FINAL VERSION

CHEMICALS OF POTENTIAL CONCERN AND CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN MEMORANDUM

MISSISSIPPI RIVER POOL 15

Prepared for
Aluminum Company of America
Davenport Facility
Riverdale, Iowa

Woodward-Clyde

263 Seaboard Lane
Franklin, TN 37067

June 1998

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ALCOA

James Colbert
EPA Region VII
Iowa-Nebraska Remedial Branch
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June 8, 1998

RE: ***Chemicals of Potential Concern and Chemicals of Potential Ecological Concern Memorandum***

Dear Jim:

Attached are Alcoa's responses to the U.S. Environmental Protection Agency's (EPA) comments on the January 1998 *Chemicals of Potential Concerns and Chemicals of Potential Ecological Concern Memorandum* (COPC/COPEC Memorandum). Alcoa generally agrees with EPA's comments. Our responses reflect discussions between Alcoa and EPA in our conference call of June 1.

To facilitate revision and EPA approval of the COPC/COPEC Memorandum, we have enclosed specific replacement pages to be inserted into the January 1998 document. After you have reviewed, and if you agree with the modifications, please replace the following portions of the document:

- Pages 3-1, 3-6, 3-8, 3-16 to 3-19, 4-1 to 4-3, D-2
- Tables 3-5 to 3-8, D-2, D-4, D-5

We have also included a new cover and spine dated June 1998 for the report to avoid future confusion in the event that unrevised copies of the January 1998 document are still circulating. If you have any questions or comments, please contact me at 319/344-1628. We look forward to receiving EPA's formal approval of the COPC/COPEC document.

Yours truly,

Anthony R. Sturtzer

Bud Sturtzer
Davenport Remediation

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1.0
INTRODUCTION

In July 1990, Alcoa entered into an Administrative Order of Consent (AOC) with the United States Environmental Protection Agency (USEPA), Region VII, under Section 106(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The Consent Order stipulates that a risk assessment of Mississippi River Pool 15 (MRP15) be conducted following completion of sediment investigations in on-site outfalls and wetlands and in MRP15.

1.1 BACKGROUND

A phased approach was taken to complete data collection within the on-site outfalls and wetlands and in MRP15 as stipulated in the 1990 AOC. A *Sediment/Soil Investigation Studies Work Plan* (YMA 1991) addressed the nature and scope of the overall investigation and was approved by EPA in July 1991. The following work phases were defined in the Work Plan to comply with the requirements of the Consent Order:

1) Phase I: Definition of potential sources of contamination from the facility to MRP15

2) Phase II: Hydraulic and sediment modeling to define the critical study area(s) within MRP15

3) Phase III: Quantification of vertical and horizontal extent of contamination within the critical study area(s)

4) Phase IV: Feasibility Study, if warranted by the Sediment/Soil Investigation Studies

Collectively, this phased approach represents the Sediment/Soil Investigation Studies as stipulated by the 1990 AOC between Alcoa and USEPA. Phases I, II and III have been completed. In accordance with the 1990 AOC, studies were conducted by Alcoa to assess on-site outfalls and wetlands (Phase I investigation) and to delineate Critical Study Areas (CSAs) in MRP15 (Phase II investigation). Phase IA of the sediment/soil investigation studies was approved by USEPA on April 20, 1994. The Phase II Field Sampling Plan (FSP) was also approved April 20, 1994. The final report *Sediment/Soil Investigations Studies: Phase II Delineation of the Critical Study Area* (WCC 1994) was submitted to USEPA on September 2, 1994. The purpose of the Phase III investigation[1] was to quantify the vertical and horizontal extent of contamination in the CSAs of MRP15. A Phase III Field Sampling Plan (Phase III FSP) was approved by EPA on September 1, 1995. Phase III field studies were conducted in September and October, 1995. The final Phase III report *Sediment and Water Sampling Results Phase III Mississippi River Pool 15 Alcoa-Davenport Facility* (WCC 1996a) was approved by USEPA on August 13, 1996.

Additional sediment data to support risk assessment activities were collected from MRP15 and the onsite wetlands in 1996 concurrent with the 1996 biennial fish investigation. This supplemental sediment sampling (hereinafter referred to as the "supplemental investigation") was conducted to: (1) collect information where data gaps had been identified from the Phase I and III investigation datasets; and (2) collect additional data that can be used to reduce the uncertainty in characterizing risk based on what is known of the contaminants and potential receptors in MRP15 (WCC 1996b; WCIA 1997). A field sampling plan was prepared and submitted to USEPA in May 1996 (WCC 1996b). A final report of results was submitted to USEPA in May 1997 (WCIA 1997).

[1] In this document, "Phase III investigation" refers to all activities associated with quantification of the vertical and horizontal extent of contamination within critical study area(s) in MRP15 inclusive of the field sampling plan, field activities, reporting and activities necessary to meet the requirements for Phase III as identified in the *Sediment/Soil Investigation Studies Work Plan* (YMA 1991).

1.2 RISK ASSESSMENT OF MRP15

Based on discussion with EPA, a series of deliverables will be prepared that will constitute the human health and ecological risk assessment of MRP15. Each of these is discussed below.

Chemicals of Potential Concern and Chemicals of Potential Ecological Concern Memorandum. This memorandum will identify: (1) the substances potentially-hazardous to human health, i.e., chemicals of potential concern (COPCs) and (2) the chemicals of potential ecological concern (COPECs) present within contaminated areas of MRP15 and on-site wetlands. The memorandum will also include the methodology/rationale used for the elimination of chemicals as COPCs and COPECs .

Exposure Assessment Memorandum. A human health Exposure Assessment Memorandum will be submitted to EPA that includes a Conceptual Site Model (CSM) and identifies the exposure scenarios, assumptions, fate and transport models and data. The memorandum will identify the toxicological and epidemiological source studies that will be referenced in assessing the toxicity of COPCs lacking an EPA toxicity value.

Human Health Risk Assessment Report. A Human Health Risk Assessment Report will be submitted to EPA.

Ecological Problem Formulation Memorandum. An Ecological Problem Formulation Memorandum will be submitted to EPA. This memorandum will provide an overview of the expected sources and migration pathways to MRP15 and/or the on-site wetlands and aquatic and terrestrial exposure scenarios to be evaluated and selection of assessment endpoints. The assessment endpoints will include organisms selected to represent sensitive aquatic and terrestrial species. The Problem Formulation will also provide the rationale and references used in

the selection of aquatic and terrestrial measurement endpoints for the quantification of exposure.

Ecological Risk Analysis Memorandum. An Ecological Analysis Memorandum will be developed which describes the specific exposure parameters, fate and transport models, data and specific approaches that will be used to characterize risk in the Ecological Risk Assessment Report.

Ecological Risk Assessment Report. The Ecological Risk Assessment Report will include a summary of the information provided in the previous submittals associated with ecological risk, as well as a toxicity assessment and risk characterization concerning contamination within critical study areas of MRP15 and on-site wetlands.

This report represents the first of these submissions, the **Chemicals of Potential Concern and Chemicals of Potential Ecological Concern Memorandum**. In this memorandum, conservative assumptions are used to screen chemicals of interest (COI)s, thereby focusing on constituents that have the potential to pose risk, i.e., COPECs. The resultant COPECs identified will then be carried forward for further evaluation to subsequent steps in the risk assessment process. The next activity associated with assessing ecological risk is the Ecological Risk Problem Formulation. In the Ecological Risk Problem Formulation Memorandum, evaluation of COPECs will be further focused through endpoint selection, detailed exposure scenarios and postulated risk hypotheses.

2.0
DATA SUMMARY

2.1 MISSISSIPPI RIVER POOL 15

Sediment and water analytical data for MRP15 from samples collected during the Phase III investigation were presented in *Sediment and Water Sampling Results Phase III Alcoa-Davenport Facility* (WCC 1996a). Analytes during the Phase III field studies[2] consisted of 46 constituents which were based on a preliminary list developed by Jacobs Engineering for EPA (JEG 1994, Appendix A). These constituents are presented in Table 2-1. The list of analytes was refined to define specific sampling locations and numbers of samples using the Data Quality Objectives Process as presented in the Phase III FSP (WCC 1995). Using this process, the selection of analytes included comparison of source area constituent concentrations to ecotoxicological screening benchmarks, consideration of exposure pathways and fate and transport properties of individual analytes, and detection limit considerations for selection of specific analytical methodologies that provided sufficient resolution, to the extent possible, for characterizing risk from the target analytes. Though the list was based on comparison to ecological criteria, the ecological screening values for surface water and sediment are typically more stringent than human health-based protection values because aquatic life are exposed to these media to a much greater degree. Therefore, screening of the Phase I data against ecological criteria and guidelines is sufficiently protective from a human health-based perspective.

Samples were collected from five discontinuous areas within MRP15 during the Phase III investigation as described in Table 2-2 and depicted in Figure 2-1. These areas were selected[3] based on an examination of historical data and river morphological characteristics, an understanding of the fate and transport characteristics of the constituents and specific additional requests from EPA. Preliminary conceptual models were developed for semi-

[2] "Phase III field studies" is used to refer to the field studies implemented in accordance with the Phase III FSP.
[3] The study area identification process was presented in *Sediment/Soil Investigation Studies: Phase II Delineation of the Critical Study Area* (WCC 1994).

volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs) and inorganics in the Phase III FSP. PCBs and SVOCs both have low solubility in water and high affinity for adsorption to particles (USEPA 1979). Because of the similarities in environmental fate, PCBs and most of the SVOCs in Table 2-1 (specifically the polynuclear aromatic hydrocarbons [PAHs]) were analyzed in all study areas.

For VOCs the predominant transport pathways are volatilization and, to a lesser extent, transport in the water column. Because of the low adsorptive nature of VOCs, volatilization during transport from potential source areas, and attenuation through dispersion as VOCs move away from a source, it is unlikely that VOCs will be a concern in MRP15. VOCs would not be expected to have a high affinity for partitioning to sediments, as would be expected of PCBs and most semivolatile organics. Because sediment transport is not expected to be a significant transport mechanism for VOCs, VOC analyses were only conducted on sediment samples located immediately downstream from Outfall 006, adjacent to the waste oil lagoon and adjacent to Wetland 1. In addition, a water sample was collected downstream from each of the outfalls where flow[4] was observed during the Phase III field studies to assess whether VOCs were present. VOCs were also collected in water samples from the reference area.

Inorganics may be found in both sediment and water based on potential fate and transport processes. Site-specific information on background concentrations for metals in sediments was unavailable during preparation of the Phase III FSP. Therefore, a key objective of sampling was to collect reference information for inorganics. Metals[5] analyses were also conducted on samples collected downstream from each of the outfalls. Mercury and cyanide were collected in samples throughout the study area adjacent to the Alcoa facility, as well as in some downstream locations. Analyses were conducted for both total and amenable cyanide. Total cyanide represents both complexed and free cyanide. Amenable cyanide represents a conservative measure of free cyanide and readily-dissociated cyanide forms that are potentially biologically available, and therefore important in assessing

[4] Flows were only observed from Outfalls 004 and 006 during Phase III.
[5] Not including mercury.

potential risk. Total and amenable cyanide were also analyzed in reference area water and sediment samples during the Phase III investigation.

