

9.0 SUMMARY AND CONCLUSIONS

This section summarizes the previous and the projected future site uses, the exposure scenarios considered, and the results and conclusions of the baseline risk assessment for the five RI sites: 2 and 12, 16 and 17, 3, 31, and 39. These sites were evaluated separately because simultaneous exposure to more than one site is not expected; exposure to one site would proportionally diminish exposure to other sites. The total hazard indices and the cancer risks estimated for each site are summarized in Table 9.1.

9.1 Sites 2 and 12

Sites 2 and 12 are in the northwestern portion of Fort Ord near the ocean on opposite sides of Highway 1. Site 12 is in the northwest corner of the Main Garrison, and Site 2 is across the highway to the southwest. Site 2 was previously used as a sewage treatment plant, with sludge drying beds and unlined pond areas. Site 12 was previously used for automotive storage, maintenance, repair, and dismantling; fuel and solvent storage; dumping of refuse; and a railroad right-of-way. Future land use at Site 2 is expected to be facilities for indoor and outdoor aquaculture and oceanographic research. Future land use at Site 12 is expected to include commercial and industrial development, a transit center, medium- to high-density residential development, and a school. Exposure scenarios quantitatively evaluated the following receptors: hypothetical commercial worker (Site 2), child resident (Site 12), and long-term (30-year) resident (Site 12).

Site 2

The total multipathway noncarcinogenic HIs for the average exposure and RME scenarios for future onsite workers at Site 2 are 0.01 and 0.1, respectively. These results indicate that noncarcinogenic adverse health effects are not expected for future populations at Site 2.

Estimated lifetime cancer risks for the future worker at Site 2 are 2×10^{-7} and 3×10^{-6} , for the average and the RME scenarios, respectively.

The estimated background RME cancer risk at Site 2 is 2×10^{-6} (Table A1 in Appendix A), which accounts for approximately 89 percent of the site specific RME risk of 3×10^{-6} . When the background related risk is subtracted from the RME site risk, the residual risk is 3×10^{-7} .

This information is summarized in Table 9.1.

Site 12

Noncarcinogenic hazard indices for average exposure are less than 1 for all receptors evaluated. Estimated RME HIs range from 0.7 (Child 6-18 years) to 2 (Child 0-6 years). The HI for the future adult resident, ages 18 to 30, is 1.

The groundwater ingestion pathway accounts for approximately 63 percent (HI = 1.2) and 92 (HI = 1.2) percent of the HI for the child and the adult respectively. The remainder of the HI (0.74 and 0.09 for the child and adult residents, respectively) results from exposure to concentrations of metals, BEHP, and total carcinogenic PAHs in soil.

Total cancer risks estimated for the future onsite resident receptor at Site 12 were 5×10^{-6} and 6×10^{-5} , for the average and RME scenarios, respectively. Nearly all of the cancer risk estimated at Site 12 is due to the presence of 2 metals in soil (arsenic and beryllium) at background concentrations and 5 VOCs in groundwater (1,2 DCA; 1,1 DCE; methylene chloride, PCE; and TCE). The groundwater ingestion pathway accounts for approximately 69 percent (average) and 57 percent (RME) of the total risk estimated at the site. Background concentrations of arsenic and beryllium in soil account for approximately 53 percent and 32 percent of the total average and RME cancer risk, respectively.

The total Site 12 soil-related cancer risks associated with arsenic and beryllium are usually lower than estimated risks associated with background concentrations of these metals. This suggests that, in general, site-related

concentrations of arsenic and beryllium are below naturally occurring background levels and exceedances may reflect the presence of hotspot(s) - not extensive site-related contamination.

The average exposure and RME blood lead levels estimated for all future receptors at Site 12 are well below the target 99th percentile blood lead level of 10 $\mu\text{g}/\text{dl}$ (Table 3.16).

The incremental cancer risk estimates (Table 9.1) including and excluding background risks are all either within or less than the 10^{-6} to 10^{-4} range identified as acceptable in the National Oil Spill and Hazardous Substances Pollution Contingency Plan (NCP Title 40 Code of Federal Regulations, Section 300), (40 CFR 300). The estimated blood-lead concentrations are all less than the target concentration of 10 $\mu\text{g}/\text{dl}$ (EPA, 1990e), indicating that no adverse health effects are expected from lead.

9.2 Sites 16 and 17

Sites 16 and 17 are in the northeastern part of the Main Garrison. Areas of Site 16 were previously used as a corporation yard, for stormwater runoff percolation, and as open space. Areas of Site 17 were previously used for motor vehicle storage and maintenance; storage of petroleum products, solvents, and other chemicals; an incinerator site; debris disposal including incinerated and unincinerated medical waste and other materials; and a baseball field. Site 17 is expected to become part of a CSU campus. Site 16 is expected to be used as a corporation yard for public agencies. Exposure scenarios quantitatively evaluated the following receptors: hypothetical student resident, utility worker construction worker, and commercial worker.

