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Compendium of ROD Language for FY 1993 Focus Areas

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COMPENDIUM OF ROD LANGUAGE FOR FY 1993 FOCUS AREAS

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NOTICE

The polices and procedures set forth here are intended as guidance to Agency and other government employees. They do not constitute rulemaking by the Agency, and may not be relied on to create a substantive or procedural right enforceable by any other person. The Government may take action that is at variance with the policies and procedures in this manual.

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COMPENDIUM OF ROD LANGUAGE FOR FY 1993 FOCUS AREAS

Introduction

This compendium has been prepared to help improve national consistency and required documentation in Superfund Records of Decision (RODs).

Sections 113, 117 and 121 of CERCLA, as amended, require the issuance of a decision document for remedial action, known as a Record of Decision (ROD). A ROD must include the rationale and purpose for the selected remedy, based on site-specific information and supporting analysis. It is important that RODs be consistent both within and across Regions with respect to organization and content to determine that all statutory and regulatory requirements have been met.

Background

During the past four years, from FY 1988 through FY 1991, ROD analyses were conducted by the Office of Emergency and Remedial Response (OERR) and the Office of Waste Programs Enforcement (OWPE) to gather data on remedies selected, to determine how well RODs were being written to comply with guidance and CERCLA requirements, and to examine overall quality and consistency. These studies have resulted in many improvements in ROD documentation over the last several years. However, because the focus and scope of the annual ROD analysis have changed considerably since 1988, the following projects are being conducted in lieu of holding a traditional three day Headquarters/Regional ROD questionnaire analysis.

The OWPE has conducted a mini-analysis of the FY 1992 source control RODs to address the distribution of treatment and containment remedies at Fund versus Enforcement-lead sites. OWPE and OERR are coordinating the development of a new data base which will be capable of analyzing current and future ROD documentation requirements and technical data. OWPE and OERR have also worked together to gather sample ROD language that pertains to ROD documentation areas which continue to be critically important from a national perspective. The resulting collection of ROD sample language, this Compendium of ROD Language for FY 1993 Focus Areas, is being sent to every Region for use in preparing FY 1993 and future RODs.

Implementation

There are five major areas of focus for ROD language which may help improve FY 1993 RODs. These were identified based on the results of the FY 1991 ROD Analysis, (conducted in January 1992 and presented to the Regions in a memorandum titled, Transmittal of the Results of the FY 1991 Records of Decision Analysis, September 4, 1992), and on issues which have continued to be of importance from a national perspective. These include:

- Rationale for the Selected Remedy. A ROD should specify which of the five balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost) that were most important in selecting the remedy. It should include a clear and concise explanation of why one alternative was chosen over the other alternatives.

- Clean-up Levels. While the land use assumptions in the baseline risk assessments are being well documented, often the land use on which the selected remedy's clean-up levels are based, is not always being documented. We need to ensure that the land use associated with the clean-up levels is clearly identified in RODs.

- Eco-Risk Assessment. A ROD should provide a good description of any ecological risk assessments conducted, or an explanation of why ecological risk was not evaluated.

- ARARs. Improved ARAR documentation is needed

  - in the Description of Alternatives section of ROD;
  - in the Statutory Determinations section of ROD.

- Enforcement Activities. A ROD should provide thorough documentation of the history of enforcement activities at a site, including;

  - Notice letters for RI/FS
  - Negotiation period for RI/FS
  - Administrative Order on Consent (AOC) date; or
  - Consent Decree (CD) date; or
  - Unilateral Administrative Order (UAO) date of issuance and the date of the compliance letter
  - Compliance History under AOC, CD or UAO.

Examples of good documentation of each of the five ROD areas of focus are presented in this compendium. The primary criteria used to compile these examples were:

- Whether the sections followed the format and contained the appropriate contents recommended by ROD guidance.
- Whether the sections were clearly written and effectively presented.
- Whether the sections appropriately reflect current Superfund program policy.

This compendium reflects the fact that there is often more than one way to present similar information, and that the level of detail may vary from ROD to ROD. However, the essential information should always be included in the ROD.

Language in the following ROD excerpts are identified in bold type, and highlight the examples of good documentation.

SECTION I

RATIONALE FOR THE SELECTED REMEDY

A ROD should specify which of the five balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost) were most important in selecting the remedy. It should include a clear and concise explanation of why one alternative was chosen over the other alternatives.

Example 1

D. Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy for OU3 utilizes permanent solutions and treatment technologies to the maximum extent practicable while providing the best balance among the other evaluation criteria. It achieves the best balance of tradeoffs with respect to the primary balancing criteria of long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; short-term effectiveness; implementability; and cost; while also considering the statutory preference for treatment as a principal element and State and community acceptance.

The selected remedy provides a high degree of long-term effectiveness and permanence as the removal of the fluff pile through the recycling process would be permanent and irreversible. Recycling the fluff would encapsulate the contaminants in a plastic matrix (the recycled product) which will prevent exposure and reduce mobility. Any residuals would be treated which would permanently remove any hazardous characteristics, and then removed and securely contained offsite. Capping the fluff would achieve only a moderate level of long-term effectiveness and permanence as the fluff would remain onsite permanently and its long-term effectiveness would require ensured long-term maintenance. Onsite incineration could achieve a moderate to high level of long-term effectiveness and permanence because destruction of the fluff would be permanent and irreversible; however, large quantities of ash and residuals would need to be treated and disposed and the implementation time period could be excessive.

The selected remedy provides significant reductions in toxicity, mobility, and volume by immobilizing contaminants in the recycled product and achieving significant volume reductions. Capping provides no reduction in toxicity or volume. Incineration would destroy organic contaminants and require treatment to stabilize the inorganic contaminants for ultimate disposal. The selected remedy is less effective than capping in the short-term, but significantly more effective than incineration which could take anywhere from nine to eighty-seven years to achieve protectiveness. The selected remedy may be slightly less implementable than capping due to the uncertainties with regard to recycling markets, but is probably more easily implementable than incineration. With regard to cost, the selected remedy may be less expensive than capping and would be less expensive than incineration.

RATIONALE FOR THE SELECTED REMEDY

Example 2

Community Acceptance

Verbal comments received at the Proposed Plan public meeting, held on June 13, 1991, in Wallingford, Kentucky, and on comments submitted to EPA during the public comment period on the Proposed Plan, indicate that the community favors Alternative 5, Natural Stabilization, over the other alternatives considered. However, the community urged inclusion of a number of features in the Record of Decision and RD/RA Consent Decree. The community's comments and suggestions, as well as EPA responses, can be found in the Responsiveness section of this Record of Decision.

The community opposes the dynamic compaction alternative (Alternatives 4, 10 and 17) for the MFDS, primarily because of concerns over accelerated release of contaminants to the environment during the compaction process. The community does not favor the grouting alternative due to concern over potential contaminant release from intact containers during the grout injection process and uncertainties over the ability of grout to adequately fill void spaces within the trenches.

9.8 Conclusions of the Comparative Analysis Summary

Of the nine criteria described above, the differences among the six remedial alternatives evaluated are not great, except with respect to the following four criteria: 1) Implementability; 2) Reduction of Toxicity, Mobility, or Volume; 3) State Acceptance; and 4) Community Acceptance. All remedial alternatives provide for roughly the same degree of long-term and short-term effectiveness. All remedial alternatives provide for overall protection of human health and the environment and all achieve ARARs. Although cost estimates differ among the remedial alternatives, none differ by more than an order of magnitude.

Therefore, Implementability, Reduction of Toxicity, Mobility or Volume, State Acceptance, and Community Acceptance weighed heavily in favor of selection of Alternative 5. Alternative 5 is the least difficult remedy to implement, utilizing proven and reliable technologies to achieve final remediation, while not requiring time-consuming research and development prior to implementation. It is less likely to result in container rupture and, therefore, benefits from the added protection of containers within the trenches. Both the State and Community favor the Natural Stabilization technology.