In water, concentrations of aluminum, copper, chromium and iron exceeded Iowa and/or EPA ambient water quality criteria at some locations in the outfalls during Phase I. Therefore, metals were analyzed in water samples collected from Area 1 (adjacent to the facility) and the reference area during the Phase III investigation. It is the policy of EPA's Office of Water that "the use of dissolved metal to set and measure compliance with water quality standards is the recommended approach, because dissolved metal more closely approximates the bioavailable fraction of metal in the water column than does total recoverable metal" (USEPA 1993a, 1994a). Therefore, dissolved (filtered) metals were measured in surface water samples.

Sediment samples for analysis of phenol and 4-methylphenol were collected in MRP15 downstream from the outfalls and in the reference area. Because 4-methylphenol was not detected in outfalls or wetland waters during the Phase I investigation, and phenol was only detected in a single water sample which was less than preliminary ecotoxicological threshold concentrations (benchmarks) presented in the Phase III FSP, 4-methylphenol and phenol were not analyzed in water during the Phase III investigation.

To ensure that the data were useful in interpreting potential risks associated with exposure to water and sediments, analytical methods were selected that, to the extent possible, provided detection limits[6] sufficiently low to compare concentrations against published screening concentrations. Preliminary ecotoxicological benchmarks were presented in the Phase III FSP to provide an indication of the potential resolution (i.e., detection limits) necessary in selecting among various analytical methodologies. As indicated in the *Conceptual Site Model for the Alcoa-Davenport Works* (Geraghty & Miller, Inc. 1995), EPA preliminary remediation goals (PRGs) have not been established for human exposures to constituents in surface sediment and water. However, ecological screening values for surface water and sediment are typically more stringent than human health-based protection values because aquatic life is exposed to a much greater degree. Therefore, a comparison of available ecotoxicological benchmarks was made to select analytical methodologies for the

[6] Detection limit as used in this memorandum refers to the sample quantitation limit.

Phase III investigation. As noted in the Phase III FSP, benchmarks were not identified for all constituents due to a lack of readily available information, and some benchmarks are still below detection limits of specific analytical methodologies. In instances where the detection limits remain above benchmarks, qualification in the risk assessment will be necessary with respect to associated uncertainty and potential data gaps.

In addition to data collected during the Phase III investigation, surface sediment samples were collected in conjunction with benthic macroinvertebrate samples adjacent to the Alcoa facility as part of the supplemental investigation. Sediment and water data for MRP15 from the Phase III investigation and supplemental investigation are summarized in Tables 2-3 and 2-4. The data presented in Tables 2-3 and 2-4 represent only data collected adjacent to the Alcoa facility, i.e., Area 1 as defined in the Phase III Sediment Investigation Report (WCC 1996a) (see also Table 2-2 and Figure 2-1). For sediment samples, only data from the upper sediment horizons (0-6 in.) were used in screening since this represents the zone of potential exposure. Where field duplicate samples were collected the measurements were averaged. Chemicals of interest in MRP15 will be selected based on data in Tables 2-3 and 2-4. The rationale for using only data collected adjacent to the facility is that if Alcoa is a source, then maximum concentrations[7] would be expected adjacent to the Alcoa facility (i.e., if the constituent was not detected adjacent to the Alcoa facility, then Alcoa is not a source of the constituent). The maximum concentrations for each of the constituents were located adjacent to the facility[8], with the exception of 4-methylphenol and butylbenzylphthalate. The highest concentration of 4-methylphenol was detected in the reference area (0.28 mg/kg)[9]. The highest concentration of butylbenzylphthalate (2.1 mg/kg) was detected on the Illinois side of the river, and is not believed to be associated with the Alcoa facility[10].

[7] Selection of chemicals of concern will ultimately be based on the maximum concentrations of detected chemicals.

[8] Data obtained from the Phase III report.

[9] This is below the ecological screening benchmark of 0.67 mg/kg published by the Ontario Ministry of Environment (Appendix C)

[10] It is also below the applicable ecological sediment screening benchmark of 11 mg/kg from EPA's ECOTOX database (Appendix C).

2.2 WETLANDS

There are two onsite wetland areas at the Alcoa facility designated as Wetland 1 and Wetland 2. Wetland 1 is located downstream from the water intake and adjacent to Outfall 005. There is exchange between waters in Wetland 1 and waters from MRP15 through a channel that is maintained by Alcoa. Wetland 2 is not directly contiguous with MRP15, but rather is located in the southwestern portion of the Alcoa property within the boundaries of the Eastern Historical Disposal Area. This wetland is only connected to MRP15 during episodes of elevated MRP15 river elevations when water can back up into Outfall 003. A channel beneath the Outfall 003 dike allows water to enter the Wetland 2 when sufficient water is present in Outfall 003.

Sediment samples were collected from both wetland areas at the Alcoa-Davenport facility during the Phase I investigation. Surface water samples were collected from Wetland 1 during Phase I[11]. Data were presented in the *Onsite Sediment Sampling Results Phase IA - SIS Alcoa - Davenport Facility* (WCC 1993). In addition, surface sediment samples were collected from the two wetlands during the supplemental investigation and were presented in *Supplemental Field Investigations in Support of Risk Assessment Activities Mississippi River Pool 15* (WCIA 1997). Analytical data for constituents evaluated for the MRP15 risk assessment collected during the Phase I and supplemental investigations are summarized in Tables 2-5 and 2-6. As with data from MRP15, field duplicate results were averaged.

2.3 ASSESSMENT OF DATA USABILITY

Assessments of data usability were provided in the respective reports for the Phase I and Phase III investigations (WCC 1993; WCC 1996a). Quality assurance/quality control (QA/QC) activities for each of the studies followed procedures described in the Quality Assurance Project Plan (QAPP) (YMA 1991) and respective field sampling plans. Data reviews were performed in a manner similar to that described under the USEPA Contract Laboratory Program data review procedures for organics (USEPA 1991a, 1994b) and inorganics (USEPA 1988a, 1994c). Data were assessed for precision, accuracy,

[11] No water was present in Wetland 2 during the Phase I investigation.

representativeness, comparability and completeness as discussed in the QAPP and under data quality objectives for each study.

Based on the data validation, analytical results were either accepted, qualified, or rejected. During the data validation process, data qualifiers were assigned to analytical results as follows:

U	Constituent was not detected
UJ	Constituent detection limit is estimated
J	Constituent value is estimated
R or I	Constituent value is unusable

Analytical data qualified as unusable were not included in development of chemicals of concern. "U"- or "UJ"-qualified data were counted as nondetects.

3.0 SELECTION OF CHEMICALS OF CONCERN

3.1 GENERAL APPROACH

A series of steps were used to identify chemicals of potential concern (COPCs -- human health) and chemicals of potential ecological concern (COPECs). These steps consisted of the following:

- Chemicals of interest (COIs) were developed from the list of analytes from the Phase III MRP15 investigation and from data collected from the wetlands during the Phase I investigation. This list of COIs was common to both the ecological and human health evaluations.
- For ecological risk assessment, COI concentrations were compared with appropriate ecotoxicological benchmarks to develop COPECs.
- For human health, COIs were compared to screening level risk-based concentrations based on direct exposure scenarios to water and sediments.

Constituents from MRP15 were screened independently from constituents in the wetlands, resulting in one set of COIs, COPCs and COPECs specific to MRP15, and another set specific to the wetlands.

3.2 SELECTION OF CHEMICALS OF INTEREST (COIs) and CHEMICALS OF CONCERN

If the chemical was not detected in sediment or surface water, then the chemical was not selected as a COI, but was evaluated as an uncertainty as discussed in Section 3.2.3. The selection of COIs is presented with the data summaries in Tables 2-3 through 2-6.

If the maximum COI concentration did not exceed the background concentration, it was not considered a COPC and COPEC. This criterion was applied only to the inorganic constituents, since organic contaminants were generally not detected or were detected at

very low concentrations in the reference area. To assess whether the maximum COI concentration exceeded the background concentration, the mean background concentration plus three standard deviations was used as a reasonable maximum allowable upper background limit (USEPA 1995a). Comparisons of inorganic constituents between the reference area and the area adjacent to the Alcoa facility are provided in Appendix B.

The overall approach for selection of chemicals of concern was generally consistent with the approach used by Jacobs Engineering in development of *Preliminary Identification of Contaminants of Concern Ecological Risk Assessment Mississippi River Pool 15* for EPA (JEG 1994). COPCs and COPECs were selected from the COIs using the following general approach:

- If the COI exceeded background and a screening concentration was available, then the maximum concentration of the COI was compared to applicable human health or ecological screening criteria. If the maximum concentration exceeded the applicable screening criterion, the COI was considered a COPC or COPEC, as appropriate.
- If a screening criterion was not available, a chemical was detected and not "J"- or "B"-coded, then the chemical was selected as a COPC or COPEC.
- If a screening criterion was not available, all detections for a particular contaminant were "J"- or "B"- coded and less than 10 percent of the samples had hits, then the contaminant was not selected as a COPC or COPEC. Conversely, if greater than 10 percent of the samples had hits, the contaminant was selected as a COPC or COPEC.

In addition, if the COI was detected at low concentrations in less than five percent of the samples, it was not considered a chemical of concern (USEPA 1989). The evaluation also considered site process knowledge and whether a constituent is an essential human nutrient. Process knowledge may be evaluated further during the quantitative risk assessment.

3.2.1 Chemicals of Potential Ecological Concern (COPECs)

A number of references were consulted resulting in several potential ectotoxicological benchmarks compiled for the majority of the COIs. Ecotoxicological screening benchmarks represent media-specific concentrations above which there is sufficient evidence for concern regarding a potential ecological impact such that further, more refined, evaluation is warranted. Exceedence of a benchmark does not indicate the level or type of risk involved (USEPA 1996a) but represents a "first step" in a baseline risk assessment. These benchmarks are not to be used as regulatory criteria, site-specific cleanup standards, or remediation goals (USEPA 1996a).

The selection of a single media-specific benchmark for a particular chemical was based on an analysis of the appropriateness of the data source for receptors associated with MRP 15. Therefore, the benchmarks used for screening COIs were prioritized based on the most site-specific applicability. This is discussed in the respective sections addressing development of COPECs for each medium. The draft guidance presented in USEPA (1994d) indicates that the lowest exposure level shown to produce adverse effects in a potential receptor species should be selected as the ultimate screening benchmark. Alcoa believes that the prioritization scheme presented for each medium is consistent with USEPA's approach in that a "potential receptor" reflects application of the most site-specific benchmark, though this may not be the lowest benchmark identified.

3.2.1.1 COPECs in Sediment

For evaluation of COIs in sediments, the following prioritization was applied where multiple benchmarks were identified[12]:

1. Effects Range Low for Freshwater (Ingersoll, *et al* 1996)
2. ECOTOX (USEPA 1995b, USEPA 1996a);

[12] Note that databases from the National Oceanographic and Atmospheric Administration (NOAA: Long and Morgan 1990, Long et at. 1995) were not specifically consulted due to their heavy reliance on marine data. However, most of these data are incorporated into the USEPA ECOTOX database.

3. ORNL's *Toxicological Benchmarks for Screening contaminants of Potential Concern for Effects on Sediment-Associated Biota* (ORNL 1997);
4. the National Sediment Contaminant Source Inventory (NSCSI [USEPA 1994e]); and
5. Ontario Ministry of the Environment (Persaud *et al.* 1992, Jaagumagi, *et al.* 1995).

