



DEPARTMENT OF THE NAVY

NORTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
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IN REPLY REFER TO

1823/PO  
5 November 1997

Ms. Christine A.P. Williams  
U.S. Environmental Protection Agency  
Region 1  
J.F Kennedy Building HBT  
Boston, MA 02203-2211

Mr. Richard Gottlieb  
Office of Waste Management  
Rhode Island Department of Environmental Management  
235 Promenade Street  
Providence, RI 02908-5767

Re: CONCEPTUAL LONG TERM MONITORING PLAN (CLTMP), SITE 07, CALF  
PASTURE POINT, NAVAL CONSTRUCTION BATTALION CENTER (NCBC)  
DAVISVILLE, RI

Dear Ms. Williams and Mr. Gottlieb,

Enclosed is a revised version of the Conceptual Long Term Monitoring Plan for Site 07, Calf Pasture Point, NCBC Davisville, RI and Responses to Comments by EPA and RIDEM on the July 1997 presentation of the preliminary plan.

The CLTMP has been revised in response to these comments. Key revisions are:

1. Further explanation of primary COC is provided in Section 2.
2. Monitoring strategies related to the source area remedies, i.e. deed restrictions and institutional controls, are stated in Section 3.
3. Interior wetland sampling is incorporated as a component of all monitoring activities as discussed in Section 4.1 (item 2).
4. Anomalous baseline period is defined in terms of climatic data in Section 4.2 (item 4).
4. Section 4.4 (item 1) discusses the repetition of seasonal sampling.
5. The revised plan does not use attenuation factors. Consequently, threshold values are defined for shoreline piezometers only, as discussed in Section 4.3.
6. Prior to any focussed remedy, a risk assessment will be conducted to evaluate the need for remediation, as discussed in Section 4.4 (item 2).
7. Figure 2 has been revised to reflect these changes.

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It is suggested that the revised CLTMP be discussed at a BCT meeting after you have had a chance to review the enclosed documents. We can set a date for this during the upcoming BCT meetings on 12 and 13 November 1997.

I look forward to working with you on the BCT to further refining the conceptual plan in support of the remedy for this site. If there are any questions on this matter, I can be reached at (610) 595-0567 ext 155.

Sincerely,

P. S. OTIS, P.E.  
Remedial Project Manager  
by direction of the Commanding Officer

Copy to:  
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NEWFIELDS -

# Conceptual Long Term Monitoring Plan Site 07, Calf Pasture Point Davisville, RI

11/05/97

## 1. Introduction

Site 07, Calf Pasture Point (the "site") is a peninsula located on the northeastern portion of the former Naval Construction Battalion Center (NCBC) Davisville (the "Base"). The site has been the subject of a series of investigations including an Initial Assessment Study (IAS) and Confirmation Study (CS); a three-part Risk Assessment Pilot Study (RAPS); a three-phase Remedial Investigation (RI); a Marine Ecological Risk Assessment (ERA); and a Facility-Wide Freshwater/Terrestrial ERA. A draft final Proposed Plan (PP) was issued in July 1997. The PP is composed of land use restrictions, long-term monitoring, and 5-year reviews. As a component of the preferred remedy, a draft version of the Conceptual Long Term Monitoring Plan (LTMP) was prepared.

The U. S. Environmental Protection Agency (EPA) Region I, the Rhode Island Department of Environmental Management (RIDEM), and the National Oceanic and Atmospheric Administration (NOAA) have made extensive comments regarding the submitted RI, FS and Conceptual LTMP. Based on these comments, the following revised Conceptual LTMP has been prepared, which represents the overall monitoring strategy of the preferred remedy.

## 2. Site Background

The site is located on the northern edge of Allen Harbor (the "Harbor"). Narraganset Bay (the "Bay"), the Harbor entrance, and the Harbor itself form the eastern, southern and southwestern shorelines of the site, respectively. The site subsurface soil and bedrock strata have been divided into three hydrogeologic zones: (1) the shallow groundwater zone, (2) the deep groundwater zone, and (3) the bedrock groundwater zone. RIDEM has classified groundwater under the site as "GB". Class GB groundwater is considered to be unsuitable for public or private drinking water use without treatment.

Prior to 1940, the Harbor extended up into the central portion of the site. During Navy's 1942/1943 dredging activities for the pier area along the Bay shoreline south of the site, dredge material was placed at the site, thereby filling in the shallow lagoon. The Harbor was also dredged and the material was likely placed at the site resulting in the joining of the island to the south with Calf Pasture Point to form what is now known as Spink Neck. At some

time between 1968 and 1974, the site was utilized to dispose of Decontaminating Agent Non-Corrosive (DANC) which is a reactive, chlorinated compound.

The primary contaminants of concern (COCs) have been identified as chlorinated VOCs including: 1,1,2,2-perchloroethane (1,1,2,2-PCA), trichloroethene (TCE), and TCE daughter products, including 1,2-dichloroethene (1,2-DCE)<sup>1</sup>.

Previous investigations have indicated that the primary COCs were released near an outcropping of bedrock within the site which is approximately 600 feet east of the Harbor shore and over 1000 feet west of the Bay. The release point is approximately 1000 feet north of the shoreline along the Harbor entrance.

Human health exposure risks have been determined to be low for two reasons: (1) the groundwater is characterized as a non-drinking water source, and (2) the Base Reuse Plan for the site specifies open space/conservation. The only potential human exposure would be during intermittent recreational activities. The results of the Marine ERA and the Phase III RI indicated that there are no site source-related risks to the terrestrial and marine ecological receptors (onsite primary COCs are chlorinated VOCs which are not presenting an ecological risk). This conclusion will be further confirmed during the initial round of Baseline sampling, as discussed in Section 4.1.

The fieldwork related to the multi-phase RI/FS was completed in June 1996. A draft Conceptual LTMP, focusing on mapping of the temporal and spatial characteristics of the plume, was submitted to EPA and RIDEM in May 1997. EPA/RIDEM comments indicated that the monitoring plan should focus mainly on monitoring conditions of the plume along potential discharge points. In response to these comments, the following revised Conceptual LTMP was prepared.

### 3. LTMP Principles

The revised Conceptual LTMP is based on the principles of Data Quality Objectives (DQO), as defined in EPA Guidance, titled: *Data Quality Objectives Process for Superfund*, Interim Final Guidance, EPA540-R-93-071, September 1993. DQO requires that any investigation be planned through a

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<sup>1</sup> Inorganic compounds are not the primary COCs at the site. According to the PP, arsenic was the only inorganic present in groundwater with a potential risk. However, only a single groundwater sample from the Phase I, II, and III RI had arsenic detected above the drinking water MCL. The second, duplicate sample from the same well revealed an arsenic level below MCL. This indicates that consideration of inorganic contaminants as the site primary COC is inappropriate.

series of steps: (1) clarify the study objectives, (2) define the most appropriate type of data to collect, (3) determine the most appropriate conditions under which to collect the data, and (4) establish the quantity and quality of data needed to adequately support the decision process.

The LTMP is proposed to address the monitoring issues related to the discharge area. The risks due to exposures at the source area are independent of risks due to exposures at the discharge area. Therefore, consistent with EPA's DQO, monitoring activities and exit criteria related to the source area and the discharge area will be pursued independently.

The remedy for the source area has been selected as institutional controls and deed restrictions. This remedy is not only protective of human health and the environment, but also offers the only feasible alternative to address the source area groundwater contamination. Groundwater monitoring is not required for ensuring proper implementation of the proposed remedy at the source area. Instead, consistent with the CERCLA process, Navy will continue its periodic inspection of institutional controls as long as the proposed deed restrictions are in effect.

**LTMP Objective:** The main objective of the LTMP is to provide a flexible plan to confirm that the plume is stable at concentrations sufficiently protective of the expected recreational and ecological receptors at the discharge area. The stated objective will be implemented consistent with a number of key factors, including:

- The onsite groundwater plume is more than twenty years old. Given the dynamic nature of the coastal groundwater flow at the site, there is significant advection/mixing in the vicinity of the contaminated groundwater. Considering the volume of water movement and the age of the plume, rapid changes in the extent of the plume and/or undiscovered slug-like plume movements are not plausible. Given the site conditions and the age of the plume, the stability of the onsite groundwater plume has been demonstrated by several investigations and observations, spanning over more than a decade. Data collected during these investigations have shown no significant increasing or decreasing trends.
- National experts, such as U. S. Geological Survey scientists, have stated that a VOC plume in a coastal area usually reaches a stable condition within five years of the initial release (F. Chapelle, *personal communication*, 1996). Therefore, the occurrence of significant increasing trends is highly unlikely.
- LTMP is not a characterization effort, instead it is aimed at confirming the observed stability of the chlorinated VOC groundwater plume along potential discharge areas. Any attempt

to incorporate RI-type sampling (e.g., measurements for model validation) into the LTMP confuses the objective of the investigation, and would be inconsistent with EPA's DQO principles.

- LTMP is a component of the preferred remedy, which includes the long term monitoring of the chlorinated VOC plume. No other constituent has been identified as the site primary COC. Therefore, consistent with the PP, the LTMP focuses mainly on monitoring the chlorinated VOC plume margins along the discharge area. The list of analytes would be adjusted if deemed necessary after the confirmatory and baseline rounds of sampling.

**Appropriate Data:** Due to the confirmatory nature of the LTMP, the sampled medium will be groundwater and interstitial water samples along the shorelines of the site and the interior wetland. All collected samples will be analyzed for the primary COCs.

**Appropriate Condition:** The LTMP focuses primarily on potential discharge points of the plume. Sampling will be conducted at a diminishing frequency to confirm plume stability under various climatic conditions.

