

***Comments On
Mineral Management Service's
Notice of Proposed Rulemaking (NOPR)
Establishing Oil Value for Royalty Due
on Federal Leases***

***By Samuel A. Van Vactor
A Report Prepared for Texaco Inc.***

I. Introduction

Crude oil pricing is complex by its nature. Crude oil quality, its density and level of contaminants, varies greatly from one region or field to another. Likewise, refineries vary in their ability to process different grades of crude oil. Moreover, the markets for petroleum products are in constant flux, both by geographic region and product type. As a consequence, relative petroleum product prices are constantly changing, and thus shifting the incentives to buy and sell the various grades of crude oil. The crude oil market responds to the shifting incentives; spot price assessments change every day and posted prices now change almost as frequently.¹

The Mineral Management Service (MMS) proposal would calculate royalty obligation based on location-quality differentials tied to one of two index price series — for the West Coast, spot price assessments of Alaska North Slope (ANS) crude oil; and, for other regions, the New York Mercantile Exchange (NYMEX) West Texas Intermediate (WTI) price for the "prompt" month. In adopting this convention, the fundamental concept that guided MMS regulations for years — royalty obligations should be based on prices in the producing field — would be jettisoned, at least for integrated oil companies. The MMS proposes to substitute formula-based pricing for the present practice of market-based pricing at the lease. Such formulas would be arbitrary and unlikely to result in values that reflect arm's-length prices at the lease. Consequently, there is considerable risk that the basis on which royalties are calculated would deviate from fair market value. These deviations could be substantial.

To determine specific lease prices, the MMS proposes to adjust the index prices by "actual" transport costs (as defined by its regulations) and a confusing variety of location-quality adjustments. The MMS's proposal is inconsistent in methodology and application. California oil fields are treated differently from fields in the mid-continent. Independent producers are treated differently from integrated companies. The result would be a multi-track accounting procedure that would be costly, confusing and discriminatory among lessees.

¹Spot price assessments are estimates of various petroleum product and crude oil prices published by the trade press. They are based on a survey of traders and others involved in the marketing of petroleum. Posted prices are prices offered for various crude oil steams "posted" by various producers and refiners.

The two crude-oil index prices the MMS has chosen (WTI at Cushing and ANS crude oil delivered to the West Coast) are traded in large volumes. However, these crude oils are not necessarily representative of a general trend. Prices in other fields change frequently, often moving in opposite directions. This will compound the problem of determining location-quality differentials reflective of fair market value, creating uncertainty about crude-oil values in the producing fields.