Tables summarizing ecological screening benchmarks in sediments are presented in Appendix C. For organic COIs, if a sediment-associated benchmark was not available, but a water benchmark was available, the equilibrium-partitioning method (USEPA 1993b) was used to calculate a sediment concentration benchmark assuming a total organic carbon (TOC) concentration of 1.5% in sediments. This value represents the average TOC concentration adjacent to the Alcoa facility.

None of the above references is directly site-specific. The Effects-Range-Low for Freshwater was selected as the primary screening benchmark because it represents the most recently developed values that are specific to freshwater. ECOTOX was selected next because its primary purpose is as a compilation of benchmarks by the EPA Superfund program to be used in the screening process. However, the ECOTOX database is generic and does not distinguish between marine or freshwater systems. The NSCSI is in draft form, and is likely subject to subsequent modification, though it considers limitations of, for example, NOAA and the Ontario Ministry of Environment. The Ontario Ministry of Environment benchmarks were placed last in order of priority because they are based on relatively oligotrophic waterbodies, unlike the Mississippi River which is a riverine and more eutrophic system. Though the NSCSI benchmarks are currently ranked fourth in the prioritization scheme, these values may be increasingly important as the MRP15 risk assessment progresses. Alcoa believes that a number of the constituents measured in sediments are the result of permitted NPDES discharges. Recognizing that point discharge sources may impact sediments, USEPA drafted the *National Sediment Contaminant Source Inventory: Point Source Analysis* which presents approaches for determining sediment quality guidelines for evaluating the effects of point source discharges on sediments. Resultant Freshwater Sediment Guideline Values from the NSCSI are included in Appendix C. The Freshwater Sediment Guideline Values are suggested as an assessment tool for impacts on sediment quality due to point source discharges.

COPECs in Sediment - MRP15

The maximum concentrations and detection limits for each of the COIs in sediments of MRP15 are presented in Table 3-1 along with their respective ecological benchmarks. Three volatile organic COIs were detected in MRP15 sediment samples: acetone, 2-butanone and carbon disulfide. The maximum concentration for 2-butanone did not exceed the available benchmark and as such is not considered a COPEC. The maximum concentrations of acetone and carbon disulfide exceed the ORNL benchmarks (64 ug/kg and 0.85 ug/kg[13], respectively).

Acetone was determined to be present as a laboratory contaminant during the quality assurance/control evaluation performed for the Phase III sediment and water investigation. This strongly suggests that the reported concentrations are not representative of the true sediment concentrations. In addition, a review of the benchmark provided by ORNL indicated equilibrium partitioning was used to derive the benchmark for acetone in sediments. A negative log K_{oc} was calculated by ORNL based on a numerical relationship with the K_{ow} (ORNL 1997). The result is that concentrations in the pore water are estimated to be higher than in the sediment. If this was correct, then as acetone is transported to the river it would not sorb to sediments, and any acetone that might be present would quickly disperse in the water in a riverine environment. The ASTER database reports a K_{oc} of 15.5 (ASTER 1996). This converts to a log K_{oc} of 1.19.

[13] The maximum detected concentration of carbon disulfide (7.9 ppb) is above the 1997 ORNL benchmark of 0.85 ppb. However, the benchmark in earlier versions of the ORNL sediment series (ORNL 1994) was 13 ppb, which was above the maximum measured concentration in MRP15 sediments. Review of the 1997 sediment benchmark derivation revealed that it is based on a single water-borne acute toxicity test with the guppy, *Poecila reticulata* (Van Leeuwen et al. 1985) (acute LC_{50} = 4,000 ppb). The earlier benchmark was derived using additional data from Van Leeuwen et al. (1985) for *Daphnia magna* (acute LC_{50} = 2,100 ppb). The omission of the *Daphnia magna* datum has a significant impact on the estimated Tier II chronic toxicity value used to derive the sediment benchmark (the fewer the number of data points, the higher the safety factor that is applied when calculating Tier II chronic values under the Great Lakes Water Quality Initiative methodology). Though it was from the same source, the rationale for omitting the daphnid data was not addressed by ORNL. The benchmark derived based on both guppy and *Daphnia magna* data (13 ppb) is considered superior because of the increased size of the dataset and inclusion of multiple taxa. Nevertheless, the 1997 benchmark of 0.85 ppb was used due to the uncertainty in derivation of the benchmark.

A recalculation of the benchmark based on a log K_{oc} value of 1.19 results in a benchmark value of 2.6 mg/kg (assuming 1.5% organic carbon). Using the revised benchmark, further supported by the fact that acetone was a laboratory contaminant, acetone is not of ecological concern.

Sediment benchmarks were obtained for each of the semivolatile organic COIs detected in sediments as presented in Table 3-1. The concentrations detected for dibenzofuran, butylbenzylphthalate, 2-methylnaphthalene, and 4-methylphenol are all below the applicable screening benchmarks and these SVOCs are therefore not considered COPECs. Dibenzofuran and butylbenzylphthalate were also detected in less than 5 percent of the samples. The remainder of the SVOCs, which consist of the priority pollutant PAHs, carbazole and phenol, exceed applicable benchmarks and are carried forward as COPECs. PAHs in river sediments attributable to the Alcoa facility are believed to be predominantly from roofing material (WCIA 1998)[14].

Among the PCBs, Aroclor 1248, Aroclor 1254 and Aroclor 1260 were all detected in MRP15 sediments. Aroclor 1248 was clearly the predominant PCB, being detected in 57 percent of the samples collected adjacent to the facility. Both Aroclor 1254 and Aroclor 1260 were detected in less than two percent of the samples at concentrations below applicable screening benchmarks, and are therefore not carried forward as COPECs. The maximum concentration for Aroclor 1248 was above the applicable screening benchmark and was retained as a COPEC in MRP15. Although they were below applicable screening benchmarks, Aroclor 1254 and 1260 will be included in the MRP15 risk assessment as part of the evaluation of total PCBs.

Among the inorganics, maximum detected concentrations of chromium, iron, and silver in sediments within MRP15 are lower than the applicable benchmarks. Therefore, these inorganics are not considered COPECs in MRP15.

[14] WCIA 1998. Polycyclic Aromatic Hydrocarbons (PAHs) at Alcoa's Davenport Works. Prepared for the Alcoa-Davenport Works by Woodward-Clyde International Americas, Franklin, TN.

The freshwater Effects Range-Medium (ER-M) was selected as the applicable screening benchmark for aluminum in sediments. The Effects Range-Low (ER-L) in sediment presented by Ingersoll et al. (1996) is stated as "unreliable" by the authors because less than five of the sediment samples in the database used to derive the ER-L were designated as toxic for aluminum. This is reflected in the percentage of non-toxic samples being incorrectly classified as toxic, a false positive rate of 52% (Ingersoll et al. 1996). This unreliability is reflected within the latest ORNL sediment benchmark document (ORNL 1997) where the Effects Range-Medium (ER-M) derived by Ingersoll et al. is recommended as a potential screening benchmark (58,000 mg/kg) over the ER-L. Based on the aluminum ER-M, aluminum is not considered a COPEC in MRP15 sediments.

Total cyanide was detected in one surface sediment sample collected from MRP15 at a concentration lower than the screening benchmark. It was also detected in less than five percent of the surface sediment samples collected immediately adjacent to the Alcoa facility. The mean concentration and frequency of detection were more than an order of magnitude lower than in the reference area. Also, amenable cyanide was not detected in surface sediments adjacent to the facility. Amenable cyanide is a measure of the environmentally relevant form of cyanide consisting of free cyanide and readily dissociable cyanide complexes. A hit of total cyanide in the absence of amenable cyanide indicates that cyanide is highly complexed, not readily dissociable and not in a toxic form. Because total cyanide was below the screening benchmark and there were no detections of amenable cyanide, cyanide is not considered a COPEC in MRP15.

Of the remaining inorganic COIs, copper, lead, manganese and zinc exceed applicable benchmarks and are retained as COPECs.

None of the COIs in MRP15 sediments were eliminated due to a lack of screening criteria, "J"- or "B"-coded data, or due to a low frequency of detection.

COPECs in Sediment - Wetlands

Sediment results specific to the wetlands and the applicable sediment benchmarks are presented in Table 3-2. Of the volatile organic COIs in wetland sediments, all but acetone are below their associated ecological-effects benchmark. The maximum concentration of acetone (180 ug/kg) exceeds the ORNL benchmark of 64 ug/kg. As discussed in Section 3.2.1.1, a revised benchmark of 2,600 ug/kg was calculated based on a corrected K_{oc}. The maximum concentration of acetone is less than the corrected benchmark.

Concentrations for each of the semivolatile organic COIs detected in the wetlands exceed applicable benchmarks and as such, are carried forward as COPECs.

Aroclors 1248 and 1254 were detected in wetland sediments. Maximum concentrations for these Aroclors were above applicable screening benchmarks and are carried forward as COPECs.

Using the ER-M screening benchmark of 58,000 mg/kg, aluminum is not considered a COPEC in the wetlands. Chromium, copper, manganese, zinc each exceed applicable benchmarks. These inorganics are therefore considered as COPECs in the wetlands. Iron and lead in wetland sediments do not exceed the applicable benchmarks and are not considered COPECs.

Total cyanide is below the screening benchmark in the wetlands. In addition, amenable cyanide analyses were conducted in Wetland 1 during the supplemental investigation in which no amenable cyanide was detected, indicating cyanide is highly complexed, not readily dissociable and not in a toxic form. Therefore, cyanide is not considered a COPEC in Wetland 1. Though amenable cyanide analyses have not been conducted in Wetland 2, the data from Wetland 1 and MRP15 indicate that cyanide in sediments is complexed. In addition, the maximum total cyanide concentration in Wetland 2[15] did not exceed the free cyanide screening benchmark. Because concentrations of total cyanide in

[15] 1 mg/kg (j) from Phase I report (WCC 1993).

Wetland 2 did not exceed the screening benchmark for either free or total cyanide, cyanide is not considered a COPEC in the wetlands.

None of the COIs in wetland sediments were eliminated due to a lack of screening criteria, "J"- or "B"-coded data, or due to a low frequency of detection.

3.2.1.2 COPECs in Surface Water

For evaluation of COIs in surface water, the following prioritization was applied where multiple benchmarks were identified:

1. State of Iowa Ambient Water Quality Standards (1990)
2. Federal Ambient Water Quality Criteria (USEPA 1985a, 1985b, 1985c, 1986, 1987, 1988b, 1991b); and
3. ECOTOX (USEPA 1995b, USEPA 1996a);
4. The lowest aquatic effects concentrations (mortality, survival or reproduction) from the following sources:
    - ORNL *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision* (ORNL 1996)
    - AQUIRE (AQuatic Information REtrieval on-line database 1996)
    - ASTER (ASsessment Tools for the Evaluation of Risk on-line database 1996)

Tables summarizing ecological screening benchmarks in water are presented in Appendix C. If the Federal Ambient Water Quality Criterion for a COI was reported only as the lowest-observed-effect level, i.e., insufficient data were available to develop a criterion, and ECOTOX presented an alternate and lower value, then the ECOTOX value was used preferentially to the ambient water quality criterion.

Where Iowa water quality standards or EPA ambient water quality criteria are hardness-dependent, a water hardness of 200 mg/L was used in the calculation of the benchmark. This is consistent with reported water hardness in MRP15 based on a review of STORET data presented in the *Sediment/Soil Investigation Studies Phase II, Delineation of the Critical Study Area* (WCC 1994).