**Appropriate Data Coverage:** Given the confirmatory nature of the LTMP, a conservative approach will be pursued. For this purpose, data-needs will be met by focusing on critical locations along the plume discharge points, i.e. the shoreline down-gradient of the disposal sources as well as potential discharge point within the on-site interior wetland. Such an approach will yield conservative (protective), yet focused results to confirm the long-term stability of the plume.

#### 4. LTMP Components

The revised LTMP is composed of the following components.

##### 4.1 Baseline Sampling/Measurements

During the first year, groundwater samples will be collected from the selected wells, as well as the shallow piezometers, as listed below. In addition, at each sampling event, groundwater levels in all existing monitoring wells at the site will be measured to verify realistic contaminant flow direction during various seasons. These rounds of sampling will provide a baseline of information on the seasonal impacts along the critical boundaries of the site.

- 1) **Shoreline Shallow Piezometer Samples:** To assess plume stability along potential discharge areas, hand-driven, temporary piezometer sampling along the shoreline will be conducted during each sampling event. The

piezometers will be installed by hand to a depth of 2 to 5 feet and permitted to stabilize over the ebb tide portion of the tidal cycle. Two probable discharge zones will be targeted: (1) the Entrance Channel cove in the vicinity/south of MW07-21S; and (2) the Harbor cove, west of MW07-10S, as shown in Figure 1. These two coves represent the most likely discharge zones for contamination migrating from the disposal sources. The exact temporary piezometer insertion point within each cove will be based on the visual identification of the location with highest flow seep. For this purpose, a pre-sampling shoreline inspection during the ebb portion of the tidal cycle will be conducted prior to each sampling event. Points with high seep and/or visible seep erosion features will be identified. These locations may vary from season to season. Therefore, the use of a one-time extensive passive sampling for determining potential discharge points is not recommended. Instead, prior to each sampling event, visual inspection will be conducted. This visual inspection procedure appears to be the most flexible and appropriate means for determining critical discharge points during each season.

- 2) **Shallow Well/Interstitial Groundwater Samples:** To assess plume stability in the shallow aquifer, previously identified impacted shallow wells along the site boundary will be sampled. The primary targeted shallow well is MW07-21S, as shown in Figure 1. This well may also serve as the shallow groundwater monitoring well for the interior wetland. Furthermore, a shallow piezometer will be installed along the most eastern portion of the interior (salt marsh) wetland, situated to the east/northeast of MW07-21S. The piezometer will be installed by hand to a depth of 2 to 5 feet.
- 3) **Deep Well Samples:** To assess plume stability in the deep aquifer and to address concerns regarding deep migration and up-welling, a number of deep wells will be sampled. Targeted wells are: MW07-28D, -9D, -11D, -24D, -21D, -23D, -12D, -25D, -22D and a new deep well west of MW07-4D, as shown in Figure 1.
- 4) **Bedrock Well Samples:** To assess plume stability in the bedrock aquifer, and to address concerns regarding bedrock migration and up-welling, a number of bedrock wells along the site shoreline will be sampled. Targeted wells are: MW07-25R, -21R, and -9R.
- 5) **Groundwater Head Measurements:** During the first year of monitoring at each seasonal sampling event, groundwater heads in all existing monitoring wells at the site will be measured to verify realistic contaminant flow direction.

- 6) **Analytes:** During baseline sampling events, collected samples will be analyzed for 1,1,2,2-PCA, TCE and TCE daughter products.
- 7) **Sampling Frequency:** Samples will be collected three times during the first year. Events will correspond with late Spring/early Summer (April/June), Fall (September/October) and Winter (December/January).
- 8) **Confirmatory Sampling:** During the first round of sampling, additional confirmatory analyses will be conducted. This sampling will address concerns regarding the presence of polycyclic aromatic hydrocarbons (PAH), pesticides, and polychlorinated biphenyls (PCB) detected in a sediment sample, previously denoted as Marine Sample V3. A groundwater sample from MW07-23S will be collected during the first round of sampling to determine whether the sediment sampling results can be related to the site groundwater. This sample will be analyzed for PAH, pesticides, and PCB. If any measured contaminant indicates an unacceptable risk to recreational and ecological receptors, it will be incorporated into all subsequent sampling and analysis activities. On the other hand, if these results confirm the RI/FS conclusion that there are no site source-related risks to the terrestrial and marine ecological receptors (site primary COCs are chlorinated VOCs which are not presenting an ecological risk), no further analysis of PAH, pesticide, and PCB will be conducted.

#### 4.2 Post Baseline LTM Decisions

As depicted in Figure 2, an overall assessment of data will be conducted at the end of the baseline sampling events in order to fine-tune the proposed monitoring activities. The first year of data will provide a baseline of information on the seasonal fluctuations of COCs at critical points at the site. As noted before, the onsite groundwater plume is expected to have reached a stable condition. Therefore, the baseline data, in conjunction with RI/FS/ERA data, will provide an adequate basis to assess COC concentration stability.

Based on the analysis of the collected LTMP data, as well as previously compiled RI/FS/ERA information, the features of post-baseline monitoring activities will be determined, including:

- 1) **Critical Season:** Available data will be analyzed in order to determine the season when the site primary COCs have the highest potential for adverse impact along the potential discharge points. If the existence of such a critical season is confirmed, subsequent measurements will be conducted during that season. If no discernable seasonal pattern is noted, subsequent annual sampling can be conducted during any season.

- 2) **LTM Wells and Piezometers:** Available chemical and hydraulic data will be analyzed in order to identify the wells and piezometers which are located along the potential discharge pathways of the plume. These wells and piezometers will subsequently be referred to as LTM (Long Term Monitoring) wells and piezometers. Wells that are neither down-gradient of the disposal source locations, nor up-gradient of discharge points will be eliminated from the sampling program.
- 3) **LTM Wells Grouping:** Based on hydraulic data, LTM wells will be divided into groups, with each group characterized as up-gradient wells of one of the probable discharge coves.
- 4) **Analysis of Climatic Data:** Climatic data will be collected and analyzed in order to assess whether the baseline period is anomalous. An anomalous period is defined as such a period where two or more consecutive measured monthly precipitation and temperature values exceed their corresponding long-term monthly average values by two standard deviations or more, respectively. If the period is proved to be climatically anomalous, another round of seasonal sampling will be performed.

#### **4.3 Shoreline Threshold Criteria**

During post-baseline monitoring, certain sampling decisions will be made based on the comparison of measured COC values at the shoreline piezometers versus their corresponding threshold levels. The outcome of these comparisons (defined as exceedance or no-exceedance, respectively) will determine the appropriate decision or contingency plan to pursue, as depicted in Figure 2.

The threshold level for primary COCs is defined at the shallow shoreline piezometers, which are closest to potential discharge points to sediment/surface water. The threshold level are established based on consideration of potential ecological receptors and a realistic, site-specific, recreational exposure scenario protective of human health.

The risk-based threshold protective of human health considers dermal exposure to surface water during wading and will be consistent with the Site 07 Human Health Risk Assessment performed by EA Engineering. The ecological threshold levels will be based upon the EPA Region I 1993 Eco Risk Screening Tables<sup>2</sup>. For conservatism, the more stringent of the human health or ecological value will be selected as the threshold level for comparison to the shallow piezometer data.

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<sup>2</sup> Environmental Services Assistance Team (ESAT), TID No. 01-9305-48, *Eco Risk Screening Tables: Soils, Sediments and Surface Water*, June 10, 1993.

The following table lists the shoreline threshold values for the key primary COCs.

Constituent	Human Health <sup>3</sup> (ppm)	Region I Eco <sup>4</sup> (ppm)	Selected Shoreline Threshold Value (ppm)
TCE	4.7	21.9	4.7
1,1,2,2-PCA	5.0	2.4	2.4
1,2-DCE	11.1	11.6	11.1

The use of such threshold values is highly conservative due to the fact that the impact of mixing and dilution is ignored. Given the significance of tidal-induced mixing along the shoreline of the site, ignoring such processes yields highly conservative threshold levels, protective of the expected recreational and ecological receptors.

#### 4.4 Post Baseline Monitoring

Subsequent sampling and analysis of LTM wells and the piezometers samples will be conducted once a year during the critical season. LTMP elements during the post-baseline period are described below and depicted in Figure 2.

