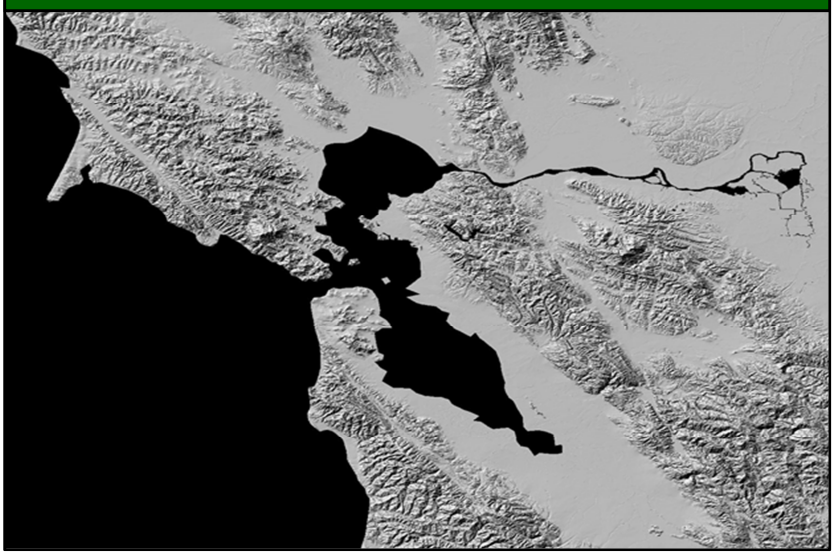
1. INTRODUCTION

The Bay Area Air Quality Management District ("BAAQMD" or the "Air District") seeks to adopt Regulation 12, Rule 15 ("Petroleum Refining Emissions Tracking" or "Regulation 12-15") and Regulation 12, Rule 16 ("Petroleum Refining Emission Limits and Risk Thresholds" or "Regulation 12-16"). The purpose of Regulation 12-15 is to track air emissions and crude oil quality characteristics from petroleum refineries over time, to complete health risk assessments (HRAs) for each Bay Area petroleum refinery, and to establish monitoring systems to provide detailed air quality data along refinery boundaries and in nearby communities. The purpose of Regulation 12-16 is to establish action levels for public notification and risk reduction based on the results of the HRAs required in Regulation 12-15, and also to require demonstrations of local compliance with national ambient air quality standards (NAAQS) for SO_2 and $PM_{2.5}$, which are the criteria pollutants with the greatest potential for local health impacts. After this introduction, this report discusses in greater detail the elements of Regulation 12-15 and Regulation 12-16 with cost impacts to Bay Area refineries (Section Two). A complete discussion of all of the elements of these rules is included in the Final Staff Report. After the discussion of cost impacts, the report describes the socioeconomic impact analysis methodology and data sources (Section Three). The report describes population and economic trends in the nine-county San Francisco Bay Area (Section Four), which serves as a backdrop against which the Air District is contemplating adopting Regulations 12-15 and 12-16. Finally, the socioeconomic impacts stemming from the proposed regulations are discussed in Section Five.

The report is prepared pursuant to Section 40728.5 of the California Health and Safety Code, which requires an assessment of socioeconomic impacts of proposed air quality rules. The findings in this report can assist Air District staff in understanding the socioeconomic impacts of the proposed requirements, and can assist staff in preparing a refined version of the rule. Figure 1 is a map of the nine-county region that comprises the San Francisco Bay Area Air Basin.

FIGURE 1:
MAP OF SAN FRANCISCO BAY AREA REGION



2. BACKGROUND OF BAAQMD'S RULE 12-15 AND RULE 12-16

In general, the Air District regulates stationary sources of air pollution, which includes certain petroleum refineries that would be subject to proposed Regulation 12, Rule 15 ("Regulation 12-15") and Regulation 12, Rule 16 ("Regulation 12-16"). Bay Area refineries are currently subject to over 20 separate air quality rules, many of which focus on specific equipment in place at refineries, as well as different kinds of pollutants emitted by refineries.

