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NAVY RESPONSES TO REGULATORY AGENCY COMMENTS ON THE DRAFT OPERABLE UNIT II PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION REPORT NAVAL STATION, TREASURE ISLAND HUNTERS POINT ANNEX SAN FRANCISCO, CALIFORNIA

DEPARTMENT OF THE NAVY
WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA 94066-0727

LIST OF ACRONYMS[a]

AAL	applied action level
AAQCD	Ambient Air Quality Criteria Document
ACL	alternate concentration limit
AF	adherence factor
AL	California action level
ARAR	applicable or relevant and appropriate requirement
ARB	Ambient Resources Board
ASIII	trivalent arsenic
ASP	Air Sampling Plan
ASR	Air Sampling Report
AST	above-ground storage tank
ASTM	American Society for Testing and Materials
ASV	pentavalent arsenic
AT	averaging time
ATc	averaging time for carcinogenic chemicals
ATn	averaging time for noncarcinogenic chemicals
ATSDR	Agency for Toxic Substances and Disease Registry
ATT	Aqua Terra Technologies
AWQC	ambient water quality criterion
BAAQMD	Bay Area Air Quality Management District
BaP	benzo(a)pyrene
BAT	best available technology
BCF	bioconcentration factor
Bdr	soil-to-plant transfer factor for reproductive tissues of plant (dry weight)
Bdv	soil-to-plant transfer factor for vegetative tissues of plant (dry weight)
BES	Battery and Electroplating Shop
bgs	below ground surface
BHC	benzene hexachloride
BSP	Background Sampling Plan
BTEX	benzene, toluene, ethylbenzene, and xylenes
BW	body weight
Bwr	soil-to-plant transfer factor for reproductive tissues of plant (wet weight)
Bwt	composite soil-to-plant transfer factor (wet weight)
Bwv	soil-to-plant transfer factor for vegetative tissues of plant (wet weight)
Ca	concentration in air
CA H&SC	California Health and Safety Code
Cal-EPA	California Environmental Protection Agency
Cal-OSHA	California Occupational Safety and Health Administration
CAS	Chemical Abstract Service
cc	cubic centimeter
CCR	California Code of Regulations (formerly the California Administrative Code)
CCV	continuing calibration verification

a From OU II PHEE report.

LIST OF ACRONYMS[a]
(continued)

CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CF	conversion factor
Cf	concentration in fruits
Cfw	chemical concentration in fresh fruit
CFR	Code of Federal Regulations
cHBL	carcinogenic health-based level
Chromium III	trivalent chromium
Chromium VI	hexavalent chromium
Ci	onsite respirable particulate level (mg/m^3)
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
cm	centimeters
CMAB	Chemical Mixtures Assessment Branch
CN	cyanide
COC	chemical of concern
cPAH	carcinogenic PAH
cPSM	minimum carcinogenic media protection standard
CR	cancer risk
CRAVE	Carcinogen Risk Assessment Verification Endeavor
CRDL	contract-required detection limit
cRfD	chronic reference dose
CRL	certified reporting limit
CrO_4	chromate
Cr_2O_7	dichromate
CRP	Community Relations Plan
CRQL	contract-required quantitation limit
Cs	concentration in soil
Csw	chemical concentration in soil (wet weight)
CT	concentration toxicity (as in CT screen)
CTO	Contract Task Order
Cv	concentration in vegetables
Cvegw	chemical concentration if fresh vegetable
Cw	concentration in groundwater
cy	cubic yard(s)
DA	San Francisco District Attorney
DAF	dermal absorption factor
DCA	dichloroethane
DCE	dichloroethene
DDD	1,1-dichloro-2,2-bis(chlorophenyl)ethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DD-	dichlorodiphenyl- (as in DD- compounds)
DFG	California Department of Fish and Game

LIST OF ACRONYMS[a]
(continued)

DI	data inadequate
DHS	California Department of Health Services (before 7/1/91; now DTSC)
DISA	Draft Initial Screening of Alternatives
dl	deciliter
DO	Delivery Order
DOH	San Francisco Department of Health
DOI	U.S. Department of the Interior
DTSC	Cal-EPA Department of Toxic Substances Control (since 7/1/91; formerly DHS)
DWR	Department of Water Resources
EA	Exposure Assessment
ECAO	EPA Environmental Criteria and Assessment Office
ED	exposure duration
EF	exposure frequency
EFH	Exposure Factor Handbook
EM	electromagnetic
EMCON	EMCON Associates
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
ERM-West	Environmental Resources Management, West (The ERM Group)
ET	exposure time
ESAP	Environmental Sampling and Analysis Plan
FFA	Federal Facilities Agreement
FI	fraction ingested
f_{oc}	fraction of organic carbon in soil
FOD	frequency of detection
f_{oil}	fraction of residual oil in the soil
Frv	ratio of chemical uptake into reproductive tissues of plant to uptake into vegetative tissues of plant
FS	Feasibility Study
ft/day	feet per day
GC/MS	gas chromatography/mass spectrometry
GC/MS/MS	gas chromatography/mass spectrometry/mass spectrometry
gpm	gallon(s) per minute
GPR	ground penetrating radar
g	gram
gs	ground surface
HA	Health Advisory (EPA)
HAD	Health Assessment Document
HBL	health-based level
$HCrO_4$	hydrochromate
HEA	Health Effects Assessment
HEAST	HEA Summary Table
HEEP	Health and Environmental Effects Profile
HI	hazard index

LIST OF ACRONYMS[a]
(continued)

HL	Henry's Law Constant
HLA	Harding Lawson Associates
HMMP	Hazardous Materials Management Plans
HPA	Hunters Point Annex
HpCDD	heptachlorodibenzo-p-dioxins
HpCDF	heptachlorodibenzofurans
HR	hazard ratio
HQ	hazard quotient
HSA	hollow-stem auger
HSP	Health and Safety Plans
HWA	California Health and Welfare Agency
HxCDD	hexachlorodibenzo-p-dioxins
HxCDF	hexachlorodibenzofurans
IAS	Initial Assessment Study
IDL	instrument detection limit
IgR	ingestion rate
IgRf	ingestion rate for fruits
IgRv	ingestion rate for vegetables
InR	inhalation rate
IR	Installation Restoration
IRIS	Integrated Risk Information System
IRM	interim remedial measure
JP-4	jet fuel
JP-5	kerosene
kg	kilogram(s)
K_{oc}	organic-carbon partition coefficient
K_{oil}	residual oil/water partition coefficient
K_{ow}	octanol-water partition coefficient
Kp	permeability constant
l	liter(s)
LMS	linearized multistage model
LOAEL	lowest observed adverse effect level
log Bdv	logarithm of soil-to-plant transfer factor for vegetative tissues of plant (dry weight)
log K_{ow}	logarithm of octanol-water partition coefficient
LUFT	leaking underground fuel tank
LUST	leaking underground storage tank
LVF	fraction of leafy vegetable ingested
m	meter
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MDL	method detection limit
MEK	methyl ethyl ketone or 2-butanone
mg	milligram
MIBK	methyl isobutyl ketone

LIST OF ACRONYMS[a] (continued)

MS	matrix spike
MSA	method of standard additions
MSD	matrix spike duplicate
MSL	mean sea level, as in 176 feet MSL
MW	monitoring well
NA	not analyzed, not available, or not applicable
NAAQ	National Ambient Air Quality Standard
NAAQSP	National Ambient Air Quality Standard - Primary
NAAQSS	National Ambient Air Quality Standard - Secondary
NACIP	Navy Assessment and Control of Installation Pollutants Program
nAL	noncarcinogenic action level
NAPL	nonaqueous phase liquid
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	not detected or nondetect or not determined
NESHAP	National Emission Standard for Hazardous Air Pollutant
ng	nanogram(s)
nHBL	health-based level for noncarcinogen
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no observed adverse effect level
nPAH	noncarcinogenic PAH
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NSRL	no significant risk level
NSTI	Naval Station Treasure Island
NTP	National Toxicological Study
NTU	nephelometric turbidity unit
OAF	oral absorption factor
OCDF	octachlorodibenzofuran
OSHA	U.S. Occupational Safety and Health Administration
OU	Operable Unit
PA	Preliminary Assessment
PAF	pulmonary absorption factor
PAH	polycyclic aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
Pb	lead
PCB	polychlorinated biphenyl
PCE	perchloroethene or tetrachloroethene
PCP	pentachlorophenol
PeCDD	pentachlorodibenzo-p-dioxins
PeCDFs	pentachlorodibenzofurans
PEL	permissible exposure limit
PHEE	Public Health and Environmental Evaluation
PmC	permeability constant

LIST OF ACRONYMS[a] (continued)

POTW	Public Owned Treatment Works
PPE	personal protective equipment
PPY	Pickling and Plate Yard
PQL	practical quantitation limit
PS	protection standard
PRC	PRC Environmental Management, Inc.
PRG	preliminary remediation goal
PVC	polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
QAMS	Quality Assurance Management Section
QAPjP	Quality Assurance Project Plan
QAPP	Quality Assurance Program Plan
QC	quality control
R	retardation factor
RA	risk assessment
RAGS	Risk Assessment Guidance for Superfund
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act of 1976
RCRA cPS mins	Resource Conservation and Recovery Act Carcinogens Protection Standards - Minimums
RCRA nALs	Resource Conservation and Recovery Act Noncarcinogenic Action Levels
RF	remaining fraction of vegetables ingested
Rf	risk factor
RfC	reference concentration
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
RMPP	Risk Management Prevention Plan
ROD	Record of Decision
ROICC	Resident Officer in Charge of Construction
RP	respirable particulate fraction
RPD	relative percent difference
RPM	Remedial Project Manager
Rr	dry-to-wet conversion factor for reproductive tissues of plant
Rs	correction for soil moisture content
RSD	relative standard deviation
Rv	dry-to-wet conversion factor for vegetative tissues of plant
RWQCB	Regional Water Quality Control Board, San Francisco Bay Region
SA	surface area (e.g., of exposed skin)
SAAQ	State Ambient Air Quality Standard
SARA	Superfund Amendments and Reauthorization Act of 1986
SDG	sample delivery group
SDI	subchronic daily intake
SDIn	subchronic daily intake for noncarcinogens
sec	second

LIST OF ACRONYMS[a] (continued)

SF	slope factor
Sf	seasonal factor
SFDCP	San Francisco Department of City Planning
SFDWQ	San Francisco Department of Water Quality
SFM	Summary of Findings Memorandum
SFPOTW	San Francisco Publicly Owned Treatment Works
SI	Site Investigation
SM	soil moisture content
SMCL	secondary maximum contaminant level
SNARL	suggested no adverse response level
SOC	semivolatile organic compound
SOW	Statement of Work
SPCC	spill prevention, control, and countermeasures
SRE	screening risk evaluation
sRfD	subchronic reference dose
SSP	Site Safety Plan
STEL	short-term exposure limit
STLC	soluble threshold limit concentration
SUPSHIP	Navy Office of the Supervisor of Shipbuilding, Conversion and Repair
SWAT	solid waste assessment test
SWMU	Solid Waste Management Unit
T/ac-mo	tons per acre per month
TBC	to be considered (material)
TCA	trichloroethane
TCDD	tetrachlorodibenzo-p-dioxins
TCDFs	tetrachlorodibenzofurans
TCE	trichloroethene or trichloroethylene
TDS	total dissolved solids
tHBL	total health-based level
tHLBc	total health-based level for carcinogens
tHLBn	total health-based level for noncarcinogens
TIC	tentatively identified compound
TF	Tank Farm
TIMP	Tidal Influence Monitoring Plan
TLV	threshold limit value
TOG	total oil and grease
TPH	total petroleum hydrocarbons
TRC	Tracer Research Corporation
Triple A	Triple A Machine Shop
TRPH	total recoverable petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
TTLC	total threshold limit concentration
TWA	time-weighted average
UBK	uptake/biokinetic model

LIST OF ACRONYMS[a]
(continued)

UCL	upper confidence limit
UF	uncertainty factor
UR	unit risk
USC	United States Code
USDA	U.S. Department of Agriculture
USS	United States Steamship
UST	underground storage tank
VOC	volatile organic compound
VP	vapor pressure
WESTEC	WESTEC Services, Inc.
WESTDIV	Western Division, Naval Facilities Engineering Command
WOE	weight of evidence
WQC	water quality criterion
WQS	water quality standard
WWII	World War II
μg	microgram(s)
%D	percent difference
%R	percent recovery
%RSD	percent relative standard deviation

NAVY RESPONSES TO REGULATORY AGENCY COMMENTS ON THE DRAFT OPERABLE UNIT II PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION REPORT

The following are the Navy's responses to the comments of the regulatory agencies on the *Draft Operable Unit (OU) II Public Health and Environmental Evaluation (PHEE) Report, Naval Station, Treasure Island, Hunters Point Annex, San Francisco, California,* dated August 12, 1992. The first and second sections contain the comments of the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) and the Navy's response to each. The first section's comments are from the Region 2 Site Mitigation Department, the second from the Human and Ecological Research Section (HERS). The third section contains the comments of the U.S. Environmental Protection Agency (EPA), which were prepared by ICF Technologies, Inc., under contract to Bechtel Environmental, Inc., under contract to the EPA, and the Navy's responses. The comments are reproduced here exactly as in the original documents.

