N00102.AR.001923
NSY PORTSMOUTH
5090.3a

LETTER AND COMMENTS REGARDING PROPOSED FIELD AND LABORATORY PROTOCOLS TO DEVELOP SITE SPECIFIC KD VALUES FOR SEDIMENT NSY PORTSMOUTH ME
10/23/1997
LEPAGE ENVIRONMENTAL SERVICES

Lepage Environmental Services, Inc.

P. O. Box 1195 • Auburn, Maine 04211-1195 • 207-777-1049 • Fax: 207-777-1370

October 23, 1997

Peter Vandermark
Seacoast Anti-Pollution League
P. O. Box 1136
Portsmouth, New Hampshire 03802

Subject: Review Comments, *Proposed Field and Laboratory Protocols to Develop Site Specific Kd Values for Sediment at Portsmouth Naval Shipyard*

Dear Mr. Vandermark:

We are transmitting comments to the Seacoast Anti-Pollution League (SAPL) concerning the Navy's *Proposed Field and Laboratory Protocols to Develop Site Specific Kd Values for Sediment at Portsmouth Naval Shipyard.* The cover letter is dated October 9, 1997, although the attached proposal is dated September 17, 1997. The purpose of the document is to describe the field sampling and laboratory methods the Navy is proposing to use in November 1997 to collect pore water from sediment samples. The results of analyzing the pore water will be used to develop site-specific sediment partitioning coefficients (Kds) to use in the Navy's on-shore/off-shore contaminant fate and transport model. Comments and questions are as follows:

1. September 18th Proposal. The field methods proposed appear to involve some amount of disturbance of the area surrounding the sediment sampling location. For example, once the drop-hammer corer has been pounded into place and the top is capped, the area next to the core barrel will be shoveled away until the bottom can be capped. How will the field activities of November 1997 affect the representativeness of sediment samples collected at the location during future rounds of sampling?

2. September 18th Proposal. The Navy should clarify what protocols will be used for future seep/sediment sampling after the November 1997 round. Will the Navy return to the protocols used prior to November 1997, or continue with the November 1997 methods in the future?

3. September 18th Proposal. The text in the first paragraph under the Proposed Protocols heading states that the groundwater flow model assumes significant discharge beneath the surface of the sediment. What is the depth at which the significant discharge takes place and how does it correlate with the proposed sampling depths?

4. **September 18th Proposal.** Does the Navy know which locations cannot be cored or will coring be attempted at all the sampling locations? If coring will be attempted, what effect will an unsuccessful try have on the nature of the sediment? How will the Navy ensure that undisturbed material is collected? Information (such as equipment and decontamination methods) about the alternative sample collection method mentioned in the last paragraph should be provided. In addition, the text and attached materials indicate that cores of one foot or more in depth will be obtained, and the pore water will be extracted from about 8 to 10 cm below the top of a core. It is unclear what depth will be represented by sediments collected by the alternative method.

5. **September 18th Proposal.** Given the concern for minimizing disturbance of the samples, shipping the samples by truck or overnight carrier does not appear to be desirable.

6. **URI/GSO Standard Operating Procedure 1.01.** The drop-hammer coring method described on page 3 includes pounding the core barrel into the sediment. How much will this disturb the sediment sample?

7. **SAIC Standard Operating Procedure.** Do metals sorb to any of the materials listed in Section 3? How will the tubing and any other components that will be in contact with the pore water be decontaminated? What is an air stone and how will it be inserted into the sediment sample (Section 4.3)?

8. **SAIC Standard Operating Procedure.** Why will the first collection of pore water be discarded (Section 4.12)? Section 4.19 mentions filtering, although Winger and Lasier (page 323) appear to recommend not filtering in order to obtain a representative sample. Under what circumstances would a sample be filtered, and how would the filtering be conducted? How would the results be compared with those of non-filtered samples?

If you have any questions regarding the comments above, please give me a call at 207-777-1049.

Sincerely,

Carolyn A. Lepage

Carolyn A. Lepage, C.G.
President

cc: Marty Raymond, Portsmouth Naval Shipyard
Iver McLeod, Department of Environmental Protection
Meghan Cassidy, Environmental Protection Agency

10SedLoc7

Development and Selection of Site Specific Sediment Kd Values in Support of Phase II Contaminant Fate and Transport Modeling at Portsmouth Naval Shipyard, Kittery, Maine

~~October 7, 1997~~

1.0 INTRODUCTION

The following summarizes the development and selection of site-specific sediment Kd values for the modeling contaminants of concern (COCs) for each of the modeling source areas (OU2, OU3 Back Channel, OU3 Clark Cove, and OU5) at PNS to be used in Phase II of the Onshore/Offshore Contaminant Fate and Transport modeling effort. Because sediment Kd values were not available, Phase I of the Onshore/Offshore Contaminant Fate and Transport modeling assumed that the sediment Kd values were equal to the soil Kd values identified for each of the modeling source areas for the calculation of sediment concentrations. For the calculation of surface water concentrations, a conservative sediment Kd of zero was used in Phase I. To better refine the modeling effort, site-specific sediment Kds for the modeling COCs for each of the source areas will be used in the Phase II modeling effort. Various data were used to (1) develop and select sediment Kd values and (2) evaluate the representativeness of the selected sediment Kd values for the modeling effort.

To select and evaluate sediment Kd values, the following Kds were compared:

- Soil Kd values used in the Phase I modeling
- Sediment Kds calculated from seep/sediment data for PNS (Rounds 7 and 8)
- Sediment Kds calculated from data from similar sites along Narragansett Bay, RI
- Sediment Kds calculated from literature data (organic COCs)

Kd values for inorganic COCs will also be calculated from pore water/sediment data for PNS once this data is available. The sediment Kd values calculated from the pore water/sediment data will be used to confirm the representativeness of the selected Kd values. There are no current plans to rerun the Phase II modeling using pore water/sediment data, unless there is a large deviation of sediment Kds calculated using the pore water/sediment data with the selected Phase II sediment Kd values.

Note the pore water collection method (Winger and Laiser, 1991) for the planned PNS pore water/sediment sampling is similar to the method used at the sites along Narragansett Bay included in this evaluation of sediment Kd values. The method involves the vacuum extraction of pore water from the sediments. Because a very large volume of sediment is required to extract sufficient volume of pore water for organic analysis, only inorganic analysis is generally performed for the pore water. Therefore, only sediment Kds for inorganic COCs will be calculated using pore water/sediment data. Other available data, including seep/sediment data and literature data, were available to calculate sediment Kds for organic COCs.

2.0 METHODOLOGY

This section discusses the development and comparison of the sediment Kd values and the selection of site-specific specific sediment Kd values for each source area. Sediment Kd values were developed for the COCs identified for each source area in the Phase I modeling effort. In addition, sediment Kd values were developed for additional COCs identified based on a review of recent sampling at PNS (Rounds 7 and 8). (Screening of additional COCs is presented in Appendix A).