SECTION II

CLEAN-UP LEVELS

While the land use assumptions in the baseline risk assessments are being well documented, often the land use on which the selected remedy's clean-up levels are based, is not always being documented. We need to ensure that the land use associated with the clean-up levels is clearly identified in RODs.

CLEAN-UP LEVELS

Example 1

....twelve (12) inches of clean site soils. The estimated costs for the selected remedy are: Capital costs: $1,498,000; Annual O&M costs: $5,000; Present worth costs: $1,557,000.

Cleanup Levels

To meet the target range of 95% of the population with blood lead levels less than 10 ug/dl, a residential lead cleanup level of 640 mg/kg was determined for the -------- site. Cleanup levels to achieve a 1 x 10^{-6} excess cancer risk or a hazard index value of not greater than one (1) for non-carcinogenic risk for other contaminants under a residential setting at the -------- site are: antimony, 110 ppm; arsenic, 0.37 ppm (10^{-6}) and 270 ppm (HI=1); cadmium, 140 ppm; mercury, 82 ppm; and for PAHs, 3 ppm benzo(a)pyrene equivalents.

X. Statutory Determinations

Under CERCLA section 121 42 U.S.C. §9621, EPA must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements, are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

CLEAN-UP LEVELS

Example 2

....in Exhibit C for determining when excavation of soils is necessary. A CLI of less than one for a particular location indicates that the total cancer risk associated with all chemicals in the location is below the target risk level. If the CLI is one or greater in a particular location, then excavation will be required. The decision on the specific method to be used will be made when the sampling and analysis program is developed during remedial design.

Fisher Ditch sediments with concentrations of carbazole greater than the 23.2 mg/kg will be excavated and treated. This action level is based on ecological risk factors.

Treatment Levels for Excavated Soils. Table 12 lists the treatment levels to be achieved in the LTU for the soils from the impoundment, process and surrounding areas. **Benzo(a)pyrene and dibenzo(a,h)anthracene together represent 96% of the risk from the carcinogenic PAHs. Reducing the concentrations of these two PAH compounds to their treatment levels should reduce the total risk from the PAHs to, or below, the 10^{-5} risk level for an industrial use scenario. Therefore, these two compounds are used as indicators for total PAH reduction.** The 2,3,7,8-TCDD equivalent concentration incorporates all dioxins/furans found in the soils.

Ex-Situ Bioremediation of the organics-contaminated soils will comply with the LDRs through a treatability variance. The treatability variance treatment level ranges or percent reduction ranges (considered ARARs) that Ex-situ Bioremediation will attain for the K001 constituents are listed in Table 12. **These treatment levels fall within the 10^{-6} to 10^{-7} risk range for an industrial use scenario.**

LDR standards will apply to the metals-contaminated soils. To meet the LDR standards, it will have to be shown that the stabilized soil is below Toxicity Characteristic levels. These treatment levels are also listed in Table 12.

The treatment levels for the sediments will be the same as for the organics-contaminated soils.

The health risks of dioxins are presently being reassessed by the Office of Research and Development (ORD). If EPA's policy on dioxins changes due to this reassessment before or during the implementation of this remedy, the equivalency concentrations for dibenzo-p-dioxins and dibenzofurans combined will be changed accordingly.

Example 2 (Continued)

Remediation Goals and Treatment Levels for the Surficial Ground Water

Ground water cleanup criteria to meet the remediation goals have been determined by examination and consideration of pre-established ARARs such as the Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and the Colorado Basic Standards for Ground Water and the use of a human health risk assessment to determine contaminant concentrations which are protective of human health.

Table 13 lists the treatment levels for the surficial aquifer. EPA has determined that ground water treatment levels for carcinogenic compounds will be the following for the surficial aquifer: 1) total 2,3,7,8-TCDD equivalency concentrations for dioxins/furans will be reduced to no greater than 0.5 (pg/L) picograms per liter; 2) trichloroethylene will be reduced to concentrations no greater than 5 micrograms per liter (ug/L); 3) tetrachloroethylene will be reduced to concentrations no greater than 1.6 ug/L; 4) carbazole will be reduced to concentrations no greater than 4.1 ug/L; and 5) other organics, if detected, which may be present in the ground water will be reduced to the most stringent Federal or state standard identified as an ARAR or TBC. The total TCDD equivalent is a proposed MCL. The treatment level for trichloroethylene is a Colorado Basic Groundwater Standard. Although a Colorado Basic Standard applies, the more stringent risk-based level was selected for tetrachloroethylene. The treatment level for carbazole was determined by risk analysis and corresponds to a 10^{-6} risk level.

EPA has also determined that groundwater treatment levels for non-carcinogenic compounds will be as listed in Table 13. All of these treatment levels, except for PCP, were determined by risk analysis and correspond to Hazard Quotients less than 1. The treatment level for PCP is a Proposed MCL identified as a TBC.

One of the goals of the ground water component of this remedial action is to restore the surficial ground water to a quality consistent with its beneficial use which is for domestic use. Based on information obtained during the remedial investigation, and the analysis of all....

Example 3

Final Remediation Goals

Final remediation goals were selected based on the PRGs previously described and the results of the alternatives analysis. Table 14 shows the final remediation goals for the --------. **All surface soils shall be excavated to depth until arsenic concentrations meet the 10^{-4} remediation goal of 36 mg/kg for industrial use. Soils beneath the treatment building shall be shall to excavated to meet the 10^{-4} remediation goal of 336 mg/kg, for industrial use. EPA has selected the more stringent cleanup level for surface soil because this is where the greatest potential for human contact exists and it will also allow residential use. Because the 10^{-5} industrial remediation goal for surface soils is approximately equal to the 10^{-4} residential cleanup level, this strategy will allow residential use of all portions of the site except the treatment building area.** Based on the results from the removal action, cleanup of soil to the selected arsenic cleanup levels will also achieve chromium and copper cleanup levels of 1,351 mg/kg and 10,000 mg/kg, respectively, associated with hazard index of 1. The selected remedy should meet the final remediation goals.

The State of Oregon cleanup standard is to clean up to background levels if possible, or if not, to a level that is protective of human health and the environment. Background arsenic levels near the -------- were measured in the range of 4 to 11 mg/kg. EPA's cleanup goal of 36 mg/kg for surface soil will be close to, but slightly higher than, measured background levels. It is EPA's judgment that the marginal increase in protection provided by cleaning up to background levels does not justify the additional remediation effort and costs.

Groundwater monitoring results will be used to verify that arsenic and chromium levels remain below the MCL.

X. Statutory Determination

The procedures and standards for responding to release of hazardous substances, pollutants, and contaminants at the Site shall be in accordance with CERCLA, as amended by SARA, and to the maximum extent practicable, the NCP, 40 C.F.R. Part 300 (1990), promulgated in the *Federal Register* on March 8, 1990.

SECTION III

ECO-RISK ASSESSMENT

A ROD should provide a good description of any ecological risk assessments conducted, or an explanation of why ecological risk was not evaluated.

The unique ecological characteristics of each site and the nature of the chemical contamination will dictate the direction and scope of the Ecological Risk Assessment to be conducted. Reference to specific test procedures and methods in the "ROD language" does not imply universal applicability at all Superfund sites, but that for the site in question, the tests and procedures selected were appropriate and the description clearly and succinctly addressed the important aspects of the risk assessment.

ECO-RISK ASSESSMENT

Example 1

....samples at the -------- indicate soil lead concentrations less than 640 mg/kg would reduce lead risk below the target level.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Ecological Risk

The ecological risk assessment conducted at the -------- consisted of:

1) **an ecological site description,**
2) **identification of the ecological contaminant of concern (hazard identification) and inclusion of a toxicological profile,**
3) **a description of the objectives, endpoints, and methods used for the ecological field study,**
4) **characterization of the ecological receptors being assessed,**
5) **identification of toxicological benchmarks from literature references for each receptor being assessed,**
6) **an exposure assessment for each of the receptors being assessed,**
7) **a characterization of risk for each of the receptors being assessed using the hazard quotient method and including a qualitative description of uncertainty, and**
8) **conclusions, tables, a map, and references.**

The ecosystem of concern is a terrestrial desert (Chihuahuan) ecosystem, consisting of grass and shrub habitat. There were no perennial surface water bodies for assessment, just dry arroyos. The terrain has a very slight slope and some rolling topography near the arroyos, but, in general, is fairly flat. The desert plants observed were mainly mesquite, creosote bush, cacti, and grasses. Desert animals observed were lizards, snakes, jack rabbits, kangaroo rats and other rodents, road runners, and other birds. Cattle graze in the study area as well as on Bureau of Land Management (BLM) land to the west of the site. Grasses are more predominant on the south side where fencing prevents access to cattle. No threatened and endangered species were observed or expected to be affected by the site activities.

