

## **APPENDIX D3**

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### **Southern California Petroleum Market Assessment**



# D3

## SOUTHERN CALIFORNIA PETROLEUM MARKET ASSESSMENT

### 1 Introduction

2 This appendix documents Southern California's petroleum infrastructure, crude and  
3 products supply, and uncertainties with the forecasted demand for petroleum products  
4 that could impact throughput of crude oil into the proposed Project terminal. It  
5 complements information provided in other document sections, especially Chapter 1  
6 (Section 1.1.3), Chapter 2 (Section 2.3), and Appendices D1 and D2. This appendix  
7 focuses on the following supply, demand, and regulatory elements:

- 8 • California refinery capacity
- 9 • California crude and products pipelines
- 10 • Imports of refined products and crude into Southern California by rail, truck,  
11 and barge
- 12 • Imports of refined products into Southern California through marine terminals
- 13 • Greater use of alternative transportation fuels, for example 85 percent ethanol  
14 and 15 percent gasoline (E85) and 10 percent ethanol and 90 percent gasoline  
15 (E10)
- 16 • Reduced demand for transportation fuels due to improved efficiency, particularly  
17 due to raised Corporate Average Fuel Economy (CAFE) standards
- 18 • Mandated reductions in greenhouse gas (GHG) emissions from the  
19 transportation sector.

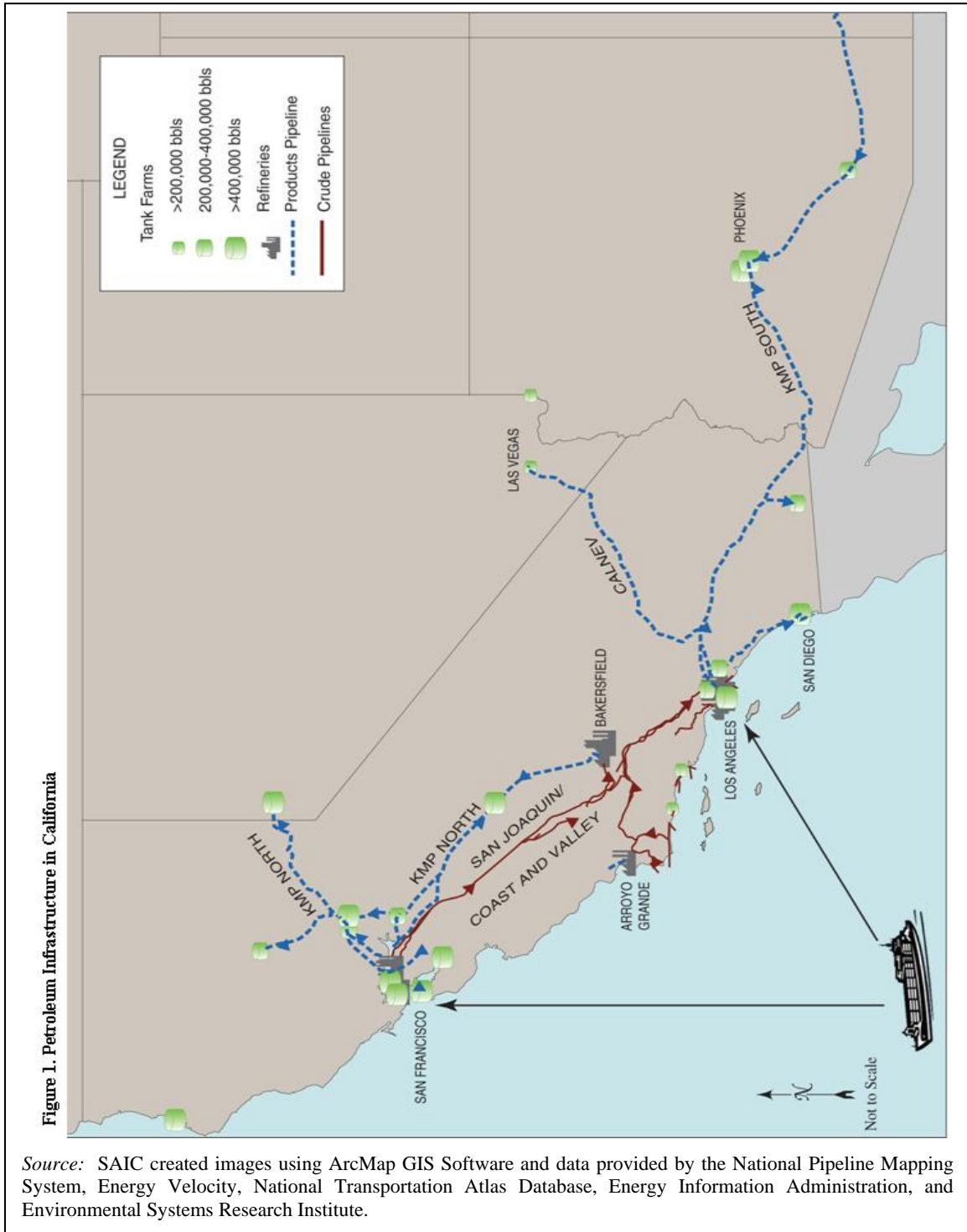
20 In addition, this section provides some additional discussion of crude oil production  
21 and receipts in California from the Baker & O'Brien (2007) forecast, such as a  
22 comparison of forecasts of Alaskan crude oil production from Baker & O'Brien and  
23 the Energy Information Administration (EIA). However, the primary discussion of  
24 that forecast is in Appendix D1.

### 25 California Supply and Delivery Infrastructure

26 This section discusses the infrastructure available for delivering crude oil to  
27 California refineries, with an emphasis on Southern California. It also discusses the  
28 infrastructure available for delivering petroleum products, particularly motor fuels, to

1 California consumers as well as consumers in Southern Nevada and Arizona, two  
 2 states that are critically dependent on California as the source of their fuels.

3 Figure 1 shows the location of major petroleum infrastructure in California.  
 4 Refineries are primarily located in the Bay Area, the Bakersfield area of Central



1 California, and the Los Angeles Basin in Southern California. Crude pipelines only  
2 serve intrastate flows and no crude pipelines bring crude or products from out of  
3 state. The Coastal and Valley crude pipeline system connects Northern, Central, and  
4 Southern California.

5 Product pipelines that transport gasoline, diesel, jet fuel etc., are separated into a  
6 Northern system and a Southern system that are not linked. The Northern product  
7 pipeline system serves the Bay area, and ships product to Fresno in Central  
8 California. The Northern system also exports product to Reno in Northern Nevada.  
9 The Southern System primarily serves the Los Angeles area and San Diego. At  
10 present, the Southern System exports 200,000 barrels per day (bpd) of its 520,000  
11 bpd capacity of products into Southern Nevada (Las Vegas) and Arizona  
12 (Phoenix). Although product could theoretically be transferred on the pipeline from  
13 Phoenix to southern California, no refineries currently operate in Phoenix, and only a  
14 limited number of refineries in the world (mostly in California) are currently capable  
15 of producing products specific to California (e.g., gasoline compliant with California  
16 Air Resources Board (CARB) standards). The pipeline could also theoretically be  
17 used to transfer crude oil (e.g., produced in Texas) to Phoenix and from there to  
18 California; however, the use of a product pipeline for crude oil would require an  
19 environmental disclosure (e.g., an Environmental Impact Report [EIR] under CEQA).  
20 Figure 1 also shows the location of tank farms for storage of crude and products  
21 throughout California and sections of Arizona and Nevada served by California  
22 product pipelines.

## 23 Crude Oil Supplies

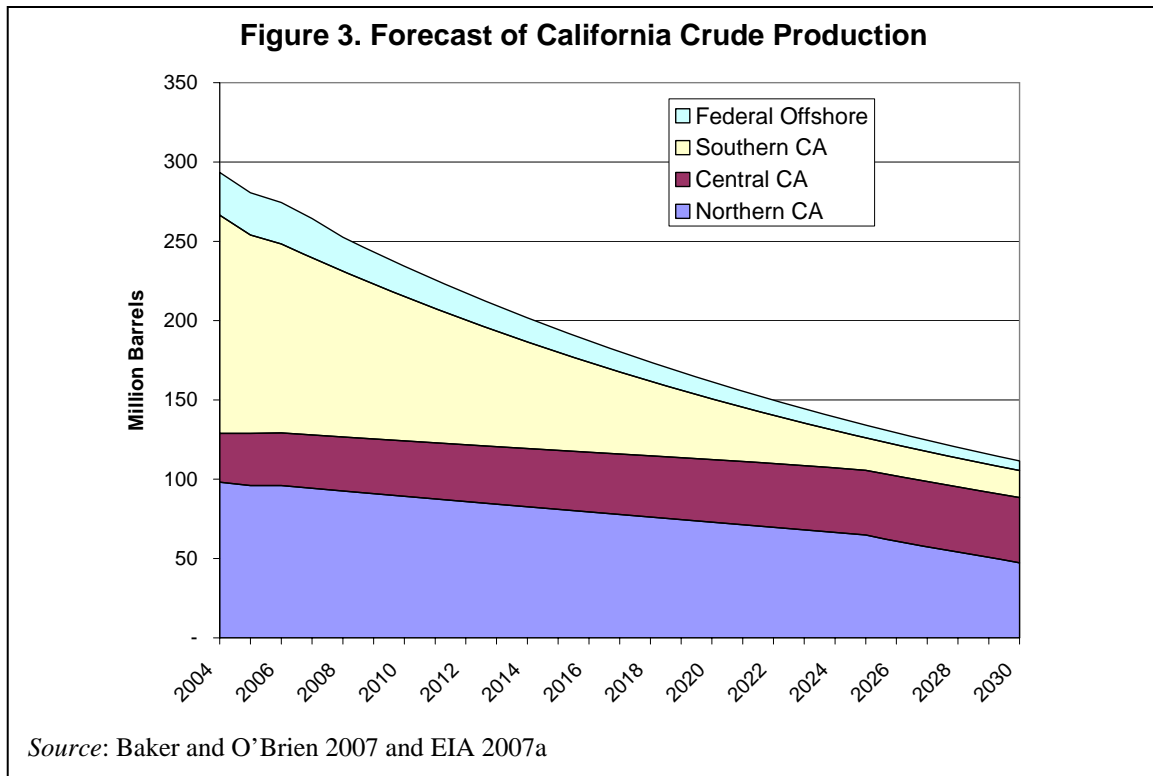
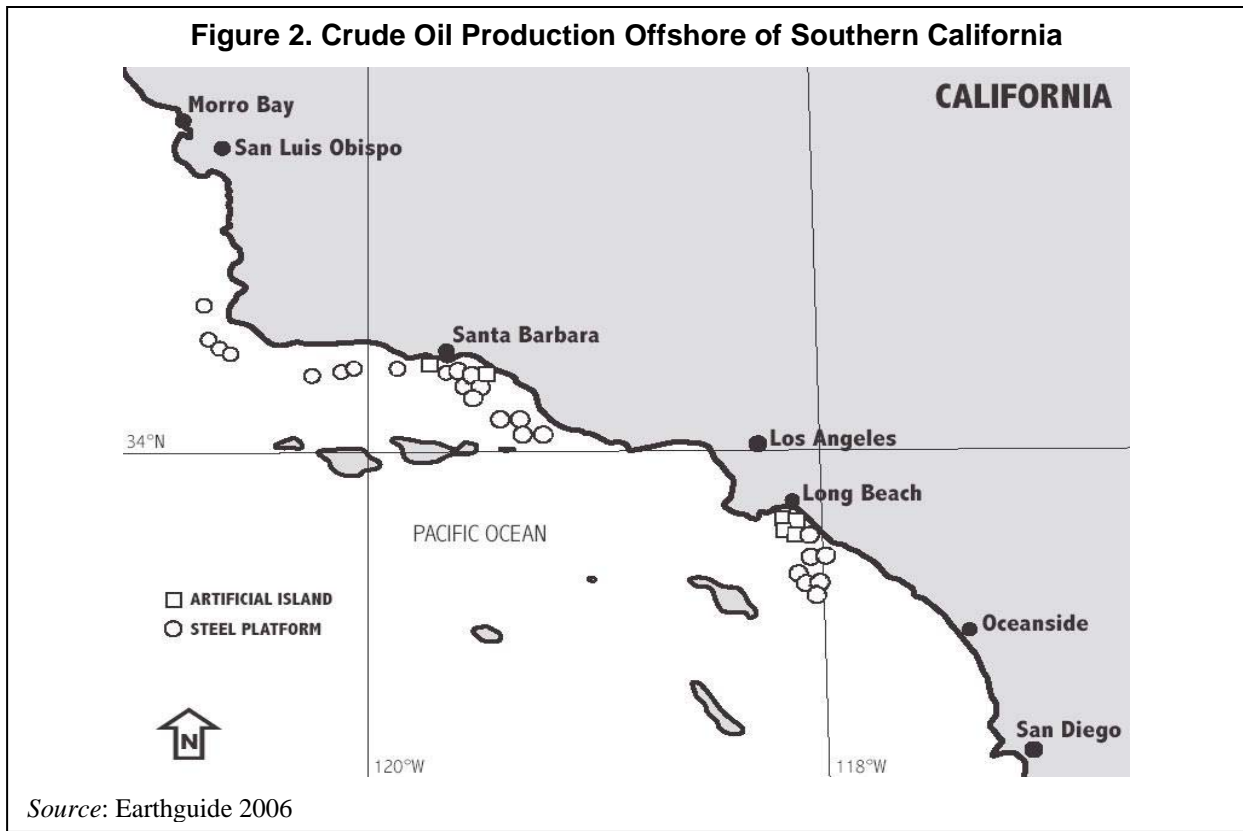
### 24 California Crude Oil Production