For all receptors evaluated at Sites 16 and 17, results of the BRA indicate that potential exposure to COPCs will result in estimated multipathway noncancer HIs at or below the EPA target HI of 1. Therefore, noncancer health effects are not of concern for the receptors evaluated. For the student resident, construction worker, and utility worker receptors, the results of the BRA indicate that potential exposures to

COPCs will result in adjusted (i.e., to account for background concentrations of metals) multipathway cancer risks at the low end or below the EPA target range of 1×10^{-4} to 1×10^{-6} . For the commercial worker receptor, the estimated cancer risk for the RME scenario is 1×10^{-5} , which is within the EPA target risk range and at the target risk of 1×10^{-5} often used for commercial worker scenarios.

The results of the lead exposure evaluation indicate that all estimated blood-lead levels are below the target concentration of 10 $\mu\text{g}/\text{dl}$. This indicates that no adverse health effects are expected from exposure of the hypothetical receptors to lead at Sites 16 and 17.

9.3 Site 3

Site 3 comprises the area of Fort Ord between Highway 1 and Monterey Bay except for Site 2. Site 3 was previously used for small arms training ranges and as open space. The expected future land use is as a limited-access state park. The following receptors were quantitatively evaluated: hypothetical child and adult nearby residents and park ranger. These receptors were evaluated for exposure to chemicals at Site 3 in two ways: first, to surface area-weighted concentrations of chemicals (i.e., assuming the receptor will be equally exposed to all bullet distribution type areas at the site); and second, to chemicals in areas where bullets constitute 1 to 10 percent soil cover, and where bullets constitute 10 percent or greater soil cover. The 1 to 10 percent and ≥ 10 percent areas were evaluated separately.

HIs for noncancer health effects estimated for all receptors exposed to weighted surface area concentrations range from 0.000009 to 0.7 for the child resident for the average and RME scenarios, respectively. For the 1 to 10 percent area, HIs ranged from 0.00003 to 2, and for the ≥ 10 percent area, from 0.0004 to 26; all values are for child residents.

Estimated site-related blood-lead concentrations for receptors exposed to weighted surface area concentrations ranged from 2.76 $\mu\text{g}/\text{dl}$ to 7.15 $\mu\text{g}/\text{dl}$ for average and RME scenarios, respectively (both for resident child). Estimated

blood-lead concentrations for receptors exposed to 1 to 10 percent areas ranged from 2.77 $\mu\text{g}/\text{dl}$ to 89.36 $\mu\text{g}/\text{dl}$, and for the ≥ 10 percent area, ranged from 2.79 $\mu\text{g}/\text{dl}$ to 177.42 $\mu\text{g}/\text{dl}$. These values are all for child residents. Cancer risks are not estimated for Site 3 because the chemicals of potential concern at the site were not considered carcinogenic.

These results indicate that, for a receptor exposed to the site on a random walk, no adverse health effects are expected from the chemicals of potential concern at the site. The hazard indices are all less than 1.0 (Table 9.1). The estimated blood-lead concentrations are all less than the target concentration of 10 $\mu\text{g}/\text{dl}$ (EPA, 1990e), indicating that no adverse health effects would be expected from lead exposure.

However, HIs and blood lead levels exceeding acceptable levels are predicted for the unlikely event that a nearby resident or park ranger is exposed solely to areas where greater than 1 percent of the surface is covered with bullet fragments. Given that over 90 percent of the site contains little or no bullet cover, such exposure is highly unlikely.

9.4 Site 31

Site 31 is situated in and atop the north side of a steep-sided ravine in the southeast part of the East Garrison. Areas of Site 31 were previously used as an obstacle course, an incinerator building, dumping of refuse including ashes apparently from an incinerator at the site, and open space. Future land use plans are to use the area for an agricultural center and open space for wildlife habitat. The agricultural center is to include production, processing, and distribution facilities and worker housing. A hypothetical resident trespasser receptor is quantitatively evaluated.

Hazard indices for noncancer health effects range from 0.0009 to 0.02. Cancer risk estimates range from 2×10^{-8} to 8×10^{-7} . Estimated site-related blood-lead concentrations ranged from 4.12 $\mu\text{g}/\text{dl}$ to 16.1 $\mu\text{g}/\text{dl}$.

Noncancer health effects are not expected from chemicals other than lead because the hazard

indices are all less than 1 (Table 9.1). The cancer risk estimates (Table 9.1) are all below the EPA target risk range of 10^{-6} to 10^{-4} . The estimated RME blood-lead concentrations exceed the target concentration of 10 $\mu\text{g}/\text{dl}$ (EPA, 1990e), indicating that lead-related adverse health effects might occur if the hypothetical exposures evaluated at this site were to occur.

9.5 Site 39

Site 39 is in the southwest portion of Fort Ord. Most of Site 39 was used for target practice; the Inland Ranges were used since the early 1900s for ordnance training exercises, including naval gunfire from offshore. Firearms training exercises were also conducted at small arms and trainfire ranges. In the future most of Site 39 is expected to become part of a habitat reserve or Natural Resources Management Area (NRMA). Several areas along the southwest border of the NRMA may be used for other purposes including recreational, education, research, and training facilities. In addition, Highway 68 may be relocated within this area. Exposure scenarios quantitatively evaluated onsite habitat management and offsite child and long-term (30-year) receptors.

