BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

IN RE APPLICATION NO. 96-1	)
	)
OLYMPIC PIPE LINE COMPANY:	)
CROSS CASCADE PIPELINE PROJECT	)
	)
	)

EXHIBIT _____ (RWE-T)

REBUTTAL TESTIMONY OF ROY W. ELLIOTT

ISSUE: IMPACTS TO GROUNDWATER AND REMEDIATION OF GROUNDWATER AND SOIL CONTAMINATION

SPONSOR: OLYMPIC PIPE LINE COMPANY

Q. Please introduce yourself to the Council.

A. My name is Roy W. Elliott. I am a principal with Dames & Moore in Seattle.

Q. Please provide a summary of your qualifications and experience.

A. I am in my 22nd year in environmental consulting and lead the hydrogeologic practice in the Pacific Northwest Region of Dames & Moore Inc. During my career I have had the opportunity to investigate, characterize and remediate petroleum releases in 13 western states and British Columbia. These projects have ranged from emergency responses for pipelines and refineries to chronic slow leaks at bulk fuel storage facilities and service stations.

In the decade of the 1990s I have managed or consulted on the remediation of over $50 million in petroleum impacted soils, sediments and ground and surface waters. These projects have included crude and distillate fuel product pipelines, petroleum refineries, bulk storage facilities, airports fuel delivery systems and bulk storage, motor vehicular fleet fuel storage, pipeline pumping stations, tankers, and truck and auto service stations. The investigation and clean up of fuel releases have been performed for impacted sediments, ground and surface water, soils, air and infrastructure. Often the work included consultation on the feasibility and cost allocation of the available remedies.

In 1984 I provided peer review to the Environmental Protection Agency for their draft report on the status of the Nation's underground petroleum fuel product storage facilities. As a principal of Dames & Moore and as one of the most senior practitioners in the petroleum remediation service, I continue to act as a national consultant to our other

offices and project managers. This also offers me the opportunity to review many incidents across the United States and in our international operations.

In addition to my work on petroleum impacted materials I have also consulted on the restoration of aquifers from petroleum impacted groundwater. My water resources experience includes developing well head protection plans for municipal water well fields, siting, designing and installing municipal industrial and agricultural water wells, and the assessment of aquifers and river basins for sustainable development.

I have consulted on the restoration of contaminated drinking water aquifers to state and federal drinking standards. My project experience includes design, installation and operation of water resource protection wells for the protection of well water supplies for municipal and agricultural uses.

In remediating petroleum releases I have used the customary means and methods including: excavation and treatment of impacted soils on site, the containment and treatment of surface water and petroleum on site, the interception and containment of groundwater on and off site by wells and trenches, the excavation and disposal of impacted soils and sediments at special landfills; the treatment methods I have used on and off site include land farming and thermal desorption for soils, air sparging and soil vapor extraction from groundwater followed by stripping and or the polishing with activated carbon, enhanced biodegradation in place and recently the boiling and vapor extraction from groundwater by electrical resistance.

A copy of my curriculum vitae is attached to my testimony as Exhibit RWE-1.

Q. On what issues will you provide rebuttal testimony?

A. Threatened impacts to groundwater resources and the remediation of groundwater and soil contamination.

Q. Please provide the Council with a summary of your rebuttal testimony.

A. I will respond to theories concerning the claimed risks to aquifers, both sole-source and non-designated, from potential petroleum releases from the proposed pipeline. In addition I will address the means and methods of groundwater and soil remediation, the regulations that control the clean up criteria and their ability to protect human health and the natural resources.

Q. Have you reviewed the ASC submitted on behalf of OPL?

A. Yes. I have reviewed the ASC and, in addition, participated in writing portions of it.

Q. Have you reviewed prefiled testimony submitted in this matter?

A. Yes, as that testimony applies to potential impacts to groundwater and agricultural soil.

Q. Based on your review of the prefiled testimony, do you have an opinion regarding potential impacts to the Cross Valley aquifer?

A. Yes. The Cross Valley Sole Source Aquifer is protected from an OPL petroleum release by multiple factors. This protection is adequate to continue long term reliance on this water supply. Although developing another water supply is prudent for sustainable development of the water utility district, it is not necessary as a precaution against theoretical damage to a well from a pipeline release.

Q. What are the factors that protect the Cross Valley water supply?

A. The factors that protect this water resource include the District's geology, the modern design and operation of the pipeline, the degree of proposed monitoring of the pipeline and its appurtenances, the existing regulations in place to protect the environment and the sophistication of the response systems to petroleum releases.

Q. What is the geology of the District?

A. The surficial and subsurface geology of the District is characterized by a layer of glacial till which typically extends from 25 to 100 feet thick (Liszak, 1993). Below the till lies a glacial advance outwash sand named the Esperance Sand by the USGS. Below the sand lies low-permeability transitional beds and bedrock. The Esperance Sand is an aquifer, in this instance an aquifer designated as a sole source aquifer.

