Naval Facilities Engineering Command
Code 06CC.LMH
San Diego, California 92132-5190

File: etswtr2June2005ResponseToTAA769Cmts

Transmittal

Date: 2 June 2005

From: Lynn Marie Hornecker

To: **Frank Cheng**
State of California Environmental Protection Agency
Department of Toxic Substances Control (DTSC), Region 4
Site Mitigation Branch, Base Closure Unit
5796 Corporate Avenue
Cypress, CA 90630

Subj: **Response to DTSC Comments**
Former Temporary Accumulation Area (TAA) 769
Former Marine Corps Air Station, El Toro

Provided for your review as the attachment is the Response to Comment package with responses to DTSC comments dated 14 December 2004 pertaining to the Former TAA 769 at the Former Marine Corps Air Station, El Toro. Revised pages for the closure report are included.

- An evaluation of the construction worker scenario was added, and the assumptions for the worker exposure assessment were presented. The former TAA site is relatively small (approximately 17 feet long by 12 feet wide), and worker exposure is limited due to the small surface area of the site and the likelihood that dust control measures would be implemented during construction activities.

- Residual beryllium levels were incorporated into the risk assessment.

- Residual lead levels were evaluated using the DTSC Lead Risk Assessment Spreadsheet.

Please provide comments on the attachment within 60 days, if possible. Please do not hesitate to contact me at (619) 532-0783 if you have questions pertaining to this transmittal. A formal transmittal letter may follow.

Attachment
Response to comments dated May 2005

Copy to:
Andy Piszkin
CSO El Toro
Project File

ADDENDUM TO SUMMARY REPORT TEMPORARY ACCUMULATION AREA 769

DATED 04 JUNE 2003

THIS RECORD IS ENTERED IN THE DATABASE AND FILED AS

RECORD NO. M60050_003417

Response to Comments on Closure Report TAA 769, Former Marine Corps Air Station, El Toro California Revision 0, dated June 4, 2003

Comment No.	Section/Page Number	Comment	Response
Specific Comments from Tayseer Mahmoud, Senior Hazardous Engineer, California Department of Toxic Substance Control, Southern California Region, dated December 14, 2004			
1.	**Section 5.0:**	Construction Worker Scenario: We concur with the Navy on evaluation of potential risks to human health under the hypothetical residential scenario. In addition, please include the construction worker exposure scenario in the HHRAs to address activities associated with potential redevelopment. The typical assumptions for the construction worker scenario include soil ingestion rate of 330 mg/day, exposure duration of one year, and an exposure frequency of 250 days a year. It should be noted that cobalt and beryllium are carcinogenic via inhalation. Since the intake through inhalation could be potentially higher in the construction scenario, the human health risk assessment should demonstrate whether or not the screening risk and hazard index estimates for construction worker are acceptable.	Comment acknowledged. A construction worker scenario, exposure assessment and construction worker scenario risk characterization has been calculated for TAA 769 site in Table 6 and 7 respectively (Attachment 1 of this response to comments document). Based on the results of the construction worker scenario it is demonstrated that the predicted cancer risk is 4×10^{-7}. That is below the *de minimus* risk level and this predicted risk is in the range generally considered acceptable for occupational risks.
2.	**Section 5.4, 4th paragraph, page 5-2;**	Section 5.4, 4th paragraph, page 5-2: Beryllium should be added to the list of detected carcinogens because beryllium is carcinogen via inhalation.	Comment acknowledged. Text on the section 5.4 has been revised to include beryllium as carcinogen. The revised Section 5.0 for TAA 769 Closure Report is included in Attachment 2 of this response to comments document.
3.	**Table 3;**	Table 3 – Residential Risk Screening Worksheet for Soil: Beryllium should be included in the calculation of cumulative risk (see comment above). .	Comment acknowledged. A revised Table 3 (Residential Risk Screening Worksheet for Soil) includes beryllium in the calculation of cumulative risk. A copy of the revised Table 3 and Table 5 is included in Attachment 3 of this response to comments document.
4.	**Table 3;**	Rather than calculate a hazard index for lead through a comparison with Cal-EPA PRG, lead should be evaluated by presenting the predicted blood lead level associated with exposures to lead in the soil. The Lead Spreadsheet (DTSC), http://www.dtsc.ca.gov/sciencetechnology should be used for this evaluation, and the results presented in the Addendum to Summary Report. Therefore, the cumulative non-cancer hazard index should not include the ratio of lead to its residential soil PRG. Please revise Table 3 accordingly.	Comment acknowledged. A lead spreadsheet for TAA 769 site using DTSC web site has been created as Table 4 and Table 3 (Residential Risk Screening Work Sheet for Soil) has been revised accordingly. Lead Spreadsheet data indicate that potential blood lead levels for residential children and adults and occupational adults are below a level of concern. A copy of the Lead Spreadsheet (Table 4) is included in Attachment 4 of this response to comments document.

Response to Comments on Closure Report TAA 769, Former Marine Corps Air Station, El Toro California Revision 0, dated June 4, 2003

Comment No.	Section/Page Number	Comment	Response
5	**Section 6, page 6-1, last bullet.**	Please add beryllium to the list of detected carcinogens in soil.	Comment acknowledged. Text on the section 6 has been revised to include beryllium as detected carcinogen. The revised Section 6.0 for TAA 769 Closure Report is included in Attachment 5 of this response to comments document.

