TETRA TECH

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Project Number 112G00949

Mr. Paul Kulpa
Rhode Island Department of Environmental Management
Division of Site Remediation
235 Promenade St.
Providence RI 02908-5767

Reference: CLEAN Contract No. N62472-03-D-0057
Contract Task Order No. 130

Subject: Response to Comments, RIDEM Letter January 2, 2009
Former Robert E. Derecktor Shipyard,
Naval Station Newport, Newport RI

Dear Mr. Kulpa:

At the RPM meeting held November 19, 2008, the Navy noted that it would be beneficial if RIDEM outlined previously identified concerns with the Ecological Risk Assessment, the Human Health Risk Assessment and the FS report for the marine sediments at Derecktor Shipyard in writing.

Per the Navy's request, your office provided these concerns on January 2, 2009 although the letter was incorrectly dated January 2, 2008.

The comments and the Navy's responses are provided in Attachment A. Attachment B provides an example calculation sheet for development of the PRG for arsenic, which has been provided to support this response.

If you have any questions, please do not hesitate to contact me.

Very truly yours,

Stephen S. Parker, LSP
Project Manager

Enclosures

c: D. Barclift, NAVFAC (w/encl.)
A. Bernhardt, TtNUS (w/encl.)
W. Johnson, NAVFAC (2, w/encl.)
K. Keckler, USEPA (2, w/encl.)
C. Mueller, NAVSTA (2, w/encl.)
File 112G00949-3.2 (w/encl.)
AR, c/o Glenn Wagner, TtNUS Pittsburgh (w/encl.)

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ATTACHMENT A
Responses to Comments From RIDEM
PRGs and FS Issues, Former Derecktor Shipyard
Comments Dated January 2, 2009

Human Health

HH1 RIDEM questioned whether cumulative affects associated with multiple contaminants were included during the development of the Preliminary Remediation Goals (PRGs). That is, whether the human health PRG developed for a contaminant of concern was based upon the fact that multiple contaminants are present or was the PRG developed assuming that only one contaminant was present. In the conference calls the Navy stated that it is their understanding that the process did include cumulative affects. Further, they would cite which section of a particular report contains this information which demonstrates that cumulative affects were addressed and employed in the process. Please submit this information.

Response: Cumulative risk for contaminants found in sampled media are presented in the risk assessment (Tetra Tech, 1998). The compounds driving this risk were selected and PRGs are calculated for these individual COCs based on a resulting contaminant specific risk of 1E-6 and a non-cancer hazard index of 1.0. To clarify, PRGs have not been calculated from COPCs that have contaminant – specific cancer risk less than 1E-6 or a non-cancer risk of 1.0.

Arsenic is the only analyte that provided a human health non cancer risk quotient > 1.0, or a cancer risk >1E-5. The risk from this analyte was limited to shellfish ingestion. Although a risk- based PRG was calculated, the background tissue concentration was selected as the PRG because it was higher than the calculated PRG, and higher than the site concentrations. Remaining cumulative non cancer risks from Tables 6-8 through 6-13 (Tetra Tech 1998) indicate a site-specific non cancer risk above 1.0 and cancer risk above 1E-5 only for the RME scenario, using the maximum concentrations detected.

HH2 RIDEM has concerns with respect to heterogeneity of contaminant distribution at the site, as well as some of the assumptions used in the process (see below). As noted in comments and discussed during the conference calls, the PRG document is not transparent and certain steps in the PRG development process are either not clear and/or missing. Following the information in the PRG document RIDEM was unable to recreate the process for developing the PRGs at the site. The Navy has acknowledged that the PRG document is not transparent and certain steps are unclear and/or missing.

Accordingly, please simply submit either a table or a spreadsheet with PRGs for all of the contaminants observed at the site. As discussed during the conference calls this is not anticipated to be a difficult task to complete, as the Navy would have all of the information in computer format including the associated equations. This will greatly expedite the process, avoid a long review and comment period and allow RIDEM to confirm that cleaning up to the recommended PRGs in the FS will also address heterogeneity and other issues, and allow the agencies to reach consensus on this issue.