In an effort to further improve air quality, the Air District seeks to adopt Regulation 12, Rule 15 and Regulation 12, Rule 16. The purpose of Regulation 12-15 is to track air emissions and crude oil quality characteristics from petroleum refineries over time, to complete health risk assessments (HRAs) for petroleum refineries, and to establish monitoring systems to provide detailed air quality data along refinery boundaries and in nearby communities. The purpose of Regulation 12-16 is to establish action levels for public notification and risk reduction based on the results of the HRAs required in Regulation 12-15, and also to require demonstrations of local compliance with national ambient air quality standards (NAAQS) for SO_2 and $PM_{2.5}$, which are the criteria pollutants with the greatest potential for local health impacts. The rule covers three classes of regulated air pollutants, including "criteria pollutants", "toxic air contaminants" (TACs), and greenhouse gases (GHGs).[1]

The Air District proposed the new rules in light of changes with regard to "crude oil slates" at the five petroleum refineries in the Bay Area. Crude oil slates refers to the characteristics of crude oil such as sulfur content and other things. Some types of crude oil require more energy to refine, which could lead to higher emissions. Other types of crude oil may contain higher levels of contaminants which, if not removed, may find their way into the emissions stream. Some crude oils tend to be more corrosive which, if not properly regulated, could result in an increase in accidents.

Proposed Regulation 12, Rule 15 includes the following steps that will result in costs to the affected petroleum refineries:

- Report on-going **annual emissions inventories** of all regulated air pollutants based on upgraded methods, including emissions from cargo carriers
- Establish a **Petroleum Refinery Emissions Profile (PREP)**, and require that on-going inventories include comparisons with the PREP
- Report on-going **crude oil quality characteristics** with annual emissions inventories (e.g., sulfur, nitrogen content, API gravity, Total Acid Number)

[1]Criteria pollutants are air pollutants for which there are ambient air quality standards that set levels of concentrations of pollutants designed to be protective of public health. Examples of criteria pollutants include ozone and particulate matter in the air. TACs refer to up to 200 air pollutant compounds that may have health impacts in terms of exposure though there are not yet any air quality standards. GHG refers to air pollutant compounds that affect global warming and climate change.

- Update refinery-wide **Health Risk Assessments (HRA)** with enhanced emissions inventories and revised OEHHA HRA guidelines

- **Enhance fence line systems and establish community air quality monitoring systems**

Proposed Regulation 12, Rule 16 includes the following steps that will result in costs to the affected petroleum refineries:

- Comply with public notification requirements and risk reduction requirements based on refinery-specific health risk established by HRA required by Regulation 12-15;

- Comply with NAAQS compliance demonstration for SO_2 and $PM_{2.5}$.

The analysis of the socioeconomic impacts of new Regulations 12-15 and 12-16 in Section Five are based on the costs in Tables 1 and 2. The basis for these costs is provided after the tables.

Table 1 - Regulation 12, Rule 15 Costs

Section	Requirement	Cost (per refinery)
12-15-401	Annual Petroleum Refinery Emissions Inventory (beginning with year 2015 data)	$90,000 / year
	Monthly Crude Slate Report (beginning with year 2015 data)	
12-15-402	Petroleum Refinery Emissions Profile Report (one-time submittal)	
12-15-413	Provide Monthly Crude Slate Reports for 2012, 2013 & 2014 (one-time submittal)	
12-15-405	HRA Modeling Protocol and HRA (one-time submittals)	$250,000 (one-time)
12-15-407	Fenceline and Community Air Monitoring Plans (one time submittal)	$250,000 (one-time)
12-15-412	Provide available energy utilization data	Not significant
12-15-501	Community Air Monitoring System (construction and operation)	$6,000,000 (one-time construction)
12-15-502	Fenceline Air Monitoring System (construction and operation)	$125,000 / year (maintenance & operation)

12-15-401, 402, 413

These sections require one-time submittals related to the refinery inventory and crude slate, as well as ongoing (monthly crude slate reports and annual inventories) are assumed to constitute one-half of a full-time employee (FTE) with a resulting annualized cost of $90,000 at each of the Bay Area refineries.

12-15-405

This section requires a one-time protocol submittal for the required Health Risk Assessment (HRA) and submittal of the HRA itself. These documents are expected to be prepared by an environmental consulting firm at a cost of no more than $250,000 at each of the Bay Area refineries. Air District staff

has contracted this type of work in the past and are familiar with the resource requirements and cost of this type of project. Although there is a provision for a refinery to be required to submit additional updated HRAs in the future, no additional cost is attributed to this provision because it is not clear that this provision will ever be used.

