BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of: Application No. 2013-01 TESORO SAVAGE, LLC TESORO SAVAGE DISTRIBUTION TERMINAL	CASE NO. 15-001 DECLARATION OF VLADIMIR SHEPSIS

I, Vladimir Shepsis, declare as follows:

1. I declare under the penalty of perjury of the laws of Washington and the United States that the following statements are true and correct.

2. My name is Vladimir Shepsis and I am a Principal Coastal Engineer at Mott McDonald, in the Coast & Harbor Engineering Division.

3. I am presently out of the country, in Ottawa, Canada.

4. I have affixed my signature to my sworn witness testimony "SWORN PRE-FILED TESTIMONY OF VLADIMIR SHEPSIS", attached hereto.

5. Upon my return to the United States, I will provide a substitute signature page for my sworn, pre-filed testimony, with a final, notarized signature.

DATED this 13th day of May, 2016.

Vladimir Shepsis, Declarant

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I, Vladimir Shepsis, state as follows:

1. I declare under the penalty of perjury of the laws of Washington and the United States that the following statements are true and correct.

2. I am over eighteen years of age, have personal knowledge of the matters herein, and am competent to testify regarding all matters set forth herein.

I. INTRODUCTION, EDUCATION AND PROFESSIONAL BACKGROUND, AND OTHER QUALIFICATIONS

3. My name is Vladimir Shepsis and I am a Principal Coastal Engineer at Mott McDonald, in the Coast & Harbor Engineering Division. I have a Bachelor's of Science and a Master's of Science in Civil Engineering from the College of Water Engineering, Hydraulic Engineering, in Kiev, Ukraine, which I received in 1973. I also have a Ph.D. in Oceanographic Engineering from the Marine Institute, Coastal Hydraulic Engineering, in Moscow, Russia, received in 1981. A copy of my Curriculum Vitae is attached hereto as Attachment A.

4. I recently received the 2016 Professional Engineer of the Year, awarded by the Washington State Society of Professional Engineers, February 13, 2016. See Attachment B, Nomination Package by Seattle Chapter of the American Society of Civil Engineers (ASCE).

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II. SCOPE OF ANALYSIS AND PURPOSE OF TESTIMONY

5. I was asked by Applicant Tesoro Savage Petroleum Terminal LLC, d/b/a Vancouver Energy to evaluate site-specific geomorphologic conditions at the three (LCR) sites studied by Pearson et al. (2006): Barlow Point, Sauvie Island, and County Line Park. I was also asked to interpret the differences in stranding risk at these three sites based on the differences in geomorphology and other physical factors.

6. The purpose of my testimony is to provide testimony regarding site-specific geomorphologic conditions at the three sites of LCR (Barlow Point, Sauvie Island, and County Line Park) and differences in stranding risk at these three sites due to the differences in geomorphology and other physical factors. I understand that my testimony will be used 1) to address how the Vancouver Energy Project's Application for Site Certification (ASC) complies with WAC 463-60-322, WAC 463-60-332, WAC 463-60-333, WAC 463-62-040, and WAC 463-62-050; and 2) to address Adjudication Issues, including the Environmental Impacts Issues (Issues 5, 6, 8, 17, 18), and the Tribal Issues (Issues 38, 40-42, 56), as identified in the Administrative Law Judge's Order Clarifying EFSEC's Process, Modifying Dispositive Motion Deadline, Summarizing Preliminary Issues, and Setting Hearing Dates (February 3, 2016).

7. I was provided and rely on the previous studies and publications as follows:

- Ackerman, N.K. 2002. Effects of vessel wake stranding of juvenile salmonids in the lower Columbia River.
- A pilot study: Report by SP Cramer & Associates, Inc., Sandy, Oregon, for the U.S. Army Corps of Engineers, Portland District, Portland, OR.
- Pearson, W.H. 2011. Assessment of potential stranding of juvenile salmon by ship wakes along the Lower Columbia River under

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scenarios of ship traffic and channel depth: Report prepared for the Portland District U.S. Army Corps of Engineers, Portland, OR.

- Pearson, W.H., Skalski, J.R., Sobocinski, K.L., Miller, M.C., Johnson, G.E., Williams, G.D., Southard, J. A., and Buchanan, R.A. 2006. A study of stranding of juvenile salmon by ship wakes along the lower Columbia River using a before-and-after design—Before-phase results: Report by the Pacific Northwest National Laboratory for the U.S. Army Corps of Engineers, Portland District, Portland, OR.

8. My analysis of the site-specific geomporphologic conditions and wake effects, and my opinions and conclusions related thereto, for the Vancouver Energy Project are contained in the report attached hereto as Attachment C, which is incorporated herein by reference.

III. ANALYSIS

A. <u>Current physical conditions of Columbia River</u>

9. The analysis has preliminarily identified morphologic features that, in combination with particulars of vessels wakes, could potentially be used as an indicator of fish stranding potential. These features, if confirmed by additional studies, can be used further to distinguish the LCR shoreline in regard to fish stranding potential.

10. Based on the current study, the morphologic features that may potentially be used as an indicator of LCR shoreline stranding potential consist of turning points of the river (river bends), and configuration of the bank slope and upper beach at the shoreline.