The ecological hazardous substance of concern attributable to site activities was determined to be lead. The determination of whether there are any other ecological contaminants of concern besides lead was based on full scan chemical

Example 1 (Continued)

analyses conducted on some of the soil and tissue samples. Also, the soil was analyzed for total organic carbon, pH, and grain size to characterize its binding ability and the mobility and bioavailability of contaminants. There were no detections above quantification limits for any site-related chemicals besides lead. There was a BNA (di-n-butylphthalate) detected which was attributed to blank contamination.

The overall objective is to determine ecological risk attributable to --------. Other objectives or endpoints evaluated included:

1) **targeting areas for ecological field sampling (vegetation transects and small mammal trapping) with an X-Ray Fluorescence (XRF) spectrometry field technique which was used to screen soils for lead contamination gradients;**
2) **determining the biological integrity or viability of vegetation by surveying vegetative populations on the site as well as in the reference areas to determine ecological differences in structure and function attributable to --------;**
3) **analyzing vegetation and small mammal tissue residues in site and reference samples to determine uptake or bioaccumulation of contaminant(s) attributable to --------;**
4) **estimating bioaccumulation of contaminant(s) attributable to -------- in other animals higher in the food chain which feed on the vegetation and small mammals directly sampled;**
5) **measuring indicators of sublethal toxicological effects of lead (such as delta aminolevulinic acid dehydratase which is a blood lead biomarker, and histopathological indicators) in site and reference small mammal samples;**
6) **identifying toxic benchmarks for lead from literature references for each plant or animal sampled or indirectly assessed;**
7) **analyzing contaminant(s) attributable to -------- by atomic absorption spectrometry on random composite site and reference soil samples taken concurrently and collected with the tissue samples for correlation with tissue residue data; and**
8) **using the XRF technique to determine whether highway traffic lead emissions are a confounding source of soil lead not attributable to --------.**

The study was designed to assess ecological risk posed by the site only in areas where soil lead concentrations were below those concentrations (500-1,000 mg/kg) that would be remediated for the protection of human health. Since

Example 1 (Continued)

earlier studies indicated that the fenced portion (12.5 acres) of the site contained high lead concentration and would be remediated, the ecological sampling was done outside the 12.5 acre fenced area. The study areas sampled were the areas to the north and to the south of the 12.5 acre fenced site area; the reference area sampled was the Bureau of Land Management (BLM) land located west of the site.

In addition to the plant population survey, samples of soils, vegetation (bush muhly grass and mesquite) tissues, and small mammal (kangaroo rat) tissues were taken. Kangaroo rats were selected for assessment because they were the only small mammals trapped in sufficient numbers in both the site and reference areas. The vegetation population survey and tissue residue analyses were to provide information on the availability of habitat and the effects of habitat alteration, the uptake of contaminant(s) in vegetation from soil, and the impacts of contaminant(s) on vegetation and impacts potentially on grazing animals (herbivores). The small mammal samples were to provide information on uptake of contaminant(s) and impact to the small mammals themselves as well as information on site specific exposure for predators (tissue residue potentially ingested by predators).

The objective in the live-trapping of small mammals was to obtain those species likely to be exposed to contamination and with a home range size limited to the size of the site to facilitate determining ecological risk attributable only to --------. In order to indirectly assess ecological risk attributable only to -------- for other species having a home range size larger than the site and occupying a niche higher up the food chain, an area use factor was calculated. An area use factor is calculated using literature values for home range size, and it is a determination of what proportion the site size is of the home range size. The species selected for indirect assessment of ecological risk were the pronghorn antelope, coyote, and red-tailed hawk. They were selected on the basis of the various ecological niches they occupy and on information from previous local studies estimating their occurrence and available habitat.

In the Receptor Characterization section, life history information from the literature is described for each of the ecological receptors (kangaroo rat, pronghorn antelope, coyote, and red-tailed hawk) being assessed. The life history information described includes body weight, diet (percentage of foods ingested and ingestion rate by weight per day), and home range size.

Example 1 (Continued)

In the Toxicological-Response Assessment section, toxicity benchmarks from literature references for each of the ecological receptors being assessed are listed. Due to various sampling and analytical difficulties encountered with field toxicity studies, literature toxicity values were used in the risk characterization. For the animals assessed, the toxicity benchmarks were based on an oral chronic toxic dose. For vegetation, the toxicity benchmark was based on a toxic absorbed tissue value.

There was clear evidence of a soil lead contamination gradient from the site. Soil lead decreased in concentration with distance from the site in both the areas to the north and south of the 12.5 acre fenced site area. There were localized elevations of soil lead in the north and south areas attributable to arroyo drainage and in the north area attributable to a breach which occurred from the site waste pond. Also, soil lead was much greater in the site-related areas compared to the reference area. The reference area lead value measured was representative of background lead measured in other previous local studies unrelated to --------. There was no indication of a contaminated soil lead gradient attributable to highway traffic lead emissions that would confound the evaluation of lead impacts from --------.

In the Exposure Assessment section, exposure or dose estimates are calculated for each of the ecological receptors. The only exposure pathway evaluated for animals was ingestion of food. The method used has been used in other EPA regional ecological risk assessments. Exposure or dose in food is converted to dose in the receptor (herbivores and carnivores). The formula used multiplies the measured tissue residue value of lead in the food item in wet weight times the percentage that the food item represents in the diet of the ecological receptor times the ingestion rate in weight per day for the ecological receptor times the area use factor discussed above divided by the body weight of the ecological receptor. All terms except the first term in the formula were obtained from literature references. The values for the first term were analyses of the mesquite, bush muhly grass, and kangaroo rat tissue sampled in the field study. Exposure estimates were calculated separately for the site and reference areas.

For vegetation, exposure was evaluated more qualitatively. Since vegetation tissues were not washed, distinction between internal (uptake) and external (aerial deposition) exposure pathways could not be made. Total lead diethylene triamine pentaacetic acid (DTPA)-extractable lead (an estimate of the availability for plant uptake), and aqueous-extractable lead were measured in collocated soil samples for correlation with plant tissue residues. Vegetation tissue lead values

Example 1 (Continued)

were positively correlated with soil lead values, although there was much less lead in the vegetative tissues compared to that in the soil. Availability of soil lead may be low due to the high soil pH (7.2-8.1) which was measured. Despite vegetation tissue lead values correlation with soil lead values, there were no apparent vegetation population trends detected in the survey correlated with soil lead that could be attributable to --------. Rather, some of the trends in the ecological measures of the vegetation populations could be attributable to differences in habitat, drainage, elevation, moisture, nutrient availability, elevated pH, and cattle grazing.

In the Risk Characterization section, toxicological and exposure information was integrated to estimate ecological risk, and uncertainty was qualitatively described.

This was achieved using EPA's hazard quotient method. The hazard quotient is a ratio of the exposure estimate divided by the toxicological benchmark value for each ecological receptor. When the result is less than one, one concludes that there is no indication of significant risk.

For the animals assessed, none of the site-related hazard quotients exceeded one. Therefore, there is no indication of site-related significant risk for the areas evaluated. A probable factor is the small size of the site compared to the larger home range sizes of some of the ecological receptors. The highest hazard quotient was 0.1 found in the kangaroo rat. Proportioning the hazard quotient from 0.1 to one (1) would result in a soil lead concentration higher than the upper end cleanup level of 1,000 ppm used for protection of human health and would be protective of the ecology considering site-related risks only.