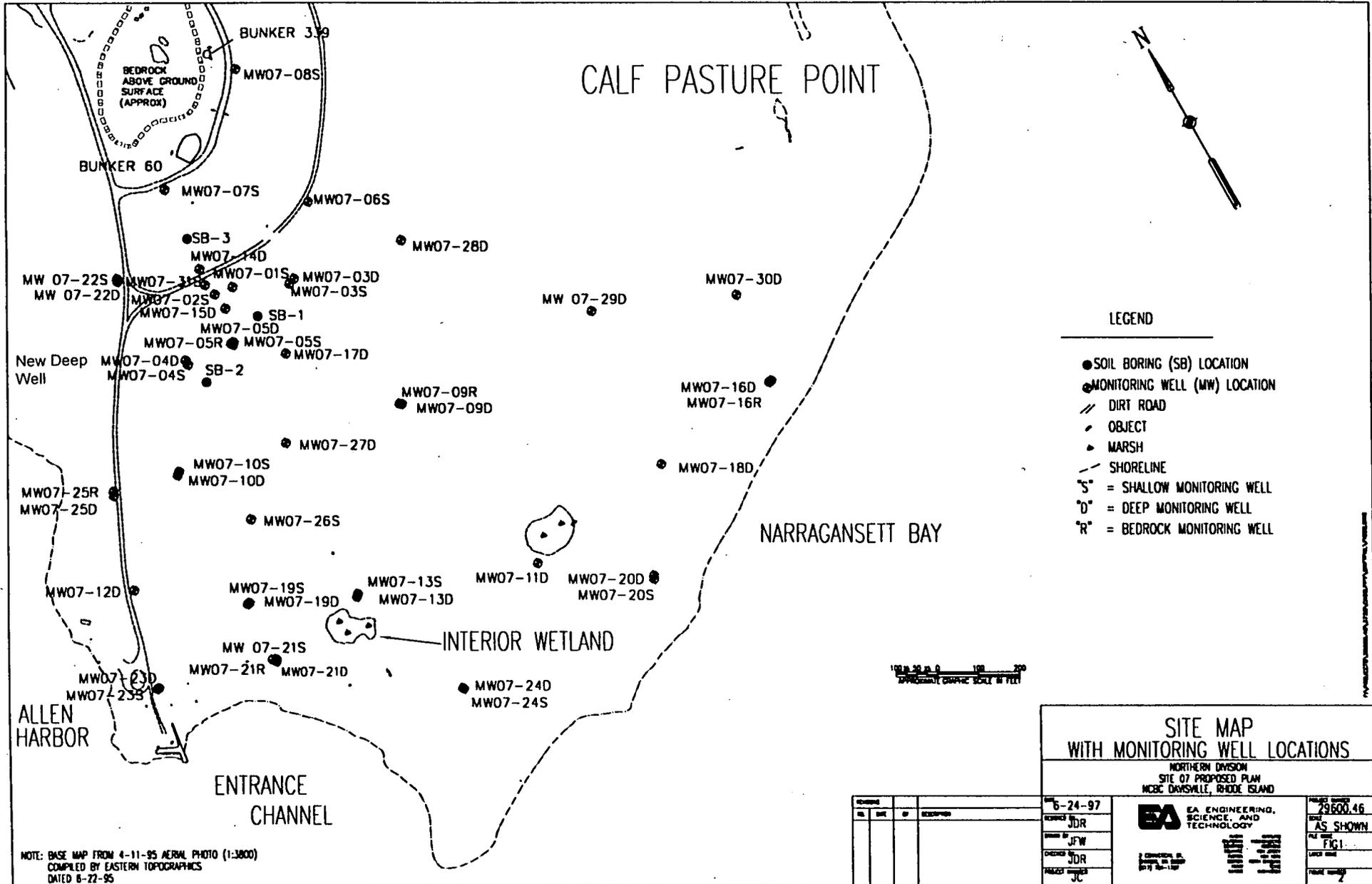
- 1) **Repeat of Seasonal Sampling:** The repeat of another round of seasonal sampling will be dependent on an anomalous climatic condition during the baseline sampling. For this purpose, climatic data will be collected and analyzed in order to assess whether the baseline period is anomalous. If the period is proved to be climatically anomalous, another round of seasonal sampling will be performed.
  
- 2) **Activation of Remedial Contingencies:** Consistent with DQO, the LTMP includes contingencies for potential outcomes. For example, activation of remedial contingencies is dependent on the occurrence of exceedances. An exceedance is defined as a condition in which the COC concentration in a shallow piezometer sample exceeds the shoreline threshold level. As depicted in Figure 2, if two consecutive annual exceedances occur, and if deemed appropriate, the following tasks will be considered: (a) sampling from existing up gradient shallow, deep and bedrock wells at the site in order to determine the location of the source of the exceedance, (b) performing a risk assessment of detected exceedances, and/or (3) identifying and implementing an appropriate, focused remedial activity.

<sup>3</sup> Based on dermal contact with surface water during wading exposure scenario.

<sup>4</sup> Environmental Services Assistance Team (ESAT), TID No. 01-9305-48, *Eco Risk Screening Tables: Soils, Sediments and Surface Water*, June 10, 1993.

- 3) **LTMP Scale Down:** The LTMP annual sampling will continue, unless in two consecutive annual sampling events, no exceedance is reported and the COC concentrations in each well do not show a significant increasing trend.
- 4) **Five-Year Review:** In five years, the LTM wells plus the shallow piezometers will be sampled for final confirmation of the plume stability. If the above criteria are met, annual sampling will be discontinued. In the case of an exceedance of the threshold criteria, annual LTM sampling and associated contingencies (Items 2 and 3) will be re-instituted.
- 5) **Ten-Year Review:** As noted in Section 3, the purpose of the LTMP is to design a sampling plan to ensure protection of the expected recreational and ecological receptors. Therefore, five years after the first five-year review, another round of sampling of the LTM wells and shallow piezometers will be conducted. If the above criteria are met, no further sampling will be pursued. In the case of an exceedance of the threshold criteria, annual LTM sampling and associated contingencies (Items 2 through 4) will be re-instituted.

FIGURE 1  
SITE MAP



SITE MAP WITH MONITORING WELL LOCATIONS			
NORTHERN DIVISION SITE 07 PROPOSED PLAN MCBC DAYSVILLE, RHODE ISLAND			
DATE: 6-24-97	PROJECT NUMBER: 29600.46	DRAWN BY: JDR	
DESIGNED BY: JFW	SCALE: AS SHOWN	CHECKED BY: JDR	
APPROVED BY: JDR	FIGURE: FIG. 1	PROJECT NUMBER: JC	

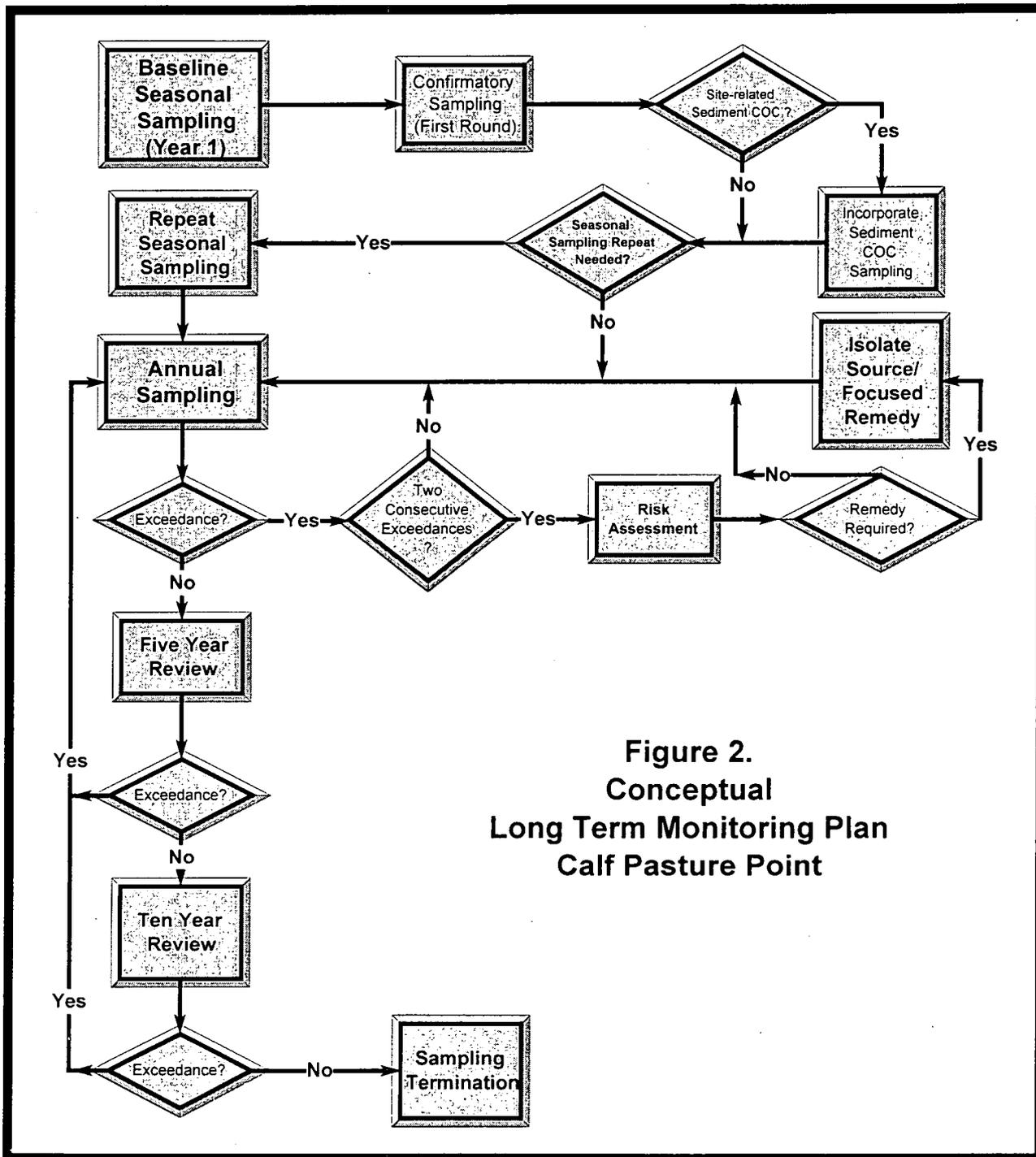


Figure 2.  
 Conceptual  
 Long Term Monitoring Plan  
 Calf Pasture Point

**Response to EPA/RIDEM Comments**  
**on**  
**Draft Conceptual Long Term Monitoring Plan**  
**Site 7 Calf Pasture Point**  
**Former Naval Construction Battalion Center, Davisville, RI**

**November 5, 1997**

**INTRODUCTION**

A Draft Conceptual Long Term Monitoring Plan (CLTMP) was prepared for Site 07, Calf Pasture Point (the "site"). The site is a peninsula located on the northeastern portion of the former Naval Construction Battalion Center (NCBC) Davisville (the "Base"). The CLTMP was presented to The U.S. Environmental Protection Agency (EPA) Region I and the Rhode Island Department of Environmental Management (RIDEM) on July 22, 1997.