Literature citations are referenced in the OU II PHEE Report unless otherwise noted. The acronym list presented in the draft report is included here for the convenience of the reader.

I. DTSC/REGION 2 SITE MITIGATION DEPARTMENT COMMENTS AND NAVY RESPONSES

A. General Comments

Comment: **The Department has reviewed the "Operable Unit II Public Health and Environmental Evaluation Report", which was received on August 12, 1992. As the assumptions of this report confirm that there are major data gaps for this Operable Unit (OU) which prevent this risk assessment from accurately quantifying risk, this report was reviewed with the focus on providing overall guidance. The following comments as well as those attached (provided by the Department's Office of Science Advisor) should be addressed in future risk assessments for the Hunters Point site as well as in OU II specific reports.**

Since the Department is currently negotiating the deliverables for OU II as part of the ongoing Dispute Resolution Committee process, we recommend that this risk assessment be revised to address minor comments. We are available for a meeting to discuss procedures for finalizing the PHEE.

Response: As discussed in a meeting of the agencies and the Navy on September 24, 1992, the Navy will prepare and submit responses to agency comments, which, in combination with the Draft OU II PHEE Report, will constitute the Draft Final OU II PHEE Report.

B. Specific Comments

Comment 1: **The document includes an accurate assessment of the major data gaps for OU II efforts to date, i.e. no results yet for underground utilities, ecological assessments, incomplete air and radioactivity studies. The Department acknowledges that the Navy plans further investigations in each of these areas.**

Response: The comment is acknowledged.; further investigation of underground utilities, potential ecological risks, air pathways and radiation conditions at HPA are planned.

Comment 2: **The term "threshold" should be used in place of "background" as discussed in the August 13, 1992 meeting between the regulators and Navy.**

Response: The term "interim ambient levels" has been adopted to refer to background levels of chemicals at HPA, as agreed in the regulatory agency meeting on August 13, 1992.

Comment 3: **Page 28; The Department does not agree with the conclusions regarding completion of characterization efforts.**

Response: Section 4.7 states that the OU II sites have been adequately characterized to assess the potential health risks at these sites and to assess the need for interim remedial action. This statement does not necessarily lead to the conclusion that characterization is complete. In fact, the need for additional characterization is explicitly noted, for example, in the last bulleted item in Section 4.5 regarding soil and groundwater at Sites IR-6 and IR-10.

Comment 4: **Pages 143-145; The Department does not agree with the discussion regarding "threshold" levels. This is preliminary as the Department does not agree with the method, population partitioning, as used for the basis of these "threshold" values.**

Response: As stated in the responses to agency comments on the Draft OU II Remedial Investigation (RI) Report dated June 12, 1992, background levels for metals will be used as a data analysis tool and will be referred to as "interim ambient levels" in future reports. As discussed in the regulatory agency meeting on August 13, 1992, the results of the background study (*HLA, 1992f*) will be used as an interim indication of the ambient chemical conditions in the fill materials. The Navy recognizes that the regulatory agencies have not approved the background study and that the levels presented in the background study as representative of ambient conditions are subject to revision. Interim ambient levels are not intended to indicate risks or cleanup goals.

II. DTSC/HERS COMMENTS AND NAVY RESPONSES

A. General Comments

Comment 1: **The specific review by the Department of Toxic Substances Control (DTSC), Human and Ecological Risk Section (HERS), concentrates upon the health risk and environmental risk portions of the report, as requested. The comments by the HERS are based on the chemical concentration data as presented, with the provision that the site-wide assessment data which is excluded from this PHEE may require additional OU2 exposure pathways or additional OU2 contaminants to be included in the basewide risk assessment. These sitewide studies include the tidal influence monitoring plan (TIMP), the ecological sampling and analysis plan (ESAP) and the radiological survey.**

Response: The results of ongoing or planned studies including those mentioned would be addressed in facility-wide or parcel-specific documents.

Comment 2: **The exposure calculations develop time-averaged dose estimates for all routes of residential exposure using age-specific body surface area, age-specific inhalation rates and age-specific body weights while U.S. EPA Risk Assessment Guidance for Superfund Sites (RAGS) calls for age-weighted estimates for soil ingestion alone. While these changes do not strictly adhere to RAGS the dose estimates should be health conservative.**

Response: The use of time-averaged dose estimates for all residential exposure pathways evaluated in the PHEE was deemed appropriate. A thorough evaluation of a resident child receptor requires age-specific intake assumptions. RAGS does not provide complete guidance for intake assumptions for this receptor. As stated in the comment, the soil ingestion pathway is specifically noted in RAGS because of the known engagement of children in pica behavior, which results in a higher soil ingestion rate for children than adults. Pathways such as dermal contact with soil and ingestion of groundwater require age-specific body surface areas and age-specific ingestion rates, respectively, which are based on survey data documented in the EPA's *Exposure Factors Handbook* (*EPA, 1990c*), and only marginally addressed in RAGS Part A. EPA references (*EPA, 1990c, 1989a, 1991b*) were used to evaluate the lifetime exposures of a child receptor, consistent with risk assessment guidance for Superfund sites. This approach was presented in interim submittals on intake assumptions and specifically discussed with the regulatory agencies (*HLA, 1991d*).

Comment 3: **This PHEE, in reality, contains four individual risk assessments, each considering separate chemicals of concern and exposure pathways.**

Response: This is true. The geographical locations of Sites IR-8, IR-9, IR-6, and IR-10 did not make one OU II risk assessment appropriate; therefore, separate risk assessments were conducted and submitted as one report. In the case of groundwater, Sites IR-6 and IR-10 were treated as one and referred to as Sites IR-6/10 due to their geographic proximity.

B. Specific Comments

Comment 1: **The statement that "Any facility-wide studies with chemical data specific to the OU II sites were used to summarize and evaluate the nature and extent of chemicals in various media of concern at the OU II sites" (Section 2.0, page 9) does not clearly express the apparent exclusion of data from the tidal influence monitoring plan (TIMP) and the environmental sampling and analysis plan (ESAP) (page 11). The results of the TIMP and/or ESAP may require reconsideration of exposure pathways for OU2 contaminants in the basewide risk assessment, especially given the statement that information from the TIMP "...is important for understanding groundwater migration pathway at HPA (Section 2.2.3, page 11).**

Response: As noted in the second sentence of Section 2.0, "information available to date ... was used to support the development of the OU II PHEE." As a practical matter, the information in the Draft OU II RI Report formed the basis for the Draft OU II PHEE. ESAP results were not available when the OU II RI or PHEE reports were prepared, nor did the ESAP collect chemical data specific to the OU II sites. Preliminary results of the TIMP were reviewed during the preparation of the Draft OU II RI Report and were considered in describing hydrogeologic conditions at OU II sites.

Comment 2: **Are the additional "recommended analyses" such as population partitioning to evaluate "background" concentrations planned even though they have "not been conducted." (Section 2.2.1, page 10)?**

Response: Implementation of the recommendations in the technical memorandum on background soil and groundwater conditions is not planned at this time, and awaits agreement with the agencies on the scope of any further analysis or characterization of ambient conditions.

Comment 3: **The results of the ESAP (Section 2.2.4, page 11), especially the sediment and tissue concentration determinations may require consideration of recreational exposure pathways and fish consumption pathways for OU2 contaminants in the basewide risk assessment. Fishing is apparently "extensive" along the shore two miles to either side of HPA (Section 3.8, page 18).**

Response: Bay recreational receptors and fish consumption pathways will be addressed in facility-wide or parcel-specific reports. The reasons for excluding recreational exposure pathways from the OU II PHEE Report are discussed in Section 8.1 of the report.

Comment 4: **The results of the radiation survey (Section 2.2.6, page 12) may require consideration of additional OU2 contaminants in the basewide risk assessment.**

Response: If radionuclides are detected within the boundaries of OU II sites, they will be considered in future facility-wide or parcel-specific reports.

Comment 5: **The word "above" should be added to the surface feature description (Section 3.1, page 13) so that the phrase reads "...in the lowlands to 180 feet above MSL at the ridge crest.".**

Response: The comment is acknowledged.

Comment 6: **Coal gasification plants and oil refineries are listed among the potential non-point sources of IR-8 contaminants (Section 4.3, page 23). While these are potential sources they should be removed from the source list if facilities of this type were never operated at HPA or in close enough proximity to account for the elevated contaminants levels. The same comment applies to a similar listing for site IR-9 (Section 4.4, page 25) and sites IR-6/IR-10 (Section 4.5, page 27)**

Response: Coal gasification plants and oil refineries are not known to represent significant nonpoint sources of contaminants in artificial fill at these sites but were justifiably listed in Section 4.0 as potential nonpoint sources. These types of operations may have been significant sources of contaminants in undisturbed bay mud and shoreline sediments or dredged sediments at HPA or in other areas along the bay.

Comment 7: **The "...lateral extent of VOC contamination in groundwater downgradient of Building 123..." (Section 4.5, page 27) must be determined prior to completion of the basewide risk assessment.**

Response: As agreed at the agency meeting on August 13, 1992, the lateral extent of VOC contamination in groundwater downgradient of Building 123 will be investigated further as part of future facility-wide or parcel-specific RI/PHEE/FS activities.

Comment 8: **HERS guidance is in agreement on all the dermal absorption factors (AFs) specified (Section 6.3, page 51) with the exception of 3 percent for VOCs. HERS recommends 10 percent as a default AF for VOCs in the absence of chemical specific factors.**

Response: A dermal AF of 3 percent for VOCs is recommended by the EPA in their *Interim Guidance for Dermal Exposure Assessment* (*EPA, 1991c*) based on a study by McKone (*1989*)[b]. Because HPA is a federal Superfund site,

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b McKone, T.E. 1989. *Dermal Uptake of Chemicals from a Soil Matrix.* Risk Analysis 10:402-419.

EPA guidance documents were used as sources of such default data when needed.

A dermal AF served two purposes in the PHEE: 1) Chemicals of concern (COC) selection and 2) Risk Characterization. Regarding COC selection, VOCs were detected at very low concentrations in soil at the four IR sites, in the microgram per kilogram (µg/kg) range, with the exception of 1,2-dichloroethene, which was detected in Site IR-10 surface soil at 1.1 milligrams per kilogram (mg/kg). Using an AF of 10 percent would not have affected the COC selection process in this case because the detected concentrations were so far below the estimated total health-based levels (tHBLs) for VOCs; therefore the COC list would remain the same even if a dermal AF of 10 percent had been used to recalculate the tHBLs.

Because VOCs were not selected as COCs in soil at any of the four IR sites, the dermal AF of 3 percent was not used in risk characterization; therefore, the end results of the PHEE would not change if an AF value of 10 percent was used.

Comment 9: **Surface water may not be the only migration path for OU2 contaminants dissolved in water (Section 7.1, page 54). Data from the TIMP may indicate that, given the condition of the stormdrain system at HPA, the stormdrains offer a more significant migration path to San Francisco Bay. This section should clearly state that migration in the stormdrain system will be considered in evaluating "surface water" migration.**

Response: The comment is acknowledged.

Comment 10: **The distinction between the Ecological Risk Assessment Work Plan, which has been submitted in Final Draft form, and the Ecological Risk Assessment, which remains to be completed, should be maintained. Bioaccumulation factors (BCFs) have been submitted in the ERA Work Plan (Section 7.3.5, page 60).**

Response: The comment is acknowledged.

Comment 11: **Maximum Contaminant Levels Goals (MCLGs), which consider only health-based criteria, are appropriate ARARs where Maximum Contaminant Levels (MCLs) which contain risk management decisions such as technological feasibility or economic cost are inappropriate (Section 7.4.3, page 64). Use of an MCL as a criterion for retaining a contaminant as a chemical of concern could lead to unquantified risk in the risk assessment.**

MCLGs, when available, were used as the basis for the selection of COCs in groundwater. Any chemical whose maximum or average concentration exceeded its MCLG was retained as a COC. In the absence of an MCLG, the MCL, if available, was used. As stated in Section 7.4.3, page 64, in the absence of both MCLs and MCLGs (promulgated ARARs) health-conservative tHBLs were developed and used to screen chemicals.

Comment 12: **Aluminum is not, as far as I can determine, an "essential nutrient" (Section 7.4.4, page 65), while the other elements listed with aluminum are essential nutrients.**

Response: Although it may not be appropriate to list aluminum as an essential nutrient, aluminum was detected at fairly consistent concentrations both laterally and vertically throughout the site; occurrences of aluminum do not appear to be related to site activities. As shown in Tables 7-8 through 7-17, aluminum surface soil and groundwater concentrations exceeded the interim ambient levels only at Site IR-9.