Dissolved concentrations of inorganic COIs are considered the most appropriate measures for use for comparisons against ecotoxicologically-based screening concentrations (USEPA 1996a). The values presented in Table 3-3 for constituents in MRP15 surface water are dissolved concentrations. The screening values obtained from ECOTOX are for dissolved concentrations (USEPA 1996a) and Federal Ambient Water Quality benchmarks have been adjusted to also reflect dissolved concentrations (USEPA 1994a). Water samples collected from the wetlands presented in Table 3-4 represent total rather than dissolved concentrations.

COPECs in Surface Water - MRP15

The maximum detected concentrations of COIs in surface water from MRP15 are presented in Table 3-3, as are their respective ecotoxicological benchmarks. The only volatile organic COIs in surface water were acetone and 2-butanone. The maximum detected concentrations were 38 ug/L and 8.7 ug/L, respectively. Acetone and 2-butanone were also noted in trip blanks during the MRP15 investigation, and are common laboratory contaminants. Nevertheless, the measured concentrations are well below benchmarks obtained from both ASTER and ORNL and, therefore, are not considered COPECs in surface water.

The only SVOC detected in water adjacent to the Alcoa facility was fluorene, in one of seven samples at a concentration of 1.1 ug/L. The detected concentration was actually upstream from the Alcoa facility at the upstream boundary of study Area 1. The surface water screening benchmark for fluorene is 8 ug/L. Therefore, fluorene is not considered a COPEC in surface water. As with the majority of the SVOCs, PCBs were not detected in surface water samples of MRP15. However, note that both the PAH group of SVOC constituents and Aroclor 1248 were measured above applicable screening benchmarks in sediments. Therefore, they will be characterized as COPECs in the water column as well.

Of the inorganic COIs, concentrations of copper, iron, manganese and zinc were below applicable screening benchmarks. These inorganics are therefore not considered COPECs in surface water.

None of the COIs in MRP15 surface water were eliminated due to a lack of screening criteria, "J"- or "B"-coded data, or due to a low frequency of detection.

COPECs in Surface Water - Wetlands

Analytical results and applicable benchmarks for surface water COIs collected from the wetland areas are presented in Table 3-4. Water samples have only been collected from Wetland 1 since there was no water in Wetland 2 during the Phase I sampling event or in either wetland during supplemental investigations.

Of the organic COIs in the wetland waters, the maximum concentrations for phenanthrene and pyrene are below ecotoxicological benchmarks. The maximum detection for Aroclor 1260 was 4.6 ug/L, which is above its reported solubility (2.7 ug/L; Choiu and Griffin 1986). This is likely due to particle-associated PCBs resulting in an apparent concentration exceeding the solubility of the chemical. Nevertheless, this concentration is above the available benchmark and Aroclor 1260 is retained as a COPEC in surface water in the wetlands.

Of the inorganic COIs in wetland surface water, only iron and manganese exceeded applicable benchmarks. Concentrations of 4,110 ug/L and 801 ug/L were measured for iron and manganese, respectively. As with Aroclor 1260 discussed previously, it is likely these concentrations are associated with particulate matter. However, since filtered samples were not collected in the wetlands, neither iron or manganese can be eliminated from consideration and are classified as COPECs in wetland surface waters.

None of the COIs in wetland surface water were eliminated due to a lack of screening criteria, "J"- or "B"-coded data, or due to a low frequency of detection.

3.2.2 Chemicals of Potential Concern - Human Health (COPCs)

Due to the differences in comparative toxicity to human *versus* ecological receptors and the screening criteria used, the list of COPCs for the human health evaluation do not

necessarily match the COPCs selected for the ecological evaluation. For the purposes of developing screening criteria for human-health exposure to MRP15 surface water and sediment, risk-based screening concentrations were calculated for direct contact with surface water and sediment while swimming. It was assumed that an adolescent child weighing 45 kg would swim near the Alcoa-Davenport Works for 10 years between the ages of 7 and 16 and be exposed to both surface water and sediment through incidental ingestion and dermal contact. Swimming was assumed to take place 7 days per year and last 2.6 hours per exposure (EPA 1989). It was assumed that while swimming, the child would incidentally ingest 0.05 L/hr surface water and 5 mg/day of sediment. The entire skin-surface area was assumed to be exposed to surface water while swimming (16,165 cm^2). For dermal exposure to sediment, the surface area of feet was assumed to be exposed (1,194 cm^2) with a sediment adherence rate of 0.2 mg/cm^2-day. The equations used to calculate RBCs, as well as COI-specific RBC calculations, are presented in Appendix D. An exception to this approach was lead, for which no oral toxicity reference dose is available. A soil screening value for lead of 400 mg/kg (USEPA 1994f) was used based on children exposed in a residential setting. This is believed to be a conservative value because the exposure pathways used to derive the soil screening value are similar, i.e., ingestion and incidental contact, and the frequency and duration of exposure are less in MRP15 compared to those used to derive the soil screening value for a residential setting.

It is highly unlikely that an adolescent would have access to the Alcoa Davenport Plant, much less choose MRP15 or the on-site wetlands as suitable places to swim. Nevertheless, the adolescent swimmer exposed to MRP15 and on-site wetlands was used as a conservative screen of COIs that should be retained as COPCs. Screening values will not be used to eliminate COIs in surface water or sediment that may have a potential to bioaccumulate or biomagnify in fish (i.e., PCBs) and could result in unacceptable risk from exposure through ingestion.

3.2.2.1 COPCs in Sediment

Sediments near the Alcoa shoreline may be contacted by site workers or fishermen; however, the exposure potential is low. COPCs for sediment were selected based on the

frequency of detection, concentration, and comparison to screening values calculated for an adolescent child exposed to sediment while swimming at the site. The assumptions used in the adolescent child swimmer scenario are provided in Section 3.2.2.

COPCs in Sediment - MRP15

Analytical data and screening benchmarks for sediment samples collected from MRP15 are summarized in Table 3-5. Benchmarks were calculated for screening COIs in sediments because appropriate sediment criteria are not available. Calculations are presented in Table D-4 in Appendix D. Sediment COPCs for MRP15 are identified in the following text.

Acetone and carbon disulfide were the only volatile organic COIs in MRP15 sediment samples, but they were not retained as COPCs because maximum detected concentrations were below screening values. A total of 21 SVOCs were identified as COIs in sediment samples collected from MRP15. Twenty of them were detected at concentrations well below screening concentrations and were not retained as COPCs. The screening levels for 2-methylnaphthalene and benzo(g,h,i)perylene were calculated using toxicity values for naphthalene and pyrene, respectively. The use of these surrogate compounds is based on similarities in structure and biological activity. No screening value was available for dibenzofuran. However, it was detected in less than 5 percent of the samples and thus is not considered a COPC.

Aroclor 1248 was detected in 57 percent of the samples, and Aroclor 1254 and Aroclor 1260, were detected in less than 5 percent of the samples. Although the maximum detected concentrations of Aroclors 1248, 1254, and 1260 did not exceed screening levels, they were retained as COPCs because PCBs have the potential to bioaccumulate and may result in unacceptable risk to receptors via fish ingestion.

Aluminum, chromium, copper, iron, lead, manganese, and zinc were detected in each sediment sample in which they were analyzed; however, all but iron were found at concentrations below screening values. Silver was detected in five sediment samples, at concentrations lower than the screening value, and was not retained. Iron, an essential

human nutrient which is toxic only at very high doses and was detected only at low concentrations, was not retained as a COPC. Amenable cyanide was not detected in 39 sediment samples at concentrations above the screening level; therefore, cyanide was not retained as a COPC.

COPCs in Sediment - Wetlands

Twenty-nine sediment samples were collected from the wetlands during the Phase I sediment investigation and supplemental investigation. Data and screening benchmarks are summarized in Table 3-6, and sediment COPCs for on-site wetlands are identified below. Calculations of screening benchmarks are presented in Table D-5 in Appendix D.

Acetone was detected in 10 of 16 sediment samples collected in the wetlands and is a common laboratory contaminant. Benzene and tetrachloroethylene were detected in 1 of 16 samples, while chloromethane was detected in 2 of 16 samples. All of these constituents were found at levels below screening levels and, therefore, were not retained as COPCs.

A total of 17 SVOCs were selected as COIs in sediment samples collected from on-site wetlands. Most were detected at concentrations well below screening concentrations and were not retained as COPCs. A screening concentration for benzo(g,h,i)perylene was calculated using pyrene as a surrogate. Based on this screening concentration benzo(g,h,i)perylene was not retained as a COPC. A screening level was not available for dibenzofuran. Therefore, dibenzofuran was retained as a COPC. No other SVOCs were retained as COPCs for wetland sediments.

Aroclor 1248 was detected in 16 of 29 wetland sediment samples, and Aroclor 1254 was detected in 22 of 29 samples. Although maximum detected concentrations of Aroclor 1248 and Aroclor 1254 did not exceed screening levels, they were retained as COPCs because PCBs have the potential to bioaccumulate and may result in unacceptable risk to receptors via fish ingestion.

Aluminum, chromium, copper, iron, manganese and zinc were detected in each of 16 wetland sediment samples analyzed. All but iron were detected at concentrations lower than the screening values. Iron, an essential human nutrient which is toxic only at very high doses and was detected at relatively low concentrations was not retained as a COPC.

3.2.2.2 COPCs in Surface Water

It is anticipated that relevant pathways for surface water exposure will include wading in shallow water along the Alcoa-Davenport Works shoreline and fishing in MRP15[16]. Fisherman wading near the shoreline may contact surface water and/or ingest fish caught from this area. COPCs selected for surface water will be used to evaluate potential risks for these receptors and exposure pathways. COPCs were identified from surface water samples collected in MRP15 near the Alcoa shoreline and in the on-site wetlands.

COPCs in Surface Water - MRP15

Analytical data and screening benchmarks for surface water samples collected from MRP15 are summarized in Table 3-7. Calculations of screening benchmarks are presented in Table D-6 in Appendix D. COPCs are identified from the COIs in the following text.

2-Butanone and acetone were the only VOCs selected as COIs in surface water samples collected from MRP15; however, they were not retained as COPCs because concentrations detected were several orders of magnitude below screening-level values, and these constituents are frequently laboratory contaminants. The remaining COIs were eliminated because they were not detected.

The SVOC fluorene was detected in one of seven surface water samples collected from MRP15. The concentration of fluorene (1.1 ug/L) is below the screening value of 9 ug/L so it was not retained as a COPC. Fluorene was the only SVOC detected in surface water

[16] The exposure scenarios, assumptions, and fate and transport models will be discussed in the Exposure Assessment Memorandum -- see Section 1.2.

samples from MRP15. PCBs were not detected in surface water and, therefore, were not retained as COPCs for surface water in MRP15.

Copper, iron, manganese, and zinc were the only inorganics identified as COIs in surface water. Maximum concentrations of manganese and zinc in surface water were less than screening levels; therefore, they were not retained as COPCs. The screening level for copper was calculated using a reference dose (RfD) that was back-calculated from the current drinking water standard (USEPA 1996b). The concentration of copper detected in MRP15 surface water was lower than the screening level for copper so it was not retained. Iron, an essential human nutrient, was found at low concentrations, and is toxic only at very high doses. For this reason, iron was not retained as a COPC.

