STUDY TITLE: Updates to the Fault Tree for Oil-Spill Occurrence Estimators Needed Under the Forthcoming BOEM 2012-2017, 5-Year Program

REPORT TITLE: Updates to Fault Tree for Oil Spill Occurrence Estimators UPDATE OF GOM AND PAC OCS STATISTICS TO 2012

CONTRACT NUMBER: M11PC00013

SPONSORING OCS REGION: Alaska

APPLICABLE PLANNING AREA: Beaufort Sea, Chukchi Sea

FISCAL YEARS OF PROJECT FUNDING: FY 2011-2016

COMPLETION DATE OF REPORT: July 2013

COSTS BY FY: FY 2012: $10,280.00
FY 2013: $64,400.00
FY 2014: $72,050.00
FY 2016: $60,450.00

CUMULATIVE PROJECT COST: $229,840 (Fixed price: $204,440.00)

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KEY WORDS: Oil spill occurrence, Beaufort Sea, Chukchi Sea, Gulf of Mexico, Pacific OCS, statistics, fault tree analysis

BACKGROUND: The Bureau of Ocean Energy Management Alaska Outer Continental Shelf (OCS) Region uses estimates of oil spill occurrences for the development of environmental impact statements for hypothetical offshore development scenarios resulting from the sale of leases for the US Beaufort and Chukchi Sea OCS. Since 2000, a series of studies and peer reviewed papers (summarized below under "STUDY PRODUCTS") carried out by Bercha International Inc. (Bercha) directed at the development of a realistic method of projecting oil spill occurrences, including source, size distribution, location, and timing for hypothetical development scenarios associated with offshore OCS lease sales.

OBJECTIVES: The main objective of this portion of the work was to update oil spill statistics for use in the fault tree analysis. Key objectives of the work may be summarized as follows:

- Assimilation of the most current data for oil spills in the US **Gulf of Mexico (**GOM) and Pacific (PAC) OCS regions from pipelines, platforms, and wells.
- Analysis of the data to provide statistics of the oil spills.

DESCRIPTION: Historical data and their statistical analyses are used as a starting point for fault tree application to oil spill indicator quantification for the Alaska Arctic OCS. In the initial fault tree analysis, data from the GOM OCS were analyzed for the period from 1972 to 1999. In 2008, a more refined publication of the data characteristics by MMS (now BOEM) has made it possible to conduct a more thorough statistical analysis as well as an update of the GOM data and its analysis to 2006. The current

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report generally discusses and gives data summaries as well as detailed statistical results from the re-analysis of the data, including an update of the GOM and PAC OCS data for platform and pipeline hydrocarbon (crude oil, diesel oil, condensate and refined petroleum products) spills, and an update of blowout and well release spill frequencies to 2012. The work is covered by BOEM contract number M11PC00013, and it is the first update under Task 2.

SIGNIFICANT CONCLUSIONS: General conclusions from the work may be summarized as follows:

- Statistics for oil spills in the US GOM and PAC OCS from 1972 to 2012 have been generated.

STUDY RESULTS: Historical data and their statistical analyses are used as a starting point for fault tree application to oil spill indicator quantification for the Alaska Arctic OCS. In the initial fault tree analysis, data from the GOM OCS were analyzed for the period from 1972 to 2006. In this study, a more refined publication of the data characteristics by BOEMRE made it possible to conduct a more thorough statistical analysis, as well as an update of the data and its analysis to 2012. Additionally, the work generated data summaries and typical statistical results for the re-analysis of the data, including an update of the GOM and PAC OCS data for platform and pipeline spills. In addition, a summary of worldwide blowout statistical data was compiled.

STUDY PRODUCTS:

Bercha International Inc., *Alternative Oil Spill Occurrence Estimators for the Beaufort and Chukchi Seas – Fault Tree Method*, (OCS Study BOEMRE 2011-030), Summary Final Report to U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Alaska Outer Continental Shelf Region, March 2011.

Bercha International Inc., *Alternative Oil Spill Occurrence Estimators and their Variability for the Alaskan OCS – Fault Tree Method – Update of GOM OCS Statistics to 2006*, (OCS Study MMS 2008-025), Final Task 3.1 Report to U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, March 2008.

Bercha International Inc., *Alternative Oil Spill Occurrence Estimators and their Variability for the Beaufort Sea – Fault Tree Method*, (OCS Study MMS 2008-035), Final Task 4A.1 Report to U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Vols. 1 and 2, March 2008.

Bercha International Inc., *Alternative Oil Spill Occurrence Estimators and their Variability for the Chukchi Sea – Fault Tree Method*, (OCS Study MMS 2008-036), Final Task 4A.2 Report to U.S. Department of the Interior, Minerals Management Service, Alaska Outer Continental Shelf Region, Vols. 1 and 2, March 2008.

Bercha, F.G., Prentki, R.T., and Smith, C. *Prediction of Oil Spill Occurrence Probabilities in the Alaskan Beaufort and Chukchi Seas OCS*. Paper No. ICETECH08-118-RF in Proceedings of the 8th International Conference and Exhibition on Performance of Ships and Structures in Ice (ICETECH 2008). Banff, Alberta, Canada. 20-23 July 2008.

Bercha, F. G. *Updates to the Fault Tree Approach to Oil Spill Occurrence Estimators for the Beaufort and Chukchi Sea.* Proceedings Alaska OCS Region 11th Information Transfer Meeting, held October 28-30, 2008, Anchorage AK, Anchorage AK: Prepared by BGES, Inc for MMS Alaska OCS Region, OCS Study MMS 2009-005, 2009.

Bercha, F.G. *Arctic and Northern Offshore Oil Spill Probabilities*. Paper No. ICETECH10-187-RF in Proceedings of the 9th International Conference and Exhibition on Performance of Ships and Structures in Ice (ICETECH 2010). Anchorage, AK, USA. 20-23 September 2010.

Bercha, F.G, Prentki, R., and Smith, C. *Alaska OCS Oil Spill Occurrence Probabilities*. Paper No. ICETECH12-142-RF in Proceedings of the 10th International Conference and Exhibition on Performance of Ships and Structures in Ice (ICETECH 2012). Banff, Alberta, Canada. 17-20 September 2012.