

## 7.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This section presents a general summary of the RFI-Phase II, along with a general discussion of key elements of the corrective action evaluation process. Summaries of findings and conclusions, along with corrective action recommendations, for each of the six Group 2 SWMUs is presented separately below.

### 7.1 RFI SUMMARY AND CORRECTIVE ACTION EVALUATION

#### 7.1.1 RFI Summary

The RFI-Phase II of the Group 2 Suspected Releases SWMUs (SWMUs 3, 5, 8, 9, 30, and 31) included historical research, site inspection, explosive risk determination, ecological habitat and key species identification, and soil, water, and air sampling and analysis. The results of the Phase II RFI form the basis of the human health and ecological risk assessment for each of the Group 2 SWMUs. The conclusions of the contamination assessment, risk assessment, and subsequent verification of the risk assessment results (Foster Wheeler, 1999) were used to determine where site controls or corrective action are required and where no further action is needed. A corrective measures study will be used to present and evaluate the land-use control and remedial technology alternatives to be used at SWMUs where site management or corrective action is required. This decision-making process will ensure that the Army meets its objective of protection of human health and the environment under conditions of continued military use of TEAD-S. Should the Army plan to release the areas of these SWMUs for another use, the risk assessment can also be used to evaluate risks associated with unrestricted (such as residential) uses.

Most of the RFI-Phase II studies and the human health risk assessment focused their evaluations on individual SWMUs. However, the evaluation of potential ecological risk selected COCs and evaluated potential risk from contaminant exposure through contact with and ingestion of surficial soil (the top 2 inches) averaged across all Group 2 SWMUs. This quantitative evaluation revealed only moderate potential ecological risk to plants from arsenic, with the highest arsenic levels detected at SWMU 3, where they are attributable to background conditions. More localized potential risks with respect to higher trophic level carnivores were qualitatively evaluated. There was no significant risk to wildlife related to any SWMU contaminants.

#### 7.1.2 Corrective Action Evaluation

The Army's objective in the corrective action process at TEAD-S is to protect the health of site workers and the quality of the environment under conditions of continued industrial (i.e., military) use. However, consistent with the requirements of the State of Utah Administrative Rules (including R315-101-3, -4, -5, and -6), the risk assessment prepared for this RFI provides an

evaluation of human health risks associated with unrestricted (e.g., residential) land uses, as well as current uses. The corrective action module of the CSDP permit also requires evaluation of explosive risks. Finally, the administrative rule concerning the principle of nondegradation must be addressed, regardless of the outcome of the risk assessments.

Based on the site and contaminant characteristics, the estimates of potential risks to human health and wild life, and compliance with related regulatory requirements, site-specific conclusions and recommendations are presented for each Group 2 SWMU in Sections 7.2 through 7.7.

#### 7.1.2.1 Evaluation of Risk Assessment Results

The corrective action criteria related to the risk assessment results, as provided for in the State of Utah Administrative Rules (R-315-101-5 and -6), are as follows:

- (1) No corrective action is necessary if the noncarcinogenic hazard index (HI) is less than 1 and the carcinogenic risk is less than  $1 \times 10^{-6}$  for residential use.
- (2) Site controls (or optional corrective action) are required if the carcinogenic risk is greater than  $1 \times 10^{-6}$  for residential use and less than  $1 \times 10^{-4}$  for actual use and the noncarcinogenic HI is less than 1.0 for residential and actual use.
- (3) Corrective action is required if carcinogenic risk is greater than  $1 \times 10^{-4}$  or the noncarcinogenic HI is greater than 1 for actual use.

There are no administrative rules regarding cleanup on the basis of the ecological risk assessment.

#### 7.1.2.2 Evaluation of Explosive Risk

Because TEAD-S has been used for handling and disposing of ordnance, the corrective action module of the CSDP permit requires characterization of explosive risk at each SWMU. The physical hazard of explosives at a SWMU are characterized as either present, absent, or possible on the basis of site history and a reconnaissance survey conducted by ordnance experts within and between the Group 2 SWMUs. An explosive hazard was identified wherever UXO, fuzes, or any type of live charge or bulk explosive was observed (See Section 3.3, p. 3-14) or where the SWMU history indicates UXO may be buried. During the UXO survey, the field crews reported these items to the TEAD EM Office so that Army EOD personnel could remove and dispose of these items properly. However, since the survey transects did not provide complete coverage of each SWMU, additional UXO could also be present within the units. No UXO or UXO debris was found along transects at SWMUs 5, 9, and 30. The explosive risk potentially posed by UXO or UXO debris found at SWMUs 3, 8, and 31 will be addressed in the CMS.