Attachment 1

Table 6 – Construction Worker Scenario Exposure Assessment

Table 7 - Construction Worker Scenario Risk Characterization

Table 6
Construction Worker Scenario Exposure Assessment
Former TAA 769

LADD Inhalation = $(CS * Dust * IR * EF * ED)/(BW * AT_{carc})$ ADD Inhalation = $(CS * Dust * IR * EF * ED)/(BW * AT_{non\text{-}carc})$

LADD Ingestion = $(CS * SIR * EF * ED)/(BW * AT_{carc})$ ADD Ingestion = $(CS * SIR * EF * ED)/(BW * AT_{non\text{-}carc})$

LADD dermal contact = $(CS * DAF * AF * SA * EF * ED)/(BW * AT_{carc})$ ADD dermal contact = $(CS * DAF * AF * SA * EF * ED)/(BW * AT_{non\text{-}carc})$

where

Variable	Parameter Definition	units	value	Basis
CS	soil concentration	mg/kg soil	chemical-specific	
Dust	airborne soil concentration	kg soil/m^3 air	5.00E-07	Assumed to be 1/20th dust PEL for total dust of 10 mg/m^3
IR	inhalation rate	m^3/day	2.00E+01	default for worker (USEPA, 2002b)
EF	exposure frequency	days/year	2.10E+01	working 21 days for 52 weeks in a year
ED	exposure duration	year	1.00E+00	assumed sporatic exposures over 1 year period
SIR	soil ingestion rate	kg soil/day	3.30E-04	Recommended Value from USEPA (2002b)
DAF	Dermal Asbsorption Factor	unitless	chemical-specific	values from DTSC's PEA Manual Used
AF	soil-to-skin adherence	kg soil/cm^2 skin	3.00E-07	Recommended Value from USEPA (2002b) (0.3 mg)
SA	exposed skin surface area	cm^2	3.30E+03	Recommended Value from USEPA (2002b)
AT_{carc}	carcinogenic averaging time	days	2.56E+04	default value for carcinogens
$AT_{noncarc}$	noncarcinogenic averaging time	days	3.65E+02	12 months year of exposure
BW	body weight	kg	7.0E+01	default value for adults

Detected Chemical	CS TAA 769 Soil Max Conc (mg/kg)	Dermal Absorption Factor	Lifetime Average Daily Dose (Cancer Endpoint)			Average Daily Dose (Non-Cancer Endpoint)		
			Inhalation (mg/kg-day)	Soil Ingestion (mg/kg-day)	Soil Dermal Contact (mg/kg-day)	Inhalation (mg/kg-day)	Soil Ingestion (mg/kg-day)	Soil Dermal Contact (mg/kg-day)
Volatiles								
Acetone	0.027	0.1	3.2E-12	1.05E-10	3.14E-11	2.2E-10	7.32E-09	2.20E-09
2-Butanone	0.002	0.1	2.3E-13	7.75E-12	2.32E-12	1.6E-11	5.42E-10	1.63E-10
Toluene	0.004	0.1	4.7E-13	1.55E-11	4.65E-12	3.3E-11	1.08E-09	3.25E-10
Semi-Volatiles								
Benzo(a)Pyrene	0.14	0.15	1.6E-11	5.42E-10	2.44E-10	1.2E-09	3.80E-08	1.71E-08
Benzo(b)Fluoranthene	0.23	0.15	2.7E-11	8.91E-10	4.01E-10	1.9E-09	6.24E-08	2.81E-08
Bis(2-Ethylhexyl)Phthalate	2	0.1	2.3E-10	7.75E-09	2.32E-09	1.6E-08	5.42E-07	1.63E-07
Fluoranthene	0.21	0.15	2.5E-11	8.14E-10	3.66E-10	1.7E-09	5.70E-08	2.56E-08
Indeno(1,2,3-cd)Pyrene	0.14	0.15	1.6E-11	5.42E-10	2.44E-10	1.2E-09	3.80E-08	1.71E-08
Pyrene	0.19	0.15	2.2E-11	7.36E-10	3.31E-10	1.6E-09	5.15E-08	2.32E-08
Pesticides								
4,4'-DDD	.12	0.5	1.4E-11	4.65E-10	6.97E-10	9.9E-10	3.25E-08	4.88E-08
4,4'-DDE	.086	0.5	1.0E-11	3.33E-10	5.00E-10	7.1E-10	2.33E-08	3.50E-08
Alpha-Chlordane	.0063	0.5	7.4E-13	2.44E-11	3.66E-11	5.2E-11	1.71E-09	2.56E-09
Dieldrin	.089	0.5	1.0E-11	3.45E-10	5.17E-10	7.3E-10	2.41E-08	3.62E-08
Endosulfan Sulfate	.045	0.5	5.3E-12	1.74E-10	2.62E-10	3.7E-10	1.22E-08	1.83E-08
Endrin	.01	0.5	1.2E-12	3.87E-11	5.81E-11	8.2E-11	2.71E-09	4.07E-09
Gamma-Chlordane	.011	0.5	1.3E-12	4.26E-11	6.39E-11	9.0E-11	2.98E-09	4.48E-09

Table 6
Construction Worker Scenario Exposure Assessment
Former TAA 769

Detected Chemical	CS TAA 769 Soil Max Conc (mg/kg)	Dermal Absorption Factor	Lifetime Average Daily Dose (Cancer Endpoint)			Average Daily Dose (Non-Cancer Endpoint)		
			Inhalation (mg/kg-day)	Soil Ingestion (mg/kg-day)	Soil Dermal Contact (mg/kg-day)	Inhalation (mg/kg-day)	Soil Ingestion (mg/kg-day)	Soil Dermal Contact (mg/kg-day)
Heptachlor Epoxide	.013	0.5	1.5E-12	5.04E-11	7.56E-11	1.1E-10	3.53E-09	5.29E-09
Metals								
Aluminum	33500	0.01	3.9E-06	1.30E-04	3.89E-06	2.8E-04	9.09E-03	2.73E-04
Antimony	7.4	0.01	8.7E-10	2.87E-08	8.60E-10	6.1E-08	2.01E-06	6.02E-08
Arsenic	5.6	0.03	6.6E-10	2.17E-08	1.95E-09	4.6E-08	1.52E-06	1.37E-07
Barium	229	0.01	2.7E-08	8.87E-07	2.66E-08	1.9E-06	6.21E-05	1.86E-06
Beryllium	1.23	0.01	1.4E-10	4.77E-09	1.43E-10	1.0E-08	3.34E-07	1.00E-08
Chromium	36.4	0.01	4.3E-09	1.41E-07	4.23E-09	3.0E-07	9.87E-06	2.96E-07
Cobalt	10.8	0.01	1.3E-09	4.18E-08	1.26E-09	8.9E-08	2.93E-06	8.79E-08
Copper	15.2	0.01	1.8E-09	5.89E-08	1.77E-09	1.2E-07	4.12E-06	1.24E-07
Iron	29600	0.01	3.5E-06	1.15E-04	3.44E-06	2.4E-04	8.03E-03	2.41E-04
Lead	66.8	0.01	7.8E-09	2.59E-07	7.77E-09	See LeadSpread - Table 4		
Manganese	410	0.01	4.8E-08	1.59E-06	4.77E-08	3.4E-06	1.11E-04	3.34E-06
Nickel	18.1	0.01	2.1E-09	7.01E-08	2.10E-09	1.5E-07	4.91E-06	1.47E-07
Thallium	1.25	0.01	1.5E-10	4.84E-09	1.45E-10	1.0E-08	3.39E-07	1.02E-08
Vanadium	85.7	0.01	1.0E-08	3.32E-07	9.96E-09	7.0E-07	2.32E-05	6.97E-07
Zinc	149	0.01	1.7E-08	5.77E-07	1.73E-08	1.2E-06	4.04E-05	1.21E-06

