

Appendix VIII - Hollister Field Office Reasonably Foreseeable Development Scenario for Oil and Gas

I. Summary

Based on an analysis of past oil and gas related activities within the boundaries of the Hollister Field Office (HFO) and the very small amount of federal mineral estate within areas of high development potential, we project that oil and gas activities on federal mineral estate within the Hollister Field Office area boundary will continue at a relatively minimal level. Overall, within the next 15-20 years, we project total surface disturbance due to all oil and gas activities on federal mineral estate to be no more than 74 acres. This estimate includes geophysical exploration (seismic), 5 exploration wells, 10 development wells and associated facilities, roads, and a transmission pipeline that could be linked to existing transmission lines within the area. One third of this disturbance, 26 acres, will be temporary, and would be mostly to totally reclaimed within a few months to a couple of years. Over the long term, both new and existing oil and gas related activities would eventually be abandoned, the lands would be reclaimed, and the sites would be restored to as near a natural condition as practical.

The total surface disturbance for up to 10 development wells would be 10 acres for well pads, 12 acres for roads, and 24 acres for a single transmission line 10 miles long. No more than 1 acre would be required for the small facility (meter, separator) on each of two parcels, for a total of 2 acres. The total surface disturbance caused by seismic operations, exploration drilling, and development would be 74 acres.

Description	Number	Unit Surface Disturbance (acres)	Total Surface Disturbance (acres)
Exploratory Wells			
Well Pads	5 wells	1 acre/well	5
Roads (40' wide)	5 x 0.5 miles	4.8 acre/mile	12
Development			
Well Pads	10	1 acre/well	10
Roads (40' wide)	10 x 0.25 mi	4.8 acre/mile	12
Facilities	4	1 acre/facility	4
Seismic (2 track x 18")	25 miles	0.36 acre/mi	9
Pipeline (20' wide)	10 miles	2.4 acres/mi	24
Total:	40 miles	74	74

II. Introduction

This appendix describes the scenario for the Reasonably Foreseeable Development (RFD) of oil and gas. The RFD scenario estimates the level and type of future oil and gas activity in the planning area and provides a basis for the analysis of cumulative effects. Based on current regulations and the small amount of projected activity on federal mineral estate within the planning area, this RFD is applicable regardless of which of the alternatives analyzed in the EIS is chosen as the Preferred Alternative.

The scenario first describes the steps involved in exploring for and developing deposits of oil and gas. Trends and assumptions affecting oil and gas activity are discussed in this appendix, followed by estimates for future oil and gas exploration and development.

The scenario for reasonably foreseeable development is based on known or inferred oil and gas potential, and applies the conditions and assumptions discussed below. Changes in available geologic data or economic conditions may alter this scenario, and some deviation should be expected over time. The lands included are limited to those with BLM-administered minerals, including split estate with federal minerals.

It should be noted that not all mineral estate managed by the BLM may have been identified at this time. For purposes of this document, we consider that all mineral estate managed by the BLM is covered by this RFD, even if we do not currently show the mineral estate on BLM maps. We also consider that mineral estate on lands that may be acquired in the future will also be covered by this RFD so long as the values and resources that are contained on the newly acquired lands do not differ significantly from those on existing known federal mineral estate.

III. Petroleum Geology of the Hollister Field Office Area

Refer to Section V, Oil and gas Occurrence and Development Potential.

IV. Past and Present Oil and Gas Exploration and Development Activity

There are 30 active oil fields and gas fields within the HFO management area, with a total administrative area of 188,000 acres. Within those administrative areas, the actual productive areas total about 58,000 acres. During the past 10 years, more than 1000 wells have been drilled within the HFO area, 93% of which were within field boundaries, with only 7% being classified as wildcats (outside administrative field boundaries). Although there are nearly 5400 acres of federal mineral estate within these productive boundaries (9% of the total), there was not a single well on federal mineral estate. This trend is not likely to change much, because nearly all of the activity in each of the past 10 years occurred in 3 fields where the federal share of mineral estate is only 1%.

Regarding new field discoveries, there have been fewer than 3 fields discovered within the last 10 years, none of which contained federal mineral estate. Because of the low amount of activity on federal mineral estate, a more detailed description of past and current activities throughout the entire HFO area is unnecessary.

V. Oil and gas Occurrence and Development Potential

The Hollister Field Office has areas of high, moderate, and low to none development potential. The size of each category is shown in the table below.

Category	Total Acres
High	1,883,449
Moderate	2,402,432
Low to None	2,529,259
Total	6,815,140

High Development Potential

The areas of high oil/gas development potential occur in five areas. The areas, a total of 1,883,000 acres, are depicted in pink on Map 10. They will be described from north to south.