25 California oil production, including federal offshore waters, peaked in 1985 at over  
26 460 million barrels (bbl) per year. Since then, production has fallen 41 percent to 265  
27 million bbl per year in 2006 (EIA 2007a). Southern California is the largest  
28 producing region, producing 119 million bbl in 2006. This is followed by Northern  
29 California (96 million bbl) and Central California (33 million bbl) (Baker and  
30 O'Brien 2007).

31 Federal and state offshore production in California lies along Santa Barbara, Ventura,  
32 Los Angeles, and Orange County (Figure 2). Federal offshore facilities produced  
33 about 26 million bbl and State offshore facilities produced about 15 million bbl in  
34 2006 (EIA 2007a).

35 California crude oil production is forecast by Baker and O'Brien (2007) to decline to  
36 106 million bbl per year by 2030, with most of the reductions coming from Southern  
37 California oil fields (Figure 3). If expected production from Federal waters is added  
38 (based on the EIA's forecast of production from federal waters published in their  
39 Annual Energy Outlook 2007 (EIA 2007b)), California production declines to 112  
40 million bbl by 2030.

41 Due to declining production, southern California will become increasingly dependent  
42 on imported crude for feedstock to its refineries. These imports will flow primarily  
43 through marine terminals.



## Crude Imports

### Alaskan Crude Supply

During the 1990s, Northern California, and to a lesser extent Southern California, obtained the majority of their marine crude imports from Alaska. However, Alaskan oil production is declining and imports of Alaskan crude have declined commensurately. Alaskan crude production peaked in 1988 at 736 million bbl and has declined 63 percent to 270 million bbl in 2006. EIA forecasts that other than a brief increase in the 2014 to 2020 period due to the introduction of supplies from the Arctic National Wildlife Refuge (ANWR), production will continue to decline to around 100 million bbl by 2030. Baker & O'Brien have a similar view, though they do not expect ANWR crude supplies (if they are eventually produced) to arrive in southern California (Baker & O'Brien 2008). Figure 4 shows both forecasts.

Note that if any crude oil from ANWR is sent to southern California, its crude oil will be delivered on marine vessel. Thus, while its development would reduce foreign oil imports, it would not reduce the need for marine import infrastructure in southern California.

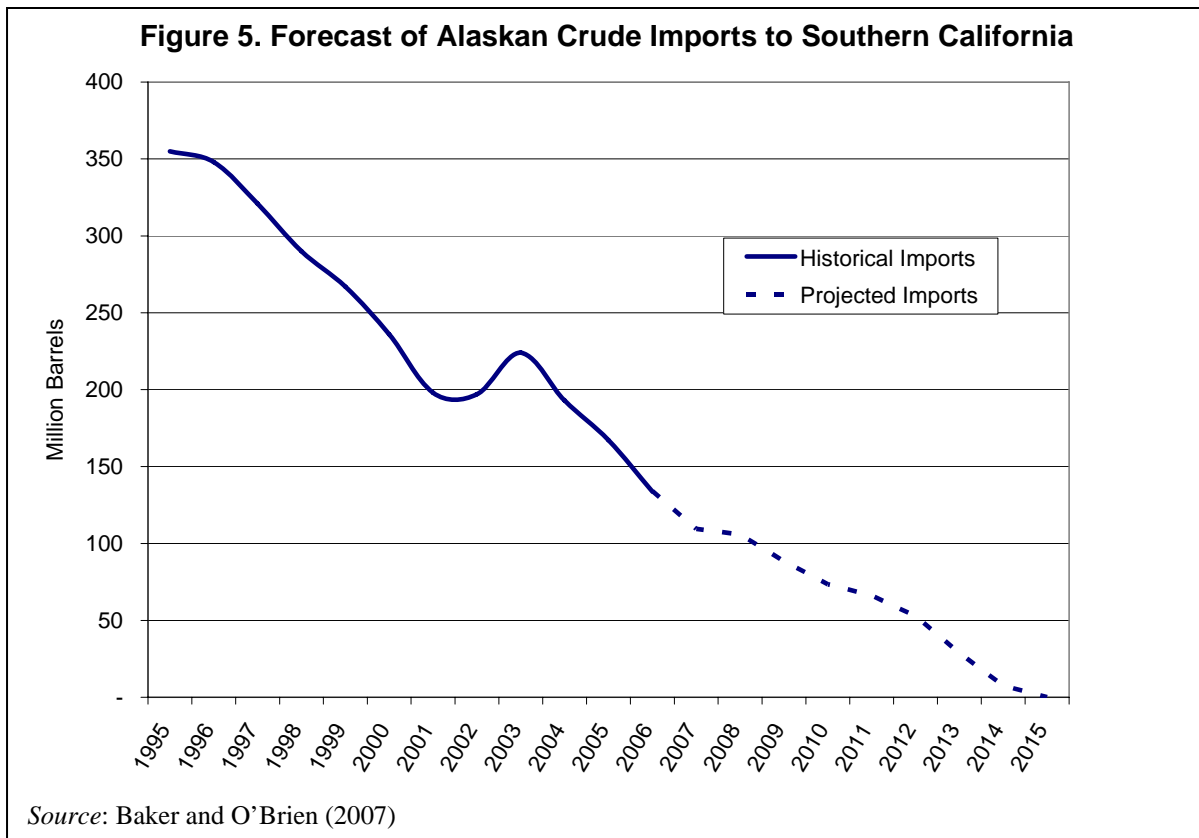
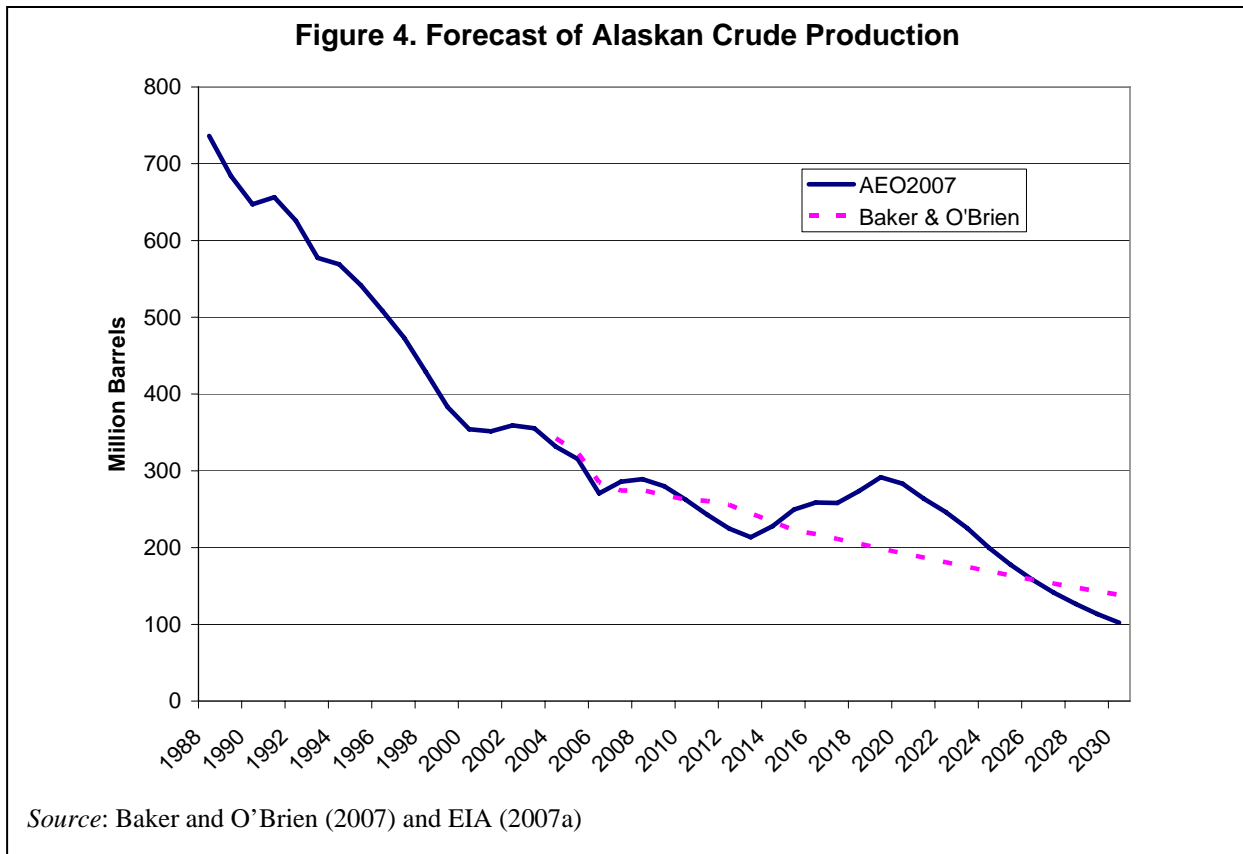
As Figure 5 shows, Alaskan crude imports into Southern California have declined 62 percent from 355 million bbl in 1995 to 134 million bbl in 2006 (Baker & O'Brien 2007). Baker & O'Brien forecast that supplies from Alaska will continue to decline and imports into Southern California will eventually cease by 2015.

