01

DEPARTMENT OF THE NAVY
PORTSMOUTH NAVAL SHIPYARD
PORTSMOUTH, N. H. 03804-5000

IN REPLY REFER TO:

March 12, 2001

MEMORANDUM

FOR THE MEMBERS OF THE RESTORATION ADVISORY BOARD (RAB) CERCLA REMEDIAL ACTION PROGRAM, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

RAB members are invited to attend a technical meeting on Thursday, April 3, 2001. The meeting had been previously scheduled for March 8, 2001 but was cancelled due to weather. The purpose of this meeting is to discuss the draft *Preliminary Remediation Goals* document. The meeting will begin at 9 a.m. and conclude by 3 p.m.

If you plan to attend this technical meeting, please contact Ms. Marty Raymond no later than Wednesday, March 28, 2001 to make arrangements to attend. She may be reached at 207-438-2536.

Sincerely,

Ken

Ken Plaisted
Navy Co-Chairman
Restoration Advisory Board

Distribution:

Doug Bogen	Jeff Clifford	
Michele Dionne	Eileen Foley	Mary Marshall
Phil McCarthy	Jack McKenna	Onil Roy
James Horrigan	Roger Wells	Carolyn Lepage

EPA Region I (M. Cassidy)
MEDEP (Iver McLeod)
NOAA (K. Finkelstein)
MEDMR (D. Card)
NHFG (C. McBane)
USFWS (K. Munney)
North Div (F. Evans)
COMSUBGRU TWO (R. Jones)
PNS(Codes 100PAO, 105, 105.5, 106, 106.3, 106.3R, NRRO)

DEPARTMENT OF THE NAVY
PORTSMOUTH NAVAL SHIPYARD
PORTSMOUTH, N. H. 03804-5000

IN REPLY REFER TO:

February 16, 2001

MEMORANDUM

FOR THE MEMBERS OF THE RESTORATION ADVISORY BOARD (RAB) CERCLA REMEDIAL ACTION PROGRAM, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

RAB members are invited to attend a technical meeting on Thursday, March 8, 2001. The purpose of this meeting is to discuss the draft *Preliminary Remediation Goals* document and responses to comments. The meeting will begin at 9 a.m. and conclude by 3 p.m.

If you plan to attend this technical meeting, please contact Ms. Marty Raymond no later than Friday March 2, 2001 to make arrangements to attend. She can be reached at 207-438-2536.

Sincerely,

Ken Plaisted
Navy Co-Chairman
Restoration Advisory Board

Distribution:

Doug Bogen	Jeff Clifford	
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DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY, NORTHEAST
NAVAL FACILITIES ENGINEERING COMMAND
10 INDUSTRIAL HIGHWAY
MAIL STOP, #82
LESTER, PA 19113-2090

IN REPLY REFER TO
5090
Code 1823/FE
3 May 2001

Ms. Meghan Cassidy
U.S. Environmental Protection Agency, Region I
1 Congress Street
Suite 1100
Mail Code HBT
Boston, MA 02114-2023

Mr. Iver McLeod
Maine Department of Environmental Protection
State House Station 17
Augusta, ME 04333-0017

Dear Ms. Cassidy/Mr. McLeod:

SUBJECT: PRELIMINARY REMEDIATION GOALS FOR OPERABLE UNIT 4 (OU4), INSTALLATION RESTORATION PROGRAM FOR PORTSMOUTH NAVAL SHIPYARD, KITTERY, ME

Enclosed are the meeting minutes for the April 3, 2001 technical meeting on the Preliminary Remediation Goals for Operable Unit 4.

Comments on the enclosed minutes are requested on or before May 21, 2001.

If additional information is required please contact Mr. Fred Evans at (610) 595-0567 x159.

For the Community Restoration Advisory Board (RAB) members; if you have any comments or questions on these issues, they can be provided to the Navy at a RAB meeting, by calling the Public

5090
Code 1823/FE
3 May 2001

Affairs Office at (207) 438-1140 or by writing to:

Portsmouth Naval Shipyard
Code 106.3R Bldg 44
Attn Marty Raymond
Portsmouth, NH 03804-5000

Sincerely,

Frederick J. Evans
Remedial Project Manager
By Direction of the
Commanding Officer

Copy to:
NOAA (K. Finkelstein)
USFWS (K. Munney)
MEDMR (D. Card)
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Mr. Doug Bogen
Mr. Jeff Clifford
Ms. Michele Dionne
Ms. Eileen Foley
Ms. Mary Marshall
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Mr. Jack McKenna
Mr. Onil Roy
Ms. Johanna Lyons
Dr. Roger Wells
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TtNUS (D. Cohen)

OFFSHORE PRELIMINARY REMEDIATION GOAL (PRG) TECHNICAL TEAM MEETING
PORTSMOUTH NAVAL SHIPYARD
April 3, 2001

The technical team meeting on Preliminary Remediation Goal (PRG) for Operable Unit 4 (OU4) was held from 9:25 a.m. to 2:45 p.m. on April 3, 2001 at Portsmouth Naval Shipyard, Kittery, Maine. Attending were Meghan Cassidy and Rick Sugatt (USEPA), Iver McLeod and Katie Zeeman (MEDEP), Ken Finkelstein (NOAA), Carolyn Lepage (TAG consultant), Jim Horrigan (SAPL representative for RAB) and the Navy project team consisting of Marty Raymond (PNS), Fred Evans (NorthDiv), Jason Speicher (NorthDiv), Greg Tracey (SAIC), and Debbie Cohen and Aaron Bernhardt (TtNUS).

