NTL No. 2015-N01

Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS for Worst Case Discharge and Blowout Scenarios

Frequently Asked Questions (FAQ's)

Exploration Plan (EP), Development and Production Plan (DPP) and a Development Operations Coordination Document (DOCD) will be collectively referred to herein as "Plan or Plans" in this FAQ document.

Worst Case Discharge will be referred to as WCD.

1. Q. What OCS areas are affected by this NTL?
A. This is a National NTL; it applies to Plans in the Gulf of Mexico, Pacific, Atlantic and Alaska OCS areas.

2. Q. What water depths does this NTL affect?
A. This NTL affects Plans that propose activities in both shallow water and deepwater (for purposes of this NTL, water depths less than 500' and water depths 500' and deeper, respectively).

3. Q. What Plans are subject to these information requirements?
A. You must submit the information identified in the NTL with a new Plan, or a pending Plan, or if submitting a revision or supplement to a previously-approved Plan. You must submit this information for the following:

- Those pending or approved Plans or documents that propose to conduct an activity that requires approval of an APD (application for permit to drill) or AST (approved sidetrack), and the APD or AST is submitted after June 18, 2010 or was filed but had not been approved by that date, and
- Those Plans that propose to conduct an activity that requires approval of an APD, and the initial, supplemental, or revised Plan that covers the activity is submitted after June 18, 2010.

4. Q. For what Plans do I not need to submit information required by this NTL?
A. You do not need to submit the additional information for the pending or approved Plans in order to conduct the following activities:

- Activities for which an APD was approved prior to June 18, 2010;
- Drilling intervention or relief wells for emergency purposes;
- Drilling waterflood, gas injection, or disposal wells, unless you determine the waterflood well is your well with the highest volume of liquid hydrocarbons;
- Drilling operations or other activities that are necessary to safely shut in, temporarily abandon, or decommission a well, or to accomplish well completion operations under 30 CFR 250.500; and

- Activities that do not require the submittal and approval of an APD.

5. Q. What if I am currently conducting a rig-related workover or am waiting on an application for permit to modify (APM) approval to conduct a rig-related workover?
A. You may conduct the rig-related workover without submitting the additional information required by this NTL for your Plan.

6. Q. If this NTL does not require me to submit additional information for my Plan, when may I conduct operations?
A. If you want to conduct an activity that does not require you to submit the additional information required by this NTL, you may conduct the activity when or if you have received all necessary approvals.

7. Q. When should I submit this information?
A. If you want to conduct an activity that requires approval of an APD, you should submit the information listed in the NTL to BOEM in your Plan. If a Plan for the well(s) was previously approved, then submit information as a Revised Plan.

8. Q. Where do I submit this additional information?
A. For the Gulf of Mexico OCS Region and Atlantic Planning Areas, submit the additional information required by this NTL by mailing or delivering it to: Regional Supervisor, Office of Leasing and Plans, Plans Section (GM 274E), Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394. For the Alaska and Pacific OCS Regions, submit the additional information described in this NTL to the address and contact for the respective OCS Region that is used to submit Plans. For additional information submitted for approved Plans or documents, provide the Plan Control Number of the referenced Plan or document and include the name of the well for which you provided blowout and WCD scenario information.

9. Q. When is the information in this NTL required for a sidetrack?
A. You must submit a Revised Plan to cover sidetracks:
- For wells that cross into an adjacent lease, and the information required in this NTL was not submitted for that lease;
- For wells drilling into a formation not previously penetrated; however, for the Gulf of Mexico (GOM) submit this information only if you require a subsea BOP or surface BOP on a floating facility; and
- For wells that you did not submit with the original Plan and you have determined will be your well with the highest volume of liquid hydrocarbons.