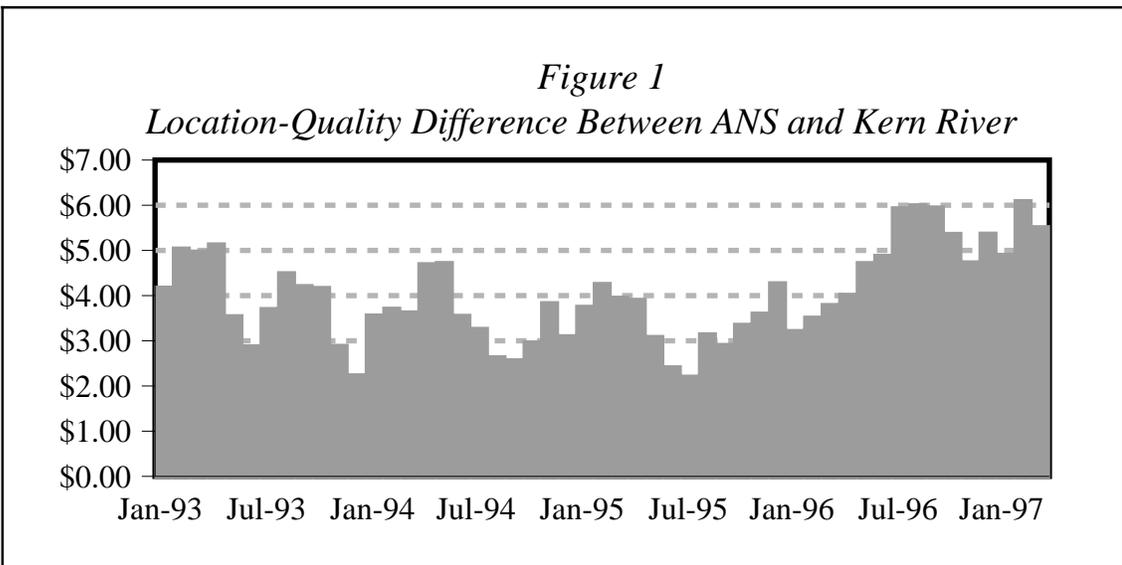
Theoretically, a formula-based pricing system for crude oils would be able to approximate market value if all the proper adjustments could be made for costs, risks and the multitude of factors that underlie constantly shifting supply and demand schedules. However, such a system would have extremely high administrative costs for both the MMS and the industry (even if accurate information about such factors were available.) It would be costly to design and implement such a system since it would require, for example, that quality and location differentials for hundreds of crude oils be calculated on a monthly, if not daily basis. Net-back adjustments for a broad range of downstream costs and risks would be required. Annual calculation of these differentials, perhaps less costly to implement, could not possibly capture the workings of the market.

The uncertainty and valuation errors created by the MMS's proposed formulas would cause a number of economic inefficiencies. Prices do much more than simply determine what is paid for the crude oil; they signal producers to produce more or less. They signal where the crude oil ought to be shipped and whether refiners should run their plants at higher capacity or cut back. Ultimately the prices refiners are willing to pay for crude oil depend on the prices they expect to receive for the petroleum products they plan to refine. For example, if the market for Bunker C fuel oil is strong, and demand for gasoline and diesel is weak, refiners will seek to increase runs of heavy crude oil in order to produce the product in demand. When this happens, prices of heavy crude oil will be bid up, or the price of light crude oil will come down. Similarly, if demand for petroleum products declines in Chicago and increases in Houston, relative prices of Texas and Oklahoma crude oils will change and supplies will be redirected to refineries that need them.

The crude-oil market is anything but static, it is constantly changing. For example, Figure 1 illustrates the average monthly spot price differential between a Kern River, 13° API crude oil located in the San Joaquin Valley (SJV),

California, and ANS, a 30° API crude oil delivered either to Los Angeles or the Bay Area of California.² Because Kern River is heavier and further from California's refineries it always sells for less than delivered ANS. However, the price difference varies enormously. In July 1995, ANS was \$2.19 greater than Kern River; in February 1997 it was \$6.08 per barrel greater. Similarly, ANS prices varied from \$0.26 to \$1.61 per barrel more than Line 63 crude oil, delivered to Los Angeles over the same period.³

In North America, the crude oil pricing structure has to account for the relative value of thousands of active crude oil fields at hundreds of pipeline junctions, aggregations points, market centers and refinery gates. How does it work? It is a decentralized process. Individual traders, who represent refiners, producers and/or marketers, make individual decisions. Every deal is different but in total the transactions aggregate to the crude oil market. Traders make their decisions based upon a vast array of market intelligence. No matter how skillfully designed, the workings of the market can not be reproduced by a set of simple formulas.



²Data used in figures are contained in attached Tables 1 and 2.

³Line 63 is a commingled stream of approximately 28 API of various California crude oils delivered to Los Angeles Basin refineries.

II. Specific problems with the MMS proposal

A. Abandoning the concept of fair market value

Replacing market-based pricing with formula-based pricing raises important philosophical, practical and legal issues. Both lessor and lessee should be concerned if the concept of payment on the basis of arm's-length prices in the producing fields is abandoned in favor of indices and formulas. Such formulas cannot reflect the day-to-day fluctuations in supply and demand in the field. Further, the results may be subject to manipulation and would lack the cross check of actual audits and verification of cash transactions.