Reference area hazard quotients exceeded one for the coyote and red-tailed hawk which indicates significant reference area risk (not attributable to --------). This was probably attributable to the larger size of the reference area used which encompassed the large home sizes of the ecological receptors and increased the area use factors.

For vegetation, ecological risk was more qualitatively characterized. Although vegetation tissue lead values were significantly different between site and reference study areas, none of the vegetation tissue residue values exceeded the tissue-based toxicity benchmark value used from the literature. Thus, the hazard quotient was inferred to be less than one which does not indicate significant risk to vegetation attributable to --------. This was supported by the results of the

Example 1 (Continued)

population survey where no population differences could be attributed to -------- impacts.

Based on the field investigation conducted at the -------- and data from the results of the laboratory analyses, the following conclusions are drawn:

1) All site-related hazard quotients were less than one which did not indicate significant ecological risk attributable to -------- in the areas and at the lead levels evaluated.

2) The small size of the site compared to larger home range sizes of ecological receptors higher up in the food chain indicates that it would be an unlikely occurrence for lead (from the areas studied) to bioaccumulate up the food chain.

3) There was clear evidence of a soil lead contamination gradient related to --------.

4) Mean body burden of lead was higher in kangaroo rats collected in the north area, but lead was also present in reference animals.

5) Plant species are distributed consistent with regional vegetation patterns. There was no clear indication that exposure of vegetation to site-related soil lead resulted in adverse effects as reflected in population measurements.

6) Lead availability to plants from the lead contaminated soils is low due to the high pH level in the soil.

7) Lead in plants is significantly higher in contaminated areas than in the reference area. However, none of the plant tissue lead values exceeded the tissue-based toxicity benchmark value from the literature.

8) Lead in and on plants is available to grazing animals.

9) Remediation of soils for the protection of human health within the range of 500-1,000 mg/kg should be adequate regarding ecological risks attributable to -------- contaminants.

Example 2

7.2 Ecological Assessment

The -------- ecological assessment focused on biological effects in subtidal areas. During the RI, sediment chemical and physical data were collected, laboratory bioassays were conducted on subtidal sediments, and evaluation of the existing benthic communities were completed. Available information from previous studies and research was incorporated as appropriate. Although clam tissue and sediment chemical data were developed for evaluating intertidal areas, the emphasis in intertidal areas was on evaluating potential human health risks.

The assessment of ecological risks relied on the "triad approach", which links contamination to specific adverse ecological effects using a preponderance of field and laboratory evidence. The three elements of sediment chemical analyses, laboratory toxicity tests (bioassays), and evaluation of the abundance of benthic organisms from specific locations are used in combination as the three elements of the triad approach. The approach was used to develop the -------- AETs, and these chemical concentrations, in conjunction with site-specific biological data, formed the basis of the ecological assessment in --------.

As described in Section 6, an AET, or "Apparent Effects Threshold," is the concentration of a chemical in sediment above which a particular adverse biological response has always been observed. Generally, for any one chemical, different biological indicators are associated with different levels of chemical contamination, leading to a range of AETs (e.g., for benthic effects, amphipod toxicity, oyster larvae effects, and microtox responses) for each compound (See Table 2, Section 6).

7.2.1 Chemicals of Concern

RI sampling of -------- sediments included a broad range of metals and organic compounds of potential concern for environmental risk. Contaminants of concern were identified for the ecological assessment based on information about their effects in the marine environment. For this reason, not all were the same as the contaminants of concern identified for human health.

Example 2 (Continued)

Sediments in -------- exceeded 2.1 mg/kg, the high AET (HAET) for mercury, at several stations sampled during the RI, and exceeded two AETs (for oyster larvae and microtox) in most remaining contaminated areas. Above the HAET, AETs for four biological measures are exceeded. Individual PAHs exceeded their respective benthic AETs in much of the harbor, and at several locations all 16 PAH compounds exceeded their benthic AETs.

Based on the comparison of the concentrations in -------- samples with the 1988 benthic AETs for --------, EPA selected mercury and all sixteen PAHs as contaminants of concern. These contaminants are used as indicators of the extents of contamination. Toxicity information for PAH and mercury was summarized in the ecological risk assessment.

Contaminants that exceeded AETs at only one or two locations were not carried forward as contaminants of concern for the ecological risk assessment. These locations are included within areas of concern for mercury of PAHs, and cleanup for PAHs and mercury would also address these contaminants.

7.2.2 Biological Effects

Laboratory bioassay results from -------- samples were grouped by sediment grain size and statistically compared with control samples and background samples. Bioassays for acute toxicity indicated that sediments from the majority of sampled locations in the East Harbor, and from several locations in the West Harbor, were toxic to amphipods, oyster larvae, or both. In general, the bioassay responses were most severe in areas of high PAH contamination.

The test species used in amphipod toxicity tests (Rhepoxynius abronius) resides in -------- and is a member of a crustacean group that forms an important part of the diet of many esturine fish. Amphipods are sensitive to many chemical contaminants, and species such as R. abronium have a high pollutant exposure potential because the burrow into the sediment and feed on sediment material. The oyster larvae used as a test species (Crassastrea gigas) resides in -------- and supports commercial and recreational fisheries. The life stages tested (embryo and larva) are very sensitive stages of the organism's life cycle. The primary endpoint is a sublethal change in devlopment that has a high potential for affecting larval recruitment.

Example 2 (Continued)

Benthic infauna are valuable indicators because they live in direct contact with the sediments, they are relatively stationary, and they are important components of esturine ecosystems. If sediment-associated impacts are not present in the infauna, then it is unlikely that such impacts are present in other biotic groups such as fish or plankton unless contaminants are bioaccumulating at levels significant for higher food-chain organisms.

During the RI, replicate benthic infauna measures were not conducted at each station in --------. Consequently, statistical comparisons of benthic abundance data between individual stations was not possible. Overall, there was a greater abundance of polychaetes in -------- than in the background areas, which could indicate a predominance of pollution tolerant organisms. However, no statistically significant difference relative to background areas was observed for molluscs, amphipods, and other crustaceans.

Other benthic studies of -------- tend to support the indication in the RI that, while sediment contamination is present above the AETs, adverse effects on benthic communities may not be occurring in the level of major taxa (polychaeta, molluscs, amphipods, other crustacea) in most subtidal areas of the West Harbor.

Additional evidence of biological effects in -------- includes the prevalence of liver lesions and tumors in English sole, as documented by NOAA (Malins, 1985). The high incidence of such effects in -------- relative to other -------- embayments was confirmed in the -------- Ambient Monitoring Program 1991 sampling. This and laboratory research citing the effects of PAH and other sediments contaminants on marine organisms add to the preponderance of evidence already indicating potential damage to -------- marine life. In addition, PAH and metals in the tissues of fish and shellfish indicate uptake of sediment contamination. Mercury tends to bioaccumulate in fish, while PAHs can bioaccumulate in some invertebrates.

Uncertainty in the ecological assessment is associated with data variability, spatial variability of contamination and benthic communities, potential biological effects of organic enrichment, grain size, and physical disturbances, and the availability of appropriate background locations for comparison.

Example 2 (Continued)

In summary, biological risks due to contamination in the West Harbor are evidenced by documented acute toxicity of sediments near the former shipyard and at some locations in the central channel, by predicted adverse effects of other sediments above AETs, and by the widespread presence of mercury and PAHs, which can accumulate in the tissues of food chain organisms.

7.3 Summary of Risk Assessment

Actual or potential releases of hazardous substances from the West Harbor OU, if not addressed by implementing the remedial action selected in this ROD, may present an imminent and substantial endangerment to public health or welfare, or the environment.

Based on the RI, the risk assessments, and available information, cleanup of the West Harbor OU is warranted. Consumption of shellfish from certain intertidal locations of the West Harbor pose a human health risk above the acceptable risk range. Sediment cleanup is expected to result in reductions of contaminant levels in fish and shellfish, and over the long term, sediment cleanup and natural recovery may eventually reduce risks to levels comparable to background. However, the correlation between fish or clam tissue contamination and sediment chemical concentrations is not sufficient to develop sediment cleanup levels corresponding to specific reductions in human health risks.

