BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

IN THE MATTER OF: APPLICATION NO. 2013-01 TESORO SAVAGE, LLC VANCOUVER ENERGY DISTRIBUTION TERMINAL	CASE NO. 15-001 EXHIBIT NO. _____ (-TRB) PREFILED DIRECT TESTIMONY OF: ZACHARY PENNEY, PhD SPONSORS: CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION, CONFEDERATED TRIBES AND BANDS OF THE YAKAMA NATION AND COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

REGARDING POTENTIAL EFFECTS OF INCREASED CRUDE OIL TRANSPORT ON COLUMBIA RIVER ANADROMOUS SALMONIDS

Q. PLEASE BRIEFLY DESCRIBE YOUR EDUCATION AND EMPLOYMENT.

A. I completed my B.S. at Sheldon Jackson College in Sitka, Alaska, where I worked at the campus salmon hatchery during the school year raising pink, chum, coho, and chinook salmon. I completed my M.Sc. at the University of Victoria, studying otolith microchemistry in sockeye salmon stocks important to the subsistence users in Sitka, Alaska. My doctoral research investigated the physiological and energetic constraints of repeat-spawning in steelhead trout in the Columbia basin and I received my doctorate (Ph.D.) in 2013 from the University of Idaho.

During the course of my studies and work, I have become familiar with fish ecology, physiology, and energetics. I have prepared papers relating to the biochemistry of the salmon

lifecycle, including papers addressing fatty acid consumption in muscle and liver tissue of migrating steelhead, blood plasma chemistry of migrating steelhead, and trace elements found in the otoliths of sockeye salmon. A copy of my Curriculum Vitae is attached.

In my present capacity, I serve as the Fishery Science Department Manager for the Columbia River Inter-Tribal Fish Commission (CRITFC) in Portland, Oregon. As Department Manager, I supervise over 30 scientists and technicians. Of these, eighteen have either master's degrees (9) or doctorate degrees (9). My job duties at CRITFC include synthesizing scientific information related to the salmon life-cycle, as well as other fish species, and communicating that information to other departments at CRITFC's governing body, and to its member tribes. I am Nimi'ipuu, a member of the Nez Perce Tribe.

Q. WHY ARE YOU PROVIDING A DECLARATION?

A. The proposed Tesoro-Savage facility could receive an average of 360,000 barrels of crude oil per day via train, store it on site, and load it onto marine vessels. These projects will result in high volumes of crude transport on the rail line from Spokane through the Columbia River Gorge along the Columbia River, as well as multiple transfers between land and water-based shipping and storage containers. The possibility of an oil spill could have acute and delayed effects on anadromous salmonids at various life stages. There are threatened and endangered populations of anadromous salmonids on the Columbia River Basin.

Q. WHAT IS THE SCOPE OF YOUR DECLARATION?

A. The scope of my declaration is to briefly identify and discuss the anadromous salmonid species present in the Columbia River Basin that could be potentially affected by increased oil transport/contamination from the proposed Tesoro-Savage terminal in Vancouver, Washington. I have outlined the basic life cycle of anadromous salmon and steelhead to highlight what life stages could be affected by oil contamination. This declaration provides no analyses of the acute and delayed effects of oil on salmon and steelhead survival or fitness. Accompanying testimony from Dr. Stanley Rice addresses the potential acute and delayed effects of oil contamination on fish, as well as other species.

Q. DISCUSS COLUMBIA RIVER BASIN ANADROMOUS SALMONIDS.

A. The Columbia River presently hosts five species of Pacific salmon, which include chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), sockeye (*O. nerka*), chum (*O. keta*), and pink salmon (*O. gorbuscha*). Columbia Pink salmon populations are considered extinct, but strays do occasionally occur above Bonneville Dam. The Columbia River also hosts two anadromous trout species, steelhead trout (*O. mykiss*) and coastal cutthroat trout (*O. clarki*). Historically, anadromous salmon returned and spawned in tributaries in Washington, Oregon, Idaho, Nevada, and British Columbia. (Fig 1.)

By definition, anadromy refers to diadromous fish that spend most of their life maturing/growing in the sea, but return to freshwater when fully grown (Bond 1996). In the case of anadromous Pacific salmon and steelhead, life begins and ends in freshwater.