### 7.1.2.3 Application of the Principle of Nondegradation

The State of Utah Administrative Rules (R315-101-3) and Army corrective action objectives require that the contamination assessment of each SWMU be considered with respect to the principle of nondegradation. The rule concerning nondegradation of the environment states that the party responsible for managing a contaminated site shall not allow levels of contamination in groundwater, surface water, soils, and air to increase after site management commences.

## 7.2 SWMU 3

SWMU 3 was used from the 1960s until the early 1970s for repair and decontamination of leaking chemical agent containers from the open storage portion of Area 2 (part of SWMU 9). The repair operations took place on a gravel pad and related wastes were disposed of in a trench near the pad. Soil samples were collected at several locations throughout the SWMU, and unfiltered groundwater samples were collected from the three existing monitoring wells. Low levels of a few organic compounds and elevated levels of several metals were detected at these locations. A human health and ecological risk assessment was performed to evaluate the potential risks associated with these chemicals.

Detected organics included one phthalate, PCBs, three SVOCs, and one agent breakdown product in the soil, and only methylene chloride in the groundwater. MPA, an agent breakdown product, was the only organic compound selected as a human health COC at SWMU 3; there were no organic ecological COCs selected at this SWMU or any of the other Group 2 SWMUs. Six metals were evaluated in the human health risk assessment, and seven metals were evaluated in the ecological risk assessment. Five of the metals were the same for both risk assessments.

The RFI sampling conducted at SWMU 3 is adequate to characterize risks to site visitors under current conditions of continued Army use. However, no invasive sampling has been conducted to characterize the subsurface in and around the disposal trench. Subsurface sampling and excavation in this potentially agent-contaminated area cannot be conducted until the Army completes the formulation of policies and procedures that will allow this type of contamination to be handled and disposed of safely. Nevertheless, information on the history of the unit indicates subsurface disposal of chemical agent and other hazardous wastes, as well as the presence of explosive ordnance. Therefore, a CMS is required for this disposal trench.

### 7.2.1 Human Health Risk Assessment Conclusions

The results of the human health risk assessment for both current- and hypothetical future residential-use exposures to soil and groundwater at SWMU 3 indicate the following:

- (1) Since high arsenic concentrations in soil at this site **are related** background conditions, risk evaluated for all current-use exposure scenarios **are below** the corrective action criteria established by the state of Utah rules.
- (2) Human health risks due to groundwater contamination **were not** evaluated for the current-use scenario due to the lack of a complete exposure **pathway**. However, groundwater-exposure risks would exceed corrective action **criteria assuming** potable use of the underlying shallow groundwater under a hypothetical **residential-use** scenario. This risk result indicates that site controls should be imposed to **restrict** use of groundwater in this area from the uppermost water-bearing zone.

These results are considered conservative, given the **assumptions** used to estimate contaminant dose and human exposures, many of which were **worst-case, screening-level** estimates. In addition, the results of all future-use risk evaluations should be **interpreted** in light of the hypothetical nature of the future residential-use scenario, the **extent** to which background levels of COCs contribute to the cancer risk and HI estimates, **and the caveats** identified for the groundwater analytical results (in particular, the metals results). For example, given the high turbidity of the groundwater samples in all SWMU 3 wells, **and the fact** that samples were not filtered, the presence of elevated levels of metals suggests that **natural conditions** (i.e., colloids, suspended particulates, adsorbed metals, etc.) may be **responsible** for the observed concentrations, not SWMU-related activities. The **natural origin** of elevated metals concentrations in the groundwater is reinforced by the occurrence of the **highest** concentrations of the metals in the upgradient well (see Figure 4.1-16, Page 4-24).

#### 7.2.2 Ecological Risk Assessment Conclusions

The ecological risk assessment qualitatively evaluated potential **risk** from chemicals present in surface and subsurface soils at SWMU 3. A low, moderate, or **high risk** ranking was assigned to each of the seven metals that met the exposure and toxicological **criteria** and were designated as COCs for all Group 2 SWMUs. Results of the qualitative ecological **risk** assessment indicate the following:

- (1) The potential risk to plants from arsenic and to **higher trophic** level carnivores (e.g., peregrine falcon) from mercury are due to elevated **background** levels of these metals in Mercur Creek sediments at the SWMU. No potential **risks** to vertebrate animals from arsenic were identified.
- (2) No pathways for exposure to surface water or groundwater **were identified** at SWMU 3.

### 7.2.3 Explosive Risk Determination Conclusions

No explosives or UXO were identified during the explosive risk determination at SWMU 3, including a survey of the open portion of the disposal trench. **However, explosives or UXO may be present in the disposal trench takes place.**

### 7.2.4 Environmental Degradation Conclusions

The contents of the covered portion of the disposal trench are **currently unknown**. Based on the debris in the open portion of the trench, it is likely that **wastes are buried in the covered trench** that, if released, could contaminate subsurface soil and possibly **groundwater** beneath the trench.

