FINDING OF NO SIGNIFICANT IMPACT

Use of Well Stimulation Treatments on the Pacific Outer Continental Shelf Pacific Outer Continental Shelf Region

Introduction

In accordance with the National Environmental Policy Act (NEPA), 42 USC 4261, *et seq.*, the Council on Environmental Quality regulations at 40 CFR 1501, *et seq.*, Department of the Interior (DOI) regulations implementing NEPA at 43 CFR Part 46, Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE) policy, BOEM and BSEE prepared a programmatic environmental assessment (PEA) of the potential effects of the use of Well Stimulation Treatments (WSTs) on the Pacific Outer Continental Shelf (POCS).

A Notice of Availability describing a public review and comment process was published in the Federal Register on February 22, 2016 (Document # 81-FR-8743). The notice was also forwarded to stakeholders, and posted on the project website: http://pocswellstim.evs.anl.gov/. The public comment period was held from February 22 to March 23, 2016. Over 10,000 comments were received, the vast majority of which were of the standardized format of outreach campaigns. The Bureaus found that approximately 75 of the comments were unique. All comments received were reviewed and considered; an issue summary document including comment categories and the government responses has been appended to the PEA. In some cases, the text of the Draft PEA was modified as a result of the comments received, primarily to provide clarification and in some cases to provide additional requested information.

BOEM and BSEE prepared the PEA to determine whether the Proposed Action may result in significant effects (40 CFR 1508.27) triggering additional mitigation to reduce such effects or the need to prepare an environmental impact statement. The PEA analyzes the potential for significant adverse effects from the Proposed Action on the human environment, which is interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment (40 CFR 1508.13 and 1508.14). The PEA was also prepared to assist with BOEM and BSEE planning and decision-making (40 CFR 1501.3b), namely, to help inform a determination as to whether the Proposed Action would cause undue or serious harm or damage to the human, marine, or coastal environment.

Purpose of the Proposed Action

The purpose of the proposed action (use of certain WSTs, such as hydraulic fracturing) is to enhance the recovery of petroleum and gas from new and existing wells on the POCS, beyond that which could be recovered with conventional methods (i.e., without the use of WSTs). The use of WSTs may improve resource extraction from some existing wells, and in some future new wells, on the POCS. The need for the proposed action is the efficient recovery of oil and gas reserves from the POCS.

Description of the Proposed Action

The WSTs evaluated in the PEA include fracturing and non-fracturing treatments which may be used for enhancing production from existing wells or accessing oil that is not accessible relying only on natural reservoir pressure. The PEA adopts the definitions that are found in State of California Senate Bill No. 4 (SB-4) Oil and Gas: Well Stimulation. The SB-4 definitions are applied to WST activities that are occurring in State waters and accessing the same formations as those being accessed by offshore platforms on the 43 active Federal leases, as well as being widely used on land in California. Adopting the SB-4 definitions allows for straightforward comparisons of WST applications in Federal and State offshore operations and in the analysis of the cumulative effects of all offshore operations.

Under the SB-4 definitions, *Well Stimulation Treatment* means any treatment of a well designed to enhance oil and gas production or recovery by increasing the permeability of the formation. WSTs include, but are not limited to, hydraulic fracturing treatments and acid well stimulations. Routine well cleanout work, routine well maintenance, routine removal of formation damage due to drilling, bottom hole pressure surveys, and routine activities that do not affect the integrity of the well or the formation are not considered WSTs.

The PEA distinguishes between "fracturing WSTs," in which WST fluids are injected at pressures required to fracture the formation (i.e., greater than the formation fracture pressure), and "non-fracturing WSTs," in which the WST fluid is injected at less than the pressure required to hydraulically fracture the formation. Diagnostic fracture injection tests (DFITs), hydraulic fracturing, and acid fracturing are the fracturing WSTs analyzed in the PEA. Matrix acidizing is the only non-fracturing WST analyzed. The four WSTs analyzed in the PEA are described as follows:

- **Diagnostic Fracture Injection Test (DFIT).** The DFIT is used to estimate key reservoir properties and parameters that are needed to optimize a main fracture job. It is a short duration procedure that involves the injection of typically less than 100 barrels of fracturing fluid at pressures high enough to initiate a fracture. Key parameters are estimated from the fluid volume injected and the pressure dissipation profile. The fluid used in a DFIT is typically the fluid that would be used in the main fracture treatment but with no proppant[1] added, thus allowing the fracture to close naturally as pressure is released.
- **Hydraulic Fracturing.** Hydraulic fracturing involves the injection of a fracturing fluid at a pressure (as typically determined by a DFIT) needed to induce fractures within the producing formation. The process generally proceeds in three sequential steps: (1) injection of a fracturing fluid without proppant to create fractures which extend out from the well; (2) injection of a slurry of fracturing fluid and proppant; and (3) injection of breakers, chemicals added to reduce the viscosity of the fracturing fluid. Upon release of pressure, the fracturing fluid is allowed to flow back (the flowback fluid) to the surface platform. Key fluid additives include polymer gels which increase the viscosity of the fluid and allow it to more easily carry proppant into the fractures, cross-linked compounds that