The first area of high oil/gas development potential is in the extreme northern part of the Hollister Field Office area in Contra Costa County. This area is dominated by gas fields that produce from Eocene and Paleocene sedimentary rocks.

The second area of high oil/gas development potential is in the Santa Clara Mountains of southeastern San Mateo and northwestern Santa Cruz Counties. There are no presently active oil or gas fields in the area. However, several drilling programs have identified potential production (“shows”) from Lower Tertiary and Upper Cretaceous formations in this area.

The third area of high oil/gas development potential is in the central part of the Hollister Field Office area in northern San Benito County. The Sargent Oil Field produces from the Miocene Monterey Formation and Pliocene Purisima Formation of the San Juan Valley sedimentary basin.

The fourth area of high oil/gas development potential is in southeastern San Benito County and western Fresno County. This area is part of the San Joaquin Basin, and has several oil fields that produce from Miocene and Pliocene marine sedimentary rocks.

The fifth area of high oil/gas development potential is in southwestern San Benito County and southeastern Monterey County. The most important oil/gas field in this area is the San Ardo field. It, and the other oil fields in the area, produce from the Miocene Monterey formation in the Salinas sedimentary basin.

Moderate Potential

There are several areas of moderate potential within the Hollister Field Office area. These areas, a total of 2,402,000 acres, are shown in yellow on Map 10. They are described as areas with Upper Cretaceous or Lower Tertiary sedimentary rocks containing many wells with oil and gas “shows” or even production, although generally not in economic quantities. Although these areas may contain numerous wells that either had production at one time, or had “shows”, they are classified as having only moderate potential because the rocks in this area are generally more highly fractured, and do not generally have trapping styles or cap rocks that permit sustained development from oil/gas accumulations.

In the southern part of the Hollister Area Office, these rocks are found in three strips along the western central and eastern parts of the Area Office. The eastern strip of Moderate oil/gas potential lies west of high-potential areas of the Sacramento-San Joaquin Basin. This strip lies east of a mass of crystalline and Franciscan metamorphic rocks in the center of the Field Office Area, including the Clear Creek Management Area in the Diablo Mountain Range.

The central strip of moderate oil/gas potential is bounded on the east by a mass of crystalline and Franciscan metamorphic rocks of the Diablo Range and a similar set of igneous and metamorphic rocks in the Coast Ranges.

The western strip of moderate oil/gas potential occurs between the coast and the western foothills of the Coast Ranges.

Low to None Development Potential

There areas of low to none (hereafter “low”) oil/gas development potential is defined as areas that are underlain dominantly by crystalline igneous rocks and metamorphic rocks of the Franciscan Formation. These areas of low oil/gas development potential, a total of 2,529,000 acres, are shown in green on Map 10.

There are five low potential zones in the Hollister Field Office. The low potential rocks occur in three discontinuous bands that run north-northwest to south-southeast in the eastern, central, and western parts of the Area Office.

The eastern low potential zone is located in the Diablo Mountains and in the Tumey-Panoche Hills. It is divided into northern and southern segments by the Vallecitos Trough.

The central low potential zone is located in the Coast Ranges as the core of a crystalline igneous-metamorphic faulted complex.

The western low potential zone has two components. The northern component is in the Santa Lucia Range, and the southern component in the Santa Lucia Range.

Occurrence Potential

Refer to Map 10 in Appendix I to identify areas of oil and gas occurrence potential in CCMA.

VI. RFD Baseline Scenario Assumptions, Discussion, and Estimated Surface Disturbance from Oil and Gas Activity on Federal Mineral Estate in the Hollister Field Office Area

For purposes of this document, we have assumed that all potentially productive areas are open under standard lease terms and conditions, except those areas designated as closed to leasing by law, regulation, or executive order. Based on current regulations and policy and the small amount of projected activity on federal mineral estate within the planning area, this RFD is applicable regardless of which of the alternatives analyzed in the EIS is chosen as the Preferred Alternative.

Future trends and assumptions: Based on the history of minimal activity for oil and gas exploration and development on federal lands within the planning area, activity over the next 15 to 20 years is likely to be sporadic. Oil and gas activity will probably consist of the issuance of some competitive and over-the-counter leases, a few geophysical surveys, and perhaps the drilling of 3-5 exploratory wells, with no more than 10 development wells, and the associated facilities/gas transmission lines. It is very unlikely that more than a total of 15 exploratory and development wells will be drilled on new federal oil and gas leases. While the large majority or even all of this activity is expected to occur in areas identified in this RFD as “High Development Potential,” there is always a possibility that federal minerals in other areas may see geophysical exploration, leasing, and even actual exploration and development drilling. It is

highly unlikely that any wells in such an area would be productive, so any associated surface disturbance would likely be short term.