COPCs in Surface Water - Wetlands

Analytical results of surface water samples collected from one of the two on-site wetlands and associated screening benchmarks are summarized in Table 3-8. Calculations of screening benchmarks are presented in Table D-7 in Appendix D. At the time of sampling during Phase I and in the supplemental investigation, Wetland 2 was dry; therefore, all three surface water samples analyzed were from Wetland 1. Surface water COPCs for the wetlands are identified below.

No volatile organic COIs were identified in surface water samples collected from the wetlands; therefore, VOCs were not evaluated as COPCs. The SVOCs phenanthrene and pyrene were each detected in one sample at concentrations of 0.5 ug/L and 2 ug/L, respectively. Both were below human health screening levels so they were not retained as COPCs.

Aroclor 1260 was detected at 4.6 ug/L in one sample. This concentration exceeds the screening value of 0.2 ug/L, so Aroclor 1260 was retained as a COPC. Aroclor 1260 was also retained because PCBs have the potential to bioaccumulate, which may result in unacceptable risk to receptors via fish ingestion.

Aluminum, chromium, copper, iron, lead, manganese, and zinc were detected in all three wetland surface water samples. Maximum concentrations of aluminum, chromium, copper, manganese and zinc were all less than screening levels so they were not retained as COPCs. There is no reference dose for lead. However, the maximum concentration was less than the national primary drinking water action level for lead in drinking water of 15 μg/L (40 CFR 141.80). Therefore, lead was not retained as a COPC. Iron, an essential human nutrient, found at low concentrations in surface water samples, and toxic only at very high dose was not retained as a COPC.

3.2.3 Uncertainties

Further evaluation was conducted on chemicals that were screened out during the selection of COIs in Section 3.2 to ensure that some constituents were not prematurely eliminated due to limitations of analytical detection as compared to screening concentrations. Chemicals not selected as COIs in Tables 2-3 to 2-6 were re-evaluated if the maximum detection limit exceeded the screening concentration for the constituent.

A list of chemicals in MRP15 and wetland sediments which did not meet the above criteria was prepared by EPA in comments dated May 22, 1998. Screening concentrations for these constituents were compared against one-half the detection limit as a proxy concentration for ND values. If a constituent was not detected and greater than 20% of nondetects exceeded the screening benchmark concentration, then the constituent was identified as an uncertainty and selected as a COPEC to be carried forward qualitatively in the MRP15 risk assessment. A summary of the evaluation is presented as follows:

MRP15 Sediments

- **mercury** -- The maximum detection limit for mercury (0.238 mg/kg) slightly exceeded the ecotox screening value (0.2 mg/kg). One-half the detection limit exceeded the screening concentration in 0 of 30 samples (0%). Because less than 20% of the proxy concentrations exceeded the screening value, mercury is not carried forward in the risk assessment.

Wetland Sediments

- **carbon disulfide** -- The minimum (12 ug/kg) and the maximum detection limit (21 ug/kg) are greater than the ecotoxicological screening value (0.85 ug/kg) for carbon disulfide and, therefore, carbon disulfide is carried forward in the risk assessment as an uncertainty.
- **2-methylnaphthalene** -- The maximum detection limit (110 mg/kg) exceeds the ecotox screening value (34.3 mg/kg). One-half the detection limit exceeded the screening concentration in 1 of 16 samples (6%). Because less than 20% of the proxy concentrations exceeded the screening value, 2-methylnaphthalene is not carried forward in the risk assessment.
- **4-methylphenol** -- The maximum detection limit for 4-methylphenol (110 mg/kg) exceeds the ecotox screening value (0.67 mg/kg). One-half the detection limit exceeded the screening concentration in 11 of 16 samples (69%). Because greater than 20 of the proxy concentrations exceeded the screening value, 4-methylphenol is carried forward in the risk assessment as an uncertainty.
- **butylbenzylphthalate** -- The maximum detection limit for butylbenzylphthalate (110 mg/kg) exceeds the ecotox screening value (11 mg/kg). One-half the detection limit exceeded the screening concentration in 1 of 16 samples (6%). Because less than 20% of the proxy concentrations exceeded the screening value, butylbenzylphthalate is not carried forward in the risk assessment.
- **phenol** -- The minimum (0.48 mg/kg) and the maximum detection limit (110 mg/kg) are greater than the ecotoxicological screening value (0.031 mg/kg) for phenol. One-half the detection limit exceeded the screening concentration in 16 of 16 samples (100%). Because greater than 20 of the proxy concentrations exceeded the screening value, phenol is carried forward in the risk assessment as an uncertainty.
- **mercury** -- The maximum detection limit for mercury (0.21 mg/kg) slightly exceeded the ecotox screening value (0.2 mg/kg). One-half the detection limit exceeded the screening concentration in 0 of 16 samples (0%). Because less than 20% of the proxy concentrations exceeded the screening value, mercury is not carried forward in the risk assessment.
- **silver** -- The minimum (1.2 mg/kg) and the maximum detection limit (2 mg/kg) are greater than the ecotoxicological screening value (1 mg/kg) for silver. One-half the detection limit exceeded the screening concentration in 0 of 16 samples (0%). Because less than 20% of the proxy concentrations exceeded the screening value, silver is not carried forward in the risk assessment.

As a result of this process, carbon disulfide, 4-methylphenol and phenol are identified as uncertainties in wetland sediments because greater than 20% of nondetects (using one-half the detection limit as a proxy concentration) exceeded screening levels. Though these constituents are not believed to present widespread contamination problems they will be carried forward as ecological uncertainties in wetland sediments and evaluated qualitatively in the MRP15 risk assessment.

In water samples, none of the detection limits (using one-half the detection limit as a proxy concentration) associated with volatile organics or metals exceed ecotoxicological screening benchmarks in either MRP15 or the wetlands. In the case of semivolatile organics, detection limits exceeded screening concentrations for anthracene in MRP15, and anthracene, benzo(a)anthracene, benzo(a)pyrene and fluorene in the wetlands. Ecotoxicological screening benchmarks are unavailable for benzo(b)fluoranthene and benzo(g,h,i)perylene benzo(k)fluoranthene, dibenz(a,h)anthracene and indeno(1,2,3-cd)pyrene. Even though they were not detected, the status of these constituents cannot be effectively evaluated, and they remain uncertainties. Therefore, because of the large degree of uncertainty in evaluating semivolatile organics in the water column, all semivolatile organics that were identified as COPECs in sediments, with the exception of phenol, will be carried forward as uncertainties and qualitatively examined in the MRP15 risk assessment. The same rationale will be used for PCBs. Phenol will not be carried forward as an uncertainty in the water column because it is not a concern from a bioaccumulative standpoint and the detection limit was lower than the screening concentration in water.

To further assess detection limits relative to human health screening levels in water, all chemicals which were not selected as COIs because they were not detected in water were re-evaluated using the procedures described in Appendix D. Detection limits associated with dibenz(a,h)anthracene, benzo(a)pyrene, Aroclor 1248, Aroclor 1254 and 1260 were higher than the associated screening concentrations. These constituents will be carried forward as uncertainties and evaluated qualitatively in the MRP15 risk assessment[17].

[17] Note that Aroclor 1260 in wetland surface water has already been selected as a COPC.

4.0
SUMMARY

Forty-six constituents were evaluated as chemicals of interest (COIs) in MRP15 and the on-site wetlands using data collected from sediment and surface water data collected during on-site (Phase I) and MRP15 (Phase III) investigations. Area and media-specific COIs were further evaluated to identify potential chemicals of concern in MRP15 and on-site wetlands, both from an ecological and human health perspective. The following table summarizes the COIs that were subsequently identified as COPECs.

TABLE 4-1
CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN

Chemical of Interest	MRP15		On-Site Wetlands	
	Sediment	Surface Water	Sediment	Surface Water
Volatile Organic Compounds (VOCs)				
Carbon disulfide	+		+[1]	
Semivolatile Organic Compounds (SVOCs)				
Carbazole	+	+[1]	+	+[1]
Dibenzofuran		+[1]	+	+[1]
Phenol	+		+[1]	
4-Methylphenol			+[1]	
PAHs				
Acenaphthene	+	+[1]	+	+[1]
Anthracene	+	+[1]	+	+[1]
Fluorene	+	+[1]	+	+[1]
Naphthalene	+	+[1]	+	+[1]
Phenanthrene	+	+[1]	+	+[1]
Fluoranthene	+	+[1]	+	+[1]
Pyrene	+	+[1]	+	+[1]
Benzo(a)anthracene	+	+[1]	+	+[1]
Benzo(a)pyrene	+	+[1]	+	+[1]
Benzo(b)fluoranthene	+	+[1]	+	+[1]
Benzo(g,h,i)perylene	+	+[1]	+	+[1]
Benzo(k)fluoranthene	+	+[1]	+	+[1]

TABLE 4-1
CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN

Chemical of Interest	MRP15		On-Site Wetlands	
	Sediment	Surface Water	Sediment	Surface Water
Chrysene	+	+[1]	+	+[1]
Dibenzo(a,h)anthracene	+	+[1]	+	+[1]
Indeno(1,2,3-cd)pyrene	+	+[1]	+	+[1]
Polychlorinated Biphenyls (PCBs)				
Aroclor 1248	+	+[1]	+	+[1]
Aroclor 1254			+	+[1]
Aroclor 1260				+
Inorganics				
Chromium (Cr)			+	
Copper (Cu)	+		+	
Iron (Fe)				+
Lead (Pb)	+			
Manganese (Mn)	+		+	+
Zinc (Zn)	+		+	

\+ - Identified as a COPEC.
+[1] - These constituents were identified as uncertainties and are carried forward for qualitative evaluation in the MRP15 risk assessment.

The human health chemicals of potential concern (COPCs) are summarized in the following table.

TABLE 4-2
HUMAN HEALTH CHEMICALS OF POTENTIAL CONCERN

Chemical of Interest	MRP15		On-Site Wetlands	
	Sediment	Surface Water	Sediment	Surface Water
Polycyclic Aromatic Hydrocarbons (PAHs)				
benzo(a)pyrene		+[1]		+[1]
dibenz(a,h)anthracene		+[1]		+[1]
Polychlorinated Biphenyls (PCBs)				
Aroclor 1248	+[1]	+[1]	+[1]	+[1]
Aroclor 1254	+[1]	+[1]	+[1]	+[1]
Aroclor 1260	+[1]	+[1]		+

\+ - Identified as a COPC.

+[1] - These constituents were selected as uncertainties based on potential for bioaccumulation, or due to limitations of analytical detection in discerning whether screening benchmarks had been exceeded (Section 3.2.3).

The chemicals of potential of ecological concern and human health chemicals of potential concern identified in the above tables will be carried forward for further evaluation in the risk assessment of MRP15 and the wetlands.

