9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 SITE-SPECIFIC CONCLUSIONS AND RECOMMENDATIONS

Site-specific conclusions and recommendations were provided for each of the sites within SWMUs 13 and 17 in Sections 7.0 and 8.0, respectively. This section briefly summarizes these conclusions and recommendations. The conclusions are based on the information gathered from previous investigations along with data collected during this Phase II RFI. Based on the objectives of this RFI along with the Utah Administrative Code, possible response actions consist of a "No Further Action" option, a recommendation for a Corrective Measures Study, or interim remedial action. All of the sites at each of these two SWMUs (13 and 17) will be following a "No Further Action" alternative or be carried forward through the CMS process.

In the case of the Fuel Spill Site at SWMU 13, even though risk assessment results indicate that no adverse effects to human health or to the local ecology are likely to occur, a CMS is recommended. This is a result of exceeding a Utah cleanup standard for TPHCs in soil along with the potential for not meeting the Principle of Non-Degradation requirements as outlined in the Utah Administrative Code.

At the Sodium Hydroxide Spill Site, a CMS is recommended primarily due to the possibility of a reportable quantity of sodium hydroxide present in the site's soil. As with the Fuel Spill Site mentioned above, no adverse effects were likely at this site based on risk assessment results.

At the remaining sites at SWMUs 13 and 17, the recommendations are based on the results of assessments conducted for contaminant fate and transport and risk to human health and the environment.

Recommendations for future actions were identified pursuant to Section R315 of the Utah Hazardous Waste Rules. Specifically, the recommendations were based on the provisions of R315-101-6 "Risk Management: Site Management Plan Approval and Closure Equivalency." This rule allows pursuit of a no action option only if the levels of cancer risk and noncarcinogenic hazard present at a site based on future land use conditions (residential scenario) are below 1E-06 and "less than one," respectively. If this criterion is met, a request for risk-based closure may be submitted. Otherwise, if this criterion is not met, then the site is to be included in a site management plan that shall be submitted (in the form of a CMS Work Plan) to the Executive Secretary within 60 days of approval of the Phase II RFI Report.

According to R315-101-6, if the level of cancer risk is less than 1E-04 under actual land use conditions but greater than 1E-06 under future land use and the noncarcinogenic hazard is "less than one" under both exposure scenarios, the site management may contain, but is not required to contain, procedures for corrective action. In this event, the site management plan shall contain appropriate management activities such as monitoring, deed notations, site security, or

post-closure care. However, the site management plan must contain procedures for corrective action if the cancer risk present at the site exceeds 1E-04 or if the hazard index is "greater than one" based on the results of the evaluation under actual land use conditions. These determinations for each site are summarized in Table 9-1.

Overall, the results of this report support a determination of no further action at 2 of the 3 sites at SWMU 17 and at 2 of the 10 sites and areas of potential concern (this includes groundwater) at SWMU 13. The remaining eight sites and the groundwater medium are recommended for further evaluation through the CMS process.

For those sites where no further action is recommended, conclusions were based primarily on no contamination being found or only low levels of contaminants being present with correspondingly low estimated risks to human health and the environment. The resulting recommendations are based on both the current and future land use exposure scenarios.

For the sites where further action is recommended, the conclusion that they be carried forward through the CMS process was based primarily on the presence of levels of contaminants identified during the RFI sampling and analysis that could pose a significant risk or hazard to human health or the environment or that exceed regulatory action levels or limits. Tables 9-1 and 9-2 summarize the conclusions and recommendations for all 12 sites along with the groundwater at SWMU 13.

A review of the chemicals at most of the sites where a CMS is recommended showed that arsenic is the key analyte driving the risk (see Sections 7.0, 8.0, and Appendix H). It is important to note that the arsenic occurrences are not a result of past operations at SWMUs 13 or 17. Indeed, some of the arsenic values that are driving risk are lower than some of the concentrations detected in the arsenic background population (see Section 5.0), indicating that naturally occurring arsenic in the soils is driving the risk at many of the sites.

9.2 SWMU-WIDE AND OFF-DEPOT CONCLUSIONS AND RECOMMENDATIONS

The risk estimates presented in Section 7.0 and Section 8.0 of this report for the on-site worker and off-site residents pertain to individual sites under current land use conditions. These risk estimates were derived on the basis of the following presumptive conditions:

- The worker proportions his activities (and the number of days worked per year) equally among the sites at SWMU 13 or SWMU 17.

- The off-site residents (adult and child) are exposed to site-specific contamination (i.e., those chemicals detected in the individual-site's surface-soil, which were modeled downwind in ambient air).