Sediment Kd values were developed from six sources of data:

- soil Kd values used in the Phase I modeling:
- seep/sediment data from PNS sampling Rounds 7 (December 1996) and 8 (April 1997)
- McAllister Point Landfill (along Narragansett Bay), Rhode Island pore water/sediment data
- Davisville (along Narragansett Bay), Rhode Island pore water/sediment data
- literature values for octanol-carbon partitioning coefficients (koc) provided in the Phase I modeling (organics only)
- koc values from additional literature sources (organics only)

In general, the development of sediment Kd values from seep/sediment data or pore water/sediment data was based on the geometric mean of the sediment Kd values calculated for each seep/sediment or pore water/sediment pair. Statistical analysis was not conducted to determine whether all the data were lognormally distributed. However, because environmental data sets with sufficient sample size often follow a lognormal distribution, the geometric mean was used for the sediment Kd development~~Each of these data and the development of Kds from these data are discussed below~~.

Table B-1 shows a summary of the sediment Kds developed from each set of data. Each of the data sources and the development of Kds from these data are discussed below.

2.1 Soil Kd

The development of soil Kd values used in the Phase I modeling is discussed in detail in Appendix B of the Onshore/Offshore Contaminant Fate and Transport Phase I Modeling Report (B&R Environmental, 1997). In summary, the selection of soil Kd values for inorganic analytes in the Phase I modeling was based on the lower (i.e., more conservative in terms of producing the greater groundwater concentrations) between the Kd calculated using site-specific soil/groundwater data and representative literature Kds. Except for the aluminum Kd for OU3 (both Back Channel and Clark Cove), the literature value was lower than the site-specific for all COCs and source areas. The calculated site-specific aluminum Kd for OU3 was lower than the representative literature value. For the organic analytes, soil Kd values wa~~s~~ere calculated in Phase I using literature values for koc and site-specific fraction of organic carbon (foc) in soil from the source area.

2.2 PNS Seep/Sediment Data

Seep/sediment data from Round 7 and Round 8 sampling events conducted at PNS were used to calculate the PNS sediment Kds for inorganic and organic COCs. These two sampling events were conducted in December 1996 and April 1997, respectively. Seep and associated sediment locations were in the vicinity of OU3 (Back Channel, Clark Cove, and Sullivan Point).

No seeps have been identified in the vicinity of OU2 or OU5. For the sediment Kd calculations, three groupings of the seep/sediment locations were used: Back Channel locations; Clark Cove locations; and all locations. Individual sediment Kds were calculated for each location using data for the seep/sediment sample pair. Filtered seep samples were used for inorganic analytes because these samples were considered representative of the inorganic that would be dissolved in seep water. Filtering is not applicable for organic analysis. Half the detection limit was used for all nondetects. A geometric mean of the individual sediment Kds was calculated for each of the location groupings for each sampling round and for both sampling rounds combined. Therefore a total of nine sediment Kd values for each analyte were developed from the Round 7/Round 8 seep/sediment data: Back Channel Kds for Round 7, Round 8, and combined Rounds 7 and 8; Clark Cove Kds for Round 7, Round 8, and combined Rounds 7 and 8; and all locations Kd for Round 7, Round 8, and combined Rounds 7 and 8. Seep/sediment data and Kd calculations are provided in Attachment 1 (B.1).

2.3 McAllister Point Landfill Data

Pore water/sediment data for Narragansett Bay from the McAllister Point Landfill, NETC Newport, Rhode Island (in the Ecological Risk Assessment for McAllister Point Landfill, March, 1997) were used to calculate the McAllister Point sediment Kds for inorganic analytes. Organic pore water data were not collected. For the sediment Kd calculation, three groupings of the pore water/sediment locations were used: sample locations near shore~~locations where the pore water was collected by drive point~~, sample locations off shore~~locations where the pore water was collected by centrifuging the sediment~~, and a reference sample location~~ (which was collected by centrifuging the sediment)~~. Individual Kds were calculated for each location using data for the pore water/sediment sample pair. When a detection limit was available, half the detection limit was used for all nondetects. Where no detection limit was available (i.e., only ND indicated), an individual Kd could not be calculated for that location. A geometric mean of the individual sediment Kds was calculated for each of the location groupings. Therefore three McAllister Point Kds were developed for each analyte (i.e., nearshore, offshore, and reference). Pore water/sediment data and Kd calculations are provided in Attachment 2 (B.2).

2.4 Davisville Data

Pore water/sediment data for Narragansett Bay from Allen Harbor Landfill and Calf Pasture Point, NCBC Davisville, Rhode Island (included in the Marine Ecological Risk Assessment for [MERA][EA EST, 1996] for the two Davisville sites) were used to calculate the Davisville sediment Kds for inorganic analytes. Organic pore water data were not collected. For the sediment Kd calculation, groupings of the pore water/sediment locations as provided in the MERA were used. In the MERA, data for three habitats are provided: intertidal wetlands, vegetated wetlands (salt marsh), and subtidal wetlands. Intertidal and vegetated wetland habitats were considered similar to PNS offshore habitats in the vicinity of the seep/sediment sampling locations. Therefore data for these habitats were included in the Kd calculations. Mean metals concentrations for pore water and sediments for four groups were taken from the MERA to calculate four sets of Kd values: intertidal wetlands, intertidal wetlands reference locations, vegetated wetlands, and vegetated wetlands reference locations. For detections less than the method limit of quantitation (MLQ), one-half of the MLQ was used for calculating the mean concentrations for pore water~~porewater~~. However, one-half the MLQ was not apparently used for detections below the MLQ in calculating the mean concentrations for sediment. The mean concentrations for pore water and sediment for intertidal wetlands and associated

reference samples and vegetated wetlands and associated reference samples were used in the Kd calculation. Therefore four Davisville Kds were developed for each analyte. Pore water/sediment data and Kd calculations are provided in Attachment 3 (B.3).

2.5 Literature~~Literture~~ Values for Koc

For organic analytes, literature values were also used to calculate sediment Kds based on the following equation:

$$Kd = koc * foc$$

Two sets of sediment Kds were calculated using this equation. The first set used the koc values provided in the PNS Phase I modeling (provided in Appendix B of the Phase I Modeling Report). The second set used alternative koc values, from a different literature source, which are provided in Attachment 4 (B.4). Sediment foc values calculated for each of the three location groupings for the PNS seep/sediment locations; Back Channel, Clark Cove, and all locations were used to calculate the sediment Kds for both kocs.

~~Note that the geometric mean was used to calculate sediment Kds for each of the data sets for the PNS seep/sediment data and the McAllister Point data because environmental data sets with sufficient sample size often follow a lognormal distribution. Mean porewater and sediment concentrations for each data set were provided in the MERA for Davisville data.~~

3.0 COMPARISON OF SAMPLING DATA

In evaluating the representativeness of the selected site-specific sediment Kd values for PNS, a comparison of the sampling data for PNS (Rounds 7 and 8 seep/sediment data), for McAllister Point Landfill (pore water/sediment data), and Davisville (pore water/sediment data) was conducted. The following is a description of the sample location, sample method, sediment type, and sediment organic carbon content for each group of data used in the calculation of sediment Kd values. Refer to Table B-2 which summarizes sediment characteristics for each group.