Subsequently, EPA and RIDEM submitted their comments on September 5 and September 9, 1997, respectively. The following provides Navy's response to the EPA and RIDEM comments. To facilitate the review process, all comments have been enumerated.

**RESPONSE TO EPA GENERAL COMMENTS**

***EPA General Comment A:** The Navy presented a revised Conceptual Long Term Monitoring Plan (CLTMP) at meeting on July 22, 1997 that may address many of our concerns with this site. However, the proposed draft CLTMP does not address exit criteria based on the CERCLA process. Monitoring must be continued as long as there is a risk to human health and the environment posed by the contamination at any part of the site. EPA cannot agree to cease all monitoring based solely on a lack of risks at the discharge points, since risks due to exposures from the source area are independent of the risks due to exposures at the discharge area. Risks from across the site, both the source area and the discharge area, must be reduced to acceptable levels in order to cease all monitoring.*

**Response:** Navy agrees with EPA that the risks due to exposures at the source area are independent of risks due to exposures at the discharge area. Therefore, consistent with EPA's Data Quality Objectives (DQO) principles, monitoring activities and exit criteria related to the source area and the discharge area will be independent.

The remedy for the source area has been selected as institutional controls and deed restrictions. Therefore, the monitoring activity will be aimed at ensuring the proper implementation of the imposed restrictions. Consistent with the CERCLA process, Navy will continue its monitoring (periodic inspection) of institutional controls as long as the proposed deed restrictions are in effect.

The objective of the CLTMP is therefore clarified as: "to provide a flexible plan to confirm that the plume is stable at concentrations sufficiently protective of the expected recreational and ecological receptors at the discharge area." Consequently, CLTMP exit criteria are established based on monitoring results along the discharge area. This implies that when the absence of unacceptable risk due to exposures at the discharge area is confirmed, CLTMP monitoring activities can cease.

***EPA General Comment B:*** EPA agrees with the statement on page 4 that the Entrance Channel Cove and the Harbor Cove are the most likely discharge zones for contamination migrating from disposal sources and are the shoreline areas that should be targeted for the monitoring of discharge zones at this time. However, the proposed approach must also include the monitoring of the source area to ensure that the Source is depleting over time and the contamination does not migrate any further to the east down the bedrock slope.

**Response:** The source area monitoring activities will be focused on ensuring the implementation and effectiveness of the proposed remedy, i.e. institutional controls and deed restrictions. This remedy is not only protective of human health and the environment, but also offers the only feasible alternative to address the source area groundwater contamination. Groundwater monitoring is not required for ensuring proper implementation of the proposed remedy at the source area. Instead, consistent with the CERCLA process, Navy will continue its periodic inspection of institutional controls as long as the proposed deed restrictions are in effect.

As stated by EPA, the risks due to exposures at the source area are independent of the risks due to exposures at the discharge area. Thus, their corresponding monitoring efforts will be pursued independently. Commingling of different, independent objectives in a monitoring plan diminishes its focus and is inconsistent with EPA's DQO principles.

***EPA General Comment C-1:*** If one of the goals of monitoring is to determine water-quality trends or confirm stability, it will be difficult to interpret the data if well locations change during each sampling period.

**Response:** The majority of CLTMP data will be derived from stationary wells. Along the shoreline, however, due to its variable dynamic condition, temporary shallow piezometers are proposed. When considering the potential relocation of discharge points from season to season, the proposed approach appears to be superior to the fixed-location sampling. If subsequent data indicate that such relocations are not occurring, then a fixed sampling approach will be pursued.

***EPA General Comment C-2:*** The proposal calls for placement of shallow wells in seep areas that appear during the ebb-tide cycle. The seep areas may represent groundwater discharge zones or, more likely, they may simply reflect discharge points for seawater that recharged the local system during the previous high-tide cycle or cycles. Discharge areas for contaminated groundwater may not correlate with the seep water. If this approach is used, some measurements are needed to demonstrate that contaminated ground water discharges in the seep areas.

**Response:** The suggested "measurements to demonstrate that contaminated groundwater discharges in the seep area" are not warranted due to the following facts:

1. Previous investigations, including the three-part Risk Assessment Pilot Study (RAPS), the site Remedial Investigation (RI), and the Marine Ecological Risk Assessment (ERA) have consistently demonstrated that the site contaminated groundwater does not pose an unacceptable risk along the discharge area.
2. The seep areas are the only conduits along the discharge area which may pose unacceptable acute risks. As demonstrated by previous investigations, even these conduits have not posed unacceptable long-term risks.
3. Sampling of seep water is proposed in order to provide a conservative means to identify and protect against unacceptable acute risks to the expected recreational and ecological receptors.
4. The location of seep areas can be identified through pre-sampling inspections. Such an approach is superior to fixed-location sampling, when considering the fact that these locations can vary from season to season.

***EPA General Comment C-3:*** *Shallow wells only 2 to 5 feet deep may encounter ground water that is largely recharged locally and may miss the most contaminated horizon(s). It is reasonable to formulate a monitoring program that targets ground water that has the highest concentrations of contaminants.*

**Response:** The CLTMP permanent shallow, deep and bedrock wells (along plume margins, up-gradient of the discharge areas) are specifically selected in order to ensure that no critical zone is missed. The shallow piezometer monitoring along the shorelines further protects the recreational and ecological receptors against acute risks.

***EPA General Comment C-4:*** *The use of risk based criteria for exit criteria only will not be appropriate at this site. The cited risk assessment for currently evaluated swimming/wading scenarios showed no risk, we agree this is the current conditions at the site and therefore are in agreement to present the public with the Navy's proposed plan for long term monitoring and deed restrictions. Risk-based criteria must be based on the scenarios and assumptions used in the RI's risk assessment. If the basis of the criteria is different from the RI (i.e., depth specific assumptions & different exposure scenario), then the Navy should submit a supplemental risk assessment using the new exposure assumptions. A new risk assessment would not change the fact that groundwater at the high plume concentrations used for drinking or showering shows unacceptable risk which is the basis for the need for action at this site.*

**Response:** The above comment is noted. The proposed CLTMP not only uses risk-based criteria, but also relies on periodic confirmation of the no-risk condition for at least 10 years. Given the age of the plume, this minimum-10-year confirmation

period provides an adequate means for the protection of the expected recreational and ecological receptors.

Further, current data indicate that the groundwater discharge at the site does not pose any risk to the expected recreational and ecological receptors. Under such a condition, demonstration of the reduction of risk is neither relevant, nor feasible. Instead, upon confirmation of the no-risk condition along the discharge area, CLTMP monitoring activities can cease. For this purpose, supplemental risk assessments would be submitted, if deemed necessary.

***EPA General Comment C-5: The Performance criteria should be a comparison of LTM data against existing data (which represent current conditions), which would then trigger a risk assessment (with the same exposure scenarios used in the RI) to determine whether the risks due to exposure to groundwater have been reduced due to the reduction in groundwater plume concentrations or have increased due to increases in groundwater concentration, in tidal discharge zones.***

**Response:** The above comment is noted. The revised CLTMP is modified by incorporating a risk assessment "node" within the CLTMP decision flow diagram.

***EPA General Comment C-6: Exit criteria should be based on the demonstrated reduction of the source area concentrations, plume stability and the reduction of risk due to groundwater exposures.***

**Response:** As noted in Response to Comments A and B, Navy agrees with EPA that the risks due to exposures at the source area are independent of the risks due to exposures at the discharge area. Therefore, consistent with EPA's DQO principles, monitoring activities and exit criteria related to the source area and the discharge area will be independent.

The monitoring activities at the source area and their exit criteria will be aimed at ensuring the proper implementation of the imposed restrictions. This alternative is not only protective of human health and the environment, but also offers the only feasible alternative to address the source area groundwater contamination. Groundwater monitoring is not required for ensuring proper implementation of the proposed remedy at the source area. Instead, consistent with the CERCLA process, Navy will continue its periodic inspection of institutional controls as long as the proposed deed restrictions are in effect.

The CLTMP exit criteria, on the other hand, are related to monitoring activities along the discharge area. Current data indicate that the groundwater discharge at the site does not pose any risk to the expected recreational and ecological receptors. Under such a condition, demonstration of "the reduction of risk" is neither relevant nor feasible. Instead, upon confirmation of the no-risk condition along the discharge area, CLTMP monitoring activities can cease.

***EPA General Comment D: Below is an alternative plan for monitoring ground-water quality at the Entrance Channel Cove and the Harbor Cove. This alternative plan will accomplish the main objective of "confirming that the plume is stable at concentrations sufficiently protective of the expected recreational and ecological receptors."***

*Other benefits of the plan include:*

- 1. Define variations in groundwater, flow patterns with climatic conditions, which may affect interpretation of water-quality trends.*
- 2. Provide the information needed to assess fluxes of contaminants to the harbor.*
- 3. Determine attenuation near the shoreline along principal flow lines.*

*Note: This plan will not be able to determine if the source area plume concentrations are reducing due to natural attenuation. Source area reduction of such a quantity to demonstrate acceptable risk and therefore removal of deed restrictions will need to be demonstrated in order to exit the monitoring program.*

*Elements of the alternative plan for monitoring in the agreed to suspected current discharge zones are as follows:*

- 1. Install permanent monitoring wells at two depths in four locations along the shore: two locations downgradient from the MW07-25 nest and two locations downgradient from the MW07-21 nest. Smaller diameter wells could be installed manually if access by a drilling rig is a problem. However, a conventional 2-inch PVC well is preferred in the event that logging or aquifer tests are needed in the future. It may be to the Navy's advantage to log the borings before setting well screens to determine the most appropriate zone(s) for sampling.*
- 2. Place the two nests so a triangle is formed to define hydraulic gradients and directions of ground-water flow. One nest at each location should be along a flow line from an existing well, as determined from available water-level data, to evaluate attenuation properties. The second well nest should be offset at the shoreline to form the triangle, preferably in the direction of the most contaminated ground water as estimated from available plume maps. The proposed well cluster at MW07-32 could serve as an offset cluster at the Harbor Cove location.*
- 3. Install one well in each nest to target the most contaminated horizon in surficial materials, estimated from available water-quality data and borehole geophysical logs in existing wells. The second well could be either deeper or shallower, depending on the depth of the most contaminated horizon, to confirm that the most contaminated horizon was encountered by the first well and that the vertical distribution of contaminated water does not change in the future. The second well would logically be deeper at the MW07-21 location because the plume is relatively shallow and shallower at the MW07-25 location because the plume is deep.*
- 4. A similar 3-nest array would be appropriate at the inland wetland locations, using the existing MW07-13 and MW07-19 nest locations as one point of the additional nest triangles.*

**Response:** The above alternative is noted and appreciated. However, the implementation of the proposed alternatives poses a number of planning and technical problems, as listed below:

1. Due to the highly diurnal variations in groundwater flow along the shoreline, it is very unlikely that a single reading from a triangular group of wells on a given day "defines variations in groundwater flow patterns with climatic conditions."