10. Q. How should I calculate the daily discharge rate for the WCD scenario?
A. You should determine the daily discharge rate as the cumulative discharge over the course of the day (i.e., 24 hour consecutive period) in which the maximum flow rate is observed, and the flow model should include the contributions from all producible reservoirs in contact with the open wellbore. For example, if the maximum observed discharge rate occurs in the first 24 hours of the uncontrolled flow, then the "worst case" discharge rate would be the cumulative oil discharge over the first day of the uncontrolled flow. Though the maximum daily rate typically

occurs on the first day, it is possible for the highest (worst case) daily rate to occur later. The package of reservoirs exposed to an open borehole with the greatest discharge potential will be considered the WCD scenario. Shallower producible reservoirs isolated by casing and cement will not be considered in the uncontrolled flow.

11. Q. What factors should I consider in determining the daily discharge rate?
A. In determining the daily discharge rate, you must consider any known reservoir characteristics. If reservoir characteristics are unknown, you must consider the characteristics of any analog reservoirs from the area and give an explanation for the selection of the reservoir(s) used. You may consider analog drilling or production data, rock and fluid compressibility, formation age, variance in pore pressures, and other relevant geologic and engineering factors to support your determination.

12. Q. What reservoirs do you consider producible?
A. In the Gulf of Mexico, 30 CFR 550.116(b)(4) considers "A resistivity or induction electric log of the well showing a minimum of 15 feet (true vertical thickness except for horizontal wells) of producible sand in one section" as one method to qualify your lease as capable of production. However, there are several reservoirs that currently produce from sands less than 15 feet (true vertical thickness except for horizontal wells). Thus, you must consider any analog reservoir that is capable of flowing liquid hydrocarbons and is exposed to the open hole. For other regions see 30 CFR 550.115.

13. Q. What specific data should I submit regarding the assumptions and calculations used to determine the volume (daily discharge rate) used in my WCD scenario?
A. You must supply the assumptions and calculations used to determine the volume (daily discharge rate) of the proposed well in your Plan or document that you expect will have the highest volume of liquid hydrocarbons. This information is used as part of your WCD scenario for Plans. Provide in a narrative the assumptions that you made (with analog data cited) concerning well design, reservoir and fluid characteristics, and pressure volume temperature (PVT) characteristics. Provide an explanation of the reasoning for the analogs used and all calculations employed to derive the WCD volume.

Form BOEM-0137 (http://www.boem.gov *See Quick Links: BOEM OCS Operations Forms*) provides tables for the operator to submit geologic and engineering parameters used in the WCD calculation. However, Form BOEM-137 is not sufficient by itself to support the WCD scenario but allows BOEM to easily identify critical factors used in the calculation. For all Plans (i.e. structure maps or cross-sections), data must be provided at a level of detail necessary to verify a WCD. The following is a general guide for additional data that should be submitted:

Wellbore:
- Wellbore schematic showing casing program for the proposed well to include casing/liner sizes (outside and inside diameters) and setting depths (MD/TVD), and hole size and depths (MD/TVD) as the well is being drilled; and
- Proposed directional survey with coordinates noted in x/y or lat/long.

Geologic Information:
- Structure Maps for each potentially producible sand to be encountered;

- Cross-section depicting all anticipated hydrocarbons bearing zones; and
- Annotated seismic section through well site location using the most recent seismic data available.

Reservoir Simulation and/or Nodal Analysis:

- For input data, screen-shot images of data input panels as viewed in the model. For output data, provide screen-shots of the summary reports/graphs of the nodal programs. For example, screen shots could include fluid, reservoir and wellbore data; PVT correlations; inflow/outflow tables; solution point data; and, if available, inflow performance relationship (IPR) versus outflow or vertical lift performance (VLP) plot; and
- BOEM may request input and output files of proprietary nodal software. If requested, send simulation input/output files in ASCII or txt format readable by common software accessories. An alternative form of input/output report would be to print the simulation input/output file to an Adobe Acrobat "printer" in order to create a pdf-format file.

14. Q. In my calculations and model runs can I assume the presence of restrictions in the wellbore that would reduce flow?

A. You must assume that the wellbore is free of drill pipe, logging tools, or other similar equipment. Bridging is not considered in the daily rate for the WCD scenario.