### 7.2.5 Recommendations for SWMU 3

A Corrective Measures Study (CMS) is recommended at SWMU 3 based on the following conclusions:

- Human health risk from soil exposure under the hypothetical residential-use scenario are below the level requiring site controls. However, risk from groundwater exposure under this scenario requires site controls.
- Arsenic was initially determined to be a risk to TEAD EM personnel in the human health risk assessment and a risk to plants in the ecological risk assessment. However, collection of additional soil samples in the alluvial system upslope from SWMU 3 showed that this arsenic is a background condition due to Mercur Creek sediments deposited in the area of the SWMU (see Figures 2.1-3 and 2.3-2). Although the arsenic risk is attributable to background conditions, site controls are appropriate to protect TEAD EM and other personnel from excessive exposure.
- Mercury, like arsenic, occurs naturally in the sediments of Mercur Creek. Although mercury may be of concern at this SWMU for higher trophic level predators because it bioaccumulates, no further action is recommended to investigate or remediate mercury at this SWMU since the mercury concentrations measured in samples from this SWMU are consistent with naturally occurring conditions in the eastern part of TEAD-S.
- Metal concentrations were detected above background in groundwater at SWMU 3. Eight metals (arsenic, barium, beryllium, cadmium, chromium, lead, nickel, and thallium) were also detected in concentrations that exceed their respective MCLs or SMCLs in one or more wells. However, these elevated metals concentrations may only reflect the turbidity of the unfiltered samples that were analyzed during the RFI-Phase II program. It is recommended that an additional set of groundwater samples, both filtered and unfiltered, be collected in the monitoring wells at SWMU 3 to evaluate the effect of sample turbidity and determine if concentrations of heavy metals in groundwater at the unit are actually above background levels. Annual groundwater monitoring is recommended to ensure that further degradation of the groundwater quality in the shallow aquifer underlying SWMU 3 does not occur.

- The Army is formulating policies that will allow safe **excavation** and handling of agent-contaminated soil and other wastes. The corrective **measures study** will also address the disposition of the materials encountered in the disposal **trench area** at this SWMU. Access to the trench should continue to be limited by TEAD-S **site controls**.
- If the Army decides to remove the metal grating from **SWMU 3**, it is recommended that wipe samples of the metal grating be taken and analyzed, to **characterize** the grating for proper disposal.
- The potential for environmental degradation from buried **waste in the covered trench** exists at SWMU 3. Site controls are recommended at the **disposal trench** until the contents of the covered trench can be evaluated and their environmental **impact assessed**.

### 7.3 SWMU 5

SWMU 5 was used from the 1940s until the early 1970s for renovation of chemical and conventional munitions. Soil samples were collected around **Building 600** and several other features within the SWMU. Low levels of organic compounds were detected in soil, air, and groundwater samples, and several metals were detected at **elevated levels** in soil and unfiltered groundwater samples at SWMU 5. A human health and ecological risk assessment was performed to evaluate the potential risks associated with these contaminants.

Detected organics in the soil samples included two phthalates, **along with** several SVOCs and VOCs. Only chloroform, trichloroethylene, and bromodichloromethane were detected in groundwater samples, while several VOCs and SVOCs were **detected in air samples** at SWMU 5. Since most of the organics were detected in a limited number of samples, 1,1,2-trichloro-1,2,2-trifluoromethane was the only organic compound selected as a **human health COC** at SWMU 5. No organic compounds were selected as ecological COCs at **this unit**. Eleven metals were also evaluated in the human health risk assessment; these included the seven metals which are ecological COCs for all of the Group 2 SWMUs.

#### 7.3.1 Human Health Risk Assessment Conclusions

The results of the human health risk assessment for both **current- and hypothetical residential-use** exposures to soil and groundwater at SWMU 5 indicate the following:

- (1) The results of the hypothetical residential-use scenario **are within** the range of risks requiring site controls as defined in the state of Utah **rules**. These risks are attributable primarily to chromium in the former pond area. This **risk estimate** was calculated under a very conservative assumption that 10 percent of **the detected chromium** is in the hexavalent state. Results obtained for the remaining **areas at the SWMU** are well below respective correction action criteria.

- (2) The results of the current-use evaluation indicate no **potential human health threats** from exposure to SWMU 5 soil or air COCs. **Cancer risks and HIs** calculated for all scenarios (the three SWMU subarea evaluations (for the former drainage pond, ditch/surficial soil, and remaining sample locations) **and the downwind demilitarization area (SWMU 31) risks are all well below respective State of Utah corrective action criteria.**
- (3) Human health risks due to groundwater contamination **were not evaluated** for the current-use scenario due to the lack of a complete exposure **pathway**. However, groundwater-exposure risks would exceed corrective action criteria, **assuming** future potable use of the underlying shallow groundwater under a residential-use scenario.