Copies of the meeting presentation on the process for development of offshore Preliminary Remediation Goals (PRGs), acronyms list, and a table showing the results of the laboratory re-evaluation of pore water copper and lead data were provided to the meeting attendees.

ATTACHMENTS
(1) Agenda
(2) Meeting Handouts

INTRODUCTION AND REVIEW OF THE AGENDA

Fred Evans welcomed everyone and indicated the purpose of the meeting is to discuss and resolve the major issues brought out in the U.S. Environmental Protection Agency (USEPA) (including U.S. Fish and Wildlife Service), National Oceanic and Atmospheric Administration (NOAA), Maine Department of Environmental Protection (MEDEP), Seacoast Anti-Pollution League (SAPL) comments on draft PRG report (dated November 2000). After everyone introduced himself or herself, Mr. Evans reviewed the agenda. Ken Finkelstein requested that the issues identified in NOAA Comment Nos. 4 and 5 be added to the agenda.

Mr. Evans also indicated that the Navy division that he works out of, formerly known as Northdiv, is now being referred to as Engineering Field Activity Northeast (EFANE). Effective April 2001, email addresses for this division will be changed from "@efdnorth.navfac.navy.mil" to "@efane.navfac.navy.mil".

OVERVIEW THE PRG DEVELOPMENT PROCESS

Greg Tracey provided a presentation of an overview of the PRG development process because various issues raised relate to the general process. The presentation facilitated discussion of these issues. In addition, the presentation was provided to help familiarize new members of the project team with the process. Mr. Tracey indicated that the process was the same one presented as part of the Interim Offshore Monitoring Plan (TtNUS, October 1999, Appendix A).

Mr. Tracey clarified that the PRGs being developed with this process are site-specific values to address the ecological risks for the PNS offshore area (Operable Unit 4, or OU4). He noted that this meaning of PRGs differs from the meaning that is currently being used on the

west coast (e.g., USEPA Region IX), where the term "PRG" is being used interchangeably with "screening level." In answer to a question of whether site-specific meant for the whole offshore area or to an offshore area by a specific onshore site, Mr. Tracey indicated that "site-specific" refers to the whole offshore area, which is OU4.

Data used for development of PRGs for OU4 include the Interim Offshore Monitoring Round 2 chemistry data and Round 2 toxicity data collocated with the chemistry data. In accordance with the Interim Offshore Monitoring plan, toxicity testing was conducted in the first late winter sampling round (Round 2) because the chemicals are expected to be more bioavailable in the late winter round versus the late summer sampling round. The Interim Offshore Monitoring Rounds 1 and 2 results and the Estuarine Ecological Risk Assessment (EERA) results were used to develop recommended PRGs.

The PRG development process relies on equilibrium partitioning (EqP) relationships. The EqP assumes that the chemical partitioning between sediment and sediment pore water and exposure to the benthic community are in equilibrium. The process focuses on pore water because there are methods available to directly measure (or estimate) the chemical concentrations in the pore water, and there are criteria available for evaluation of the concentrations (water quality screening values, or WQSVs). The assumptions regarding the EqP relationship rely on the chemicals having a certain level of bioavailability. Therefore, the assumptions may not be valid if the chemical is not bioavailable. For example, if chemical concentrations in the sediment are from non-biologically available sources (e.g., metal pieces in the sediment), then the sediment concentration may not be in equilibrium with the pore water concentration.

In the PRG process, the EqP is used to estimate pore water concentrations for organics; however, the inorganic pore water concentrations are measured. This was done because only a small volume of pore water is needed for the inorganic analysis (approximately 50 to 100 ml). However, 3 to 4 liters of pore water are needed for the organic analysis. This would require the collection of several gallons of sediment from each station. Therefore, the organic pore water concentrations are estimated based on the sediment concentration, the sediment organic carbon content, and empirically derived chemical-specific partitioning coefficients (Koc).

In answer to a question of how the sediment and pore water can be related when the exposure pathway is different, it was indicated that based on the EqP relationship, the sediment and pore water are in equilibrium. Therefore, the risks factors to the benthic organisms will be the same whether sediment or pore water are evaluated. A question was raised whether macro benthos diversity sampling was conducted for the offshore. It was indicated that the sampling was conducted as part of the EERA and the results considered in the estimation of ecological risks for the offshore during the EERA.

There was some discussion about a recent draft USEPA guidance for evaluation sum polycyclic aromatic hydrocarbons (PAHs). This approach relies on evaluating the sum of measured PAHs (approximately 30 PAHs) as well as the individual PAHs. Mr. Tracey indicated that a similar approach was used for PRG development, that is the Hazard Quotient (HQ)s for each location were summed and evaluated. High molecular weight (HMW) and low molecular weight (LMW) PAHs were summed and evaluated too.

There was also a question on the uncertainty in the Koc values used to estimate pore water concentrations. It was indicated that the Koc values were obtained from a USEPA document, and were developed using empirical measurements. The estimation of the pore water concentrations is intended to reduce the uncertainty regarding the extent of chemical exposures by incorporating both chemical- (i.e., Koc) and site-specific (i.e., TOC) factors. This approach has the advantage over use of literature based benchmarks because site-specific conditions are included in the calculation of the pore water concentrations.

In the PRG development process, the results of toxicity tests are used to determine the No Observable Effects Concentration (NOEC) for the chemicals detected. The samples included in the toxicity testing are grouped based on whether the results showed the sample was toxic or non-toxic to the test organism. For the pore water toxicity testing, three concentration dilutions for each sample were tested (100%, 50%, and 25%). To be considered a toxic sample, the sample needed to be toxic in at least two of the three dilutions. Samples showing toxicity in only the 100% concentration sample were not considered toxic samples. This is because the species would not be exposed to 100% concentration pore water and an LC50 can be calculated with more confidence if at least two dilutions are toxic. Dilution series are conducted as part of the toxicity testing because the sensitivity of the test organism may cause a lot of false positives. Sediment particles and other confounding factors can cause toxicity to the species. Therefore, samples that have toxicity in at least two of the dilutions are more likely to be truly toxic samples.