Pacific salmon and steelhead follow 6 general phases of development during their life cycle (Fig. 1), which includes: 1) egg, 2) alevin, 3) fry, 4) smolt, 5) adult and 6) spawner phases. The egg, alevin, fry, and spawner phases occur solely within freshwater. The smolt and adult phases include the migratory transitions between freshwater and the ocean (smolt) and between the ocean and freshwater (adult) (Fig.2). A basic description of the anadromous life cycle was provided by Groot and Margolis (1991)"

> *"Pacific salmon spawn in gravel beds in rivers, streams, and along lake shores. They generally migrate to sea after an early freshwater life and are widely distributed over the North Pacific Ocean and Bering Sea during the marine years of their lives. Most perform extensive migrations while at sea. Some populations or subpopulations of certain species stay in coastal waters or remain in freshwater….Upon maturation, after one to seven years (depending on species and stock), Pacific salmon usually return to their home rivers and natal breeding grounds."*

For some Columbia River salmon populations (e.g. Redfish Lake, ID sockeye salmon), freshwater migrations to and from the ocean can extend well beyond 600 km, whereas Columbia River chum salmon migrate less than 100 km from the ocean.

Comparatively, sea-run coastal cutthroat trout do not exhibit the expansive migrations of Pacific salmon and steelhead in the ocean. Unlike Pacific salmon and steelhead, sea-run coastal cutthroat trout do not always return to freshwater in a sexually mature[ing] state and may make multiple sea-water migrations to feed and attain growth (Johnston 1982).

Post-spawn survival is different between anadromous Pacific salmon and sea-run trout (Quinn and Meyers 2004). Pacific Salmon are semelparous and die after their first and only spawning cycle. Steelhead and coastal cutthroat trout are iteroparous and can spawn more than once, although repeat spawning rates can be variable (Quinn and Myers 2004).

Life history variation and reproductive strategies are variable between and within anadromous salmonids in the Columbia River Basin. These differences include, but are not limited to the timing/return to freshwater to spawn (i.e. seasonal races), actual spawn timing, spawning location/migration distance, gonadal maturation, period of egg incubation and rearing periods of fry. For example, Columbia River Chinook salmon fry exhibit high variation in freshwater residence and age of smoltification. Depending on the seasonal race, (e.g. spring-, summer-, and fall-chinook), chinook fingerlings may reside in freshwater between a few weeks to a few years (Brannon et al. 2004). As such, a multitude of different sized chinook salmon smolts could potentially be exposed to oil contamination in the event of a spill in the Columbia River gorge or tributary.

Due to the large number of life cycle differences and reproductive strategies that occur between anadromous salmonid populations in the Columbia River, a full review of each species, subspecies (inland vs. coastal steelhead), seasonal-race (e.g. fall vs. spring run chinook salmon), run-type (A vs. B-run steelhead), or genetic group is beyond the scope of this declaration. Rather it is simply important to note, that these anadromous salmonids exist in the Columbia River at numerous phases of their life cycle. Anadromous salmon and trout

in the Columbia River also use different portions of the river during various phases of their life cycle. For example, smolt migrations of most chinook, coho, sockeye, and steelhead at Bonneville Dam occurs between April and July (Table 1). An oil spill during smolt migration could have severe consequences to all populations of salmon and steelhead in the States of Idaho, Oregon, and Washington; including threatened and endangered populations. Similarly, most Columbia River adult salmon and steelhead return to spawn in the between April and October, although winter-run steelhead can return between November and April (Fig. 3). Furthermore summer-run stream-maturing steelhead, like those in the Snake River subbasin, overwinter in various areas of the Columbia River before spawning in the spring of the following year (Behnke 1992). A helpful discussion of anadromous salmonid use of the Columbia River estuary can be found in the National Marine Fisheries Service "Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead." (NMFS, 2011). The Recovery Plan module also makes recommendations for actions to benefit anadromous salmonids, including reducing sources of pollutants.

In summary, the Columbia River basin contains anadromous salmonids at various life stages year-round. The threat of acute or delayed effects of an oil spill could affect numerous species at various life stages.

END OF DIRECT TESTIMONY

I declare under penalty of perjury that the above testimony is true and correct to the best of my knowledge. Executed this 13th day of May, 2016.

Zachary Penney, PhD