These results are considered conservative, given the assumptions used to estimate contaminant doses and human exposures, many of which were worst-case, screening-level estimates. In addition, the results of the residential risk evaluations should be interpreted in light of the hypothetical nature of this scenario, the extent to which background levels of COCs contribute to the cancer risk and HI estimates, and the caveats identified for the groundwater analytical results (in particular, the metals results). For example, given the high turbidity of the groundwater samples in all SWMU 5 wells, and the fact that samples were not filtered, the presence of elevated levels of metals suggests that natural conditions (i.e., colloids, suspended particulates, adsorbed metals, etc.) may be responsible for the observed concentrations, not SWMU-related activities.

### 7.3.2 Ecological Risk Assessment Conclusions

The ecological risk assessment qualitatively evaluated potential risk from chemicals present in surface and subsurface soils at SWMU 5. A low, moderate, or high risk ranking was assigned to each of the seven metals that met the exposure and toxicological criteria and were designated as COCs.

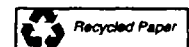
The results of the qualitative ecological risk assessment indicate potential risk to plants from chromium in subsurface soil, especially in the bottom of the drainage pond.

### 7.3.3 Explosive Risk Determination Conclusions

Based on the observations made during the RFI-Phase II field program, there is no explosive risk related to past operations at SWMU 5.

### 7.3.4 Environmental Degradation Conclusions

Because the UST at Building 600 remains in place and the contents have not been removed, the potential exists for the tank contents to leak to the soil and possibly to the groundwater. Soil contamination beneath and near the drainage pond may also leach to the soil and groundwater.



### 7.3.5 Recommendations for SWMU 5

A CMS is recommended at SWMU 5 based on the following **conclusions**:

- Chromium was not a human health concern for the **current use of this inactive SWMU**, but would be of concern in the hypothetical residential-use scenario only at the pond area. Chromium also poses a moderate potential risk to plants in the bottom of the drainage pond.
- The UST near Building 600 should be managed under the state-approved UST closure plan for TEAD-S.
- Five metals (antimony, beryllium, cadmium, chromium, and lead), along with chloride and trichloroethylene, were detected at concentrations that **exceeded their respective MCLs or SMCLs** in one or more wells during RFI-Phase II sampling at SWMU 5. These concentrations could present a human health risk if the shallow groundwater were used as a potable water supply.
- Annual groundwater monitoring is recommended to **ensure that further degradation of the groundwater quality in the shallow aquifer underlying SWMU 5 does not occur.**

### 7.4 SWMU 8

The Surveillance Test Site (SWMU 8) was used from the 1940s until the late 1960s for functional testing of a representative portion of all munitions stored at TEAD-S. Low levels of a few organic compounds and elevated levels of several metals were detected throughout the SWMU. A human health and ecological risk assessment was performed to evaluate the potential risks associated with these contaminants.

Detected organics included three explosives, along with several VOCs and SVOCs. Only PETN and trichlorofluoromethane were widespread enough at the SWMU to be considered as organic COCs. Seven metals, including six ecological COCs, were also identified as human health COCs. These metals, along with silver (an ecological COC), were evaluated in their respective risk assessments to determine their impact on humans and biota.

#### 7.4.1 Human Health Risk Assessment Conclusions

The results of the human health risk assessment for both current- and hypothetical future residential-use exposures to soil at SWMU 8 indicate no potential health threats associated with exposure to SWMU 8 soil. Cancer risks and HIs calculated for all exposure scenarios (current use and future residential use for both SWMU-wide and location-specific evaluations) are below State of Utah corrective action criteria.

These results are considered conservative, given the assumptions used to estimate contaminant doses and human exposures, many of which were worst-case, screening-level estimates. In



addition, the results of the residential-use risk evaluation should be interpreted in light of the hypothetical nature of this scenario and the extent to which background levels of COCs contribute to the cancer risk and HI estimates.

#### 7.4.2 Ecological Risk Assessment Conclusions

The ecological risk assessment screened risks associated with **seven metals** and assigned a low, moderate, or high ranking to each. Results of the qualitative ecological risk assessment indicate the potential risk to plants from zinc in surficial soils of the drainage ditch and near the drop tower site is moderate.

#### 7.4.3 Explosive Risk Determination Conclusions

The ordnance and ordnance debris, including UXO, observed along reconnaissance transects across SWMU 8 during the RFI-Phase II program are documented in Table 3.3-1 (page 3-17). Access to SWMU 8 is generally limited to TEAD workers with training in UXO recognition and avoidance. This minimizes the risk of explosion under conditions of current use by Army personnel. However, UXO related to SWMU 8 operations should be addressed at the time of SWMU closure.