Response: Clarification on the process to develop PRGs at the site was provided in the "Summary of TBT at Site 19 Derecktor Shipyard (Tetra Tech 10/17/08 – Draft, and 11/7/08 – Revised). The detail is provided in Appendix B of the FS report (Tetra Tech 2008).

Although it is recognized that RIDEM would like to have PRGs calculated for all contaminants detected, it is unnecessary. The process that was used to develop PRGs is compliant with EPA RAGS Part D as well as Navy risk assessment policies for the IR program. It is not necessary to calculate PRGs for every constituent detected.

HH3 If the Navy elects not to provide the PRGs for all of the contaminants of concern please submit the following information:

Provide the equation and an example calculation for converting wet tissue weight to dry weight.

Response: The information requested is provided in the Technical Memorandum: Summary of TBT at Site 19, Derecktor Shipyard (Tetra Tech 11/7/08), Page 1, second to last paragraph.

Provide the equation and example calculation for converting tissue concentration, which represents a risk, to sediment concentration, which represent a risk.

Response: This calculation is presented on Page 16 of the final PRG document, presented as Appendix B of the revised FS. The calculation used to convert this to a sediment concentration is presented at the bottom of Page 20 of the PRG document. It uses biota-sediment accumulation factors (BSAFs), as presented in the tables for that document.

Provide a reference for the relative absorption factor for PCBs. Please provide the calculation for the tissue concentration of PCBs, which represents an unacceptable risk.

Response: The reference for the relative absorption factor for PCBs is provided on table 10 of the final PRG document, presented as Appendix B of the revised FS. The values are taken from EPA guidance as noted on the table footnote, and the full reference is stated on page 35 of that document. The PCB concentration used for the exposure point concentration is the sum of the PCB congeners measured. Appendix A of the Human Health Risk Assessment Report (Tetra Tech 1998) provides this information.

Provide the equations and example calculations for the development of the PRG for one of the contaminants of concern proposed by the Navy. This information must be clear, with each step outlined, showing the equation, the example calculation and the appropriate input values, (default or site specific) including the appropriate tables or other sources of data that serve as input into the equation (as previously noted certain key steps in the processes are not found in the PRG document).

Response: An example calculation for arsenic in shellfish is provided as an attachment to this response summary. Arsenic was selected as an example because it poses both cancer risk and non cancer risk for the subsistence fisherman.

Once RIDEM has this information and is able to generate the PRGs for the other contaminants at the site, then it will be possible to evaluate whether the limited PRGs are appropriate. Please be advised that this approach by its nature will greatly increase the overall time of the process and potentially lead to a series of different reviews and/or inquiries.

Response: The comment is noted. As stated earlier, the process that was used to develop PRGs is compliant with CERCLA and Navy risk assessment policies for the IR program. RIDEM should be aware that the Navy is bound to this regulatory and policy-based process.

HH4 As noted in previous correspondence and in the conference calls RIDEM has concerns with ingestion rates employed in the PRG process. The ingestion rates used in the document are not in concert with that developed by the United States Food and Drug Administration, (as an illustration, the Navy's ingestion rate for an adult is less then half the rate used by the FDA for a child). The rate proposed by the Navy for the subsistence fisherman may, however, be used to represent the amount of shellfish consumed by a typical individual. In an effort to move the project forward RIDEM recommends that the Navy state that the rate for the subsistence fisherman represents the rate for an individual, which consume shellfish. RIDEM has stated that if the Navy agrees to this adjustment the Navy will not have to redevelop new PRGs associated with modified ingestion rates. That is, the human health PRG developed by the Navy may be used and simply assigned to that of the typical individual. As such, it would represent the central tendency in a risk assessment. The Navy, at this site only, will not have to develop a new PRG for the substance fisherman (that is RIDEM will forgo the requirement to develop a maximum value, as represented by the substance fisherman, in the risk assessment process, provided that concerns in Comments 5 & 6 below are met).

Response: The basis for the ingestion rates used is presented in the Human Health Risk Assessment Report, Appendix E (Tetra Tech 1998). The request above is to revise the name of the receptor from "Subsistence Fisherman" to "Fisherman", and have the risk for that receptor represent the shellfish ingestion risk for all receptors. However, this change would eliminate the residential shellfish ingestion scenarios. Such a change would require revision of HHRA that was finalized in 1998 without formal dispute. The Navy does not concur with making this change.