2. The objective of CLTMP is to confirm the plume stability - not to determine groundwater flow conditions along the shoreline. Incorporation of such auxiliary objectives confuses the planning process and is inconsistent with EPA's DQO principles.
3. It is not clear how sampling from triangular groups of wells provides "the information needed" to assess flux contaminants and attenuation factors. This is rather confusing when considering EPA's other comments, such as Specific Comment to "Section 4.2: Post Baseline LTM Decisions, (4) COC Attenuation Factor." This comment clearly indicates that EPA views the direct use of data from a series of wells as an inadequate approach for determining attenuation factors.
4. Ensuring the integrity and maintenance of permanent wells in a tidal zone is impracticable. This problem becomes even more complicated when considering the impact of winter ice or the potential cross contamination among the proposed clustered wells as flow direction varies diurnally.

The monitoring of groundwater at the interior wetland is further discussed in Response to EPA Specific Comments 6 and 10.

***EPA General Comment E:*** *The plan does not include a discussion of the statistical tests that will be used to define trends nor the number of samples that will be needed to apply appropriate statistical tests. These decisions must be made during finalization of the LTMP.*

**Response:** The CLTMP objective is to confirm the plume stability. This plan is not aimed at statistical assessment of trends. Therefore, at this stage, any discussion about the appropriate statistical test is premature. This issue will be revisited during the final development of the LTMP, if deemed necessary.

***EPA General Comment F:*** *If wells are sampled only once a year after the second or third 5-year review, part of the plan should include maintenance and periodic (quarterly) checks on the integrity of the wells. Many things can happen to a well over a 1-year period.*

**Response:** Navy agrees with the above comment. The Long Term Monitoring Plan (LTMP) shall include provisions for the maintenance of permanent wells.

***EPA General Comment G:*** *The use of simple attenuation factors for calculating threshold values is unacceptable for this site due to the complex hydro-geological conditions.*

**Response:** The above comment is noted. In the revised CLTMP, attenuation factors are not used.

## RESPONSE TO EPA SPECIFIC COMMENTS

**EPA Specific Comment 1 (Section 2, Site Background, Page 2, paragraph 2):** *It is unclear from the Navy's discussion whether or not inorganics are to be included in the list of analytical parameters in "baseline" as well as subsequent LTMP sampling rounds. Potential site-related risks to terrestrial and marine ecological receptors as well as human exposure could result from inorganic contamination in ground water, surface water, as well as sediment. It is inappropriate to screen out inorganics at this time due to incomplete data, particularly ground water and sediment data from the principle ground water discharge areas to be identified during the implementation of the LTMP. In fact, a clear goal of the current LTMP is to establish representative sampling locations for ground water discharge. Until these locations are confirmed, true impacts to ground water, adjacent surface water, and sediment cannot be assessed. The LTMP needs to be revised to clearly address and specify sediment sampling in areas to determined to be ground water discharge zones. Inorganics need to be added to the analysis list.*

**Response:** The Proposed Plan (PP) clearly identifies site primary contaminants of concern (PCOCs) as chlorinated volatile organic compounds (CVOCs). In fact, the PP proposes the LTMP in order to monitor of the CVOC plume which is attributed to the past Decontaminating Agent Non-Corrosive (DANC) releases.

Inorganic compounds are not site PCOCs. According to the PP, arsenic was the only inorganic present in groundwater with a potential risk. However, only a single groundwater sample from the Phase I, II, and III RI had arsenic detected above the drinking water MCL. The second, duplicate sample from the same well revealed an arsenic level below MCL. This clearly indicates that consideration of inorganic contaminants as the site PCOCs is inappropriate. Consequently, the CLTMP which is a component of the PP, focuses only on CVOCs.

Furthermore, numerous investigations, including three-part Risk Assessment Pilot Study (RAPS), the site Remedial Investigation (RI), and the Marine Ecological Risk Assessment (ERA) have demonstrated that Harbor sediments are not impacted by the site contaminants of concern (COCs). Given these facts, at this stage, sediment sampling and/or analysis for non-PCOCs are beyond the scope of the CLTMP objective. Incorporation of such auxiliary objectives is inconsistent with EPA's DQO principles, and thus, must be avoided.

**EPA Specific Comment 2 (Section 3, LTMP Principles, LTMP Objectives, Page 3, 1st bullet):** *This bullet states that the stability of the groundwater plume has been confirmed through several investigations with results showing "no increasing or decreasing trends." This statement infers a conclusion based on a substantial data set of analytical results, specifically with regard to groundwater analyses. In fact, many of the wells, especially along the shoreline and the perimeter of the plume have only been sampled once. The wells along the edge of the plume are better situated to evaluate trends in contamination and determine whether the plume is in a stable state. This statement should be modified to be less definitive and be more representative of the data collected to date.*

**Response:** The above comment is noted. The statement in the CLTMP clearly indicates that the plume age, the site hydraulic condition, and the site data have collectively demonstrated the plume stability. To further highlight this, the bullet item is revised as: "Given the site conditions and the age of the plume, the stability of the onsite groundwater plume has been demonstrated by several investigations and observations, spanning over more than a decade."

***EPA Specific Comment 3 (Section 3, LTMP Principles, LTMP Objectives, Page 3, last, bullet):*** *It is acknowledged by all parties that further refinement of the monitoring network which will support the LTMP is needed. This additional level of detail, although not a "characterization effort" in the sense mentioned here by the Navy, nonetheless will require additional intrusive work leading to establishment/confirmation of appropriate locations for monitoring ground water discharge to surface water.*

**Response:** As repeatedly stated by EPA (e.g., EPA comment on the site modeling efforts dated July 31, 1997, and EPA Specific Comment to "Section 4.2: Post Baseline LTM Decisions, (4) COC Attenuation Factor"), the site shoreline has a very complex hydrogeological condition. Therefore, any series of one-time, intrusive or non-intrusive, measurements, provides only partial information about the hydraulic condition at the exact hour of those measurements. Recognizing this major limitation, the CLTMP avoids redundant measurements, and instead focuses on locations that can pose acute risks. This approach is flexible, yet provides a conservative means for protection of the expected recreational and ecological receptors.

***EPA Specific Comment 4 (Page 3, Appropriate Data):*** *Sediment sampling needs to be added to the LTMP, coincident with the sample locations and frequencies specified for "ground water and interstitial water samples along the site shoreline". Inorganics need to be added in this context.*

**Response:** As noted above, the Proposed Plan (PP) clearly identifies CVOCs as the site PCOCs. The CLTMP is a component of the PP, and thus, focuses on the site PCOCs. Furthermore, numerous investigations, including the three-part Risk Assessment Pilot Study (RAPS), the site Remedial Investigation (RI), and the Marine Ecological Risk Assessment (ERA) have demonstrated that Harbor sediments are not impacted by the site COCs. Given these facts, at this stage, sediment sampling is beyond the scope of the CLTMP objective. Incorporation of auxiliary objectives, such as sediment sampling and/or non-PCOC analysis, is inconsistent with EPA's DQO principles, and thus, are avoided in the CLTMP.

***EPA Specific Comment 5 (Section 4.1 Baseline Sampling/Measurements, (1) Shoreline Shallow Piezometer Samples, Page 4):*** *This section states trial shallow piezometers will be installed in areas to depths between 2 to 5 feet. (See general concerns above with sampling location changes and use of permanent well locations.) This section does not indicate a minimum number of piezometers to be installed and sampled. Because of the variability of the geology at the site, the lack of plume characteristics in these two areas (western shoreline and southern shoreline), and since future monitoring, to a large extent, will be based on the monitoring results, it is recommended that a minimum of three*

*piezometers in each area be installed and sampled as part of the baseline monitoring. This number is based on the information available at the site, the number of permanent wells sampled may change based on additional site specific information gathered during the LTM.*

*A screening approach is strongly recommended prior to the installation of the permanent piezometers or wells. For example, numerous hand augers/borings should be installed near the intended location in order to screen (with field GC or PID) for any discreet contamination horizon.*

*Unless GC or PID readings indicate a discreet contaminant horizon in the upper sediments, the piezometer/well samples should be collected at deeper depths so as to minimize effects of dilution from any rain event or interaction with harbor surface water recharge which may mask the plume characteristics. (See concerns about the possible non-colocation of seeps and contaminated groundwater articulated above.)*

*The "visual inspection" and chemical verification procedures mentioned here and in the proposed CLTMP need to be applied towards collecting sediment samples from the contaminated horizon. Sediment sampling needs to be included regardless of the final "procedures" which are agreed upon. Shallow shoreline piezometer samples will be needed in all key ground water discharge zones for every sampling event*

**Response:** The Navy agrees with the EPA position concerning the complex hydrogeological condition along the shoreline of the site. Therefore, any one-time series of measurements, such as GC or PID readings, provides partial information about the hydraulic condition at the exact hour of those measurements. Recognizing this major limitation, the CLTMP avoids redundant measurements, and instead focuses on locations that can pose acute risk. The exact number of such measurements will be determined based on pre-sampling inspections. This approach is flexible, and yet provides a conservative means for protection of the expected recreational and ecological receptors.