12-15-407

The one-time fenceline and community monitoring plans are expected to be prepared by an environmental consulting firm at a cost of no more than $250,000 at each of the Bay Area refineries. Air District staff is familiar with the required elements of type of document and the resources required to complete them.

12-15-412

The energy utilization data required to be provided by each refinery is data that has already been prepared for the refineries' own use. Therefore, no significant cost is associated with the submittal of this data.

12-15-501 and 502

The draft Air Monitoring Guidelines prepared as a companion document to Rule 12-15 suggest that 2 permanent fenceline monitors (upwind and downwind of the refinery) and 1 to 3 permanent community monitors (depending on meteorological conditions and the location of receptors) will be required. In addition, temporary monitors will probably be necessary to establish pollutant gradients to allow siting of community monitors. Total capital cost, including site development, infrastructure development (electricity and communications) and construction is not expected to exceed $6,000,000 per refinery. Assuming $25,000 per year for maintenance and operation at each monitor, and 5 monitors per refinery, the total annual cost is not expected to exceed $125,000 per year per refinery. Air District staff have designed, constructed and operated similar monitoring facilities and are familiar with these costs.

Table 2 - Regulation 12, Rule 16 Costs

Section	Requirement	Cost (per refinery)
12-16-301 and 302	Risk Reduction Audit and Plan (one-time submittal)	$250,000 (one-time)
12-16-303	Implementation of Risk Reduction Plan.	$600,000 (one-time) for diesel particulate filter installation on all permitted engines
12-16-304, 305.1 and 406	SO_2 and $PM_{2.5}$ NAAQS compliance through air modeling or air monitoring with no capital costs.	$250,000 (one-time for preliminary work leading to compliance through Sections 12-16-305.2 and 408)
12-16-304, 305.2 and 408	SO_2 and $PM_{2.5}$ NAAQS compliance through emission reductions (construction and operation of a wet gas scrubber system)	Chevron, Shell, Tesoro, Valero: $8,200,000 / year each (annualized); Phillips 66: $3,000,000 / year (annualized)

12-16-301 and 302

These sections establish three increasing health effect thresholds ("notification risk", "significant risk" and "unreasonable risk"). Previous HRAs at the three refineries found that they were all below the "notification risk" threshold. However, the HRA methodology has been revised and the Air District has estimated, based on the new guidelines and the current refinery inventory data, that new HRAs required by Regulation 12-16 will place all five Bay Area refineries in the "significant risk" category, such that each refinery would perform the specified public notification of a significant risk finding, and also prepare a Risk Reduction Audit and Plan (RRAP). Air District staff estimate that public notification and preparation of a RRAP will cost no more than $250,000 at each of the Bay Area refineries, if performed by an environmental consultant. The Air District regularly performs public notifications related to facility risk and is able to estimate these costs. The Air District also has engaged environmental consulting firms to perform work similar to an HRA and is able to estimate these costs.

12-16-303

After a refinery has prepared a Risk Reduction Audit and Plan (RRAP), it must implement the elements of the RRAP. The RRAP itself will indicate the specific sources and operations within the refinery that contribute most to the refinery health impact on the public, and will allow the refinery operator to choose the most cost-effective approach to risk reduction.

For the purposes of estimating a cost of compliance for this report, it will be assumed that each refinery will be able to reduce significantly the health risk from all stationary sources at the refinery by installing particulate control filters ("diesel particulate filters" or "DPFs") on all diesel engines onsite. DPFs are used here as the example risk reduction measure because: 1) refineries use many diesel engines, 2) most of these are older, uncontrolled engines with high emission rates, 3) the health impact of diesel particulate is very high relative to other toxic compounds, and 4) CARB has established that retrofits of DPFs are generally successful at achieving particulate emission reductions of 85% or more and maximum cost of $55 per horsepower for a DPF retrofit, with no significant increase in operations or maintenance costs (from the CARB staff report for the 2011 Stationary Diesel Engine ATCM).