#### 7.4.4 Environmental Degradation Conclusions

Ordnance debris in the drainage ditch and on the elevated pad near the former drop tower site has caused elevated metals concentrations at these locations. If ordnance debris remains, further contamination of the soil and possible contamination of the shallow groundwater could occur.

#### 7.4.5 Recommendations for SWMU 8

A CMS is recommended at SWMU 8 based on the following conclusions:

- Human health risk under the hypothetical residential-use scenario is below the level requiring corrective action at SWMU 8.
- Zinc poses a moderate potential ecological risk for plants in the drainage ditch and near the former drop tower site.
- To prevent any environmental degradation, it is recommended that ordnance debris be removed from the drainage ditch and from the elevated pad in proximity to the drop tower site.
- UXO in SWMU 8 poses a potential explosive risk. Any UXO within the SWMU that presents an immediate safety hazard to current operations at TEAD-S will be noted and will be removed by TEAD-EOD as part of their normal ongoing operations. UXO encountered during the removal operation at the drop tower site and drainage ditch would be flagged by field personnel and removed by Army EOD personnel. Removal of other ordnance debris related to operations of SWMU 31 which overlaps with the SWMU 8 area, including

possible UXO, will occur during closure of SWMU 31, which is an open burning/open detonation area operating under interim status.

## 7.5 SWMU 9

SWMU 9, Area 2 (including Mustard Holding and Pit Areas), was used until the mid-1970s for the open storage and occasional renovation of chemical agent munitions. Although agent leaks reportedly occurred in this unit, agent breakdown products (IMPA and MPA) were detected in only 3 isolated soil samples at the SWMU. Low levels of metals were also detected in soil samples. A human health and ecological risk assessment was performed to evaluate the potential risks associated with these chemicals.

Detected organics in the soil samples include low levels of two phthalates, two agent breakdown products (MPA and IMPA), PCBs, VOCs and SVOCs. Only methylene chloride was detected in the groundwater at this SWMU, and that detection occurred in only one downgradient well. Toluene, di-n-butyl phthalate, trichlorofluoromethane, and MPA were the only organics selected as human health soil COCs at SWMU 9. There were no organic ecological COCs at the unit. Six metals, which were both human health and ecological COCs at this SWMU, were also evaluated in the risk assessment.

### 7.5.1 Human Health Risk Assessment Conclusions

The results of the human health risk assessment for both current- and hypothetical future residential-use exposures to soil and groundwater at SWMU 9 indicate the following:

- (1) The cancer risks calculated for SWMU 9 potentially require site controls according to State of Utah regulations. However, these risks may be largely attributable to background levels of arsenic.
- (2) Human health risks due to groundwater contamination were not evaluated for the current-use scenario due to the lack of a complete exposure pathway. However, groundwater exposure risks exceed regulatory levels established for risk-based (clean) closure for both cancer and noncancer exposure endpoints, assuming a future residential-use scenario.

These results are considered conservative, given the assumptions used to estimate contaminant doses and human exposures, many of which were worst-case, screening-level estimates. In addition, the results of all future-use risk evaluations should be interpreted in light of the hypothetical nature of the future residential-use scenario, the extent to which background levels of COCs contribute to the cancer risk and HI estimates, and the caveats identified for the groundwater analytical results (in particular, the metals results). For example, given the high turbidity of the groundwater samples in all SWMU 9 wells, and the fact that samples were not filtered, the presence

of elevated levels of metals suggests that natural conditions (i.e., colloids, suspended particulates, adsorbed metals, etc.) may be responsible for the observed concentrations, not SWMU-related activities. In addition, the majority of the highest metals concentrations occurred in the upgradient well at SWMU 9 (see Figure 4.4-15, p. 4-122).

#### 7.5.2 Ecological Risk Assessment Conclusions

The ecological risk assessment qualitatively evaluated potential risk from chemicals present in surface and subsurface soils at SWMU 9. A low, moderate, or high risk ranking was assigned to each of the seven metals that met the exposure and toxicological criteria and were designated as COCs. Results of the qualitative ecological risk assessment indicate a low potential risk ranking was assigned to all seven metal COCs detected in the soil at SWMU 9, indicating that minimal risk to biota was present within this large SWMU.

#### 7.5.3 Explosive Risk Determination Conclusions

Based on observations made during the RFI-Phase II field program, there is no explosive risk related to past operations at SWMU 9.

#### 7.5.4 Environmental Degradation Conclusions

No degradation mechanisms were identified at SWMU 9.

#### 7.5.5 Recommendations for SWMU 9

A corrective measures study for SWMU 9 is recommended for the following reasons:

- Arsenic in soil poses a cancer risk greater than  $10^{-6}$  for hypothetical residential use.
- Methylene chloride and several metals in SWMU 9 groundwater samples exceed their MCLs. These COCs may not be attributable to releases from SWMU 9, but they indicate that the shallow groundwater at this unit is unsuitable as a drinking water supply.