Table 7
Construction Worker Scenario Risk Characterization
Former TAA 769

Inhalation Risk =	Inhalation LADD * CSFi	Inhalation HQ =	Inhalation ADD / RfDi
Oral Risk =	(Soil Ingestion LADD + Soil Dermal Contact LADD) * CSFo	Oral HQ =	(Soil Ingestion ADD + Soil Dermal Contact ADD) / RfDo

where

Variable	rameter Definition	units	value
Inhalation LADD	Lifetime Average Daily Dose - Inhalation Pathway	mg/kg-day	Table 6
Soil Ingestion LADD	Lifetime Average Daily Dose - Soil Ingestion Pathway	mg/kg-day	Table 6
Soil Dermal Contact LADD	Lifetime Average Daily Dose - Soil Dermal Contact Pathway	mg/kg-day	Table 6
Inhalation ADD	Lifetime Average Daily Dose - Inhalation Pathway	mg/kg-day	Table 6
Soil Ingestion ADD	Lifetime Average Daily Dose - Soil Ingestion Pathway	mg/kg-day	Table 6
Soil Dermal Contact ADD	Lifetime Average Daily Dose - Soil Dermal Contact Pathway	mg/kg-day	Table 6
CSFi	Cancer Slope Factor - Inhalation	$(mg/kg\text{-}day)^{-1}$	OEHHA Toxicity Database, EPA (2004)
CSFo	Cancer Slope Factor - Oral	$(mg/kg\text{-}day)^{-1}$	OEHHA Toxicity Database, EPA (2004)
RfDi	Reference Dose - Inhalation	mg/kg-day	OEHHA Toxicity Database, EPA (2004)
RfDo	Reference Dose - Oral	mg/kg-day	OEHHA Toxicity Database, EPA (2004)

Table 7
Construction Worker Scenario Risk Characterization
Former TAA 769

Chemical	CSFi	CSFo	Source	Inhalation Risk	Oral Risk	Total Risk	RFDi	RFDo	Source	Inhalation HQ*	Oral HQ*	Hazard Index*
Volatiles												
Acetone	Not Applicable						9.00E-01	9.00E-01	IRIS/IRIS	0.0000	0.0000	0.0000
2-Butanone	Not Applicable						1.40E+00	6.00E-01	IRIS/IRIS	0.0000	0.0000	0.0000
Toluene	Not Applicable						8.57E-01	2.00E-01	OEHHA/IRIS	0.0000	0.0000	0.0000
Semi-Volatiles												
Benzo(a)Pyrene	3.9	12	OEHHA	4.E-12	9.E-09	9.E-09	NA	NA	IRIS/IRIS			0.0000
Benzo(b)Fluoranthene	0.39	1.2	OEHHA	7.E-11	2.E-09	2.E-09	NA	NA	-/-			0.0000
Bis(2-Ethylhexyl)Phthalate	0.84	0.3	OEHHA	3.E-10	3.E-09	3.E-09	8.00E-01	8.00E-01	IRIS/IRIS	0.0000	0.0000	0.0000
Fluoranthene	Not Applicable						4.00E-02	4.00E-02	IRIS/IRIS	0.0000	0.0000	0.0000
Indeno(1,2,3-cd)Pyrene	0.39	1.2	OEHHA	4.E-11	9.E-10	1.E-09	NA	NA	-/-			0.0000
Pyrene	Not Applicable						3.00E-02	3.00E-02	IRIS/IRIS	0.0000	0.0000	0.0000
Pesticides												
4,4'-DDD	0.34	0.34	OEHHA	4.E-11	4.E-10	4.E-10	NA	NA	-/-			0.0000
4,4'-DDE	0.24	0.24	OEHHA	4.E-11	2.E-10	2.E-10	NA	NA	-/-			0.0000
Alpha-Chlordane	1.2	1.3	OEHHA	6.E-13	8.E-11	8.E-11	2.00E-04	5.00E-04	IRIS/IRIS	0.0000	0.0000	0.0000
Dieldrin	16	16	OEHHA	7.E-13	1.E-08	1.E-08	5.00E-05	5.00E-05	IRIS/IRIS	0.0000	0.00	0.001
Endosulfan Sulfate	Not Applicable						6.00E-03	6.00E-03	IRIS/IRIS	0.0000	0.0000	0.0000
Endrin	Not Applicable						3.00E-04	3.00E-04	IRIS/IRIS	0.0000	0.0000	0.0000
Gamma-Chlordane	1.2	1.3	OEHHA	1.E-12	1.E-10	1.E-10	2.00E-04	5.00E-04	IRIS/IRIS	0.0000	0.0000	0.0000
Heptachlor Epoxide	5.5	5.5	OEHHA	3.E-13	7.E-10	7.E-10	1.30E-04	1.30E-05	IRIS/IRIS	0.0000	0.001	0.001
Metals												
Aluminum	Not Applicable						1.40E-03	1.00E+00	-/IRIS	0	0.0	0.2
Antimony	Not Applicable						NA	4.00E-04	-/IRIS		0.01	0.01
Arsenic	12	9.5	OEHHA	5.E-11	2.E-07	2.E-07	8.57E-06	3.00E-04	OEHHA/IRIS	0.0	0.01	0.01
Barium	Not Applicable						1.40E-04	7.00E-02	IRIS/IRIS		0.00	0.001
Beryllium	8.4	NA	OEHHA	2.E-11		2.E-11	2.00E-06	2.00E-03	OEHHA/IRIS	0.0	0.000	0.01
Chromium	Not Applicable						5.71E-05	1.50E+00	OEHHA/IRIS	0.0	0.0000	0.01
Cobalt	9.8	NA	IRIS	1.E-10		1.E-10	5.70E-06	2.00E-02	IRIS/IRIS	0.0	0.000	0.02
Copper	Not Applicable						NA	4.00E-02	-/IRIS		0.000	0.0001
Iron	Not Applicable						NA	3.00E-01	-/IRIS		0.0	0.03
Lead	0.042	0.0085	OEHHA	2.E-07	2.E-09	2.E-07	NA	NA	-/-	See LeadSpread - Table 5		
Manganese	Not Applicable						5.71E-05	2.40E-02	OEHHA/IRIS	0	0.00	0.1
Nickel	0.91	NA	OEHHA	2.E-09		2.E-09	1.43E-05	2.00E-02	OEHHA/IRIS	0.0	0.000	0.01
Thallium	Not Applicable						NA	6.60E-05	-/IRIS		0.01	0.01
Vanadium	Not Applicable						NA	1.00E-03	-/IRIS		0.0	0.02
Zinc	Not Applicable						NA	3.00E-01	-/IRIS		0.000	0.0001
			Pathway Risk	2.E-07	3.E-07				Pathway Hazard Index	0.3	0.1	
			Total Risk			4.E-07			Scenario Total Hazard Index			0.4