The above comment also states that sampling should be done in a manner "to minimize effects of dilution from any rain event or interaction with the harbor surface water which may mask the plume characteristics." The objective of CLTMP is to provide a realistic assessment of the plume margins. Dilution along the shore line is not a masking effect. In fact, dilution is part of the dynamics of the discharge area which must not be ignored.

Further, as noted above, numerous investigations, including three-part Risk Assessment Pilot Study (RAPS), the site Remedial Investigation (RI), the Marine Ecological Risk Assessment (ERA) have demonstrated that Harbor sediments are not impacted by the site COCs. Given these facts, at this stage, sediment sampling is beyond the scope of the CLTMP objective.

***EPA Specific Comment 6 (Section 4.1 Baseline Sampling/Measurements, (2) Shallow Well Samples, Page 4):*** *The Conceptual LTMP only proposes the collection of one shallow monitoring well as part of the baseline sampling. Because natural attenuation factors alone are not appropriate to calculate threshold criteria for the inner monitoring wells, the*

*importance of monitoring the shoreline points is increased. Therefore, additional shallow monitoring wells should be included as part of the baseline sampling regime to include:*

- *MW07-23S - this well is important because of its location. Shallow groundwater in the area of this well likely discharges to both Allen Harbor to the west and to the entrance channel to the south. Contamination has been detected at significant concentrations in the deep zone. While minimal contamination has been detected in the shallow groundwater (acetone - possible lab contaminant) there is some question (USGS logging data) whether the optimum portion of the shallow zone was monitored.*
- *MW07-13S - this well is situated to potentially identify groundwater contamination entering the inland wetlands from the north. Deep contamination has been confirmed at well location MW07-27D. Evidence suggests that contaminant upwelling from deeper zones is occurring south of this well. (If contaminant upwelling is occurring farther east than confirmed, this well would likely identify the contamination.)*
- *The Conceptual LTMP indicates that a deep well is to be placed west of MW07-04D along the western shoreline. This well should be constructed as a cluster well to monitor shallow, intermediate, and deep zones as proposed in the original Conceptual LTMP (revision dated May 29, 1997). The location of this well cluster should be established with the use of geoprobe/hydroprobe sampling. This well should then be incorporated into the baseline sampling.*
- *The Conceptual LTMP calls for the placement of shallow piezometers east of MW07-19 and MW07-21 to confirm the presence or absence of shallow contamination eastward of these well clusters into the interior wetlands. This sampling is proposed as part of the confirmation sampling. It is strongly recommended that these piezometers and results obtained be used to place/locate permanent well nests for continued sampling, as noted above. The necessity for continued sampling of these wells may be evaluated at the completion of the first 5 year review or as deemed appropriate in the future.*

**Response:** The above suggestions are assessed below.

1. Groundwater samples from MW07-23S and MW07-13S have not contained site COCs at detectable levels. Therefore, at this time, their incorporation into the CLTMP is not warranted. However, subsequent sampling, such as the confirmatory sampling or the interior wetland measurements may yield results that justify the incorporation of these wells into the Long Term Monitoring Plan (LTMP).
2. The depth of the proposed new well has been selected consistent with CVOC plume delineations performed during the RI, which are supported by data from numerous shallow, deep and bedrock wells. Therefore, at this stage, additional cluster wells are not deemed necessary.
3. The Navy agrees with the EPA suggestion for incorporation of a permanent shallow well within the interior wetland. Recent visits by the Navy RPM indicated that the interior wetland covers areas monitored by MW07-19 and MW07-21. Upon accurate delineation of the interior wetland, the CLTMP will be revised, if necessary, in order to ensure the inclusion of monitoring of shallow and interstitial groundwater within the interior wetland.

**EPA Specific Comment 7 (Section 4.1 Baseline Sampling/Measurements, (3) Deep well Samples, Page 5):** *A shallow bedrock well, as well as "a new deep well west of MW07-4D", is needed in this part of the site.*

**Response:** As noted above, the depth of the proposed new well has been selected consistent with CVOC plume delineations performed during the RI, which are supported by data from numerous shallow, deep and bedrock wells. Therefore, at this stage, additional cluster wells are not deemed necessary.

**EPA Specific Comment 8 (Section 4.1 Baseline Sampling/Measurements, (6) Analytes, Page 5):** *This section states that the samples collected will be analyzed for 1,1,2,2-PCA, TCE, and TCE daughter products. Inorganic analyses for arsenic, iron, and manganese as proposed in the original Conceptual LTMP should be included along with other risk drivers such as Tetrachloroethene and 1,1,2-Trichloroethene, in order to provide a more complete picture of the geochemistry at this site.*

**Response:** The site PCOCs have already been determined as chlorinated volatile organic compounds (CVOCs). In fact, the PP proposes the LTMP in order to monitor the CVOC plume which is attributed to the past Decontaminating Agent Non-Corrosive (DANC) releases.

Inorganic compounds are not site PCOCs. According to the PP, arsenic was the only inorganic present in groundwater with a potential unacceptable risk. However, only a single groundwater sample from the Phase I, II, and III RI had arsenic detected above the drinking water MCL. The second, duplicate sample from the same well revealed an arsenic level below MCL. This clearly indicates that consideration of inorganic contaminants as the site PCOCs is inappropriate. Consequently, the CLTMP which is a component of the PP, focuses only on CVOCs.

Further, the CLTMP objective is to confirm the CVOC plume stability. The CLTMP is not aimed at providing "a more complete picture of the geochemistry at the site." Incorporation of auxiliary objectives into the plan diminishes its effectiveness and is inconsistent with EPA's DQO principles.

**EPA Specific Comment 9 (Section 4.1 Baseline Sampling /Measurements, (7) Sampling Frequency, Page 5):** *The baseline sampling event is proposed to consist of three rounds of sampling the first year to establish a critical season for COC discharges. This determination is to be based on one sampling season. An analysis of existing data including hydrographs and weather related data should be performed to correlate with the analytical data. In the event that the baseline sampling does not confirm/verify the presumed critical season, additional evaluation or additional sampling may be required.*

**Response:** The CLTMP decision process includes an assessment of the baseline data for determination of the frequency of subsequent sampling events. The aim of this investigation is to determine whether a critical season exists. If the existence of such a season is confirmed, subsequent measurements will be conducted during that season. Otherwise, subsequent annual sampling can be conducted during any season.

The repeat of another round of seasonal sampling is dependent on an anomalous climatic condition during the baseline sampling. For this purpose, climatic data will be collected and analyzed in order to assess whether the baseline period is anomalous. If the period is proved to be climatically anomalous, another round of seasonal sampling will be performed.

***EPA Specific Comment 10 (Section 4.1 Baseline Sampling/Measurements, (8) Confirmatory Sampling, Page 4):*** *The confirmatory sampling is designed to confirm the presence or absence of contamination near the interior wetland located east of MW07-19 and to attempt to attribute sediment contamination identified in sample V3 collected as part of the Marine Ecological Risk Survey to the site. According to the Conceptual LTMP the continued monitoring of these two areas is dependent on the one-time sampling performed as part of the confirmatory sampling. The confirmatory sampling proposed for the interior wetland includes the placement of a shallow piezometer between MW07-19 and the wetland and a sediment sample from the wetland. Because of the importance of this wetland with regard to ecological risk, the basis for monitoring this location should not be based on a one-time sampling event. Especially, since the potential source of this contamination is suspected of being the area of contaminant discharge located near monitoring wells MW07-19 and MW07-21. It is unclear whether the contamination in this area is in a stable state. Therefore, it is recommended that up to three shallow piezometers/geoprobes be placed between the wetland and MW-19 and groundwater samples collected. These piezometers/geoprobes should be used to locate a permanent groundwater well(s) for continued monitoring. Piezometer "triplet" configurations, as discussed in previous EPA comments, are needed in the MW07-19 nest area as well as the MW07-13 nest area. The wetland sediment and ground water sampling effort needs to add inorganics. The basis for future monitoring can then be reviewed after sufficient data has been collected to verify/establish trends.*

**Response:** The above comment is assessed below.

1. Navy agrees with the EPA suggestion for incorporation of a permanent shallow well within the interior wetland. Recent visits by the Navy RPM indicated that the interior wetland covers areas monitored by MW07-19 and MW07-21. Upon accurate delineation of the interior wetland, the CLTMP will be revised, if necessary, in order to ensure the inclusion of monitoring of shallow and interstitial groundwater within the interior wetland.
2. As noted before, the CLTMP is aimed at the site PCOCs, which are clearly defined and listed in the PP. This is required in order to ensure the consistency of the CLTMP with the PP. In fact, the PP proposes the LTMP in order to monitor the CVOC plume which is attributed to the past Decontaminating Agent Non-Corrosive (DANC) releases.
3. Inorganic compounds are not site PCOCs. According to the PP, arsenic was the only inorganic present in groundwater with a potential risk. However, only a single groundwater sample from the Phase I, II, and III RI had arsenic detected above the drinking water MCL. The second, duplicate sample from the same well revealed an arsenic level below MCL. This clearly indicates that consideration of inorganic contaminants as the site PCOCs is

inappropriate. Consequently, the CLTMP which is a component of the PP, focuses only on CVOCs.