Geophysical exploration: Geophysical exploration is conducted to determine the subsurface structure of an area and the potential for mineral resources. There are three geophysical survey techniques that are generally used to define subsurface characteristics through measurements of the gravitational field, magnetic field, and seismic reflections.

Gravity and magnetic field surveys—involve small, portable measuring units that are easily transported by light off-highway vehicles, such as 4-wheel drive pickup trucks and jeeps, or aircraft. Both off and on-highway travel may be necessary. Although these two survey methods can take measurements along defined lines, it is more common to have a grid of distinct measurement stations. Surface disturbance resulting from these surveys is negligible, consisting almost exclusively of soil or vegetation compaction that persists no more than a few months.

Seismic reflection surveys—are the most common of the geophysical methods, and they produce the most detailed subsurface information. Seismic surveys are conducted by sending shock waves, generated by a small explosion or by mechanically beating the ground with a thumping or vibrating platform.

In the **explosive method**, small charges are detonated on the surface or in a shallow drill hole. The surface charge method uses 1 to 5-pound charges attached to wooden laths 3 to 8 feet above the ground. Placing charges lower than 6 feet usually results in destruction of vegetation, whereas placing the charges higher, or on the surface of deep snow, results in little visible surface disturbance. In the drill hole method, holes for the charges are drilled using truck-mounted or portable air drills. In general, this method uses 4 to 12 holes per mile of line, and a 5 to 50-pound explosive charge is placed in each hole, covered, and detonated. The shock wave created is recorded by geophones placed in a line on the surface. In rugged terrain, a portable drill carried by helicopter can sometimes be used. The vehicles used for a drilling program may include heavy truck-mounted drill rigs, track-mounted drill rigs, water trucks, a computer recording truck, and a light pickup.

In the **mechanical method**, four large trucks are usually used, each equipped with pads about 4-feet square. The pads are lowered to the ground, and the vibrations are electronically triggered from the recording truck. Once information is recorded, the trucks move forward a short distance and the process is repeated. Surface disturbance includes flattening of vegetation and compaction of soils.

In either type of seismic reflection surveys, existing roads and trails are used where possible. However, off-road travel is necessary in some cases. Several trips per day are made along a seismograph line, usually resulting in a well defined two-track trail.

It is expected that no more than three Notices of Intent, involving seismic reflection and gravity/magnetic field surveys across federal surface, would be filed under all Alternatives and the Proposed RMP during the life of this plan. Although it is unlikely, it is possible that one or two of the parcels with federal surface could be involved in a 3-D seismic proposal. If that occurs, the total expected surface disturbance could be up to 9 acres, based on up to 25 miles of seismic lines and a two track road with each track being 18" wide. It is possible that much of the travel could be located on existing roads or other previously disturbed lands, and there could be some hand laying of lines, and that would result in less new disturbance.

Drilling phase: After a parcel is leased, there may or may not be any actual disturbance. In fact, historically, a large majority of leases are relinquished without ever having any actual surface disturbance. In the event that an Application for Permit to Drill (APD) is submitted, a site specific evaluation will be made by the BLM to ensure compliance with NEPA requirements. Based on the results of that evaluation, additional Conditions of Approval may be added, and the operator may only begin construction after complying with lease stipulations and Conditions of Approval of the drilling permit. When a site requires construction of an access road, the shortest feasible route is usually selected to reduce the haul distance and construction costs. Environmental factors or a landowner's wishes may dictate a longer route in some cases. Drilling in the planning area is expected to be done using existing roads and construction of only short (approximately 0.5 mile) roads to access drill site locations.

Even though there are 30 active oil fields and gas fields that are partly or totally within the Hollister FO area, only 9% land within the productive boundaries of those fields contains federal minerals (5400 federal acres out of a total of more than 58,000 acres). In the past ten years, 1030 wells have been drilled in the entire FO area, but no wells have been drilled on federal minerals within the entire FO area. Consequently, based on the history of oil and gas exploration in the planning area, it is projected that no more than three to five exploratory wildcat wells (wells outside of the administrative boundary of existing oil and gas fields) would be drilled on BLM-administered land in the planning area during the life of this plan. Although the success rate for wildcat wells has improved markedly during the past decade, largely due to improved seismic data, it is still unlikely that any new fields would be discovered by drilling on federal minerals because there is so little activity in areas with significant amount of federal mineral estate.