3.1 PNS Sampling Locations

The seep/sediment data for PNS consisted of samples collected in three areas in the vicinity of OU3: Back Channel, Clark Cove, and Sullivan Point. "Back Channel" samples were collected from seven locations (BC-1005, BC-1006, BC-1012, BC-1016, BC-1017, BC-1018, and BC-1020). Except for the seep sample from BC-1017 during Round 8, seep samples were collected directly from the seep or from drive points during both rounds. A peristaltic pump was used to collect the seep sample from the drive point at BC-1017 during Round 8. Back Channel sediment samples generally consisted of silty fine to medium sand to sandy brown/black silt. Organic debris was noted in sediment in the Back Channel. Only trace clay was noted (ranging from less than 1% to 5%). Total organic carbon ranged from approximately 2% to almost 6%.

"Clark Cove" samples were collected from four locations (CC-1004.3, CC-1004.4, CC- 004.5, and CC-1011). Because sediment was not present at CC-1004.4, this location was not included in any of the sediment Kd calculations. Seep samples were collected by peristaltic

pump from either a drive point or a trench dug to catch the seep water. Clark Cove sediment samples consisted of silty fine to medium sand with a trace clay (less than 1%). Total organic carbon was between 1% and 2%.

Sullivan Point samples were collected from three locations (SP-1001, SP-1002, SP-1003). Along with the Back Channel and Clark Cove samples, these samples were included in the "all locations" sediment Kd calculation. Sullivan Point seep samples were collected by direct fill from the seep water (no drive point). Sullivan Point sediment samples consisted of fine to medium sand with trace silt (generally less than 10%) and trace clay (less than 1%). Total organic carbon was between 1% and 2%. (B&R Environmental, April 1997 and August 1997).

3.2 McAllister Point Landfill Sampling Locations

McAllister Point Landfill is an 11.5-acre landfill at the edge of Narragansett Bay at NETC Newport. The landfill was in operation from 1955 to the mid 1970s. Because of the similarity with OU3 at PNS (landfill lying on shore of tidal estuary), McAllister Point Landfill pore water/sediment data were used to calculated sediment Kds. McAllister Point Landfill samples were split into three groups; samples ~~where the pore water sample was collected by drive point (similar to PNS seep samples)~~ collected near shore, samples ~~where the pore water samples were collected by centrifuging sediment samples~~ collected off shore, and samples collected from a reference location.

–Seven pore water/sediment samples were collected from nearshore locations~~from drive points~~ (NSB-1, NSB-2, NSB-3, NSB-4, NSB-5, NSB-6, and NSB-7). The pore water samples were collected by digging a hole in the sediment (at low tide), allowing the hole to fill with water, and collecting the sample from the water in the hole. Sediment samples were collected at the same location as the pore water samples. The associated sediment samples consisted of mostly sand (greater than 95%) and trace silt (less than 5%). Clay made up less than 1% of the sediment. Total organic carbon ranged from 0.9% to 2.1%.

– Nine pore water/sediment - samples were collected from offshore locations~~by centrifuging sediment from the sample location~~ (MCA-8, MCA-9, MCA-10, MCA-11, MCA-12, MCA-13, MCA-14, MCA-15, and MCA-16). The pore water samples were obtained in the laboratory using a vacuum extraction method (Winger and Laiser, 1991). The extraction method involves collecting a sufficient size sediment sample and extracting the pore water from the sediment using a vacuum-operated pore water extractor. Sediment samples from these locations consisted of silty sand (generally 60 to 90% sand). Clay made up less than 1% of the sediment. Total organic carbon ranged from 1% to 2.9%. One pore water/sediment pair sample was collected from a reference location (MCA-17, Cranston Cove). ~~The pore water sample was collected by centrifuging the sediment from the sample location.~~ The pore water sample was collected using the vacuum extraction method. Sediment at the reference location was reported to consist of silty sand; however, specific ~~i~~Information on sediment type and total organic carbon from the reference location is not available. (Ecological Risk Assessment, March 1997).

3.3 Davisville Sampling Locations

Allen Harbor Landfill and Calf Pasture Point at Davisville are located on the shore of Allen Harbor. Allen Harbor is an estuarine embayment of the Narragansett Bay marine system

connected to the Bay by a narrow, dredged channel. Allen Harbor is isolated from the main flow of tidal current which promotes sediment deposition in the Harbor (EA EST, 1996). Because of the similarity with PNS, Davisville pore water/sediment data were used to calculated sediment Kds.

Davisville samples were collected ~~from Narragansett Bay~~ in the vicinity of Allen Harbor Landfill and Calf Pasture Point. Samples were collected from three types of habitats: intertidal wetlands, vegetated wetlands (salt marsh), and subtidal habitats. Only data from the intertidal and vegetated wetlands data samples were used in the sediment Kd calculations. Subtidal habitat was not considered similar to the habitats along the shore of PNS since these habitats are submerged under water at low tide. Data provided in the Draft Final Allen Harbor Landfill and Calf Pasture Point Marine Ecological Risk Assessment Report (EA EST, 1996) were used. Sediment samples from the intertidal wetlands habitat including the reference locations generally consisted of sand or silty sand with no clay. Several samples consisted of sandy silt. Total organic carbon ranged from less than 1% to approximately 5%. Sediment samples from the vegetated wetlands habitat excluding the reference locations consisted of sandy silt or silt with trace sand. Only trace clay was found in one sediment sample. Total organic carbon ranged from approximately 4% to 9%. Sediment collected from the vegetated wetlands reference locations consisted of silty sand or sand with a trace of silt. Total organic carbon was approximately 1% (EA EST, 1996). Reportedly the Davisville pore water samples were collected by the vacuum extraction method.~~Information is not available on the sampling methods~~.

3.4 Summary

McAllister Point Landfill and Davisville data are considered appropriate for the PNS sediment Kd calculation and evaluation because of the similarity of waste sites (landfill sites), sampling locations (in a tidal estuarine area), and sediment type (silty sand and sandy silt with trace clay).~~In summary, the samples used in the sediment Kd calculation for McAllister Point Landfill and Davisville were collected from similar types of sediment to those found at PNSBased on sampling technique, McAllister Point Landfill porewater samples collected from drive points were considered similar to the sampling method used for PNS seep sampling. The centrifuge sampling technique is similar to the proposed technique for the upcoming PNS porewater/sediment sampling~~. Sampling techniques varied for the pore water at the three sites, where only the offshore samples at McAllister Point Landfill and the samples from Davisville were collected using the same technique (i.e., vacuum extraction method). However, a trend in sediment Kd values based on sampling technique (~~between drive point and centrifuge~~i.e., sediment Kds higher based on one sampling technique or the other) was not apparent~~ for the McAllister Point Landfill samples~~.