4. The CLTMP objective is to confirm the plume stability. The CLTMP is not aimed at verifying or establishing trends. During the final development of the LTMP, however, appropriate analytical techniques will be considered, if deemed necessary.

***EPA Specific Comment 11 (Section 4.2 Post Baseline LTM Decisions, (1) Critical Season, Page 6):*** As stated above, a presumed critical season should be established based on existing data, then confirmed with the baseline sampling data. If the baseline sampling data does not confirm/validate the presumed critical season, additional seasonal rounds may be required.

**Response:** As noted above, the CLTMP decision process includes an assessment of the baseline data for determination of the frequency of subsequent sampling events. The aim of this investigation is to determine whether a critical season exists. If the existence of such a season is confirmed, subsequent measurements will be conducted during that season. Otherwise, subsequent annual sampling can be conducted during any season.

The repeat of another round of seasonal sampling is dependent on an anomalous climatic condition during the baseline sampling. For this purpose, climatic data will be collected and analyzed in order to assess whether the baseline period is anomalous. If the period is proved to be climatically anomalous, another round of seasonal sampling will be performed.

***EPA Specific Comment 12 (Section 4.2 Post Baseline LTM Decisions, (4) COC Attenuation Factor, Page 6):*** It should be noted that the confirmation of natural attenuation is more complex than the ongoing monitoring program could address. There are at least four basic conditions which must be present to confirm natural attenuation processes are taking place. These include, but are probably not limited to:

1. The points of sampling must be on flow lines from the source.
2. There must be a reduction in contaminant mass.
3. Site geochemistry must assure that conditions are right for reduction including the presence of electron acceptors, state of redox, and other factors.
4. Daughter products of contaminants must be present, perhaps with indicators of mineralization.

At the Calf Pasture Point site, it has been observed that the determination of stable groundwater flow lines is difficult due to the complex hydro-geological conditions such as heterogeneous and discontinuous soil medium, sporadic vertical hydraulic connection, strong, tidal influence, dynamic salt water intrusion, seasonal variation of infiltration rate, and others. In addition, a geochemical investigation has not been performed at the site to demonstrate the natural attenuation. Therefore, a simple calculation of "the ratio of measured contemporaneous concentrations" at the two points will erroneously estimate the attenuation factor, if the attenuation occurs at the site. One can estimate the concentration ratio between any selected two points but the ratio cannot be used to postulate the "natural attenuation factor" without presenting, the minimally required proofs

*shown above. A cursory examination of the site data would not place it among the best candidates for CVOC natural attenuation. The degradation process appears to be stalling at the 1,2-DCE stage possibly due to a lack of a suitable organic substrate.*

**Response:** Considering the potential difficulties in computing attenuation factors, the use of these factors are deleted in the revised CLTMP. However, it must be stated that the Navy does not agree with a number of speculative statements in the above comment.

***EPA Specific Comment 13 (Section 4.3 Threshold Criteria, (1) Shoreline COC Threshold Level, Page 7):*** *Although the proposed procedure for determining the shoreline COC threshold level may be theoretically acceptable, the discussion of risk-based screening levels as presented is too vague for the purpose of this document. Some references that the Navy currently intends to use may be unacceptable to EPA Region I. For example, Region III BTAG Screening levels are referenced, but this source is currently not accepted by Region I ecological risk assessors. The Navy must be more specific about the sources that will be used to obtain both the human health and ecological screening levels, to ensure that these sources are acceptable to Region I. Also, the Navy must address how the screening values will be selected if the screening values cited in different sources are dissimilar.*

*The process described for estimating threshold levels is particularly inappropriate for inorganics in sediment, which may have the potential for accumulation rather than attenuation via dilution and mixing over time. The LTMP needs to address sediment, and particularly this issue, in greater detail.*

**Response:** The appropriate threshold levels will be determined in the LTMP which will be subject to review and approval by EPA Region I and RIDEM. Further, as noted before, issues related to non-PCOCs and Harbor sediment are beyond the scope of the CLTMP. Incorporation of these auxiliary issues is inconsistent with EPA's DQO principles, and will diminish the effectiveness of the CLTMP.

***EPA Comment 14 (Section 4.3 Threshold Criteria, (2) Inland Well COC Threshold Level, Page 7):*** *Inland well COC thresholds were to be based on an "attenuation factor" calculated from shoreline monitoring points. As stated earlier, the use of attenuation factors for this site is not warranted based on the complex heterogeneous, dynamic nature of the site. Therefore, the use of inland monitoring points should only be used for identifying trends in contaminant levels and confirming the stability of the plume.*

**Response:** Considering the potential difficulties in computing attenuation factors, the Navy will delete the use of these factors in the revised CLTMP. Therefore, the inland wells are mainly monitored for confirmation of the plume stability.

***EPA Comment 15 (Section 4.4 Post Baseline Monitoring, Page 7):*** *This section states that continued monitoring of the interior wetlands will be based on the results of the baseline sampling. For reasons stated previously, it is recommended that this location be included in post baseline sampling and evaluated during the first and possibly subsequent 5 year reviews.*

**Response:** Navy agrees with the EPA suggestion for incorporation of a permanent shallow well within the interior wetland. Recent visits by the Navy RPM indicated that the interior wetland covers areas monitored by MW07-19 and MW07-21. Upon accurate delineation of the interior wetland, the CLTMP will be revised, if necessary, in order to ensure the inclusion of monitoring of shallow and interstitial groundwater within the interior wetland.

**EPA Comment 16 (Section 4.4 Post Baseline Monitoring, (2) LTMP Scale Down, Page 8):** *This section states that after two consecutive sampling rounds in which no exceedances or significant increasing trends were identified, sampling can be discontinued. According to this proposed plan, all groundwater monitoring can be stopped after two years. This is not consistent with ensuring protection of human health and the environment, especially in light of the fact that there is unacceptable risk at the source, it is not documented that the entire plume is in a stable state, nor is it consistent with Figure 2 (flow diagram). Figure 2 indicates a minimum of ten years of monitoring.*

*This section is too definitive. It should be stated that after two consecutive years of sampling rounds of no exceedances or significant increasing trends the continued monitoring of individual wells will be evaluated by the BCT. At a minimum, no monitoring well sampling should be discontinued prior to the initial 5 year review. There is an abundance of chlorinated VOCs that could cause a risk if groundwater was ever used for drinking or showering and if any buildings were ever built over the higher concentration areas of the plume. This remedy must be evaluated every 5 years while these risks still exist.*

*It is inappropriate to place inland wetland sampling and arsenic analyses, and for that matter all sediment and inorganic analyses, as "contingent" upon a "snapshot" baseline data assessment. Uncertainties and temporal variability in ground water discharge locations as well as the accumulative potential of inorganics, including arsenic, in sediment are some of the reasons.*

**Response:** The Navy has invested its efforts in developing a CLTMP in order to establish definitive framework against aimless, endless monitoring activities. The Navy's objective is protection of human health and the environment. That is why the decision flow diagram has specific contingencies for corrective measures when exceedances are confirmed. The flow diagram also allows for more frequent sampling, if deemed appropriate. For example, if the baseline period proves to be an anomalous climatic year, seasonal sampling will be repeated for another year. As noted in the CLTMP, regardless of annual sampling results, five-year sampling and analysis reviews will continue for at least ten years.

Consistent with the DQO process, the CLTMP decision rules are formulated prior to collection of data, such that all stakeholders would reach the same conclusions as monitoring results become available. For this purpose, the CLTMP is designed to avoid conflicting rules. For example, in the above comment, EPA first suggests that annual monitoring can be discontinued after two no-exceedance years (subject to the BCT approval). Then EPA immediately issues a demand that: "[a]t a minimum, no monitoring well sampling should be discontinued prior to the initial 5 year

review.” Incorporation of such conflicting rules into the CLTMP is counter-productive and defeats its purpose.

As noted above, Navy agrees with EPA that the risks due to exposures at the source area are independent of the risks due to exposures at the discharge area. Therefore, consistent with EPA’s DQO principles, monitoring activities and exit criteria related to the source area and the discharge area are independent.

The remedy for the source area has been selected as institutional controls and deed restrictions. Therefore, the monitoring activities should be aimed at ensuring the proper implementation of the imposed restrictions. Inspection of institutional controls does not require groundwater monitoring. Instead, consistent with the CERCLA process, Navy will continue its periodic inspection of institutional controls as long as the proposed deed restrictions are in effect.

The above necessitates a further clarification of the CLTMP objectives, as: “to provide a flexible plan to confirm that the plume is stable at concentrations sufficiently protective of the expected recreational and ecological receptors at the discharge area.” Consequently, when the absence of unacceptable risk along the discharge area is confirmed, CLTMP monitoring activities will cease.

Finally, as stated above, issues related to non-PCOCs and Harbor sediment are beyond the scope of the CLTMP. In fact, the PP proposes the LTMP in order to monitor the CVOC plume which is attributed to the past Decontaminating Agent Non-Corrosive (DANC) releases. Inorganic compounds are not site PCOCs. According to the PP, arsenic was the only inorganic present in groundwater with a potential risk. However, only a single groundwater sample from the Phase I, II, and III RI had arsenic detected above the drinking water MCL. The second, duplicate sample from the same well revealed an arsenic level below MCL. This clearly indicates that consideration of inorganic contaminants as the site PCOCs is inappropriate. Consequently, the CLTMP which is a component of the PP, focuses only on CVOCs.

Previous investigations have also demonstrated that Harbor sediments are not impacted by the site COCs. Therefore, incorporation of such auxiliary issues is inconsistent with EPA’s DQO principles.