To estimate the highest expected cost of DPF implementation, the horsepower of all the permitted diesel engines at Chevron refinery (from 2014 Title V permit), the refinery with the highest crude oil processing rate, was summed and CARB's retrofit cost estimate of $55 per horsepower was applied:

Total diesel horsepower: 10,914 HP at 22 diesel engines

Total estimated cost: (10,914 HP)($55/HP) = $600,000

12-16-304, 305.1 and 406

Section 304 requires a demonstration of local compliance with SO_2 and $PM_{2.5}$ NAAQS through air modeling or air monitoring (Section 406). To provide a conservative cost estimate, it will be assumed that neither modeling nor monitoring demonstrate compliance and that emission reductions (Section 407) will be required. However, $250,000 of preliminary work is estimated to occur to inform the finding that emission reductions will be required.

12-16-304, 305.2 and 408

When compliance with the SO_2 and $PM_{2.5}$ NAAQS cannot be established through the air modeling or monitoring in Section 406, emission reductions of these pollutants will be required. For 3 refineries (Chevron, Shell, Tesoro), compliance cost is based on the installation of a wet scrubber system with an annualized cost of $8.2 million on FCCU exhausts to address both SO_2 and $PM_{2.5}$ emissions. Valero Refinery has already installed a wet scrubbing system on their combined FCCU and Fluid Coker exhaust stack that has resulted in significant reductions of SO_2 and $PM_{2.5}$. Valero therefore does not have the compliance option of installing a wet scrubber. But given that it has already achieved significant SO_2 and $PM_{2.5}$ emission reductions, the further cost of control is expected to be bounded by the same wet scrubber cost applied to the other refineries. Phillips 66 does not operate an FCCU and therefore does not have a single very large source of $PM_{2.5}$ emissions. To significantly reduce SO_2 emissions, Phillips 66 could install a hydrotreating system to reduce the sulfur content of the refinery fuel gas that is burned throughout the refinery. District staff have estimated such a system to have an annualized cost of $3 million.

All costs are summarized in Table 7 of Section 5, with costs shown above as occurring one-time converted to annualized costs by applying a capital recovery factor of 0.14 to the one-time cost, as discussed in Table 7.

3. METHODOLOGY

Applied Development Economics (ADE) began this analysis by preparing a statistical description of the industry groups of which the affected sources are a part, analyzing data on the number of establishments, jobs, and payroll. We also estimated sales generated by impacted industries, as well as net profits for each affected industry.

This report relies heavily on the most current data available from a variety of sources, particularly the State of California's Employment Development Department (EDD) Labor Market Information Division. In addition, this report relies on data from the State of California's Energy Commission (CEC), particularly with respect to measuring throughput capacity of the five refineries subject to these new regulations. From the CEC, we also obtained information on retail and wholesale prices of gasoline and other refinery products, as well as industry-specific profitability ratios.

With the above information, ADE was able to estimate net after tax profit ratios for sources affected by the proposed new regulations. ADE calculated ratios of profit per dollar of revenue for affected industries. The result of the socioeconomic analysis shows what proportion of profits the compliance costs represent. Based on assumed thresholds of significance, ADE discusses in the report whether the affected sources 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 jobs losses are estimated using a regional IMPLAN input-output model. In some instances, particularly where consumers are the ultimately end-users of goods and services provided by the affected sources, we also analyzed whether costs could be passed to households in the region.

When analyzing the socioeconomic impacts of proposed new rules and amendments, ADE attempts to work closely within the parameters of accepted methodologies discussed in a 1995 California Air Resources Board (ARB) report called "Development of a Methodology to Assess the Economic Impact Required by SB513/AB969" (by Peter Berck, PhD, UC Berkeley Department of Agricultural and Resources Economics, Contract No. 93-314, August, 1995). The author of this report reviewed a methodology to assess the impact that California Environmental Protection Agency proposed regulations would have on the ability of California businesses to compete. The ARB has incorporated the methodologies described in this report in its own assessment of socioeconomic impacts of rules generated by the ARB. One methodology relates to determining a level above or below which a rule and its associated costs is deemed to have significant impacts. When analyzing the degree to which its rules are significant or insignificant, the ARB employs a threshold of significance that ADE follows. Berck reviewed the threshold in his analysis and wrote, "The Air Resources Board's (ARB) use of a 10 percent change in [Return on Equity] ROE (i.e. a change in ROE from 10 percent to a ROE of 9 percent) as a threshold for a finding of no significant, adverse impact on either competitiveness or jobs seems reasonable or even conservative."