4.0 SELECTION OF SITE-SPECIFIC SEDIMENT Kd VALUES

Table B-1 provides a summary of the sediment Kds developed and the minimum and maximum sediment Kd values (not including the soil Kds from Phase I modeling). Where available, sediment Kds developed using PNS seep/sediment data for both Rounds 7 and 8 will be used as the site-specific sediment Kd values for the Phase II modeling. For carbon disulfide, the

sediment Kd calculated using site-specific sediment foc and literature value for koc was selected.

For antimony, selenium, and tin, only the soil literature values for Kd from the Phase I Modeling Report were available because antimony, selenium, and tin data were not available for PNS, McAllister Point, or Davisville. Because the calculated sediment Kds for the other inorganics showed an increase from the Phase I soil Kd (as much as approximately 600,000 times greater), the Phase I soil Kd values multiplied by some factor were considered appropriate for selecting the site-specific sediment Kd value. Typical v~~V~~alence states of the inorganic COCs (e.g., manganese commonly has a valence of ±2)~~-~~were identified using a chemistry textbook (Sawyer et al, 1994 and Lindeburg, 1994) and evaluated to determine whether there was a trend in the increase in sediment Kd over the Phase I soil Kd. However, no trend was apparent between the increase in sediment Kd and typical valence state. Therefore an arbitrary factor of 400 was determined by taking the geometric mean of the ratios of sediment Kd for Rounds 7 and 8 for "all locations" to the Phase I soil Kd for the other inorganic COCs (i.e., the factor of increase in the sediment Kd over the Phase I soil Kd). Evaluation of the valences and calculation of the geometric mean are included in Attachment B.1. Note that although the sediment Kd values for antimony, selenium, and tin may~~will~~ be further evaluated as part of the modeling sensitivity analysis, these three modeling COCs were not identified as risk-drivers (risk COCs) in the offshore ecological or human health risk assessments for PNS.~~.~~

PNS data were considered the most representative because they are site specific. Evaluation of the sediment Kd values for PNS Round 7, PNS Round 8, McAllister Point (except reference sample sediment Kds), and Davisville (except reference locations sediment Kds) are about the same order of magnitude. Sediment Kd values for reference locations were generally (although not always) much lower than the other Kd values. It is not known if differences in the sediment Kd values were related to sampling technique, sediment type, or contamination level. (Note that sediment Kd values calculated from pore water/sediment data for PNS [to be collected in November 1997] may give some indication on sediment variations based on sample technique.) Therefore, sediment Kd values calculated using the PNS data were selected as site-specific Kds. Because there was no apparent trend in the variation between sediment Kds calculated for the separate rounds of PNS data, combined Rounds 7 and 8 sediment Kds were selected. Rounds 7 and 8 combined provided the largest sample set to calculate the geometric mean.

For the OU3 Back Channel and Clark Cove source areas, PNS sediment Kds developed for the Back Channel and Clark Cove, respectively were selected as site-specific sediment Kds. For OU2 and OU5, the selection of PNS sediment Kd was not as obvious. To aid in determining which PNS sediment Kds were appropriate for OU2 and OU5, the surficial sediment distribution map of the Lower Great Bay/Piscataqua River Estuary (Ward, 1994) was used. However, the sediment distribution map in the vicinity of PNS did not provide sufficient detail~~ata~~ to select the Back Channel versus Clark Cove sediment Kds. Therefore, the PNS sediment Kds developed for all locations was selected for OU2 and OU5.

The following table summarizes the sediment Kds selected for each source area.

Source Area	Selected Sediment Kd
OU2	Use all locations Rounds 7 & 8 Kd; except antimony, tin, and carbon disulfide. Antimony and tin use Phase I

	Modeling based soil Kd times 400 and carbon disulfide use literature value-based sediment Kd calculated for "All Locations".
OU3 Back Channel	Use Back Channel Rounds 7 & 8 Kd; except tin and carbon disulfide. Tin use Phase I Modeling based soil Kd times 400 and carbon disulfide use literature value-based sediment Kd calculated for "Back Channel".
OU3 Clark Cove	Use Clark Cove Rounds 7 & 8 Kd; except tin and carbon disulfide. Tin use Phase I Modeling based soil Kd times 400 and carbon disulfide use literature value-based sediment Kd calculated for "Clark Cove".
OU5	Use all locations Rounds 7 & 8 Kd; except selenium. Selenium use Phase I Modeling based soil Kd times 400.

5.0 SUMMARY AND CONCLUSIONS

Sediment Kd values were calculated using PNS specific seep/sediment data, pore water~~porewater~~/sediment data from similar sites, and literature value-based Kds using site-specific focs. In most cases site-specific sediment Kd values were selected from the PNS specific data. For carbon disulfide~~Several COCs,~~ the literature value-based sediment Kd~~s~~ was selected since PNS specific data were not available for this COC. For antimony, selenium, and tin, only ~~or~~ Phase I soil Kd values were available. This data was considered the least appropriate for PNS sediment Kd selection. Since all the site-specific sediment Kd values were higher than the Phase I soil Kd values, Phase I soil Kd values multiplied by a factor of 400 ~~(i.e., for antimony, selenium, and tin)~~ were selected as the site-specific sediment Kd for these three COCs.~~selected when PNS specific data were not available~~.

Although the sediment Kds developed herein may provide more site-specific data for use in the Phase II modeling for the calculation of predicted surface water concentrations, ~~However,~~ the method used to calculate the sediment Kd values has limitations which can cause the sediment Kd values to be biased conservatively high for estimating predicted sediment concentrations. This will be conservative for assessing the potential migration of contaminants from the on-shore areas to the sediment in the intertidal areas. Limitations include the use of nondections in the calculation of sediment Kd and the analytical method used to analyze COC concentrations in the sediment.

The use of one-half the detection limit for non-detect seep sample data in the calculation of the Kd values will bias the sediment Kd values high. If a concentration is not detected in the seep water it can have two physical meanings (1) the contaminant is present in the seep water but is below the detection limit or (2) the contaminant is not present at all in the seep water. If the constituent is actually in the seep water, using one-half the detection limit is a reasonable approach to calculate the sediment Kd value. If the constituent is not present at all in the seep water it would indicate that the constituent is not being transported in the dissolved phase in the groundwater and whatever concentration is in the sediment sample represents an immobile form of the constituent. Calculating a sediment Kd value in this situation is not meaningful. By using one-half the detection limit, the assumption is that the contaminant may actually be

present in the seep water. This calculation will generally result in high Kd values because the seep concentrations (half the detection limit) are very low. Kd values calculated with half the detection are generally higher than Kd values calculated with a detection, so use of these data will conservatively bias the overall geometric mean of the sediment Kd values high.