From 2001 to 2006, crude supply from Alaska has been declining while foreign imports of crude have been increasing (Figure 6). In 2006, Southern California imported 234 million bbl of crude, with 185 million bbl from foreign sources and 49 million bbl from Alaska. As recently as 2003, Southern California imported 82 million bbl of crude from Alaska and only 142 million bbl from foreign sources (Baker & O'Brien 2007).

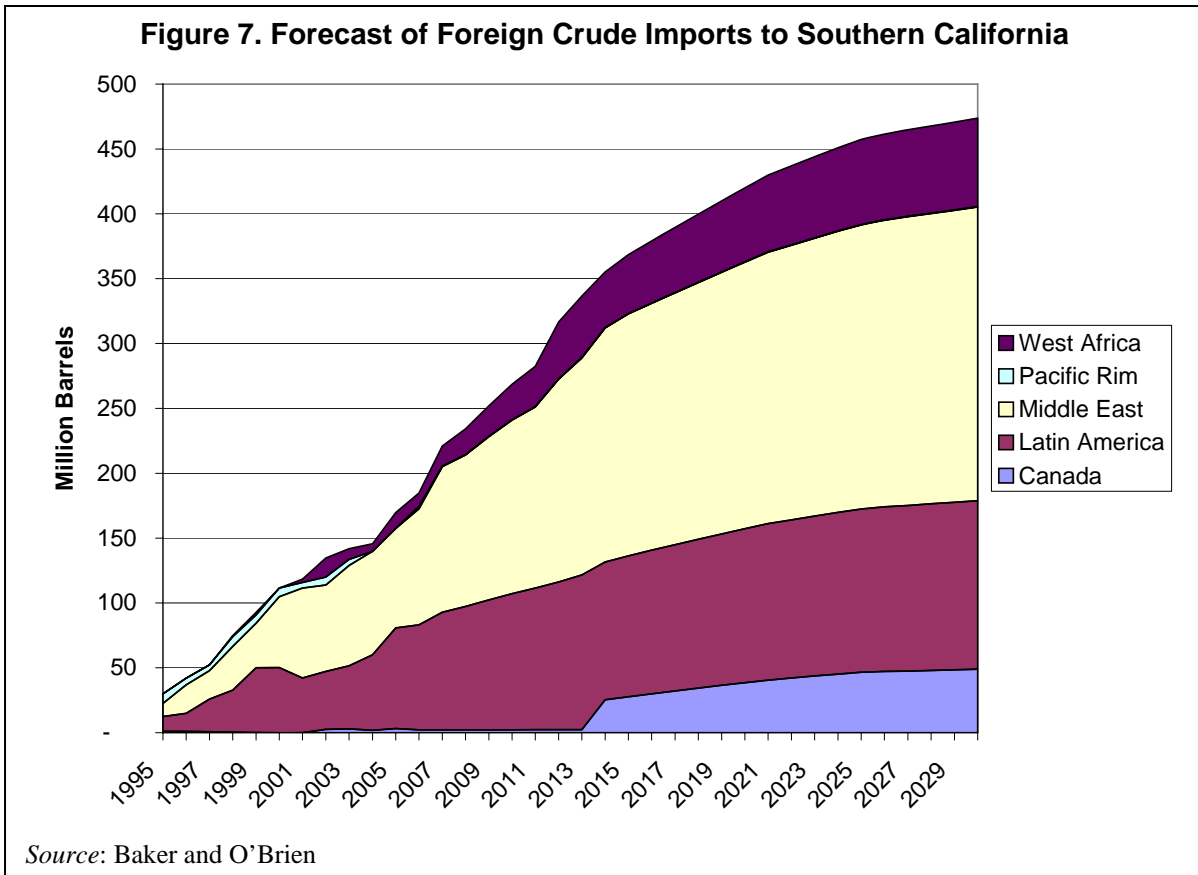
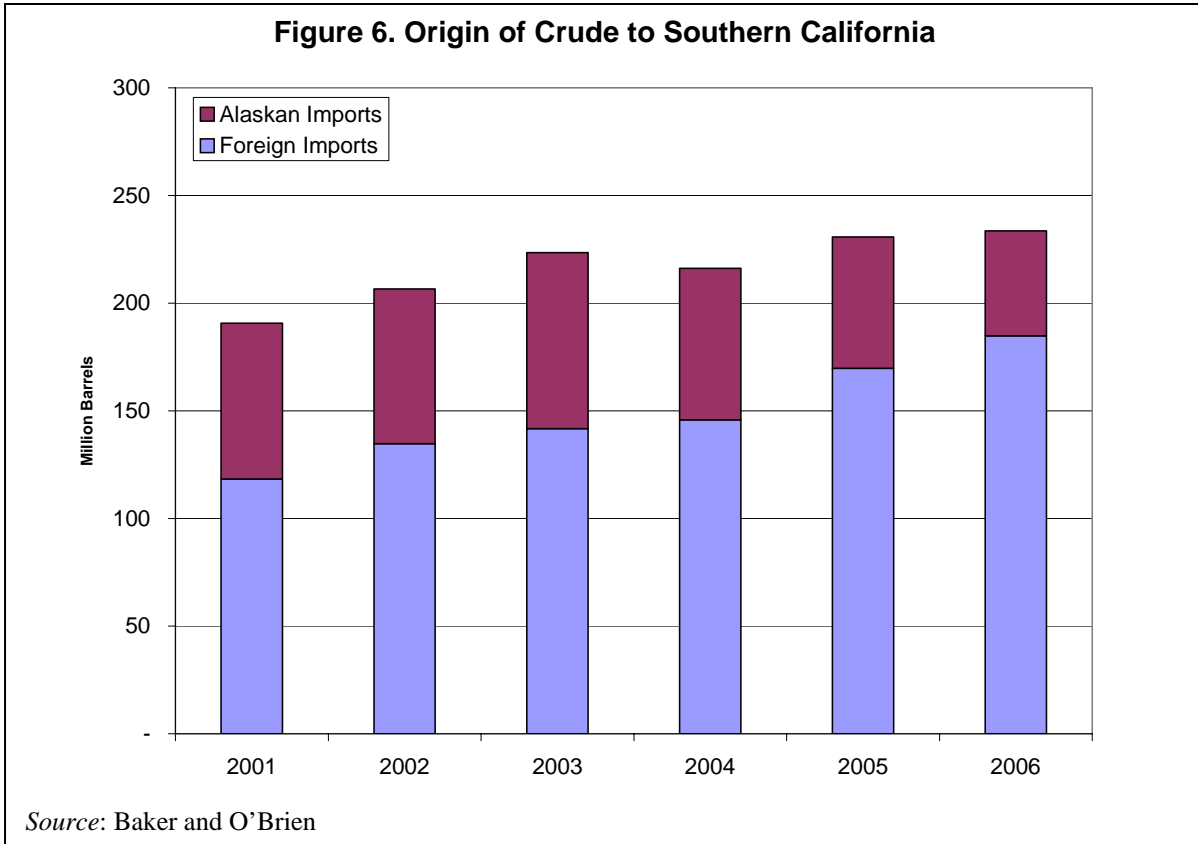
### Non-Alaskan Sources of Crude

Crude imports from non-Alaskan sources are growing rapidly. In 1999, 82 million bbl of crude was imported to Southern California from Canada, Latin America, the Middle East, and the Pacific Rim. Latin America, the Middle East, and the Pacific Rim made up most of those imports, with 31 million bbl, 28 million bbl, and 20 million bbl respectively. In 2006, imports from Latin America and the Middle East increased to 81 million bbl and 89 million bbl. West Africa began exporting crude to Southern California in 2001. Imports of Canadian crude have increased due to increasing production of Alberta's oil sands (NEB 2006).

Total imports to Southern California are expected to reach 474 million bbl of crude by 2030. Figure 7 shows that Baker and O'Brien projects that the Middle East will be the biggest supplier of crude to Southern California by 2030, with an estimated 227 million bbl. Baker and O'Brien (2007) also forecasts increasing imports from Canada, Latin America, and West Africa. Imports from the Pacific Rim are projected to be minimal into the future.







1 Latin America contributors primarily consist of crude from Brazil, Ecuador, and  
2 Mexico, with some contributions from Argentina, Columbia, Peru, and Venezuela.  
3 Crude from the Middle East mainly originates from Iraq and Saudi Arabia, with  
4 consistent supplies from Kuwait, Oman, and the United Arab Emirates. Yemen and  
5 Abu Dhabi have supplied crude to Southern California in the past. West Africa is  
6 seen to be an increasing source of crude with supplies coming mainly from Angola,  
7 Chad, Congo, Equatorial Guinea, Gabon, and Nigeria (Baker & O'Brien 2007).

## 8 Refined Products Supply

### 9 California Refineries

10 In 2005, California's refineries processed 672 million bbl of crude oil, supplying  
11 transportation fuels and other products to market in California, Nevada, Arizona, and  
12 Oregon. Southern California refineries supply Arizona and Southern Nevada,  
13 particularly Las Vegas. Total California refining capacity is over 2 million bpd, with  
14 53 percent located in Southern California, primarily the Los Angeles Basin, 39  
15 percent in Northern California, primarily in the Bay area, and 8 percent in the  
16 Bakersfield area of Central California. California's refineries generally operate at  
17 over 92 percent of capacity (EIA 2007c).

18 Refinery facilities include storage tanks for storing crude oil prior to processing,  
19 storing intermediate petroleum products, and storing blending components used to  
20 create finished gasoline. In addition, refiners use storage tanks to hold finished  
21 product prior to distribution into the pipeline system or for longer periods of time so  
22 that inventory can be drawn down during a refinery outage, planned maintenance, or  
23 period of high demand.