Comment 13: **While it is appropriate not to consider recreational exposures in this PHEE based on no-action concentrations (Section 8.1, page 70), the base-wide risk assessment must include consideration of recreational exposure scenarios.**

Response: Future facility-wide or parcel-specific RI/PHEE/FS activities will consider recreational receptors, where appropriate. The reasons for not considering recreational exposure pathways were discussed in Section 8.1 of the report.

Comment 14: **It is unclear why use of total body surface based on male construction workers alone is considered an appropriate estimate while both male and female skin surface areas are use to estimate the total body surface for office workers (Section 8.3.2.5, page 107).**

Response: The RME scenario, as described in the referenced section, assumes the construction worker to be wearing only shorts and shoes, no shirt. Because female construction workers would not be assumed to be clothed in such a manner, total body surface areas based on male body surface areas alone were used, which is more conservative than if both women and men had been considered in the calculation.

Comment 15: **HERS recommends that baseline risk assessments be performed with no time-weighted factors, such as the fraction ingested in the groundwater drinking water calculation (Section 8.3.2.5, page 113). Following this guidance would raise the hazard and risk estimate for groundwater ingestion by one third.**

Response: The "fraction ingested" intake assumption was specifically based on EPA recommendations (*EPA, 1990c*). As discussed in General Comment 2, the time-weighted factors used in the PHEE were developed from several EPA references.

Comment 16: **The first sentence (Section G4.1, G4.2 and G4.3) apparently refers to both adults and children. The second sentence refers only to children and should begin a new paragraph. The second sentence also uses the plural "levels" when there is only one level in each case. The phrase "predicted average blood lead levels" is confusing, since it at first appears to refer to the 50th percentile blood lead level. "Predicted blood lead level based on the average exposure scenario" would be more correct in referring to a particular exposure level.**

Response: The comment is acknowledged.

Comment 17: **It is not necessary to derive the mean corresponding to a 95th percentile of 10 μg/dl and compare that to the mean predicted. Both the EPA and DTSC methods yield the 95th percentile directly. Additionally, the upper 95th percentile is redundant, since there is no lower 95th percentile.**

Response: The comment is acknowledged.

Comment 18: **DTSC does not require, and finds it confusing, to evaluate both average and RME exposures. Both the EPA UBK and the DTSC Lead Spreadsheet are distributional methods, which directly consider population variability in exposure and in response to exposure.**

Response: Both average and RME scenarios were evaluated using the EPA UBK model because EPA guidance allows for changes in default parameters without compromising the quality of the data. The DTSC model was used to evaluate an RME scenario and default parameters were not changed other than for higher (more conservative) soil ingestion rates.

Comment 19: **If the inhalation rate for childhood exposure (Section G3.1, page G-7) is for the 0-5 age range, the units (m^3/day) appear incorrect. An inhalation rate of 1.24 m^3/hour is listed in the body of the document (page 95).**

Response: The units were erroneously reported in the text as m^3/hour instead of m^3/day. The input value for the model was accurate, 1.24 m^3/day.

Comment 20: **The DTSC Lead Spreadsheet uses a default value of 2.2 kg/day food intake for adults. The tables show this value, while the text lists 1.3 kg/day (Section G3.2, page G-8).**

Response: The 1.3 kg/day in the text should be changed to 2.2 kg/day. As indicated in the comment, 2.2 kg/day was used in the Lead Spreadsheet for all blood-lead calculations.

Comment 21: **The text shows the DTSC Lead Spreadsheet default value of 1.85 g/day soil on skin while the spreadsheet tables show a lower value. If the DTSC Lead Spreadsheet method is used, it should be used unaltered unless changes in default values are clearly identified and approved.**

Response: Revised Appendix G tables are attached showing results using the 1.85 g/day contract rate. The conclusions of the PHEE do not change as shown by the revised Table 9-6.

Comment 22: The DTSC considers an incremental cancer risk of 10^{-6} as the departure point at which risk management decisions may be made to take action to lower the risk, not a "risk range" of 10^{-4} to 10^{-6} (Section 9.1.2, page 125).

Response: The target risk criteria to be used in risk management decisions at HPA would need to be considered by all agencies involved in the project. The criteria of 1×10^{-6} (*DHS, 1990*)[c] and 1×10^{-5} (*HWA, 1988*)[d] may be appropriate at sites where actual exposures are occurring or expected, but, for the hypothetical exposure scenarios used in the PHEE, these criteria may not be appropriate. The EPA criteria were presented because the site is a National Priorities List site, and EPA is the lead agency for the facility.

Comment 23: The introduction to the calculation or "incremental risk" (Section 9.4, page 142) seems to indicate that increased concentration of metals above a "background" is the only contamination due to site-specific activities. If the purpose of this "incremental risk" analysis is to provide information on the risk posed by contaminants related to site-specific activities, then contamination by any organic compounds must be included in the "incremental risk" calculation. Consideration of only metal contamination gives a misleading impression of the proportion of the total risk associated with site-specific activities.

Response: The purpose of the incremental risk analysis was to show the risks associated with each IR site that may not be associated with site activities. If, for example, metals in soil were shown to be at concentrations above the interim ambient levels, an incremental risk analysis was performed to assess the risk associated with the ambient levels apart from the contributions of the levels associated with site-related activities. Organics, other than perhaps PAHs, would not require a separate incremental risk analysis because the total risk for these chemicals (Appendix F) was assumed to be associated with site-related activities. The organic chemicals of interest are generally not considered to occur naturally and thus were all considered to be site-related; therefore they were discussed only in terms of total health risk instead of incremental risk.

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c Department of Health Services (DHS), 1990. *Scientific and Technical Standards for Hazardous Waste Sites, Book II.* Toxic Substances Control Program. August.

d California Health and Welfare Agency (HWA), 1988. California Code of Regulations, Division 2, Chapter 3, State of California Safe Drinking Water and Toxic Enforcement Act of 1986. Article 8, Section 2211 et. seq.

Comment 24: Why are no incremental cancer risk calculations performed for nickel at site IR-9 (Table 9-11) when an oral slope factor is listed for nickel (Table 7-19)?

Response: Table 7-19 should be revised to exclude the oral slope factor (SF) for nickel and should include a footnote referring the reader to the toxicological profile for nickel in Appendix D which would be revised to state the following:

The oral SF listed for nickel in Table 7-19 is a value recommended for nickel refinery dust by the California Environmental Protection Agency (Cal-EPA) Office of Environmental Health Hazard Assessment. In the absence of an SF from another source such as IRIS or HEAST, this value could be used on the basis of the hierarchy outlined in the toxicity assessment (Section 6.1); however, this value was extrapolated from the value for inhalation toxicity of nickel refinery dust. On the basis of the toxicity literature, there is inconclusive evidence that nickel is a potential carcinogen via the oral route; therefore, EPA has not developed an oral SF for nickel. The results in the PHEE (Appendices F and H) were presented without considering oral/dermal carcinogenicity. A noncarcinogenic oral reference dose for nickel is presented in both IRIS and HEAST and, on the basis of the toxicological literature, was considered a more appropriate critical toxicity value for use in risk characterization.

Comment 25: The ratio of total chromium to chromium VI which was used to determine that chromium would be evaluated as chromium III in soil must be presented. This ratio should be applied to the total chromium soil concentration to carry chromium III and chromium VI in soil as separate contaminants in the risk assessment.

Response: A ratio approach was not necessary because separate laboratory analyses of chromium VI were performed to speciate the oxidation state of chromium present at the OU II sites. On the basis of the results of the soil chemical analyses presented in Tables 4-1 through 4-13, the frequency of detection and concentrations of chromium VI were far lower than those of total chromium. In addition, on the basis of OU II RI results and as shown in Tables 7-8 through 7-15, total chromium in soil at OU II sites was primarily chromium III. Furthermore, chromium VI and total chromium (as chromium III) were analyzed separately in the COC selection process; the chromium VI values were well below the tHBLs developed for soil.

Comment 26: What is the source of the non-carcinogenic PAHs in groundwater at sites IR-6 and IR-10 if the same non-carcinogenic PAHs are not considered chemicals of concern in soil at sites IR-6 and IR-10 (Table 7-18)? The chemical of concern selection process may be flawed if the soils at IR-6 and IR-10 are the suspected source of these non-carcinogenic PAHs.

Response: The chemical selection process in not considered flawed, but may need further clarification. Although not explicitly stated in RAGS, chemicals selected as COCs in one medium do not warrant listing them as COCs in other media especially when justifications are provided in the risk assessment. The following are further justifications for not listing noncarcinogenic PAHs (nPAHs) as COCs in soil at Sites IR-6 and IR-10. The lube oil tanks, former lube oil tank racks and diesel tank are the suspected original source of nPAHs detected at Site IR-6 (*HLA, 1992e*). The maximum and average soil concentrations did not indicate a potential for health risks based on comparison to total health-based levels (tHBLs); tHBLs were estimated based on two direct contact pathways (ingestion and dermal contact) and one inhalation pathway (dusts). The groundwater maximum concentrations were shown to be in excess of tHBLs for three of the eight detected nPAHs (Table 7-17). Eight nPAHs were listed as COCs (Table 7-18) to consider their additive effect, and to present future hypothetical health risks based on current detected concentrations. Concentrations in groundwater from the suspected point source (and non-point sources) are not expected to increase from current levels since partitioning of chemical mass between the soil and groundwater is judged to have reached equilibrium (Section 8.3.1.4 of the OU II PHEE report), and the interim removal actions being implemented at Site IR-6 (*HLA, 1992e*) will eliminate the original point source contributing to the nPAHs in groundwater.

Comment 27: The groundwater exposure calculations for IR-9 future residents were checked using the formula and default parameters in U.S. EPA RAGS and the exposure calculated in this PHEE is higher for all contaminants. The calculations and risk estimates included here should not be less protective than "standard" RAGS estimates.

Response: It is assumed that the DTSC evaluated the groundwater ingestion pathway for which RAGS Part A has documented only adult resident default parameters for the average and RME scenarios (*EPA, 1989a*). The RAGS Part A default parameters and the intake assumptions in Table 8-13 are identical for the RME scenario defined in the PHEE; therefore the risk characterization results would be identical, not lower. For the average scenario, risk characterization results would be slightly lower than the RAGS Part A approach which results in a potential cancer risk estimate of 9×10^{-5} instead of 1×10^{-4}. The only difference between RAGS Part A and the PHEE is due to including a fraction of intake (FI) of 75 percent in the PHEE based on the *Exposure Factors Handbook* (*EPA, 1990c*). As the risk characterization results for the RME scenario for Sites IR-9 and IR-6/10 exceed 1×10^{-4} and 1×10^{-3}, respectively, the slightly lower average scenario results do not affect the conclusions of the PHEE. The resident child receptor evaluated for groundwater exposure pathways for both scenarios in the report is expected to be more health protective than the RAGS Part A approach.

C. Concluding Comments

Comment 1: **This Public Health and Environmental Evaluation incorporates the Department of Toxic Substances' comments previously made on exposure pathways and default exposure parameters. While the determination of age-weighted exposure is more detailed than recommended in U.S. EPA guidance for superfund sites, the hazard and risk estimates appear health conservative and should not underestimate the site-related risk.**

Response: The comment is acknowledged.

Comment 2: **The results of the tidal influence monitoring plan (TIMP), the ecological sampling and analysis plan (ESAP), the ecological risk assessment work plan (ERA) and the radiological survey may require consideration of the effect of OU2 contaminants in the risk assessments for other operable units or reevaluation of the risk associated with radionuclides at OU2.**

Response: The comment is acknowledged.

Comment 3: **While this baseline risk assessment may serve to direct interim remediation efforts, selection of the final remedial alternative for OU2 must await completion of the basewide risk assessment.**

Response: Final remedial alternatives will be evaluated in future facility-wide or parcel-specific reports.

III. EPA/COMMENTS AND NAVY RESPONSES

A. General Comments

Introductory Comment: **This risk assessment is written in a generally clear and concise manner which should render it accessible to the lay public. However, there are areas in the risk assessment document which should be expanded upon, or substantially revised. These and other issues are discussed in more detail below.**

This draft risk assessment was reviewed with the knowledge that the OU II sites (IR-8, IR-9, IR-6 and IR-10) are near other OU sites on the HPA site, which are either under investigation or planned for future investigation. Thus, the total carcinogenic and noncarcinogenic risks estimated for the OU II sites in this risk assessment represent only a portion of the potential total risks due to exposures to chemicals from the entire HPA site. In addition, it is understood that environmental impacts to ecological receptors are being investigated on a facility-wide basis and, thus, were not evaluated in the PHEE.

Response: The comment is acknowledged.

Introductory Comment: **Four separate risk assessments were performed for the HPA OU II. Each site was evaluated with different lists of potential chemicals of concern (PCOC) for each media. This is an issue of substantive concern.**

Response: See the responses to DTSC/HERS General Comment 3.