### 7.6 SWMU 30

The CAMDS Landfill, SWMU 30, was used until the late 1970s to burn dunnage in three trenches. After the trenches became inactive, the area was used for disposal of non-hazardous construction debris during the building and expansion of the adjacent CAMDS facility. Soil samples collected throughout the trench and adjacent open storage area showed detections of several organic compounds at low levels and elevated levels of some metals in subsurface samples at the burn trenches. The results form the basis of a human health and ecological risk assessment of SWMU 30, the conclusions of which are summarized below.

### 7.6.1 Human Health Risk Assessment Conclusions

The results of the human health risk assessment for both **current- and hypothetical residential-use exposures to soil at SWMU 30** indicate the following:

- (1) Elevated concentrations of soil COCs were limited to **subsurface depths** at SWMU 30 test pit locations.
- (2) The risk assessment of the SWMU 30 area indicated **no potential risk to workers under current use**. There is risk associated with **chronic exposure** of industrial workers to subsurface arsenic contamination based on the possibility that any potential construction activities could bring subsurface contamination to the surface. The risks from this latter scenario are above the level allowing risk-based (clean) closure of the burn trenches.
- (3) The cancer risk and HI calculated assuming hypothetical residential-use exposures to maximum soil COC concentrations (at test pit locations) both exceed State of Utah criteria that allow risk-based (clean) closure. Of the soil COCs evaluated, only arsenic and lead exceed the regulatory criteria. As stated in the risk assessment, risks calculated for future-use scenarios should be interpreted in light of the contribution of background levels of arsenic.

These results are considered conservative, given the assumptions used to estimate contaminant doses and human exposures, many of which were worst-case, screening-level estimates. In addition, the results of the residential-use risk evaluations should be interpreted in light of the hypothetical nature of this scenario, and the extent to which background levels of COCs contribute to the cancer risk and HI estimates.

### 7.6.2 Ecological Risk Assessment Conclusions

The ecological risk assessment qualitatively evaluated potential risk from chemicals present in surface and subsurface soils at SWMU 30. A low, moderate, or high risk ranking was assigned to each of the seven metals that met the exposure and toxicological criteria and were designated as COCs. Results of the qualitative ecological risk assessment indicate the following:

- (1) The potential risk to plants from arsenic was ranked **high due to subsurface contamination at 30-TP-1 in the eastern burn trench**.
- (2) If an exposure pathway existed, the potential risk to **plants from chromium** would also have been high at the same location in SWMU 30.
- (3) The metals contamination is attributed to releases **from the adjacent CAMDS facility (known releases SWMU 13)**, since no arsenic- or chromium-containing wastes are believed to have been disposed of at SWMU 30.

### 7.6.3 Explosive Risk Determination Conclusions

Based on observations made during the RFI-Phase II field program in fall 1993, there is no explosive risk at SWMU 30 from unexploded ordnance.

### 7.6.4 Environmental Degradation Conclusions

Groundwater contamination in this area is attributed to SWMU 13, the adjacent CAMDS facility, not to activities at the SWMU 30 burn trenches.

### 7.6.5 Recommendations for SWMU 30

Because risk associated with industrial use and hypothetical residential use exceeds regulatory levels that allow risk-based (clean) closure, a corrective measures study is recommended at SWMU 30. The corrective measures study will address subsurface metals contamination.

## 7.7 SWMU 31

SWMU 31 Demilitarization Area (Northeast of SWMU 1), is an active RCRA unit operating under interim status where explosives have been burned and detonated since the early 1980s. Low levels of a few organic compounds and metals were detected in soil and surface water samples from the detonation pits at SWMU 31. A human health and ecological risk assessment was performed to evaluate the potential risks associated with these chemicals.

Detected organics in soil and surface water samples were primarily explosive compounds. The distribution of 2,4,6-TNT in the soil was widespread enough for it to be considered a COC. However, explosives detected in the surface water were not considered COCs due to the limited frequency of surface water in the numerous pits and the ephemeral nature of the water. Three metals were evaluated in both the human health and ecological risk assessments.

### 7.7.1 Human Health Risk Assessment Conclusions

Soil exposure risks for SWMU 31 were calculated assuming hypothetical residential use of the area. The cancer risk and the HI were calculated using maximum soil concentrations of copper and 2,4,6-TNT (the only soil COCs identified) and average concentrations of air COCs. These results indicate negligible potential risks associated with hypothetical residential exposures to constituents in soil and air at SWMU 31; therefore, these risk results can be assumed to apply to current receptors as well.