***EPA Specific Comment 17 (Section 4.4 Post Baseline Monitoring, Activation of Remedial Contingencies, Page 8): Exceedance/activation criteria are needed for sediments, including inorganic COCs in sediment. Criteria must be consistent with the exposures reasonably expected at the site that have been evaluated during the RI.***

**Response:** Previous investigations have demonstrated that Harbor sediments are not impacted by the site COCs. Incorporation of such auxiliary issues is inconsistent with EPA’s DQO principles.

***EPA Specific Comment 18 (Section 4.4 Post Baseline Monitoring, LTMP Scale Down, 5 & 10 yr reviews, Page 8): The LTMP annual sampling must continue after plume stability is confirmed in the discharge zone, as long as the site contamination is high enough that***

*exposures to groundwater necessitate land use and drinking water restrictions. The remedy must be shown to be needed by demonstrating that the contamination still exists at such high levels. Sampling every 5 years may not demonstrate to the public that the plume is effectively being monitored.*

**Response:** As noted above, Navy agrees with EPA that the risks due to exposures at the source area are independent of the risks due to exposures at the discharge area. Therefore, consistent with EPA's DQO principles, monitoring activities and exit criteria related to the source area and the discharge area will be pursued independently.

The remedy for the source area is institutional controls and deed restrictions. Therefore, the monitoring activities should be aimed at ensuring the proper implementation of the imposed restrictions. Inspection of institutional controls does not require groundwater monitoring. Instead, consistent with the CERCLA process, Navy will continue its periodic inspection of institutional controls as long as the proposed deed restrictions are in effect.

The objective of CLTMP is therefore clarified as: "to provide a flexible plan to confirm that the plume is stable at concentrations sufficiently protective of the expected recreational and ecological receptors at the discharge area." Consequently, when the absence of unacceptable risk along the discharge area is confirmed, CLTMP monitoring activities will cease.

***EPA Specific Comment 19 (Figure 2):*** *The Figure needs to be amended so as to provide for inclusion of regular 5 year reviews as specified by the CERCLA process as long as an unacceptable risk remains at the site. A box for "risk assessment" is needed prior to "Isolate Source/focused Remedy. The "Site-related Sediment COC" needs to be evaluated on an ongoing basis (i.e., not on the basis of a sole "confirmatory sampling" round), including inorganics as site related indicators. Sediment sampling at the discharge zones must be performed as part of the annual sampling in order to understand the partitioning of groundwater contaminants up through the sediments from deeper to more shallow zones.*

**Response:** The revised Figure 2 will contain a box for risk assessment prior to the "isolate source/focused remedy." At this stage, given the wealth of information on sediment contamination at Allen Harbor, the proposed one-time confirmatory sampling is adequate. Subsequent measurements, including the confirmatory sampling, may justify additional sediment investigation.

Further, the site PCOCs have already been determined and listed in the PP. The PP proposes the LTMP to monitor the CVOC plume which is attributed to the past Decontaminating Agent Non-Corrosive (DANC) releases. Inorganic compounds are not site PCOCs. According to the PP, arsenic was the only inorganic present in groundwater with a potential risk. However, only a single groundwater sample from the Phase I, II, and III RI had arsenic detected above the drinking water MCL. The second, duplicate sample from the same well revealed an arsenic level below MCL. This clearly indicates that consideration of inorganic contaminants as the site PCOCs is inappropriate. Consequently, the CLTMP which is a component of the PP, focuses only on CVOCs. Incorporation of auxiliary issues, such as analysis of "site

related indicators," not only is inconsistent with EPA's DQO principles, but also generates a LTMP inconsistent with the PP.

## RESPONSE TO RIDEM COMMENTS

***RIDEM Comment 1 (General Comment):*** RIDEM would like the opportunity to review the results of the borings from Allen Harbor prior to agreeing to any specific sampling locations for the long term monitoring plan (LTMP).

**Response:** The above comment is noted.

***RIDEM Comment 2 (Page 3, Section 3, LTMP Principles, Appropriate Condition; Paragraph 1, Sentence 2):*** "Sampling will be conducted at a diminishing frequency to confirm plume stability under various climatic conditions." *It is not stated how the frequency of sampling would be diminished. This should be stated. RIDEM typically requires quarterly sampling for the first two years of monitoring with a reduction in frequency thereafter provided it has been demonstrated that contamination is in check. The reduction in frequency is characteristically followed by semi-annual and then annual sampling. As ample data is collected the frequency of sampling could be further reduced, if justified. Therefore, criteria will need to be developed to determine when sampling frequency can change.*

**Response:** In principle, the Navy agrees with the above comment. Exact procedures for determining the sampling frequency is discussed in the CLTMP and depicted in its attached decision flow diagram.

Furthermore, previous investigations including the Initial Assessment Study (IAS) and Confirmation Study (CS), the three-part Risk Assessment Pilot Study (RAPS), the three-phase Remedial Investigation (RI), the Marine Ecological Risk Assessment (ERA), and the Facility-Wide Freshwater/Terrestrial ERA provide a substantial data base for comparison of results. Therefore, for this site, incorporation of a typical two year sampling period is not necessary.

However, as stated above, the CLTMP decision process includes an assessment of the baseline data for determination of the frequency of subsequent sampling events. The repeat of another round of seasonal sampling is dependent on an anomalous climatic condition during the baseline sampling. For this purpose, climatic data will be collected and analyzed in order to assess whether the baseline period is anomalous. If the period is proved to be climatically anomalous, another round of seasonal sampling will be performed.

***RIDEM Comment 3 (Page 5, Section 4.1, Baseline Sampling/Measurements; Item 7 (Sampling Frequency), Whole Section):*** *This section states that three samples will be taken during the first year. Baseline sampling should take place over a two year period to provide a comparison of results from the previous year in the event of an abnormal season (ideally three years of data should be obtained).*

**Response:** As noted above, previous investigations including the Initial Assessment Study (IAS) and Confirmation Study (CS), the three-part Risk Assessment Pilot Study (RAPS), the three-phase Remedial Investigation (RI), the Marine Ecological Risk Assessment (ERA), and the Facility-Wide Freshwater/Terrestrial ERA provide a substantial data base for comparison of results. Therefore, for this site, incorporation of a typical two year sampling period is not necessary.

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***RIDEM Comment 4 (Page 5, Section 4.1, Baseline Sampling/Measurements; Item 8 (Confirmatory Sampling), Sentence 3):*** This sentence indicates that one hand driven piezometer will be placed in the inland wetland. A minimum of three piezometers should be placed within this wetland, one at the eastern end, the second at the western end, and the third somewhere in the middle.

**Response:** In principle, Navy agrees with the RIDEM and EPA suggestion for incorporation of a permanent shallow well within the interior wetland. Recent visits by the Navy RPM indicated that the interior wetland covers areas monitored by MW07-19 and MW07-21. Upon accurate delineation of the interior wetland, the CLTMP will be revised, if necessary, in order to ensure the inclusion of monitoring of shallow and interstitial groundwater within the interior wetland.

***RIDEM Comment 5 (Page 6, Section 4.2, Post Baseline LTM Decisions; Paragraph 1, Sentence 2):*** "The first year of data will provide a baseline of information on the seasonal fluctuations of COC at critical points of the site." As noted in comment #3 RIDEM feels, that at a minimum, two years worth of seasonal data should be collected and ideally three years of data should be obtained to account for any abnormalities in any of the seasonal data.

**Response:** As noted above, previous investigations including the Initial Assessment Study (IAS) and Confirmation Study (CS), the three-part Risk Assessment Pilot Study (RAPS), the three-phase Remedial Investigation (RI), the Marine Ecological Risk Assessment (ERA), and the Facility-Wide Freshwater/Terrestrial ERA provide a substantial data base for comparison of results. Therefore, for this site, incorporation of a two year sampling period is not necessary.

The CLTMP decision process includes an assessment of the baseline data for determination of the frequency of subsequent sampling events. The repeat of another round of seasonal sampling is dependent on an anomalous climatic condition during the baseline sampling. For this purpose, climatic data will be collected and analyzed in order to assess whether the baseline period is anomalous. If the period is proved to be climatically anomalous, another round of seasonal sampling will be performed.

**RIDEM Comment 6 (Page 7, Section 4.3, Threshold Criteria; Item 2 (inland Well COC Threshold Level), Paragraph 1, Sentence 2):** Please be advised that these attenuation factors should be based on a minimum of two years worth of data as noted in comments 3 and 5.

**Response:** In response to EPA comments, the use of attenuation factors were deleted in the revised CLTMP. For more information, see Response to EPA Specific Comment 14.

**RIDEM Comment 7 (Page 8, Section 4.4, Post Baseline Monitoring; Item 2 (LTMP Scale Down):** "The LTMP annual sampling will continue, unless in two consecutive annual sampling events no exceedances is reported and the COC concentrations in each well do not show a significant increasing trend." Based on the above statement it would appear that sampling could end after two years, This is not acceptable to RIDEM since there is no long term data to support that the plume is stable. Sampling must continue long enough to demonstrate that the plume is stable and no unacceptable risk is present to human health and the environment. As noted in prior comments, the frequency of sampling can be reduced if previous sampling indicates the plume is stable and not posing unacceptable risk.

**Response:** The CLTMP will continue for at least ten years. Regardless of annual sampling results, five year reviews will be conducted. The Navy will continue the proposed forms of monitoring in the discharge area.

The remedy for the source area is institutional control and deed restrictions. Therefore, periodic inspections will ensure the proper implementation of the imposed restrictions. Consistent with the CERCLA process, Navy will continue its monitoring of institutional controls as long as the proposed deed restrictions are in effect.