[1] A proppant is a solid material, typically sand, treated sand, or man-made ceramic materials, designed to keep an induced fracture open during or following a fracture treatment.

help further increase the fluid viscosity, and breaker chemicals which break down the cross-linked polymers and allow them to return more readily to the surface after fracturing is completed. Other important additives may include pH buffers, clay control additives, microbial biocides and surfactants to aid in fluid recovery. In offshore applications, the base fracturing fluid is filtered seawater.

- **Acid Fracturing.** Acid fracturing is similar to hydraulic fracturing except that instead of using a proppant to keep fractures open, an acid solution is used to etch channels in the rock walls of the fractures, thereby creating pathways for oil and gas to flow to the well. As with a hydraulic fracturing WST, a pad fluid is first injected to induce fractures in the formation. Next, the acid fracturing fluid is injected at pressures above the formation fracture pressure and allowed to etch the fracture walls. The acid fracturing fluid is typically gelled, cross-linked, or emulsified to maintain full contact with the fracture walls. Fifteen percent hydrochloric acid (15% HCl) solutions are typically used in carbonate formations such as limestone and dolomite, while hydrofluoric acid (HF) solutions and HCl/HF mixtures are used in sandstone and Monterey shale formations and in other more heterogeneous geologic formations, typically at levels of 12% and 3%, respectively. The fracturing fluid typically also includes a variety of additives at a combined concentration on the order of 1% or less, such as inhibitors to prevent corrosion of the steel well casing, and sequestering agents to prevent formation of gels or iron precipitation which may clog the pores.
- **Matrix Acidizing.** In matrix acidizing, a non-fracturing treatment, an acid solution, is injected into a formation where it penetrates pores in the rock to dissolve sediments and muds. By dissolving these materials, existing channels or pathways are opened and new ones are created, allowing formation fluids (oil, gas and water) to move more freely to the well. Matrix acidizing also removes formation damage around a wellbore, which also aids oil flow into the well. The acid solution is injected at pressures below the formation fracture pressure and is thus a non-fracturing treatment. Three distinct fluids are commonly used sequentially: (1) an HCl acid preflush fluid; (2) a main acidizing fluid generated from mixing HCL and ammonium bifluoride to produce an HCl/HF mud acid at typically 12% and 3%, respectively (some operations use mud acid, for example sandstone and Monterrey shale while some operations primarily use 15% HCl); and (3) an ammonium chloride overflush fluid. The acidizing fluid also includes a variety of additives at a combined concentration of on the order of 1% or less, similar to those used in acid fracturing.

Environmental Assessment and Socioeconomic Considerations

BOEM and BSEE evaluated the Proposed Action (allow use of WSTs) and three alternatives: allow use of WSTs with subsurface seafloor depth stipulations, allow use of WSTs but no open water discharge of WST waste fluids, and a No Action Alternative (allow no use of WSTs). Additional alternatives were considered but ultimately not analyzed in the PEA, often because they were not substantially different, from an environmental perspective, than the alternatives that were analyzed.

Alternative 1: Proposed Action – Allow use of WSTs

Under this alternative, BSEE technical staff and subject matter experts will continue to review applications for permit to drill (APDs) and applications for permit to modify (APMs), and, if deemed compliant with performance standards identified in BSEE regulations at Title 30, *Code of Federal Regulations*, Part 250, subpart D (30 CFR Part 250, subpart D), will approve the use of fracturing and non-fracturing WSTs at the 22 production platforms located on the 43 active leases on the POCS. Adverse effects to the environment would occur; the level of these impacts would range from negligible to moderate, depending on the specific environmental resource. Anticipated impacts of the Proposed Action on environmental resources are summarized below.

Physical Resources

Air quality: Impacts due to elevated photochemical ozone from ozone precursor emissions from diesel pumps and support vessels, visibility degradation from emissions of particulate matter, contributions of greenhouse gas emissions associated with routine WST activities, and temporary effects on air quality from releases of WST fluids and hydrocarbons under potential accidents. The PEA shows that these impacts would be negligible because WSTs are expected to be used so infrequently, and because the incremental contribution of the use of any WSTs to air quality impacts are immeasurable or very small.

Water quality: Potential impacts of routine WST operations on water quality within the 100-m radius mixing zone defined under the U.S. Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) general permit may occur from permitted fluid discharges to the ocean, or from accidental releases of fluids, either before, during, or after WSTs. Compliance with the provisions of the permit would prevent effects outside the mixing zone. Because of the highly-diluted context, and because any impacts on water quality would be temporary and localized, impacts would be minor. Depending on the type of accident, the PEA shows that accidental releases are either so unlikely that they are not reasonably foreseeable, or the impacts would be very minor, temporary and localized.