B. Complexities of determining location-quality differentials

The MMS correctly understands that location differentials are not the same thing as transportation costs. They comment: "Although location differentials would reflect differences in the value of oil at different locations they are not transportation cost allowances."⁴ However, after stating this principle, the MMS has almost completely ignored it. Instead, the methodology proposed is a combination of actual transport costs from the field to a variety of aggregation points and then differentials to market centers and to Cushing, Oklahoma. For the West Coast no differentials are proposed at all; instead ANS prices are to be adjusted for quality to make them "comparable" to the California crude oil in question and only estimated transport costs deducted.

The proposed procedure simply does not reflect how the market works. For example, the field price of Midway Sunset, a heavy crude oil produced in California's San Joaquin Valley is influenced by a number of factors that may be unique to that grade of oil in that field. Market value for royalties is set by what willing buyers and willing sellers pay for it at the lease. The correct location-quality differential between Midway Sunset and ANS is nothing more or less than the difference between the market prices of the two at their respective points of sale at any given time. It is impossible to accurately net back ANS values to the Midway Sunset field under the MMS's proposed formulas. Midway Sunset crude oil flows to local refineries in Bakersfield, north to Bay Area refineries, east to

⁴DOI, MMS 30 CFR Parts 206 and 208, p 3747.

Texas and south to Los Angeles. In virtually all cases the crude oil is commingled with a variety of other oils so that its specific properties can no longer be discerned. By itself, Midway Sunset cannot be shipped on an unheated crude oil pipeline, it has to be mixed with lighter crude oils. What constitutes transport cost or quality adjustment in this kind of system? Midway Sunset's delivered price may follow WTI one day and the next ANS or some other crude oil.

Appendix G of the NOPR contains an illustration of the MMS's methodology with respect to California crude oils. The royalty value for Midway Sunset was calculated using the average ANS spot price for September 1996, less a location quality-differential and transportation cost allowance.

Specifics on the calculation were not included by the MMS. However, questioning at the MMS's public hearing in Denver, Colorado on April 15, 1997, revealed that the location-quality adjustment was calculated using 1) the price-gravity adjustment for California crude oils published in posted-price bulletins applied to the gravity difference between Midway Sunset and ANS of 25¢ per degree amounting to \$3.38, then 2) a sulfur penalty of 65¢, and then 3) transportation rates for the Four Corners Pipeline (a common carrier pipeline) between the SJV aggregation point and Long Beach refineries of 75¢ per barrel. MMS officials stressed that this calculation was for illustrative purposes only; actual numbers would change after their methodology was modified and improved.

Analysis of this information, however, shows that the MMS's proposed methodology (regardless of the actual numbers used) is arbitrary and unrelated to market value. During September 1996, Chevron's average posted price for Midway Sunset was \$15.98. Kern River crude oil (the same gravity and similar location to Midway Sunset) spot prices from Reuters averaged \$15.77 for the month. These prices (determined by buyers and sellers in or near the producing field) will match the "value" calculated by the MMS's index methodology only by accident. Some of the specific difficulties with the estimate contained in the NOPR include:

ANS Prices: The MMS used a spot ANS price of \$21.25 for September, 1996. The source was not identified and it does not match average prices from either Reuters or British Petroleum (BP), although it is close. Most importantly, however, ANS spot prices are forward prices; they are negotiated in one month

for delivery in the next. In contrast, posted prices are contemporaneous; they are prices paid at the time of delivery. Deliveries of ANS in September 1996 were based on August spot prices. BP, the largest seller of ANS is explicit about its pricing methodology. Thus, BP's West Coast ANS price for delivery in September 1996 was \$19.95 per barrel. (October deliveries, negotiated in September, were \$21.70.) Using this ANS price of \$19.95 applied to the MMS differential of \$4.98 results in a royalty value of \$14.97 per barrel, \$1 below posted prices and 80¢ below spot prices for a similar crude oil in a nearby location.