4. REGIONAL DEMOGRAPHIC AND ECONOMIC TRENDS

This section of the report tracks economic and demographic contexts within which the Air District is contemplating new Regulations 12-15 and 12-16. Table 3 tracks population growth in the nine-county San Francisco Bay Area between 2003 and 2013, including data for the year 2008. Between 2003 and 2008, the region grew by approximately 1 percent a year. Between 2008 and 2013, the region grew annually at a much slower rate of 0.1 percent per year. Overall, there are 7,420,453 people in the region. At 1,868,558, Santa Clara County has the most people, while Napa has the least, at 139,255.

TABLE 3:
REGIONAL DEMOGRAPHIC TRENDS: 2003-2013
POPULATION GROWTH: SAN FRANCISCO BAY AREA

	Population			Annual Percent Change		
	2003	2008	2013	03 - 08	08 - 13	03 - 13
California	36,199,342	38,292,687	38,340,074	1.1%	0.0%	0.6%
Bay Area	**7,025,575**	**7,375,678**	**7,420,453**	**1.0%**	**0.1%**	**0.5%**
Alameda County	1,495,162	1,556,657	1,573,254	0.8%	0.2%	0.5%
Contra Costa County	1,005,590	1,060,435	1,087,008	1.1%	0.5%	0.8%
Marin County	250,793	258,618	255,846	0.6%	-0.2%	0.2%
Napa County	131,228	137,571	139,255	0.9%	0.2%	0.6%
San Francisco County	795,042	845,559	836,620	1.2%	-0.2%	0.5%
San Mateo County	717,921	745,858	745,193	0.8%	0.0%	0.4%
Santa Clara County	1,739,939	1,857,621	1,868,558	1.3%	0.1%	0.7%
Solano County	416,379	426,729	424,233	0.5%	-0.1%	0.2%
Sonoma County	473,521	486,630	490,486	0.5%	0.2%	0.4%

Source: Applied Development Economics, based on total population estimates from The California Department of Finance (E-5 Report)

Data in Table 4 describe the larger economic context within which officials are contemplating new Regulations 12-15 and 12-16. Businesses in the region employ over three million workers, or 3,376,819. The number of private and public sector jobs in the region grew annually by 0.5 percent between 2008 and 2013, after having grown somewhat slightly also between 2003 and 2008 by 0.8 percent a year. Of the 3,376,819 workers, 422,634, or 12.5 percent, are in the public sector, meaning 87.5 percent of all employment is in the private sector. In the state, almost 15 percent of all jobs are in the public sector, with 85 percent in the private sector. Relative to the state as a whole, manufacturing, professional/technical services, and education/health service sectors comprise a greater proportion of the regional employment base. In the region, these sectors comprise 9 percent (manufacturing), 11 percent (professional/technical services), and 15 percent (private education/health services) respectively of total employment. In the state, these sectors comprise 8 percent (manufacturing),7 percent (professional/technical services), and 14.6 percent (private

education/health services) of the statewide job base. In other words, as a percent of total workforce, the region employs more people in sectors with occupations that presumptively require more skills and are higher-paying. Conversely, typically lower-paying sectors such as agriculture and retail represent a higher share of the overall statewide employment base relative to the Bay Area. In the state, 2.7 percent of all jobs are in agriculture, whereas in the region, the figure is 0.4 percent. Almost 10.5 percent of all jobs in the state are in retail, while in the region, 9.8 percent of all jobs are in retail.

