PART 3: RESPONSIVENESS SUMMARY

A. Stakeholder Issues and Lead Agency Responses

The RI/FS Site was published in January 2004. Several comments were received from community residents, municipalities, area businesses, potentially responsible parties, and the CDPHE. The comments may be viewed at the CSMRI Site website http://www.is.mines.edu/ehs/CSMRI/CSMRI.htm).

A summary of the comments received and the School's responses to the comments are listed below.

Selection of Remedial Alternative Five

Every Commenter that indicated a preference for a remedial alternative indicated a preference for off-site removal of contaminated soils. The School selected Remedial Alternative Five that included off-site removal of contaminated soils.

Several Commenters indicated the most economical remedial alternative should be used. Those Commenters related that the off-site disposal Alternative was the most economical. The School supports selection of that Alternative as the most economical while simultaneously being effective and striking the best balance among competing tradeoffs.

Several Commenters indicated that the nearest solid waste landfill facility would be most appropriate for disposal of contaminated soils. The School generally agreed with that position, and selected an Alternative that will include disposal of most of the soils from the Site at a local solid waste facility. However, a small proportion of the soils from the Site may be disposed at a RCRA Subtitle C facility in Idaho or the CSI facility in Bennett Colorado can receive soils that have higher concentrations of radium, thorium, and uranium than the soils that are slated to be disposed of at the BFI facility. Uncertainties about the administrative feasibility of accepting such materials through the successful demonstration through a waste acceptance risk assessment is the leading driver for this approach.

Several Commenters stated that the selected Remedial Alternative should allow for maximum flexibility of future land use options. The Commenters stated that selection of the off-site disposal Alternative would provide such maximum flexibility. The School agreed with those comments.

One Commenter stated that cleanup of the Site would allow the area to be developed as a recreational facility for the enjoyment of the public and the community. The School agrees that the selected Remedial Alternative should allow use of the Site for uses such as recreational or residential development.

Determination of Background Contaminant Levels

One Commenter supplied several questions regarding the locations and composition of the background samples. The primary goal in selecting the background samples was to find material representative of the Site. The majority of the Site and surrounding area no longer has an "A" soil horizon because of extensive anthropogenic activities. In addition, "A" horizons in similar areas tend to be rather thin because of the semi-arid climate and shortgrass prairie vegetation. However, a small number of samples were collected in remaining "A" horizons on the Site and these samples fall within the range of values presented in the background discussion in the RI/FS (e.g., CSM141, 145, 146, 162).

The Commenter indicated that the background samples may have been collected in areas with artificial fill (from Weimer's map – RI/FS Figure 2-3). However, if one closely examines the Weimer figure the majority of the background samples were collected from the Louviers alluvium. Artificial fill was easily identified visually during the subsurface investigations (primarily sand and miscellaneous building debris) and none of the background samples were collected from these areas. The sedimentary layers across the site were fairly consistent and all of the background samples were collected from the upper regions of these layers. CDPHE has approved the selection of the locations for background samples.

A Commenter indicated that the gamma survey was incorrectly compared to data previous generated by URS. However, the gamma survey conducted as part of the RI/FS was only used as an initial screening tool for locating radioactive material. The gamma survey is not being used to establish background levels for cleanup verification purposes. Consistent with CDPHE guidance, soil removal scenarios were based solely on the analytical results of the soil samples. Kriging techniques and visual observations were subsequently used to develop excavation volumes for planning purposes. The estimated excavation volumes were based on the laboratory analytical results. In contrast, use of gamma survey data would be inadequate to determine excavation volumes.

The same Commenter indicated that the Am-241, Pu-238, and Pu-239 values should have been compared to the URS data and not to the Rocky Flats Site. However, URS did not analyze their samples for these radionuclides. These radionuclides are fission products released during above ground nuclear tests. Their distribution is assumed to be relatively uniform because of atmospheric deposition. Because of the transport mechanism involved, these materials would not be confined to the "A" horizon, but would be deposited on surfaces exposed to the atmosphere at the time of the tests. CDPHE requested additional samples be analyzed for these radionuclides. The majority of samples contained none of these fission products. Of the small number that did contain traces of the radioisotopes, all were at activities below the fallout levels.