There was also discussion about checking the data to see whether anything detected in the samples that were toxic at 100% but included in non-toxic group may be of interest and may account for the toxicity. The Navy indicated that the 100% pore water samples were not included in the toxic group because the sea urchins and other similar organisms are not exposed to 100% pore water in the field.

To ensure that the PRGs concentrations are not less than background concentrations, the NOEC is compared to the concentration for the reference stations. Overall the concentrations at the Shipyard stations are similar to or greater than the concentrations at the reference stations. Therefore, in most cases the NOEC is greater than the reference concentration.

PRIMARY DISCUSSION POINTS AND RESOLUTION

As part of the PRG development process presentation, several of the issues were discussed. After the presentation, the remaining issues were discussed. The following provides a summary of the issues and the discussion and resolution of the issues in the order the issues were identified on the agenda.

BULLET 1 Overview of PRG Process including Assumptions:

Example calculations/presentation of calculations for each step (EPA Comment 1):
Issue – A detailed figure or flow chart for the individual steps of the process and inclusion of primary characteristics and formulas for each step would be helpful to follow the process better.

Discussion – Table ES-1 provides the steps and formulas. References to the specific tables in the PRG process and example calculations would be helpful.
Resolution – The Navy will add table references for the equations provided in Table ES-1 and example calculations similar to those provided in the Interim Offshore Monitoring Plan (Appendix A) will be provided in the PRG report for OU4.

Sediment particle ingestion (MEDEP Comment 1 and SAPL Comment 2):
Issue - The contribution of sediment particle ingestion by benthic organisms to the toxicity is not accounted for in the PRG process.
Discussion – In the EqP approach, everything is assumed to be in balance and exposure is simultaneous. Therefore, either looking at pore water concentrations or sediment concentrations would provide the same evaluation of toxicity (because they are in equilibrium). However, because it is easier to measure (or estimate) the pore water concentrations that the organisms would be exposed to than the sediment concentrations that the organisms would be exposed to (surficial chemicals and not the chemicals in the entire sediment particle), pore water is used in the PRG process. Although there may be more exposure over time from release of chemicals from the ingested sediment because of digestive juices in the organism's stomach, this release of chemicals is a time dependent function. In general, the exposure to pore water and the release of chemicals into the organism's stomach over the lifetime of the organism are considered to be in equilibrium. Therefore, using pore water concentrations should account for the toxicity from sediment ingestion. Also, the sediment toxicity test does incorporate all routes of chemical exposure.
Resolution – There are some compounds where sediment ingestion is more significant than pore water exposure. This is an uncertainty, but for OU4, PRGs correlate with risks identified in the EERA, so ingestion does not appear to be a significant issue for the COCs at OU4.

Fish consumption (SAPL Comment 10):
Issue – Health advisories for fish consumption need to be considered as part of the PRG process.
Discussion - PRGs are only required at this time for ecological receptors based on the evaluation of offshore human health and ecological risks (as documented in the Interim Record of Decision for OU4 and the Interim Offshore Monitoring Plan). The EERA indicated that the major risk concerns are exposure to benthic organisms; therefore, the PRGs are developed to address exposure of benthic organisms.
Resolution – As part of the Interim Offshore Monitoring, data that can also be used to evaluate human health concerns are being collected. Should human health risks need to be addressed in the future, the Navy believes that the appropriate data are available. The MEDEP indicated that the State has tissue action levels for human consumption of fish. However, at the current time, the Navy will not develop PRGs for human consumption of fish.

BULLET 2 Reanalysis of pore water data (EPA Comment 2)

Issue – Detection limits for copper and lead pore water data were above the WQSV; therefore, the Navy had the pore water samples reevaluated by the laboratory.
Discussion – Aaron Bernhardt explained that the initial detection limit for copper was 5 ug/l, which is above the WQSV (3.1 ug/L). The laboratory re-evaluated the data to see whether there were any detections below the 5 ug/l. They were able to identify all detections above 3 ug/l. Aaron explained that there were some additional detections. However, because of

blank contamination (not detected at 5 ug/l, but detected above 3 ug/l) there were changes in the copper data where some samples will now be qualified as nondetect. The reevaluated data will be used for revision to PRGs that will be presented in the draft final PRGs. For lead the laboratory was unable to identify detections lower than 20 ug/l and therefore, the laboratory reanalyzed the samples using a lower detection limit. The new detection limit achieved was 3 ug/l, which is below the WQSV (8.1 ug/L). There were no detections of lead in the pore water samples above 3 ug/L.
Resolution – The reevaluated pore water data for copper will be used for the PRG calculation presented in the draft final PRG report.