Adverse biological effects have been documented in portions of the West Harbor and are predicted by the contaminant concentrations present. Most of the biological effects observed are associated with areas of heavy sediment contamination. Potential redistribution of contaminants through sediment redistribution from heavily contaminated areas is also of concern, as is the potential for uptake by marine organisms. Where chemical information predicts significant adverse effects on benthic organisms but redistribution and biological uptake are not of concern, cleanup is warranted unless the absence of adverse biological effects at levels of concern is documented.

Example 3

VI.3 Environmental Risks

The principal risks posed by the runoff of metals-bearing AMD from -------- are the associated impacts on aquatic life in the Spring Creek drainage, Keswick Reservoir, and the Sacramento River downstream of Keswick Dam. Among these natural resources, the most important are the fishery resources in the Sacramento River downstream of Keswick Dam. Migratory populations of chinook salmon, steelhead trout, resident trout, and numerous other aquatic and terrestrial species can be or are affected by AMD from -------- (EPA, 1992b).

The salmon and steelhead trout populations have high commercial and/or recreational value to the region (USFWS and USBR, 1984; USFWS and CDFG, 1987). The susceptibility of these populations to contaminants originating from -------- has been documented (Wilson, 1982). One of the chinook salmon runs, the winter run, is a species listed by the Federal Government as threatened with extinction and listed by the State of California as a species endangered with extinction.

Pollution from -------- is considered to be a major factor causing the decline in Sacramento River fishery resources, and an impediment in achieving fishery resource restoration goals. Other major factors contributing to the decline include loss of spawning habitat, predation, habitat degradation, mortality at dams and diversions, overfishing, and natural disasters (such as drought) (Vogel, 1989). Fish migrating into the uppermost river reach of the Sacramento River risk being killed by AMD from --------; offspring of adult fish spawning in that reach have reduced chances of survival due to the -------- AMD (Finlayson and Wilson, 1979). There is an indication that AMD from -------- has reduced the suitability of available spawning grounds for salmon in the uppermost reaches of the Sacramento River and that fish population reductions have occurred following uncontrolled spillage of -------- AMD (Finlayson, 1979). The greatest decline in salmon-spawning populations has occurred within the uppermost river reach from Balls Ferry upstream to Redding, a distance of approximately 26 river miles (NOAA, 1989).

Since the late 1960s, when fish counts were initiated at Red Bluff Diversion Dam (RBDD), each of the anadromous salmonid runs has suffered major declines. A more extensive data base is available specifically for fall-run chinook. This data base demonstrates that recent levels of spawning escapement to the upper

Example 3 (Continued)

Sacramento River are only about 50 percent of levels observed during the late 1950s. The greatest decline among the salmon runs has occurred for the winter run, which has been reduced to less than 5 percent of run sizes during the late 1960s. This serious decline prompted the 1989 listing of this fish as a threatened species by the Federal Government (NMFS, 1989) and an endangered species by the State of California (CDFG, 1989).

The primary potential exposed fisheries populations are the salmonids and steelhead trout present in the Sacramento River; Boulder Creek and Spring Creek are devoid of fisheries and aquatic invertebrates below the mine drainage area. The upper Sacramento River chinook salmon runs, steelhead trout run, and resident populations of rainbow trout have life history characteristics that make them vulnerable to potential adverse effects from AMD originating from --------. The probability and magnitude of potential exposure depends on the releases of contaminated water from Spring Creek Debris Dam (SCDD), the releases of water from Shasta Dam, and the life stages present within the zone of impact.

For spring- and fall-run chinook salmon, in a worst-case scenario, approximately half of an entire year's fall spawning production could be at risk from contaminants released from --------. The impact of the release depends in large part on the pattern of releases from Shasta Dam relative to when releases occur from AMD. For example, if flood control releases from Shasta Dam could cause most of the year's production to migrate downstream of the affected water quality zone, thereby reducing the AMD's impact.

Winter-run chinook salmon could be at higher risk compared to other runs. They are most likely to seek cooler water areas closest to Keswick Dam due to potentially lethal water temperatures in lower reaches of the Sacramento River. Under drought-type conditions, these fish are the most important to future runs because eggs laid farther downstream are more likely to be adversely affected by lethal warm water temperatures. However, these same drought conditions are more likely to create conditions (uncontrolled AMD release and low dilution in the Sacramento River) where AMD from -------- could pose a high risk to juvenile rearing in the uppermost reach of the river.

Example 3 (Continued)

The steelhead trout and resident rainbow trout populations that are potentially at risk are not well defined or understood. However, both the adult and yearling life phases are potentially at risk because both are present in the river when fish kills have historically occurred.

At present, a memorandum of understanding commits the U.S. Bureau of Reclamation (USBR) to operate SCDD in a manner that (when considering releases of dilution water from Shasta Dam) will protect aquatic life in the Sacramento River downstream of Keswick Dam. The USBR must also operate Shasta Dam to provide electric power, irrigation water, and flood control. The USBR estimated that during an average year it may lose between $16 million and $168 million, depending on the level of protection required in the Sacramento River, by supplying water to dilute Spring Creek flows. There is the potential that USBR's ability to supply adequate dilution water will be further reduced due to conflicting priorities for water use, thereby increasing the potential risk to the aquatic community.

It is extremely difficult to quantify fish mortality in the Sacramento River as a result of contamination from --------. This is due to a variety of factors, including the general size of the Sacramento River downstream of Keswick Reservoir and difficulty of visually observing dying or dead fish during periods when the water is turbid. However, there have been 39 documented fish kills near Redding since 1940, and there have been observations of adult steelhead mortalities near Redding attributable to metal contamination from -------- since installation of the SCDD.

Boulder and Spring Creeks, downstream from -------- discharges, do not support aquatic populations, and the creeks may remain sterile following remediation at --------. Aquatic populations, water column and benthic, in Keswick Reservoir downstream of Spring Creek are at risk because of sediment contamination, as well as water column contamination. Below Keswick Dam, contaminant concentrations occasionally exceed toxic concentrations for sensitive life stages and frequently exceed both EPA and State of California criteria to protect aquatic life, indicating that these populations are also at risk.

Any terrestrial wildlife onsite has the potential for direct exposure to AMD, such as deer drinking from contaminated creeks or licking metals-laden salts along the flume system, or consuming contaminated plants, fish or other organisms. More than 300 species of amphibians, reptiles, birds, and mammals can be expected to occur in the Boulder Creek basin and downstream areas that may be directly exposed to AMD.

ECO-RISK ASSESSMENT

Example 4

6.5 Soil Cleanup Goals for Groundwater Protection

U.S. EPA's Center for Environmental Assessment Modeling (CEAM) provided their Exposure Assessment Multimedia Model (MultiMed) for application at the --------. The model was used in conjunction with traditional contaminant mass partitioning formulae to determine the soil cleanup goals necessary for protection of Memphis Sands aquifer quality. Based on Site-specific soil and hydrogeologic conditions, a soil cleanup goal of 533 ug/kg TCE was determined to be protective of the Memphis Sand aquifer. The goal is applicable to the contaminant source areas ("hot spots") previously discussed. Remedial efforts need only focus on a limited portion of the Site as soil contaminants are restricted to approximately 20% of the total Site area.

All discussions regarding MultiMed input variable selection, model outputs and soil cleanup goal calculations are provided in Appendix R of the RI.

6.6 Ecological Considerations

No U.S. Dept. of Interior or State of TDEC lands or federally listed endangered species of wildlife were identified at the Site. The nature of the Site is such that avian or terrestrial wildlife would not be drawn to the Site. A surface water quality assessment and a biological impact assessment were conducted. The assessments included a quantitative study of benthic species diversity in Nonconnah Creek, and a qualitative review of sensitive and endangered species typical of southeastern Shelby County. Data to date indicate no significant adverse ecological impacts from the present soil or groundwater contamination. This preliminary survey does not rule out ecological impacts to aquatic and terrestrial species through contaminated food chain mechanisms. However, TCE is not biocumulative and as a result, it is not expected to cause deleterious food chain effects based on currently available data.