Comment 1: **The use of risk-based Total Health-Based Levels (THBLs) (e.g., Preliminary Remediation Goals (PRGs); RAGS, Part B, 1991) to eliminate PCOCs is not an accepted EPA methodology. PRGs provide remedial feasibility and design engineers with long-term clean-up targets to use during evaluation and selection of remedial alternatives (EPA, 1991). The lists of PCOCs should be revised to include those chemicals eliminated by the use of THBLs. This constitutes a major deficiency of this draft risk assessment.**

Response: The EPA reference was noted in the PHEE since the methods for estimating tHBLs are similar to the approach referenced in RAGS Part B; however, tHBLs are not the same as PRGs (*EPA, 1991f*) and were not presented as such in the PHEE. tHBLs are similar to other soil Applicable or Relevant and Appropriate Requirements (ARARs), and are conservative health-based values that can be used to compare media concentrations in order to select a focused, representative list of the most toxic COCs for risk assessment. PRGs, on the other hand, as was stated in the comment, provide long-term clean-up targets to use during the evaluation and selection of remedial alternatives.

The tHBLs were developed on the basis of EPA guidance for PRGs to represent soil concentrations considered to result in estimated daily doses (1) associated with an estimated one-in-one-million probability that an exposed individual would develop cancer (10^{-6} cancer risk) or (2) expected to be without appreciable risk of deleterious noncarcinogenic effects (hazard quotient less than 1.0) (*EPA, 1991f*).

The exposure pathways used to estimate tHBLs yield more conservative and health-protective results than PRGs and other soil ARARs. The tHBLs addressed three exposure pathways: ingestion, inhalation, and dermal contact. PRGs, on the other hand, consider two exposure pathways: ingestion and inhalation. Other ARARs, such as Resource Conservation and Recovery Act (RCRA) action levels (ALs) and minimum and maximum protection standards for carcinogens (PS mins maxs, respectively) address exposure via one pathway, ingestion. Because tHBLs are more conservative than other ARARs and PRGs, their use in the COC selection process should not be considered a major deficiency in the report.

Chemicals were not excluded based on FOD or interim ambient levels. In fact, the use of health-conservative tHBLs as a screening tool resulted in a more justifiable list of COCs, especially in the absence of ARARs for soil. Therefore, the COC list is as it stands and includes the compounds that account for most of the hypothetical risk at the OU II sites.

Comment 2: **Current exposure scenarios were not quantified. The HPA site is described as a light industrial and commercial use facility with no permanent residents, workers or other users (e.g., recreational). This assumption requires further documentation. Current RAGS guidance includes the evaluation of onsite and, if appropriate, offsite occupational exposures. This has not been done in this draft version but should be included in the version.**

In this draft risk assessment, the reasons for excluding current potential offsite receptor populations were based on: 1) air sampling results; 2) that 90% of the site is considered paved or covered with buildings; and 3) that groundwater is currently not used for domestic or industrial purposes. However, air sampling data (Tables 4-1 to 4-3) show that toxic air chemicals have been detected at several locations in the OU II. The chemicals detected include benzene, toluene, ethylbenzene and xylenes. In this risk assessment, Plate C1 (Conceptual Model of Potential Migration Pathways), indicates the possible exposure pathways of: 1) volatilization of chemicals from contaminated soil; 2) volatilization of chemicals around buildings; and 3) migration of chemicals entrained onto fugitive dust particles exist as potential complete exposure pathways. The existent data describe the area adjacent to HPA, the South Bayshore district, as heavily developed with predominantly industrial/commercial areas (44% land use) with some residential areas (18)%.

A current exposure pathway scenario, therefore, should be developed to include potential onsite and offsite worker and resident population exposures to volatile organic chemical (VOC) emissions and fugitive particulate emissions due to possible wind erosion from the various OU sites. A quantitative assessment of the potential health risks from these exposures should be developed in order to provide risk management with adequate information. Any uncertainties in this pathway analysis should be presented.

Response: To clarify the following response, for the OU-based approach, onsite refers to anything occurring with the boundaries of the specific OU II IR sites; offsite refers to anything occurring outside the boundaries of OU II sites; off-facility refers to areas outside the boundaries of HPA. Current onsite, offsite, and off-facility exposures were not quantified for the following reasons:

- Section 8.1 of the PHEE details the reasons why onsite future exposures were considered to more than adequately characterize potential health risks to offsite or off-facility commercial and residential populations, and is further clarified below. Furthermore, future onsite hypothetical health risks were conservatively quantified assuming no surface covers at OU II sites.

- Currently, over 90 percent of the surface areas of OU II sites have barriers to fugitive dust and vapor emissions such as buildings or pavement; therefore, current offsite and off-facility exposures would not be expected to occur.

- No one works or lives at the OU II sites; remediation workers who practice health and safety measures are the only people present at these sites.

- Strict security controls at HPA, including fences, gates, and guards, control access to the OU II sites.

- The Agency for Toxic Substances and Disease Registry (ATSDR) conducted a Health Assessment at the site (included meetings with site workers and others) and found that the HPA facility does not present any immediate danger to public health; this will be further documented in their 1993 report.

- Please see response to EPA Specific Comment 4.

- With respect to VOC emissions, although high VOC concentrations were observed in the sample collected at Location 9, near Site IR-9, it is likely that measured air concentrations at Location 9 are not representative of releases from IR-9, based on review of soil and groundwater data presented in the OU II RI Report. Of the 10 VOCs detected in the Location 9 sample, none were detected in groundwater from wells at Site IR-9, 5 were not detected in any of 105 soil samples collected at IR-9, 3 were detected in only 1 or 2 of 105 samples, and 2,2-butanone (MEK) and toluene,, were not considered representative of environmental conditions at Site IR-9. This indicates that sources of VOC that could account for concentrations of VOCs measured in air do not exist in soil or groundwater at Site IR-9 (*HLA, 1992g*).

- The air sampling results from Location 7 may have been specific to Sites IR-6 and IR-10 but more than likely are not related to the onsite soil and groundwater concentrations presented in Table 4-12 through 4-14. Furthermore, no receptors are located downwind of these sites. The soil and groundwater organics considered to be volatile were detected at very low concentrations in both soil and groundwater and are not expected to volatilize through current barriers such as pavement and buildings; therefore they are not expected to contribute to air exposure pathways.

- As stated in Section 7.2, page 54(2), "Tables 4-1, 4-2 and 4-3 presented air sampling results for Locations A8, A9, and A7 which are the air sampling locations closest to Sites IR-8, IR-9, and IR-6, respectively (Section 4.0 and Plate 2). These results were compared to the federal and state Permissible Exposure Limits (PELs), California Proposition 65 No Significant Risk Levels (NSRLs), State Ambient Air Quality Standards (SAAQS), state Applied Action Levels (AALs), and federal Threshold Limit Values (TLVs) and state PELs, as presented in Table B4. The maximum detected site concentrations do not exceed these standards; therefore, current exposures to these chemicals are not considered of concern at these sites." Furthermore, these same air sampling results were compared to RCRA ALs in air for noncarcinogens and RCRA PS mins and maxs for carcinogens. These levels were developed on the basis of long-term residential inhalation exposures. The maximum detected site concentrations are less than these standards for all chemicals with the exception of dieldrin whose maximum detected concentration falls between the PS max and PS min range (representing a cancer risk range of 10^{-4} to 10^{-6}); therefore, current exposures to these chemicals are not considered of concern at these sites, and as described above cannot necessarily be shown to be associated with OU II sites.

The following discussion provides further clarification of Appendix C and the main text of the OU II PHEE report.

- As discussed in Appendix C (page C-12) metals are not expected to present "a significant current migration pathway for air entrainment of metal-contaminant particulate matter ... on the basis of the results of air sampling;" in addition, the existing site barriers make this pathway even less likely to present current short- or long-term health threats.

- The conceptual model in Appendix C is a general diagram showing potential migration pathways at HPA and is not necessarily specific to any one of the OU II IR sites or to current or future exposure scenarios. The discussion in Appendix C is related to the physical-chemical properties of the chemicals detected in air, soil, and groundwater at OU II sites and is not specific to the concentrations detected, the current conditions (such as barriers), or other important factors that justify selection of complete exposure pathways in a risk assessment. Furthermore, the discussion in Appendix C does not state that current migration pathways are complete for fugitive vapor and dust emissions as stated in the comment. Specifically, page C-12 states "air transport may potentially be a *significant* migration pathway for ... chemicals ... identified in air samples. The air is a potential though not significant current migration media for other compounds identified at OU II." The current exposure pathways were, therefore, judged to be incomplete at the sites.

Comment 3: **Potential future onsite exposure pathways do not include the inhalation of VOCs in indoor air, even though benzene, 1,2-dichloroethene, tetrachloroethene, tricholoroethene and vinyl chloride were listed as chemicals of concern (COC) in groundwater at site IR-6/10. This potential exposure pathway should be evaluated in the risk assessment.**

Response: The inhalation of VOCs in air (indoor and outdoor) was not included in risk characterization because the concentrations in soil and groundwater were judged to be too low to present an air concentration that would present a potential health risk to current or future hypothetical human receptors. This approach is further supported by performing a screening level calculation using the following assumptions and methods:

- Assume maximum detected concentration of vinyl chloride (Table 4-14), the most toxic and volatile VOC detected in groundwater at Sites IR-6/10;

- Assume intake assumptions and equation shown on Table 8-7 for the RME inhalation of outdoor air scenario;

- Assume an exposure point concentration in outdoor air estimated by using a volatilization model such as Jury et al., (*1983*) and a box model recommended by EPA (*Dobbins, 1979*; *EPA, 1991*). The Jury et al., model considers chemical depletion over time and site-specific parameters that affect chemical migration; therefore it is a more realistic model to characterize chemical volatilization than models such as Andelman's model, which was used in the estimation of groundwater HBLs (Table 7-7; *Andelman, 1990*).

Based on these assumptions, the health risks from inhalation exposures of ambient air containing vinyl chloride are estimated to be less than a 1×10^{-7} cancer risk. This estimate does not exceed EPA's target risk range of 1×10^{-6} to 1×10^{-4}. The conclusions of the PHEE would not change since the total cancer risk estimate of 1×10^{-3} presented for groundwater at Site IR-6/10 (Table 9-5) would not materially change.

Comment 4: **The Hydrogeology section (Section 3.3) describes the groundwater flow direction in the southern part of HPA as generally inland (i.e. westerly). This is inconsistent with the site groundwater descriptions in Sections 4.3 through 4.5. Moreover, if the direction of groundwater flow is inland, then there could be a potential for future offsite exposures to contaminated groundwater from the site. Populations, whether residential and/or occupational, that are present in the direction of known groundwater flow should be considered in the risk assessment. This represents a gap in this current analysis.**

Response: A review of Sections 3.3, 4.3, 4.4, and 4.5 in conjunction with the OU II RI Report, in particular Plates 4 and 5, does not indicate any inconsistent statements with respect to groundwater flow. An evaluation of offsite receptors was not necessary because groundwater does not appear to flow from the OU II sites to off-facility inland locations and because an evaluation of future hypothetical onsite receptors is the most site-specific assessment of potential health risks (Section 8.1). Furthermore, an evaluation of recently measured onsite concentrations is conservative when assessing risk because no allowance is made for dilution during transport from the sites to potential offsite receptors.

Comment 5: Summary tables for total (e.g., multipathway) estimated carcinogenic and noncarcinogenic risks to the potential receptor populations should be present in the text and in an Executive Summary. It is generally not health-protective to assume that exposures occur in isolation from one another. This is especially important since the potential health risks from this OU II have yet to be compiled with the potential risks from the other OUs at the HPA site.

Response: Summary tables will be provided as appropriate in future PHEE reports; however, with the exception of Sites IR-6 and IR-10, the OU II sites are not adjacent to one another. It may be appropriate to add the risks due to groundwater exposure at Sites IR-6/10 to the individual risks due to soil exposure at Site IR-6 and IR-10. It would be inappropriate to add the risks at Site IR-8 to those at Site IR-9 or to add these to the risks at Sites IR-6/10 because of the geographic separation of the sites.

Comment 6: The calculation of "incremental health risks" from exposures to selected chemicals is not a standard EPA risk assessment protocol. While probably acceptable within the text for comparative purposes only, these "incremental" risks should not be in the Executive Summary of cumulative health risk tables. Also, the text for the "incremental" health risk characterization is poorly written and should be clarified. In addition, a discussion of how PRP-defined, background groundwater inorganic threshold concentrations were developed is necessary, if EPA chooses to accept this methodology.

Response: The discussion of incremental risks will be improved in future reports. The development of threshold concentrations was presented in the *Draft Technical Memorandum, Background Soil and Groundwater Conditions* (*HLA, 1990f*) and therefore was not separately described in the OU II PHEE Report.

Comment 7: An Executive Summary should be prepared which includes all of the components of the baseline risk assessment, as identified in RAGS (EPA, 1989; page 9-8).

Response: The Executive Summary describes the components of the OU II baseline risk assessment specific to the approaches used in the OU II PHEE, which were consistent with EPA guidelines for risk assessment. Although the RAGS Part A "suggested" outline was not followed to the letter, each component of a baseline risk assessment report as suggested by RAGS Part A was presented in the OU II PHEE Report (*EPA, 1989b*). Any specific comments can be addressed separately.