11. It is known that unique hydrodynamic effects from river flow and all types of passing vessels (including shallow draft and deep draft) may occur in areas at close proximity to river bend. It is also known that these effects differentiate, depending on the type of river bend site; concave or convex. Passing vessels (all types of vessels) at river

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bend (most likely at concave sites) in combination with specifics of river flow and morphologic features may form unique hydrodynamic effects that result in the ability of stranding certain types of fish. Therefore, one indicator of potential fish stranding effect may be a river bend, specifically the concave side of the bend. Shoreline at close proximity to this bend may have a potential for stranding fish if other physical conditions and morphologic factors, such as bank slope (see below) are met. The stranding effect at this type of shoreline may occur from all types of vessel wakes generated by deep-draft vessels, as well as from small fishing and pleasure boats.

12. Configuration of a bank slope that may indicate the existence of a fish stranding effect also is preliminarily identified as a combination of a steep deep water slope and shallow underwater terrace with no or a small upper beach. Vessel wakes propagate a long distance along this slope with small dissipation. When a vessel wake arrives at the shoreline, the upland-directed hydrodynamic force is still significant and capable of trapping fish and forcing the fish toward the upper bank.

13. The above fish stranding indicators are likely applicable to the upstream part of the Barlow Point shoreline. This part of the shoreline is in close proximity to the river bend, and the bottom slope is composed of a steep slope in combination with a flat and shallow underwater terrace. There also was no or minimal upper beach observed at this part of the shoreline. The physical condition indicators explain hot spots of fish stranding observed at this part of Barlow Point shoreline from previous studies.

14. In contrast, a gradual and uniform beach extending deep into the river may be an indicator of no or very limited fish stranding capacity. Interaction of vessel wakes with this type of beach slope causes an effective transformation of kinetic energy. As a result the upward directed hydrodynamic force from the vessel wake arriving at the upper part of shoreline is reduced and not sufficient to generate a fish stranding effect. Thus, the

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fish stranding effect at this type of shoreline is minimal. County Line Park, Sauvie Island, and the downstream portion of Barlow Point shorelines represent this type of morphologic composition. Fish stranding at these areas is low compared to Barlow Point.

15. Previous studies and numerical modeling that I had conducted at various regions, including Lower Columbia River have demonstrated the importance of coastal and riverine morphology on propagation of short and long period vessel wakes and their (wakes) interaction with shoreline (river banks). The Lower Columbia River study, referenced above had been conducted to determine possible impacts from passing vessels on shoreline and river bank stability. This study was performed using a Hydrodynamic Longwave Unsteady Model (VH-LU) model. The model has been validated with numerous field data collection programs and proved to be a reliable engineering tool for analysis of vessel hydrodynamics effects. Due to the accuracy and reliability of the model, VH-LU has been adopted as a module of the commercial software OPTIMOR.

B. <u>Assessment of the ESFEC DEIS wake impact analysis</u>

16. I reviewed the Section of Draft Environmental Impact Statement (DEIS) related to wake impacts, including DEIS Sections §§ 3.3.3.3, 3.4.3.3, 3.5.3.3, 3.6.1., 3.6.3.1, and 3.6.3.3.

17. The DEIS relied upon the analysis within the Pearson et al. (2006). It is my opinion that the statistical models and framework published by Pearson et al. (2006) (and used by 2007 report) was a first approximation for developing a methodology for evaluating fish stranding due to vessel wakes at three specific sites along the Columbia River. The reports provide valuable information and entertain innovative ideas that potentially may be applicable for developing a methodology. However, the statistical relationships of the framework as presented in the Pearson et al.'s 2006 publication and

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used by the 2007 study are questionable and may not be appropriate for any realistic estimates of fish stranding at the sites. My initial review of the framework, used by 2007 study, has identified inconsistencies with interpretation and application of various aspects of vessel hydrodynamics and uncertainties with defining reliable statistical relationships between governing factors. For example, the 2007 report defines block coefficient as the product of multiplication three vessel dimensions: length, beam, and draft and includes a constant scaling factor of 10-8. The actual definition of block coefficient includes the mass of displaced water (sometimes it is defined by ship deadweight). If the calculation of block coefficient were conducted properly, using the mass of displaced water, the statistical relationships between kinetic energy and stranding factors would have been of different shape and the regression coefficients that were used for calculations of stranding fish would be much different.

18. The Pearson study also misinterpreted vessel speed. Vessel wakes as well a drawdown effect depends on vessel speed relatively to still water, as opposed to ground speed. These two speeds (relatively to still water and to the ground) may be significantly different, depending on current direction and velocities. It appears that the vessel speed data that were used in the 2007 report are based on the ground speed of passing vessels only. It is likely that if the report properly accounts for vessel speed the stranding predictions would differ dramatically from those presented in the report.

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IV. ATTACHMENTS

19. I have attached the following exhibits to my testimony:

Attachment A:	Curriculum Vitae
Attachment B:	Nomination Package by Seattle Chapter of the American Society of Civil Engineers (ASCE)
Attachment C:	Technical Report: Lower Columbia River Morphology and Fish Stranding

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DATED this 13 th day of May, 2016.

Vladimir Shepsis, Declarant

STATE OF _____)
)
COUNTY OF _____)

Vladimir Shepsis, being duly sworn upon oath, deposes and says: The foregoing testimony is true, correct and complete to the best of my knowledge, information and belief and is given subject to the laws of perjury in the State of Washington.

GIVEN under my hand and official seal this _____ day of _____, 2016.

NOTARY PUBLIC in and for the State of:

_____

Residing at: _____

My Commission Expires: _____

Printed Name of Notary:

_____

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