Soil Classification for Disposal

CDPHE has provided guidance for the disposal of material at a licensed Subtitle D landfill (see CDPHE memo titled "CSMRI soil cutoff values for planning and budgeting purposes", February 25, 2004). Using the CDPHE guidance, the majority of the material is suitable for disposal at a Subtitle D Landfill without having to perform a waste acceptance risk assessment. For the remaining minority of materials, CDPHE has approved disposal of them at a RCRA subtitle C facility in Idaho without having to perform a waste acceptance risk assessment (all hazardous wastes are solid wastes) or another solid waste landfill that may demonstrate through a waste acceptance risk assessment that the landfill may properly accept these materials. In short, CDPHE has approved the disposal of all of the affected material at RCRA facilities. Only solid wastes may be disposed of at these designated RCRA facilities.

CDPHE commented that materials with contaminants should not be classified as solid waste, but rather technologically enhanced naturally occurring radioactive material (TENORM). Yet, CDPHE has simultaneously approved the disposal of the same material at RCRA facilities that may only accept solid waste. The School believes that if the material is TENORM, then it is a subset of solid waste for regulatory purposes. Nonetheless, both the School and CPDHE agree that the material is regulated under RCRA and may disposed of at RCRA disposal facilities, which may only accept solid wastes, otherwise disposal at these facilities would not be allowed.

One commenter stated that Colorado law precludes disposal of solid waste materials in solid waste landfills when the materials exhibit gross alpha activity in excess of 40 pCi/g. This statement was provided without a specific regulatory citation to support it. The School is aware of a 40 pCi/g threshold for land disposal of treatment sludges on open land, not for disposal in landfills.

Ground-Water Investigation

One of the goals of the proposed remedial plan is to achieve activities / concentrations less than the published MCL at the point of compliance wells (CSMRI-04 and CSMRI-05). Source removal is the most effective method to ensure that this goal will be achieved. This approach is consistent with ALARA principles. Although dilution would likely result in minimal activities/concentrations in Clear Creek itself, alluvial activities/concentrations could remain elevated. Although downstream users currently treat the alluvial water, ALARA principles require compliance with the MCL prior to treatment. Moreover, one cannot rely on future users of the water to treat it just because some downstream water users treat their water today.

One reviewer commented on the unknowns associated with the transport of lead and the influence of clay layers on the site. The clay layers may impede the downward migration of the lead; however, such transport is highly dependent on the species of lead. Additional factors such as fertilizers and other soil treatments also can affect the migration of lead. Long term erosion also can transport the material across the surface and eventually into nearby Clear Creek. Examination of the site topography demonstrates that large portions of the current surface have been exposed below the original clay layers. Lead contamination below the clay layers is available to reach groundwater without opportunity for natural attenuation through deposition onto clays. In much of the Site, the clay and other sedimentary layers are uplifted to the vertical, eliminating such protective mechanisms. Leaving the lead in place also requires institutional controls.

Another comment suggested that a natural depositional layer (orange-tan color) that had elevated activities could be contributing to the observed ground-water activity. However, the layer in question has elevated activities of the thorium decay chain but background activities of the uranium decay chain. The ground-water samples contain elevated uranium concentrations. In addition, the layer in question is located significantly above the observed ground-water elevations.

A reviewer indicated that the wells on Site would not be suitable as a water supply because of the low recharge rate. Only two of the wells had low recharge rates (CSMRI-02 located near the freshman parking lot and CSMRI-06 located north of the former Building 101N). Review of the location of CSMRI-02 showed that it had minimal direct connection with the site

hydrogeology. Recharge for CSMRI-06 appeared to be limited by its position next to a paleochannel (another boring installed to the east had a significantly larger ground-water zone). The other five wells produced ample quantities of water for residential use.

A comment was made about possible improper use of the ground-water pathway in the risk analysis because of the location of the site within the City of Golden borders. Although drinking water is currently provided by the city's water distribution system, the persistence of radionuclides and metals would make the material problematic for an extended period of time (well over 1,000 years). Long term drought or significant land use changes could make the ground-water usage plausible in the future. Again, ALARA principles would apply.

CDPHE has requested that Clear Creek be sampled to quantify material migrating into the surface water. They also have requested a limited amount of aquifer testing be performed and ground water sampling be continued during the remediation effort. The School plans to comply with these requests and continue ground-water monitoring to confirm the effectiveness of remedial efforts.

Risk Assessment

Several comments were made regarding the use of the subsistence farmer for the risk assessments. The subsistence farmer scenario is typically used for the baseline risk assessment. Although the reviewer correctly notes that a subsistence farm would not be allowed under current city regulations, the city regulations may not be in place for the life of the metals and radionuclides.

CDPHE has agreed to allow the application of the suburban resident to the Site. However, CDPHE also commented that the resident must be modeled as a maximally exposed individual who does consume ground water and grows food in a backyard garden. These changes to the RI/FS risk model were accepted and used for the ROD. Current zoning standards are also not determinative of future land uses for risk assessment purposes.