These results are considered conservative, given the assumptions used to estimate contaminant doses and human exposures, many of which were worst-case, screening-level estimates.

### 7.7.2 Ecological Risk Assessment Conclusions

The ecological risk assessment qualitatively evaluated potential **risk** from chemicals present in surface and subsurface soils at SWMU 31. A low, moderate, or **high risk ranking** was assigned to each of the seven metals that met the exposure and toxicological criteria and were designated as COCs. Results of the qualitative ecological risk assessment indicate the following:

- (1) A low potential risk ranking was assigned to all metals detected in the soil and surface water at SWMU 31.
- (2) Because of the frequent detonation activities at the SWMU, flora has been removed from the area around the detonation pits to reduce the fire hazard and little habitat for wildlife is provided.

### 7.7.3 Explosive Risk Determination Conclusions

Due to the detonation activities at SWMU 31, there is a significant risk associated with the physical hazard of live explosives in the unit. The ordnance and ordnance debris observed along transects through SWMU 31 are documented in Table 3.3-1 (page 3-17). There is a significant amount of UXO and ordnance debris within the SWMU, indicating a moderate to high risk. However, since travel through the SWMU is limited to TEAD workers in the EOD section with training in UXO recognition and avoidance, the risk of explosion is remote under conditions of present use by Army personnel. All ordnance and ordnance debris would be removed during SWMU closure.

### 7.7.4 Environmental Degradation Conclusions

SWMU 31 is an active open burning/open detonation (OB/OD) area currently operating under interim status. Sampling at the detonation pits indicated minimal risk to human health and the environment. Any activities at the unit that could cause degradation of the environment will be managed under the operating plan for the OB/OD area.

### 7.7.5 Recommendations for SWMU 31

Risks to human health and biota are negligible associated with both current- and future-use exposures to constituents in soil and air. UXO removal should occur at the time of closure of this interim status unit. Based on the risk assessment results and the fact that the unit is an interim status RCRA unit, no corrective action or CMS is recommended at SWMU 31 under RCRA corrective action.

### 7.7.2 Ecological Risk Assessment Conclusions

The ecological risk assessment qualitatively evaluated potential risk from chemicals present in surface and subsurface soils at SWMU 31. A low, moderate, or high risk ranking was assigned to each of the seven metals that met the exposure and toxicological criteria and were designated as COCs. Results of the qualitative ecological risk assessment indicate the following:

- (1) A low potential risk ranking was assigned to all metals detected in the soil and surface water at SWMU 31.
- (2) Because of the frequent detonation activities at the SWMU, flora has been removed from the area around the detonation pits to reduce the fire hazard and little habitat for wildlife is provided.

### 7.7.3 Explosive Risk Determination Conclusions

Due to the detonation activities at SWMU 31, there is a significant risk associated with the physical hazard of live explosives in the unit. The ordnance and ordnance debris observed along transects through SWMU 31 are documented in Table 3.3-1 (page 3-17). There is a significant amount of UXO and ordnance debris within the SWMU, indicating a moderate to high risk. However, since travel through the SWMU is limited to TEAD workers in the EOD section with training in UXO recognition and avoidance, the risk of explosion is remote under conditions of present use by Army personnel. All ordnance and ordnance debris would be removed during SWMU closure.

### 7.7.4 Environmental Degradation Conclusions

SWMU 31 is an active open burning/open detonation (OB/OD) area currently operating under interim status. Sampling at the detonation pits indicated minimal risk to human health and the environment. Any activities at the unit that could cause degradation of the environment will be managed under the operating plan for the OB/OD area.

### 7.7.5 Recommendations for SWMU 31

Risks to human health and biota are negligible associated with both current- and future-use exposures to constituents in soil and air. UXO removal should occur at the time of closure of this interim status unit. Based on the risk assessment results and the fact that the unit is an interim status RCRA unit, no corrective action or CMS is recommended at SWMU 31 under RCRA corrective action.

### 7.7.2 Ecological Risk Assessment Conclusions

The ecological risk assessment qualitatively evaluated potential risk from chemicals present in surface and subsurface soils at SWMU 31. A low, moderate, or high risk ranking was assigned to each of the seven metals that met the exposure and toxicological criteria and were designated as COCs. Results of the qualitative ecological risk assessment indicate the following:

- (1) A low potential risk ranking was assigned to all metals detected in the soil and surface water at SWMU 31.
- (2) Because of the frequent detonation activities at the SWMU, flora has been removed from the area around the detonation pits to reduce the fire hazard and little habitat for wildlife is provided.