Comment 8: **The question of whether the existing site conceptual model, involving the three operable units, as currently defined, is adequate for purposes of a quantitative baseline health risk assessment was preliminarily addressed. On the basis of just the information available to ICF/Clement for OU II (both historical and field sampling results), certain preliminary conclusions were reached.**

First, it would greatly facilitate the risk assessment process if more geographically-based criteria were used to assign the soils (surface and vadose zone) into more logically-defined sub-units. This would help to better define the various exposure pathways for each environmental media and to focus the potential exposures to specific receptor populations.

Second, it is suggested that consideration be given to creating a whole new OU for groundwater, per se, across the site. Because of the interconnectiveness of the groundwater aquifer(s) in this area, attempting to deal with groundwater, based on surface/subsurface soil conditions within each soils OU would pose a highly complex problem for any quantitative risk assessment. Rather, by treating the entire site's groundwater as its own OU, perhaps with a sub-division into groundwater areas that flow into the Bay and those areas that flow inland, a more coherent risk assessment should be possible.

Response: Discussions between the Navy and the agencies are ongoing regarding a parcel-based approach to the RI/PHEE/FS process. Such an approach would address risks and final remedial actions for soil and groundwater on a parcel-specific rather than OU-specific basis.

B. Specific Comments

Note: Each comment includes a PHEE Report page number, usually with a paragraph number in parentheses.

Comment 1: **xxii(2) Reference is needed for the specific state and federal drinking water criteria which would classify the groundwater at Site IR-8 as non-potable.**

Response: The potability of groundwater was assessed using the broader federal criterion for an underground potable water source, i.e., total dissolved solids (TDS) less than 10,000 mg/l (CFR 40-144.3). With respect to TDS levels, the Regional Water Quality Control Board (RWQCB) considers water with less than 3,000 mg/l TDS as potentially potable.

Comment 2: **xxiv(1) For noncarcinogenic health effects, it should be stated that EPA has determined that a Hazard Index above 1.0 indicates that potential noncarcinogenic health effects may occur as a result of exposure to the specified chemicals.**

Response: This statement appeared in Section 6.2.1 on page 47(3) and Section 9.1.1 on page 122(1) but not on page xxiv(1), as noted in this comment.

Comment 3: **xxiv Summary tables for total carcinogenic and noncarcinogenic risks to potential receptors should be included for the entire OU II.**

Response: This approach is not considered appropriate for the OU II sites. See the response to EPA General Comment 5 and DTSC/HERS General Comment 3. A summary approach would be considered for facility-wide or parcel-based reports.

Comment 4: **xxvii(2) How are the "ambient conditions" at HPA defined? The statement that potential adverse health effects associated with antimony, arsenic, beryllium, manganese, nickel, lead and potentially other metals, may be associated in part with ambient conditions at HPA, could be said about any Site. The total potential health risks associated with the HPA site should be addressed in the risk assessment.**

Response: The total potential health risks addressed in the PHEE Report were presented in Tables 9-1 through 9-5 and Appendix F. The incremental risks associated with occurrences of inorganics above interim ambient levels were also calculated and presented in Tables 9-7 through 9-12 and Appendix H.

Comment 5: **17(2) Is the South Bayshore district the same as the Hunters Point district described on page 4?**

Response: No; the differences are outlined in Appendix A of the PHEE Report and shown on Plate A-1.

Comment 6: **21(6th bullet) Groundwater levels in A-aquifer are described as between 4 and 8 feet bgs. On page 14 they are described from 2 to 12 feet bgs. Please explain.**

Response: Page 14 refers to the depth to groundwater over the HPA facility as a whole while page 22 refers only to Site IR-8 groundwater. The hydrogeologic characteristics are different and thus were separately described in the PHEE Report.

Comment 7: **22(2nd bullet) The text describes groundwater flow in A-aquifer at IR-8 is southward toward the Bay. On page 15, the groundwater flow in the southern part of the HPA is described as generally inland. This is inconsistent. Please clarify.**

Response: Please refer to Plates 4 and 5 of the OU II RI Report. Data from Site IR-8 indicate that groundwater flow in the A-aquifer across Site IR-8 is toward the south. Groundwater flow south and west of Site IR-8 appears to be influenced by the sanitary sewer system at HPA, which may cause inland flow along the south shore of the facility.

Comment 8: **28(1st bullet) Why are surface and subsurface soils not included as primary media for contamination at or from the OU II site? If this is due to a lack of field sampling data, then this needs to be specifically discussed in the Uncertainty Section.**

Response: Soils are considered to be a primary contaminated medium at HPA. Section 4.6 states that the primary media for the migration of chemicals at OU II sites are air, surface water, and groundwater. Under existing conditions, soils are not considered primary media for migration; the significance of soil contamination at OU II sites was evaluated in the PHEE on the basis of the data, which were considered adequate for this purpose.

Comment 9: **29(1) In Region IX recommendations (EPA, 1989) surface soil samples taken many inches or feet (>12" - 30") below ground surface do <u>not</u> qualify as surface soils and should not be used in the baseline PHEE for estimating potential dermal and/or fugitive dust exposures.**

Response: The use of 0 to 2 ft bgs (0 to 24 inches) to define surface soils at OU II sites for evaluation of potential exposures was justified and consistent with EPA Region IX guidelines as explained below (*EPA, 1989c*). The guidance on surface soils is under the heading "Sample Collection" and does not address all the data issues one needs to consider in evaluating a useable dataset for evaluating COCs and exposure point concentrations. Furthermore, the guidance does not define "many inches or feet" as 12 to 30 inches. Instead, it gives several guidelines for selecting the "active" zone where chemical exposures are expected to occur. Specifically, "deeper soils subject to disturbance activities" can extend 12 to 18 inches bgs, and samples taken many inches or feet bgs are important if "actual current exposures" are to be evaluated "whereas exposure to deeper contamination is usually only a potential future exposure" issue. Because future exposures were considered for risk characterization in the OU II PHEE and future scenarios were based on potential disturbance of surface soils due to demolition activities prior to residential development, 0 to 2 ft bgs was judged to be consistent with the guidance.

Comment 10: **43(1) The text should read, "Toxicity profiles for each chemical of concern are..."**

Response: The comment is acknowledged.

Comment 11: **44(4) Were the Department of Toxic Substances Control (DTSC) toxicity values used as the third most reliable source for toxicity criteria? If so, this should be stated.**

Response: As stated in bulleted Item 8 of the Legend to Table 6-1, DTSC values were used in the absence of EPA values unless otherwise noted.

Comment 12: **45(3) December 31, 1992 should be December 31, 1991.**

Response: The comment is acknowledged.

Comment 13: **47(3) ...the potential may "exist", not "exists".**

Response: The comment is acknowledged.

Comment 14: **47(3) "...target organs were summarized for <u>selected</u> COCs only..."**

Response: The comment is acknowledged.

Comment 15: **48(1) "A" SF is a plausible, not "An" SF...**

Response: Common usage dictates "an" SF because the acronym is pronounced as individual letters (an es-ef).

Comment 16: **49(1) ..."a" SF, not "an" SF**

Response: See the response to the preceding comment.

Comment 17: **52(1) Table 7-19 does not list Permeability Coefficients (PmCs).**

Response: The correct table reference is Table 8-15.

Comment 18: **55(3) "FODs" has not been previously defined.**

Response: FOD was previously defined in Section 4.9, page 35(3), and in the list of acronyms.

Comment 19: **58(1) is (EPA, 1990f) the correct reference?**

Response: No, the appropriate reference is (*EPA, 1990d*).

Comment 20: **61(3) It is stated that the COCs include chemicals that are present at concentrations below threshold background concentrations, as well as those above threshold concentrations. Is this also true for the**

"incremental" health risk estimates? Specific chemicals involved here should be identified, if any relative comparison use of the tHBLs is retained in the text.

Response: As indicated in the text, a detailed study was conducted to estimate ambient threshold (interim ambient levels) concentrations for the chemicals detected at HPA (*HLA, 1992b,f*). Although the results of this evaluation were not used in the PHEE to select COCs (i.e., many selected COCs were detected at concentrations below these ambient concentrations), these data were presented in the PHEE Report (Tables 7-8 through 7-15) for informational purposes. Because the selected COCs included chemicals both above and below interim ambient levels concentrations, two distinct risk analyses were performed in the PHEE, at the request of the EPA: one used total detected concentrations, the second calculated risks using interim ambient levels for those individual COCs occurring as concentrations above interim ambient levels. The PHEE presented (1) results assuming that all COCs were site-related and none represented "background" or ambient conditions (see Section 9.0), and (2) the "incremental" risk associated with only those metal COCs present above interim ambient levels. The purpose was to assist in remediation decision making.

By definition, COCs evaluated in the incremental risk analysis occurred at concentrations above interim ambient levels; these COCs were listed in Table 7-18 and Appendix H. Further information on the comparison of site and interim ambient levels was presented in the COC selection discussion and in Tables 7-8 through 7-15. In addition, specific chemicals evaluated in both the incremental risk analysis and the risk characterization of all COCs were listed in Table 7-18. Please note the typographical error in this table, discussed in Comment 32.

Comment 21: 62(2) "TDS" has not been previously defined.

Response: TDS was defined in the list of acronyms as total dissolved solids.

Comment 22: 62(2) How can the groundwater at the IR-9 and IR-6/10 sites be considered potentially potable, while groundwater at site IR-8 is considered non-potable. Sites IR-9 and IR-8 are only about 1,000 feet apart. If the groundwater sampled is from different aquifers, this should be stated. A consistent groundwater model needs to be identified.

Response: Potability was addressed on a site-specific basis in the OU II PHEE by review of TDS data collected at the IR sites and comparing the data to the EPA potability criterion of 10,000 mg/l. Groundwater potability may be addressed on a larger parcel-specific or facility-wide basis in future reports.

Comment 23: **66(2) "UCL" has not been previously defined.**

Response: UCL was previously defined in Section 4.9, page 35(3), and in the list of acronyms.

Comment 24: **77(4) "...found to occur", not "...fount to occur".**

Response: The comment is acknowledged.

Comment 25: **82(1) RAGS (EPA, 1989) definition of RME, includes the word ...reasonably expected to occur...**

Response: The comment is acknowledged.

Comment 26: **86(3) Why not use the site-specific average and maximum wind speeds of 5 m/s and 10 m/s respectively, as described in the meteorology Section (3.6) for the HPA site, instead of the default value of 4.7 m/s? Both the average and maximum wind speed values are more conservative for screening-level calculations.**

Response: The default wind speed of 4.7 m/s is more conservative for screening-level calculations than the site-specific average and maximum wind speeds of 5 m/s and 10 m/s, respectively. According to Equation 8-1, page 86, the onsite respirable particulate level, Ci, is a function of wind speed. Because the wind speed term is in the denominator, a wind speed greater than 4.7 m/s would result in a lower, less conservative Ci. The results for the inhalation of dust pathway, as presented in the PHEE are therefore health protective.

Comment 27: **90(2) The average case scenario future onsite office worker exposure duration, ED of 9 years in the EPA (1991b) reference was unable to be located. The ED of 25 years for the RME scenario office worker is correct. What is the reference for the ED of 9 years?**

Response: Due to the lack of survey data on exposure durations for the average scenario for commercial workers, average scenario data for residents were used, assuming that, if an individual were to live in the same area for 9 years, he or she could also be assumed to work at the same place for 9 years. Both EPA references document 9 years for residents; 9 years was assumed for workers as well *(EPA, 1989b, 1990c)*. The reference should give both EPA references with an explanation.

Comment 28: **90(2) An exposure duration of 1 year for future construction workers is undocumented. What is the reference for this value? Similarly, what is the reference for the average case exposure frequency of 30 days in one year for construction workers?**

Response: EPA and Cal-EPA guidance for construction scenarios are not available. Therefore, exposure durations of 30 days per year for the average scenario and 1 year for the RME scenario for construction workers were based on professional judgement for a hypothetical construction scenario. These assumptions are often used when actual development plans for a site are not available. A very conservative assumption of 250 days for 1 year was used as the upperbound exposure duration.

Comment 29: 90(2) Even if retained for comparative purposes only, the tHBLs for a child were calculated using the age range of 0-5 years. How does this influence the calculations for incremental health risk?

Response: The list of COCs would not influence or change the calculations performed for incremental health risks, because incremental health risks were performed for metals only. tHBLs were used as a screening tool for selecting a representative list of COCs. The methods used in the PHEE report for estimating tHBLs to be protective of children were based on a child age 0 to 5 years rather than 0 to 9 years or 0 to 30 years. The latter age groups consider average and RME lifetime exposures, respectively. Carcinogenic tHBLs (tHBLcs) can be estimated based on these lifetime exposure durations. For metals, the main pathway contributing to the tHBLc was ingestion of soil, not dermal contact or inhalation pathways. Therefore the tHBLc based on a child 0 to 5 is appropriate for screening purposes since the 0 to 5 age group is the most sensitive to ingestion of soil exposures.