Q. Where are the District's water wells developed?

A. The District's water production wells are developed in the Esperance Sand. Groundwater in this aquifer is typically semi-confined to unconfined and occurs in two zones; a shallow zone between 200 and 145 feet mean sea level (MSL), and a deeper zone between 306 and 236 feet MSL. These zones are beneath the till cover across a majority of the District.

Q. How is this aquifer recharged?

A. Groundwater recharge in the area occurs primarily from precipitation. The rainfall that infiltrates the ground has a slow path downward through the till and the interbedded lenses of sand and gravel. Some of these recharging waters perch on the till and erupt as

springs in the uplands and valley sides. These waters drain off as creeks and do not recharge the sole source aquifer.

Q. What information did you consider in developing your opinion regarding the Cross Valley Aquifer?

A. My review included Dames & Moore investigations in the Cross Valley Aquifer area and the available geologic maps (Minard, 1998a, 1981b), as well as review of an aquifer susceptibility analysis completed by the USGS (1996).

Q. What do those studies indicate?

A. My review of the studies indicates that the proposed pipeline route in the vicinity of the aquifer crosses an area underlain by 50 feet of glacial till. The only areas not mantled by the till are exposures of advance outwash that are found between approximate pipeline mileposts (MP) 3.25 and 4. At these locations, drainages tributary to Evans Creek have eroded through the till. The outwash is more permeable than the till and consequently more susceptible to potential releases from the Cross Cascade Pipeline.

Q. Is the work you reviewed site specific, and specific to petroleum releases?

A. The aquifer susceptibility analysis (USGS, 1996) used statistical methods to assess the susceptibility of regions within the study area to potential contamination from the ground surface. The analysis is not site specific but intended to provide the District with a planning resource. The assessment does not differentiate the potential contaminants or their mobility in soil or groundwater. For instance, the analysis does not compare the risk of dry cleaner solvents to gasoline. The analyses were weighted according to depth to groundwater and annual recharge (precipitation) in the study area assessed by the USGS.

According to the analyses by the USGS, the area crossed by the pipeline between MP 0 and MP 5.5 is classified as having a 'low' susceptibility to contamination, except in the Evans Creek area discussed above, which is classified as having a 'moderate' susceptibility.

Q. Do you have a further opinion regarding the susceptibility of the Evans Creek area to petroleum contamination?

A. The Evans Creek area where the till has been eroded primarily drains groundwater from the aquifer to the Creek. Petroleum potentially released in such an area would migrate toward the creek and not toward a well.

Q. Generally speaking, why is the Cross Valley aquifier classified as having lower susceptibility to contamination?

A. The sole source aquifer is protected by the local geology and is also protected by shallow perched groundwater occurrences. Where shallow groundwater occurs it is a hydraulic barrier to the downward movement of petroleum, which floats on water. The deep occurrence of the groundwater in the Cross Valley aquifer is protected by the overlying materials of low permeability.

Q. You stated that the proposals for pipeline design and monitoring also protect the Cross Valley Aquifer. Could you expand on that statement?

A. OPL's pipeline will be constructed of steel that is strong, flexible, protected from corrosion by cathodic protection, and subject to high degree of inspection both at installation and during the operational life. In my experience, releases that have occurred historically from older pipelines typically would have been prevented in newer pipelines

by modern materials and construction. If a leak occurs in a pipeline system it is almost always at block valves, the booster pumps or pumping station. OPL's pipeline will have secondary containment of block valves and pumping stations, allowing for early detection and containment of any releases from these facilities. Furthermore, the block valves and pumping stations of the proposed pipeline will be above ground where the conditions are directly observable.

The modern pipeline also is monitored in several ways that add protection against mechanical failure, appurtenances leakage and corrosion failure. The buried pipeline locations are protected by signage and one-call locators. In addition, the lines are examined from the air frequently to observe conditions and the pipelines are surveyed by a "smart pig," which measures the metal pipeline wall thickness and can detect dents from external forces and thinning from corrosion.

Q. Is there adequate regulation and enforcement in place to protect the environment and human health should a release from the OPL pipeline take place?

A. In this decade significant advances in regulation and enforcement have added substantial protection to the environment from the release of petroleum fuel. The Oil Pollution Act of 1990 advanced the already strong criteria for spill prevention and containment by requiring spill response plans from pipeline operators and bulk fuel terminals. These plans require one hour response times by trained teams with equipment caches in the one hour response areas.

Due to these regulations, OPL will be required to have a spill response plan for their entire system in place prior to operation. In addition, the State of Washington Model

Toxic Control Act (MTCA) has been applied to thousands of petroleum releases. This act has enforcement power to require not only clean up but also natural resources protection.

Q. Are other aquifers such as the North Bend, Snoqualmie and Yakima River aquifers, also protected by modern pipeline systems, monitoring and regulatory requirements?