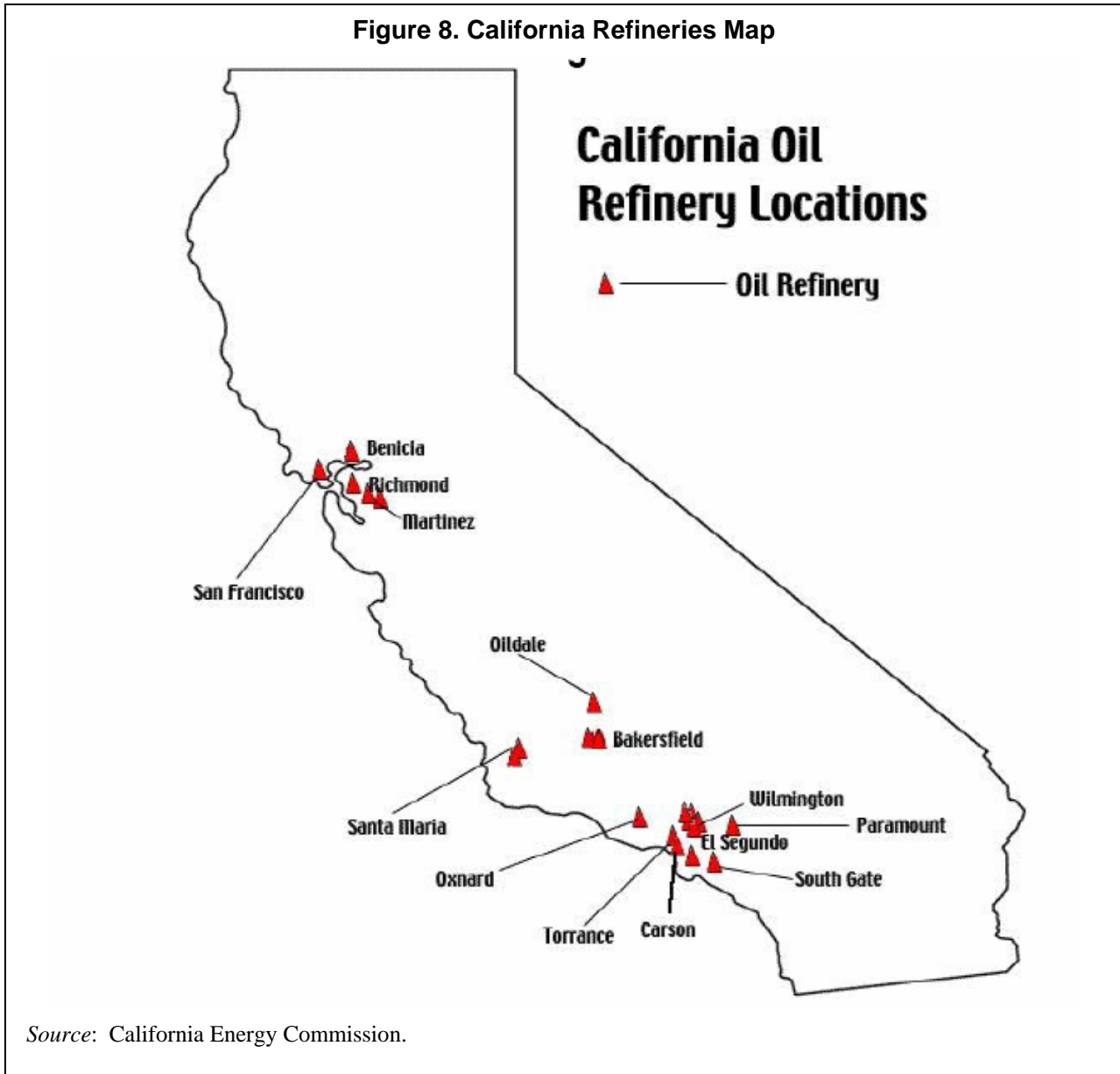
24 Figure 8 shows the three primary refining centers in the Bay area, the Los Angeles  
25 Basin, and Central California.

26 Northern California refineries are located in the Bay area. Table 1 shows that Bay  
27 area refineries have total capacity of 784,501 bpd, all of which produce fuels that  
28 meet CARB standards.

29 In Central California refineries are primarily located in the Bakersfield area and in  
30 the city of Arroyo Grande. Table 2 shows that in total, Central California has 160,700  
31 bpd of refining capacity, of which 92,000 bpd meet CARB standards.

32 In Southern California, ten refineries are located in the Los Angeles Basin and one in  
33 Oxnard. Most Los Angeles Basin refineries are concentrated two to five miles north of  
34 the Port of Los Angeles, while ExxonMobil has one refinery in Torrance and  
35 Chevron has a refinery El Segundo, near Santa Monica Bay. Total refining capacity  
36 in Southern California is approximately 1.1 million bpd, of which only two do not  
37 meet CARB standards.

38 Figure 9 shows the relationship of Southern and Central California's refineries to  
39 pipeline infrastructure, while Tables 3 and 4 provide greater detail on Southern  
40 California refineries.



**Table 1. Northern California Refineries and Capacities**

Company	Refinery	City	Operational Year	CARB Gasoline and Diesel Production	Capacity (bpd)
Chevron	Richmond	Richmond	1902	Yes	242,901
Valero	Benicia	Benicia	1968	Yes	144,000
Shell	Martinez	Martinez	1915	Yes	155,600
Tesoro	Golden Eagle	Martinez	1913	Yes	166,000
ConocoPhillips	Rodeo	Rodeo	1896	Yes	76,000
<b>Total</b>					<b>784,501</b>

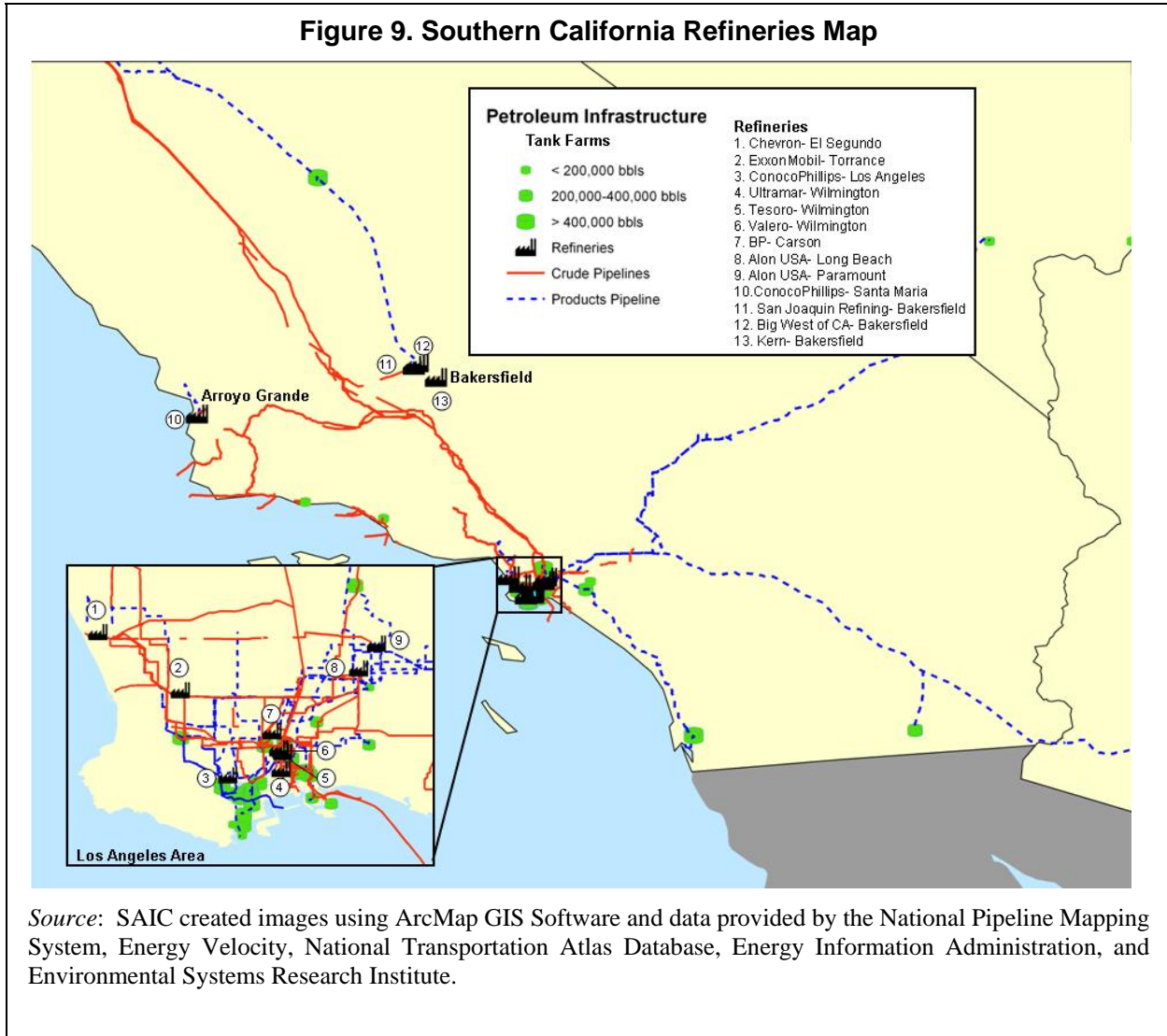
Source: EIA 2007c, CEC 2007c and CEC PIIRA Database

**Table 2. Central California Refineries and Capacities**

Company	Refinery	City	Operational Year	CARB Production	Capacity (bpd)
ConocoPhillips	Santa Maria	Arroyo Grande	1955	No	44,200
San Joaquin Refining	Bakersfield	Bakersfield	1969	No	24,500
Big West of California	Bakersfield	Bakersfield	1932	Yes	66,000
Kern Oil & Refining	Bakersfield	Bakersfield	1934	Yes	26,000
<b>Total</b>					<b>160,700</b>

Source: EIA 2007c, CEC 2007c and CEC PIIRA Database

**Figure 9. Southern California Refineries Map**



Source: SAIC created images using ArcMap GIS Software and data provided by the National Pipeline Mapping System, Energy Velocity, National Transportation Atlas Database, Energy Information Administration, and Environmental Systems Research Institute.

**Table 3. Southern California Refineries and Capacities**

Company	Refinery	City	Operational Year	2005 CARB Production	Capacity (bpd)
Chevron	El Segundo	El Segundo	1912	Yes	260,000
ExxonMobil	Torrance	Torrance	1907	Yes	149,500
ConocoPhillips	Los Angeles	Wilmington	1917	Yes	139,000
Valero (Ultramar)	Wilmington	Wilmington	1969	Yes	80,887
Tesoro	Wilmington	Los Angeles	1923	Yes	97,000
Valero	Wilmington	Los Angeles	1969	No	6,300
BP	Carson	Wilmington	1938	Yes	265,000
Alon USA	Long Beach	Los Angeles	1932	No	26,000
Alon USA	Paramount	Los Angeles	1930	Yes	50,000
<b>Total</b>					<b>1,074,687</b>

Source: EIA 2007c, CEC 2007c and CEC PIIRA Database

**Table 4. Southern California Refinery Profile**

Company	Refinery	Atmospheric Distillation		Vacuum Distillation		Delayed Coking		Catalytic Cracking		Catalytic Reforming	
		BCD	BSD	Units	BSD	Units	BSD	Units	BSD	Units	BSD
Chevron	El Segundo	260,000	274,000	1	143,000	1	66,000	1	72,500	3	49,000
ExxonMobil	Torrance	149,500	155,800	1	102,300	2	54,600	1	100,200	3	20,000
ConocoPhillips	Los Angeles	139,000	147,000	1	82,000	1	53,200	1	51,600	2	36,000
Valero (Ultramar)	Wilmington	80,887	81,000	1	45,000	2	29,000	1	54,000	1	17,000
Tesoro	Wilmington	97,000	103,500	1	65,000	1	40,000	1	34,000	2	31,500
Valero	Wilmington	6,300	6,500	1	5,000	0	0	0	0	0	0
BP	Carson	265,000	265,500	2	140,000	2	70,500	1	102,500	4	52,000
Alon USA *	Long Beach	18,000	19,800	2	15,000	0	0	0	0	0	0
Alon USA	Paramount	50,000	53,000	2	30,000	0	0	0	0	1	8,500
<b>Total 9 Refineries</b>		<b>1,065,687</b>	<b>1,106,100</b>	<b>12</b>	<b>627,300</b>	<b>9</b>	<b>313,300</b>	<b>6</b>	<b>414,800</b>	<b>16</b>	<b>214,000</b>

Notes: \* 15,000 BCD at Edgington Refinery was idle on 1/1/07.  
BCD = barrels/calendar day; BSD = barrels/stream day

Sources: EIA 2007c and Company Web Sites.