The total potential risks and hazards for each of these receptor groups is then determined by summing their individual site-related risks/hazards. This approach is not applicable to the

Table 9-1. Summary of Conclusions and Recommendations for 12 Sites and Groundwater at SWMUs 13 and 17

SITE	CONCLUSION	RECOMMENDATION
Fuel Spill Site (SWMU 13)	The COPCs in the soil at this site are fuel-related VOCs, SVOCs, and TPHCs. The approximate lateral and vertical extent of these contaminants have been defined. Risk assessment results indicate that no adverse effects to human health or to the local ecology are likely to occur due to site-specific chemicals. However, TPHCs could not be quantitatively evaluated under the human health risk assessment because of lack of USEPA criteria for TPHCs.	It is recommended that the Fuel Spill Site be carried forward through the CMS process. The CMS process will only evaluate the soils above the vadose zone (vadose zone and saturated soils are influenced by the groundwater, which does not pose a risk to human health or to the environment under current-use scenarios). This recommendation is based on the fact that TPHCs could not be thoroughly evaluated in the risk assessment process and because some of the TPHC concentrations exceed Utah action levels for TPHC contaminated soils (30 μg/g for gasoline, 100 μg/g for diesel). Additionally, it is possible that the Non-Degradation Requirements as outlined in the Utah Administrative Code could be violated as a result of these TPHCs.
Underground Storage Tank Site (SWMU 13)	Analytical results from the samples that were collected at this site during the Phase II RFI indicate that there is not a contamination problem at this site. Additionally, the risk assessment results indicate that no adverse effects to human health or to the environment are likely to occur from site-specific contamination.	No further action is necessary at the Underground Storage Tank Site.
3X Yard (SWMU 13)	The COPCs in the soil at this site are arsenic and chromium, which were detected in the soils above background. The approximate lateral and vertical extents of chromium have been defined, while the arsenic detections represent natural variation of naturally occurring levels. Risk assessment results indicate that no adverse effects to the local ecology are likely to occur from site-related contamination. However, site-specific soil contamination resulted in risk levels exceeding the State threshold of 1E-06 for the current on-site worker and for the future on-site residents. Thus, a "no further action" option cannot be pursued according to item (d) of R315-101-6[a].	Because carcinogenic risks to the on-site worker and the future resident are elevated, it is recommended that the 3X Yard be carried forward through the CMS process, pursuant to item (d) of R315-101-6.

Table 9-1. Summary of Conclusions and Recommendations for 12 Sites and Groundwater at SWMUs 13 and 17 (continued)

SITE	CONCLUSION	RECOMMENDATION
Boiler Blowdown Discharge Site (SWMU 13)	The COPCs are TPHCs in the soil and VOCs and explosives in the surface water. The TPHC contamination does not appear to be associated with activities at this site. Indeed, the data indicate that this fuel-related contamination is likely associated with past operations at the Fuel Spill Site. While VOCs and explosives were detected in the 1991 surface-water sample, no contamination was detected in the 1993 water sample (the 2,6-dinitrotoluene detection was unconfirmed), indicating that the boiler discharge is not a source of contamination. Risk assessment results indicate that no adverse effects to human health or to the environment are likely to occur due to site-specific chemicals.	No further action is necessary at the Boiler Blowdown Discharge Site. However, the TPHC data collected at this site should be used along with the Fuel Spill Site data when evaluating the Fuel Spill Site during the CMS process.
Drainage Ditch Site (SWMU 13)	The COPCs are metals and anions in the soil, and anions in the surface water. Although the above-mentioned analytes were detected above background, it is likely that they are not a result of operations at this site and represent natural variation in the background concentrations. Risk assessment results indicate that no adverse effects to the environment are likely to occur from site-related contamination. However, site-specific soil contamination resulted in risk levels exceeding the State's threshold of 1E-06 for the future on-site construction worker and future on-site residents. Thus, a "no further action" option cannot be pursued according to item (d) of R315-101-6.	Because carcinogenic risks to the future on-site construction worker and future resident are elevated, it is recommended that the Drainage Ditch Site be carried forward through the CMS process pursuant to item (d) of R315-101-6.

Table 9-1. Summary of Conclusions and Recommendations for 12 Sites and Groundwater at SWMUs 13 and 17 (continued)