SECTION IV

ARARs IN DESCRIPTION OF ALTERNATIVES

Improved ARAR documentation is needed in the Description of Alternatives section of ROD.

ARARs IN DESCRIPTION OF ALTERNATIVES

Example 1

C. Summary

Multi-layer capping is a reliable technology for isolating wastes from the above-ground environment and significantly mitigates the effects of contaminants on human health and the environment. Soil and synthetic materials for capping are readily available and equipment used for implementation is primarily standard road construction equipment. Although capping significantly reduces contaminant mobility, it does not reduce the toxicity or volume of the waste and requires long-term maintenance and monitoring for continued effectiveness.

D. ARARs and TBCs

Major ARARs under this alternative include:

1. Chemical-Specific ARARs

(a) 25 PA Code Chapter 261 and 40 C.F.R. § 261.24 for identification of characteristic hazardous wastes;
(b) the National Ambient Air Quality Standards (NAAQS) set forth at 40 C.F.R. Part 50;
(c) the Pennsylvania Air Pollution Control Act, 25 PA Code Chapters 123 and 127;

2. Action-Specific ARARs

(d) 25 PA Code Chapter 102, which pertains to erosion control requirements related to excavation activities;
(e) 25 PA Code § 264.310 relating to closure and post-closure care;
(f) OSHA standards for worker's protection, 29 C.F.R Parts 1904, 1910, and 1926;

3. Location-Specific ARARs

(g) The Clean Water Act, 33 U.S.C. §§ 1251 et seq.; 40 C.F.R. Part 403 relating to the discharge of wastewaters to a publicly owned treatment works;

Example 1 (Continued)

4. To Be Considered

(h) Executive Order 11988, 40 C.F.R. §6, Appendix A, concerning federal wetlands policies;

(i) PA Proposed Residual Waste Regulations to be codified at 25 PA Code Parts 287-299 (requirements will be considered during remedial design);

(j) Draft Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER Directive No. 9355.4-02 (June 13, 1989)).

D. Summary

Incineration would eliminate the toxicity and mobility of organic contaminants and reduce the total volume of contaminated media. Stabilization of the incinerator residuals, if necessary, would reduce the toxicity and mobility of inorganic contaminants by chemically and/or physically binding them in the stabilized matrix. Volume would increase somewhat after stabilization. Disposal of the residuals offsite would prevent human and environmental contact. The fluff feed rate into the incinerator would be very low in order to achieve optimal performance of the pollution control equipment in capturing lead and other inorganic contaminants. Therefore, incineration of the fluff would take from nine to eight-seven years.

E. ARARs and TBCs

Major ARARs under this alternative include:

1. Chemical-Specific ARARs

(a) 25 PA Code Chapter 261 and 40 C.F.R. § 261.24 for identification of characteristic hazardous wastes;
(b) the National Ambient Air Quality Standards (NAAQS) set forth at 40 C.F.R. Part 50;
(c) the Pennsylvania Air Pollution Control Act, 25 PA Code Chapters 123 and 127;

Example 1 (Continued)

2. Action-Specific ARARs

(d) 25 PA Code Chapter 102, which pertains to erosion control requirements related to excavation activities;
(e) 25 PA Code Chapter 264, subchapter 0 - Pennsylvania regulations for hazardous waste incineration;
(f) the EPA TSCA regulations for incineration of PCB materials, 40 C.F.R. § 761.70;
(g) RCRA incineration standards set forth at 40 C.F.R. Part 264, subpart 0;
(h) 25 PA Code Chapter 264 and 40 C.F.R. Part 268 regarding storage, disposal, and treatment of hazardous wastes;
(i) RCRA and Department of Transportation regulations governing the transportation of hazardous wastes, 25 PA Code Chapters 262 and 263 and 49 C.F.F. Parts 107 and 171-179, respectively;
(j) OSHA standards for worker's protection, 29 C.F.R. Parts 1904, 1910, and 1926;

3. Location-Specific ARARs

(k) The Clean Water Act, 33 U.S.C. §§ 1251 et seq.; 40 C.F.R. Part 403 relating to the discharge of wastewaters to a publicly owned treatment works;

4. To Be Considered

(l) the EPA Guidance on Metals and Hydrogen Chloride Controls for Hazardous Waste Incinerators (EPA Office of Solid Waste, August 1989);
(m) Executive Order 11988, 40 C.F.R. § 6, Appendix A, concerning federal wetlands policies;
(n) PA Proposed Residual Waste Regulations to be codified at 25 PA Code Parts 287-299 (requirements will be considered during remedial design);
(o) Draft Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER Directive No. 9355.4-02 (June 13, 1989)).

Example 2

....higher cost). This alternative entails total removal of grease skimmings (though not any contaminated soil) which would then be disposed of offsite at a permitted hazardous waste landfill. As this is an offsite activity, such disposal must comply with all applicable hazardous and solid waste disposal requirements. These include RCRA and the state Dangerous Waste and solid waste regulations.

d) Excavation and Onsite Treatment. Treatment onsite is either through land treatment or incineration. Land treatment is described as biological treatment of the waste done onsite but not in-situ. This meets EPA's preference for onsite treatment.

The chief advantages of this alternative are its permanent elimination of one potential contaminant source. Its elimination of the health hazard for this area of the site, and the fact that it restores the area for possible future use. No administrative restrictions would be necessary after excavation and treatment were completed.

Disadvantages of this alternative include health and safety impacts associated with excavation, environmental concerns (e.g., worker exposure to contaminants during excavations and treatment), demonstrated effectiveness, and costs.

ARARs

Several action-specific ARARs are identified for excavation and treatment alternatives evaluated for the Skimmings Unit area within the landfill.

The skimmings originated soils not excavated can be treated as a non-disturbed solid waste unit (not hazardous) and capped according to applicable regulations.

Excavation of the skimmings could also be expected to result in the release of some quantity of volatile organics. There are currently no standards for PERC emission, so any requirements would be determined by risk assessments which are not ARARs, but are "to be considered" in design of the remedial action.

Example 2 (Continued)

Excavation and onsite treatment of the skimmings includes two treatment options. Both options include the excavation of the grease skimmings followed by treatment and placement back onsite. Land treatment of the skimmings has no applicable regulations. However, the disposal of any hazardous wastes generated as a result of the treatment process would be required to meet the RCRA disposal requirements, which would be applicable to this new waste's disposal.

The incineration of the skimmings has relevant and appropriate RCRA requirements for the operation and disposal of the waste streams. Although the incoming waste is not RCRA regulated. The RCRA ash and air emissions requirements for incineration would be relevant and appropriate because of the PERC concentrations in the waste.

There were no chemical-specific or location-specific ARARs identified for the excavation alternatives.

For the excavation with offsite disposal alternative, the RCRA hazardous waste regulations are not applicable because the skimmings are not a RCRA waste. However, offsite activities, such as disposal, will be regulated by applicable laws and regulations, and are not subject to ARAR analysis. For example, the transportation and packaging of the skimmings as hazardous solid waste because of the PERC content is regulated by the U.S. Department of Transportation.

d) Administrative Restrictions This would involve restricting land use with respect to future onsite excavation and construction.

The chief advantages of this alternative are its low cost and ease of implementation. Public health would be protected by reducing exposure to the contaminants at the site.

The primary disadvantage is that administrative restrictions would not be effective in eliminating or reducing health concerns offsite. Infiltration would not be reduced nor surface water or groundwater flow controlled; thus the leachate would continue to be produced. The MFS, which is an ARAR and requires landfill capping, would not be met.