For semivolatile organics, cPAHs for example, tHBLcs (Table 7-3 and 7-4) based on 0 to 5 years are higher (less protective) than tHBLcs estimated based on 0 to 9 years or 0 to 30 years because the main pathways contributing to tHBLs are both ingestion and dermal contact with soil. However, incremental risks were not calculated for organics; therefore, incremental risk results would not change.

Comment 30: 132(3) For OU II sites IR-6 and IR-10, the noncarcinogenic Hazard Indices due to groundwater exposure (Table 9-5) should be added to the noncarcinogenic Hazard Indices due to soil exposure (Tables 9-3 and 9-4). The absence of these compiled (RME) risk estimates (also see below), represents a decided underestimate of potential health risks at the OU II sites.

Response: The soil risk estimates presented in Table 9-3 and 9-4 for Site IR-6 and IR-10, respectively, can be added to the risk estimates for groundwater at IR-L/IR-10 (Table 9-5) as a conservative assessment of total risks for the two sites considered together (Attachment 1).

Comment 31: 141(1) For OU II sites IR-6 and IR-10, the carcinogenic risks due to groundwater exposure (Table 9-5) should be added to the carcinogenic risks due to soil exposure (Tables 9-3 and 9-4).

Response: The comment is acknowledged.

Comment 32: **142(2) "Incremental" risks (Tables 9-7 to 9-12) have not been calculated for all inorganic PCOCs noted with an "x" in Table 7-18. For example, where are the "incremental" risk estimates for chromium III in subsurface soil at IR-10? In addition, "incremental" risks were calculated for beryllium in subsurface soil at IR-10 (Table 9-9), even though is was not identified in Table 7-18 with an "x". These tables should be cross-checked for accuracy.**

Response: Incremental risks were correctly calculated for all potential inorganic COCs marked with an "x" in Tables 9-7 through 9-12. Because of a typographical error in Table 7-18, the beryllium entry should have been "x" and the chromium III entry should have been "[x]". Chromium III was detected at concentrations below the interim ambient levels; therefore, a separate incremental risk analysis was not performed.

Comment 33: **143(2) For clarity, the third sentence should be changed to, "The 'incremental' risk characterization using Table H1 background metal exposure point concentrations provided in the Air Sampling Report and Work Plan (HLA, 1992g)..."**

Response: The comment is acknowledged.

Comment 34: **144(2) On page 56, the text describes background concentrations that were compared to maximum and arithmetic mean concentrations and reviewed for informational purposes only. Thus, it should be explained in Section 9.4 that any relation to the NCP target HI of 1.0 or carcinogenic risk range of 10^{-4} to 10^{-6} for estimated "incremental" carcinogenic and noncarcinogenic risks is purely for informational purposes only in this current risk assessment.**

Response: On page 56, the word "informational" was used to emphasize that chemicals were not excluded on the basis of the comparison to interim ambient levels. The incremental risk analysis provides risks from chemical occurrences that may be associated with point source releases related to site activities.

Comment 35: **145(4) Similar to comment above, conclusions drawn from the "incremental" health risk evaluation should be qualified.**

Response: We disagree. Qualifications are only required when describing interim ambient levels.

Comment 36: **148(3) See General Comments regarding THBLs/PRGs. THBLs can not be used to exclude chemicals from the list of PCOCs. This section needs to be re-calculated.**

Response: See the response to General Comment 1. The exclusion of PCP as discussed on page 148(3) from the COC list, was fully explained in the text.

Comment 37: **149(2) See General Comment #1 regarding THBLs /PRGs.**

Response: See the response to General Comment 1.

Comment 38: **149(2) The text should read, "A representative list of potential COCs was selected for each OU II site to perform..."**

Response: The comment is acknowledged.

Comment 39: **153(3) Sentence should read, "To predict potential health effects from chemicals entrained onto dust in indoor air.."**

Response: The comment is acknowledged.

Comment 40: **160(2) See General Comment #1 regarding THBLs/PRGs.**

Response: See the response to General Comment 1.

Comment 41: **161(2) See General Comment #2 regarding current condition exposure scenarios.**

Response: See the response to General Comment 2.

Comment 42: **162 See General Comment #2 regarding potential inhalation of fugitive VOC exposure pathway.**

Response: See the response to General Comment 2.

Comment 43: **Table 6-1 Was Table 6-1 meant to be two tables, e.g., 6-1 and 6-2? It appears that oral toxicity values should be Table 6-2. If this is the case, then references throughout the text should be changed accordingly.**

Response: No, Table 6-1 is one table as indicated by the title and pagination even though the columns of information are different on pages 3 and 4.

Comment 44: **Table 7-3 Footnote /b/ does not correspond to anything in the table.**

Response: Footnote /b/ is indexed to "Chromium (as Chromium III)" on page 1.

Comment 45: **Table 7-17 See General Comment #2 regarding the potential inhalation of VOCs exposure pathway. Vinyl chloride is listed as a COC detected in groundwater at Site IR-6/10. There could be a potential for VOCs such as vinyl chloride to volatilize through soils around, and into buildings on the site.**

Response: See the response to General Comment 2.

Comment 46: **C-9(3) Hexavalent chromium (Cr VI) was detected in soil and groundwater above background levels. Why have risks only been evaluated for chromium III? Page C-11 states that hexavalent chromium is expected to be mobile in the soil and groundwater at the OU II. In absence of site-specific, validated sampling data for Cr VI in the environmental media of concern, risks should be calculated with the default toxicity criteria for Cr VI.**

Response: Site-specific validated sampling data for chromium VI and total chromium in soil and groundwater were presented in Tables 4-4 through 4-14, separately. The chemical concentrations of chromium VI detected in soil at the OU II sites were very low compared to total chromium. As stated in response to DTSC/HERS Specific Comment 25, total chromium analyses for soil were representative of chromium III at all OU II sites and were therefore evaluated as such. Based on the COC selection process used in the PHEE (see Section 7.0), chromium VI was not selected as a COC in soil but was selected for groundwater at Sites IR-9 and IR-6/10.

Comment 47: **C-12(2) See General Comment #2 regarding current condition exposure scenarios. Since onsite air sampling detected chemicals such as naphthalene, benzene, toluene, ethylbenzene and xylenes, inhalation of VOCs should be included in the current condition exposure scenario.**

Response: We disagree. Please see the response to General Comment 2.

Comment 48: **C-14(3) What is the reference for the retardation factor equation?**

Response: The reference is: Freeze, R.A. and Cherry, J.A., 1979. *Groundwater*. Englewood Cliffs, New Jersey: Prentice-Hall Inc. The porosity term in the equation was incorrectly noted as "n_e, effective porosity." The correct notation is "n, porosity."

Comment 49: **C-15(1) What is the reference for the soil partition coefficient equation?**

Response: The reference is: Karickhoff, S.W., 1984. Organic Pollutant Sorption in Aquatic Systems. *Journal of Hydraulic Engineering* 110:707-735.

Comment 50: **Table C5: The reference for Stone (1991) is not included in the Reference Section.**

Response: The Reference is: Stone, W.A., 1991. *Assessing Health Risks Associated with Diesel Contaminated Soils and Groundwater*. Conference Proceedings of the Fifth Annual Conference on Hydrocarbon Contaminated Soils, Calabrese, D.J. and P.T. Kostecki (eds.), Volume 1, Lewis Publishers, Inc. Chelsea, Michigan, pp. 167-180.

Comment 51: Appendix F: On page 94 of the main text, the exposure time, ET for office workers inhaling potentially contaminated dusts in indoor air was assumed to be 4 hours per day, however it appears that an ET value of 8 hours per day was used to calculate chronic daily intakes. Thus, the estimated risks due to inhalation of contaminated fugitive dusts in indoor air will be overestimated (Table F2 for site IR-8). In general, all risk estimate tables should be cross-checked with the assumptions stated in the text for accuracy.

Response: An ET of 8 hours/day was incorrectly used to calculate risks for this receptor and pathway for Sites IR-8 and IR-10; the results for Site IR-9 were correctly calculated using 4 hours/day. Essentially, the hazard indices and upper bound excess cancer risk estimates for future hypothetical office workers listed on Tables 9-1 and 9-4 should be divided by two to derive the correct risk estimates. This error did not affect the final results of the PHEE and yielded, in fact, conservative results.

C. Comments on the OU II RI Report Appendix C and Navy Responses

Comment 52: The "Data Validation and Evaluation Report" ("Appendix C") of the Hunter's Point Annex Draft Risk Assessment (RA) OU II RI report, dated June 12, 1992, was reviewed by ICF/KE for purposes of ensuring that the data validation process described was adequately designed, conducted and represented in the RA report. Since there were no "raw" analytical data or supporting project documentation provided with submission of Appendix C, verification of specific analytical results and associated qualifications cited in the report was not possible. Therefore, review of Appendix C by ICF/KE entailed a technical evaluation of the data validation process employed, and a determination of whether this specified process has adequately assessed data quality. In general, the data validation approach, as outlined in Appendix C appears to be technically sufficient for evaluating the quality of selected project data. The analytical methodologies, laboratory data review documents, and validation criteria referenced in Appendix C are both appropriate and standard tools for achieving the goals and data quality objectives (DQOs) specified in Section 2.0 ("Objectives and Scope") of the report. The few specific concerns, as itemized below, essentially regard the scope or scale of the "full" data validation component as described in Appendix C. The degree to which these concerns affect the overall data validation process remains a risk management decision. As mentioned in Section 1.0 ("Introduction") of the report, the level of validation performed was intended to be consistent with USEPA QC Level IV data quality objectives (Data Quality Objectives for Remedial Response Activities Development, USEPA, March 1987). The Naval Energy and Environmental Support Activity (NEESA) equivalent of the USEPA Level IV QC requirements is defined as "Level D" (Sampling and Chemical Analysis QA Requirements for the Navy Installation

Restoration Program; NEESA, June 1988). NEESA mandates that analytical data generated under Level D QC guidelines be, at a minimum, validated per CLP criteria. According to Appendix C, only approximately 10% of the samples received "full review" (Section 3.2) and several analyses were never subjected to this complete data validation (Table C18).

Since many essential CLP validation elements are not included in the "cursory review", of which 100% of samples were subjected, there are concerns that the extent of full validation may not be adequate to accurately assess quality of the complete data set, and that NEESA Level D QC requirements may not have been fully satisfied. These concerns can only be addressed by a more thorough evaluation of the complete field sampling program database.

For instance, according to Table C18, data from the following analyses did not receive any fraction of full review: EPA 350.1, EPA 8015, dibenzofuran by GC/MS/MS and Modified EPA 8080. Therefore, validation elements specific to full review (e.g., calibration, system performance, reporting limit verification, analyte quantitation and identification, etc.) were apparently never checked for these analytical data. Section 4.2.1 ("Laboratory and Field Blanks") indicates that the GC/MS/MS analyses, a specialized non-EPA standard method, experienced blank contamination problems and suggests that perhaps cross-contamination with other samples had occurred. No portion of this analytical data was fully validated. This, at the least, should be fully addressed in the Uncertainty Section of the final PHEE.

Moreover, Tables C19, C21, C23, C25 and C27 of Appendix C provide values reflecting the percent of total data qualified due to specific QC criteria. The criteria in these five tables (i.e., calibration, system performance, internal standards, ICP serial dilutions and ICP interference checks) are only evaluated during full data review. The "percent qualified" values furnished in these tables can be misleading since they were statistically generated using "total" number of analyses performed and not that "fraction" of analyses actually subjected to full data validation. Hence, summary statements made in Sections 5.4.2.1 ("Calibration") and 5.4.2.2 ("System Performance") alluding to the low frequency of observed problems described in Tables C19 and C21 may be potentially biased by these figures. Similarly, this should be fully addressed in the Uncertainty Section of the final PHEE.

Lastly, the estimated completeness of the data (see Section 5.4 "Completeness") was extrapolated from the full review results and deemed "very high" relative to the nationwide average of USEPA Level IV data sets. Concerns exist regarding how this completeness value was calculated, since full review frequencies varied, depending on analysis and the validity of assuming that the portion of analytical data fully review here is an accurate representation of the entire data set. This

should be addressed specifically in the PHEE Uncertainty Section and considered explicitly by risk management.

Except for those above noted concerns pertaining to the frequency of full data validation and whether NEESA Level D QC requirements were unequivocally satisfied, the review by ICF/KE of Appendix C from the OU II RI report concluded that the technical approach employed for data validation was both satisfactory for achieving the stated data quality objectives and adequately presented in the RA report.

Response: As originally defined in the Quality Assurance Project Plan (QAPP), about 10 percent of the analyses were to receive full CLP validation, which is a common and accepted industry practice (*HLA, 1988a*). For this reason, the roughly 10 percent fully validated data were considered acceptable.