HH5 RIDEM has concerns with the assumption concerning the amount of shellfish an individual will harvest from the area. Typically, individuals are able to harvest more shellfish from an area that that allowed by law. Assuming that an individual only takes the daily limit allowed under RIDEM regulations it would take approximately 2.5 –4 trips for an individual to collect the amount of shellfish calculated in the human health risk assessment (the range in number of trips depends upon whether quahogs, soft shell clams, mussels or a combination of shell fish is harvested). Therefore, it is realistic to assume that the amount of shellfish calculated in the human health risk assessment can

be considered to come from the Derecktor Shipyard site. Please modify the document accordingly.

Response: The issue is not the amount of shellfish that could be legally taken from the site, but the amount that is reasonable to assume would be taken from the site for personal consumption over the course of a year. Put simply: The risk assessment assumes the subsistence fisherman will eat one meal per day of fish and shellfish (365 meals per year), but only 10% (36.5 meals) of what he eats will be quohogs, mussels and lobster from this site, because of its use as a commercial port and thus a result of the limited fishery. This is a reasonable assumption.

HH6 In human health risk assessments a hazard quotient of one is used to demarcate what represent an unacceptable risk. The document designates an unacceptable risk as being equal to a hazard quotient of ten. As the regulations and the guidance states that a hazard quotient of one represents an unacceptable risk, the document needs to be modified to state that a hazard quotient of one would be employed to designate what represent an unacceptable in the human health risk assessment.

Please be advised that the human health risk management process is used to determine how to address the human health risk at a site. That is, the human health risk management may be used to designate what form of remediation will be required for the areas, which represent an unacceptable risk in the human health risk assessment. As an illustration, dredging may be required for a hazard quotient of X while monitoring, shellfish restrictions, etc., may be employed for areas with a hazard quotient of Y.

Response: While this may be a discussion more appropriate for the proposed plan, the Navy is pleased to see that RIDEM is willing to enter into these discussions on risk management.

The Navy concurs that a hazard quotient (HQ) of 1 that indicates risk from site releases indicates a remedy is needed. The Baseline PRGs are based on a HQ of 1 (concentrations in sediment >1 * Baseline PRG). The recommended PRGs (RPRGs) are based on an PRG-HQ of either 1, 2, or 10 depending on the endpoint (Table 16 of the PRG document describes this). The Navy agrees that different actions may be appropriate for different areas, based on the PRG-HQs. Further discussion on this matter is warranted and welcome as part of the development of the proposed plan.

Ecological

E1 Similar to issues broached by the EPA it appears that certain contaminants of concern were not adequately addressed.

Response: Please see the response to E2 below

E2 An ecological risk assessment was performed which evaluated a variety of lines of evidence to ascertain the risk present at the site. This is necessary as no one test or line of evidence is deemed sufficient to ascertain ecological risk. The PRGs process only relied on one line of evidence, toxicity, to demarcate areas, which represent an

unacceptable risk. It is not appropriate to ignore the other lines of evidence in this process. Further, toxicity is not a robust test, nor can it be used to usurp the results of the other lines of evidence. The Office of Waste Management has requested that the Navy employ all of the lines of evidence in the ecological PRG process. As discussed in the conference calls and meetings the Office of Waste Management is willing, at this site, to forgo the deficiencies in both the ecological risk assessment and the PRG process and used the ecological PRGs process in the document, provided that the concerns with respect to the human health risk assessment noted above are met. This will avoid the laborious and time consuming process to resolve the many technical and process issues associated with the ecological PRG process and will allow the agencies to reach consensus at this site and move the site forward into remedy and ultimately site close out.

Response: The lines of evidence evaluated in the ecological risk assessment are all accounted for in the PRG development. The Navy followed EPA's ecological risk assessment guidance and policy in development of the ecological risk assessment and the PRGs. The Navy believes that they have provided documentation resolving the human health issues described above and that the FS can be moved ahead.

