

APPENDIX B. PROPOSED POREWATER SAMPLING METHODS

Lower Duwamish Waterway Group

Port of Seattle / City of Seattle / King County / The Boeing Company

MEMORANDUM

To: Allison Hiltner; Rick Huey
From: LDWG
Subject: Proposed porewater sampling methods
Date: June 17, 2005

This memorandum briefly summarizes results from the porewater reconnaissance sampling conducted on June 6 and 7, 2005. Based on those results, this memorandum proposes sampling methods and targeted depths for the porewater sampling event scheduled for the week of June 20, 2005 in the LDW at RM 2.3 to 2.4, Great Western International (GWI), and at RM 3.6, Boeing Plant 2/Jorgensen Forge.

RECONNAISSANCE METHODS

During the reconnaissance, the bottom substrate was probed by inserting a metal pole into the sediment to determine the thickness of the mud layer and the depth below the mud at which sand was encountered. At the shallower locations (5 ft below MLLW), the sediment was probed from the boat, while at the deeper locations (10 to 15 feet below MLLW), sediment was probed by a diver.

At selected locations, attempts were made to withdraw porewater samples from the sediment using either a PushPoint mini-piezometer designed by MHE products, or an EPA-designed modified PushPoint mini-piezometer. The EPA design has a longer screened interval and wider inner diameter than the MHE sampler. Samples were withdrawn from the piezometer using a peristaltic pump.

Conventional parameters were measured in surface water collected just above the bottom at each site and in porewater collected with the peristaltic pump and mini-piezometers. These measurements, made with a Hydrolab, were compared to determine if there were differences in conductivity or dissolved oxygen (DO).

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At locations PZ-01 and PZ-04 (with a bottom elevation of 5 ft below MLLW), the mud layer generally extended to at least 5 ft below the sediment surface, with a thinning of the layer to less than 5 ft thick at locations closer to shore at bottom elevations of about 0 to 2 ft below MLLW (see Figure 3-6 of the porewater QAPP). Between the 0 to -2 ft MLLW contours, the substrate was sand or riprap below the mud layer. The mud layer

was visible as a black sticky mud on the probe. At locations PZ-03, PZ-05, and PZ-06 (with bottom elevations of 10 to 15 ft below MLLW), the surface sediment layer was primarily soft sediment, based on feel by the diver using the probe, with a thickness generally greater than 5 ft. PZ-02 could not be accessed because a barge was present at the sampling location.

No attempt was made to extract porewater from the shallower locations PZ-01 and PZ-04, because it was assumed it would not be possible to obtain a sample from the sticky mud. The EPA-designed piezometer was used to extract a porewater sample from the top 6-12 inches of the soft sediment layer at PZ-06 (with a bottom elevation of 15 ft below MLLW). The porewater extracted at this location was a very dark color with high turbidity. The analytical laboratory (ARI) has confirmed that it will be possible to analyze VOCs in this type of water sample with no effect on the reporting limits. Differences in conductivity and DO between the porewater and surface water were observed, as shown in Table 1.

Table 1. Conductivity and DO results for porewater and surface water samples

LOCATION ID	CONDUCTIVITY ($\mu\text{mhos/cm}$)		DO (mg/L)	
	POREWATER	SURFACE WATER	POREWATER	SURFACE WATER
PZ-06	34,900	38,900	2.0	6.6
PZ-07	17,004	2,585	2.0	8.5
PZ-12	43,800	40,990	1.6	5.0

The porewater QAPP stated that a syringe would be used to withdraw the portion of sample to be analyzed for VOCs. However, during the reconnaissance, it was observed that a steady stream of water could be withdrawn using the peristaltic pump, rather than an irregular flow of water, indicating that a minimum amount of air would be incorporated during collection of the sample into the vial, so that a syringe may not be needed. However, if during sampling it appears that air is becoming incorporated into the sample, then a syringe will be attached to the tubing to withdraw the sample, instead of using the pump.

Based on the reconnaissance results, which indicate the presence of a homogenous mud or soft sediment layer with a thickness greater than 5 ft at all of the piezometer sampling locations (although information was not available for PZ-02), attempts will be made to withdraw a porewater sample from a depth of 1 ft below the sediment surface at each location, using the EPA-designed mini-piezometer. If a sample cannot be withdrawn at 1 ft, then an attempt will be made to withdraw a sample at 2 ft below the sediment surface. If it is not possible to withdraw a porewater sample at a particular location using the mini-piezometer, then a peeper will be placed at a depth below the sediment surface of 10 cm at that location during the week of July 18, 2005 when the other peepers are deployed.

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At locations PZ-07 and PZ-10 (with a bottom elevation of 5 ft below MLLW), a sticky mud layer ranged from about 1.5 to 3 ft in thickness (see Figure 3-7 of the porewater QAPP). A porewater sample could not be extracted from within this mud layer using the MHE-designed mini-piezometer and the peristaltic pump. Beneath the mud layer was a sandy substrate. A clear porewater sample was obtained from about 6 inches below the mud/sand interface at PZ-07. Differences in conductivity and DO between the porewater and surface water were observed, as shown in Table 1.

At locations PZ-08, PZ-09, PZ-11, and PZ-12 (with bottom elevations of 10 to 15 ft below MLLW), the surface sediment layer was primarily soft material, based on feel by the diver using the probe, with a thickness generally greater than 5 ft. The MHE-designed piezometer was used to extract a porewater sample from the top 6-12 inches of the soft sediment layer at PZ-12 (15 ft below MLLW). A clear porewater sample was obtained. Differences in conductivity and DO between the porewater and surface water were observed, as shown in Table 1.

Based on the reconnaissance results, porewater samples will be collected using the MHE-designed mini-piezometer from locations PZ-07 and PZ-10, at depths of 1 ft below the mud/sand interface (approximately 2.5 to 4 ft below the sediment surface). At the four deeper piezometer locations, samples will be collected at 1 ft below the sediment surface using the MHE-designed mini-piezometer, because this piezometer is shorter than the EPA-designed sampler and will be easier for the diver to handle underwater.

Samples will be collected using the peristaltic pump unless it appears that air is becoming incorporated into the sample, in which case a syringe will be used instead of the pump. If it is not possible to withdraw a sample at a particular location using the proposed methods, then a peeper will be placed at a depth below the sediment surface of 10 cm at that location when the other peepers are deployed during the week of July 18, 2005.