TABLE 4
SAN FRANCISCO BAY AREA EMPLOYMENT TRENDS BY SECTOR: 2003-2013

		Private and Public Sector Employment Trends			Employment Distribution		Ann. Percentage Chg: Bay Area	
		2003	2008	2013	Bay Area '13	State '13	03-08	08-13
Private and Public Sectors		**3,158,570**	**3,285,661**	**3,376,819**			**0.8%**	**0.5%**
Private Sector Only		**2,713,025**	**2,837,090**	**2,954,185**	**87.5%**	**85.2%**	**0.9%**	**0.8%**
11	Agriculture, Forestry, Fishing & Hunting	17,710	18,726	13,315	0.4%	2.7%	1.1%	-6.6%
21	Mining	1,744	982	1,876	0.1%	0.2%	-10.9%	13.8%
22	Utilities	4,639	5,497	5,591	0.2%	0.4%	3.5%	0.3%
23	Construction	177,987	178,171	151,847	4.5%	4.1%	0.0%	-3.1%
31-33	Manufacturing	361,948	343,551	308,961	9.1%	8.1%	-1.0%	-2.1%
42	Wholesale Trade	123,213	116,685	121,274	3.6%	4.5%	-1.1%	0.8%
44-45	Retail Trade	335,893	333,952	329,247	9.8%	10.4%	-0.1%	-0.3%
48-49	Transportation and Warehousing	51,995	54,050	68,846	2.0%	2.8%	0.8%	5.0%
51	Information	117,546	114,889	136,214	4.0%	2.9%	-0.5%	3.5%
52	Finance and Insurance	150,174	136,632	118,304	3.5%	3.4%	-1.9%	-2.8%
53	Real Estate and Rental and Leasing	61,693	58,089	55,222	1.6%	1.7%	-1.2%	-1.0%
54	Professional and Technical Services	277,412	344,560	378,755	11.2%	7.4%	4.4%	1.9%
55	Management of Companies and Enterprises	67,779	60,845	69,367	2.1%	1.4%	-2.1%	2.7%
56	Administrative and Waste Services	177,198	185,013	192,231	5.7%	6.4%	0.9%	0.8%
61	Educational Services	63,905	76,185	88,322	2.6%	2.0%	3.6%	3.0%
62	Health Care and Social Assistance	283,259	305,784	417,312	12.4%	12.6%	1.5%	6.4%
71	Arts, Entertainment, and Recreation	48,740	51,438	57,255	1.7%	1.7%	1.1%	2.2%
72	Accommodation and Food Services	252,693	283,578	314,978	9.3%	9.1%	2.3%	2.1%
81	Other Services, Ex. Public Admin	137,155	156,925	114,764	3.4%	3.1%	2.7%	-6.1%
99	UNCLASSIFIED ESTABLISHMENTS	342	11,538	10,504	0.3%	0.4%	102.1%	-1.9%
Public Sector Only (Federal, State and Local)		**445,545**	**448,571**	**422,634**	**12.5%**	**14.8%**	**0.1%**	**-1.2%**
	Public Sector (excluding public educ.)	299,104	302,052	281,196	8.3%	8.2%	0.2%	-1.4%
6111	Public Education: Elementary and Secondary	112,275	105,053	104,467	3.1%	4.7%	-1.3%	-0.1%
6112	Public Education: Junior College	9,850	16,629	11,910	0.4%	0.6%	11.0%	-6.5%
6113	Public Education: Colleges and Universities	24,316	24,837	25,024	0.7%	1.2%	0.4%	0.2%
611z	Public Education: Other			37	0.0%	0.0%		

Source: Applied Development Economics, based on California EDD LMID

Table 4 also shows the precipitous decline in employment in industries most-affected by the downturn in the economy that began in late 2007, namely housing. Construction employment declined by 3.1 percent per year between 2008 and 2013, with finance and insurance dropping by 2.8 percent per year, and real estate dropping by 1.0 percent. On a positive note, employment in health care increased annually by 6.4 percent annually between 2008 and 2013, and transportation-warehousing increased annually by five percent.

Proposed Regulations 12-15 and 12-16 affect one particular industry in the Bay Area, namely refineries. While the California EDD LMID reports that there are 23 refineries in the nine-county region, more than likely, this state agency applied a broader definition for refinery operations in the region. Appendix A identifies a number of "refineries" included in the EDD LMID's database; as this shows, many are not full scale refineries but rather are engaged in a variety of petroleum-related operations. Nonetheless, Table 5 shows refinery trends *per* the EDD-LMID. What is striking about Table 5 is the high average pay workers garner in this industry.

TABLE 5:
SF BAY AREA EDD-LMID REFINERY TRENDS, 1999-2009

	2003	2008	2013	03-08 CAGR	08-13 CAGR
Establishments	35	23	23	-8.05%	0.00%
Employment	6,738	7,816	5,323	3.01%	-7.39%
Payroll	$768,112,469	$1,326,728,738	$986,117,494	11.55%	-5.76%
Average Pay	$114,006	$169,756	$185,250	8.29%	1.76%

Source: Applied Development Economics, Inc., based on California EDD LMID

Table 6 identifies the businesses in the Bay Area that are full-scale refineries. The list comes from the CEC, which also included each refinery's throughput capacity. Of the five operating refineries in the region, Chevron is the largest, with the capacity to refine 245,271 42-gallon barrels of crude oil per day. At 78,400, Phillips 66 has the lowest throughput capacity.