BULLET 3 Copper data at M4-1 (NOAA Comment 8, MEDEP Comment 1)

Issue – The copper concentration in the sediment at M4-1 appears to be very high.
Discussion - After Round 3 of the interim offshore monitoring, the Navy noticed that copper concentrations at Monitoring Station 4, sample location 1 (M4-1) were increasing noticeably. Jason Speicher explained that he went to the monitoring station to see whether there was anything obvious that may be accounting for the copper concentrations. Mr. Speicher found small pieces of metals debris that included copper. There appeared to be some debris around the concrete blocks and under the blocks. It is likely that because the copper at M4-1 is associated with the particles that it is not leaching to water (copper oxide is not soluble). The copper debris does not appear to be a wide spread area, but tidal exchange could be moving the copper to the offshore sediment. This is an example of where the assumptions of the EqP may not be valid because the copper in the sediment apparently is not available to partition to the pore water, and therefore, is not in equilibrium. It was noted that copper concentrations in some other samples also appeared to be high in Round 2 and could be outliers.
Resolution – The Navy will evaluate the locations with concentrations greater than 500 mg/kg (M9-1, M3-2, M8-3, and M11-3 in addition to M4-1) to determine whether the concentrations of copper at these locations represent outliers. The Navy believes that M4-1 is an outlier based on finding copper metal in the sediment. It will be removed from the calculation of the average sediment PRG concentration step. The Navy will also do a visual inspection of the other locations during Round 4 sampling to see whether there may be some physical reason for the higher copper concentrations. In addition, the Navy indicated that 3 extra sediment samples at M4-1 will be collected during Round 4 and analyzed for metals.

BULLET 4 - OU4-wide averages versus AOC-wide PRGs (MEDEP Comments 1, 20, 22, 26b, SAPL Comment 1)

Issue – Are OU4-wide average PRGs appropriate or should AOC-wide PRGs be developed?
Discussion – Two concerns are associated with this issue. The first concern relates to using an average rather than an upper confidence limit (UCL). An average is used because the PRGs are being developed to address average conditions. This will provide a more conservative (lower) average sediment concentration. The second concern relates to using an OU4-wide PRG versus an AOC-wide PRG. The PRG development process presented in the meeting (and as part of the Interim Offshore Monitoring Plan) was considered to develop a single set of PRGs for all of OU4. A basis for developing AOC-specific PRGs has not

been identified and sufficient data are not available to develop AOC-specific PRGs. The assumption is that the conditions that impact the sediment conditions in the OU4 area are the same everywhere. In answer to a concern about whether the different onshore sources will impact the offshore area differently, it was explained that the difference in chemical impact is accounted for in the process through the identification of the Limiting COCs. The sediment conditions that are important with respect to the development of PRGs and application of PRGs to various habitats around OU4 are the TOC and grain-size.
Resolution – The Navy will look at sediment conditions (TOC and grain-size) to see whether there are conditions that suggest a difference in the sediment in one AOC versus another. If there are significant differences then further discussion will be necessary to determine how to address the differences. If there are no significant differences, then OU4-wide PRGs are appropriate.

BULLET 5 Recommended PRGs(MEDEP Comments 13b, 23, 30, 31)
Issue – Areas characterized as having "no risk" that also have PRG exceedances will be not be considered. In addition, the PRG process is trying to identify the point of departure between low and intermediate risk.
Discussion - There are no AOCs characterized as having "no risk". All areas, regardless of the risk characterization in the EERA will be evaluated for PRG exceedances and trends as part of the Interim Offshore Monitoring Program. The Navy noted that for use for the interim offshore monitoring data evaluation, the numbers calculated in the PRG development process for OU4 are adequate for use as IRGs. However, there are uncertainties with using the PRGs for the OU4 Feasibility Study, particularly because it appears that ammonia may be accounting for some of the toxicity identified in the offshore areas.
Resolution – The PRGs are not trying to make a distinction between risk to identify areas that will or will not be included in remedial actions. This is a Feasibility Study decision. The Recommended PRGs will be used as IRGs for the interim offshore monitoring program, but re-evaluation of the appropriateness of these numbers for use in the OU4 FS will be necessary and additional investigation may be required.

BULLET 6 PRGs for pesticides and dioxin

PRGs for pesticides (MEDEP Comment 32b, SAPL Comment 9)
Issue – PRGs for pesticides must be developed.
Discussion – Pesticide PRGs were calculated but not carried through to a Recommended PRG and will not be an Interim Remediation Goal (IRG) for the evaluation of interim offshore monitoring at this time. The data is there to develop a PRG if pesticides are identified as a COC for OU4. However, based on the results of the evaluation of PRG exceedances compared with the ecological risk results, higher concentrations of pesticides were detected in areas of low risk than areas of intermediate risk. Therefore, at this point the implementation of a PRG for pesticides is uncertain.
Resolution – The issue as to whether pesticides are COCs for OU4 needs to be resolved between the Navy and MEDEP and it will need to be resolved separately from this PRG document. Pesticides need to be carried through the PRG process at least as far as development of a sediment-based concentration so that a PRG will be available if necessary in the future.

PRGs for dioxin (SAPL Comment 12)
Issue – How will dioxins be considered in the PRG process?
Discussion – Dioxins have not been identified as a COC for OU4 and the data necessary to calculate a PRG are not available. The dioxin data available for the offshore need to be evaluated and if it is determined that a PRG for dioxins is needed, then additional data may need to be collected.
Resolution – A PRG for dioxins is not necessary at this time. The dioxin data available for the offshore will be evaluated. All participants at the meeting were given an action item to look into what dioxin screening levels are available for sediment and fish tissue.

BULLET 7 Clarification of comments (EPA Comment 7 and MEDEP Comment 4)

These comments were clarified during the discussion of Bullet 1, under Example calculations/presentation of calculations for each step (EPA Comment 1).

BULLET 8 Other Issues/Comments

Two additional issues were added to the agenda and are discussed below.