Geologic resources/seismicity: The potential that WSTs may stimulate seismic activity in seismically active areas such as the Santa Barbara Channel, and thus result in an increase in seismic hazard in the vicinity of the wells where fracturing WSTs are being implemented, was evaluated in the PEA. The analysis shows that due to the nature of the WSTs used and the context of the offshore environment, it is not expected that the Proposed Action would contribute to seismicity.

Biological Resources

The Proposed Action is expected to have negligible to minor effects on biological resources. Potential lethal, sublethal or displacement impacts on benthic communities, fishes, marine and coastal birds, marine mammals, and sea turtles following ocean disposal of WST waste fluids or accidental release of WST fluids or hydrocarbons from potential accidents may occur but would be minor, short-term and localized.

Benthic resources, marine and coastal fish, birds, mammals and reptiles: The primary concerns with regard to these biological resources is the potential for lethal, sublethal, or displacement impacts following ocean disposal of WST waste fluids or the accidental release of WST fluids or hydrocarbons from potential accidents. The PEA shows that these impacts are negligible because of the infrequency of WSTs, the very small concentration of any WST chemicals in the

discharged water, and because of the highly-diluted context of any discharges.

Socioeconomic Considerations

There are very few interfaces between the use of WSTs offshore and social or economic factors. Most potential considerations, such as archaeological resources, areas of special concern, and environmental justice, were briefly considered but discounted from further analysis in the PEA because no meaningful impacts could be discerned.

Commercial and recreational fisheries were considered, namely, the potential for preclusion from fishing areas through interference with vessels transporting WST materials and equipment, or from localized closure of fisheries due to accidental release of WST fluids. These instances were discounted, though, because there is not expected to be an increase in vessel traffic due to WSTs, and because the likelihood of accidental releases are so small.

Alternative 2: Allow Use of WSTs with Subsurface Seafloor Depth Stipulations.

Under this alternative, no use of fracturing WSTs would be approved at depths less than 2,000 ft (610 m) below the seafloor surface. This alternative is intended to reduce the likelihood that a fracturing WST would produce fractures that could intersect an existing fault, fracture or well and potentially create a pathway to the seafloor surface and result in a hydrocarbon release to the ocean. Under any of the action alternatives, the risk of fracturing WST resulting in a surface expression is already exceedingly low and not reasonably foreseeable. Therefore, Alternative 2 would only result in a marginal reduction in this remote risk. The overall impacts to physical, biological and socioeconomic resources would be similar to the Proposed Action.

Alternative 3: Allow Use of WSTs but No Open Water Discharge of WST Waste Fluids.

Under this alternative, no WSTs would be approved that use open ocean disposal of any WST-related waste fluids (such as the flowback) or of produced water comingled with WST waste fluids. This alternative is intended to eliminate any potential effects of discharges of WST-related chemicals on the marine environment. Currently, permitted open water discharge of produced water could continue when produced water does not contain WST-related chemicals. When WST-related chemicals are present, produced water would need to be disposed by alternative means such as through injection. Additional injection wells could be needed at one or more of the platforms where disposal currently occurs only via permitted open water discharge. The overall impacts to physical, biological and socioeconomic resources would be similar to the Proposed Action. There are additional potential impacts to benthic, fishes, marine mammals, sea turtles and archaeological resources from drilling new injections wells.

Alternative 4: No Action—Allow No Use of WSTs.

Under this alternative, none of the four WSTs identified for the proposed action would be approved for use in any current or future wells on the 22 platforms associated with active leases on the POCS. This alternative would eliminate all effects of the use of WSTs. Production at some wells may be expected to decline sooner than under the proposed action, as reservoir pressures continue to decline with primary production. Routine well maintenance activities (e.g., wellbore cleanup) and enhanced oil recovery techniques (e.g., water flooding) that fall outside of the SB-4 definitions of WSTs would continue (as they would under any of the other three alternatives). For example, well maintenance conducted with the well tree installed, which may not require specific BSEE approval, would continue, including (1) acid wash (a form of acid treatment), (2) solvent wash (a chemical method of cutting paraffin), (3) casing scrape/surge (a

method of scale or corrosion treatment and swabbing), and (4) pressure/jet wash (a method of bailing sand and a scale or corrosion treatment). In addition, well maintenance operations that require removal of the tree, which are not considered routine and need an approved APM, would also continue.

Significance Review (40 CFR 1508.27)

Consistent with 40 CFR 1508.27, significance is evaluated by considering both context and intensity. Context can refer to both the spatial and social settings. For this Proposed Action, the context is the POCS, and the vicinity of offshore oil and gas production in Santa Barbara, Ventura, and Los Angeles Counties. It is within this context that the intensity of potential effects of the Proposed Action is considered.