15. Q. Should I assume that the blowout preventer is attached to the wellhead and calculate flow through the BOP?

A. No. Assume that the BOP is not connected to the wellhead. If circumstances indicate a WCD discharge point at the top of the BOP, assume for modeling purposes that the innermost casing string at the wellhead extends to the top of the BOP.

16. Q. How long will it take BOEM to verify the WCD volume calculations and assumptions?

A. Each WCD calculation will be completed within the regulatory approval time frame.

17. Q. I recently drilled a development well but the well data is not due to be sent to BSEE until later. Should I include the recent well data with the information required in this NTL?

A. If new well data contains important analog data, submitting that well data will facilitate BOEM's review of the Plan.

18. Q. Will BOEM use the analog data that I submit with the supplemental information to verify the WCD scenario?

A. BOEM will consider the submitted analog data as the basis for the assumptions and calculations that support your WCD volume determination. BOEM has proprietary data that might not be available to you. If appropriate, BOEM will use that data as an analog.

19. Q. What information should I provide concerning my arrangements for drilling relief wells and the availability of a rig to drill a relief well?

A. If you submit a Plan or supplemental information to a previously approved Plan, you must identify (by name and current location) at least one drilling rig capable of drilling a relief well in

the event you have a blowout. This rig must be capable of drilling in the water depth where your well is located and to the total depth of your well. You must discuss rig package constraints and specify as accurately as possible the time it would take to contract the rig, move it onsite, and drill a relief well. Also, discuss the feasibility of drilling a relief well from a neighboring platform or an onshore location.

20. Q. What does BOEM mean by "package of reservoirs exposed to an open borehole with the greatest discharge potential" will be considered the WCD scenario?
A. The WCD daily volume is calculated for the entire strata being drilled, not necessarily the target objective. The target objective may, in fact, produce the maximum discharge; however, BOEM identifies all potentially producible hydrocarbon sands (PPHS) simultaneously exposed to any open segment of the wellbore *during* drilling to determine the package of reservoirs that will discharge the maximum daily volume.

The graphic *Example Well Casing Program* and the companion graphic *Example Potential Producible Hydrocarbon Sands Encountered* in Attachment A illustrates how BOEM determines maximum discharge. The maximum discharge may not be from the combination of PPHS "D" and "E". The maximum daily liquid hydrocarbon discharge may be from the thicker, high permeability PPHS ‘’A", "B", and "C" reservoirs *during* drilling when those sands are exposed to the open wellbore. A loss of well control that initiates the oil discharge event should be assumed to occur at the depth of full penetration of the "A", "B", and "C" sands. Once the intermediate casing has been set to isolate the "ABC" sands, then BOEM assumes that the casing does not fail and the next open hole interval is evaluated.

21. Q. What are the common problems that hinder the timely verification of the calculations and assumptions used in the determination of the WCD volume?
A. There are four main problems that BOEM encounters in data submitted in support of the WCD volume determination:

- Data supplied by the operator is insufficient to verify the critical parameters needed to perform a reservoir simulation/nodal analysis;
- Data supplied by the operator is inconsistent. For example, the depth of the top of sand in the wellbore schematic does not agree with the depth of the top of sand in the directional survey;
- Analogs used in the assumptions and calculations are not identified; and
- Borehole data (PVT, permeability, reservoir pressure, etc.) derived from the analogs were not submitted to BSEE. Analytical and interpretive data obtained from the drilling of wells must be submitted to BSEE.

22. Q. At what conditions do you want the reservoir fluid data?
A. Oil data in an unproduced reservoir must be provided at initial reservoir conditions and at bubble point conditions, including the formation volume factor, oil viscosity, bubble point, Rsi (initial solution gas-oil ratio), API oil gravity, gas specific gravity, oil compressibility and reservoir rock compressibility. Gas reservoir data should include initial reservoir pressure, dew point, API gravity of condensate, specific gas gravity, condensate yield (BBLS/MMCF), and reservoir rock compressibility. The reservoir data in a produced or producing reservoir should be at current reservoir conditions.