As noted in Appendix C, full validation was not performed on the data from EPA Test Method 350.1 (ammonia), EPA Test Method 8015 (2-butanone), or dibenzofuran analysis by GC/MS/MS. Because ammonia and dibenzofuran were not identified as primary constituents in the RI or as COCs in the PHEE, full validation was not expected to materially change the conclusions of these studies. Prior to parcel-specific RI/PHEE/FS reports, the data from EPA Method 350.1 and dibenzofuran analysis by GC/MS/MS may undergo full validation. EPA Method 8015 was performed on six groundwater samples to confirm the presence of the 2-butanone identified in previous groundwater samples whose data had not yet undergone cursory validation. During cursory validation, 2-butanone was identified as a laboratory contaminant; thus, the analyses by EPA Test Method 8015 were not necessary. Full validation is not required for these analyses. Table C18 of Appendix C incorrectly noted that the data from modified EPA Test Method 8080 were not fully validated; six samples were fully validated, but the qualifiers were inadvertently omitted form the database. These qualifiers will be entered into the database prior to future submittals of OU II data.

Of the approximately 10 percent of the samples that underwent full validation, few calibration, system performance, or other problems were found. This indicates that an exhaustive full validation review of the data from all analyses is not likely to find more frequent QC problems. Consequently, the percentage of data qualified due to specific QC criteria and the estimated level of completeness would not be expected to change significantly. The uncertainty sections of future parcel-specific PHEE reports will address these issues.

ATTACHMENTS

Attachment 1. Summary of Risks from Multipathway Exposures, Soil and Groundwater at Site IR-6/10
OU II PHEE Report
Hunters Point Annex

Receptor Populations Exposure Pathways	Hazard Index Average	Hazard Index RME	Potential Upper Bound Excess Cancer Risk Average	Potential Upper Bound Excess Cancer Risk RME
Future Hypothetical Onsite				
Construction Workers				
Inhalation of dust in outdoor air	5E-01	5E+01	5E-07	2E-05
Ingestion of soil	9E-02	2E+00	1E-05	3E-05
Dermal contact with soil	6E-03	8E-01	1E-06	1E-04
Multipathway Exposures	6E-01	5E+01	1E-05	2E-04
Future Hypothetical Onsite				
Adult Office Workers				
Soil Pathways				
Inhalation of dust in indoor air	3E-02	1E-01	3E-07	3E-06
Inhalation of dust in outdoor air	6E-02	4E-01	6E-07	1E-05
Ingestion of soil	5E-02	2E-01	9E-06	8E-05
Dermal contact with soil	3E-02	2E-01	6E-05	1E-03
Groundwater Pathways				
Ingestion of groundwater	2E-01	5E+00	1E-05	1E-03
Dermal contact with groundwater during showering	5E-02	6E-01	4E-07	4E-05
Inhalation of groundwater vapors during showering	--	--	2E-07	5E-05
Multipathway Exposures	4E-01	6E+00	8E-05	2E-03
Future Hypothetical Onsite				
Child/Adult Residents				
Soil Pathways				
Inhalation of dust in indoor air	7E-01	2E+00	5E-06	4E-05
Inhalation of dust in outdoor air	2E-01	1E+00	2E-06	1E-05
Ingestion of soil	2E+00	5E+00	2E-04	8E-04
Ingestion of fruits	5E-01	7E+00	1E-05	1E-04
Ingestion of vegetables	4E-01	6E+00	1E-05	2E-04
Dermal contact with soil	2E-01	1E+00	3E-04	4E-03
Groundwater Pathways				
Ingestion of groundwater	3E+00	1E+01	1E-04	2E-03
Dermal contact with groundwater during showering	1E-01	2E+00	1E-06	8E-05
Inhalation of groundwater vapors during showering	--	--	1E-06	9E-05
Multipathway Exposures	7E+00	4E+01	6E-04	7E-03
Future Hypothetical Onsite				
Adult Residents				
Soil Pathways				
Inhalation of dust in indoor air	1E-01	5E-01	1E-06	2E-05
Inhalation of dust in outdoor air	4E-03	5E-02	9E-08	2E-06
Ingestion of soil	2E-01	4E-01	3E-05	3E-04
Ingestion of fruits	8E-02	1E+00	3E-06	6E-05
Ingestion of vegetables	1E-01	2E+00	5E-06	1E-04
Dermal contact with soil	5E-02	3E-01	8E-05	2E-03
Groundwater Pathways				
Ingestion of groundwater	1E+00	6E+00	6E-05	1E-03
Dermal contact with groundwater during showering	8E-02	9E-01	6E-07	7E-05
Inhalation of groundwater vapors during showering	--	--	3E-07	8E-05
Multipathway Exposures	2E+00	1E+01	2E-04	4E-03

2E-01 = 2 x 10^-1
Dashes (--) = pathway not calculable because organic chemicals of concern do not have toxicity values and inorganic chemicals of concern are not volatile.
All figures rounded to one significant figure for presentation purposes, therefore, the results for Appendix F for individual pathways may result in a slighty different value for multipathway exposures than presented.

Table 9-6. Summary of Risks from Multipathway Exposures for Lead
HPA OU II PHEE Report
San Francisco, California

Receptor Populations IR Sites	Average Scenario Model-Estimated Blood-Lead Level (µg/dl)	HR	RME Scenario Model-Estimated Blood-Lead Level (µg/dl)	HR
Future Hypothetical Onsite				
Adult Construction Worker				
IR-9	N/A	--	8.03	0.8
IR-6	N/A	--	23.75	2.4
IR-10	N/A	--	8.21	0.8
Future Hypothetical Onsite				
Adult Office Worker				
IR-9	N/A	--	2.60	0.3
IR-6	N/A	--	4.79	0.5
IR-10	N/A	--	2.73	0.3
Future Hypothetical Onsite				
Child Resident				
IR-9	2.37	0.4	11.4	2.0
IR-6	6.74	1.2	38.1	6.7
IR-10	2.41	0.4	11.6	2.0
Future Hypothetical Onsite				
Adult Resident				
IR-9	N/A	--	4.71	0.5
IR-6	N/A	--	12.36	1.2
IR-10	N/A	--	4.86	0.5

Dashes (--) denote not calculable

HR =Hazard Ratio; calculated as the quotient of the model-estimated blood-lead level divided by the target blood-lead level of 5.68 µg/dl (for children) or 10 µg/dl (for adults); Appendix G

N/A =Not applicable for this model

µg/dl =micrograms lead per deciliter blood

Table 9-12. Summary of Site Incremental Risks from Exposures to Lead in Soil, Sites IR-9, IR-6 and IR-10 /a/
HPA OU II PHEE Report
San Francisco, California

Reasonable Maximum Exposure Scenario

Receptor Populations IR Sites	Total Model-Estimated Blood-Lead Level (µg/dl)	HR	Background Model-Estimated Blood-Lead Level (µg/dl)	HR	Incremental Model-Estimated Blood-Lead Level (µg/dl)	HR
Future Hypothetical Onsite						
Adult Construction Worker						
IR-9	8.03	0.80	2.00	0.20	6.03	0.60
IR-6	23.75	2.38	2.00	0.20	21.75	2.18
IR-10	8.21	0.82	2.00	0.20	6.21	0.62
Future Hypothetical Onsite						
Adult Office Worker						
IR-9	2.60	0.26	2.00	0.20	0.60	0.06
IR-6	4.79	0.48	2.00	0.20	2.79	0.28
IR-10	2.73	0.27	2.00	0.20	0.73	0.07
Future Hypothetical Onsite						
Child Resident						
IR-9	11.40	2.01	2.00	0.35	9.40	1.65
IR-6	38.10	6.71	2.00	0.35	36.10	6.36
IR-10	11.60	2.04	2.00	0.35	9.60	1.69
Future Hypothetical Onsite						
Adult Resident						
IR-9	4.71	0.47	2.00	0.20	2.71	0.27
IR-6	12.36	1.24	2.00	0.20	10.36	1.04
IR-10	4.86	0.49	2.00	0.20	2.86	0.29

Lead not a chemical of concern at Site IR-8.

µg/dl = micrograms lead per deciliter blood

HR = Hazard Ratio; calculated as the quotient of the model-estimated blood-lead level divided by the target blood-lead level of 5.68 µg/dl (for children) or 10 µg/dl (for adults); Appendix G for additional discussion.

Total = Health risks quantified for chemicals of concern selected for IR site (Appendix G) based on measured site concentration.

Background = Health risks quantified for chemicals of concern where IR detected site concentration greater than background (threshold) concentrations shown in Table 7-1 (Appendix G).

Incremental = The difference between total and background; used to evaluate potential incremental risks from each IR site for the chemical of concern in the media of concern for exposure pathway of concern.

/a/ Exposure pathways included inhalation of dust, ingestion of soil, dermal contact with soil, ingestion of fruits and vegetables (residents only) and ingestion of groundwater.

LEAD RISK ASSESSMENT SPREADSHEET – IR9 CONSTRUCTION WORKER
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (μg/m³)	0.0283				
LEAD IN SOIL (μg/g)	404	BLOOD Pb, ADULT (μg/dl)	4.52	8.03	10.2
LEAD IN WATER (μg/l)	1.8				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Pb Pathway	μg/dl	Route-specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.08 =	1E-04 (μg/dl)/(μg/day)	*	404 μg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	2%
SOIL INGESTION:	3.41 =	0.018 (μg/dl)/(μg/day)	*	404 μg/g	*	0.48 g soil/day	76%
INHALATION:	0.05 =	1.64 (μg/dl)/(μg/m³)	*	0.03 μg/m³			1%
WATER INGESTION:	0.10 =	0.04 (μg/dl)/(μg/day)	*	2 μg/l	*	1.4 l water/day	2%
FOOD INGESTION:	0.88 =	0.04 (μg/dl)/(μg/day)	*	10.0 μg Pb/kg diet	*	2.2 kg diet/day	19%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (μg/kg) = 10.0μg/kg

LEAD IN PRODUCE = 10μg/kg or 0.00045 * soil lead = 10.0μg/kg

Shaded valued are site-specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – IR9 OFFICE WORKER
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	0.0283	BLOOD Pb, ADULT (µg/dl)	1.46	2.60	3.3
LEAD IN SOIL (µg/g)	404				
LEAD IN WATER (µg/l)	1.8				
SITE–GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Pb Pathway	µg/dl	Route–specific constant			concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.08 =	1E–04	(µg/dl)/(µg/day)	*	404 µg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	5%
SOIL INGESTION:	0.36 =	0.018	(µg/dl)/(µg/day)	*	404 µg/g	*	0.05 g soil/day	24%
INHALATION:	0.05 =	1.64	(µg/dl)/(µg/m³)	*	0.03 µg/m³			3%
WATER INGESTION:	0.10 =	0.04	(µg/dl)/(µg/day)	*	2 µg/l	*	1.4 l water/day	7%
FOOD INGESTION:	0.88 =	0.04	(µg/dl)/(µg/day)	*	10.0 µg Pb/kg diet	*	2.2 kg diet/day	60%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (µg/kg) = 10.0 µg/kg

LEAD IN PRODUCE = 10 µg/kg or 0.00045 * soil lead = 10.0 µg/kg

Shaded valued are site–specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – IR9 ADULT RESIDENT
OU II PHEE Report
Hunters Point Annex

INPUT

MEDIUM	LEVEL
LEAD IN AIR (µg/m³)	0.0283
LEAD IN SOIL (µg/g)	404
LEAD IN WATER (µg/l)	1.8
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	1

OUTPUT

	50th percentile	95th percentile	99th percentile
BLOOD Pb, ADULT (µg/dl)	2.65	4.71	6.0

EQUATIONS, ADULTS

Blood Pb Pathway	µg/dl		Route-specific constant			concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.08	=	1E−04	(µg/dl)/(µg/day)	*	404 µg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	3%
SOIL INGESTION:	0.71	=	0.018	(µg/dl)/(µg/day)	*	404 µg/g	*	0.1 g soil/day	27%
INHALATION:	0.05	=	1.64	(µg/dl)/(µg/m³)	*	0.03 µg/m³			2%
WATER INGESTION:	0.10	=	0.04	(µg/dl)/(µg/day)	*	2 µg/l	*	1.4 l water/day	4%
FOOD INGESTION:	1.71	=	0.04	(µg/dl)/(µg/day)	*	19.4 µg Pb/kg diet	*	2.2 kg diet/day	65%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (µg/kg) = 19.4µg/kg

LEAD IN PRODUCE = 10µg/kg or 0.00045 * soil lead = 181.8µg/kg

Shaded valued are site-specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – IR6 CONSTRUCTION WORKER
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	0.0988	BLOOD Pb, ADULT (µg/dl)	13.36	23.75	30.3
LEAD IN SOIL (µg/g)	1410				
LEAD IN WATER (µg/l)	2.4				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Pb Pathway	µg/dl		Route-specific constant			concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.28	=	1E−04	(µg/dl)/(µg/day)	*	1410 µg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	2%
SOIL INGESTION:	11.91	=	0.018	(µg/dl)/(µg/day)	*	1410 µg/g	*	0.48 g soil/day	89%
INHALATION:	0.16	=	1.64	(µg/dl)/(µg/m³)	*	0.10 µg/m³			1%
WATER INGESTION:	0.13	=	0.04	(µg/dl)/(µg/day)	*	2 µg/l	*	1.4 l water/day	1%
FOOD INGESTION:	0.88	=	0.04	(µg/dl)/(µg/day)	*	10.0 µg Pb/kg diet	*	2.2 kg diet/day	7%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (µg/kg) = 10 µg/kg