RESRAD Inputs: One reviewer commented that the 25 mrem/yr dose guideline be used rather than the 15 mrem/yr dose. CDPHE indicated that the 15 mrem/yr dose was the preferred number. In addition EPA guidance explains that the 15 mrem/year standard is equivalent to the CERCLA NCP risk requirements for cleanups; see, EPA Guidance Document OSWER 9200.4-18, Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination, Aug. 27, 1997. The risk assessment for the RI/FS supports the EPA guidance and CDPHE's request. In any event, there is not much of a practical difference in terms of volume and cost between the use of 15 mrem/yr and 25 mrem/yr. Field instrumentation parameters and the pragmatic desire to avoid having to perform a second round of excavation and sampling, will likely lead to a similar amount of soil removed under either dose standard.

A comment indicated that the mass loading parameter for RESRAD was relatively sensitive. This number was increased in the model to account for the windy nature of the Site. However, use of the parameter at the level cited by the commenter resulted in an inhalation dose of 0.043 mrem/yr. The higher number used increased the dose to 0.13 mrem/yr, an increase of approximately 0.2 percent of the total dose contribution of the site. The resulting change in risk from this change was not significant.

The default K_d values were reviewed and, when insufficient data were available, assumptions were made according to visual observations of soils. In some cases the default RESRAD value was used because it was consistent with the observed soil type.

Lead Modeling

One Commenter indicated that insufficient data was available to properly use the IEUBK model for lead. The lack of site specific information was acknowledged in the RI/FS. However, Site lead concentrations are sufficiently elevated to be of concern. Residential facilities at college campuses typically include married student housing that have small children. In addition, college students include numerous women of reproductive age, including a percentage that may be pregnant at any given time. Therefore, college campus populations almost certainly include sensitive receptors such as small children and pregnant women.

CDPHE has requested the use of the maximally exposed individual scenario for the site cleanup, which would be more supportive of the 13 ?g Pb/dL value generated by the preliminary IEUBK model.

Allowing elevated concentrations of lead to remain on Site would require continuing institutional controls such as deed restrictions and marking of the soil to limit excavation in those areas.

Site-Specific Work Plans

The Colorado Department of Public Health and Environment state that the Proposed Plan "lacks sufficient detail for approval at this time." The School intends to submit site-specific work plans including a Task Plan, Sampling and Analysis Plan, Site Safety and Health Plan, Quality Assurance Plan, License Decommissioning Plan, and other documentation to provide detail for Department approval. The RI/FS is not a substitute for work plans.

Cost Analyses

One Commenter expressed concerns regarding the cost analyses provided in the RI/FS. The Commenter specifically cited concerns with the background and risk analyses that have been addressed elsewhere. The Commenter stated that errors in these analyses would lead to elevated volumes of soil being removed from the Site. The commenter assumes that the soil volume has been exaggerated by "as much as 5,000 cubic yards" and feels that estimated total volume may be as low as 5,000 cubic yards, rather than the 10,000 cubic yards used in the RI/FS.

The order of magnitude cost estimates presented in the RI/FS were only intended to provide a general comparison of the *relative* costs of each alternative, not serve as a definitive cost proposal. The School intends to vigorously pursue cost-saving measures to reduce the costs of the selected alternative below the order of magnitude estimate in the RI/FS.

The Commenter also states that "*the School had an opportunity to have the Site fully remediated, including removal of the impacted soil and other remedy elements contemplated by the Proposed Plan, for under $2,000,000.00. See, March 29, 2002, Cotter Corporation…Technical Proposal and Cost Proposal to the Colorado School of Mines*." The referenced proposal included the removal of concrete and asphalt, site investigation, sample analysis, and the removal of small amounts of impacted soils and totaled $1,198,293.00. That

total did not include the cost of work added by change order from the School for Phase One work, Phase Two work, Site restoration costs, or groundwater monitoring during and after remediation activities. In fact, it would not have been possible for the proposal to include remedial action costs since the subsurface soils had not yet been characterized. However, calculations using the unit rate costs presented in the Cotter proposal and the quantities of material that were assumed for cost estimation in the RI/FS, the cost for Phase Two remediation work alone would have been well in excess of the $2,000,000 figure quoted by the Commenter.

The School is highly motivated to act reasonably and reduce costs where possible, while still accomplishing the selected remedy.

B. Technical and Legal Issues

These issues were addressed in Part III.A. No expansion on them is necessary here.