Example 2 (Continued)

e) No Action. The landfill would be left in its current condition without any remedial action being taken. There would be no cost, but public health would not be protected. ARARs would not be met. The extracted contaminated groundwater would then be treated or discharged into the city's wastewater treatment plant for treatment and then discharged into the Spokane River. Three levels of treatment have been identified in the FS, which are no treatment, treatment to drinking water levels and Ambient Water Quality Criteria (AWQC) levels, or treatment to background levels.

All of the pump and treat alternatives would also require groundwater monitoring, administrative restrictions, and an alternative drinking water supply. There would be minimal environmental impact during well construction and few anticipated health or safety concerns for the surrounding community.

ARARs

The ARARs are essentially the same for the two extraction alternatives. The major regulations that contribute to the list of potential chemical-specific ARARs are the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), and the Water Quality Standards for the State of Washington (WAC-173-201) (90.48 RCW). The acts are under the jurisdiction of and are enforced by the Washington State Department of Health Services, the Washington State Department of Ecology (Ecology), and EPA.

The SDWA Maximum Contaminant Level (MCL) standards are enforceable standards that are applicable to surface water or groundwater that can be classified as a source or potential source of drinking water. The MCLs are applicable to any action that affects the concentration of contaminants in groundwater which is a source of drinking water, such as the SVRPA.

The discharge of extracted water to the Spokane River is considered to be offsite and is therefore not subject to ARARs analysis. Compliance with the applicable laws regulation and permit requirements is necessary. Some discussion of the discharge requirements is included since treatment may be done onsite.

Example 2 (Continued)

The CWA Ambient Water Quality Criteria (AWQC) are designed to protect aquatic life and human health. The state of Washington adopts the AWQC by reference into their water quality standards, so the AWQC are requirements for surface water discharges. Table 5 presents chemical-specific potential ARARs for water. The table is arranged by chemical compound.

SECTION V

ARARs IN STATUTORY DETERMINATIONS

Improved ARAR documentation is needed in the Statutory Determinations section of ROD.

ARARs IN STATUTORY DETERMINATIONS

Example 1

1. Chemical Specific

The bedrock aquifer at and beyond the compliance boundary of the Landfill is a possible drinking water source. Maximum Contaminant Levels (MCLs) promulgated under the Safe Drinking Water Act which regulate public drinking water supplies, are applicable to drinking water at the tap and are not applicable to ground water. However, because the ground water may be used a potential drinking water source, MCLs are relevant and appropriate.

The Vermont Groundwater Protection Act establishes primary ground water quality standards and contains enforcement standards. Under the Act, two enforcement standards have been established which are more stringent than MCLs. The standards are for tetrachloroethene and xylenes. EPA has incorporated the enforcement standard for xylenes as the cleanup level for this contaminant of concern. Pursuant to CERCLA section 121(d)(4)(C) and section 300.430(f)(1)(ii)(C)(3) of the NCP, EPA is invoking a waiver of the enforcement standard for tetrachloroethene.

2. Action Specific

RCRA hazardous waste closure requirements, 40 CFR Part 264, Subpart G, and hazardous waste landfill closure requirements, 40 CFR 264.310, Subpart N, are ARARs for a substantial part of the remedial action. Under Part 264, Subpart G, closure of a hazardous waste disposal facility must be done so as to control, minimize, or eliminate "post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere." Section 264.111(b). Section 264.310, Subpart N, provides specific closure requirements for a hazardous waste landfill.

Example 2

....to reduce this risk to 1.4E-4 and is expected to lower the noncarcinogenic risks to acceptable levels. Institutional controls to restrict the use of ground water until cleanup levels are attained will eliminate the short-term potential risk from this route of exposure. The remedy also provides protection from direct contact with contaminated soils by the installation of security fencing.

The potential for continuing contamination of the ground water will be significantly reduced by in-situ vapor stripping of the landfill materials and surrounding soils in conjunction with the existing landfill cap and ground water cut-off wall. By reducing the contamination in the surrounding soils in-situ vapor stripping will also greatly reduce the risk of direct contact.

There are no short-term risks associated with the Selected Remedy that cannot be readily controlled. In addition, no adverse cross media impacts are expected to result from implementation of the Selected Remedy.

Compliance with Applicable or Relevant and Appropriate Requirements

The Selected Remedy of ground water extraction and treatment and in-situ vacuum extraction will comply with all applicable or relevant and appropriate chemical-, location-, and action-specific ARARs. Those ARARs are as follows:

1. Chemical-Specific ARARs

a. Relevant and appropriate Maximum Contaminant Levels (MCLs) promulgated Under the Safe Drinking Water Act, 43 U.S.C. §300f to 300j-26 and set forth at 40 C.F.R. §§141.11(b) and 141.61(a) and proposed MCLs set for in 54 Fed. Reg. 22062 (May 22, 1989) are:

Substance	MCL [Proposed MCL]
Benzene	5 ppb
Chlorobenzene	[100 ppb]
Tetrachloroethene	[5 ppb]

Example 2 (Continued)

Toluene	**[2000 ppb]**
Trans-1,2 dichloroethylene	**[100 ppb]**
Trichloroethene	**5 ppb**
Vinyl Chloride	**2 ppb**
Arsenic	**50 ppb**
Barium	**1000 ppb**
Cadmium	**10 ppb**
Chromium	**50 ppb**
Lead	**50 ppb**

SECTION VI

ENFORCEMENT HISTORY

A ROD should provide thorough documentation of the history of enforcement activities at a site, including:

- Notice letters for RI/FS
- Negotiation period for RI/FS
  - Administrative Order on Consent (AOC) date; or
  - Consent Decree (CD) date; or
  - Unilateral Administrative Order (UAO) date of issuance and the date of the compliance letter
- Compliance History under AOC, CD, or UAO.

ENFORCEMENT HISTORY

Example 1

....the lagoon, backfill and grading of the lagoon and illegal diversion ditch, and repair of the Site's perimeter fence. A mobile onsite treatment system was installed to provide treatment and filtration of heavy metal-contaminated surface water that continues to flow across the Site after rain events. In addition, Site security was provided through contracting with a local guard service.

C. Inclusion on the National Priorities List

The -------- was scored using the Hazard Ranking System (HRS) in 1987 by EPA. The Site was given an HRS score of 46.58, based on pathway scores for groundwater, surface water, and air. The Site was proposed for inclusion on the National Priorities List (NPL) in June of 1988, and was promulgated on the NPL on October 4, 1989.

D. History of CERCLA Enforcement Activities

Between 1987 and 1988, EPA identified and notified several hundred potentially responsible parties ("PRPs") for the Site conditions. Based upon review of -------- documentation of the pounds of scrap batteries generated and transported to the Site for processing and/or disposal, and responses to requests for information from several companies who sent scrap batteries to the Site, EPA developed a list of 391 PRPs. Following the proposal of the Site on the NPL, EPA issued General Notice letters to the PRPs in August 1988, requesting them to conduct or fund a Removal Action and/or Remedial activities. On September 19, 1989, 46 PRPs entered into an Administrative Consent Order with EPA for the conduct of a Remedial Investigation and Feasibility Study ("RI/FS").

On December 17, 1991, EPA issued a Unilateral Administrative Order for Removal Action pursuant to Section 106(a) of CERCLA, 42 U.S.C. Section 9606(a), to the 46 PRPs who performed the RI/FS for the Site. This Order required the PRPs to operate and maintain an automated onsite water treatment plant to address the contaminated surface water that continues to flow across the Site during precipitation events.

EPA continued to develop information on the PRPs associated with the Site, and the documents collected from -------- offices during the

Example 1 (Continued)

course of the RI/FS. Upon identifying additional parties who generated, transported and/or arranged for the treatment or disposal of scrap batteries, EPA continued to issue General Notice letters and encourage PRP participation in the response actions. As a result of this work, a total of 528 PRPs were identified for the --------.