Most drilling is expected to occur in areas of land designated as high development potential (shown on Map 10). Although there is a low probability that a field will be discovered on federal land during the life of this plan, if a field containing federal land were to be discovered in the northern portion of HFO area, it is likely that the discovery would be gas because all of the occurrences in that area are gas. Conversely, if a field containing federal land were to be discovered in the southern portion of HFO area, it is likely that the discovery would be oil because all of the occurrences in that area are oil.

During the first phase of drilling, the operator would move construction equipment over existing maintained roads to the point where the access road begins. Less than 0.5 mile of moderate duty access road per well with a gravel surface 20 feet wide is expected for construction. With ditches, cuts, and fill, the total width of surface disturbance would average 40 feet. The second part of the drilling phase is the construction of a drill pad up to 1 acre in size. The likely duration of well drilling, testing, and abandonment is 3 or 4 months per site. The total disturbance for each exploratory well and any new road is estimated to be 3.4 acres. The total surface disturbance caused by exploratory drilling of 3-5 wells over the life of this plan is expected to be no more than 10-17 acres.

Field development and production: Exploratory drilling is not expected to lead to the development of a producing field in the planning area. Nonetheless, the following scenario describes the operations and effects associated with field development.

The minimum size considered economically feasible would depend mainly on its proximity to existing infrastructure. There are many fields within the boundaries of the HFO area, mostly in the extreme southern and extreme northern portions of the area, and it is likely that any pipelines from a new field would be relatively short. The wells within the actual productive boundaries (smaller than the administrative boundaries) of gas fields are spaced on average at 80-160 acres. For oil fields in the HFO

area, spacing is much closer. In the larger oilfields, usual development spacing is typically at 5-7 acres per well. However, spacing can be as close as one well per acre in areas with heavy oil. Although it is unlikely that a new field will be discovered on federal minerals, for planning purposes we will assume a fairly small to mid size oil field may be discovered somewhere within the planning area. The average field size in the FO area is over 1900 acres, but that is significantly skewed by the presence of a few very large fields. The bottom 80% of the active fields in the FO area average 650 acres, about one square mile. If a single oilfield of that size was discovered, on average it would contain 9.1% federal mineral estate, about 60 acres. At 5-7 acres per well, it would take approximately 10 wells to fully develop the parcel. Each development well would require an estimated 0.25 mile of road, which would have a surface of crushed aggregate or gravel approximately 20 feet wide (total disturbed width of 40 feet). Well pads would be no more than 1 acre in size. Oil/gas produced would be carried by pipelines that could be linked to existing and proposed transmission lines in the planning area. Average infield pipeline length is estimated to be 0.25 mile per well, which could probably be largely contained within the road right of way and little new surface disturbance would be required. The total distance from a new field to an existing transmission pipeline is likely to be less than 10 miles. The width of the surface disturbance for pipelines would average 20 feet.

The total surface disturbance for up to 10 development wells would be 10 acres for well pads, 12 acres for roads, and 24 acres for a single transmission line 10 miles long. No more than 1 acre would be required for the small facility (meter, separator) on each parcel. For planning purposes, we will assume that the wells may be on two separate parcels, so there would be a total of 2 acres for facilities. The total surface disturbance caused by seismic operations, exploration drilling, and development would be 74 acres.

Description	Number	Unit Surface Disturbance (acres)	Total Surface Disturbance (acres)
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Total:	40 miles	74	74

Plugging and abandonment: Wells that are drilled and determined to be dry holes are plugged according to a plan designed for the condition of each well. Plugging involves placing cement plugs at strategic locations in the hole. Drilling mud is used as a spacer between the plugs to prevent communication between fluid-bearing zones. The drill casing is cut off at least 5 feet below ground level and capped by welding a steel plate on the casing stub. After plugging, all equipment and debris would be removed and the site restored as near as reasonably possible to its original condition. It is projected that much of the surface disturbance from exploratory activities and all of the seismic activities would be of short duration (between a few months and a couple of years). The impacts from the successful development wells would last longer, but it would still be completely reclaimed eventually

Military Bases – Fort Hunter Liggett military base is within the planning area. Leasing these lands requires consent from the local Base Commander. It has been shown in numerous cases across the country and within California that oil and gas exploration and development can often be conducted in a manner that is fully compatible with ongoing military operations. It is quite possible that negotiations between BLM and military personnel may result in agreement to lease lands within the boundaries of bases or other military lands. In the event that happens, appropriate leasing stipulations that would fully protect the military’s mission will be added prior to any land being leased.

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