SITE	CONCLUSION	RECOMMENDATION
Chemical Unload Site (SWMU 13)	The COPCs in the soil are VOCs, SVOCs, metals, and anions. Although some of the metals and anions were detected above background, it is likely that they are not a result of operations at this site and represent natural variation in the background concentrations. The traces of VOCs and SVOCs, which are commonly associated with laboratory procedures, were detected in only three samples and do not represent a contamination problem at this site. Risk assessment results indicate that no adverse effects to the environment are likely to occur from site-related contamination. However, site-specific soil contamination resulted in a risk to the future on-site construction worker above the State's threshold of 1E-06 and in hazards to the future on-site residents above the State's threshold of 1.0.	Because carcinogenic risk to the future on-site construction worker and noncarcinogenic hazards to future residents are elevated, it is recommended that the Chemical Unload Site be carried forward through the CMS process pursuant to item (d) of R315-101-6.
Pavement Perimeter Site (SWMU 13)	The COPCs in the soil are VOCs, metals, and anions. Although some of the metals and anions were detected above background, it is likely that they are not a result of operations at this site and represent natural variation in the background concentrations. The VOCs were detected in trace amounts from only one sample and do not represent a VOC contamination problem at this site. Risk assessment results indicate that no adverse effects to the environment are likely to occur. However, site-specific soil contamination resulted in risk levels exceeding the State's threshold of 1E-06 for the current and future on-site workers and for future on-site residents. Thus, a "no further action" option cannot be pursued according to item (d) of R315-101-6.	Because cancer risks to current and future on-site workers and future residents are elevated, it is recommended that the Pavement Perimeter Site be carried forward through the CMS process pursuant to item (d) of R315-101-6.
Sodium Hydroxide Spill Site (SWMU 13)	The COPC is sodium hydroxide. The approximate lateral and vertical extents have been defined. Risk assessment results indicate that no adverse effects to human health or to the environment are likely to occur due to site-specific contamination. However, alkalinity could not be quantitatively evaluated under the human health risk assessment.	It is recommended that the Sodium Hydroxide Spill Site be carried forward through the CMS process because alkalinity could not be thoroughly evaluated in the risk assessment process and because it was determined that some of the soil below the spill site is contaminated with sodium hydroxide. Recent construction over the former spill site has occurred making any further investigations difficult.

Table 9-1. Summary of Conclusions and Recommendations for 12 Sites and Groundwater at SWMUs 13 and 17 (continued)

SITE	CONCLUSION	RECOMMENDATION
Wastewater Lagoons (SWMU 13)	The COPCs are VOCs, SVOCs, TPHCs, radionuclides, metals, and anions. The approximate lateral and vertical extents of these chemicals have been defined. Risk assessment results indicate that no adverse effects to the environment are likely to occur due solely to site-specific contamination. However, site-specific soil contamination at Lagoons 1, 2, and 3 resulted in risk levels exceeding the State's threshold of 1E-06 for future construction workers and on-site residents. Thus, a "no further action" option cannot be pursued according to item (d) of R315-101-6.	Because cancer risk to the future construction on-site resident is elevated, it is recommended that the Wastewater Lagoons Site be carried forward through the CMS process pursuant to item (d) of R315-101-6.
Groundwater (SWMU 13)	The COPCs in the groundwater at SWMU 13 are VOCs, SVOCs, TPHCs, ABPs, explosives, metals, anions, and radionuclides. Although some of these chemicals appear to be the result of operations at this SWMU, many of the detections are likely to be natural occurrences (metals, anions, radionuclides). Groundwater modeling results indicate that none of these will ever reach the TEAD-S boundary in concentrations of any concern. However, a "no further action" option cannot be pursued according to item (d) of R315-101-6 because some of the risks to future on-site residents exceed the State's threshold of 1E-06.	Because the cancer risk and noncarcinogenic hazard to future on-site residents are unacceptably high, it is recommended that this medium be carried forward to the CMS pursuant to item (d) of R315-101-6.
Mercury Contamination Spill Site (SWMU 17)	This site was remediated in 1990 and closure was approved on September 11, 1991.	No further action is recommended at the Mercury Contamination Spill Site.
Fuel Spill Site (SWMU 17)	The COPCs are VOCs and SVOCs. These chemicals were detected in trace amounts and do not represent a contamination problem at this site. Risk assessment results indicate that no adverse effects to human health or to the environment should occur due to site-specific contamination.	No further action is recommended at the Fuel Spill Site.

Table 9-1. Summary of Conclusions and Recommendations for 12 Sites and Groundwater at SWMUs 13 and 17 (continued)

SITE	CONCLUSION	RECOMMENDATION
Drum Storage Site (SWMU 17)	The COPCs are VOCs and metals. The VOCs were only detected in trace amounts and do not represent a contamination problem at this site. The metals detected above background appear to be associated with fill material and are not a result of site operations. Risk assessment results indicate that no adverse effects to the environment are likely to occur due to site-specific contamination. However, because site-specific soil contamination resulted in risk levels exceeding the State's threshold of 1E-06 for the current on-site worker and for future on-site residents, a "no further action" option cannot be pursued according to item (d) of R315-101-6.	Because cancer risks to the on-site worker and future residents are elevated, it is recommended that the Drum Storage Site be carried forward through the CMS process pursuant to item (d) of R315-101-6.

*R315-101-6 is explained in Section 1.2 and at the beginning of this section.