5.0
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TABLE 2-1 CONSTITUENTS EVALUATED FOR MRP15 RISK ASSESSMENT		
INORGANICS and PCBs	**VOLATILE ORGANIC COMPOUNDS**	**SEMIVOLATILE ORGANIC COMPOUNDS**
Aluminum	Acetone	Acenaphthene
Chromium	Benzene	Anthracene
Copper	Bromodichloromethane	Benzo(a)anthracene
Iron	2-Butanone	Benzo(a)pyrene
Lead	Carbon Disulfide	Benzo(b)fluoranthene
Manganese	Chloromethane	Benzo(g,h,i)perylene
Mercury	1,2-Dichloroethene	Benzo(k)fluoranthene
Silver	Methylene Chloride	Butylbenzylphthalate
Zinc	Tetrachloroethene	Carbazole
Cyanide	Toluene	Chrysene
Aroclor 1248	1,1,1-Trichloroethane	Dibenz(a,h)anthracene
Aroclor 1254	Trichloroethene	Dibenzofuran
Aroclor 1260	Vinyl Chloride	Fluoranthene
	Xylenes,Total	Fluorene
		Indeno(1,2,3-cd)pyrene
		2-Methylnaphthalene
		4-Methylphenol
		Naphthalene
		Phenanthrene

Phenol
Pyrene

TABLE 2-2
PHASE III STUDY AREAS

AREA	DESCRIPTION	BASIS FOR CONSIDERATION	RATIONALE FOR SELECTION
Area 1	Relatively narrow section along the western shore (up to about 200 ft wide) extending from the northern boundary of the Alcoa facility (about MRM 489.8 to Duck Creek and immediately downstream from a wing dam at about MRM 487.7.	This location is directly adjacent to Alcoa. Sediment contamination is present in this area based on previous studies.	Information was already available addressing contamination in this area. Further sampling was needed, particularly downstream from Outfall 001 to Duck Creek.
Area 2	Two Areas adjacent to wing dams at about MRM 486.7 and MRM 486.2.	These wing dams are immediately downstream from the Alcoa facility and are probably the first downstream areas where sedimentation might occur as a result of structure in the river.	Sediment samples had not been collected from this area in the past. These were in Phase III due to the proximity to the Alcoa facility and indication of contamination in both upstream and downstream sediments.
Area 3	Immediately downstream from Interstate 74 along Iowa shore at about MRM 485.4.	River morphology suggests this area may contain slower velocities possibly resulting in sedimentation.	A sample collected in this area by the USEPA NEIC in 1983 indicated measurable levels of Aroclor 1248 (0.4 mg/g).
Area 6	Backwater SE from Lock and Dam 15 from about MRM 483.0 to 483.2.	This is a potential area of sedimentation and a sample of Aroclor 1254 (0.4 ug/g) was measured here by USEPA NEIC in 1983.	Though the presence of Aroclor 1254 was not attributed to Alcoa in the NEIC report, USEPA requested samples be collected in this area during Phase III.
Area 7	Northwest portion of Rick Island just downstream from a partially submerged trailor dam.	This is the first location downstream from the trailor dam that might be affected by cross-river contaminant transport from the Alcoa facility.	Area 7 was incorporated into the Phase III investigation at the request of USEPA.

TABLE 2-3
SUMMARY OF SEDIMENT DATA FROM MRP15
AND SELECTION OF COIs
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Minimum Detection Limit	Maximum Detection Limit	COI?
Volatile Organic Compounds (ug/kg)									
1,1,1-Trichloroethane	5	ND	ND	0	5	0	6.3	9.1	no
1,2-Dichloroethene (total)	5	ND	ND	0	5	0	6.3	9.1	no
2-Butanone	5	4.6	13	5	0	100	25	37	yes
Acetone	5	22	97	5	0	100	25	37	yes
Benzene	5	ND	ND	0	5	0	6.3	9.1	no
Bromodichloromethane	5	ND	ND	0	5	0	6.3	9.1	no
Carbon disulfide	5	4.5	7.9	2	3	40	6.3	9.1	yes
Chloromethane	5	ND	ND	0	5	0	13	18	no
Methylene chloride	5	ND	ND	0	5	0	6.3	9.1	no
Tetrachloroethene	5	ND	ND	0	5	0	6.3	9.1	no
Toluene	5	ND	ND	0	5	0	6.3	9.1	no
Trichloroethene	5	ND	ND	0	5	0	6.3	9.1	no
Vinyl chloride	5	ND	ND	0	5	0	13	18	no
Xylenes (total)	5	ND	ND	0	5	0	6.3	9.1	no
Semivolatile Organic Compounds (mg/kg)									
2-Methylnaphthalene	74	0.36	13	22	52	30	0.25	52	yes
4-Methylphenol	19	0.055	0.12	5	14	26	0.033	0.074	yes
Acenaphthene	74	0.36	91	30	44	41	0.25	52	yes
Anthracene	74	0.27	11	26	48	35	0.25	52	yes
Benzo(a)anthracene	74	0.034	40	66	8	89	0.0067	5.2	yes
Benzo(a)pyrene	74	0.016	32	74	0	100	0.0063	5.2	yes
Benzo(b)fluoranthene	74	0.027	38	73	1	99	0.0063	5.2	yes
Benzo(ghi)perylene	74	0.022	17	69	5	93	0.0073	5.2	yes
Benzo(k)fluoranthene	74	0.016	20	73	1	99	0.0063	2.6	yes
Butylbenzylphthalate	74	0.595	0.595	1	73	1	0.25	52	yes
Carbazole	74	0.36	57	11	63	15	0.25	52	yes
Chrysene	74	0.04175	40	58	16	78	0.019	5.2	yes
Dibenz(a,h)anthracene	74	0.014	7.2	40	34	54	0.0073	5.2	yes
Dibenzofuran	74	0.54	1.3	2	72	3	0.25	52	yes
Fluoranthene	74	0.02	130	74	0	100	0.0073	5.2	yes
Fluorene	74	0.33	4.3	17	57	23	0.25	52	yes
Indeno(1,2,3-cd)pyrene	74	0.013	12	61	13	82	0.0073	5.2	yes

TABLE 2-3
SUMMARY OF SEDIMENT DATA FROM MRP15
AND SELECTION OF COIs
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Minimum Detection Limit	Maximum Detection Limit	COI?
Naphthalene	74	0.47	82	31	43	42	0.25	14	yes
Phenanthrene	74	0.45	75	32	42	43	0.25	14	yes
Phenol	19	0.023	0.18	17	2	89	0.017	0.028	yes
Pyrene	74	0.016	83	69	5	93	0.0073	5.2	yes
PCBs (mg/kg)									
PCB-1248	72	ND	3.5	41	31	57	0.041	2.7	yes
PCB-1254	72	ND	0.68	1	71	1	0.041	2.7	yes
PCB-1260	72	ND	0.099	1	71	1	0.041	0.27	yes
Inorganics (mg/kg)									
Aluminum	21	3386	14991	21	0	100			yes
Chromium	21	8.3	29.4	21	0	100			yes
Copper	25	8.1	91.8	25	0	100			yes
Iron	21	7496	28517	21	0	100			yes
Lead	25	7.9	83	25	0	100			yes
Manganese	21	394	1099	21	0	100			yes
Mercury	30	ND	ND	0	30	0	0.134	0.238	no
Silver	21	ND	0.315	5	16	24	0.661	1.19	yes
Zinc	25	24.6	261.8	25	0	100			yes
Amenable Cyanide	39	ND	ND	0	39	0	0.31	0.58	yes[1]
Total Cyanide	39	ND	0.68	1	38	3	0.31	0.58	yes

ND - Not Detected

COI - Chemical of Interest

The maximum and minimum detection limits are reported only for samples reported as nondetects.

Shaded areas indicate chemical was detected in all samples.

[1] Amenable cyanide was retained as a COI since it is useful in interpreting total cyanide.

TABLE 2-4
SUMMARY OF SURFACE WATER DATA FROM MRP15 AND SELECTION OF COIs
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Minimum Detection Limit	Maximum Detection Limit	COI?
Volatile Organic Compounds (ug/L)									
1,1,1-Trichloroethane	7	ND	ND	0	7	0	1	1	no
1,2-Dichloroethene (total)	7	ND	ND	0	7	0	1	1	no
2-Butanone	7	3.2	8.7	2	0	29	10	10	yes
Acetone	7	3.4	38	4	3	57	10	10	yes
Benzene	7	ND	ND	0	7	0	1	1	no
Bromodichloromethane	7	ND	ND	0	7	0	1	1	no
Carbon disulfide	7	ND	ND	0	7	0	1	1	no
Chloromethane	7	ND	ND	0	7	0	1	1	no
Methylene chloride	7	ND	ND	0	7	0	1	1	no
Tetrachloroethene	7	ND	ND	0	7	0	1	1	no
Toluene	7	ND	ND	0	7	0	1	1	no
Trichloroethene	7	ND	ND	0	7	0	1	1	no
Vinyl chloride	7	ND	ND	0	7	0	1	1	no
Xylenes (total)	7	ND	ND	0	7	0	1	1	no
Semivolatile Organic Compounds (ug/L)									
2-Methylnaphthalene	7	ND	ND	0	7	0	2	2	no
Acenaphthene	7	ND	ND	0	7	0	2	2	no
Anthracene	7	ND	ND	0	7	0	1	1	no
Benzo(a)anthracene	7	ND	ND	0	7	0	0.13	0.13	no
Benzo(a)pyrene	7	ND	ND	0	7	0	0.2	0.2	no
Benzo(b)fluoranthene	7	ND	ND	0	7	0	0.18	0.18	no
Benzo(ghi)perylene	7	ND	ND	0	7	0	0.2	0.2	no
Benzo(k)fluoranthene	7	ND	ND	0	7	0	0.17	0.17	no
Butylbenzylphthalate	7	ND	ND	0	7	0	2	2	no
Carbazole	7	ND	ND	0	7	0	2	2	no
Chrysene	7	ND	ND	0	7	0	0.2	0.2	no
Dibenz(a,h)anthracene	7	ND	ND	0	7	0	0.2	0.2	no
Dibenzofuran	7	ND	ND	0	7	0	2	2	no
Fluoranthene	7	ND	ND	0	7	0	0.5	0.5	no

TABLE 2-4
SUMMARY OF SURFACE WATER DATA FROM MRP15
AND SELECTION OF COIs
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Minimum Detection Limit	Maximum Detection Limit	COI?
Fluorene	7	ND	1.1	1	6	14	1	1	yes
Indeno(1,2,3-cd)pyrene	7	ND	ND	0	7	0	0.2	0.2	no
Naphthalene	7	ND	ND	0	7	0	2	2	no
Phenanthrene	7	ND	ND	0	7	0	1	1	no
Pyrene	7	ND	ND	0	7	0	0.5	0.5	no
PCBs (ug/L)									
Aroclor 1248	7	ND	ND	0	7	0	0.5	0.5	no
Aroclor 1254	7	ND	ND	0	7	0	1	1	no
Aroclor 1260	7	ND	ND	0	7	0	1	1	no
Inorganic Compounds (ug/L)									
Aluminum -DISS	7	ND	ND	0	7	0	100	100	no
Chromium -DISS	7	ND	ND	0	7	0	20	20	no
Copper -DISS	7	8	8	1	6	14	10	10	yes
Iron -DISS	7	43.7	98	5	2	71	40	40	yes
Lead -DISS	7	ND	ND	0	7	0	3	3	no
Manganese -DISS	7	12.7	116	7	0	100	10	10	yes
Mercury -DISS	7	ND	ND	0	7	0	0.2	0.2	no
Silver -DISS	7	ND	ND	0	7	0	5	5	no
Zinc -DISS	7	33	91	7	0	100	20	20	yes
Amenable Cyanide	7	ND	ND	0	7	0	5	5	no
Cyanide, Total	7	ND	ND	0	7	0	5	5	no