Intensity refers to the severity of effect. Pursuant to 40 CFR 1508.27(b), the following ten factors have been considered in evaluating the significance of the Proposed Action:

1. **Impacts that may be both beneficial and adverse.** Potential adverse effects of the Proposed Action to the environment are not significant. Overall, most resources will not be impacted or impacts will be negligible. In some cases where impacts are somewhat more pronounced, such as with discharge of produced water, the impacts are minor, short-term and localized.
2. **The degree to which the Proposed Action affects public health or safety.** Within its environmental analysis, BSEE and BOEM considered the distance of the Proposed Action from local communities, potential effects of expected allowable discharges and emissions. Due to the short-term, localized, and infrequent nature of potential impacts arising from the Proposed Action, no effects on public health and safety are expected.
3. **Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.** The Proposed Action would not take place in historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas. Some public comments stated that the Santa Barbara Channel is a unique and ecologically rich area; however, there is no consequence of the Proposed Action that has bearing on any of these noted characteristics.
4. **The degree to which the effects on the quality of the human environment are likely to be highly controversial.** BSEE and BOEM evaluated the degree to which the potential effects of the proposed activities may be highly controversial. In developing the PEA, BSEE and BOEM reviewed relevant studies, scientific literature, past BSEE/BOEM/MMS NEPA analyses, and EPA analyses. BSEE and BOEM reviewed public comments, in part to determine if substantial questions exist on whether the proposed action would cause significant degradation of any environmental factor. Although some questions were raised during the public comment period as to the availability of adequate information, there is no question as to the overall consequences. The analysis of the PEA shows that there is no potential for the Proposed Action to cause significant environmental effects.

5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.** Production of oil and gas, including the use of WSTs, is a highly-regulated and studied activity that has been taking place for many decades. Risks and effects have been identified and evaluated in the PEA. During the public comment period, some issues were raised with respect to the availability of specific information, for example, regarding the composition of produced water discharges. Concerns raised by stakeholders were fully considered and addressed as appropriate in the PEA. Furthermore, the effects analyses in the PEA are based on the best available scientific information. Sufficient information was available to support sound scientific judgments regarding the potential for environmental effects.

6. **The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.** The PEA describes the effects arising from a suite of potential future WSTs. The future treatments will continue to be proposed by operators and undergo further NEPA review prior to approval. Similarly, oil and gas activities that are not described in the Proposed Action and analyzed in the PEA would also require separate review and approval before they could proceed. Thus, the Proposed Action will not serve as a precedent for future actions nor represent a decision in principle about a future consideration. Accordingly, the degree to which the Proposed Action may establish a precedent for future actions or represent a decision in principle about a future consideration does not render the potential impacts significant.

7. **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.** Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts. The PEA considered the potential cumulative effects of the Proposed Action when combined with other past, present, and reasonably foreseeable activities. The PEA concludes that the Proposed Action is not reasonably anticipated to produce significant impacts or to add to the effects of other activities such that the incremental effects of the action results in significant effects. Further, this PEA evaluated a suite of potential future WSTs

8. **The degree to which the Proposed Action may affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.** Activities associated with the Proposed Action are not anticipated to disturb historic or prehistoric properties, or coastal areas that include these sites. The Proposed Action is not expected to adversely affect, or cause the loss of, any scientific, cultural, or historic resources. Therefore, the degree to which the Proposed Action may adversely affect historic resources does not render the potential impacts significant.

9. **The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.** The PEA, being programmatic in nature, does not immediately authorize any activity with the potential to have impacts on endangered species. During environmental review of proposed future WSTs, any potential impacts to

endangered species or their critical habitat will be contemporaneously evaluated, and consultation initiated where appropriate. Additionally, the potential for the Proposed Action to impact endangered species or critical habitat is included in the overall analysis related to fish and wildlife, and the impacts were found to be negligible.

10. **Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.** The use of WSTs in oil and gas production is a highly-regulated activity, not only by BOEM and BSEE but through a variety of other processes intended to protect the environment. For example, the Clean Water Act NPDES permitting system places limitations on the allowable discharge of waste fluids. No threat of a violation of law exists with regard to the Proposed Action.

Finding of No Significant Impact

We have considered the evaluation of the potential effects of the Proposed Action and the review of the 40 CFR 1508.27 significance factors. It is our determination that the Proposed Action would not cause any significant impacts. It is our determination that implementing the Proposed Action does not constitute a major federal action significantly affecting the quality of the human environment within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969.

Richard Yarde, Regional Supervisor, Office of Environment,
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27 May 16
Date

Charles B. Barbee, Regional Environmental Officer,
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27 May 16
Date