The MMS also got the gravity of ANS wrong. Since production began at the Point McIntyre field on the North Slope and a second gas processing unit was added to Prudhoe Bay, average ANS gravity has increased to nearly 30°. Thus, ANS prices should have been discounted \$4.13 for 16.5° of gravity difference, rather than \$3.38 for 13.5° of difference. This point illustrates how difficult it is to successfully create a price formula. Things change all the time — the quality of the crude oil, transportation options, refinery configuration are just some of the factors affecting prices.

The MMS's most serious error concerns the application of California crude oil price-gravity differentials as a quality adjustment to ANS. Price-gravity differentials in posted price bulletins are meant to measure small variations around the gravity of the crude oil stream actually being delivered to the posting company. They are not intended to be applied across crude oil fields or for comparison to a wholly different crude oil. ANS is of much better refining quality than almost all California crude oils; it is lighter, more stable and predictable than commingled streams of California oils. ANS is delivered in large volumes and is not plagued by the heavy metals contained in most California crude oils. When ANS is compared to California crude oils of identical gravity using actual arm's length transactions or spot price assessments it typically sells for 50¢ to \$1 per barrel more.

Sulfur Penalty: Similarly, the 65¢ per barrel sulfur penalty applied to Midway Sunset was inappropriate. There is less than one-tenth of one percent more sulfur in Midway Sunset than there is in ANS, thus 65¢ is much too high. (65¢ might, however, be too low when other quality differences are considered.) This issue underscores the difficulty in making these adjustments. There certainly is a sulfur penalty at work in the market for crude oil, but the approximate

discount for each type of crude oil at any point in time is difficult to measure. There is no market information relating to sulfur that can readily be separated from other location and quality issues.

Transportation Cost Allowance: The MMS calculated a location differential of 75¢ per barrel between the aggregation point and ANS delivered to Los Angeles using pipeline transportation rates determined by the California PUC for the Four Corners Pipeline.⁵ Unfortunately, such a shipment is not possible. Midway Sunset is approximately 13° and the Four Corners' system is unheated. In order to meet pipeline specifications the shipper must meet a minimum average of approximately 26°; to ship heavy crude oil on the pipeline it has to be blended with lighter crude oils or intermediate refinery products.

It is possible to ship heavy crude oil to Los Angeles by other means. Shell operates a unit train and heavy oils can always be shipped by tanker truck. These options, however, are about twice the cost of the pipeline rate for lighter crude oils. Blending costs and shipment of a commingled crude oil stream may sometimes be cheaper than train or truck. But such costs are very difficult to calculate. Further, serious difficulties exist in valuing the commingled crude oil stream once it reaches Los Angeles.

Market Differentials: The MMS netback approach involves an estimate of crude oil values in the field that starts with prices at market centers and works backwards, by subtracting transport and other costs. In certain cases such calculations would approximate market value at the lease and other times they would not. The Midway Sunset example selected by the MMS to explain its proposed rule is, itself, a perfect example of the inherent difficulties in the netback approach. Location-quality differentials cannot be accurately measured by "cost" calculations, because costs are only one part of the demand-supply equation that sets market value at the lease. What may be valid one month, could be completely irrelevant the next. As pointed out above, Midway Sunset crude oil flows to four different refinery centers: Which one, if any, sets the netback value?

The MMS proposes to collect location-quality differentials, average them

⁵There is only one heated pipeline from the SJV to Los Angeles. It is a proprietary line owned by Mobil and is not available to other producers or refiners.

for a year and publish them. Such a procedure completely overlooks the dynamic nature of the market. Figure 1 demonstrated the month-to-month variability in Kern River crude oil as compared to ANS.

