

6/16/05 - 02435



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CARIBBEAN ENVIRONMENTAL PROTECTION DIVISION
CENTRO EUROPA BUILDING, SUITE 417
1492 PONCE DE LEON AVENUE, STOP 22
SAN JUAN, PR 00907-4127

June 16, 2005

Mr. Jeffrey Harlow
Western Vieques Remedial Project Manager
Installation Restoration Section
Environmental Programs Branch
Environmental Division
Naval Facilities Engineering Command
Code-EV24JH
6506 Hampton Blvd.
Norfolk, VA 23508-1278

Re: Tiered Human Health Screening Approach for Evaluating TPH Contamination in Soil at
the Former Atlantic Fleet Weapons Training Facility

Dear Mr. Harlow:

The U.S. Environmental Protection Agency (EPA) and the Puerto Rico Environmental Quality Board (EQB) agreed on using the enclosed human health screening approach for sites where TPH analysis is conducted to determine the extent of petroleum contamination in soil. The approach incorporates the human health toxicity criteria presented in EPA's new Provisional Peer-Reviewed Toxicity Values document for petroleum.

If you have any questions or comments, please contact me at (787) 741-5201.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Daniel Rodriguez".

Daniel Rodriguez
Remedial Project Manager
Enforcement and Superfund Branch

Enclosure

cc: Yarissa Martinez, EQB, w/ encl.
Felix Lopez, FWS, w/ encl.
Brett Doerr, CH2M Hill, w/encl.

Tiered Human Health Screening Approach for Evaluating TPH Contamination in Soil at the Former Atlantic Fleet Weapons Training Facility

The following human health screening approach has been developed for sites where TPH analysis is conducted to determine the extent of petroleum contamination in soil. This screening approach is used to determine if the concentrations of petroleum detected at a site are below levels of concern. The approach incorporates the human health toxicity criteria presented in EPA's new Provisional Peer-Reviewed Toxicity Values (PPRTVs) document for petroleum. The approach consists of three tiers, where the first tier is considered to be the most conservative method, followed by more flexible, yet conservative methods for conducting screening under Tiers 2 and 3.

This screening approach for petroleum releases in soil assumes that the petroleum releases have been adequately characterized using TPH methods applicable to the type of petroleum product released. This screening approach may be used as sites where TPH analysis of soil samples has been or will be conducted.

Tier 1

Tier 1 consists of comparing the total TPH concentration to the EPA Region 9 PRG for benzene, based on its noncarcinogenic toxic endpoint and assuming only ingestion exposure. The screening criterion is 31 mg/kg, at a hazard quotient of 0.1. The noncarcinogenic toxic endpoint is adverse hematological affects.

Only ingestion exposure is considered due to the historical nature of petroleum releases and the lack of inhalation toxicity criteria. EPA Region 2 recognizes that this is a highly conservative approach as it assumes that TPH is as toxic as its most toxic constituent, benzene. However, this Tier 1 value can be used as a conservative screening criterion without further evaluation of exposure pathways or cumulative effects.

Tier 2

Tier 2 consists of evaluating the systemic effects of the chemicals of potential concern (COPCs) at a site to determine if other chemicals cause adverse hematological effects. If no other COPC causes adverse hematological effects, then the screening criterion for TPH is 310 mg/kg, which is the screening criterion for benzene based on ingestion exposure and a hazard quotient of 1.0. If other COPCs cause adverse hematological effects, then EPA Region 2 may adjust the screening criterion for TPH within the range of 31 mg/kg to 310 mg/kg such that the total hazard index does not exceed 1.0.

Tier 2 allows for flexibility in determining the appropriate TPH screening criterion based on segregating chemicals with different noncarcinogenic effects. This approach is consistent with risk assessment methodology, which allows for the evaluation of toxic endpoints or systems when determining the overall site hazard index. This approach is considered a conservative screening approach as it uses benzene as a surrogate chemical for TPH and ensures that cumulative effects of noncarcinogenic chemicals are below acceptable levels.