The other ~~Another~~ limitation inherent in the sediment Kd calculation is the analytical method used to determine the concentration in the sediment samples. The standard methods for analyzing the solid samples for metal evaluates the total amount of the metal in the sediment sample no matter what form the metal is in, including metals which are part of the mineral structure of the sediment. This portion of the metal in the sediment sample is likely immobile in the absence of a low pH. Including the immobile portion of the metal in the Kd calculation will yield a sediment Kd value which is the average of all forms of the metal in the sample (including forms of the metal adsorbed to the soil, metals present in the sample in the form of precipitate, and metals which are part of the mineral structure). A sediment Kd value which includes the concentration of the metal in the mineral structure will be higher than one which only represents the mobile portion of the metal. The model will only simulate the mobile portion of the contaminants. The sediment Kd values calculated by this method could therefore be biased high. However, this method will yield a reasonable approximation since the precipitation of the metals could be occurring near the shoreline (as the fresh groundwater meets the saltwater in the Piscataqua River). The sediment Kd values calculated by the standard method would account for both the adsorbed metals and the precipitated metals in the sediment samples.

It is important to consider the limitations of the sediment Kd calculation and how these limitations affect the results of the Phase II modeling. The sensitivity analysis will include an evaluation of how sensitive the model results are to changes in the sediment Kd values. The results of the sensitivity analysis will then be considered along with the results of the baseline modeling to evaluate and determine the conclusions of the Phase II modeling.~~How these limitations affect the results of the Phase II modeling will be further evaluated as part of the sensitivity analysis.~~ Minimum and maximum sediment Kd values for each COC are shown in Table B-1. For COCs evaluated as part of the sensitivity analysis, this range will be used. Ranges of sediment Kd values for the sensitivity analysis for antimony, selenium, and tin, if these COCs are included in the sensitivity analysis, will be identified during the Phase II modeling.

Inorganic	Phase I Modeling		PNS						
	McAllister Point				Davisville				
	Selected	Minimum	Maximum						Back
Channel		Clark Cove		All Locations					
PNS	Soil Kd Seep/Sediment Kd								
	Sediment Kd		Sediment Kd					Site-specific	
	Sediment Kd	Sediment Kd					Sediment Kd		
	Sediment Kd		Sediment Kd						
COCs	(L/kg)[1]	(L/kg)[2]							(L/kg)[3]
	(L/kg)[4]			Sediment Kd					
	Minimum		Maximum	Minimum		Maximum		Minimum	
	Maximum								
	Back Channel			Clark Cove				All Locations	
	Nearshore		Offshore	Reference		Intertidal		Intertidal	
	Vegetated	Vegetated							
	Round 7		Round 8	Round 7		Round 7		Round 8	
	Round 7	Round 7	Round 8	Round 7					Sample
	Wetlands	Wetlands	Wetlands	Wetlands					
			and	and				and	
	Habitat	Reference	(Salt Marsh)	(Salt Marsh)					
			Round 8			Round 8			
	Round 8			Locations		Habitat		Reference	
			Locations						
Aluminum	235	5,870,721	2,111,175	3,520,528		1,165,913			
	1,017,227	1,089,035	3,407,355	1,478,628		2,244,595			
	1,348,101	2,173,622	1,752,969	NA	NA	NA	NA		
	1,017,227	5,870,721							
Antimony (OU2)	45	NA	NA	NA	NA	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Arsenic	29	3,449	3,714	3,579	1,570	2,909	2,137	2,586	2,918	2,747	3,090
	344	75	2,164	45	3,920	31		31	3,920		
Cadmium	75	1,677	3,355	2,372	476	1,503	846	920	2,259	1,442	
	535	NA	NA	7,500	6,300	2,100	6,300		476	7,500	
Chromium	19	422,865	149,011	251,021	365,833	173,620					
	252,024	357,960	143,666	226,774	123,033	92,263					
	70,588	15,746	16,250	2,440	37,500	2,440	422,865				
Copper	35	27,225	23,324	25,199	44,149	15,094	25,814	21,321	18,033	19,608	18,389
	17,681	6,550	36,379	6,000	20,748	1,665		1,665	44,149		

Iron	25	6,539,504	177,604	1,077,701	701,385	315,936					
	470,737	2,768,042	307,155	922,073	59,344	142,410					
	3,963	NA	NA	NA	NA	3,963	6,539,504				
Lead	270	53,742	77,941	64,721	55,920	33,644	43,375	47,509	51,380	49,407	253,948
	60,272	15,667	14,839	1,208	14,765	8,000		1,208	253,948		
Manganese	65	34,546	30,737	32,586	25,569	18,905	21,986	31,679	24,088	27,624	
	368	127	333	NA	NA	NA	NA		127	34,546	
Mercury	52	3,288	1,470	2,198	601	245	384	1,466	552	899	12,713
	4,806	1,148	2,667	16,000	4,800	2,500		245	16,000		
Nickel	7	2,034	3,462	2,774	7,361	2,463	3,816	3,025	3,289	3,186	2,938
	5,605	6,688	3,928	833	2,393	1,250		833	7,361		
Selenium (OU5)	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA	NA	NA		NA	NA	
Silver	8	1,612	568	957	626	206	359	850	375	565	NA
	NA	NA	3,520	2,240	3,480	2,240		206	3,520		
Tin (OU2, OU3)	130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	NA	NA	NA	NA	NA	NA	NA		NA	NA	
Zinc	62	7,658	1,878	3,792	22,009	2,351	7,193	10,956	1,911	4,576	10,049
	5,594	15,000	37,919,000	265,500	3,737,667	512,500					
	1,878	37,919,000									

Organic	**Phase I Modeling**		**PNS**							
	Literature Value-Based						**Alternative Literature**			
		Minimum	**Maximum**		BC foc	CC foc	SP foc			
PNS COCs	**Soil Kd**	**Seep/Sediment Kd**								
	Sediment Kd			**Value-Based Sediment Kd**						
	Sediment	**Sediment**		2.8	1.9	0.9				
	(L/kg)[1]	**(L/kg)[2]**								**(L/kg)[6]**
		(L/kg)[7]			**Kd**	**Kd**	2.4	1.5	0.9	
		Back Channel		Clark Cove				All Locations		
		Back	Clark	All	Back	Clark	All			
	3.3	0.9	1.6							
		Round 7		Round 8		Round 7		Round 7		Round 8
	Round 7		Round 7		Round 8		Round 7		Channel	Cove
	Locations		Channel		Cove	Locations				
	3.2									
				and			and			and
								2.2		

				Round 8				Round 8			
	Round 8										
	5.7										
Carbon disulfide		1.37 (OU2)		0.52 (OU3)		NA	NA	NA	NA	NA	NA
	NA	NA	NA	1.30	0.63	0.88	NA	NA	NA		
	0.63	1.30	3.10	1.37	1.95						
Benzo(a)pyrene		33,700 (OU5)		307,682		176,686		233,159		9,579	6,197
	7,704	69,387	64,175	66,730	29,070	13,974	19,686	NA	NA	NA	
	6,197	307,682									
PCBs [5]		9260 (OU2)		59,849	12,125	26,938	6,146	4,214	5,089	23,496	7,027
	12,849	8,807	4,233	5,964	NA	NA	NA			4,214	59,849
Phenanthrene		600 (OU5)		70,070	175,403		110,862		11,160	13,294	12,180
	29,712	73,623	46,771	519	249	351	656	315	444		
	249	175,403									
4,4'-DDT	29200 (OU2)		4,601	3,091	3,771	4,653	1,362	2,518	5,064	2,944	3,861
	27,816	13,371	18,837	6,837	3,286	4,630			1,362	27,816	
	11000 (OU3)										
			4,652	2,055	2,895						

NA - Not Available

(1) Taken from Phase I Modeling Report. All inorganic soil Kds are literature values. Organic soil Kds calculated using literature koc values and site-specific soil foc values.