Using the documents collected from the -------- offices, EPA developed a Waste-In List or Volumetric Ranking Summary which specified the volume of waste contributed to the -------- by individual PRPs. EPA developed this list as a settlement tool to identify those PRPs who would qualify as de minimis parties under CERCLA Section 22(g). Between January and August of 1992, EPA completed activities associated with an early de minimis waste contributor settlement, as authorized under Section 122(g) of CERCLA. In July 1992, a de minimis settlement was reached between EPA Region III and 170 -------- PRPs. This settlement is embodied in an Administrative Consent Order, pursuant to which the settling PRPs agreed to pay approximately $3,491,233 toward EPA's past response costs incurred at the Site, and the future costs associated with the required remedial action.

E. Highlights of Community Participation

The public participation requirements of Sections 113(k)(2)(B) (i-v) and 117 of CERCLA have been met in this remedy selection process. A newspaper advertisement was published in the Times News, Lehighton, Pennsylvania, on Saturday, July 18, 1992. It specified the availability of the Proposed Remedial Action Plan (PRAP), the duration of the public comment period, and the location of the Administrative Record file.

The public comment period began on July 18, 1992, and was scheduled to end on August 18, 1992. EPA received a timely request for an extension of the comment period, and thus granted the minimum 30-day extension, in accordance with the provisions of the NCP. A newspaper advertisement was published in the Times News, Lehighton, Pennsylvania, on August 17, 1992, notifying the public of the extension of the comment period to September 18, 1992.

ENFORCEMENT HISTORY

Example 2

....bedrock formations of shale, limestone, and coal are mined locally as economic resources. Within a two mile radius of the Site, there are several sand and gravel pits in the valley, with clay and coal strip mines in the valley sides.

The unconsolidated alluvial valley deposits form extensive aquifers which are the principal water supplies for municipalities in the valley. Ground water flow in the valley is generally southwestward. The Gnadenhutten municipal well field is located approximately 4,000 feet northeast (upgradient) of the --------. Several wells, including municipal, residential, and plant wells are located within a 1.5 mile radius of the Site (see Figure 3).

Contamination at the Site was found in the form of sludge in the source areas, in the soils beneath the sludges, in ground water, and in sediments. The soil and sludges are being addressed under the first operable unit. The contaminants found in the ground water include antimony, beryllium, total chromium, cyanide, fluoride, lead, and bis (2-ethylhexyl) phthalate at levels above the maximum contaminant levels (MCLs) established under the Safe Drinking Water Act (SDWA). However, no one is currently drinking this water. The sediments of the Tuscarawas River in the vicinity of the Site contain elevated levels of chromium. Polychlorinated biphenyls (PCBs) were found in 2 of 41 sediment samples.

II. <u>Site History and Enforcement Activity</u>

The -------- plant was established by Harry (Red) Sugar in 1940. The facility has manufactured aluminum products since 1945 when it was incorporated as -------- In 1969 -------- merged with --------. The plant was then acquired by the -------- in August 1971. The -------- was acquired by the -------- --------, a division of the --------, in January 1977. In December of 1986, -------- sold the plant to --------; however, -------- retained ownership of a 4.8 acre portion of the property, most of used for sludge disposal. This 4.8-acre area constitutes the -------- NPL Site.

Prior to 1965, neutralized process wastewater was discharged directly to the Tuscarawas River. A settling basin was completed in 1965 at the request of the State of Ohio Department of Health.

Example 2 (Continued)

During the period from 1965 to 1978, the unlined settling basin and sludge pit were used for disposal of wastewater and wastewater treatment sludge. This sludge is a process waste which is included in the Resource Conservation and Recovery Act (RCRA) list of hazardous wastes. The sludge is listed under the waste code "F019" because wastewater treatment sludges from the chemical conversion coating of aluminum contain chromium and cyanide. As a result of effluent overflow from the settling basin and plant wastewater discharge, sludge is also located in the wooded area (formerly known as the "swamp" area) adjacent to the settling basin. The total volume of sludge and soil at the Site was originally estimated in the 1989 Record of Decision (ROD) for the source material operable unit (SMOU) to be approximately 8,850 tons. The current estimate is that 33,000 tons of material, including debris, will require removal. Since 1978, no solid wastes have been placed in the settlement basin or sludge pit; wastewater treatment sludges have been mechanically dewatered at the plant and shipped to an off-site facility for disposal. However, the treated wastewater discharge route included the impoundments until October 1980, when the effluent discharge was rerouted around the impoundments to the wooded area, which drained to the river. In October 1986, the outflow from the wastewater treatment plant was rerouted away from the wooded area directly to a permitted outfall at the river. No standing water was present in the wooded area within one month of the diversion of the outfall. The treated process wastewater has been discharged to the Tuscarawas River through a National Pollutant Discharge Elimination System (NPDES) permitted outfall since 1976.

Based on reports filed by --------, the United States Environmental Protection Agency (U.S. EPA) conducted a preliminary assessment of the Site in 1983. Because of a concern that water resources might become contaminated from sludge leachate, the Site was proposed for inclusion on the NPL in October 1984. The Site was formally placed on the NPL in June 1986.

In November of 1984, -------- retained International Technologies Corporation (IT) to perform a Remedial Investigation/ Feasibility Study (RI/FS). In March 1985, RI activities began at the Site. An Administrative Order by Consent was issued in January 1987 among

Example 2 (Continued)

U.S. EPA, the Ohio Environmental Protection Agency (OEPA), and -------- for conducting the RI/FS.

The RI was conducted at the Site from March 1985 through January 1989. During the study, samples of sludge, underlying soil, ground water, and Tuscarawas River sediments were collected at and near the Site. An investigation was also conducted to determine if drums containing waste were buried at the Site. Sections of the draft RI pertaining to ground water and sediments were not approved by U.S. EPA and OEPA. Consequently, U.S. EPA split the Site into the SMOU and the ground water operable unit (GWOU), and requested that a separate focused FS be completed for the SMOU, as enough information was available to study cleanup alternatives for the contaminated sludge and soil at the Site. A Focused FS (FFS) developed for the SMOU, presenting an array of alternatives to address the contaminated sludge and soil, was completed in June 1989. The ROD for the SMOU was signed on September 9, 1989.

In a letter dated June 14, 1989, U.S. EPA requested that -------- submit a supplemental RI work plan for the additional investigations to complete the RI/FS for the GWOU. The primary goals of the supplemental RI were to evaluate the nature and extent of affected ground water, to prepare a Baseline Risk Assessment for the GWOU, and to evaluate potential remedial alternatives. The work plan and related planning documents were finalized on January 31, 1991. The supplemental RI was conducted by -------- consultant, ERM-Southwest, between April and July of 1991. The supplemental RI report was completed in January 1992. The Baseline Risk Assessment was approved in June 1992. The FFS and the Proposed Plan for the GWOU were completed and made available to the public on August 19, 1992. The supplemental RI work was performed by -------- under the existing Administrative Order on Consent.

Pursuant to its authority under Section 122(e) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), U.S. EPA sent a special notice letter to -------- on June 26, 1989, notifying the company of its potential liability for CERCLA response costs and responsibility for conducting the design and implementation of

Example 2 (Continued)

the U.S. EPA's preferred alternative for the --------. As a result of this notice letter, -------- informed U.S. EPA that -------- Industries might also be a potentially responsible party (PRP) as a former owner and operator. Pursuant to its authority under Section 122(e)(2)(C) of CERCLA, U.S. EPA notified -------- Industries of its potential liability as an additional PRP and invited -------- to enter into negotiations with U.S. EPA and --------.

Negotiations with both companies were unsuccessful, and on December 28, 1989, U.S. EPA issued Unilateral Administrative Orders to both -------- and -------- Industries for the design and implementation of the remedy for the SMOU. -------- has written the required Site documents, and is conducting the remedial action. -------- has filed a complaint against -------- to compel binding arbitration to determine allocation of financial responsibility. -------- has not conducted any Site remedial work to date. On April 11, 1991, a petition for involuntary bankruptcy reorganization of -------- under Chapter 11 was filed in U.S. Bankruptcy Court. On May 2, 1991, -------- filed a petition for voluntary reorganization.

The U.S. EPA is the lead agency responsible for managing the investigation of the -------- being conducted by --------. OEPA is the support agency for the Site cleanup.

* U.S. G.P.O.:1993-341-835:81059