TABLE 6
BAY AREA REFINERIES (CALIFORNIA ENERGY COMMISSION) AND CRUDE OIL CAPACITY

Refinery	Barrels Per Day
Chevron U.S.A. Inc., Richmond Refinery	245,271
Tesoro Refining & Marketing Company, Golden Eagle (Avon/Rodeo) Refinery	166,000
Shell Oil Products US, Martinez Refinery	156,400
Valero Benicia Refinery	132,000
Phillips 66, Rodeo San Francisco Refinery	78,400

Source: Applied Development Economics, Inc., based on California Energy Commission

5. SOCIOECONOMIC IMPACT ANALYSIS

This section of the report analyzes socioeconomic impacts stemming from new Regulations 12-15 and 12-16. If the proposed new regulations are adopted, the District estimates that the five impacted refineries would incur total annualized costs ranging from $4.3 million to $9.5 million for ten years, the period over which costs associated with capital equipment would be amortized. After the amortization period, ongoing costs of $215,000 per year per refinery would continue for additional inventories, reports and operation and maintenance of air monitoring systems.

The five affected sources' combined throughput capacity is approximately 674,582 42-gallon barrels per day, which takes into consideration periods when refineries may be off-line. While the affected sources refine 674,582 barrels of crude oil per day, they generate an estimated 693,044 gallons of refined products a day. Assuming a 87 percent utilization rate, and further estimating the price of refined product at $120 per barrel[2], we estimate the affected refineries generate $30.3 billion in revenues a year, from which is generated $2.1 billion in after-tax net profits. When comparing these figures with the annualized costs stemming from the proposed new regulations, we obtain cost-to-net profit ratio ranging from 1.5 percent to 2.7 percent. **As a result, impacts are less than significant.** Moreover, because this establishment is not a small business, small businesses are not disproportionately impacted by the proposed regulations.

[2] $119.80 per barrel of gasoline = $((436{,}600*\$124.26)_{\text{GASOLINE}}+(124{,}748*\$112.35)_{\text{JET FUEL}}+(131{,}748*\$112.35)_{\text{KEROSENE, OTHERS}}) / (693{,}044)_{\text{TOTAT REFINED PRODUCTS}}$

TABLE 7 SOCIOECONOMIC IMPACT ANALYSIS: PROPOSED NEW RULES REGULATION 12, RULE 15 & REGULATION 12, RULE 16						
	All Sources	**Chevron**	**Tesoro**	**Shell**	**Valero**	**Phillips 66**
Effective Barrels of Crude Per Day	674,582	212,648	143,921	135,598	114,443	67,972
Estimated Revenues	$30.3 billion	$9.6 billion	$6.5 billion	$6.1 billion	$5.1 billion	$3.1 billion
Estimated Net Profits	$2.1 billion	$653 million	$442 million	$416 million	$351 million	$208 million
Annual Costs for Regulations 12-15, 12-16 with one-time costs annualized by applying a capital recovery factor (CRF) factor of 0.14. This CRF is derived using BAAQMD's cost-effectiveness methodology in the BACT-TBACT Workbook and assuming an interest rate of 6% and "project horizon" of 10 years.						
Reg 12-15-401, 402, 413, 405: Inventories and Crude Reports (Initial & Annual)	$450,000	$90,000	$90,000	$90,000	$90,000	$90,000
Reg 12-15-405: HRA Protocol and HRA Preparation (annualized)	$175,000	$35,000	$35,000	$35,000	$35,000	$35,000
Reg 12-15-407: Fenceline and Community Air Monitoring Plans (annualized)	$175,000	$35,000	$35,000	$35,000	$35,000	$35,000
Reg 12-15-501 & 502: Fenceline & Community Monitoring Construction (annualized)	$4,200,000	$840,000	$840,000	$840,000	$840,000	$840,000
Reg 12-15-501 & 502: Fenceline & Community Monitoring, Operation & Maintenance	$625,000	$125,000	$125,000	$125,000	$125,000	$125,000
Reg 12-16-301 and 302: Risk Reduction Audit and Plan Preparation (annualized)	$175,000	$35,000	$35,000	$35,000	$35,000	$35,000
Reg 12-16-303: Implementation of Risk Reduction Plan (annualized)	$420,000	$84,000	$84,000	$84,000	$84,000	$84,000
Reg 12-16-304, 305.1, 406: Preliminary Modeling or Monitoring (annualized)	$175,000	$35,000	$35,000	$35,000	$35,000	$35,000
Reg 12-16-304, 305.2, 407: SO_2 and $PM_{2.5}$ emission reductions (annualized)	$35,800,000	$8,200,000	$8,200,000	$8,200,000	$8,200,000	$3,000,000
Total Annualized Costs	$42,195,000	$9,479,000	$9,479,000	$9,479,000	$9,479,000	$4,279,000
Cost to Net Profits	2.0%	1.5%	2.1%	2.3%	2.7%	2.1%
Significant?	No, in all cases	No, in all cases	No, in all cases	No, in all cases	No, in all cases	No, in all cases