23. Q. Does BOEM recognize skin in the WCD analysis?
A. Operators have used the term skin to represent various conditions in the wellbore; BOEM guidance is to assume skin is equal to zero. BOEM does recognize the calculation of a geometric skin to account for the direction of the drill bit's interface with the productive interval, and a gas turbulence factor (D factor) in high rate gas wells.

24. Q. What exactly is considered the WCD in terms of the reservoir characteristics that are used in the calculations? Does BOEM want the P10 (larger) numbers for all reservoir and rock properties for the reservoir simulation?
A. You must consider any known reservoir characteristics. If reservoir characteristics are unknown you must consider the characteristics of any analog reservoir from the area and explain the selection of the reservoir(s) used. In simple terms, it can be considered the best drilling results the operator can expect to encounter at the well site. The WCD model is not expected to be formed as a combination of extreme values for key variables (for example, maximum conceivable thickness combined with maximum conceivable permeability to obtain an extremely improbable "kh") but rather a "success" exploration case typified by analog reservoirs, analog commercial fields, and recent discoveries.

25. Q. The operator may not have access to all data in the vicinity of the well site, especially in exploratory drilling. What data does BOEM use to complete a WCD analysis?
A. BOEM uses the data from valid analogs to derive the WCD volume. Our corporate database contains proprietary and nonproprietary information that can be used in the reservoir simulation. BOEM will not release proprietary data to the public.

26. Q. How does BOEM convey the reason(s) for disparity between the operator's calculation of WCD and BOEM's WCD?
A. BOEM will notify the operator when the operator's WCD volume is less than BOEM's volume. Included will be a list of the major parameters (sand thickness, permeability, yield, etc.) that we determined were the reason(s) for disparity.

27. Q. I was notified that my WCD volume was less than BOEM's WCD volume. Can I receive more clarification on the actual critical parameters and analogs that BOEM used in their analysis?
A. BOEM does not release the analogs and their corresponding data due to potential proprietary issues. However, BOEM will discuss the methodology and nonproprietary analogs, assumptions, and calculations used in the WCD analysis with the operator. For the Gulf of Mexico OCS Region and Atlantic Planning Areas, contact the Reserves Section Chief at 504-736-0557, BOEM Point of Contact on WCD technical issues. For WCD technical issues in the Alaska OCS Region contact the Regional Supervisor for Resource Evaluation at 907-334-5320. For the Pacific OCS Region contact the Regional Supervisor for Office of Strategic Resources at 805-389-7855.

28. Q. I was notified that BOEM's verification of the WCD volume resulted in differences which need to be reconciled. What must I do to resolve the WCD differences?

A. 1. You must respond to BOEM to reconcile the differences between the BOEM verification and your WCD volume. You may submit additional information, request a meeting or teleconference, or determine to concur with BOEMs verification of your WCD volume.

2. Once you have reconciled the WCD volume with BOEM, you need to determine if your OSRP will need to be revised.

a. If you determine that your OSRP should be revised, then submit to BOEM the amended pages for the blowout scenario section and oil spill section with the reconciled WCD volume, ensuring to include the statement that a revision to the OSRP will be or has been submitted to BSEE.

b. If you determine that your OSRP does not need to be revised, then submit to BOEM the amended pages for the blowout scenario section and oil spill section with the reconciled WCD volume.

29. Q. My WCD calculated volume was deemed adequate by BOEM. Does that mean that the analogs and methodology were accurate?

A. Even when the operator's WCD calculated volume is determined to be adequate there still may be large discrepancies between analogs, assumptions and/or calculations used by the operator and BOEM. The differences may counter each other with the net result that the operator's submitted WCD flow is higher than that modeled by BOEM.