LEAD IN PRODUCE = 10 µg/kg or 0.00045 * soil lead = 10 µg/kg

Shaded valued are site-specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – IR6 OFFICE WORKER
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	0.0988	BLOOD Pb, ADULT (µg/dl)	2.69	4.79	6.1
LEAD IN SOIL (µg/g)	1410				
LEAD IN WATER (µg/l)	2.4				
SITE–GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Pb Pathway	µg/dl		Route–specific constant			concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.28	=	1E–04	(µg/dl)/(µg/day)	*	1410 µg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	10%
SOIL INGESTION:	1.24	=	0.018	(µg/dl)/(µg/day)	*	1410 µg/g	*	0.05 g soil/day	46%
INHALATION:	0.16	=	1.64	(µg/dl)/(µg/m³)	*	0.10 µg/m³			6%
WATER INGESTION:	0.13	=	0.04	(µg/dl)/(µg/day)	*	2 µg/l	*	1.4 l water/day	5%
FOOD INGESTION:	0.88	=	0.04	(µg/dl)/(µg/day)	*	10.0 µg Pb/kg diet	*	2.2 kg diet/day	33%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (µg/kg) = 10 µg/kg

LEAD IN PRODUCE = 10 µg/kg or 0.00045 * soil lead = 10 µg/kg

Shaded valued are site–specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – IR6 ADULT RESIDENT
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	0.0988	BLOOD Pb, ADULT (µg/dl)	6.96	12.36	15.7
LEAD IN SOIL (µg/g)	1410				
LEAD IN WATER (µg/l)	2.4				
SITE–GROWN PRODUCE? (1 = Yes; 0 = No)	1				

EQUATIONS, ADULTS

Blood Pb Pathway	µg/dl		Route–specific constant			concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.28 =	1E–04	(µg/dl)/(µg/day)	*		1410 µg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	4%
SOIL INGESTION:	2.48 =	0.018	(µg/dl)/(µg/day)	*		1410 µg/g	*	0.1 g soil/day	36%
INHALATION:	0.16 =	1.64	(µg/dl)/(µg/m³)	*		0.10 µg/m³			2%
WATER INGESTION:	0.13 =	0.04	(µg/dl)/(µg/day)	*		2 µg/l	*	1.4 l water/day	2%
FOOD INGESTION:	3.90 =	0.04	(µg/dl)/(µg/day)	*		44.3 µg Pb/kg diet	*	2.2 kg diet/day	56%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (µg/kg) = 44.3 µg/kg

LEAD IN PRODUCE = 10 µg/kg or 0.00045 * soil lead = 634.5 µg/kg

Shaded valued are site–specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – IR10 CONSTRUCTION WORKER
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	0.0286				
LEAD IN SOIL (µg/g)	408	BLOOD Pb, ADULT (µg/dl)	4.62	8.21	10.5
LEAD IN WATER (µg/l)	3				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Pb Pathway	µg/dl		Route-specific constant			concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.08	=	1E-04	(µg/dl)/(µg/day)	*	408 µg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	2%
SOIL INGESTION:	3.45	=	0.018	(µg/dl)/(µg/day)	*	408 µg/g	*	0.48 g soil/day	75%
INHALATION:	0.05	=	1.64	(µg/dl)/(µg/m³)	*	0.03 µg/m³			1%
WATER INGESTION:	0.17	=	0.04	(µg/dl)/(µg/day)	*	3 µg/l	*	1.4 l water/day	4%
FOOD INGESTION:	0.88	=	0.04	(µg/dl)/(µg/day)	*	10.0 µg Pb/kg diet	*	2.2 kg diet/day	19%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (µg/kg) = 10.0 µg/kg

LEAD IN PRODUCE = 10 µg/kg or 0.00045 * soil lead = 10.0 µg/kg

Shaded valued are site-specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – IR10 OFFICE WORKER
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (μg/m³)	0.0286	BLOOD Pb, ADULT (μg/dl)	1.53	2.73	3.5
LEAD IN SOIL (μg/g)	408				
LEAD IN WATER (μg/l)	3				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Pb Pathway	μg/dl		Route-specific constant			concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.08	=	1E-04	(μg/dl)/(μg/day)	*	408 μg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	5%
SOIL INGESTION:	0.36	=	0.018	(μg/dl)/(μg/day)	*	408 μg/g	*	0.05 g soil/day	23%
INHALATION:	0.05	=	1.64	(μg/dl)/(μg/m³)	*	0.03 μg/m³			3%
WATER INGESTION:	0.17	=	0.04	(μg/dl)/(μg/day)	*	3 μg/l	*	1.4 l water/day	11%
FOOD INGESTION:	0.88	=	0.04	(μg/dl)/(μg/day)	*	10.0 μg Pb/kg diet	*	2.2 kg diet/day	57%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (μg/kg) = 10.0 μg/kg

LEAD IN PRODUCE = 10 μg/kg or 0.00045 * soil lead = 10.0 μg/kg

Shaded valued are site-specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – IR10 ADULT RESIDENT
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (μg/m³)	0.0286	BLOOD Pb, ADULT (μg/dl)	2.73	4.86	6.2
LEAD IN SOIL (μg/g)	408				
LEAD IN WATER (μg/l)	3				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	1				

EQUATIONS, ADULTS

Blood Pb Pathway	μg/dl		Route-specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.08 =	1E-04	(μg/dl)/(μg/day)	*	408 μg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	3%
SOIL INGESTION:	0.72 =	0.018	(μg/dl)/(μg/day)	*	408 μg/g	*	0.1 g soil/day	26%
INHALATION:	0.05 =	1.64	(μg/dl)/(μg/m³)	*	0.03 μg/m³			2%
WATER INGESTION:	0.17 =	0.04	(μg/dl)/(μg/day)	*	3 μg/l	*	1.4 l water/day	6%
FOOD INGESTION:	1.72 =	0.04	(μg/dl)/(μg/day)	*	19.5 μg Pb/kg diet	*	2.2 kg diet/day	63%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (μg/kg) = 19.5μg/kg

LEAD IN PRODUCE = 10μg/kg or 0.00045 * soil lead = 183.6μg/kg

Shaded valued are site-specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – CONSTRUCTION WORKER, IR9 BACKGROUND EXPOSURE
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	0.02	BLOOD Pb, ADULT (µg/dl)	1.09	1.93	2.5
LEAD IN SOIL (µg/g)	20				
LEAD IN WATER (µg/l)	0				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Pb Pathway	µg/dl		Route-specific constant			concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.00	=	1E-04	(µg/dl)/(µg/day)	*	20 µg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	0%
SOIL INGESTION:	0.17	=	0.018	(µg/dl)/(µg/day)	*	20 µg/g	*	0.48 g soil/day	16%
INHALATION:	0.03	=	1.64	(µg/dl)/(µg/m³)	*	0.02 µg/m³			3%
WATER INGESTION:	0.00	=	0.04	(µg/dl)/(µg/day)	*	15 µg/l	*	1.4 l water/day	0%
FOOD INGESTION:	0.88	=	0.04	(µg/dl)/(µg/day)	*	10.0 µg Pb/kg diet	*	2.2 kg diet/day	81%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (µg/kg) = 10.0 µg/kg

LEAD IN PRODUCE = 10 µg/kg or 0.00045 * soil lead = 10.0 µg/kg

Shaded valued are site-specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – CONSTRUCTION WORKER, IR6 BACKGROUND EXPOSURE
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	0.015				
LEAD IN SOIL (µg/g)	20	BLOOD Pb, ADULT (µg/dl)	1.08	1.91	2.4
LEAD IN WATER (µg/l)	0				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Pb Pathway	µg/dl	Route-specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.00 =	1E-04 (µg/dl)/(µg/day)	*	20 µg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	0%
SOIL INGESTION:	0.17 =	0.018 (µg/dl)/(µg/day)	*	20 µg/g	*	0.48 g soil/day	16%
INHALATION:	0.02 =	1.64 (µg/dl)/(µg/m³)	*	0.02 µg/m³			2%
WATER INGESTION:	0.00 =	0.04 (µg/dl)/(µg/day)	*	15 µg/l	*	1.4 l water/day	0%
FOOD INGESTION:	0.88 =	0.04 (µg/dl)/(µg/day)	*	10.0 µg Pb/kg diet	*	2.2 kg diet/day	82%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (µg/kg) = 10.0µg/kg

LEAD IN PRODUCE = 10µg/kg or 0.00045 * soil lead = 10.0µg/kg

Shaded valued are site-specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – CONSTRUCTION WORKER, IR10 BACKGROUND EXPOSURE
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (μg/m³)	0.025	BLOOD Pb, ADULT (μg/dl)	1.09	1.94	2.5
LEAD IN SOIL (μg/g)	20				
LEAD IN WATER (μg/l)	0				
SITE–GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Pb Pathway	μg/dl	Route–specific constant			concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.00 =	1E–04	(μg/dl)/(μg/day)	*	20 μg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	0%
SOIL INGESTION:	0.17 =	0.018	(μg/dl)/(μg/day)	*	20 μg/g	*	0.48 g soil/day	15%
INHALATION:	0.04 =	1.64	(μg/dl)/(μg/m³)	*	0.03 μg/m³			4%
WATER INGESTION:	0.00 =	0.04	(μg/dl)/(μg/day)	*	15 μg/l	*	1.4 l water/day	0%
FOOD INGESTION:	0.88 =	0.04	(μg/dl)/(μg/day)	*	10.0 μg Pb/kg diet	*	2.2 kg diet/day	80%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (μg/kg) = 10.0μg/kg

LEAD IN PRODUCE = 10μg/kg or 0.00045 * soil lead = 10.0μg/kg

Shaded valued are site–specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – OFFICE WORKER, BACKGROUND EXPOSURE
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	0.0009	BLOOD Pb, ADULT (µg/dl)	0.90	1.59	2.0
LEAD IN SOIL (µg/g)	13				
LEAD IN WATER (µg/l)	0				
SITE–GROWN PRODUCE? (1 = Yes; 0 = No)	0				

EQUATIONS, ADULTS

Blood Pb Pathway	µg/dl	Route–specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.00 =	1E–04 (µg/dl)/(µg/day)	*	13 µg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	0%
SOIL INGESTION:	0.01 =	0.018 (µg/dl)/(µg/day)	*	13 µg/g	*	0.05 g soil/day	1%
INHALATION:	0.00 =	1.64 (µg/dl)/(µg/m³)	*	0.00 µg/m³			0%
WATER INGESTION:	0.00 =	0.04 (µg/dl)/(µg/day)	*	15 µg/l	*	1.4 l water/day	0%
FOOD INGESTION:	0.88 =	0.04 (µg/dl)/(µg/day)	*	10.0 µg Pb/kg diet	*	2.2 kg diet/day	98%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (µg/kg) = 10.0µg/kg

LEAD IN PRODUCE = 10µg/kg or 0.00045 * soil lead = 10.0µg/kg

Shaded valued are site–specific lead concentrations input to the model.

LEAD RISK ASSESSMENT SPREADSHEET – ADULT RESIDENT, BACKGROUND EXPOSURE
OU II PHEE Report
Hunters Point Annex

INPUT		OUTPUT			
MEDIUM	LEVEL		50th percentile	95th percentile	99th percentile
LEAD IN AIR (µg/m³)	0.0009	BLOOD Pb, ADULT (µg/dl)	0.89	1.58	2.0
LEAD IN SOIL (µg/g)	13				
LEAD IN WATER (µg/l)	0				
SITE-GROWN PRODUCE? (1 = Yes; 0 = No)	1				

EQUATIONS, ADULTS

Blood Pb Pathway	µg/dl	Route-specific constant		concentration in medium		contact rate	percent of total
SOIL CONTACT:	0.00 =	1E-04 (µg/dl)/(µg/day)	*	13 µg/g	*	1.85 g soil/day (5 g/m² * 0.37 m²)	0%
SOIL INGESTION:	0.02 =	0.018 (µg/dl)/(µg/day)	*	13 µg/g	*	0.1 g soil/day	3%
INHALATION:	0.00 =	1.64 (µg/dl)/(µg/m³)	*	0.00 µg/m³			0%
WATER INGESTION:	0.00 =	0.04 (µg/dl)/(µg/day)	*	15 µg/l	*	1.4 l water/day	0%
FOOD INGESTION:	0.86 =	0.04 (µg/dl)/(µg/day)	*	9.8 µg Pb/kg diet	*	2.2 kg diet/day	97%

EQUATIONS, DIETARY LEAD

TOTAL DIETARY LEAD = 0.945 * 10 + 0.055 * Pb in produce (µg/kg) = 9.8 µg/kg

LEAD IN PRODUCE = 10 µg/kg or 0.00045 * soil lead = 5.9 µg/kg

Shaded valued are site-specific lead concentrations input to the model.