6. APPENDIX A: LIST OF EDD-LMID BAY AREA "REFINERIES"

County	Name of Establishments	City	Number of Workers
Alameda	DASSEL'S PETROLEUM INC	FREMONT	1-4 employees
Alameda	RCA OIL RECOVERY	NEWARK	1-4 employees
Contra Costa	BAY AREA DIABLO PETROLEUM CO	CONCORD	1-4 employees
Contra Costa	CHEVRON CORP	RICHMOND	1-4 employees
Contra Costa	CHEVRON CORP	PACHECO	20-49 employees
Contra Costa	CHEVRON CORPORATION	SAN RAMON	5,000-9,999
Contra Costa	PHILLIPS 66 RODEO REFINERY	RODEO	500-999 employees
Contra Costa	GENERAL PETROLEUM	RICHMOND	10-19 employees
Contra Costa	GOLDEN GATE PETROLEUM	RICHMOND	1-4 employees
Contra Costa	GOLDEN GATE PETROLEUM	RICHMOND	1-4 employees
Contra Costa	GOLDEN GATE PETROLEUM	CONCORD	1-4 employees
Contra Costa	NU STAR	MARTINEZ	20-49 employees
Contra Costa	PITCOCK PETROLEUM INC	PLEASANT HILL	10-19 employees
Contra Costa	SHELL MARTINEZ REFINERY	MARTINEZ	500-999 employees
Contra Costa	TESORO GOLDEN EAGLE REFINERY	PACHECO	500-999 employees
Contra Costa	UOP	DANVILLE	1-4 employees
Marin	GRAND PETROLEUM	SAN RAFAEL	1-4 employees
Marin	GREENLINE INDUSTRIES LLC	LARKSPUR	20-49 employees
San Francisco	DOUBLE AA CORP	SAN FRANCISCO	1-4 employees
San Francisco	R B PETROLEUM SVC	SAN FRANCISCO	5-9 employees
San Francisco	SEAYU ENTERPRISES INC	SAN FRANCISCO	5-9 employees
San Mateo	DOUBLE AA CORP	SOUTH SAN FRANCISCO	5-9 employees
San Mateo	SABEK INC	SOUTH SAN FRANCISCO	5-9 employees
San Mateo	SEAPORT REFINING & ENVRNMNTL	REDWOOD CITY	5-9 employees
Santa Clara	COAST OIL CO LLC	SAN JOSE	20-49 employees
Santa Clara	SHELL OIL PRODUCTS US	SAN JOSE	1-4 employees
Solano	BAY AREA DIABLO PETROLEUM CO	BENICIA	1-4 employees
Solano	CAT TECH INC	DIXON	1-4 employees
Solano	DANVILLE PETROLEUM	VALLEJO	5-9 employees
Solano	GOLDEN GATE PETROLEUM	BENICIA	1-4 employees
Solano	RUBICON OIL	BENICIA	1-4 employees
Solano	TIMEC CO INC	VALLEJO	20-49 employees
Solano	VALERO BENICIA REFINERY	BENICIA	250-499 employees
Solano	VALERO REFINING CO	BENICIA	1-4 employees
Solano	VALERO REFINING CO	BENICIA	1-4 employees
Sonoma	BAY AREA DIABLO PETROLEUM CO	CLOVERDALE	1-4 employees
Sonoma	ROYAL PETROLEUM CO INC	PETALUMA	5-9 employees

Source: ADE, Inc., based on California EDD LMID "Employers By Industry" Database