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DEPARTMENT OF THE NAVY
NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
10 INDUSTRIAL HIGHWAY
MAIL STOP, #82
LESTER, PA 19113-2090

IN REPLY REFER TO

5090
Code 1823/FE

NOV 0 4 1996

Ms. Meghan Cassidy
U.S. Environmental Protection Agency Region 1
JFK Federal Building, Mailcode HBT
Boston, MA 02203-2211

Ms. Nancy Beardsley
Maine Department of Environmental Protection
State House Station 17
Augusta, ME 04333-0017

Subj: INSTALLATION RESTORATION PROGRAM
PORTSMOUTH NAVAL SHIPYARD, KITTERY, ME

Dear Ms. Cassidy and Ms. Beardsley:

Enclosed are responses to MEDEP comments on the Navy's proposed off-shore mixing methodology for the On-Shore/Off-Shore Contaminant Fate and Transport Modeling effort. If you have any questions on this matter please call me at (610) 595-0567 extension 159.

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

Portsmouth Naval Shipyard
Code 121.10 Bldg 44
Attn Marty Raymond
Portsmouth, NH 03804-5000

Sincerely,

Frederick J. Evans

FREDERICK J. EVANS, P.E.
Remedial Project Manager
By direction of the Commanding Officer

Encl: Response to MEDEP Comments Dated October 18, 1996,

Distribution:
NOAA (K. Finkelstein)
US Fish & Wildlife Service (K. Munney)
ME Dept. of Marine Resources (D. Card)
NH Fish & Game (J. Nelson)
PNS (Code 121.10, M. Raymond)
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Mr. Doug Bogen
Ms. Michele Dionne
Ms. Mary Marshall
Mr. Jack McKenna
Mr. Onil Roy
Shipyard (100PAO) w/o encl
Brown and Root Environmental (L. Klink, B. Horne)

RESPONSE TO MEDEP COMMENTS DATED OCTOBER 18, 1996
POSITION PAPER
ON-SHORE/OFF-SHORE CONTAMINANT FATE AND TRANSPORT MODELING
PROPOSED PHASE I OFF-SHORE MIXING MODEL METHODOLOGY
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

GENERAL COMMENTS

1. **Comment**: The subscripts are not always clear in the report copy I read. For example the subscripts for C in equation (4) appear to be the same but I assume the equation is $C_I = C_i(1/1-D_f)$.

   Response: The subscripts for equation (4) are as stated in the comments. It is anticipated that the position paper will not be revised and resubmitted. A clearer copy can be provided to the reviewer if desired, however, the equations from the position will also be presented in the Phase I On-Shore/Off-Shore Modeling Work Plan to be resubmitted shortly. Original copies of the Work Plan will be provided to MEDEP for review.

2. **Comment**: Steady state conditions/concentrations, as referenced in the report, would be more correctly described as tidally averaged, quasi-steady state conditions.

   Response: Agree. "Tidally averaged, quasi-steady state conditions" is a more accurate description of the steady state conditions as discussed in the position paper. The text in the Work Plan will be revised accordingly.

3. **Comment**: Equation (6) is not a strictly correct representation of the transport out of the near shore zone; but I agree that, as the author points out, it is probably a conservative estimation.

   Response: Agree. The representation of the transport of contaminants out of the near-shore zone is simplified so that it does not account for all of the mixing processes which are actually occurring in the near-shore zone, however, as the reviewer agrees, it is a conservative representation.

4. **Comment**: It is proposed to use current velocity output from the UNH WASP5 model for the non-tidal or net velocity. I am not familiar with this specific model (I am familiar with WASP5 in general), but I assume that the hourly velocity output accurately represents the combined tidal and fresh water flows (i.e., reversing currents) and that the velocity to be used is the average over at least one tidal cycle so that the net (non tidal) velocity is obtained. I recommend that actual current velocity data be used if available.

   Response: The WASP5 Model developed by the University of New Hampshire simulates conditions over a 30 day period, therefore, the average of the hourly output (representing

both tidal and fresh water flows combined) does represent the net (non-tidal) velocity over the 30-day period. Current velocity measurements were made in the Piscataqua River and used to calibrate the WASP5 model, however, measurements were not taken directly off-shore of any of the Sites to be included in the Phase I Modeling. Current velocities were taken in Clarks Cove, however, the net flow in the cove is approximately zero and the non-tidal current is not proposed to be used to calculate mixing in this area. Since current measurements were not available directly off-shore from the Sites to be modeled and the WASP5 output is available, it was decided to use the WASP5 output. Given the level of detail and simplifications in the rest of the off-shore mixing modeling approach, it is felt that the WASP5 model output will provide sufficient accuracy to be used in the off-shore mixing calculations.