(2) Calculations for sediment Kds using seep/sediment data from PNS Rounds 7 and 8 are provided in Attachment B.1.

(3) Calculations for sediment Kds for Narragansett Bay using porewater/sediment data from McAllister Point Landfill, Rhode Island are provided in Attachment B.2. Only nearshore and offshore locations used for Kd selection, reference location not used.

(4) Calculations for sediment Kds for Narragansett Bay using porewater/sediment data from Davisville, Rhode Island are provided in Attachment B.3. Only intertidal and vegetated wetlands habitat data used for Kd selection, reference locations not used.

(5) Total PCBs data used for calculation of Kd using PNS seep/sediment data. Phase I soil Kd for Aroclor 1254 and Aroclor 1260.

(6) Koc values from Phase I Modeling Report and site-specific focs used to calculate Kd values. Kd=koc*foc

(7) Alternative koc literature values provided in Attachment B.4. Two koc values provided for 4,4'-DDT. Kd=koc*foc.

site-specific foc for Back Channel - 2.85%, for Clark Cove - 1.37%, for all locations - 1.93%

Sample Location		Sediment Description	Sand Content	Silt Content	Clay Content
PNS	Back Channel	silty sand to sandy silt	17 - 82%	17 - 82 %	< 1 - 5 %
	Clark Cove	silty sand	65 - 98%	2 -34 %	< 1%
	Sullivan Point	sand with trace silt & trace clay	76 - 99%	1 - 24 %	< 1%
McAllister Point	Nearshore	sand with trace silt & trace clay	96 - 99 %	1 - 4 %	< 1%
	Offshore	silty sand with trace clay	57 - 93 %	5 - 43 %	< 1%
	Reference Location	silty sand	NA	NA	NA
Davisville	Intertidal Wetlands	sand or silty sand to sandy silt	8 - 100 %	0 - 92 %	< 1%
	Vegetated Wetlands	sandy silt or silt with trace sand	4 - 50 %	50 - 96 %	< 1%
	Reference Locations	silty sand or sand with trace silt	88 - 98 %	2 - 12 %	< 1%

NA - Not available
TOC - Total Organic Carbon

Table A-1

IDENTIFICATION OF ADDITIONAL PHASE II MODELING COCS BASED ON GROUNDWATER DATA [1]

Chemical	Phase I [2] Maximum Positive Detect	Rounds 7 & 8 Data [3]		Surface Water Criteria [4]		Phase I COC?	Exceeds Surface Water Criteria?	Comment
		Maximum Positive Detect	Frequency of Detection	Criteria	Source			
Operable Unit 2 (DRMO, Incinerator Site)								
Calcium	861,000	1,570,000	28/28	---	---	no	---	essential nutrient; not added as Phase II COC
Magnesium	1,140,000	1,280,000	28/28	---	---	no	---	essential nutrient; not added as Phase II COC
Manganese	3,560	4,260	26/28	10	3	yes	yes	Phase I COC for all modeling source areas
Selenium	17	42.6	1/28	71	1	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
Thallium	16	17.8	7/28	2,130	2	no	no	not detected above surface water criteria; not added as Phase II COC
Bis(2-ethylhexyl)phthalate	5.5	7	11/32	360	1	no	no	not detected above surface water criteria; not added as Phase II COC
Operable Unit 3 (JILF, WOT MBI, MBII) (Clark Cove and Back Channel)								
Barium	2,010	3,760	81/82	10,000	3	no	no	not detected above surface water criteria; not added as Phase II COC
Calcium	522,000	842,000	82/82	---	---	no	---	essential nutrient; not added as Phase II COC
2-Methylphenol	5	5.5	3/11	1,800	6	no	no	not detected above surface water criteria; not added as Phase II COC
2-Nitrophenol	NA	4	1/11	4,850	2	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
Acenaphthylene	NA	1	1/84	300	3	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
Bis(2-ethylhexyl)phthalate	18	28	30/84	360	1	no	no	not detected above surface water criteria; not added as Phase II COC
Butylbenzylphthalate	NA	4	1/84	3.4	3	no	yes	low frequency of detect; not added as Phase II COC
Carbazole	6	8.5	4/84	---	---	no	---	low frequency of detect; not added as Phase II COC
Diethyl phthalate	NA	0.8	1/84	3.4	3	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
Dimethyl phthalate	NA	3	7/84	3.4	3	no	no	not detected above surface water criteria; not added as Phase II COC
Di-N-butyl phthalate	NA	2	3/84	3.4	3	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
Di-N-octyl phthalate	2	11.25	2/84	3.4	3	no	yes	low frequency of detect; not added as Phase II COC
1,1,2-Trichlorotri-fluoroethane (Freon)	25	1,000	10/82	59,000	6	no	no	not detected above surface water criteria; not added as Phase II COC
1,1-Dichloroethane	13.5	25	10/82	320,000	3	no	no	not detected above surface water criteria; not added as Phase II COC

Table A-1

IDENTIFICATION OF ADDITIONAL PHASE II MODELING COCS BASED ON GROUNDWATER DATA [1]

Chemical	Phase I [2] Maximum Positive Detect	Rounds 7 & 8 Data [3]		Surface Water Criteria [4]		Phase I COC?	Exceeds Surface Water Criteria?	Comment
		Maximum Positive Detect	Frequency of Detection	Criteria	Source			
1,1-Dichloroethene	NA	5.5	2/82	224,000	2	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC

Table A-1

IDENTIFICATION OF ADDITIONAL PHASE II MODELING COCS BASED ON GROUNDWATER DATA [1]

Chemical	Phase I [2] Maximum Positive Detect	Rounds 7 & 8 Data [3]		Surface Water Criteria [4]		Phase I COC?	Exceeds Surface Water Criteria?	Comment
		Maximum Positive Detect	Frequency of Detection	Criteria	Source			
Operable Unit 3 (JILF, WOT, MBI, MBII)(Clark Cove and Back Channel) Continued								
4-Methyl-2-pentanone	NA	2	2/82	460,000	5	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
Acetone	18	160	24/82	9,000,000	5	no	no	not detected above surface water criteria; not added as Phase II COC
Benzene	11	18	12/82	700	1	no	no	not detected above surface water criteria; not added as Phase II COC
Chloroethane	NA	5	4/82	8,600	6	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
Styrene	NA	3	4/82	1,600	6	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
Trichloroethene	NA	5	4/82	2,000	2	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
Vinyl chloride	NA	13	5/82	224,000	3	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
4,4'-DDD	NA	0.26	1/70	0.68	3	no	no	not detected above surface water criteria and low frequency of detect; not added as Phase II COC
Operable Unit 5 (Site 27, Berth 6 Industrial Area)								
Thallium	NA	9	2/10	2,130	2	no	no	not detected above surface water criteria; not added as Phase II COC