Sources:

OEHHA = California Office of Environmental Health Hazard Assessment Toxicity Criteria Database, searched January 2005

IRS = U.S. Environmental Protection Agency Integrated Risk Information System or Equivalent, as presented in the 2004 Preliminary Remediation Goal Tables from US EPA Region 9

- = not source since there is no value

NA = not applicable since the chemical is not a carcinogen or no noncarcinogenic health criteria have been published

*: Any value presented as "0.0000" is less than 0.0001 (<0.0001)

Attachment 2

Revised Section 5.0

5.0 Risk Characterization and Hazard Index Calculation

This section briefly describes the approach used to estimate risk and summarizes the baseline screening level risk assessment results for former TAA 769. A screening level risk assessment for human health based on a residential land use was conducted following the guidance provided in the EPA Region 9 PRGs Memorandum dated November 1, 2002 (EPA, 2002). In accordance with DTSC comments letter dated 14 December 2004, the risk evaluation has been expanded to include a screening level assessment of health effects on construction workers and an assessment of potential exposure to lead using DTSC's Lead Spread Model (version 7.0); this assessment was based on the guidance for this scenario in the EPA *Supplemental Guidance to Developing Soil Screening Guidance for Superfund Sites* (EPA, 2002). The analytical results of Shaw Environmental, Inc. confirmation soil borings (TAA769-SB-A through TAA769-SB-C) and the RCRA Facility Assessment (RFA) angle boring (222A1) conducted at former TAA 769 were used to calculate risks.

5.1 Physical Characteristics

Based on the review of the RFA boring log (222A1), the subsurface lithology at former TAA 769 consists of primarily of silts and sands. These units appear typical of the channel and overbank deposits in comprising the Holocene deposits on the Tustin Plain. The groundwater is present at a depth of approximately 111 feet below ground surface (CDM, 2003).

5.1.1 Exposure Assessment

Former TAA 769 was used as a temporary hazardous waste storage area. Areas surrounding former TAA 769 are unpaved.

The Station officially closed on July 2, 1999 in accordance with the Base Closure and Realignment Act of 1993 (BRAC III). Former TAA 769 is located within a parcel designated for future use as Open Space: Exposition Center according to the Great Park Land Use Plan that was issued by the City of Irvine in June 2002.

For screening purposes, the ingestion, dermal contact, and inhalation exposure pathways are assumed to be complete for former TAA 769, as if the area were unpaved. Should the screening fail, further evaluation of the exposure pathways would be required. A site conceptual model for former TAA 769 is shown on Figure 3.

Under a residential land use scenario at former TAA 769, workers or humans could be potentially exposed to surrounding soil by ingestion, dermal contact, or inhalation of dust or

volatilized contaminants. These are the same exposure pathways evaluated by the EPA PRGs (EPA, 2002). Figure 4 presents the potential migration pathways at TAA 769.

For the purposes of this risk screening evaluation, the residential scenario is used as the worst-case scenario. The PRGs based on this exposure scenario are provided in Table 3.

The assessment of lead is based on predicting blood lead levels rather than a comparison of the dose to a toxicity criterion. For this risk assessment, DTSC's Lead Spread Model (version 7.0) has been used to estimate the potential adverse health effects of lead. For this assessment, all default exposure assumptions have been used except for the soil concentration of lead (Table 4).

The redevelopment of the TAA 769 site will likely involves construction activities that will disturb soil. In accordance with DTSC comments letter dated 14 December 2004, a screening level risk assessment was also conducted for this receptor. The exposure pathways assumed to be complete for construction workers are inhalation of soil particulates, soil ingestion, and soil dermal contact. This is a small site (approximately 17 foot by 12 foot area) at which any construction is not likely to take more than 1 to 2 days for either total excavation or utility maintenance. However, a health conservative assessment was taken to this assessment, particularly regarding the length of time workers will be exposed to soil, for this assessment it was assumed that construction workers would be on-site and involved in activities that will create high levels of dust for one month (21 work days) over a single year (that is an exposure averaging time of 365 days).