5. **Comment**: Strictly speaking, Maine has no specific regulation which defines the boundary or dimension of a mixing zone. Maine laws and/or rules include the following references to mixing zones.

(A)

After adoption of any classification by the Legislature for surface waters or tidal flats or sections thereof, it is unlawful for any person, firm, corporation, municipality, association, partnership, quasi-municipal body, state agency or other legal entity to dispose of any pollutants, either alone or in conjunction with another or others, in such manner as will, after reasonable opportunity for dilution, diffusion or mixture with the receiving waters or heat transfer to the atmosphere, lower the quality of those waters below the minimum requirements of such classifications, or where mixing zones have been established by the department, so lower the quality of those waters outside such zones, notwithstanding any exemptions or licenses which may have been granted or issued under sections 413 to 414-B.

The department may establish a mixing zone for any discharge at the time of application for a waste discharge license. The department shall attach a description of the mixing zone as a condition of a license issued for that discharge. After opportunity for a hearing in accordance with section 345-A, the department may establish by order a mixing zone with respect to any discharge for which a license has been issued pursuant to section 414 or for which an exemption has been granted by virtue of section 413, subsection 2. Prior to the commencement of any enforcement action to abate a classification violation, the department shall establish in the manner provided in this paragraph a mixing zone with respect to the discharge sought to be affected.

The purpose of a mixing zone is to allow a reasonable opportunity for dilution, diffusion or mixture of pollutants with the receiving waters before the receiving waters below or surrounding a discharge will be tested for classification violations. In determining the extent of any mixing zone to be established under this section, the department may require from the applicant testimony concerning the nature and rate of the discharge; the nature and rate of existing discharges to the waterway; the size of the waterway and the rate of flow therein; any relevant seasonal, climatic, tidal and natural variations in such size, flow, nature and rate; the uses of the waterways in the vicinity of the discharge, and such other and further evidence as in the department's judgment will enable it to establish a reasonable mixing zone for such discharge. An order establishing a mixing zone may provide that the extent thereof varies in order to take into account seasonal, climatic, tidal and natural variations in the size and flow of, and the nature and rate of, discharges to the waterway.

Where no mixing zones have been established by the department, it is unlawful for any person, corporation, municipality or other legal entity to dispose of any pollutants, either alone or in conjunction with another or others, into any classified surface waters, tidal flats or sections thereof, in such manner as will, after reasonable opportunity for dilution, diffusion, mixture or heat transfer to the atmosphere, lower the quality of any significant segment of those waters, tidal flats or sections thereof, affected by such discharge, below the minimum requirements of such classification, and notwithstanding any licenses which may have been granted or issued under sections 413 to 414-B.

(B)

Zone of Passage. All discharges of pollutants shall, at a minimum, provide for a zone of passage for free-swimming and drifting organisms. Such zone of passage shall not be less than 3/4 of the cross-sectional area at any point in the receiving body of water. Such zone of passage may be reduced whenever the applicant for a discharge can demonstrate that (a) because of physical phenomena in the receiving body of water such minimum zone cannot be maintained and (b) such minimum zone of passage is not necessary to protect organisms in the receiving body of water from substantial adverse effects.

(C)

Calculation of dilution factors: A simple dilution model using stream design flows specified in subsection E.(4) of this rule must be used to determine allowable effluent limits unless there is information that makes another model approved by the Department more appropriate. All substances are assumed to be conservative. Background concentrations will be included in all calculations, using available site data or other data appropriate for the region.

a. Dilution factors (DF) for freshwater discharges are calculated using the following models:

i. If the entire water supply that ultimately makes up the effluent flow (Qe) is taken from the receiving water upstream of the location from which the stream design flow (Qr) is calculated or measured, then:

$$DF = Qr/Qe$$

ii. If part or all of the water supply taken from any other location (Qo) is discharged in the effluent, then:

$$DF = (Qr + Qo)/Qe$$

b. For estuarine and marine discharges, dilution factors (DF) are calculated as follows.

i. For discharges to the ocean, dilution must be calculated as near-field or initial dilution, or that dilution available as the effluent plume rises from the point of discharge to its trapping level, at mean low water level and slack tide for the acute exposure analysis and at mean tide for the chronic exposure analysis using appropriate models determined by the Department such as MERGE or CORMIX. Where far-field impacts on sensitive resources such as swimming beaches or clam flats are a concern, other appropriate methods estimating far-field dilution must be used.

ii. For discharges to estuaries, dilution must be calculated using a method determined by the Department to be appropriate for the site conditions. Where freshwater river flow is dominant and instantaneous mixing across the width can be assumed, dilution must be calculated as in subsection E(3)(a). Where tidal flow is dominant or incomplete mixing is assumed, dilution must be calculated as in subsection E(3) (b) (i). Where appropriate, other methods such as dye studies or water quality methods may be used.