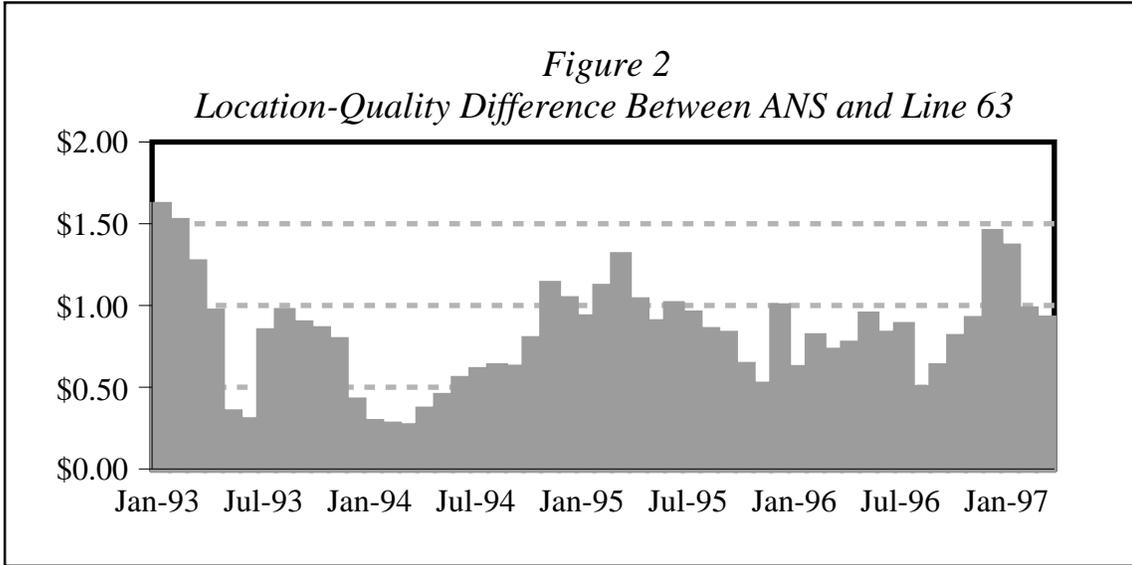


Figure 2 illustrates a similar variability between ANS and Line 63.