ND - Not Detected
DISS - Dissolved
COI - Chemical of Interest

TABLE 2-5
SUMMARY OF SEDIMENT DATA FROM WETLANDS
AND SELECTION OF COIs
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Minimum Detection Limit	Maximum Detection Limit[1]	COI?
Volatile Organic Compounds (ug/kg)									
1,1,1-Trichloroethane	16	ND	ND	0	16	0	12	21	no
1,2-Dichloroethane (Total)	16	ND	ND	0	16	0	12	21	no
2-Butanone	16	ND	ND	0	16	0	12	21	no
Acetone	16	ND	180	2	14	13	12	21	yes
Benzene	16	ND	24	1	15	6	12	21	yes
Bromodichloromethane	16	ND	ND	0	16	0	12	21	no
Carbon disulfide	16	ND	ND	0	16	0	12	21	no
Chloromethane	16	ND	13	2	14	13	12	21	yes
Methylene chloride	16	ND	32	1	15	6	12	21	yes
Tetrachloroethylene	16	ND	4	4	12	25	12	21	yes
Toluene	16	ND	5	1	15	6	12	21	yes
Trichloroethylene	16	ND	ND	0	16	0	12	21	no
Vinyl Chloride	16	ND	ND	0	16	0	12	21	no
Xylenes (Total)	16	ND	ND	0	16	0	12	21	no
Semivolatile Organic Compounds (mg/kg)									
2-Methylnaphthalene	23	ND	ND	0	23	0	0.33	110	no
4-Methylphenol	16	ND	ND	0	16	0	0.48	110	no
Acenaphthene	23	ND	26	8	15	35	0.33	110	yes
Anthracene	23	ND	62	13	10	57	0.33	8.1	yes
Benzo(a)anthracene	23	ND	190	21	2	91	0.0083	8.1	yes
Benzo(a)pyrene	23	ND	160	22	1	96		8.1	yes
Benzo(b)fluoranthene	23	ND	220	22	1	96		0.54	yes
Benzo(g,h,i)perylene	23	ND	110	19	4	83	0.0083	8.1	yes
Benzo(k)fluoranthene	23	ND	74	21	2	91	0.5	8.1	yes
Butylbenzylphthalate	23	ND	ND	0	23	0	0.33	110	no
Carbazole	23	ND	46	12	11	52	0.33	8.1	yes
Chrysene	23	ND	23	20	3	87	0.33	8.1	yes
Dibenz(a,h)anthracene	23	ND	1.3	8	15	35	0.33	110	yes
Dibenzofuran	23	ND	15	5	18	22	0.33	8.1	yes
Fluoranthene	23	ND	450	22	1	96		8.1	yes
Fluorene	23	ND	25	7	16	30	0.33	8.1	yes

TABLE 2-5
SUMMARY OF SEDIMENT DATA FROM WETLANDS
AND SELECTION OF COIs
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Minimum Detection Limit	Maximum Detection Limit[1]	COI?
Indeno(1,2,3-cd)pyrene	23	ND	120	20	3	87	0.48	8.1	yes
Naphthalene	23	ND	11	4	19	17	0.33	8.1	yes
Phenanthrene	23	ND	360	16	7	70	0.33	0.86	yes
Phenol	16	ND	ND	0	16	0	0.48	110	no
Pyrene	23	0.032	420	23	0	100			yes
PCBs (mg/kg)									
Aroclor-1248	29	0.11	18	16	13	55	0.046	2.3	yes
Aroclor-1254	29	ND	6.6	22	7	76	0.055	4.1	yes
Aroclor-1260	29	ND	ND	0	29	0	0.048	4.6	no
Inorganic Compounds (mg/kg)									
Aluminum	16	6710	36600	16	0	100			yes
Chromium	16	16	54.4	16	0	100			yes
Copper	16	12.9	69.5	16	0	100			yes
Iron	16	12400	27900	16	0	100			yes
Lead	16	13.6	40.7	16	0	100			yes
Manganese	16	324	952	16	0	100			yes
Mercury	16	ND	ND	0	16	0	0.1	0.21	no
Silver	16	ND	ND	0	16	0	1.2	2	no
Zinc	16	56.5	163	16	0	100			yes
Cyanide, Total	23	0.6	1	16	7	70	0.32	0.47	yes
Cyanide, Amenable	7	ND	ND	0	7	0	0.32	0.47	yes

ND - Not Detected

COI - Chemical of Interest

The maximum and minimum detection limits are reported only for samples reported as nondetects.

Shaded areas indicate constituent was detected in all samples, or was not available.

Where there was only a single nondetect among all samples, the detection limit is persented in the "Maximum Detection Limit" column.

TABLE 2-6
SUMMARY OF SURFACE WATER DATA FROM WETLANDS
AND SELECTION OF COIs
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Minimum Detection Limit	Maximum Detection Limit	COI?
Volatile Organic Compounds (ug/L)									
1,1,1-Trichloroethane	3	ND	ND	0	3	0	10	10	no
1,2-Dichloroethane (Total)	3	ND	ND	0	3	0	10	10	no
2-Butanone	3	ND	ND	0	3	0	10	10	no
Acetone	3	ND	ND	0	3	0	10	10	no
Benzene	3	ND	ND	0	3	0	10	10	no
Bromodichloromethane	3	ND	ND	0	3	0	10	10	no
Carbon disulfide	3	ND	ND	0	3	0	10	10	no
Chloromethane	3	ND	ND	0	3	0	10	10	no
Methylene chloride	3	ND	ND	0	3	0	10	10	no
Tetrachloroethylene	3	ND	ND	0	3	0	10	10	no
Toluene	3	ND	ND	0	3	0	10	10	no
Trichloroethylene	3	ND	ND	0	3	0	10	10	no
Vinyl Chloride	3	ND	ND	0	3	0	10	10	no
Xylenes (Total)	3	ND	ND	0	3	0	10	10	no
Semivolatile Organic Compounds (ug/L)									
2-Methylnaphthalene	3	ND	ND	0	3	0	10	10	no
4-Methylphenol	3	ND	ND	0	3	0	10	10	no
Acenaphthene	3	ND	ND	0	3	0	10	10	no
Anthracene	3	ND	ND	0	3	0	10	10	no
Benzo(a)anthracene	3	ND	ND	0	3	0	10	10	no
Benzo(a)pyrene	3	ND	ND	0	3	0	10	10	no
Benzo(b)fluoranthene	3	ND	ND	0	3	0	10	10	no
Benzo(g,h,i)perylene	3	ND	ND	0	3	0	10	10	no
Benzo(k)fluoranthene	3	ND	ND	0	3	0	10	10	no
Butylbenzylphthalate	3	ND	ND	0	3	0	10	10	no
Carbazole	3	ND	ND	0	3	0	10	10	no
Chrysene	3	ND	ND	0	3	0	10	10	no
Dibenz(a,h)anthracene	3	ND	ND	0	3	0	10	10	no
Dibenzofuran	3	ND	ND	0	3	0	10	10	no
Fluoranthene	3	ND	ND	0	3	0	10	10	no
Fluorene	3	ND	ND	0	3	0	10	10	no
Indeno(1,2,3-cd)pyrene	3	ND	ND	0	3	0	10	10	no

TABLE 2-6
SUMMARY OF SURFACE WATER DATA FROM WETLANDS AND SELECTION OF COIs
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Minimum Detection Limit	Maximum Detection Limit	COI?
Naphthalene	3	ND	ND	0	3	0	10	10	no
Phenanthrene	3	ND	0.5	1	2	33	10	10	yes
Phenol	3	ND	ND	0	3	0	10	10	no
Pyrene	3	ND	2	1	2	33	10	10	yes
PCBs (ug/L)									
Aroclor-1248	3	ND	ND	0	3	0	1	1	no
Aroclor-1254	3	ND	ND	0	3	0	1	1	no
Aroclor-1260	3	ND	4.6	1	2	33	1	1	yes
Inorganic Compounds (ug/L)									
Aluminum	3	1500	3110	3	0	100			yes
Chromium	3	3.5	4	3	0	100			yes
Copper	3	5	10	3	0	100			yes
Iron	3	1530	4110	3	0	100			yes
Lead	3	3.2	6.4	3	0	100			yes
Manganese	3	370	801	3	0	100			yes
Mercury	3	ND	ND	0	3	0	0.2	0.2	no
Silver	3	ND	ND	0	3	0	5	5	no
Zinc	3	45	74	3	0	100			yes
Cyanide, Total	3	ND	ND	0	3	0	5	5	no

ND - Not Detected

COI - Chemical of Interest

The maximum and minimum detection limits are reported only for samples reported as nondetects.

Shaded areas indicate constituent was detected in all samples, or was not available.

TABLE 3-1
SELECTION OF COPECs IN MRP15 SEDIMENTS
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Number of J- or B-Coded Data	Percent J/B-coded Data[1]	Minimum Detection Limit	Maximum Detection Limit	Screening Benchmark	COPEC?	Rationale
Volatile Organic Compounds (ug/kg)													
2-Butanone	5	4.6	13	5	0	100	5	100	25	37	270	no	A
Acetone	5	22	97	5	0	100	2	NA	25	37	2600	no	A
Carbon disulfide	5	4.5	7.9	2	3	40	2	NA	6.3	9.1	0.85	yes	B
Semivolatile Organic Compounds (mg/kg)													
2-Methylnaphthalene	74	0.36	13	22	52	30	0	NA	0.25	52	34.3	no	A
4-Methylphenol	19	0.055	0.12	5	14	26	0	NA	0.033	0.074	0.67	no	A
Acenaphthene	74	0.36	91	30	44	41	0	NA	0.25	52	0.62	yes	B
Anthracene	74	0.27	11	26	48	35	6	NA	0.25	52	0.01	yes	B
Benzo(a)anthracene	74	0.034	40	66	8	89	32	NA	0.0067	5.2	0.019	yes	B
Benzo(a)pyrene	74	0.016	32	74	0	100	13	NA	0.0063	5.2	0.084	yes	B
Benzo(b)fluoranthene	74	0.027	38	73	1	99	10	NA	0.0063	5.2	0.037	yes	B
Benzo(ghi)perylene	74	0.022	17	69	5	93	22	NA	0.0073	5.2	0.013	yes	B
Benzo(k)fluoranthene	74	0.016	20	73	1	99	6	NA	0.0063	2.6	0.037	yes	B
Butylbenzylphthalate	74	0.595	0.595	1	73	1	0	NA	0.25	52	11	no	A,E
Carbazole	74	0.36	57	11	63	15	0	NA	0.25	52	22.5	yes	B
Chrysene	74	0.04175	40	58	16	78	33	NA	0.019	5.2	0.03	yes	B
Dibenz(a,h)anthracene	74	0.014	7.2	40	34	54	12	NA	0.0073	5.2	0.01	yes	B
Dibenzofuran	74	0.54	1.3	2	72	3	0	NA	0.25	52	2	no	A
Fluoranthene	74	0.02	130	74	0	100	13	NA	0.0073	5.2	0.033	yes	B
Fluorene	74	0.33	4.3	17	57	23	0	NA	0.25	52	0.01	yes	B
Indeno(1,2,3-cd)pyrene	74	0.013	12	61	13	82	28	NA	0.0073	5.2	0.03	yes	B
Naphthalene	74	0.47	82	31	43	42	0	NA	0.25	14	0.013	yes	B
Phenanthrene	74	0.45	75	32	42	43	13	NA	0.25	14	0.027	yes	B
Phenol	19	0.023	0.18	17	2	89	0	NA	0.017	0.028	0.031	yes	B
Pyrene	74	0.016	83	69	5	93	40	NA	0.0073	5.2	0.04	yes	B
PCBs (mg/kg)													
PCB-1248	72	ND	3.5	41	31	57	0	NA	0.041	2.7	1	yes	B
PCB-1254[3]	72	ND	0.68	1	71	1	0	NA	0.041	2.7	0.81	no	A,E
PCB-1260[3]	72	ND	0.099	1	71	1	0	NA	0.041	2.7	4500	no	A