30. Q. There are water sands in the WCD open hole interval. Does BOEM model water sands in the WCD analysis?

A. BOEM will model water sands that are in contact with the open hole stratigraphically above, or between, potentially productive hydrocarbon sands (PPHS) only if the water sand(s) has been modeled by the operator. Only water sands that would contribute to the flow should be modeled. The water sand(s) modeled by the operator may be considered hydrocarbon bearing sands by BOEM unless evidence is submitted by the operator that conclusively indicates the sand(s) to be water bearing. No water sands below the PPHS are modeled as contributing to the well discharge.

31. Q. What flow correlations are used by BOEM in reservoir simulation?

A. Reservoir simulators have a selection of various flow correlations within the applications. BOEM uses the following depending on various reservoir parameters and casing designs:

Flow Correlations	Reservoir	General Conditions
Hagedorn and Brown	Oil	Vertical well with 2- or 3-phase (GLR* < 5000 scf/stb) flow with or without water cut.
Orkiszewski	Oil	Vertical well with 2- or 3-phase flow with or without water cut.
Duns and Ros	Oil	Vertical well with 2-phase. Not applicable with water cut.
Beggs and Brill	Oil	Deviated and vertical wells with water cut (<10 %).
Cullender and Smith	Dry Gas	Vertical dry gas wells.
Gray and Ross	Wet Gas	Condensate of < 50 stb per mmscf and water < 5 bbl per mmscf.

* GLR=gas-liquids ratio; scf= standard (surface) cubic feet; stb=stock tank (surface) barrels; mmscf=millions of standard cubic feet

Other flow correlations may be used if the operator submits data in support of the correlation.

32. Q. I used proprietary reprocessed seismic data in the WCD analysis. Do I need to submit the reprocessed seismic data with the assumptions, analogs and calculation in support of the WCD volume to the Plan Coordinator?
A. No. BOEM compares the quality of the seismic data submitted with the Plan to the seismic data that BOEM possesses. BOEM will request the operator's reprocessed seismic data if needed for the WCD analysis.

33. Q. What should be shown on the proposed wellbore diagram schematic?
A. Submit the wellbore diagram that represents the wellbore casing and open hole components that will exist during the drilling of the potential WCD open hole intervals. Do not show any completion or production tieback liners that would be involved in the completion process and that would not form part of the WCD flow path. Do not include any contingency liners that might be run if problems arise. List the open hole size as-proposed and specify any assumed washout size that may exist at the time of the WCD event. Include casing inside diameter for the planned casing strings. If a hole opener or reamer will be used to drill the open hole section be sure to include that information.

34. Q. Is BOEM considering the receipt of reservoir property maps in a digital format to speed up the WCD review process?
A. Yes. The reservoir simulation software BOEM uses can import mapped data of various reservoir properties. As an example, the operator exports a data file of the reservoir property, in a three column table containing X, Y, and Z coordinates, into Excel as an ascii data file, and saves as a *.csv file. The reservoir simulation software BOEM uses can only receive map data in a comma separated table (*.csv). Submission of an image file of the map(s) will verify the data was loaded successfully into the software and will help identify any significant differences in software gridding and contouring.

35. **Q**. **Where does BOEM consider the discharge point?**
A. The discharge point is considered to be at the location of the BOP in the GOM and Pacific Regions. In Arctic drilling environments, special conditions or atypical riser-BOP configurations may mandate an alternative discharge point (operators are recommended to contact the BOEM Alaska OCS Region). For example, if the operator places the BOP in a mud cellar to avoid drifting icebergs, BOEM models the WCD point of discharge at the top of the BOP and assumes that the innermost casing string at the wellhead extends to the top of the BOP (i.e., approximately the mudline). Another example is if a well is proposed in the Arctic to have a two-part BOP system with one BOP at the base of the riser sitting on a wellhead a few feet above the mudline and a second BOP on deck or under the rig floor, then BOEM considers the BOP-riser-BOP arrangement to constitute a *BOP system* and places the WCD model point of discharge at the wellhead near the mudline. For Artic drilling on an artificial island, the point of discharge should be assumed to be the top of the BOP for purposes of the WCD scenario.

36. Q. BOEM has requested a proposed directional survey for the well that I expect to have the highest volume of liquid hydrocarbons, but a directional survey is not required for a Plan. Why is that information requested?