A. Testimony has been offered postulating high risk scenarios in these areas that pose great risk to human health and the environment. In my opinion those risk scenarios are unrealistic. Nevertheless, spill response planning required by federal statute dictates identification of worst case scenarios within the one hour response time zones, as well as plans to contain and control the releases.

Q. Have you personally performed remediation of petroleum spills that threatened impacts to groundwater?

A. Yes.

Q. Please provide an overview of the techniques that can be used control and remediate such spills.

A. The groundwater resource is protected from petroleum releases by a range of capture and control techniques. First on the surface fluid petroleum is stopped by coffer dams and adsorbent materials. These are usually constructed as part of an emergency response. Infiltrating petroleum is directly removed by excavation in finer grained soils. In free draining sands and gravels in which the petroleum can reach groundwater, cut off trenches or interceptor wells are rapidly installed. These devices are used to contain and capture the petroleum and impacted groundwater for subsequent separation and treatment

usually at the surface. Pumped and separated water is then treated and discharged under State NPDES Permits to the waters of the state, if available treatment can be performed by sanitary sewers with the approval of the operators and the state. Recovered petroleum is usually returned to be reincorporated into the petroleum stocks. In cases of deep percolation of a petroleum release toward a groundwater source where only leachable petroleum components actually reach the groundwater, resource protection wells are used to intercept and protect any nearby water supply wells.

Q. Has Dames & Moore responded to a release in geologic conditions similar to those in the North Bend, Snoqualmie or the Yakima river alluvial aquifers?

A, Dames & Moore responded to an actual petroleum release over an unconfined aquifer with drinking water supply wells less than ¼ mile downgradient adjacent to a creek in a mountain valley in a state park. The Indian, Alaska pumping station experienced a mechanical failure releasing the pipeline's contents in a wooded area of the park adjacent to a fast-flowing creek. The release occurred in August, some four to six weeks before freezing conditions and snow would hamper clean up. The spill response included recovery trenches, capture of impacted alluvial aquifer water, monitoring of the creek and downgradient wells, and eventually the removal and treatment of impacted soils. Although thousands of barrels of jet fuel were released, the creek never became contaminated, the downgradient wells remained free of petroleum and the site has been restored.

Q. It has been suggested that a release of petroleum to irrigation canals or a river from which irrigation water is drawn would result in a long term impact to these agriculturally valuable soils. Do you have opinions regarding these contentions?

A. This is highly unlikely for a number of reasons. First if a spill were to be released to a river, the emergency response would result in containment action that would include shutting off irrigation and water supply intake systems. Secondly, if petroleum were to enter an irrigation canal and be spread on a field, there would likely be an acute response by an existing crop but the impact to farm land is short term. The natural biological action of soil bacteria augmented, if required, by additional remediation would correct the problem. A long term impact to the on-going agricultural land use is highly improbable.

Q. What about spills that occur directly on agricultural lands?

A. Those of us who have been cleaning up soils from petroleum releases have, for over two decades, made use of the native bacteria. If a release occurred to farmland it would probably have an acute effect on the crop directly impacted by the fuel and that damage would have to be mitigated. The soil likely could be treated by "land farming" to biologically degrade the petroleum. The actual results of such remediation has been studied as early as 1978 by Dibble and Bartha and published in Soil Science. Full recovery of the crop land within one to two years is an expected result of remedial action.

Q. Have you personally performed or overseen remediation of petroleum-impacted soils?

A. Yes, many times.

.**Q. What remedial methods are employed to mitigate soils impacted from a petroleum release?**

A. Initial response actions focus on containment of the fuel and removal or recovery of liquid product. A range of options then exists for managing the residual petroleum

contaminated soil. If the contaminated soil is excavated, it can be treated or disposed of in a state-approved manner. On-site treatment can include aeration, land farming, or low temperature thermal desorption. The soil also can be treated in-place with supplemental oxygenation enhancement compounds and nutrients to stimulate biological degradation of the hydrocarbons.

Q. Is soil remediation difficult, and are there local contractors experienced with this process?

A. Soil remediation for petroleum impacts is a routine operation. The Department of Ecology allows the Independent Action as the typical approach for such remediation. This is because there are so many qualified practitioners in the business of remediation of petroleum-impacted soils and the procedures for performance and monitoring are well known. Again, there is an abundance of experienced remediation contractors across the state of Washington. Since the 1980s most underground fuel storage tanks in Washington have been upgraded or replaced. Many of the tanks had experienced releases, which required removal and treatment of the impacted soils. Contractors familiar with tanks and excavation rose to the need. These contractors provide a pool from which spill response contracts are often developed. The materials needed for setting up a land farm, the equipment and operators of thermal desorption operations, and the vendors, equipment and materials needed for in-place treatment are available and used across the state regularly.

I declare under penalty of perjury under the laws of the State of Washington that the foregoing testimony is true and correct to the best of my knowledge and belief.

DATED this _____ day of March, 1999.

Roy W. Elliott