(D)

4. **Stream design flows.** Stream design flows used in the analyses of dilution factors from dilution models must be consistent with the exposure of the population at risk to any and all toxic pollutants.

a. Analyses using numerical acute criteria for aquatic life must be based on ¼ of the 1Q10 stream design flow to prevent substantial acute toxicity within any mixing zone, according to EPA's Mixing Zone Policy and to ensure a Zone of Passage of at least 3/4 of the cross-sectional area of any stream as required by Department rule. Where it can be demonstrated that a discharge achieves rapid and complete mixing with the receiving water, by way of an efficient diffuser or other effective method, analyses may use a greater proportion of the stream design flow, up to and including all of it, as long as the required Zone of Passage is maintained. Flows that allow bioaccumulation of compounds to levels that are carcinogenic, mutagenic or teratogenic are not to be used in setting effluent limits.

b. Analyses using statewide numerical chronic criteria for aquatic life must be based on 7Q10 stream design flow.

c. Analyses using human health criteria must be based on stream flows consistent with the duration of exposure.

<u>Response</u>: Agree. As discussed in the response to Comment 1, it is anticipated that the position paper will not be modified and resubmitted, however, the text concerning the off-shore mixing will be clarified in the Work Plan to reflect Maine's laws/regulations concerning the mixing zones. Paragraph (B) does describe a zone of passage for free-swimming and drifting organisms being "not less than 3/4 of the cross sectional area at any point in the receiving body of water." This is probably what the CORMIX Manual was referencing which was in turn referenced in the position paper stating that 1/4 of the stream cross section could be used for the mixing zone. The text of the Work Plan will be revised to reference the Maine regulations directly. The mixing zone calculations based on 1/4 of the cross sectional area will be retained in the proposed approach to be used as a benchmark for the other calculations to be completed.

6. <u>Comment</u>: In regard to the proposed sensitivity analyses or analysis scenarios, I suggest a fourth scenario:

For a range of D_f values, determine C_l and the area/width of the near shore mixing zone that would result in a C_{near} being equal to the instream chronic criteria concentration for each (or a representative number) of the specific toxics of concern.

Response: Agree. The suggested fourth scenario can also be evaluated as part of the sensitivity analysis. Given the C_{near} concentration, the contaminant mass loading rate to the intertidal zone, the non tidal current, and the site geometry, the corresponding D_f, C_I, and the area/width of the near-shore mixing zone can be calculated.

7. **Comment**: In general the proposed modeling approach appears reasonable with sufficient conservatism built in to be protective of the receiving waters. Because the model is a tidally averaged model, the results will be limited to evaluation of chronic criteria only. Acute criteria evaluation would require short term (1 hour) evaluation on a smaller spatial scale.

   Response: Agree. The proposed modeling approach will result in tidally averaged concentrations in the near-shore mixing zone. It would be appropriate to compare the model predicted concentrations in the near-shore mixing zone (C_{near}) to chronic criteria. The comparison of the predicted concentrations to screening levels will be coordinated with the off-shore ecological risk assessment to ensure consistency between these two investigations.

8. **Comment**: Comparisons should also be made between both acute and chronic instream criteria and C_I, the concentration within the intertidal zone.

   Response: Agree. The concentration in the intertidal zone will be compared to both the acute and chronic instream criteria. The comparisons of the model predicted concentrations to screening levels will be coordinated with the off-shore ecological risk assessment to ensure consistency between these two investigations.

9. **Comment**: I recommend that an additional document be reviewed for possible application to this project:

   USEPA, 1982, "Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants - Part 2", EPA-600/6-82-004b Environmental Research Laboratory, USEPA, Athens, Georgia.

   Specifically, chapter 6 dealing with estuaries.

   Response: In the evaluation of the available modeling tools, conducted to develop the off-shore mixing model approach, a later version of the recommended document was reviewed. This document is:

   USEPA, 1985, "Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Groundwater - Part II (Revised 1985)," EPA/600/6-85/002b, Environmental Research Laboratory, USEPA, Athens Georgia.

   This document does provide procedures for estimating the concentrations in a tidally influenced river/estuary upstream and downstream of a point source located along the side of the estuary in Section (6.4.2.2. of the above referenced document). This procedure

involves calculating the cross sectional average concentrations of a segment of the estuary. Since this approach only yields concentrations averaged over a much larger volume than what was required for the Phase I modeling, it was not investigated further. A short description and a listing of all of the references reviewed for possible application to the Phase I modeling at PNS will be presented in the Phase I Modeling Report.