Estimated RME HIs are 0.004 for the offsite child resident, and 1 for the habitat management worker. These results indicate that noncancer health effects are not expected from exposure to COPCs at Site 39 because the highest hazard index for an individual receptor is 1 (Table 9.1).

Average multipathway cancer risks for both the offsite resident and habitat management worker receptors are at the low end or below the EPA target risk range of 1×10^{-6} to 1×10^{-4} . RME multipathway cancer risk estimates are 3×10^{-6} and 8×10^{-5} for the offsite resident and habitat management worker receptors, respectively. The RME risk for the offsite resident is at the low end of the EPA target risk range. In addition, the evaluation of this receptor is considered to be highly conservative as discussed in Section 7.6.2.2. The RME cancer risk for the habitat management worker is predominantly due to potential exposure to COPCs in groundwater (3×10^{-5} , or 39 percent of the total RME risk), arsenic in soil (5×10^{-6} , or 7 percent of the total RME

risk), beryllium in soil (3×10^{-5} , or 42 percent of total RME risk), and RDX in soil (7×10^{-6} , or 9 percent of the total RME risk). Available data suggests that the detected concentrations of metals in groundwater at Site 39 are naturally occurring. Moreover, direct exposure of the worker receptor from groundwater at Site 39 is unlikely. As discussed in Volume II Remedial Investigation, Site 39, additional groundwater monitoring will be performed to assess potential site-related impacts to groundwater. Adjusting this risk from arsenic in soil to account for background levels of arsenic in soil reduces this component of the multipathway risk to a risk that is below the EPA's level of concern.

The results of the lead exposure evaluation indicate that all estimated blood-lead levels are below the target concentration of $10 \mu\text{g}/\text{dl}$. This indicates that no adverse health effects are expected from exposure of the hypothetical habitat management worker or offsite resident to lead.

SECTION 9.0
TABLES

Table 9.1. Summary of Total Hazard Indices and Cancer Risks - All Sites
Volume III - Baseline Risk Assessment, Basewide RI/FS
Fort Ord, California

Site Receptor	Average Scenario		RME Scenario	
	Total	Total	Total	Total
	HI	Risk	HI	Risk
Site 2				
Commercial Worker	0.01	2E-07	0.10	3E-06
Site 12				
Resident (0 - 9 years)	0.4	/b/ 5E-06	NA	NA
Resident (0 - 30 years)	NA	NA	2	/b/ 6E-05
Site 16				
Utility Worker (PP)	0.0001	1E-09	0.009	7E-08
Utility Worker (PPE)	0.0003	1E-09	0.02	7E-08
Construction Worker (DOL)	0.0004	3E-09	0.3	2E-06
Commercial Worker (DOL)	0.009	7E-07	0.08	1E-05
Site 17				
Construction Worker	0.0005	2E-09	0.3	1E-06
Sites 16 and 17				
Student Resident (18 - 23 years)	0.2	1E-07	1	93-7
Site 3 - Weighted Surface Area				
Nearby Resident (0 - 9 years)	0.000009	/b/ NA	NA	NA
Nearby Resident (0 - 30 years)	NA	NA	0.7	/b/ NA
Park Ranger	0.01	NA	0.4	NA
Site 3 - 1 to 10 Percent Area				
Nearby Resident (0 - 9 years)	0.00003	/b/ NA	NA	NA
Nearby Resident (0 - 30 years)	NA	NA	2	/b/ NA
Park Ranger	0.03	NA	1	NA

**Table 9.1. Summary of Total Hazard Indices and Cancer Risks - All Sites
Volume III - Baseline Risk Assessment, Basewide RI/FS
Fort Ord, California**

Site Receptor	Average Scenario		RME Scenario	
	Total HI	Total Risk	Total HI	Total Risk
Site 3 - >10 Percent Area				
Nearby Resident (0 - 9 years)	0.0004	/b/ NA	NA	NA
Nearby Resident (0 - 30 years)	NA	NA	26 /b/	NA
Park Ranger	0.6	NA	16	NA
Site 31				
Nearby Resident Trespasser	0.0009	2E-08	0.02	8E-07
Site 39				
Habitat Management Worker	0.1	2E-06	1	8E-05
Offsite Resident	0.0004 /b/	2E-07	0.004 /b/	3E-06

RME Reasonable maximum exposure.
 HI Hazard index.
 PP Pete's Pond.
 PPE Pete's Pond Extension.
 DOL DOL Maintenance Yard.
 2E-07 2×10^{-7} .
 NA Not available or not applicable.

/a/ Potential cancer risks not evaluated at Site 3 because chemicals of potential concern are not considered carcinogenic.
 /b/ Only the most sensitive age-group for the child receptor is presented.