NOAA Comment 4
Issue – The text indicates that the sea urchin toxicity test is more sensitive than amphipod toxicity test (third paragraph on page 8 of the draft report). However, looking at Table 2.2-2, there does not seem to be a correlation between the results for the toxicity testing for sea urchin and amphipod. If sea urchin is more sensitive then it would be expected that wherever the amphipod test showed toxicity, the sea urchin test should also show toxicity.
Discussion – No correlation between the tests was intended. The testing for pore water and sediment use different species. In general more instances of toxicity are identified using sea urchins than amphipods; however, this does not mean that where there is toxicity based on amphipod testing that the sea urchin testing will also show toxicity.
Resolution - The text on page 8, paragraph 3, last sentence of the PRG report will be revised as follows: "In general, more instances of toxicity are identified using sea urchins than amphipods (Carr 1996). However, there may be stations where the sediment is toxic to amphipods but the pore water at that station is not toxic to sea urchins. This may be because the two species have different sensitivities to the same chemicals."

NOAA Comment 5
Issue – Should the low observable effects concentration (LOEL) be the number carried forward through the process rather than the no observable effects level (NOEL)?:
Discussion - If the site had only one (or very few) contaminants and there were a sufficient number of toxic samples, then it would be possible to identify a LOEL with sufficient confidence to use in the process. However, with multiple contaminants, using the NOEL is a safer more conservative approach.
Resolution – Use of the NOEL is appropriate for OU4.

OTHER ISSUES/COMMENTS

Carolyn Lepage raised a concern that source/onshore sites are not considered in the PRG process. The Navy indicated that the purpose of this exercise is to develop PRGs for sediment for the offshore. That is for each Limiting COC, to identify a sediment concentration below which organisms exposed to sediment will have no observable effects. It is not clear how the PRG could address sources/onshore sites, except to ensure that the list of Limiting COCs includes COCs related to each of the sources. The process for identifying the Limiting COCs accounts for the differences in the sources/onshore sites, therefore, the Navy believes the list of Limiting COCs is appropriate for OU4. The way to link the onshore impacts to the offshore is part of the interim monitoring program and decisions based on the program (based on evaluation of concentration trends). Therefore, the Navy believes that the concern for linkage of the onshore and offshore is being addressed appropriately.

The USEPA requested that the Acute:Chronic Ratio (ACR) used in the WQSV selection (see Figure 2.2-1 and Table 2.2-1) be chemical specific where possible. If a chemical-specific ACR is not available, than the generic value identified (8:1) is acceptable. This impacts silver, naphthalene, aldrin, gamma BHC, and DDE. The Navy will look to see whether chemical-specific ACRs are available for these chemicals. It is noted that this is a departure from the PRG development process proposed as part of the Interim Offshore Monitoring Plan, but should not significantly impact the PRG development.

A question was raised whether sediment quality criteria were used as screening values and whether they were ARARs. The sediment quality criteria are not promulgated and therefore are not ARARs. Sediment benchmarks (ER-Ls, TELs, SQALs) were used only when water quality criteria were not available. The USEPA noted that some of the water quality criteria needed to be updated per USEPA (1999) and the Navy indicated that this would be done for the draft final PRG report.

Ms. Lepage indicated that the PRG report was very difficult for the public to understand and requested that the Executive Summary be revised to provide a non-technical explanation of the PRG development. The Navy indicated that they would review the Executive Summary to try to provide additional explanation of the PRG development process; however, the document is a very technical document and the Navy does not believe that it is appropriate to try to revise the document to provide non-technical discussions. The Navy prefers to prepare a fact sheet for the public to provide a non-technical explanation.

WRAP UP

The Navy believes that the discussion of the issues and resolutions identified should resolve most of the comments on the draft PRG report. Follow-up comments are due April 11, 2001 and the Navy will address any follow-up comments and provided the responses as part of the draft final PRG report.

ATTACHMENT 1

AGENDA

AGENDA
OFFSHORE PRG TECHNICAL MEETING
APRIL 3, 2001

9:00 a.m. – 9:15 a.m.	Introduction, Review of Agenda, and Objectives of the Meeting
9:15 a.m. – 10:00 a.m.	Overview of PRG Process
10:00 a.m. – 2:30 p.m.	Primary Discussion Points
2:30 p.m.– 3:00 p.m.	Wrap Up

10 minute break each hour

30 minute break for lunch between Noon and 1:00 p.m.

Primary Discussion Points and related comment numbers

- Overview of PRGs Process including Assumptions (EPA Comment No. 1; MEDEP Comment Nos. 1 and 20; SAPL Comment Nos. 2 and 10)
- Reanalysis/Re-Evaluation of Pore Water Data and Additional Analyses of Round 2 Samples and how it affects PRGs (EPA Comment No. 2)
- Copper concentrations at MS4-1 (NOAA Comment No. 8)
- PNS-wide versus AOC-wide PRGs (MEDEP Comment Nos. 1, 22, and 26b; SAPL Comment No. 1)
- Recommended PRG calculation (MEDEP Comment Nos. 13b, 23, 30, and 31)
- Pesticides and Dioxins as PRGs (MEDEP Comment No. 32b; SAPL Comment Nos. 9 and 12)
- Comments requiring clarification (EPA Comment No. 7 and MEDEP Comment No. 4)
- Other Issues/Comments

ATTACHMENT 2

MEETING HANDOUTS

Process for Development of Offshore Preliminary Remediation Goals (PRGs) at Portsmouth Naval Shipyard

3 April 2001
Technical meeting at PNS

1

What are Site-specific PRGs and what are they used for?

- Site-specific PRGs:
  - ***are*** a group of "Limiting" Chemicals of Concern (CoCs) and associated concentrations that, when exceeded, account for the majority of site-related risk.
  - ***are not*** screening values (e.g. Generic PRGs).
- Using site-specific PRGs:
  - ***will*** reduce CoC exposure to site receptors to levels expected to eliminate actionable chemical risks for all site-related CoCs.
  - ***Can*** address multiple pathways and receptors for protection of environment.