Tier 3

Tier 3 consists of separating TPH into appropriate aliphatic and aromatic fractions based on historical knowledge of the type of petroleum release and the use of default aliphatic and aromatic percentages. Massachusetts has guidance on converting a TPH concentration into appropriate aliphatic and aromatic fractions based on the type of petroleum release. This method assumes default percentages for aliphatic and aromatic fractions. These default percentages are presented in the following table.

Table 1. Default Aliphatic and Aromatic Percentages for TPH

Petroleum Product	MADEP Percent Aliphatic	MADEP Percent Aromatic
Gasoline	NA	NA
Diesel #2	40%	60%
#3 to #6 Fuel Oil	30%	70%
Kerosene and Jet Fuel	70%	30%

NA – Not Applicable

For gasoline and other lighter hydrocarbon petroleum products, MADEP does not provide default percentages for TPH since analysis for TPH may result in significant losses of hydrocarbons lighter than C9. If gasoline or jet fuels releases are being investigated, TPH-GRO analysis is a more appropriate analytical method. The sum of the BTEX constituent concentrations constitutes the low molecular weight aromatic fraction. The VOC analytical data, including tentatively identified compound data, should be evaluated to determine the concentration of aromatics that should be assigned to the medium molecular weight aromatic fraction. The concentration that constitutes the low molecular weight aliphatic fraction is the difference between the TPH-GRO concentration and sum of the BTEX and aromatic compounds assigned to the medium weight aromatic fraction. This evaluation will require consultation with a chemist to ensure that the aromatic fraction is determined appropriately.

For diesel and other petroleum products identified in Table 1, the total TPH concentration is separated into percent aliphatic and aromatic fractions based on the default percentages. For example, for a site where the maximum TPH concentration is 1,200 mg/kg (as is the case for TPH data reported to date for AOC E), the TPH concentration consists of 480 mg/kg aliphatics and 720 mg/kg aromatics. These concentrations are compared to the screening criteria derived using the PPRTVs for medium molecular weight aliphatic and aromatic fractions presented in Table 2 below. If the concentrations of aliphatics and aromatics are below the screening criteria, then the concentration of TPH would not be of concern.

If the calculated aliphatic and/or aromatic fractions exceed the screening criteria, then the Navy can propose a method for analyzing the aliphatic and aromatic fractions for EPA review and approval.

The PPRTVs and associated toxic endpoints along with the screening criteria developed using these reference doses are summarized in the following table.

Table 2. Aliphatic and Aromatic Fractions Screening Criteria

Fraction	Reference Dose (mg/kg-day)	Toxic Endpoint	Screening Criteria HQ = 0.1	Screening Criteria HQ = 1
Low Molecular Weight Aliphatics (GRO-Aliphatics)	0.06	Neurotoxicity	470	4700
Low Molecular Weight Aromatics (GRO-Aromatics)	Assess BTEX individually			
Medium Molecular Weight Aliphatics (DRO-Aliphatics)	0.1	Hepatic and hematological changes	780	7800
Medium Molecular Weight Aromatics (DRO-Aromatics)	0.02	Renal, body weight, Hepatic effects	160	1600
High Molecular Weight Aliphatics	2.0	Hepatic effects	16000	160000
High Molecular Weight Aromatics	0.03	Renal, hepatic and hematological effects	230	2300

For the example presented above where the maximum TPH concentration is 1200 mg/kg (and the petroleum product released is diesel), the aliphatic fraction (480 mg/kg) is below a level of concern at a HQ of 0.1. The aromatic fraction (720 mg/kg) is below a level of concern assuming that no other chemical causes the same effects. If other chemicals are present that affect the same endpoints, then the screening criteria for the aromatic fraction would be set at a level between 160 mg/kg and 1600 mg/kg, depending on the number of chemicals present.