The potential air concentration of soil is difficult to predict since it is a function of the activities and the climate. Based on occupational regulations, unprotected workers should not be exposed to soil suspended in the air at a concentration that exceeds the Occupational Safety and Health Administration Permissible Exposure Limit (PEL) of 10 mg/m^3. For the purposes of this risk assessment, it was assumed that average concentration over the construction period would be a concentration equal to $1/20^{th}$ of the PEL. This is likely to be a conservative measure since earthmoving and heavy equipment travel (i.e., those actions which would create the highest dust emissions) would not expect to last for more than a few minutes during any given work days. During other activities, wind erosion of a bare soil surface is likely to create the dust and the emission rates for wind-erosion are generally substantially lower than during the earthmoving activities. Other exposure factors are shown on Table 6.

5.2 Toxicity Assessment

The PRGs incorporate the toxicity values from the Integrated Risk Information System (IRIS), the Health Effects Assessment Summary Tables, and the National Center for

Environmental Assessment. Cancer PRGs incorporate cancer toxicity values and the noncancer PRGs incorporates the toxicity values for chronic health affects other than cancer (EPA, 2002). Both cancer risk and noncancer hazards were evaluated in this screening risk assessment. For the construction worker scenario, toxicity factors were obtained, in order of priority, from the Office of Environmental Health Hazard Assessment (OEHHA) toxicity criteria database and EPA's IRIS and comparable databases, as evaluated and published in the 2004 PRG tables. The values used are provided in Table 6.

5.3 Risk Characterization

Risk Characterization for Residential Receptor

The PRGs are concentrations calculated using standard exposure factors that are protective of humans, including sensitive groups, over a lifetime. These PRG concentrations pose acceptable cancer risk or non-cancer hazard under the exposure scenarios evaluated. Generally, a cancer risk of 10^{-6} or less and a non-cancer hazard index (HI) of 1.0 or less are considered acceptable levels of exposure. Therefore, the PRG concentrations are calculated to the lower end of the acceptable cancer risk range of 10^{-6} and to a non-cancer hazard index of 1.0.

Cancer risk is calculated by dividing the site concentration by the PRG for each chemical. The ratios are added and the sum is then multiplied by 10^{-6}. The hazard index is calculated by dividing the site concentration by the PRG for each chemical and adding the resultant ratios.

Although maximum concentrations for chemicals detected at the site are used for this risk screening, comparisons are not made to maximum detected background concentrations. To maintain a conservative estimate of background risk, the 95th quantile background concentrations calculated for the Station (BNI, 1996b) are used to calculate background contributions to cancer risk.

At former TAA 769, the detected carcinogens in soil were benzo(a)pyrene, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, ideno(1,2,3-cd)pyrene, 4,4'-DDD, 4,4'DDE, dieldrin, heptachlor epoxide, arsenic, beryllium, chromium, and cobalt. The summed cancer risk for soil under the potential future residential scenario after subtracting background is less than 10^{-6} (Table 3).

Compounds that were detected at former TAA 769 that contribute to the non-cancer HI include acetone, 2-butanone, toluene, fluoranthene, pyrene, endrin, aluminum, antimony, arsenic, barium, beryllium, cobalt, copper, iron, lead, manganese, nickel, thallium, vanadium and zinc. The summed non-cancer hazard index for soil under the potential future residential

scenario after subtracting background is 2.93 (Table 3). This is a conservative HI because it assumes that maximum detected concentrations are representative of the entire site and is summed across all toxicological endpoints.

As indicated earlier, the exposures to lead in the soil at the TAA 769 site have been evaluated using the DTSC's Lead Spread model (Table 4). This model predicts the blood lead concentrations for children and adults based on site conditions as well as baseline lead exposures that are obtained from food, air, and drinking water. For the site, the model predicts 99% of all exposed children would have a blood lead level of 7.0 µg/dL or less. For pica children, the model predicts the blood lead levels of 99% of all exposed individuals would be 8.4 µg/dL or less. Generally, the critical blood lead level is 10 µg/dL, at this concentration intervention to reduce lead exposures are implemented. Based on this comparison, no potential health threat for the lead soil levels at the TAA 769 site have been identified.

Target Organ Evaluation for Residential Receptor

Because initial screening for residential scenario resulted in an HI greater than 1.0, a target organ evaluation was conducted for the potential contributors. The only significant contributors are those chemicals with maximum concentrations that could affect the HI or those that contribute 0.1 or greater to the HI are aluminum, antimony, arsenic, iron, lead, manganese, thallium, and vanadium as shown in Table 5.

Using maximum concentrations, the iron overload resulted in an HI of 1.29 (Klaasen et. al., 1999). The target organ hazard index using maximum values for cardio-vascular system, skin, endocrine system, longevity, central nervous system (1.16), kidney, blood, and reproductive system were each less than 1.0. The contributor to iron overload was iron.

The target organ evaluation using average concentrations for aluminum, antimony, arsenic, iron, lead, manganese, thallium, and vanadium resulted in a HI fot each of the target organs of less than 1.0.

Results of the target organ evaluation using maximum concentrations and then for average concentrations are shown in Table 5.

Risk Characterization for Construction Worker

Table 7 presents the risk characterization for the construction workers. Based on the maximum measured concentration of each COPC in the soil, the predicted cancer risk is 4×10^{-7}. That is below the *de minimus* risk level and this predicted risk is in the range generally considered acceptable for occupational risks. The primary risk drivers in this assessment are

arsenic, the risk via the soil ingestion and skin contact routes is 2 x 10^{-7}, and lead, the inhalation risk is 2 x 10^{-7}. The site concentrations of arsenic (2.7 to 5.6 mg/kg) are consistent with background, naturally occurring concentrations of arsenic at MCAS El Toro is 6.86 mg/kg. The cancer risk for lead is based on the maximum detected concentration (66 mg/kg), which is the only concentration that appears to be above the naturally occurring concentration at MCAS El Toro: the other 5 lead results at the TAA 769 site ranged from 3.5 to 10 mg/kg and the background level is 15 mg/kg. Consequently, this risk is associated with only a portion of the site. This risk is also associated with the assumed concentration of soil suspended in the air of 0.5 mg/m^3, which is a conservative estimate for long term exposures. It should also be noted that the LeadSpread model predict a blood lead levels for adult workers of 3.4 µg/dL or less (Table 4) that is below a concentration of concern. This is based on a soil air concentration that is 1/1000th assumed in the cancer risk assessment.