NA = Not analyzed or not detected
--- = Not available or not applicable

(1) All units are in ug/L.
(2) Phase I groundwater data were the groundwater data used in the Phase I Contaminant Fate and Transport Modeling (B&R Environmental, February, 1997).
(3) Low-flow groundwater data were collected during the recent sampling events, Round 7 (December 1996) and Round 8 (April 1997)
(4) Surface water criteria sources are as follows:
1 - Maine Water Quality Criteria, Protection of Aquatic Life, chronic, salt, 1995
2 - Maine Water Quality Criteria, Protection of Aquatic Life, acute, salt, 1995
3 - EPA Region III Biological Technical Assistance Group (BTAG) Screening Level, Protection of aquatic life, marine, 1995
4 - Maine Water Quality Criteria, Protection of Aquatic Life, chronic, fresh, 1995
5 - EPA Region III BTAG Screening Level, Protection of Aquatic Life, fresh, 1995
6 - EPA Region III Risk Based Screening Levels for tap water, 1996

TABLE A-2

IDENTIFICATION OF ADDITIONAL PHASE II MODELING COCS BASED ON SEEP DATA [1]

Parameter	Seep Data		Surface Water Criteria [2]		Phase I COCs ?	Frequency of Criteria Exceedance	Comment
	Maximum Detection	Location of Maximum	Criteria	Source			
Pesticides/PCBs (ng/L)							
4,4'-DDT	*55*	*SP-1001*	*1*	*1*	*no*	*7/28*	*frequently detected above surface water criteria; added as Phase II COC for all modeling source areas*
Alpha-chlordane	5.8	SP-1001	4	3	no	2/28	low frequency of criteria exceedance and low frequency of detect in on-shore media; not added as Phase II COC
Inorganics (Total) (µg/L)							
Aluminum	343	BC-1017	87	4	yes	13/28	Phase I COC for all modeling source areas
Copper	42.5	BC-1017	2.9	1	yes	20/28	Phase I COC for all modeling source areas
Iron	3,130	BC-1012	1,000	4	yes	2/28	Phase I COC for all modeling source areas
Lead	9.3	BC-1017	8.5	1	yes	1/28	Phase I COC for all modeling source areas
Manganese	169	BC-1006	10	3	yes	18/28	Phase I COC for all modeling source areas
Nickel	41.85	BC-1018	8.3	1	yes	16/28	Phase I COC for all modeling source areas
Zinc	413	CC-1004.3	86	1	yes	9/28	Phase I COC for all modeling source areas
Inorganics (Dissolved) (µg/L)							
Aluminum	105.9	BC-1017	87	4	yes	1/28	Phase I COC for all modeling source areas
Copper	19.1	SP-1001	2.9	1	yes	15/28	Phase I COC for all modeling source areas
Iron	3,610	BC-1012	1,000	4	yes	1/28	Phase I COC for all modeling source areas
Lead	9.2	BC-1005	8.5	1	yes	1/28	Phase I COC for all modeling source areas
Manganese	162	BC-1006	10	3	yes	16/28	Phase I COC for all modeling source areas
Nickel	42.3	BC-1005	8.3	1	yes	13/28	Phase I COC for all modeling source areas
Zinc	243	CC-1004.3	86	1	yes	11/28	Phase I COC for all modeling source areas

[1] The seep data were collected during the recent sampling events, Round 7 (December 1996) and Round 8 (April 1997)

[2] Surface water criteria sources are as follows:

1 - Maine Water Quality Criteria, Protection of Aquatic Life, Chronic, Salt (1995)
2 - Maine Water Quality Criteria, Protection of Aquatic Life, Acute, Chronic (1995)
3 - EPA Region III BTAG (Biological Technical Assistance Group) Screening Level, Protection of Aquatic Life, Marine (1995)
4 - Maine Water Quality Criteria, Protection of Aquatic Life, Chronic, Fresh (1995)

Italicized parameter added as Phase II COC.

TABLE A-3
IDENTIFICATION OF ADDITIONAL PHASE II MODELING COCS BASED ON SEDIMENT DATA [1]

Parameter	Sediment Data		Criteria	Frequency	Phase I	Comment
	Maximum Detection	Location of Maximum	NOAA-ERM[2]	of ERM Exceedance	Modeling COC?	
Semivolatile Organics (μg/kg)						
Benzo(a)anthracene	1,710	BC-1018	1,600	1/26	no	low frequency of ERM exceedance and not detected in seep above surface water criteria; not added as Phase II COC
Fluoranthene	5,660	BC-1018	5,100	1/26	no	low frequency of ERM exceedance and not detected in seep above surface water criteria; not added as Phase II COC
Phenanthrene	1,500	BC-1012	1,500	1/26	yes (OU5)	low frequency of ERM exceedance and not detected in seep above surface water criteria; not added as Phase II COC for OU2 or OU3
Pyrene	4,220	BC-1018	2,600	1/26	no	low frequency of ERM exceedance and not detected in seep above surface water criteria; not added as Phase II COC
Pesticides/PCBs (μg/kg)						
2,4'-DDT	37.5	CC-1004.5	7	7/26	no	not detected in seep above surface water criteria; not added as Phase II COC
4,4'-DDD	1,060	BC-1018	20	10/26	no	not detected in seep above surface water criteria; not added as Phase II COC
4,4'-DDE	38.3	CC-1004.5	27	1/26	no	low frequency of ERM exceedance and not detected in seep above surface water criteria; not added as Phase II COC
4,4'-DDT	*265*	*SP-1001*	*7*	*17/26*	*no*	*frequently detected above ERM and detected in seep above surface water criteria; added as Phase II COC for all modeling source areas*
Sum of PCBs	1,000	BC-1017	180	8/26	yes (OU2)	not detected in seep above surface water criteria; not added as Phase II COC for OU3 or OU5
Inorganics (mg/kg)						
Copper	528.7	BC-1020	270	5/26	yes	Phase I COC for all modeling source areas
Lead	855	BC-1005	218	2/26	yes	Phase I COC for all modeling source areas
Mercury	2.975	BC-1016	0.71	4/26	yes	Phase I COC for all modeling source areas
Nickel	97.6	CC-1004.5	51.6	7/26	yes	Phase I COC for all modeling source areas
Zinc	1,089	CC-1004.5	410	6/26	yes	Phase I COC for all modeling source areas

(1) The sediment data were collected during the recent sampling events, Round 7 (December 1996) and Round 8 (April 1997).
(2) Sediment criteria is from the National Oceanic and Atmospheric Administration (NOAA) Effects Range Median (ERM).