**Box 1. Definitions of Refining Terms**

**Atmospheric Crude Oil Distillation.** The refining process of separating crude oil components at atmospheric pressure by heating to temperatures of about 600 degrees Fahrenheit to 750 degrees Fahrenheit (depending on the nature of the crude oil and desired products) and subsequent condensing of the fractions by cooling.

**Barrels per Calendar Day.** The amount of input that a distillation facility can process under usual operating conditions. The amount is expressed in terms of capacity during a 24-hour period and reduces the maximum processing capability of all units at the facility under continuous operations to account for the following limitations that may delay, interrupt, or slow down production.

**Barrels per Stream Day.** The maximum number of barrels of input that a distillation facility can process within a 24-hour period when running at full capacity under optimal crude and product slate conditions with no allowance for downtime.

**Catalytic Cracking.** The refining process of breaking down the larger, heavier, and more complex hydrocarbon molecules into simpler and lighter molecules. Catalytic cracking is accomplished by the use of a catalytic agent and is an effective process for increasing the yield of gasoline from crude oil. Catalytic cracking processes fresh feeds and recycled feeds.

**Catalytic Reforming.** A refining process using controlled heat and pressure with catalysts to rearrange certain hydrocarbon molecules, thereby converting paraffinic and naphthenic type hydrocarbons (e.g., low-octane gasoline boiling range fractions) into petrochemical feedstocks and higher octane stocks suitable for blending into finished gasoline.

**Delayed Coking.** A process by which heavier crude oil fractions can be thermally decomposed under conditions of elevated temperatures and pressure to produce a mixture of lighter oils and petroleum coke. The light oils can be processed further in other refinery units to meet product specifications. The coke can be used either as a fuel or in other applications such as the manufacturing of steel or aluminum.

**Vacuum Distillation.** Distillation under reduced pressure (less the atmospheric) which lowers the boiling temperature of the liquid being distilled. This technique with its relatively low temperatures prevents cracking or decomposition of the charge stock.

Source: EIA 2007d

1 Southern California refineries make up of 53 percent of atmospheric, 50 percent of  
2 vacuum distillation, 76 percent of delayed coking, 57 percent of catalytic cracking,  
3 and 48 percent of catalytic reforming capabilities for the state of California. Box 1  
4 provides definitions of these terms.

### 5 California Refinery Performance

6 The performance of the Southern California refineries has been quite good over the  
7 past two years. All of the refineries have undergone planned outages for overhauls  
8 and turnarounds of the units. Six of the refineries have experienced documented  
9 unplanned outages:

- 10 • BP Los Angeles
- 11 • Chevron El Segundo
- 12 • ConocoPhillips Los Angeles
- 13 • ExxonMobil Torrance
- 14 • Tesoro (formerly Shell) Wilmington
- 15 • Valero Wilmington

The primary cause for these outages has been loss of electrical power typically at a substation supplied by the local utility. Unexpected outages result in shut downs of individual units (i.e., atmospheric distillation, distillate hydrocracker, fluid catalytic cracker, etc.). These unit outages can last a week or so as the plant is not shut down in an orderly manner and restart can be laborious. Cumulatively, none of the refineries had more than 40 days of outages. Also, rarely is the entire refinery shut down (e.g., Valero Wilmington was the only refinery to totally shut down when power was lost in October 2007).

Only one refinery in Southern California has suffered an extended, unplanned outage over the past two years. The ExxonMobil refinery in Torrance had a fire in February 2006 that resulted in a 50-day outage of all major units.

As the demand for transportation fuels continues to grow, California's twenty-one refineries have responded by gradually increasing their capacity. Based on increased future transportation fuel consumption in California and neighboring states, demand is growing faster than the ability of California's refineries to produce those fuels. Consequently, California is importing increasing quantities of finished petroleum products, placing more pressure on already-congested marine terminals.

On average California refineries operate at over 92 percent capacity. It is unlikely that new refineries will be built in Southern California due to regulatory and institutional impediments, although upgrades and capacity creep should contribute to between 0.4 and 1 percent annual growth in capacity. For example, Tesoro recently purchased the Wilmington Refinery from Shell in 2007 and announced plans to expand the refining capacity to 121,000 bpd by 2011, and expand the crude oil grades it can process. Tesoro also plans to replace the heater of the refinery's coking unit by 2010.<sup>1</sup>

## California Crude and Products Pipelines

Crude oil is delivered to different regions of California through a network of pipelines that carry it from both onshore and offshore oil wells to petroleum refineries. The main crude oil pipelines transport crude from the southern San Joaquin Valley oil fields to refineries in the Bay Area, the Los Angeles Basin, and Bakersfield. In addition, pipelines connect the refineries in Santa Maria and Oxnard to the rest of the system and transfer imported crude oil from marine terminals to refineries. Table 5 shows the major crude pipelines within California.

**Table 5. Major Intrastate California Crude Pipeline Systems**

<i>Operator</i>	<i>Pipeline</i>	<i>Capacity (bpd)</i>
Plains All American	Coast, Valley and Los Angeles System	290,000
ConocoPhillips	Coast and Valley System	85,000
ConocoPhillips	Los Angeles and Ventura	50,000
ExxonMobil	San Joaquin Valley Crude System	210,000
Shell Pipeline Company	Valley and Los Angeles Basin Crude System	N/A
<i>Source: Company Websites</i>		

<sup>1</sup> Reuters, 13:42 January 29, 2007

1 Crude pipelines in California are intrastate, and only move crude to refineries within  
2 the state. There are five major crude systems in California (see Table 5 above):  
3 Plains All American Coast, Valley and Los Angeles System, ConocoPhillips' Coast  
4 and Valley and their Los Angeles and Ventura Systems, Shell's Valley and Los  
5 Angeles Basin System, and ExxonMobil's San Joaquin Valley Crude System.  
6 ConocoPhillips' Coast and Valley System and ExxonMobil's San Joaquin Valley  
7 System transports crude from the San Francisco and Arroyo Grande area to refineries  
8 in Bakersfield and Los Angeles area. Shell's Los Angeles Basin System supplies  
9 crude to refineries in El Segundo, Torrance, Carson, Los Angeles, and Long Beach,  
10 and has storage facilities in Ventura, Fillmore, and Brea. Shell's Valley System  
11 supplies crude oil to refineries in the San Francisco Bay area. ConocoPhillips' Los  
12 Angeles and Ventura System also supplies crude to the Los Angeles Basin and  
13 Ventura area.

14 There are no petroleum product pipelines that currently import product into the state  
15 (see the "California Supply and Delivery Infrastructure" section above for a  
16 discussion of the potential to use the Southern product pipeline system between  
17 southern California, Phoenix, and Nevada to import product into California), and so  
18 imported products must be brought in through marine terminals. The Los Angeles  
19 Basin is the origin of pipeline deliveries of gasoline, jet fuel, and diesel to other parts  
20 of southern California, Nevada, and Arizona, with deliveries distributed through the  
21 Watson Station, or "hub." Refined products, either produced in state or imported, are  
22 transferred via pipeline from marine terminals and refineries to around 70 distribution  
23 terminals located throughout California. From the distribution terminals, refined  
24 products are usually trucked to retail outlets.

25 Most of the product pipeline systems in northern and southern California are owned  
26 by Kinder Morgan (KM). The KM western pipeline system is the largest pipeline  
27 system used to transport refined products (gasoline, diesel, and jet fuel) from refining  
28 centers to the various product terminals in California, Nevada, and Arizona. The KM  
29 western system is comprised of approximately 3,400 miles of pipeline varying in  
30 diameter from 4 to 24 inches. The system delivers products to distribution terminals,  
31 several military installations, commercial airports, and other interconnecting  
32 pipelines.

33 The KM western pipeline system is subdivided into a northern and a southern system.  
34 The northern system connects Bay area refineries to distribution terminals located in  
35 Sacramento, Chico, Reno, Stockton, Fresno, San Jose, Oakland, and South San  
36 Francisco. Fresno is also connected by pipeline to the Big West refinery in  
37 Bakersfield.

38 The KM southern system connects refineries and marine terminals in the Los  
39 Angeles Basin to distribution terminals in Los Angeles, San Diego, Imperial,  
40 Barstow, Las Vegas, Phoenix, and Tucson. In addition, a network of gathering lines  
41 connects marine facilities, refineries, and other storage facilities to the main  
42 pipelines. Pipelines also distribute jet fuel, produced in refineries or imported through  
43 marine terminals, to the major airports and some military bases.

44 KM's CalNev products pipeline interconnects with KM's southern system at Colton  
45 and terminates in Las Vegas, Nevada. It is a 6-14" pipeline with a capacity of  
46 200,000 bpd.



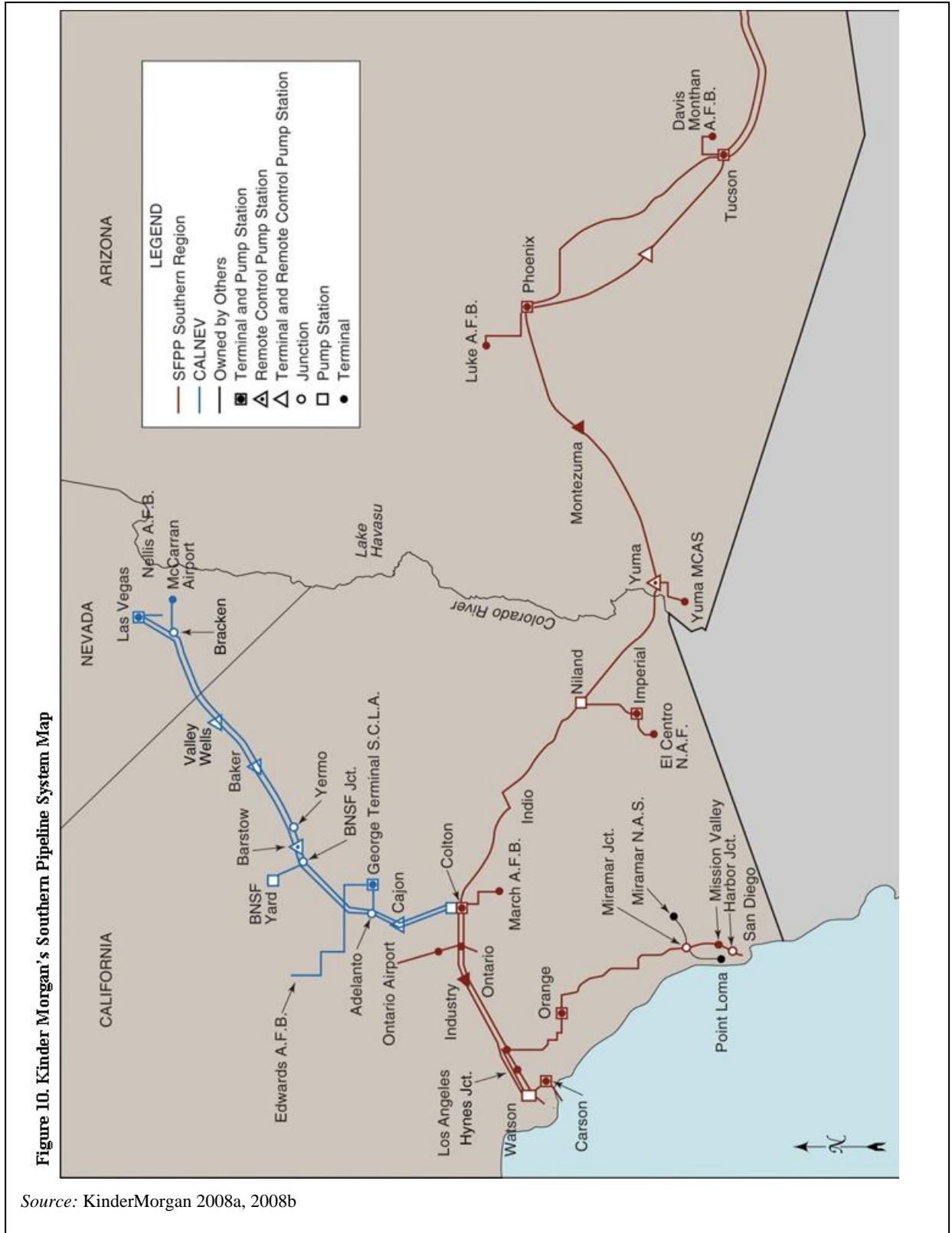
KM’s East Line products pipeline supplies the Phoenix area with products from refineries in El Paso, Texas. This 12” pipeline has a capacity of 95,000 bpd and has recently been expanded to service the rapidly growing Arizona market. The significance of the pipeline to Southern California is that the proposed expansion to 200,000 bpd, discussed later, will help relieve pressure on KM’s southern system to Phoenix and Tucson. Refiners and importers in California have historically transported substantial amounts of petroleum products by pipeline to Arizona. This expansion would lessen the impact of Arizona’s rapid growth on California supply, as Gulf Coast products begin to reach Arizona in greater volume.