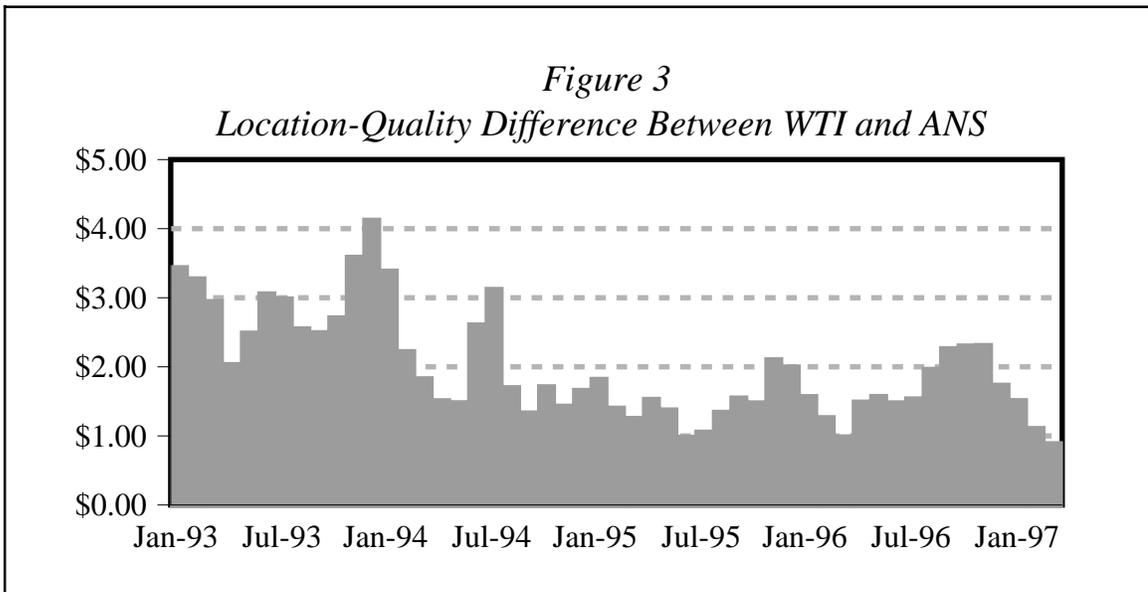
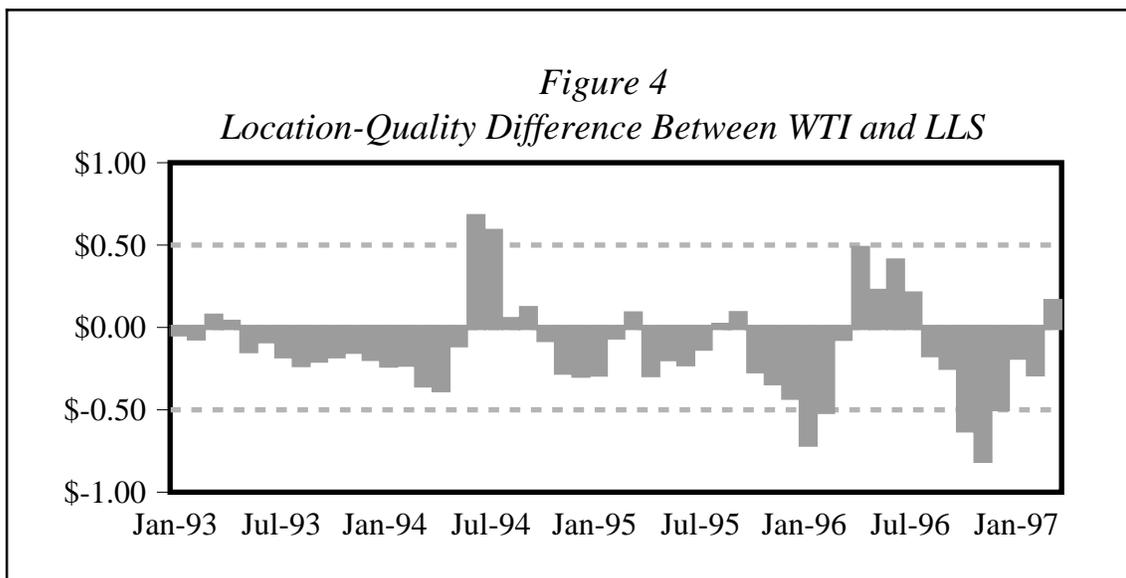


Figure 3 demonstrates the variability between ANS on the West Coast and WTI at Cushing, Oklahoma.

Figure 4 compares Louisiana Light at St. James (LLS), to WTI . The price differentials between these two crude oils are particularly revealing. On average WTI and LLS prices are about the same, but the differential is usually quite substantial and moves unpredictably; there is no apparent pattern. A similar result would be found for almost every other crude oil in the U. S. As noted above, there are virtually no public data on location-quality differentials. Thus, the MMS will have no cross check on the data submitted by royalty lessees.



Part of the variability in location-quality differentials may be due to the idiosyncratic movements of ANS and WTI themselves. Stated another way, these prices are not necessarily reliable indicators of the general trend in crude oil prices. WTI prices at Cushing are particularly sensitive to the availability of inland pipelines and the specific refineries they serve. In contrast, ANS and most foreign crude oils are waterborne with a great many delivery options. ANS sales are, however, dominated by a single seller, BP. The monthly average of ANS prices has varied from \$0.89 to \$4.12 below WTI at Cushing over the last four years. Once again, these variations are quite unpredictable and are not captured by annual averages.