### 7.7.3 Explosive Risk Determination Conclusions

Due to the detonation activities at SWMU 31, there is a significant risk associated with the physical hazard of live explosives in the unit. The ordnance and ordnance debris observed along transects through SWMU 31 are documented in Table 3.3-1 (page 3-17). There is a significant amount of UXO and ordnance debris within the SWMU, indicating a moderate to high risk. However, since travel through the SWMU is limited to TEAD workers in the EOD section with training in UXO recognition and avoidance, the risk of explosion is remote under conditions of present use by Army personnel. All ordnance and ordnance debris would be removed during SWMU closure.

### 7.7.4 Environmental Degradation Conclusions

SWMU 31 is an active open burning/open detonation (OB/OD) area currently operating under interim status. Sampling at the detonation pits indicated minimal risk to human health and the environment. Any activities at the unit that could cause degradation of the environment will be managed under the operating plan for the OB/OD area.

### 7.7.5 Recommendations for SWMU 31

Risks to human health and biota are negligible associated with both current- and future-use exposures to constituents in soil and air. UXO removal should occur at the time of closure of this interim status unit. Based on the risk assessment results and the fact that the unit is an interim status RCRA unit, no corrective action or CMS is recommended at SWMU 31 under RCRA corrective action.



### 7.7.2 Ecological Risk Assessment Conclusions

The ecological risk assessment qualitatively evaluated potential risk from chemicals present in surface and subsurface soils at SWMU 31. A low, moderate, or high risk ranking was assigned to each of the seven metals that met the exposure and toxicological criteria and were designated as COCs. Results of the qualitative ecological risk assessment indicate the following:

- (1) A low potential risk ranking was assigned to all metals detected in the soil and surface water at SWMU 31.
- (2) Because of the frequent detonation activities at the SWMU, flora has been removed from the area around the detonation pits to reduce the fire hazard and little habitat for wildlife is provided.

### 7.7.3 Explosive Risk Determination Conclusions

Due to the detonation activities at SWMU 31, there is a significant risk associated with the physical hazard of live explosives in the unit. The ordnance and ordnance debris observed along transects through SWMU 31 are documented in Table 3.3-1 (page 3-17). There is a significant amount of UXO and ordnance debris within the SWMU, indicating a moderate to high risk. However, since travel through the SWMU is limited to TEAD workers in the EOD section with training in UXO recognition and avoidance, the risk of explosion is remote under conditions of present use by Army personnel. All ordnance and ordnance debris would be removed during SWMU closure.

### 7.7.4 Environmental Degradation Conclusions

SWMU 31 is an active open burning/open detonation (OB/OD) area currently operating under interim status. Sampling at the detonation pits indicated minimal risk to human health and the environment. Any activities at the unit that could cause degradation of the environment will be managed under the operating plan for the OB/OD area.

### 7.7.5 Recommendations for SWMU 31

Risks to human health and biota are negligible associated with both current- and future-use exposures to constituents in soil and air. UXO removal should occur at the time of closure of this interim status unit. Based on the risk assessment results and the fact that the unit is an interim status RCRA unit, no corrective action or CMS is recommended at SWMU 31 under RCRA corrective action.

### 7.7.2 Ecological Risk Assessment Conclusions

The ecological risk assessment qualitatively evaluated potential risk from chemicals present in surface and subsurface soils at SWMU 31. A low, moderate, or high risk ranking was assigned to each of the seven metals that met the exposure and toxicological criteria and were designated as COCs. Results of the qualitative ecological risk assessment indicate the following:

- (1) A low potential risk ranking was assigned to all metals detected in the soil and surface water at SWMU 31.
- (2) Because of the frequent detonation activities at the SWMU, flora has been removed from the area around the detonation pits to reduce the fire hazard and little habitat for wildlife is provided.

### 7.7.3 Explosive Risk Determination Conclusions

Due to the detonation activities at SWMU 31, there is a significant risk associated with the physical hazard of live explosives in the unit. The ordnance and ordnance debris observed along transects through SWMU 31 are documented in Table 3.3-1 (page 3-17). There is a significant amount of UXO and ordnance debris within the SWMU, indicating a moderate to high risk. However, since travel through the SWMU is limited to TEAD workers in the EOD section with training in UXO recognition and avoidance, the risk of explosion is remote under conditions of present use by Army personnel. All ordnance and ordnance debris would be removed during SWMU closure.

### 7.7.4 Environmental Degradation Conclusions

SWMU 31 is an active open burning/open detonation (OB/OD) area currently operating under interim status. Sampling at the detonation pits indicated minimal risk to human health and the environment. Any activities at the unit that could cause degradation of the environment will be managed under the operating plan for the OB/OD area.

### 7.7.5 Recommendations for SWMU 31

Risks to human health and biota are negligible associated with both current- and future-use exposures to constituents in soil and air. UXO removal should occur at the time of closure of this interim status unit. Based on the risk assessment results and the fact that the unit is an interim status RCRA unit, no corrective action or CMS is recommended at SWMU 31 under RCRA corrective action.