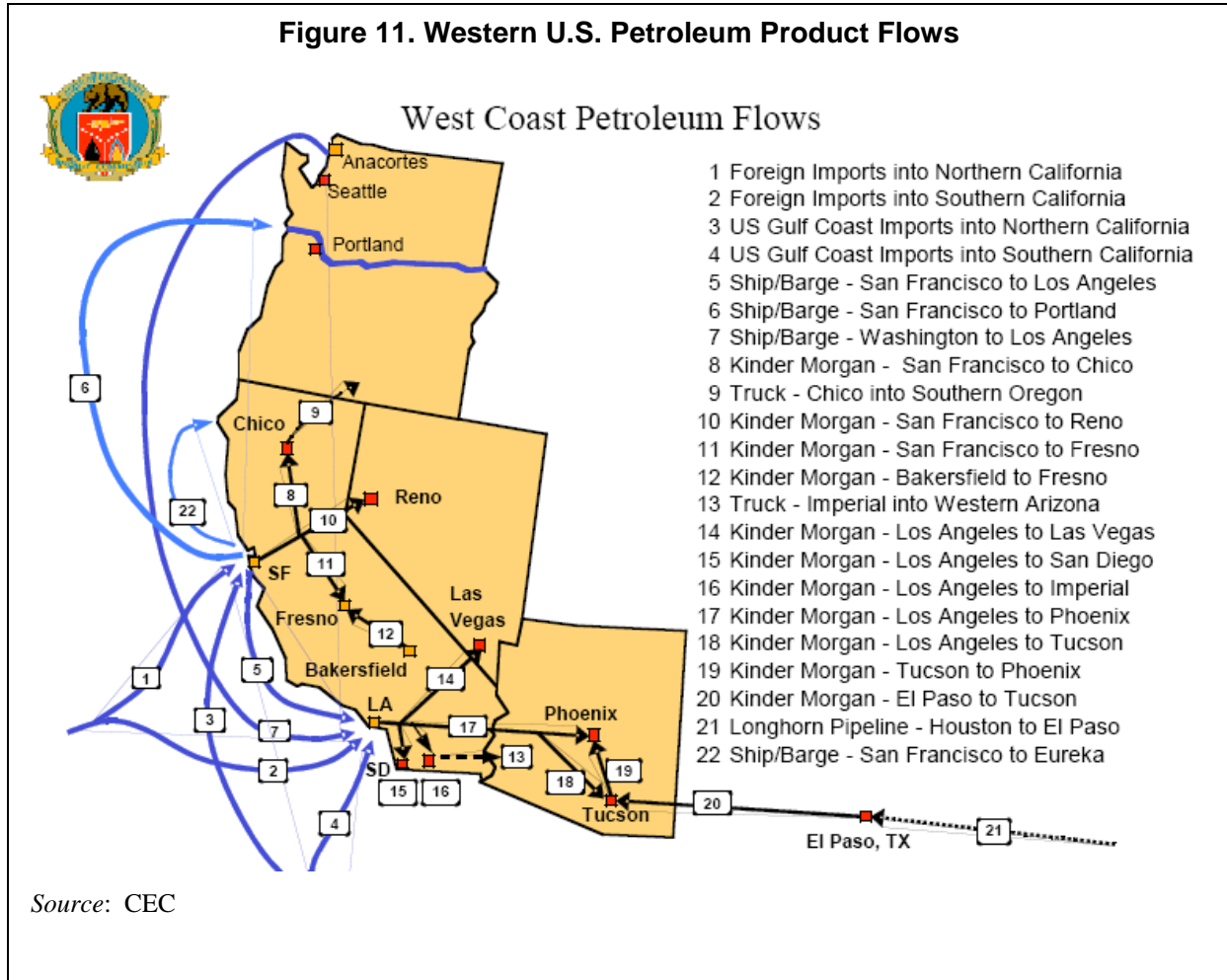
Figure 10 shows KM pipelines system in southern California. Table 6 provides additional details about each. Note that KM’s Northern and Southern California systems are not connected by pipeline, and, as with crude oil, no pipeline delivers products to California from out of state.

**Table 6. Major California Products Pipeline Systems**

<i>Operator</i>	<i>Pipeline</i>	<i>Start</i>	<i>Terminus</i>	<i>Segment</i>	<i>Capacity (b/d)</i>
Kinder Morgan	CalNev	CA	NV	NA	200,000
Kinder Morgan	KMP (South Line-West)	CA	AZ, NM	Watson to Norwalk Norwalk to Colton Norwalk to Orange Orange to Mission Valley Colton to Niland to Phoenix Niland to Imperial Mission Valley to San Diego Harbor	520,000 520,000 144,000 144,000 200,000 30,000 NA
Kinder Morgan	KMP (East Line)	TX	AZ	Phoenix to Tucson Tucson to Phoenix El Paso to Tucson	14,000 55,000 95,000
Kinder Morgan	KMP (North Line)	CA	NV	Concord to San Jose Concord to Stockton and Bradshaw Concord to Sacramento and Rocklin Rocklin to Reno Rocklin to Chico Concord to Fresno Richmond to Brisbane Concord to Richmond Bakersfield to Fresno	96,000 95,000 152,000 45,000 41,000 63,000 63,000 63,000 63,000
<i>Source: CEC 2002 Company Websites</i>					

The state of California is a net importer of petroleum products. Northern California has historically been a net exporter of petroleum products, exporting not only to other western states and foreign destinations but also to the Los Angeles Basin. However, imports are increasing relative to exports, and Northern California may soon become a net importer. Figure 11 shows the general flow of petroleum products in western states.





1 Southern California also receives refined products from Petroleum Administration for  
 2 Defense Districts (PADD) 3. The Gulf Coast states of Alabama, Arkansas,  
 3 Louisiana, Mississippi, New Mexico, and Texas make up PADD 3.

4 **Pipeline Expansions and Upgrades**

5 The California pipeline system was built in the 1950s and 1960s. Over the next 20  
 6 years, new pipeline projects will be undertaken to replace or expand specific  
 7 segments. Since crude oil pipelines have excess capacity, shipment delays are rare.  
 8 However, certain portions of California’s fuels pipeline network, particularly the  
 9 gathering lines that deliver fuels from refineries and marine facilities to the main KM  
 10 lines, operate at close to maximum capacity, especially during the summer. During  
 11 congested periods, truck transport is often employed to supplement pipeline  
 12 deliveries.

13 **Kinder Morgan Pacific East Line Expansion**

14 During 2007, KM completed and placed into service its \$153 million East Line  
 15 petroleum products pipeline expansion that increased pipeline capacity from El Paso,

1 Texas, to Tucson and Phoenix, Ariz. The expansion replaced almost 130 miles of 8-  
2 inch diameter pipeline between El Paso and Tucson with new state-of-the-art 16-inch  
3 diameter pipe, more than doubling the capacity on the East Line to over 200,000 bpd.  
4 The project also included construction of a new pump station and a 490,000 bbl tank  
5 facility near El Paso, and upgrades to existing stations and terminals between El Paso  
6 and Phoenix.

### 7 **Kinder Morgan CALNEV Expansion**

8 KM is expanding its CALNEV pipeline system into Las Vegas, Nevada. The \$400  
9 million expansion involves the construction of a new 16” pipeline from Colton,  
10 California to Las Vegas, Nevada. System capacity would increase to approximately  
11 200,000 bpd upon completion of the new pipeline, and capacity could be increased as  
12 necessary to over 300,000 bpd with the addition of pump stations. The expansion is  
13 expected to be complete by 2010.

14 The new pipeline will transport gasoline and diesel, as well as military jet fuel for  
15 Nellis Air Force Base. The existing 14-inch diameter pipeline will be dedicated to  
16 commercial jet fuel service for McCarran International Airport and any future  
17 commercial airports planned for the Las Vegas market. The 8-inch diameter pipeline  
18 that currently serves McCarran International Airport would be purged and held for  
19 future service.

20 The project includes construction of two new 80,000 bbl tanks at CALNEV's Las  
21 Vegas terminal, which will store gasoline and diesel. In addition, the Las Vegas  
22 terminal project will realign several existing storage tanks to provide additional  
23 ethanol and transmix storage capability.

24 The significance of the CALNEV expansion is that greater flow of imported products  
25 will be required through Southern California marine terminals to provide fuel to the  
26 growing Southern Nevada market.

## 27 **Marine Infrastructure**

28 Facilities for importing crude oil and refined products are available in forty-six  
29 marine terminals in California, thirty-nine of which are located in the two major  
30 refining centers in the Bay area and Los Angeles. The other seven marine terminals,  
31 in San Diego, Ventura, and Humboldt counties, are not directly linked to refineries.  
32 These terminals are used to ship and receive products in areas that are not served by  
33 pipelines.

34 The Port of Los Angeles, Port of Long Beach, and El Segundo Marine Terminal  
35 encompass the major terminals for marine import of crude oil into southern  
36 California. There are currently six terminals at the Port of Los Angeles receiving  
37 crude and petroleum products with over 5 million bbl of storage capacity.

38 The California Energy Commission (CEC) 2005 assessment of petroleum  
39 infrastructure (CEC 2005) states that.

40 *“Marine facilities for crude oil and refined petroleum fuels include berthing*  
41 *locations (docks, wharves, etc.), adjacent storage tanks, and a network of*

1 pipelines to transfer petroleum products to and from marine vessels. In addition,  
2 non-adjacent storage tanks connected by pipeline to a marine terminal are  
3 considered part of the marine infrastructure. Almost all of California's refineries  
4 have their own proprietary berth and marine storage or nearby access to those of  
5 a third party.