Dredging Operation

D1 The Office of Waste Management has reviewed the cost estimates and has requested certain information from the Navy to support the estimated cost. The Navy has elected not to address RIDEM's concern and has recommended that the Office of Waste Management employ a contractor to produce a cost estimate in order to check the validity of the Navy's estimate. Per the Navy's recommendation this task is being implemented.

Response: A package of supplemental materials on this topic were provided to RIDEM at their request in the past (Tetra Tech Letter dated 4/22/99). That package provides the requested support information.

Be advised that FS estimates are +30% and -50% in accordance with EPA guidance. Additionally, actual costs for projects completed are not dissimilar from anticipated costs. It appears that RIDEM does not fully understand the cost of remedial action projects on this scale. Further discussion on this topic is not necessary.

D2 As noted in past correspondence and in meetings the Office of Waste Management has requested that the area to be sample be greater then that proposed in the Feasibility Study. This will address concerns associated with contaminant redistribution at the site during the berthing of the inactive ships, anticipated redistribution of contaminants when the inactive ships are removed, depth of contamination, recently obtained information concerning areas of contamination, etc.

Response: The extent of the pre-design investigation will be open for discussion at a later time. However, for the purpose of the FS, a single line item noting that the investigation will be conducted, and a single reasonable cost for that effort should

be included. This has been agreed to with the EPA and will be included in the revised FS report.

D3 RIDEM agrees with dredging and feels that all of the areas of concern should be dredged. This will avoid problems associated with capping.

Response: The comment is noted.

Calculation Worksheet

CLIENT/SITE: Former Robert E. Derecktor Shipyard		Job Number: 112G01474
SUBJECT: Example Calculation of PRGs for ingestion of fish, Former Derecktor Shipyard, Newport RI. Example given: Arsenic		
BASED ON: SAIC 1998, Tetra Tech 1998 and SAIC and URI, 1997		
BY: D.J. Morgan	CHECKED BY: A-M Christian	DATE: October 13, 2009

STEP 1 - Calculate acceptable level of contaminant (arsenic) in shellfish tissue based on an acceptable risk level.

PURPOSE: To calculate preliminary remediation goals (PRGs) for arsenic from ingestion of fish.

EQUATIONS:

PRGs:

PRG (can) = Risk / (IFc x CSFo)

PRG (noncan) = HQ / (IFn / RfDo)

Intake Factor:

$$IFc = \frac{IngRate \times FI \times CF \times EF \times ED}{BW \times ATc}$$

$$IFn = \frac{IngRate \times FI \times CF \times EF \times ED}{BW \times ATn}$$

Where:

ST PRG (can)	=	preliminary remediation goal for shellfish tissue based on cancer risk (mg/kg-fish)
Risk	=	specified cancer risk level
IFc	=	intake factor for calculating cancer risks (kg-fish/kg-BW-day)
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)
ST PRG (noncan)	=	preliminary remediation goal for shellfish tissue based on non-cancer hazard quotient (mg/kg-fish)
HQ	=	specified hazard quotient level for this contaminant
IFn	=	intake factor for calculating noncancer hazard indices (kg-fish/kg-BW-day)
RfDo	=	oral noncarcinongenic reference dose (mg/kg/day)
IngRate	=	fish ingestion rate (mg/day) - Ingestion rate assumes 150 mg/serving, 36.5 servings per year.
FI	=	fraction of fish ingested from contaminated source (unitless)
CF	=	conversion factor (1E-06 kg/mg)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
ATc	=	averaging time for calculating cancer risks (days)
ATn	=	averaging time for calculating noncancer hazard quotient (days)

ASSUMPTIONS:

Risk	=	1E-06
HQ	=	1
CSFo	=	1.5E+00 $(mg/kg/day)^{-1}$
RfDo	=	3.00E-04 mg/kg/day
IngRate	=	15600 mg/day
FI	=	1
CF	=	1.00E-06 kg/mg
EF	=	350 days/year
ED	=	30 years
BW	=	70 kg
AT_C	=	25550 days
ATn	=	10950 days