Table 7 also presents the non-carcinogenic health hazard assessment. A hazard index of 0.4 has been predicted. All chemicals had hazard quotients equal to or less than 1. .

Summary

The site-related incremental cancer risk and non-cancer hazard index at former TAA 769 are acceptable for the following reasons:

- The net carcinogenic risk is less than 10^{-6} for the residential scenario and construction worker scenario.
- For the residential scenario, the target organ evaluation using average concentrations for aluminum, antimony, arsenic, iron, lead, manganese, thallium, and vanadium resulted in a HI for each of the target organs of less than 1.0.
- DTSC's Lead Spread model for the TAA 769 site, predicts 99% of all exposed children would have a blood lead level of 7.0 µg/dL or less. For pica children, the model predicts the blood lead levels of 99% of all exposed individuals would be 8.4 µg/dL or less. Generally, the critical blood lead level is 10 µg/dL, at this concentration intervention to reduce lead exposures are implemented. Based on this comparison, no potential health threat for the lead soil levels at the TAA 769 site has been identified.
- For the construction worker scenario, the hazard index is less than 1.

Attachment 3

Revised Table 3 – Residential Risk Screening Worksheet for Soil for TAA 769

Revised Table 5 – Hazard Index by Target Organ System Endpoints for TAA 769

Response to Comments
Table 3
Residential Risk Screening Worksheet for Soil
Former TAA 769

Detected Chemical	Maximum TAA 769 Soil Concentration (mg/kg)	MCAS El Toro Background Concentration[A] (mg/kg)	CANCER			NON-CANCER		
			Residential PRG[B] (mg/kg)	TAA 769 Maximum Ratio[C]	MCAS El Toro Background Ratio[D]	Residential PRG[E] (mg/kg)	TAA 769 Maximum Ratio[F]	MCAS El Toro Background Ratio[F]
Volatiles								
Acetone	0.027	NE	NE	NE	NE	1.6E+03	1.69E-05	NE
2-Butanone	0.002	NE	NE	NE	NE	7.3E+03	2.74E-07	NE
Toluene	0.004	NE	NE	NE	NE	5.2E+02	7.69E-06	NE
Semi-Volatiles								
Benzo(a)Pyrene	0.14	0.027	6.2E-02	2.26E+00	4.35E-01	NE	NE	NE
Benzo(b)Fluoranthene	0.23	0.028	6.2E-01	3.71E-01	4.52E-02	NE	NE	NE
Bis(2-Ethylhexyl)Phthalate	2	NE	3.5E+01	5.71E-02	5.71E-02	NE	NE	NE
Fluoranthene	0.21	0.045	NE	NE	NE	2.3E+03	9.13E-05	1.96E-05
Indeno(1,2,3-cd)Pyrene	0.14	0.021	6.2E-01	2.26E-01	3.39E-02	NE	NE	NE
Pyrene	0.19	0.041	NE	NE	NE	2.3E+03	8.26E-05	1.78E-05
Pesticides								
4,4'-DDD	.12	0.0361	2.4E+00	5.00E-02	5.00E-02	NE	NE	NE
4,4'-DDE	.086	0.145	1.7E+00	5.06E-02	5.06E-02	NE	NE	NE
Alpha-Chlordane	.0063	0.00224	NE	NE	NE	NE	NE	NE
Dieldrin	.089	0.0199	3.0E-02	2.97E+00	2.97E+00	NE	NE	NE
Endosulfan Sulfate	.045	0.0031	NE	NE	NE	NE	NE	NE
Endrin	.01	0.00222	NE	NE	NE	1.8E+01	5.56E-04	1.23E-04
Gamma-Chlordane	.011	0.0027	NE	NE	NE	NE	NE	NE
Heptachlor Epoxide	.013	NE	5.3E-02	2.45E-01	2.45E-01	NE	NE	NE
Metals								
Aluminum	33500	14800	NE	NE	NE	7.6E+04	4.41E-01	1.95E-01
Antimony	7.4	3.06	NE	NE	NE	3.1E+01	2.39E-01	9.87E-02
Arsenic	5.6	6.86	3.9E-01	1.44E+01	1.76E+01	2.2E+01	2.55E-01	3.12E-01
Barium	229	173	NE	NE	NE	5.4E+03	4.24E-02	3.20E-02
Beryllium	1.23	0.669	1.1E+03	1.12E-03	6.08E-04	1.5E+02	8.20E-03	4.46E-03
Chromium	36.4	26.9	2.1E+02	1.73E-01	1.28E-01	NE	NE	NE
Cobalt	10.8	6.98	9.0E+02	1.20E-02	7.76E-03	1.4E+03	7.71E-03	4.99E-03
Copper	15.2	10.5	NE	NE	NE	3.1E+03	4.90E-03	3.39E-03
Iron	29600	18400	NE	NE	NE	2.3E+04	1.29E+00	8.00E-01
Lead	66.8	15.1	NE	NE	NE	See LeadSpread - Table 4		
Manganese	410	291	NE	NE	NE	1.8E+03	2.28E-01	1.62E-01
Nickel	18.1	15.3	NE	NE	NE	1.6E+03	1.13E-02	9.56E-03
Thallium	1.25	0.42	NE	NE	NE	5.2E+00	2.40E-01	8.08E-02
Vanadium	85.7	71.8	NE	NE	NE	5.5E+02	1.56E-01	1.31E-01
Zinc	149	77.9	NE	NE	NE	2.3E+04	6.48E-03	3.39E-03

Response to Comments
Table 3
Residential Risk Screening Worksheet for Soil
Former TAA 769

Subtotal sum of ratios		2.08E+01	2.16E+01		2.93E+00	1.84E+00
MCAS EL TORO BACKGROUND RISK RATIOS	CANCER RISK		2.16E-05	NON-CANCER HAZARD INDEX		1.84
TAA 769 SUMMED RISK	CANCER RISK	2.08E-05		NON-CANCER HAZARD INDEX	2.93	
TAA 769 RISK LESS BACKGROUND RISK (NET RISK)	NET CANCER RISK	$<1 \times 10^{-6}$				

[A] MCAS El Toro Background upper threshold limit concentrations from Final Technical Memorandum Background and Reference Levels, Bechtel National, Inc. 1996.

