# APPENDIX D

# EMPIRICAL DEMONSTRATION OF PROTECTION OF GROUNDWATER

Concentrations of arsenic, cadmium, copper, lead, mercury, nickel, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), polychlorinated biphenyls (PCBs), and dioxins/furans in Port Parcel 3 soil and arsenic, copper, mercury, and zinc in MJB North Area soil at some locations exceeded soil cleanup levels protective of groundwater calculated using the fixed-parameter three-phase partitioning model described in WAC 173-340-747(4). However, the concentrations of these constituents in groundwater at the shoreline wells (i.e., landward of the proposed point of compliance) measured during the groundwater monitoring events show that the existing concentrations in soil are protective of groundwater. An empirical demonstration that soil concentrations are protective of groundwater is provided below.

The Model Toxics Control Act (MTCA) regulations [WAC 173-340-747(9)] identify requirements for demonstrating that soil concentrations will not cause an exceedance of groundwater cleanup levels as follows:

- Measured groundwater concentrations must be less than or equal to the groundwater cleanup level
- Sufficient time must have elapsed for migration of the hazardous substance from soil to groundwater to have occurred
- Characteristics of the site that would impact migration of contaminants to groundwater must be representative of future site conditions.

## GROUNDWATER CONCENTRATIONS

Measured groundwater concentrations of arsenic, cadmium, copper, lead, mercury, nickel, cPAHs, PCBs, and dioxins/furans in the Port Uplands Area shoreline wells (i.e., the groundwater point of compliance) comply with the preliminary groundwater cleanup levels protective of marine surface water, as discussed in Section 6.2.2.1 of this report and below:

- PCBs, cadmium, and mercury were not detected in any groundwater sample from any well during the four groundwater monitoring events.
- cPAHs were not detected in any shoreline well (i.e., landward of the proposed groundwater point of compliance) during the four groundwater monitoring events.
- Dioxins/furans were analyzed for during the first and fourth groundwater monitoring events. During the first event, although dioxins/furans were detected in shoreline wells MW-101 and MW-108, the concentrations, using TEFs, were below the preliminary groundwater cleanup level for 2,3,7,8 TCDD. All detected dioxins/furans were either less than the practical

quantitation limit (PQL) or were associated with congeners with a toxicity equivalency factor (TEF) of 0.0. Based on these results, removal of dioxins/furans from the list of future analytes was requested and was verbally approved by the Washington State Department of Ecology (Ecology) on August 26, 2004 (Ecology 2004). As requested by Ecology, the fourth groundwater monitoring event included analysis for dioxins/furans in some wells. During the fourth event, all concentrations of dioxins/furans using TEFs were below the preliminary groundwater cleanup level for 2,3,7,8 TCDD.

- Copper, lead, arsenic, and nickel were detected in groundwater at one or more of the shoreline wells at least once during the four groundwater monitoring events. The detected concentrations of copper and lead did not exceed the preliminary groundwater cleanup levels protective of marine surface water at any of the wells. The detected concentrations of arsenic in shoreline wells did not exceed the preliminary groundwater cleanup level, except during one event, when the concentration of total arsenic but not dissolved arsenic in monitoring well MW-101 slightly exceeded the preliminary groundwater cleanup level. Dissolved arsenic was not detected in this well at a concentration exceeding the preliminary groundwater cleanup level during any of the monitoring events; therefore the groundwater at the shoreline wells is considered to comply with the preliminary cleanup level for arsenic. Detected concentrations of nickel in the shoreline wells, were similar to the concentrations in the upgradient well, MW-103, although concentrations in some wells during some events exceeded the preliminary cleanup level. However, none of the detected concentrations exceeded the updated marine chronic criteria described in Section 3.1.

Measured groundwater concentrations of arsenic, copper, mercury, and zinc in MJB North Area in shoreline wells comply with the preliminary groundwater cleanup levels protective of marine surface water, as discussed in Section 6.2.2.2 of this report.

As described above, the groundwater concentrations in all shorelines wells comply with the cleanup levels. Therefore, the first MTCA requirement above is met.

**SUFFICIENT TIME**

Sufficient time has elapsed for the constituents identified above to have migrated to groundwater. Known sources of contaminants in Port Parcel 3 soil are associated with historical activities at the northern portion of the former Scott Paper Company mill site (Property) that occurred prior to the Port of Anacortes' (Port) purchase of the Property in 1979. The depths to groundwater for the wells located on Port Parcel 3 or immediately adjacent to Port Parcel 3 (MW-101, MW-102, MW-105, MW-106, MW-107, MW-109, and MW-110) vary from 3.6 ft to 12.7 ft below ground surface (BGS) as indicated on Table 3 of this report. The minimum time available for migration of contaminants to groundwater, based on termination of mill activities and purchase of the Property by the Port over 25 years ago, is expected to be adequate for contaminants to have reached the groundwater; therefore, the second MTCA requirement above is met.

## FUTURE SITE CONDITIONS

Physical conditions at Port Parcel 3 that would impact migration of soil contaminants to groundwater are not likely to change significantly. Port Parcel 3 is currently comprised of Seafarers' Memorial Park, which is mostly unpaved, a paved parking lot, and two paved roadways. The Park was built in 1995 and is planned to remain as a park. Development adjacent to the roadways at Port Parcel 1 and Port Parcel 2 is expected to occur; however, the roadways are planned to remain in place. Development is also likely at the MJB North Area; however development is not expected to increase migration of soil contaminants to groundwater. Therefore, the current characteristics of the site that would impact migration of contaminants to groundwater are considered to be representative of future site conditions, meeting the third MTCA requirement.

## CONCLUSIONS

As described above, although constituents are present in Port Parcel 3 and MJB North Area soil at concentrations exceeding the calculated concentrations protective of groundwater, based on an empirical demonstration, the existing soil concentrations are protective of groundwater.

## REFERENCES

Ecology. 2004. Personal communication (Telephone conversation with Ron Timm, Washington State Department of Ecology, re: *2nd Quarter Groundwater Monitoring Scope*). Kris Hendrickson, Landau Associates, Inc., Edmonds, Washington. August 26.