A. BOEM geologist uses the directional survey to project the length (drilled thickness) of the potential producible hydrocarbon sands in contact with the open wellbore for the purpose of flow modeling.

37. Q. How do I estimate the maximum duration and volume for the potential blowout discussed in the blowout scenario of 30 CFR 550.213 (g)/30 CFR 550.243 (h)?

A. In the public part of the Plan, report the blowout scenario discharge volume during the days estimated to arrest the oil discharge at the incident well by drilling a relief well. The blowout scenario discharge volume is the cumulative daily volume of oil discharged during the period necessary to mobilize, drill and kill the flow from the incident well. If no discharge schedule (reflecting rates that progressively decline with reservoir de-pressurization) is reported, the discharge volume is calculated as the daily discharge rate in bbls/day multiplied by the duration of the blowout scenario**.**

38. Q. Will there be occasions where after the Plan has been approved the operator is expected to submit a revised or new WCD scenario?

A. BOEM or BSEE may determine that a new WCD scenario is required to be submitted.

ATTACHMENT A

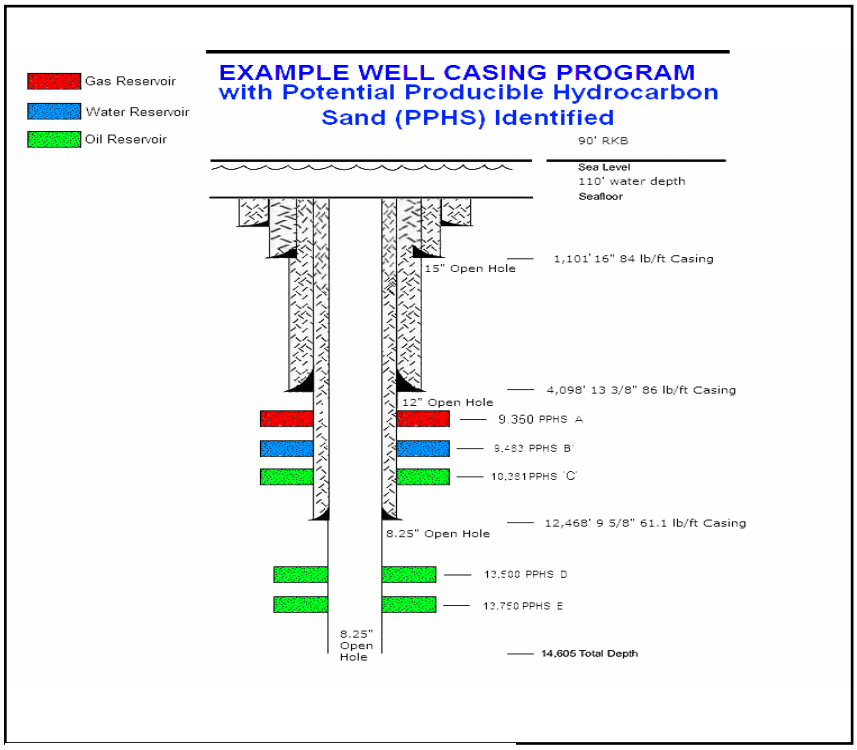

Figure 1. Well Casing Program

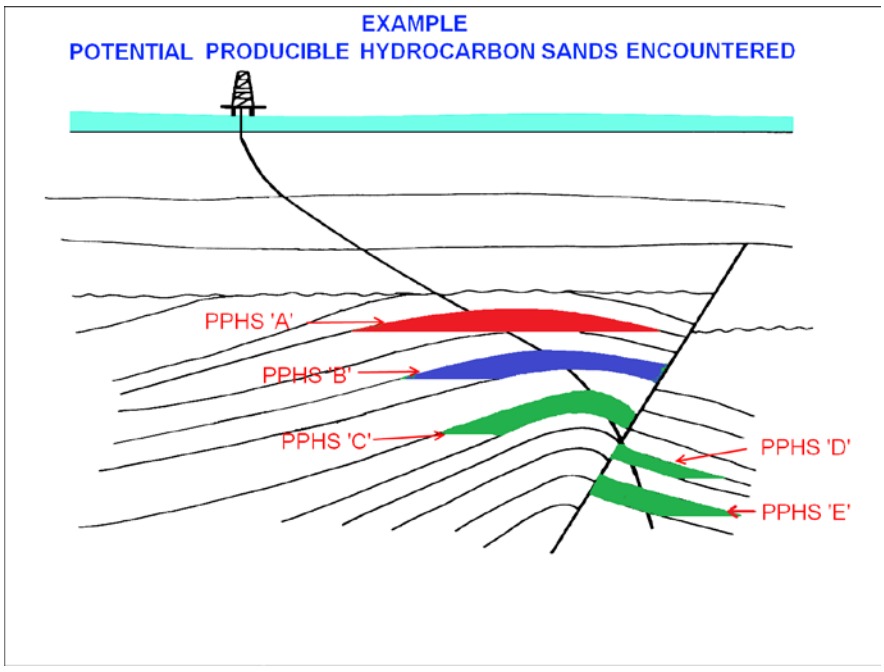

Figure 2. Identifying PPHS.

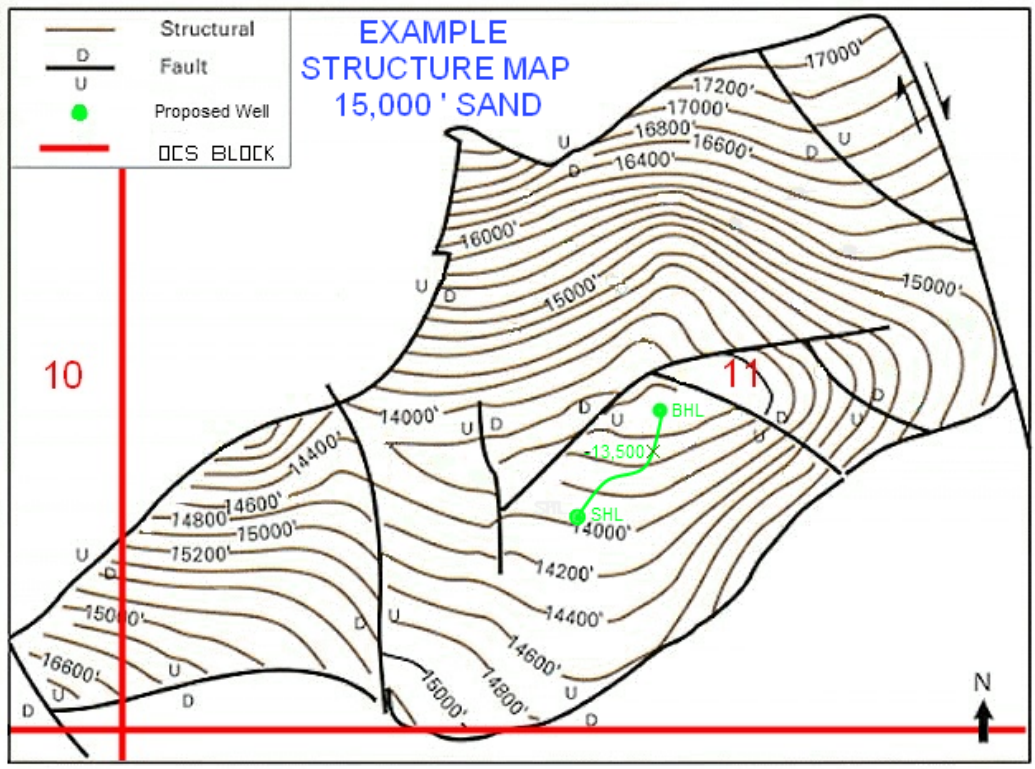

Figure 3. Structure Map.
Please note the entire reservoir is shown on the image and is not cut off at the lease lines.