6 In the Los Angeles Basin, the bulk of marine crude oil import facilities, in the  
7 Ports of Los Angeles and Long Beach, are located near most of the major  
8 refineries. In addition, ChevronTexaco operates a marine facility (the El  
9 Segundo Marine Terminal) on Santa Monica Bay. Southern California already is  
10 a net importer of petroleum products, with these imports expected to grow  
11 steadily as market demand grows.

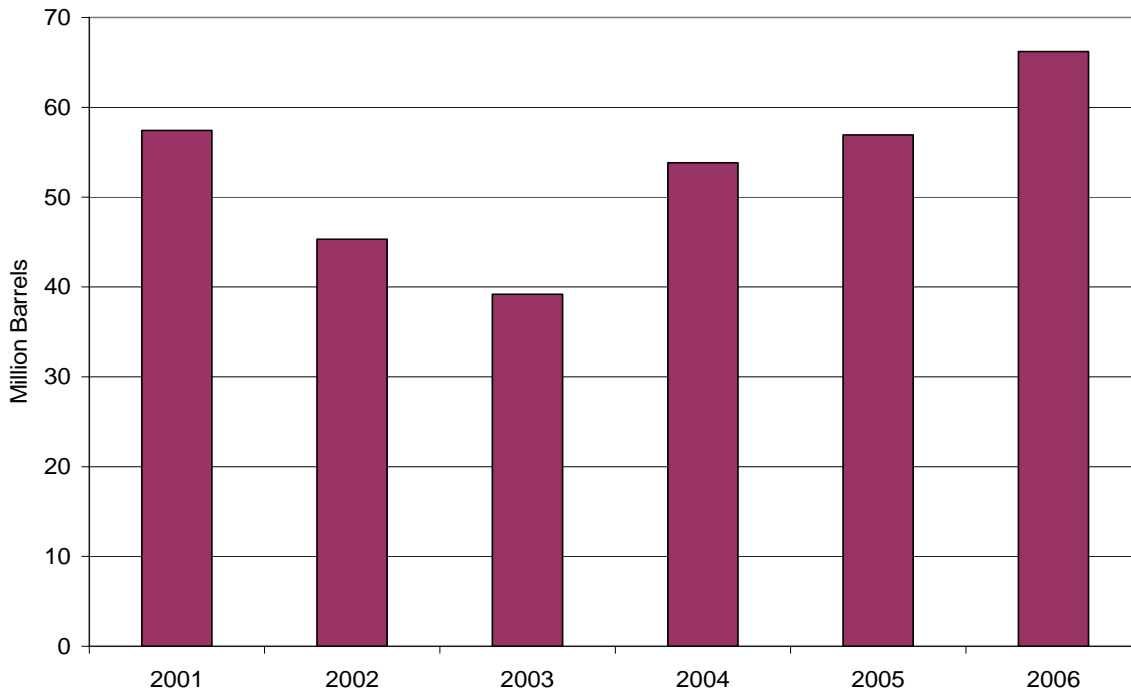
12 The Los Angeles Basin faces constraints related to marine infrastructure,  
13 including local issues associated with land use and environmental and safety  
14 concerns. The proximity of urban development creates pressure to classify  
15 petroleum activities at these ports as "inconsistent" with area risk management  
16 plans. As a result, ports are moving towards the shipping of containerized goods,  
17 and away from petroleum products

18 The rapid growth in the movement of goods through the ports of Los Angeles and  
19 Long Beach has resulted in tremendous demand for land to accommodate the  
20 offloading, storage, and transfer of cargos. The scarcity of available land has  
21 required new acreage created by filling in portions of both harbors, including the  
22 addition of over 500 acres of new land referred to as Pier 400. However, most  
23 space at Pier 400 is now occupied with cargo container activity, with only  
24 enough available land for one set of petroleum infrastructure storage tanks and  
25 two berths. Given the lack of available space, it is quite possible that another  
26 Pier 400 would have to be created to accommodate additional infrastructure or  
27 existing infrastructure that may be forced to relocate. The growth in cargo  
28 movements through the Ports of Los Angeles and Long Beach has led to greater  
29 concern over emissions. Efforts to limit emissions could impact the ability of the  
30 industry to import adequate quantities of crude oil and refined products. In  
31 particular, regulation likely will be geared toward emissions from berthed  
32 marine vessels. This could have more of an impact on crude oil and refined fuel  
33 carriers than on other types of vessels since these carriers use far more power to  
34 operate the pumps used to discharge cargos.

35 The southern California terminals are experiencing difficulties in adding any  
36 new petroleum storage capacity and, in some cases, maintaining existing storage  
37 facilities. A number of petroleum storage tanks have been idled and subsequently  
38 demolished over the last several years. Some of these storage tanks were  
39 decommissioned because of changing demands for certain types of petroleum  
40 products. In other cases, however, storage tank facilities were forced to close  
41 because port authorities have not renewed the leases. This loss of storage  
42 capacity has placed additional demands on the remaining facilities and most  
43 storage facilities now operate at near capacity".

44 Southern California ports are also seeing tremendous growth in imports of petroleum  
45 products. Between 2003 and 2006, petroleum product imports significantly increased  
46 from around 39 million bbl to 66 million bbl per year (Figure 12). This level of  
47 imports is creating congestion in the ports, which proposed expansions are meant to  
48 alleviate.

**Figure 12. Petroleum Product Imports to Southern California**



Source: EIA 2007e and EIA 2007f

## Rail Truck, and Barge Transportation

Refineries outside of the Los Angeles Basin rely almost entirely on trucking for product distribution. Within the LA Basin there is an extensive system of product pipeline (Figure 9). After fuels have been received at a wholesale distribution terminal, via pipeline or truck, fuels are then delivered to retail outlets by tanker trucks. The wholesale distribution terminal is equipped with a “truck rack,” which feeds gasoline, diesel, and jet fuel into the trucks. Distribution terminals include storage tanks used to hold refined product before it is dispensed into tanker trucks. Jet fuel is distributed at the major airports through on-site storage facilities, fed by the same fuels pipeline systems that supply the wholesale distribution terminals. The exception is Los Angeles International Airport, where a dedicated pipeline runs directly from the Port of Los Angeles to storage tanks at the airport.

The state’s fuel distribution terminals do not face major constraints. Most terminals in the state recently completed the necessary modifications and expansions, at a total cost of around \$700 million, to make the transition from using MTBE to using ethanol as a gasoline additive. The transition involved adding a limited number of rail facilities to deliver ethanol, increasing dedicated storage for ethanol, and adding equipment to dispense ethanol into fuel trucks. All of the required modifications and expansions appear to have been completed (CEC 2005, page 25).

1 Rail is not used to transport much product or crude; however, it is used extensively to  
2 transport ethanol, a blending component in gasoline. Ethanol is transported to  
3 blending facilities close to retail distributors. According to the Renewable Fuels  
4 Association, 75 percent of the ethanol is transported by rail throughout United States  
5 and remains the primary method of transportation to Southern California. Ethanol is  
6 contained in general service tank cars during rail transport. Each car can range from  
7 8,000 to 33,000 gallons of capacity.<sup>2</sup>

8 Burlington Northern Santa Fe (BNSF) Railway has the ability to supply the entire  
9 Los Angeles Basin demand via their Ethanol Express Line from the Midwest. The  
10 BNSF Ethanol Express consists of 95-car unit trains from a gathering location in the  
11 Midwest. One train from the Midwest reaches Los Angeles markets every 3 days,  
12 and it takes less than 24 hours to unload the ethanol.<sup>3</sup> Figure 13 shows major freight  
13 railroad routes and petroleum refinery and storage infrastructure in California.

14 There are no major barge movements of crude or petroleum products to or within  
15 California because there are no connecting inland waterways. Barges are used to  
16 transport product and crude on inland waterways or along the coast. Most crude  
17 would arrive via ocean going vessel, although some products are occasionally barged  
18 from Northern California refineries to Southern California terminals along the coast.  
19 The heaviest barge activity is associated with movements of petroleum products  
20 within San Pedro Harbor (between various marine terminals) and within the greater  
21 San Francisco Bay and Delta. Barges are often employed to transfer petroleum  
22 products from marine vessel to marine terminal, a process referred to as “lightering”.

## 23 **Factors Affecting Regional Demand**

24 Chapter 1 (Section 1.1.3), Chapter 2 (Section 2.3), and Appendix D1 summarize in  
25 detail CEC’s forecasts for transportation fuels demand among consumers and  
26 businesses. This section addresses recent plans and policies that could reduce demand  
27 for refined petroleum products, specifically the State Alternative Fuels Plan (CEC  
28 and CARB 2007) and recent federal legislation affecting CAFE standards.

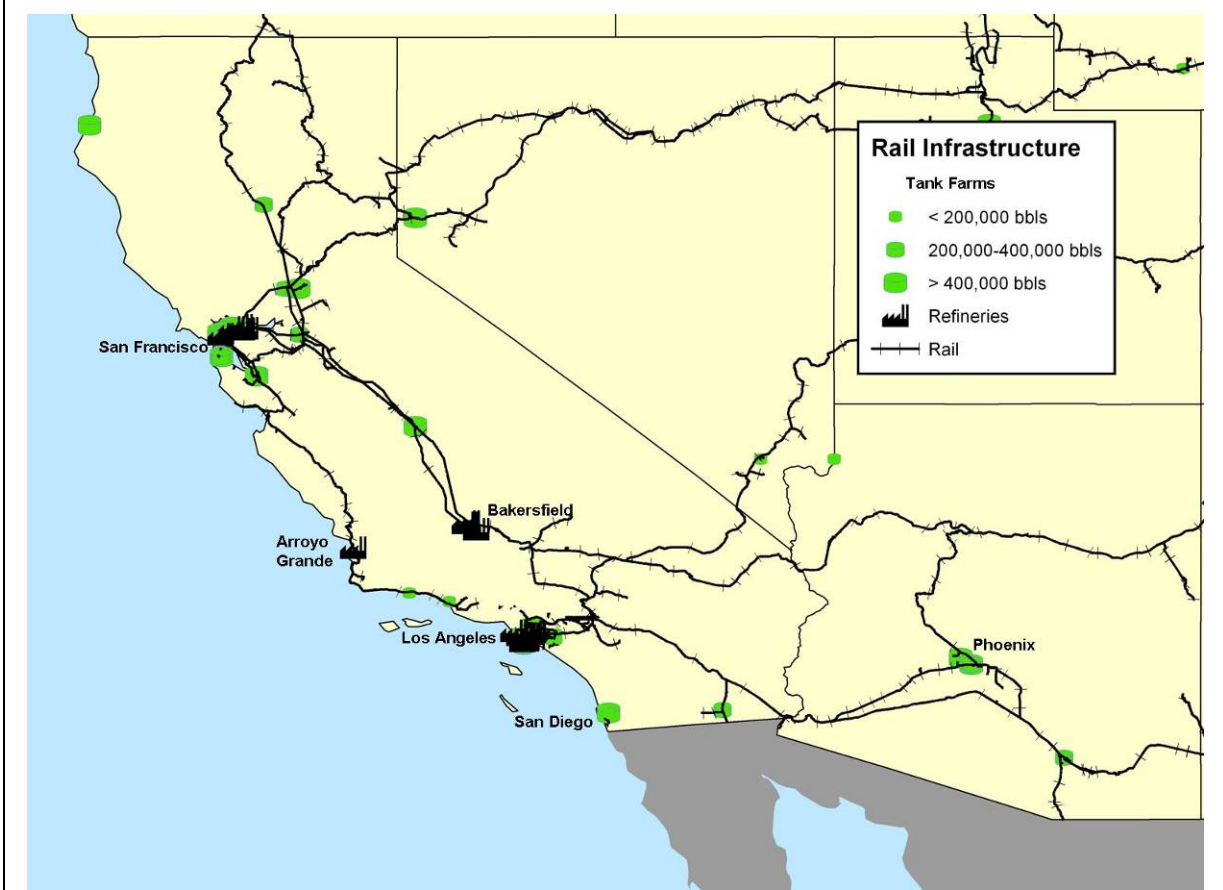
29 A number of policies are being implemented in California, which if successful, have  
30 the potential to significantly reduce future motor fuel consumption. The most  
31 aggressive and also most recent initiative is the State Alternative Fuels Plan, released  
32 by the CEC and CARB in December 2007.