C. Inconsistencies in methodology and application

As noted above, two quite different procedures for determining field royalty values are being proposed for the West Coast and East-of-the-Rockies. As data are collected, there are likely to be many more deviations; as with the Midway Sunset example, it would not be surprising to discover that nearly every field is an exception. Further, the proposal suggests quite different standards for different companies. Those with integrated operations or those who trade crude oil, engaging in exchanges and other complex transactions, would be required to pay royalties on the basis of the index calculation. The concept of arm's-length sales prices would be retained only for certain independent producers. A dual standard is economically inefficient for the industry and likely to prove difficult and costly for the MMS to implement.⁶

D. Index prices are not representative.

The MMS has selected ANS spot prices as the index against which to gauge the value of California crude oils. This is problematic for several reasons. ANS is delivered to California refineries located at tidewater in Los Angeles or the Bay Area. It is a mid-gravity crude oil, with roughly 800 thousand barrels per day delivered to California. About half of the total goes to Exxon and ARCO refineries. These companies are ANS producers and generally refine their own crude oil. Remaining deliveries of ANS are sales and/or exchanges made by BP, Phillips and other ANS producers that do not have West Coast refineries.

Because ANS is waterborne and shipping costs from Valdez to Hawaii, Puget Sound and California are similar, ANS has a single price for West Coast deliveries. Generally spot ANS prices reported in the trade press are cited as differentials (discounts) from WTI at Cushing. The spot deals are tracked by

⁶Situations could arise where two producers were alike in all aspects excepting that one producer had purchased as well as sold oil sometime during the last two years. The basis on which the two lessees would pay royalties could be markedly different: one paying on the basis of a fixed differential from a moving index price, while the other paid on the basis of gross proceeds. Which of the two would be advantaged is unclear. What is clear is that the standard tax/royalty criterion that calls for equals to be treated equally would be violated.

Platts, Dow Jones, and Reuters and the resulting ANS spot price assessments are published. Generally, two to three cargos a week are sold spot and prices are updated after such sales.

There is some concern about the future liquidity of the ANS spot market, since it may now be exported. So far, foreign sales volume is limited, but this could change. In any case, the potential for exports has caused some ANS buyers to switch their preference to term contracts. Thus, the volume of spot sales could decline, reducing the reliability of spot prices for determining market value.

California crude oils are not as homogeneous as ANS. They vary widely in location, quality characteristics and transportation options. Most California crude oils are heavy and laden with metals and sulfur. As a consequence their prices are discounted relative to ANS or foreign imports. All large volume California fields — e.g., Kern River, Belridge, Midway Sunset, and Wilmington — produce heavy crude oils. Most offshore crude oils are not only heavy but contain high concentrations of sulfur. It takes a specialized refinery to process these crude oils. California has developed the most sophisticated refinery structure in the world with a high proportion of bottoms upgrading capacity in order to refine indigenous crude oils.

There are a limited number of heated crude-oil pipelines in California capable of moving the heavy crude oil. Most heavy oils are upgraded by intermediate refining or blending in order to be moved to refineries in Los Angeles or the Bay Area. Thus the process of determining transport costs for particular crude oils in particular fields is difficult, if not impossible.

Since 1993 ANS spot prices have averaged 82¢ per barrel higher than spot prices for Line 63. This 82¢ reflects a quality difference not captured by divergence in API gravity on average over the period and the MMS's proposed formulas. (Line 63 API gravity and sulfur content have been quite similar to ANS.) It is not possible to determine the fair market value of California crude oils based on ANS prices without taking into account such obvious arm's-length value differences. (The MMS has proposed to ignore this market-determined differential and to simply adjust ANS prices to a California crude oil equivalent based on gravity and sulfur differences.) Similar problems exist for crude oils in the mid-continent. WTI prices at Cushing are only indirectly related to prices in Louisiana, New Mexico, and Wyoming.