SHELLFISH PRG CALCULATIONS

IFc =	9.16E-05 kg/kg-day (calculated by spreadsheet)	
	9.16E-05 kg/kg-day (calculated by hand)	
IFn =	2.14E-04 kg/kg-day (calculated by spreadsheet)	
	2.14E-04 kg/kg-day (calculated by hand)	
ST PRC (can) =	7.3E-03 mg/kg-fish (calculated by spreadsheet)	Acceptable concentration of COC in shellfish for cancer risk of 1E-6
	7.3E-03 mg/kg-fish (calculated by hand)	
ST PRG (non can) =	1.4E+00 mg/kg-fish (calculated by spreadsheet)	Acceptable Concentration of COC in shellfish for noncancer HQ of 1
	1.4E+00 mg/kg-fish (calculated by hand)	

CLIENT	JOB NUMBER
FORMER DERECKTOR SHIPYARD	
SUBJECT: EXAMPLE CALCULATION: PRG FOR ARSENIC IN SHELLFISH	
BASED ON: SEE PAGE 1	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
STEP 2 - SSP			10/13/09

STEP 2:

CALCULATE TEV (PAGE 17, SAIC, 1998)

TEV = THRESHOLD EFFECTS VALUE

a) CONVERT WET WEIGHT C_c and C_{NC} TO DRY WEIGHT RESULT IN RISK BASED VALUES (RBVs) FOR TISSUE

GIVEN: % SOLIDS IN SHELLFISH = 14% (REF #3)

$$RBV\ mg/kg\ dry = \frac{ST\ PRG\ (wet)}{14\%} \rightarrow \text{(FROM PAGE 1)}$$

$$RBV\ \text{FOR CANCER } 1E\text{-}4 = \frac{0.73\ mg/kg\ wet}{14} = 0.05\ mg/kg\ dry$$

$$RBV\ \text{FOR CANCER } 1E\text{-}6 = \frac{0.0073}{14} = 0.0005\ mg/kg\ dry$$

$$RBV\ \text{FOR NON CANCER} = \frac{1.4}{14} = 0.1\ mg/kg\ dry$$

b) COMPARE TISSUE RBVs TO REF. DATA: USE TABLE 13, SAIC, 1998

95% UCL OF REF TISSUE AVAIL = 17.27 mg/kg dry*
CALC. RBV NONCANCER = 0.1 mg/kg dry
CALC RBV CANCER (1E-4) = 0.05 mg/kg dry
CALC RBV CANCER (1E-6) = 0.0005 mg/kg dry

ALL CALCULATED VALUES ARE BELOW REFERENCE DATA, THEREFORE, REFERENCE 95% UCL IS SELECTED AS TEV = 17.27

* REFERENCE TISSUE SAMPLES COLLECTED FROM AREAS OUTSIDE RELEASE AREAS

CLIENT		JOB NUMBER	
FORMER DERECKTOR SHIPYARD			
SUBJECT			
SEE P. 1			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE
STEP 3 - SSP			10/13/09

STEP 3

CONVERT TEV (IN TISSUE CONC.) TO SEDIMENT CONCENTRATIONS REFERENCE 3.1.2 OF SAIC, 1998. USE BIOACCUMULATION FACTOR (BAF) DEVELOPED IN SAIC, URI 1997.

$$\text{IF BAF} = \frac{\text{TEV mg/kg in TISSUE-DRY}}{\text{CONCENTRATION IN SED}}$$

$$\text{THEN PRG IN SED} = \frac{\text{TEV mg/kg}}{\text{BAF}}$$

$$\text{OR PRG} = \frac{17.27}{0.875} = 19.74$$

THEREFORE: BASELINE PRG FOR ARSENIC IN SEDIMENT BASED ON SHELLFISH INGESTION = 19.74 mg/kg

REFERENCES:

1) FINAL PRG DEVELOPMENT DOCUMENT, DERECKTOR SHIPYARD CODDINGTON COVE, SAIC, NOVEMBER 1998

2) MARINE HUMAN HEALTH RISK ASSESSMENT: OFFSHORE AREAS OF FORMER DERECKTOR SHIPYARD, TTNUS Sept. 1998

3) DERECKTOR SHIPYARD MARINE ECOLOGICAL RISK ASSESSMENT REPORT, SAIC AND URI MAY 1997