2

Objectives

- Describe the approach for development of site-specific, sediment-based PRGs for aquatic health for Operable Unit 4 (OU4);
- Present example calculations demonstrating the process.

3

Data Requirements

Assemble necessary data for derivation from Round 2 Interim monitoring:

- Sediment chemistry (metals, organics, TOC, SEM:AVS)
- Porewater chemistry (metals)
- Sediment toxicity (amphipod survival)
- Porewater toxicity (sea urchin larval development).

Implement PRGs by comparison against:

- Estuarine Ecological Risk Assessment (EERA) risk findings
- EERA chemistry results
- Round 1 and Round 2 chemistry results (all site stations)

4

Overall Approach (2 Phases)

Derivation (5 Steps)

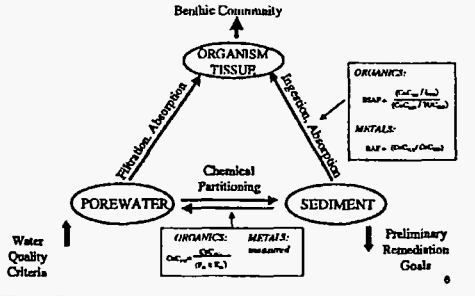
- Calculate protective concentrations in porewater that represent a threshold for toxicity (called Threshold Effects Values).

Implementation (2 Steps)

- Convert TEVs into sediment-based units (Baseline PRGs); and assess effectiveness for addressing risks identified in the EERA investigations (*i.e.*, Recommended PRGs).

5

Equilibrium partitioning relationships for CoCs among environmental media.



6

Advantages of using the EqP Approach in PRG Development

The PRG derivation process uses the chemical concentration of pore water as the primary measure of potential adverse effects (*i.e.*, risk) to aquatic biota.

Advantages of proposed PRG process include:

- For metals and some organics, direct measurements of CoCs in pore water are used to predict exposure, hence benchmarks (i.e., water quality criteria) based on single chemical exposures can be applied.
- For organic chemicals, the EqP model is used to estimate pore water concentrations, based on site specific environmental conditions.

7

PRG Development: Step 1.

PRG Step 1 includes:

1. Select screening level benchmarks representing no effect concentrations, in order of preference to obtain Water Quality Screening Values :
   - EPA marine or freshwater Water Quality Criteria,
   - Values calculated from other water criteria, and
   - Values calculated from comparably protective sediment benchmarks using Equilibrium Partitioning model.
2. Normalize exposure concentrations to benchmarks:
   - Facilitates ranking of chemicals according to potential for risk.

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Exhibit 1A. Example calculation of porewater concentration for organic contaminants using Equilibrium Partitioning.

EqP model for organics:
$C_p = C_s/(f_{oc} * K_{oc})$ (DiToro *et al.*, 1991)

Station	CoC	C_S	f_{oc}	K_{oc}	C_p
A	Benzo(a)anthracene (H)	234	0.0148	1.01E+05	0.04
	Benzo(a)pyrene (H)	317	0.0148	1.01E+06	0.02
	Chrysene (H)	444	0.0148	4.01E+05	0.07
	Dibenz(a,h)anthracene (H)	52.7	0.0148	3.77E+06	0.0010
	Fluoranthene (H)	778	0.0148	1.08E+05	0.49
	Pyrene (H)	1190	0.0148	1.08E+05	0.75
	HMW PAHs				1.38

C_p - organic chemical porewater concentrations (ug/L)
C_s - sediment concentration (ug/kg dry weight)
f_{oc} - fraction of organic carbon (%TOC/100)
K_{oc} - organic carbon/water partitioning coefficient; derived from $\log_{10}K_{ow}$ ($\log_{10}K_{oc} = 0.00028 + 0.983 * \log_{10}K_{ow}$); where K_{ow} = the octanol/water partition coefficient
$HC_{TW} - C_p * WQBV$

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Exhibit 1B. Example Calculation of Pore Water Hazard Quotients for organic contaminants.

Station	CoC	C_{pw}	WQSV	HQ_{pw}
A	Total PCBs	2.30E-03	0.03	0.08
	Anthracene (L)	0.54	0.29	1.87
	Benzo(a)anthracene (H)	0.04	0.07	0.61
	Benzo(a)pyrene (H)	0.02	0.04	0.50
	Chrysene (H)	0.07	0.10	0.79
	Dibenz(a,h)anthracene (H)	9.52E-04	1.70E-03	0.57
	Fluoranthene (H)	0.49	14.00	0.03
	Pyrene (H)	0.76	0.63	1.22
	HMW PAHs	1.39	0.42	3.29

WQSV = Water Quality Screening Value

HQ_{pw} = Pore Water Hazard Quotient (unitless, C_{pw}/WQSV)

(L) = Low Molecular Weight PAH analyte, (H) = High Molecular Weight Analyte

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PRG Development: Step 2.

Calculate site-specific screening level benchmarks based on measured toxicity:

1. Assemble chemical database consisting of samples found to be non-toxic:
   - Amphipod survival not affected in bulk sediment (> 80% survival);
   - Sea urchin development not affected in pore water (~dilutions less than 50% full strength seawater).
2. Determine threshold concentration where onset of toxicity is likely:
   - Determine statistical distribution type (i.e., normal or log-normal);
   - Calculate 95% quantile (mean + upper 95% confidence limit) of the data distribution;
   - Select the larger of generic (literature-based) and site-specific benchmarks.

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Exhibit 2. Example calculation of the site-specific no-effects quotient from the collocated chemistry/toxicity data.

Site-specific no-effect quotient = Upper bound 95th quantile of non-toxic HQ_{PW} values.