[B] Residential soil PRG for cancer from the EPA Region 9, November, 2002 list.

[C] The Ratio is determined by dividing the Concentration by the respective PRG.

[D] Where the background concentration exceeds the maximum concentration the background ratio was defaulted to the maximum ratio.

[E] Residential soil PRG for non-cancer from the EPA Region 9, November, 2002 list.

[F] The Ratio is determined by dividing the Concentration by the respective PRG.

mg/kg - Milligrams per kilogram.

NE - Not established/No entry.

PRG - Preliminary remediation goal.

Maximum detected values used were taken from IT, 2002 and JEG, 1992 RFA soil borings.

Table 5
Hazard Index By Target Organ System Endpoint, Former TAA 769

Detected Chemical	Maximum TAA 769 Soil Concentration (mg/kg)	MCAS El Toro Background Concentration[a] (mg/kg)	Residential PRG[b] (mg/kg)	TAA 769 Maximum Ratio[c]	Cardio-vascular System	Skin	*Iron Overload	Endocrine System	Longevity	Central Nervous System	Gastro-intestinal tract	Kidney	Blood	Repro-ductive System
METAL CONTRIBUTORS														
Aluminum	33500	14800	7.6E+04	4.41E-01						4.41E-01				
Antimony	7.4	3.06	3.1E+01	2.39E-01	2.39E-01			2.39E-01	2.39E-01		2.39E-01			
Arsenic	5.6	6.86	2.2E+01	2.55E-01	2.55E-01	2.55E-01				2.55E-01				
Iron	29600	18400	2.3E+04	1.29E+00			1.29E+00							
Manganese	410	291	1.8E+03	2.28E-01						2.28E-01				2.28E-01
Thallium	1.25	0.42	5.2E+00	2.40E-01		2.40E-01				2.40E-01				
Vanadium	85.7	71.8	5.5E+02	1.56E-01	1.56E-01						1.56E-01	1.56E-01	1.56E-01	
Subtotal sum of ratios				2.84E+00	6.49E-01	4.95E-01	1.29E+00	2.39E-01	2.39E-01	1.16E+00	3.95E-01	1.56E-01	1.56E-01	2.28E-01
			NON-CANCER HAZARD INDEX	2.84	0.65	0.49	1.29	0.24	0.24	1.16	0.39	0.16	0.16	0.23

Detected Chemical	Average TAA 769 Soil Concentration (mg/kg)	MCAS El Toro Background Concentration[a] (mg/kg)	Residential PRG[b] (mg/kg)	TAA 769 Average Ratio[c]	Cardio-vascular System	Skin	*Iron Overload	Endocrine System	Longevity	Central Nervous System	Gastro-intestinal tract	Kidney	Blood	Repro-ductive System
METAL CONTRIBUTORS														
Aluminum	22250	14800	7.6E+04	2.93E-01						2.93E-01				
Antimony	4.6	3.06	3.1E+01	1.49E-01	1.49E-01			1.49E-01	1.49E-01		1.49E-01			
Arsenic	4.3	6.86	2.2E+01	1.95E-01	1.95E-01	1.95E-01				1.95E-01				
Iron	21617	18400	2.3E+04	9.40E-01			9.40E-01							
Manganese	334	291	1.8E+03	1.86E-01						1.86E-01				1.86E-01
Thallium	0.76	0.42	5.2E+00	1.46E-01		1.46E-01				1.46E-01				
Vanadium	57.0	71.8	5.5E+02	1.04E-01	1.04E-01						1.04E-01	1.04E-01	1.04E-01	
Subtotal sum of ratios					4.48E-01	3.41E-01	9.40E-01	1.49E-01	1.49E-01	8.20E-01				1.86E-01
			NON-CANCER HAZARD INDEX	2.01	0.45	0.34	0.94	0.15	0.15	0.82	0.00	0.00	0.00	0.19

[a] MCAS El Toro Background upper threshold limit concentrations from Final Technical Memorandum Background and Reference Levels, Bechtel National, Inc. 1996b.

[b] Residential soil PRGs for non-cancer from the EPA Region 9, November 1, 2002 list.

[c] The primary target organs were identified from toxicity profiles available on the IRIS website. Information was obtained from the Risk Assessment Information System website when information from the IRIS website was limited. The Ratio is determined by dividing the maximum concentration by the respective PRG.

mg/kg - Milligrams per kilogram.

PRG - Preliminary remediation goal.

**Klaasen, Curtis D., Watkins, John B. III, 1999, Casarett and Doull's Toxicology, The Basis Science of Poisons; 5th Edition, Companion Handbook, McGraw Hill, United States of America.*

Attachment 4

Table 4 – Lead Spread Model for TAA 769

Table 4
LeadSpread Model, Former TAA 769

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

USER'S GUIDE to version 7

INPUT	
MEDIUM	LEVEL
Lead in Air (ug/m^3)	0.028
Lead in Soil/Dust (ug/g)	66.8
Lead in Water (ug/l)	15
% Home-grown Produce	7%
Respirable Dust (ug/m^3)	1.5

OUTPUT							
	Percentile Estimate of Blood Pb (ug/dl)					PRG-99	PRG-95
	50th	90th	95th	98th	99th	(ug/g)	(ug/g)
BLOOD Pb, ADULT	1.3	2.4	2.9	3.5	4.0	676	1063
BLOOD Pb, CHILD	2.3	4.3	5.1	6.2	7.0	146	247
BLOOD Pb, PICA CHILD	2.8	5.1	6.1	7.4	8.4	94	159
BLOOD Pb, OCCUPATIONA	1.1	2.1	2.5	3.0	3.4	3475	5464