Italicized parameter added as Phase II COC.

Identification of Additional COCs for Phase II Contaminant Fate and Transport Modeling at Portsmouth Naval Shipyard, Kittery, Maine

Section 1.0 INTRODUCTION

The following summarizes the identification of additional contaminants of concern (COCs) for Phase II modeling for OU2, OU3, and OU5. For Phase II modeling the COCs used in Phase I modeling will be used. However, since the Phase II modeling will use low-flow groundwater data and seep/sediment data from Round 7 (December 1996) and Round 8 (April 1997) field sampling events at Portsmouth Naval Shipyard (PNS), evaluation of these data was conducted to determine whether additional COCs should be added to the Phase I list of COCs.

The evaluation of data consisted of:

- Comparing low-flow groundwater data to be used in Phase II modeling with the groundwater data used in Phase I modeling and screening potential COCs.
- Comparing seep data with surface water criteria and screening potential COCs
- Comparing sediment data with sediment criteria and screening potential COCs.

The methodology for the comparison of data and screening of potential COCs is discussed in Section 2.0. The results are presented in Section 3.0.

Section 2.0 METHODOLOGY

For the low-flow groundwater data, a comparison of the maximum concentrations for groundwater between samples collected by bailer and samples collected by low-flow sampling techniques during PNS sampling Rounds 7 (December, 1996), and 8 (April, 1997) was conducted. The Phase I modeling groundwater input data consisted of groundwater samples collected by bailer (referred to below as Phase I modeling data). However, the Phase II modeling groundwater input data will consist of groundwater samples collected by low-flow sampling techniques during PNS sampling Rounds 7 and 8 (referred below as Phase II modeling data). Because groundwater samples collected by bailer can contain significant amounts of suspended solids which are a result of sampling technique rather than an indication of suspended solids moving with the groundwater, low-flow sampling techniques were used in the recent groundwater sampling at PNS. Low-flow sampling minimizes disturbances in the well and yields a groundwater sample more representative of actual amounts of suspended solids being transported in the groundwater.

The comparison of groundwater data was conducted for each of the operable units (OUs) included in the modeling effort (OUs 2, 3, and 5). For each OU, Phase I COCs were automatically included as Phase II COCs. Additionally, contaminants which had Phase II modeling maximum concentrations greater than Phase I modeling maximum concentrations or which were not analyzed or not detected in Phase I were identified as potential new COCs and screened further. The screening consisted of identifying whether the Phase II maximum concentration was above the surface water criteria (criteria used in the Phase I modeling were used in this screening), whether the analyte was already identified as a Phase I COC and/or

The comparison of sediment concentrations with ER-M criteria is provided in Table A-3. The results showed exceedances of four PAHs, several DDT compounds, PCBs, and several inorganics. All of the PAHs had a low frequency of detect above the sediment criteria and were also not detected in seep samples above the surface water criteria. One of the PAHs (phenanthrene) was already identified as a Phase I COC for OU5 (and therefore retained as a COC for Phase II modeling), but will not be added as a new COC for OU2 or OU3. Except for 4,4'-DDT, the pesticides and PCBs had either a low frequency of detect above the sediment criteria and/or were not detected in seep samples above the surface water criteria. 4,4'-DDT was added as a Phase II COC for all modeling source areas (OU2, OU3, and OU5) because it was frequently detected above the sediment criteria and was frequently detected above surface water criteria in the seep samples. The inorganics were already identified as COCs in the Phase I modeling.

Section 4.0 SUMMARY

Based on the evaluation of low-flow groundwater data, seep data, and sediment data from PNS sampling Rounds 7 and 8, only 4,4'-DDT was added as a new COC. 4,4'-DDT will be included as a Phase II COC for all the modeling source areas in addition to the COCs already identified in the Phase I modeling.

whether the contaminant was consistently detected in the low-flow groundwater samples. Table A-1 provides the screening of analytes for each OU which had Phase II modeling maximum concentrations greater than Phase I. This table provides the maximum low-flow groundwater concentration from Rounds 7 and 8, the Phase I modeling maximum groundwater concentration, the frequency of detection during Rounds 7 and 8, the surface water criteria, and screening comment.

The seep and sediment data from Rounds 7 and 8 were compared to the criteria, surface water criteria and NOAA ER-M, respectively, used in the Phase I modeling. Analytes which had exceedances of the criteria were identified as potential new COCs and screened further. For seep data, the screening consisted of identifying the frequency of detection above the criteria, frequency of detection in on-shore media (i.e., soil or groundwater), and/or whether the analyte was already identified as a Phase I COC. For sediment data, analytes were screened based on whether the contaminant was frequently detected above the criteria, whether the contaminant was detected in any of seep samples, and/or whether the analyte was already identified as a Phase I COC. Tables A-2 and A-3 provide the screening of analytes for seep and sediment, respectively. These tables provide the maximum detection in Rounds 7 and 8, the criteria, frequency of criteria exceedance, and screening comment. Note that although seep and sediment samples collected during Rounds 7 and 8 were only located in the vicinity of OU3, potential new COCs were identified and screened for all the modeling OUs.

Section 3.0 RESULTS

The comparison of maximum groundwater concentrations from samples collected by bailer (Phase I modeling input data) with ~~and~~ samples collected by low-flow sampling techniques during PNS sampling Rounds 7 (December, 1996), and 8 (April, 1997) (Phase II modeling input data) is provided in Table A-1. The results show several analytes with maximum concentrations greater in Phase II than Phase I for OU2, OU3, and OU5. However, upon further evaluation, none of these analytes were added as Phase II COCs. Two analytes (calcium and magnesium) were screened out in the Phase I COC screening based on they are essential nutrients rather than contaminants, and were likewise screened out in the Phase II COC screening. One analyte (manganese) was already identified as a Phase I COC and so is automatically included as a Phase II COC. The other analytes were screened out because the maximum concentration was below the surface water criteria and/or the frequency of detection was low.

The comparison of seep concentrations with surface water criteria is provided in Table A-2. The results showed exceedances of two pesticides and several inorganics (both total and dissolved concentrations). All of the inorganic analytes are already Phase I COCs for all the modeling source areas (OU2, OU3, and OU5). 4,4'-DDT was added as a Phase II COC for all modeling source areas because it was frequently detected in seep samples above surface water criteria. This is considered conservative because 4,4'-DDT was not detected in any of the low-flow groundwater samples at OU3. 4,4'-DDT was also not detected in any of the low-flow groundwater samples at OU2 (and was not analyzed at OU5). Alpha-chlordane was screened out based on low frequency of detection above the surface water criteria and based on a low frequency of detection in on-shore media (1 detection in 40 samples for groundwater and 2 detections in 88 samples in soil at OU3).

APPENDIX A

Identification of Additional Contaminants of Concern for Phase II Contaminant Fate and Transport Modeling