PW conc. = Pore water concentration, (µg/L)

95th quantile = Mean + Upper 95% Confidence Limit (tail-law; derived from t-test statistical analysis)

HQ_{pw} = PW Hazard Quotient (unitless) = PW conc./WQSV

HMW PAH HQ_{pw} = sum of HQ_{pw} for PAH analytes with High Molecular Weight (HMW)

*Where n≤ 3 the maximum non-toxic PW HQ is used instead of the 95% quantile due to small sample size.

HMW PAHs		Bulk Sed Non-Toxic to Amphipods	Pore Water Non Toxic to Sea Urchins
Station	PW Conc.	HQ_{pw}	HQ_{pw}
A	0.72	2.97	
B	1.16	4.61	
C	0.86		7.32
D	0.32		
E	1.89	5.98	
...	...	...	...
Y	1.41	3.72	0.74
Z	1.2E-1	3.E-01	1.82
sample size (n)		15	3
Tukey		2.131	*
Mean		1.88	*
Max			7.32
95% UCL = HQ_{pw}		2.87	7.32

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PRG Development: Step 3.

Retain all CoCs potentially contributing to risk:

For each analyte:

1. Compare site-specific no-effect HQ (NOEQ) with maximum observed HQ associated with a toxic sample (Max PW-HQ_{TOX});
2. Retain only those CoCs and NOEQs where the Max PW-HQ_{TOX} is greater than the NOEQ.

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Exhibit 3. Example Derivation of the No Effect Quotient (NOEQ) for a bedded sediment exposure pathway.

- The NOEQ is the highest departure from the HQ = 1 equivalent concentration (i.e., WQSV) for which site-specific adverse effects are unlikely to occur.
- Only those CoCs for which the maximum HQ_{PW} of toxic samples exceeds the site-specific benchmark are retained for further PRG development.

Amphipod Exposures	Non-toxic Samples			Toxic Samples		
CoC	n	95th Quantile HQ_{PW}	NOEQ	n	Max PW-HQ	Max PW-HQ>NOEQ?
Anthracene	15	1.36	1.36	2	1.21	NO
HMW PAHs	15	2.87	2.87	2	3.41	YES
Total PCBs	15	0.11	1.00	2	1.78	YES

For 95th quantile values < 1, an NOEQ = 1 is adopted.

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PRG Development: Step 4.

Derivation of Threshold Effects Values (TEVs)

Threshold Effects Values are the lowest feasible NOEC concentrations (e.g. above background) that can be used as PRGs for the site.

The Threshold Effect Value is calculated as follows:

1. The NOEQ values are converted into NOEC (*e.g.*, water concentration units) for comparison against background concentrations;
2. The Reference Screening Value (RSV), representing the background concentration for a chemical, is calculated as the 95th upper quantile of the reference dataset.
3. The greater of the NOEC and RSV is taken as the TEV. This ensures that the PRG will not be set lower than the background concentration.

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Exhibit 4. Example Derivation of Threshold Effect Values

Threshold Effect Value Calculations:

- NOEC = NOEQ x WQSV
- RSV = upper 95th quantile of reference pore water concentrations;
- TEV = Max (NOEC, RSV).

CoC	NOEQ	* WQSV	= NOEC	RSV	TEV
HMW PAHs	2.87	0.29	0.82	0.18	0.82
Total PCBs	1.00	0.03	0.03	1.96E-04	0.03
o,p'-DDE	2.8	1.00E-03	2.80E-03	3.59E-03	3.59E-03

NOEQ = No Observable Effect Quotient (unitless) RSV = Reference Screening Value (µg/L)
WQSV = Water Quality Screening Value (µg/L) TEV = Threshold Effects Value (µg/L)
NOEC = No Observable Effect Concentration (µg/L)

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PRG Development: Step 5.

Limiting CoC Selection

"Limiting" CoCs are the chemicals that when addressed by the remedial action will reduce risk of all chemicals to acceptable levels (EPA, 1991)

Limiting CoC selection process:

For chemicals with NOEQs from Step 4,

1. Normalize CoC concentrations to TEVs:
   - Divide pore water concentrations by aquatic TEVs (TEV HQ = [PW] / TEV).
2. Identify the chemical contributing the most risk at the station:
   - Rank and sum TEV HQs across analytes within station;
   - Select CoC with highest HQ as Limiting CoC wherever sum TEV HQ >1.
3. Process repeated at all stations to identify L-CoCs for site.

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Exhibit 5. Example of "Limiting" CoC selection process

Limiting CoCs are the chemical contributing the most risk at the station. Addressing the L-CoCs will also address risks from collocated CoCs.

L-CoC calculations:

For TEVs derived from Step 4;

- PW HQ_{TEV} = [PW]/TEV.
- L-CoC = Maximum HQ_{TEV} where Sum HQ_{TEV} > 1.

CoC	PW HQ_{TEV} Station			
	A	B	C	D
HMW PAHs	0.95	1.13	0.42	1.80
Total PCBs	0.15	1.78	0.06	0.08
Sum HQ_{TEV}	1.09	2.91	0.48	1.88
Max HQ_{TEV}	0.95	1.87	-	1.80
"Limiting" CoC	HMW PAHs	Total PCBs	-	HMW PAHs

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PRG Development: Step 6.

Calculation of Baseline Preliminary Remediation Goals

- Baseline PRGs are TEVs converted into sediment concentration units.
- Conversion method assumes that risk of chemicals in the benthic environment is the same whether measured as pore water (TEV-HQ) or bulk sediment (PRG HQ) exceedences.
- The PRG is estimated for every sample. The baseline PRG to be applied across the site is calculated as an average of all sample-specific PRG estimates.