EXPOSURE PARAMETERS			
	units	adults	children
Days per week	days/wk	7	
Days per week, occupational		5	
Geometric Standard Deviation		1.6	
Blood lead level of concern (ug/dl)		10	
Skin area, residential	cm^2	5700	2900
Skin area occupational	cm^2	2900	
Soil adherence	ug/cm^2	70	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001	
Soil ingestion	mg/day	50	100
Soil ingestion, pica	mg/day		200
Ingestion constant	(ug/dl)/(ug/day)	0.04	0.16
Bioavailability	unitless	0.44	
Breathing rate	m^3/day	20	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.08	0.19
Water ingestion	l/day	1.4	0.4
Food ingestion	kg/day	1.9	1.1
Lead in market basket	ug/kg	3.1	
Lead in home-grown produce	ug/kg	30.1	

Click here for REFERENCES

PATHWAYS

ADULTS	Residential			Occupational		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	3.8E-5	0.00	0%	1.4E-5	0.00	0%
Soil Ingestion	8.8E-4	0.06	4%	6.3E-4	0.04	4%
Inhalation, bkgrnd		0.05	3%		0.03	3%
Inhalation	2.5E-6	0.00	0%	1.8E-6	0.00	0%
Water Ingestion		0.84	63%		0.84	73%
Food Ingestion, bkgrnd		0.22	16%		0.23	20%
Food Ingestion	2.4E-3	0.16	12%			0%

CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.6E-5	0.00	0%		0.00	0%
Soil Ingestion	7.0E-3	0.47	20%	1.4E-2	0.94	33%
Inhalation	2.0E-6	0.00	0%		0.00	0%
Inhalation, bkgrnd		0.04	2%		0.04	1%
Water Ingestion		0.96	41%		0.96	34%
Food Ingestion, bkgrnd		0.50	21%		0.50	18%
Food Ingestion	5.5E-3	0.37	16%		0.37	13%

Attachment 5

Revised Section 6.0

6.0 Conclusions and Recommendations

The following conclusions are based upon existing background information, previous field investigations, and Shaw Environmental Inc.'s confirmation soil sampling analytical results and screening level risk assessment calculations:

- Former TAA 769 consists of an approximately 17-foot by 12-foot concrete pad with berm, roof, and chain-linked fence. No cracks or stains were observed on the surface of the TAA.
- TAA 769 was investigated as SWMU 222 during the RFA.
- During a field RFA visit in 1991, JEG identified SWMU 222 (also known as TAA 769) as a temporary hazardous waste storage area. Because the TAA was used as a HWSA in the past, SWMU 222 (TAA 769) was recommended for a sampling visit (JEG, 1993).
- JEG advanced one angle boring (222A1) on the northwest side of SWMU 222 (TAA 769). Soil boring 186A1 was drilled using a hollow-stem auger rig to a depth of 62 feet below ground surface (bgs). Because the concentrations of detected compounds were below RFA established cleanup goals for the site and/or below the contract required detection limit (CRDL), JEG recommended "No Further Action (NFA)" for SWMU 222 (TAA 769).
- In 1994, as part of the RFA, BNI visited former TAA 769, and observed a 10-foot by 10-foot, concrete pad with berm and roof. There were twenty 5-gallon containers stored at TAA 769, and the concrete pad appeared clean. Based on observations during their site visit, BNI did not recommend sampling at the TAA.
- In October 2002, a *Summary Report, Temporary Accumulation Area (TAA) 769, Marine Corps Air Station, El Toro, California* was submitted to the California Department of Toxic Substances Control (DTSC) Region 4.
- After reviewing the Summary Report the DTSC, in a letter dated October 29, 2002, requested further investigation.
- Based on the October 2002 letter from the DTSC, Shaw Environmental, Inc. collected a total of 6 confirmation soil samples from three hand auger boring locations (TAA769-SB-A through TAA769-SB-C), in close proximity to TAA 769 in April 2003.
- The detected carcinogens in soil were benzo(a)pyrene, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, ideno(1,2,3-cd)pyrene, 4,4'-DDD, 4,4'DDE, dieldrin, heptachlor epoxide, arsenic, beryllium, chromium, and cobalt, which were evaluated to determine the risk associated with their presence for present or anticipated future land uses.
- Compounds that were detected at former TAA 769 that contribute to the residential scenario non-cancer HI include acetone, 2-butanone, toluene, fluoranthene, pyrene, endrin, aluminum, antimony, arsenic, barium, beryllium, cobalt, copper, iron, lead,

manganese, nickel, thallium, vanadium and zinc. For the construction scenario, the noncarcinogenic chemical of concern is aluminum.

- The residential risk calculations for former TAA 769 resulted in a site-related net cancer risk less background risk of less than 10^{-6}. The predicted risk level for construction workers is 4×10^{-7}.
- DTSC's Lead Spread model for the TAA 769 site, predicts 99% of all exposed children would have a blood lead level of 7.0 µg/dL or less. For pica children, the model predicts the blood lead levels of 99% of all exposed individuals would be 8.4 µg/dL or less. Generally, the critical blood lead level is 10 µg/dL, at this concentration intervention to reduce lead exposures are implemented. Based on this comparison, no potential health threat for the lead soil levels at the TAA 769 site have been identified.
- The target organ evaluation using average concentrations for aluminum, antimony, arsenic, iron, lead, manganese, thallium, and vanadium resulted in a HI for each of the target organs of less than 1.0.

The objectives of this project are considered to be achieved, since former TAA 769 is no longer used for storage of hazardous waste. Confirmation soil sampling was conducted at former TAA 769 to verify that concentrations of contaminants were at or below acceptable background or health-risk based concentrations.

Based upon the absence of evidence of a significant release at former TAA 769, the screening risk calculations, it is recommended that former TAA 769 (SWMU 222) should be identified as "closed" in the next Base Realignment Closure Business Plan update.