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<sup>2</sup> (Gatx Rail, [http://www.gatx.com/rail/equipment\\_types\\_specs/browse\\_by\\_equipment\\_types.asp#general](http://www.gatx.com/rail/equipment_types_specs/browse_by_equipment_types.asp#general)).

<sup>3</sup> Data from company website

**Figure 13. California Railroad Map**



Source: SAIC created images using ArcMap GIS Software and data provided by the National Pipeline Mapping System, Energy Velocity, National Transportation Atlas Database, Energy Information Administration, and Environmental Systems Research Institute.

1 **The State Alternative Fuels Plan**

2 In January 2007, Governor Schwarzenegger issued Executive Order S-01-07 to  
 3 decrease carbon intensity of transportation fuels by 10 percent by 2020 and to reduce  
 4 statewide greenhouse gases to 80 percent below 1990 levels by 2050. In support of  
 5 EO S-01-07, AB 1007 directed the CEC and CARB to prepare a State Alternative  
 6 Fuels Plan.<sup>4</sup> The plan was released in November 2007. One of the Plan's  
 7 recommendations is that the Governor set targets on a gallon equivalent basis for use

<sup>4</sup> Assembly Bill 1007 directs the Energy Commission, in partnership with the California Air Resources Board, to develop and adopt the State Alternative Fuels Plan to:

- Recommend policies, such as standards, financial incentives, research and development programs, to stimulate the development of alternative fuel supply, new vehicles and technologies, and fueling stations.
- Evaluate alternative fuels using a full fuel cycle analysis of emissions of criteria air pollutants, air toxics, greenhouse gases, water pollutants, and other substances that are known to damage human health.
- Set goals to increase alternative fuels in 2012, 2017, and 2022 that there is no net material increase in air pollution, water pollution, or any other substances that are known to damage human health.



1 of 10 different alternative motor fuels in the on-road and off-road sectors. If fully  
2 implemented, the plan would reduce gasoline and diesel use by 9 percent by 2012, 11  
3 percent by 2017, and 26 percent by 2022 (CEC and CARB 2007). These targets do  
4 not apply to air, rail, or marine fuel uses.

5 These goals, if implemented, would require a dramatic expansion in the use of fuels  
6 such as compressed natural gas, hydrogen, renewable diesel, bio-diesel and ethanol in  
7 motor vehicles. The Alternative Fuels Plan also proposes a multi-faceted strategy to  
8 develop hybrid and electric vehicle technologies; build the infrastructure to deliver  
9 the alternative fuels; increase the blending of more biofuels into gasoline and diesel;  
10 improve the fuel efficiency of vehicles; and reduce miles traveled by California  
11 motorists through more effective land use planning. Specifics of the plan are to (1)  
12 reduce GHG emissions through demand side measures, (2) increase the availability  
13 of alternative fuels, particularly those produced in California, (3) reduce petroleum  
14 consumption and dependence on petroleum imports, and (4) improve overall air  
15 quality.

- 16 **1. GHG Reduction Goal:** The state's GHG emission reduction goals are to  
17 reduce GHG emissions to the level emitted in 2000 by 2010, to the level  
18 emitted in 1990 by 2020, and to 80 percent below the level emitted in 1990  
19 by 2050. Assembly Bill 32 sets forth requirements for the California Air  
20 Resources Board on achieving 1990 GHG emission levels by 2020. In  
21 addition, the Low Carbon Fuels Standard (LCFS) requires fuel suppliers and  
22 distributors to reduce the carbon intensity of their fuels by 10 percent by  
23 2020
- 24 **2. In State Biofuels Production and Use Goal:** The Bioenergy Action Plan  
25 California, approved and publicly released by the Governor in July 2006, sets  
26 specific biofuels use targets in California of 0.93 million gasoline gallon  
27 equivalents in 2010, 1.6 billion in 2020, and 2 billion in 2050. In addition,  
28 the Governor emphasized the need for California to produce these biofuels  
29 within the state, establishing goals of a minimum of 20 percent of biofuels  
30 production within California by 2010, 40 percent by 2020, and 75 percent by  
31 2050.
- 32 **3. Petroleum Consumption Goal:** In 2003, the CEC and CARB jointly  
33 adopted a strategy to reduce California's dependence on petroleum. The two  
34 agencies demonstrated that it is feasible to reduce the on road use of gasoline  
35 and diesel fuel to 15 percent below 2003 levels by 2020 based on technology  
36 and fuel options that are achievable and cost beneficial. The two agencies  
37 recommended that the state pursue the strategy by establishing a goal to  
38 increase the use of non petroleum fuels to 20 percent of on road fuel demand  
39 by 2020 and 30 percent by 2030.
- 40 **4. Air Quality Goal:** Achieve ozone and 2.5 micron particulate matter (PM<sub>2.5</sub>)  
41 standards set by the US Environmental Protection Agency and the CARB.

42 Some specific recommendations of the State Alternative Fuels Plan are:

- 43 • Accelerate the growth of alternative fuels, displacing more than 4 billion  
44 gasoline gallon equivalents (20 percent) in 2020, 30 percent by 2030, and 50  
45 percent by 2050. This would be achieved by promoting a mix of biofuels,

- 1 natural gas, propane, and electric drive technologies in place of conventional  
 2 gasoline and diesel.
- 3 • Increase air quality standards to promote the greater reliance on alternative  
 4 vehicles, including plug in hybrid electric vehicles (PHEV), battery electric,  
 5 and fuel cells. The report sets a goal that over 75 percent of vehicles in  
 6 operation by 2050 would be non-petroleum based.
  - 7 • Expand the infrastructure available to handle ethanol (E-85), propane, natural  
 8 gas, and hydrogen and provide facilities for recharging PHEVs.
  - 9 • Displace traditional fuels with alternative fuels in market niches such as  
 10 transit buses, school buses etc.
  - 11 • Increase state and federal incentives for alternative fuels and adopt mandates  
 12 such as the Low-Carbon Fuel Standard.
  - 13 • Increase CAFE standards.

14 Table 7 shows the maximum feasible alternative fuel use shown in the State  
 15 Alternative Fuels Plan assuming that the “roadmap” is followed, and assuming  
 16 “high” fuel prices.

17 **Table 7. Maximum Feasible Alternative Fuel Use (Billion Gallons Gasoline Equivalent)**

<i>Alternative Fuels Case</i>	<i>Milestone Year</i>		
	<b>2012</b>	<b>2017</b>	<b>2022</b>
Business As Usual	1.4	1.7	2.1
AB 1007 (Moderate Case)	2.4	3.7	5.3
Aggressive Case	2.9	6.8	11.3

*Source: CEC and CARB 2007.*

18 **Impact on Demand**

19 Although the Plan provides a roadmap on how to achieve GHG emission reductions,  
 20 it does not have the force of law. Therefore estimates of reductions in transportation  
 21 fuel demand are the most optimistic estimates if all provisions are followed. Actual  
 22 demand reductions are likely to be less than shown in Table 7.

23 The alternative fuel goals are very aggressive and assume that the necessary  
 24 infrastructure and incentives can be put in place. Infrastructure would need to be built  
 25 to support wholesale and retail distribution outlets for hydrogen powered vehicles,  
 26 and sufficient availability of ethanol is needed for E85. Ethanol production on such a  
 27 large scale would likely affect feedstock prices, and is already having an impact on  
 28 food prices in some parts of the U.S. New technologies need to be developed for the  
 29 production of cellulosic ethanol from feedstock such as switch grass. While these  
 30 technologies are developed, Southern California will continue to depend on  
 31 conventional motor fuels.

32 **H.R.6 – Energy Independence and Security Act of 2007**

33 On December 19, 2007, Congress passed and the President signed H.R. 6, the Energy  
 34 Independence and Security Act of 2007. Major provisions that impact motor fuel  
 35 usage in the US and In Southern California include Title I – improved vehicle

economy and Title II increased production of biofuels. The stated purposes of the act are to:

- Move the U.S. toward greater energy independence and security;
- Increase the production of clean renewable fuels;
- Protect consumers;
- Increase the efficiency of products, buildings, and vehicles;
- Promote research on and deploy greenhouse gas capture and storage options; and
- Improve the energy performance of the Federal Government.

Key Provisions of the Titles I and II are:

- *Vehicle Fuel Economy for Automobiles.* Required CAFE standards of at least 35 mpg by model year 2020, beginning with model year 2011. For model years 2021-2030, a CAFE standard of the maximum feasible average fuel economy standard for that model year is required. Funding to promote the use of plug-in and other electric vehicle technologies, a near-term transportation sector electrification program, and domestic development and manufacturing of efficient vehicles and parts are included.
- *Vehicle Fuel Economy for Medium and Heavy Duty Vehicles.* Calls for first-ever efficiency standard to be established.
- *Production of Biofuels:* The total amount of biofuels added to transportation fuels is required to increase to 36 billion gallons by 2022 (compared to 4 billion gallons in 2006). By 2022, 21 billion gallons of the total required must come from advanced biofuels, including 16 billions gallons from cellulosic biofuels by 2022 and 1.0 billion gallons of bio-mass based diesel by 2012. A grant program to encourage the production of advanced biofuels will be established.

According to the American Council for an Energy Efficient Economy, CAFE standards, which are a 40 percent increase over current values, are projected to:

- Save consumers \$22 billion in the year 2020; ~\$1,000 per year per family in fuel cost savings
- Cut U.S. oil demand by 2 million bbl a day in 2030, an 8 percent decrease in the amount forecasted by DOE
- Cut GHG emissions equivalent to taking 28 million cars off the road
- Represent ~60 percent of the estimated total energy savings from the law.

## Future Infrastructure Requirements

CAFE standards proposed by California under the State Alternative Fuels Plan are greater than those in H.R. 6, which means that the reductions shown in Table 7 would not be any greater due to H.R. 6 implementation.

1 As stated elsewhere in the document (Chapter 1 Section 1.1.3, Chapter 2 Section  
2 2.3), even with full implementation of the State Alternative Fuels Plan,  
3 improvements such as the proposed Project would be required in order to  
4 accommodate import of conventional petroleum fuels.

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