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Exhibit 6. Example Calculation of Baseline Preliminary Remediation Goals

Formula Derivation:

1. $HQ_{TEV} = HQ_{PRG}$
2. $HQ_{TEV} = [Sed]/TKG$
3. PRG estimate = $[Sed] / HQ_{TEV}$)
4. PRG baseline = $\Sigma(C_s/TEV\text{-}HQ)/n$

"Limiting" CoC	Station	C_s	HQ_{TEV}	C_s/HQ_{TEV}
HMW PAHs	A	4065	0.95	4298
	B	4939	1.50	3300
	C	9818	1.13	8714
	...	...	...	...
	Y	4613	1.80	2558
	Z	241	0.15	1604
			Sum:	105459
			n:	17
			Baseline PRG:	6204

PRG - Preliminary Remediation Goal (ug/kg), HQ_{TEV} - Threshold Effect Value-Hazard Quotient (unit less)
C_s - Sediment concentration (ug/kg), N - Number of Observations.

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PRG Development: Step 7.

Baseline PRG Evaluation and selection of Recommended PRGs

- **Baseline PRGs are evaluated to determine whether CoCs and concentrations will be suitable for addressing risk as identified in the EERA.**
- **The Baseline PRGs that address the risks are selected as "Recommended" PRGs.**

The baseline PRG evaluation procedures include:

1. Compare PRG exceedences against risk assessment findings; elevated PRG-HQs should be observed with increasing risk;
2. Compare PRG values against generic benchmarks; PRGs should be generally comparable or likely causes for site-specific deviations from generic values should be identified.

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Exhibit 7. Example Evaluation of Baseline PRGs

The baseline and RPRGs are calculated for use in the Feasibility Study and to assist in risk management decisions regarding the setting of Remediation Goals.

Baseline PRG evaluation procedures:

1. Select PRG chemical;
2. Identify samples where chemical has highest PRG HQ;
3. Rank PRG HQ against ERA findings;
4. Determine whether possible trend for higher PRG HQ with higher risk exists;
5. Identify discernable breakpoints in PRG HQ-risk relationship as input into risk management decisions;
6. Assess protectiveness of PRG by qualitative evaluation against generic sediment benchmarks
7. Repeat process for remaining PRGs

Station	Risk	HQ$_{PRG}$ Max	
A	Low	1.4	
B	Low	1.5	2.0*
C	Intermediate	2.0	
D	Intermediate	3.1	
E	High	4.6	
F	High	9.7	
G	High	11.0	

*In consideration of all PRG/risk comparisons, a RPRG = 2X the BPRG was adopted for the case study.

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Implementation of PRGs

- RPRGs developed with this process are specific to OU4;
- Appropriate as Interim Remediation Goals for the offshore interim monitoring program;
- IRGs may be revised for use in the FS depending on risk management input.
  - More likely to be more conservative than not;
  - Could change depending on findings of the interim monitoring program (i.e., additional investigation/study may be necessary to develop appropriate PRGs for use in the FS).

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Summary of PRG Process

- PRG process implemented at other Navy and EPA sites;
- PRG process provides a site-specific sediment number protective of benthic community for OU4;
- RPRGs are used as IRGs for interim monitoring only; further risk management input needed to refine PRGs for the Feasibility Study.

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DEPARTMENT OF THE NAVY
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IN REPLY REFER TO

5090
Code 1823/FE
27 MAR 2001

Ms. Meghan Cassidy
U.S. Environmental Protection Agency, Region I
1 Congress Street
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Mail Code HBT
Boston, MA 02114-2023

Mr. Iver McLeod
Maine Department of Environmental Protection
State House Station 17
Augusta, ME 04333-0017

Dear Ms. Cassidy/Mr. McLeod:

SUBJECT: PRELIMINARY REMEDIATION GOALS FOR OPERABLE UNIT 4, INSTALLATION RESTORATION PROGRAM FOR PORTSMOUTH NAVAL SHIPYARD, KITTERY, ME

Enclosed is the proposed agenda for the April 3, 2001 technical meeting on the Preliminary Remediation Goals for Operable Unit 4.

If additional information is required please contact Mr. Fred Evans at (610) 595-0567 x-159.

Sincerely,

Frederick J. Evans
Remedial Project Manager
By Direction of the
Commanding Officer

AGENDA
OFFSHORE PRG TECHNICAL MEETING
APRIL 3, 2001

9:00 a.m. – 9:15 a.m.	Introduction, Review of Agenda, and Objectives of the Meeting
9:15 a.m. – 10:00 a.m.	Overview of PRG Process
10:00 a.m. – 2:30 p.m.	Primary Discussion Points
2:30 p.m.– 3:00 p.m.	Wrap Up

10 minute break each hour

30 minute break for lunch between Noon and 1:00 p.m.

Primary Discussion Points and related comment numbers

- Overview of PRGs Process including Assumptions (EPA Comment No. 1; MEDEP Comment Nos. 1 and 20; SAPL Comment Nos. 2 and 10)
- Reanalysis/Re-Evaluation of Pore Water Data and Additional Analyses of Round 2 Samples and how it affects PRGs (EPA Comment No. 2)
- Copper concentrations at MS4-1 (NOAA Comment No. 8)
- PNS-wide versus AOC-wide PRGs (MEDEP Comment Nos. 1, 22, and 26b; SAPL Comment No. 1)
- Recommended PRG calculation (MEDEP Comment Nos. 13b, 23, 30, and 31)
- Pesticides and Dioxins as PRGs (MEDEP Comment No. 32b; SAPL Comment Nos. 9 and 12)
- Comments requiring clarification (EPA Comment No. 7 and MEDEP Comment No. 4)
- Other Issues/Comments

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