Table 9-2. Summary of Selection Criteria for Site-Specific Recommendations at SWMUs 13 and 17

Site	Future Residential Scenario[a]		Current Worker Scenario[a]		Potential For Violation of the Non-Degradation Principle	Potential For Ecological Risk	Contamination Exceeds Regulatory Action Levels	Recommendations	
	Risk < 1E-06 AND Hazard < 1	Risk > 1E-06 OR Hazard > 1	Risk < 1E-04 AND Hazard < 1	Risk > 1E-04 OR Hazard > 1				NFA[b]	CMS[c]
Fuel Spill Site (SWMU 13)	X		X		X		X		X
Undergd. Storg. Tank Site (SWMU 13)	X		X					X	
3X Yard (SWMU 13)		X	X						X
Boiler Blowdn. Discharge Site (SWMU 13)	X		X					X	
Drainage Ditch Site (SWMU 13)		X	X						X
Chemical Unload Site (SWMU 13)		X	X						X
Pavement Perimeter Site (SWMU 13)		X	X						X
Sodium Hydrox. Spill Site (SWMU 13)	X		X				X		X

Table 9-2. Summary of Selection Criteria for Site-Specific Recommendations at SWMUs 13 and 17 (continued)

Site	Future Residential Scenario[a]		Current Worker Scenario[a]		Potential For Violation of the Non-Degradation Principle	Potential For Ecological Risk	Contamination Exceeds Regulatory Action Levels	Recommendations	
	Risk < 1E-06 AND Hazard < 1	Risk > 1E-06 OR Hazard > 1	Risk < 1E-04 AND Hazard < 1	Risk > 1E-04 OR Hazard > 1				NFA[b]	CMS[c]
Wastewater Lagoons (SWMU 13)		X	X						X
Groundwater (SWMU 13)		X							X
Mercury Contamin. Spill (SWMU 17)	X		X					X	
Fuel Spill Site (SWMU 17)	X		X					X	
Drum Storage Site (SWMU 17)		X	X						X

[a]Total risk and/or hazard based on site-specific chemicals (i.e., due to chemicals detected in the individual sites's media); groundwater was evaluated separately.
[b]NFA refers to "No Further Action."
[c]CMS refers to "Corrective Measures Study."

future on-site resident receptor group since it was assumed that each resident spends all of his/her time at the specific site under evaluation (i.e., that the resident resides at a single site and that the majority of his/her exposure occurs while living at this single location).

To obtain the total worker cancer risk and noncarcinogenic hazard at each SWMU, the values corresponding to each site were summed. Similarly, for the off-site residents, the total cancer risk and noncarcinogenic hazard were estimated by summing the individual contributions from all sites within both SWMU 13 and 17.

The total carcinogenic risk and total noncarcinogenic hazard to the current on-site worker resulting from exposure to chemicals within the soil, surface water, and air throughout SWMU 13 were estimated to be 5.1E-06 and 0.13, respectively. The total carcinogenic risk and total noncarcinogenic hazard to the current on-site worker at SWMU 17 were estimated to be 9.0E-06 and 0.30, respectively. Although these total cancer risks exceed the State's negligible risk level of 1E-06, they are below the State's corrective-action threshold of 1E-04. The total noncarcinogenic hazards to the current worker are well below the State's recommended hazard index of 1. The sites responsible for the majority of these risks are the 3X Yard and the Pavement Perimeter Site at SWMU 13, and the Drum Storage Site at SWMU 17.

The total carcinogenic risks resulting from exposure to airborne chemicals originating at both SWMU 13 and SWMU 17 were estimated to be 5-5E-09 for the current off-site adult resident and 3.8E-09 for the child resident. The total noncarcinogenic hazards to the off-site adult and child were 0.0002 and 0.0009, respectively. The risk estimates are below the State's negligible risk level of 1E-06. In addition, the hazards calculated for these receptors are less than the State's recommended hazard index of 1. Thus, significant impacts to off-base receptors are unlikely to occur under current environmental conditions at SWMUs 13 and 17.

In summary, it is recommended that the three sites contributing significantly to SWMU-wide worker risks, evaluated under the current land use scenario, be carried forward through the CMS process. These sites are the 3X Yard and the Pavement Perimeter Site at SWMU 13, and the Drum Storage Site at SWMU 17. In conjunction with the site-specific risk-assessment conclusions presented previously (in Section 9.1), this project's overall recommendations are that a total of six sites at SWMU 13 and one site at SWMU 17 should be carried forward through the CMS process based on risk assessment results (see Table 9-2). In addition, the following two sites at SWMU 13 should be carried forward through the CMS process for reasons other than the risk assessment results: the Fuel Spill Site to address TPHC concentrations that exceed the State's action level coupled with the potential to violate the Principle of Non-Degradation as described in the Utah Administrative Code; and the Sodium Hydroxide Spill Site to assess a reportable quantity of sodium hydroxide in the soil.