TABLE 3-1
SELECTION OF COPECs IN MRP15 SEDIMENTS
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Number of J- or B-Coded Data	Percent J/B-coded Data[1]	Minimum Detection Limit	Maximum Detection Limit	Screening Benchmark	COPEC?	Rationale
Inorganics (mg/kg)													
Aluminum	21	3386	14991	21	0	100	0	NA			580008	no	A, F
Chromium	21	8.3	29.4	21	0	100	0	NA			39	no	A
Copper	25	8.1	91.8	25	0	100	0	NA			41	yes	B
Iron	21	7496	28517	21	0	100	0	NA			200000	no	A
Lead	25	7.9	83	25	0	100	0	NA			55	yes	B
Manganese	21	394	1099	21	0	100	0	NA			730	yes	B
Silver	21	ND	0.315	5	16	24	5	NA	0.661	1.19	1	no	A
Zinc	25	24.6	261.8	25	0	100	0	NA			110	yes	B
Amenable Cyanide	39	ND	ND	0	39	0	0	NA	0.31	0.58	1	no	A[2]
Total Cyanide	39	ND	0.68	1	38	3	0	NA	0.31	0.58	5	no	A

ND - Not Detected

COPEC - Chemical of Potential Ecological Concern

The maximum and minimum detection limits are reported only for samples reported as nondetects.

Shaded areas indicate constituent was detected in all samples, or was not available.

[1] This was only calculated if the constituent was detected, and all detections were j- or b-coded. Otherwise "NA" is indicated as not applicable.

[2] Amenable cyanide was used as an indicator of the potentially toxic, free or readily dissociable form of cyanide.

[3] Detections will be included in evaluation of risk associated with total PCBs

A - Maximum COI concentration did not exceed screening value.

B - Maximum COI concentration exceeded screening value.

C - a screening benchmarks was not available, and the constituent was detected at least once in which the value was not j- or b-qualified.

D - a screening benchmark was not available, all detections were either j-or b-coded, and the constituent was detected in less than 10 percent of the samples.

E - constituent was detected at relatively low concentrations in less than 5 percent of the samples collected.

F - See text: the aluminum ER-L Screening Benchmark was determined to be unreliable - the ER-M benchmark is used; 58,000 mg/kg

G - Cyanide was not selected as a COPEC because amenable cyanide was not detected.

TABLE 3-2
SELECTION OF COPECs IN WETLAND SEDIMENTS
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Number of J- or B-Coded Data	Percent J/B-coded Data[1]	Minimum Detection Limit	Maximum Detection Limit1	Screening Benchmark	COPEC?	Rationale
Volatile Organic Compounds (ug/kg)													
Acetone	16	ND	180	2	14	13	2	13	12	21	2600	no	A
Benzene	16	ND	24	1	15	6	0	NA	12	21	57	no	A
Chloromethane	16	ND	13	2	14	13	2	13	12	21	17900	no	A
Methylene chloride	16	ND	32	1	15	6	1	6	12	21	370	no	A
Tetrachloroethylene	16	ND	4	4	12	25	4	25	12	21	940	no	A
Toluene	16	ND	5	1	15	6	1	6	12	21	670	no	A
Semivolatile Organic Compounds (mg/kg)													
Acenaphthene	23	ND	26	8	15	35	8	35	0.33	110	0.62	yes	B
Anthracene	23	ND	62	13	10	57	13	57	0.33	8.1	0.01	yes	B
Benzo(a)anthracene	23	ND	190	21	2	91	15	NA	0.0083	8.1	0.019	yes	B
Benzo(a)pyrene	23	ND	160	22	1	96	11	NA		8.1	0.084	yes	B
Benzo(b)fluoranthene	23	ND	220	22	1	96	12	NA		0.54	0.037	yes	B
Benzo(g,h,i)perylene	23	ND	110	19	4	83	10	NA	0.0083	8.1	0.013	yes	B
Benzo(k)fluoranthene	23	ND	74	21	2	91	13	NA	0.5	8.1	0.037	yes	B
Carbazole	23	ND	46	12	11	52	12	52	0.33	8.1	22.5	yes	B
Chrysene	23	ND	23	20	3	87	14	NA	0.33	8.1	0.03	yes	B
Dibenz(a,h)anthracene	23	ND	1.3	8	15	35	8	35	0.33	110	0.01	yes	B
Dibenzofuran	23	ND	15	5	18	22	5	22	0.33	8.1	2	yes	B
Fluoranthene	23	ND	450	22	1	96	8	NA		8.1	0.033	yes	B
Fluorene	23	ND	25	7	16	30	7	30	0.33	8.1	0.01	yes	B
Indeno(1,2,3-cd)pyrene	23	ND	120	20	3	87	14	NA	0.48	8.1	0.03	yes	B
Naphthalene	23	ND	11	4	19	17	4	17	0.33	8.1	0.013	yes	B
Phenanthrene	23	0.045	360	16	7	70	10	NA	0.33	0.86	0.027	yes	B
Pyrene	23	0.032	420	23	0	100	13	NA			0.04	yes	B
PCBs (mg/kg)													
Aroclor-1248	29	ND	18	16	13	55	0	NA	0.046	2.3	1	yes	B
Aroclor-1254	29	ND	18	22	7	76	0	NA	0.055	4.1	0.81	yes	B
Inorganic Compounds (mg/kg)													
Aluminum	16	6710	36600	16	0	100	16	100			580008	no	A,E
Chromium	16	16	54.4	16	0	100	16	100			39	yes	B
Copper	16	12.9	69.5	16	0	100	0	NA			41	yes	B
Iron	16	12400	27900	16	0	100	16	100			200000	no	A
Lead	16	13.6	40.7	16	0	100	0	NA			55	no	A
Manganese	16	324	952	16	0	100	0	NA			730	yes	B

TABLE 3-2
SELECTION OF COPECs IN WETLAND SEDIMENTS
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Number of J- or B-Coded Data	Percent J/B-coded Data[1]	Minimum Detection Limit	Maximum Detection Limit1	Screening Benchmark	COPEC?	Rationale
Zinc	16	56.5	163	16	0	100	0	NA			110	yes	B
Cyanide, Total	23	ND	1	16	7	70	16	100	0.32	0.47	5.0	no	A
Cyanide, Amenable	7	ND	ND	0	7	0	0	NA	0.32	0.47	1.0	no	A

ND - Not Detected

COPEC - Chemical of Potential Ecological Concern

The maximum and minimum detection limits are reported only for samples reported as nondetects.

Shaded areas indicate constituent was detected in all samples, or was not available.

Where there was only a single nondetect among all samples, the detection limit is persented in the "Maximum Detection Limit" column.

[1] This was only calculated if the constituent was detected, and all detections were j- or b-coded. Otherwise "NA" is indicated as not applicable.

A - Maximum COI concentration did not exceed screening value.

B - Maximum COI concentration exceeded screening value.

C - a screening benchmarks was not available, and the constituent was detected at least once in which the value was not j- or b-qualified.

D - a screening benchmark was not available, all detections were either j-or b-coded, and the constituent was detected in less than 10 percent of the samples.

E - See text: the aluminum ER-L Screening Benchmark was determined to be unreliable - the ER-M benchmark is used; 58,000 mg/kg

TABLE 3-3
SELECTION OF COPECs IN MRP15 SURFACE WATER
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Number of J- or B-Coded Data	Percent J/B-coded Data[1]	Minimum Detection Limit	Maximum Detection Limit	Screening Benchmark	COPEC?	Rationale
Volatile Organic Compounds (ug/L)													
2-Butanone	7	3.2	8.7	2	0	29	2	29	10	10	263418	no	A
Acetone	7	3.4	38	4	3	57	2	NA	10	10	507640	no	A
Semivolatile Organic Compounds (ug/L)													
Fluorene	7	ND	1.1	1	6	14	0	NA	1	1	3.9	no	A
Inorganic Compounds (ug/L)													
Copper -DISS	7	8	8	1	6	14	0	NA	10	10	35	no	A
Iron -DISS	7	43.7	98	5	2	71	0	NA	40	40	1000	no	A
Manganese -DISS	7	12.7	116	7	0	100	0	NA	10	10	120	no	A
Zinc -DISS	7	33	91	7	0	100	0	NA	20	20	450	no	A

ND - Not Detected

DISS - Dissolved

COPEC - Chemical of Potential Ecological Concern

The maximum and minimum detection limits are reported only for samples reported as nondetects.

[1] This was only calculated if the constituent was detected, and all detections were j- or b-coded. Otherwise "NA" is indicated as not applicable.

A - Maximum COI concentration did not exceed screening value.

B - Maximum COI concentration exceeded screening value.

C - a screening benchmarks was not available, and the constituent was detected at least once in which the value was not j- or b-qualified.

D - a screening benchmark was not available, all detections were either j-or b-coded, and the constituent was detected in less than 10 percent of the samples.

TABLE 3-4
SELECTION OF COPECs IN WETLAND SURFACE WATER
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL	Number of Samples	Minimum Conc.	Maximum Conc.	Number of Detections	Number of Nondetects	Percent Detections	Number of J- or B-Coded Data	Percent J/B-coded Data[1]	Minimum Detection Limit	Maximum Detection Limit	Screening Benchmarks	COPEC?	Rationale
Semivolatile Organic Compounds (ug/L)													
Phenanthrene	3	ND	0.5	1	2	33	1	33	10	10	6.3	no	A
Pyrene	3	ND	2	1	2	33	1	33	10	10	61	no	A
PCBs (ug/L)													
Aroclor-1260	3	ND	4.6	1	2	33	0	NA	1	1	1.3	yes	B
Inorganic Compounds (ug/L)													
Aluminum	3	1500	3110	3	0	100	0	NA			3290	no	A
Chromium	3	3.5	4	3	0	100	3	100			40	no	A
Copper	3	5	10	3	0	100	3	100			35	no	A
Iron	3	1530	4110	3	0	100	0	NA			1000	yes	B
Lead	3	3.2	6.4	3	0	100	0	NA			30	no	A
Manganese	3	370	801	3	0	100	0	NA			120	yes	B
Zinc	3	45	74	3	0	100	0	NA			450	no	A

ND - Not Detected

COPEC - Chemical of Potential Ecological Concern

The maximum and minimum detection limits are reported only for samples reported as nondetects.

Shaded areas indicate constituent was detected in all samples, or was not available.

[1] This was only calculated if the constituent was detected, and all detections were j- or b-coded. Otherwise "NA" is indicated as not applicable.

A - Maximum COI concentration did not exceed screening value.

B - Maximum COI concentration exceeded screening value.

C - a screening benchmarks was not available, and the constituent was detected at least once in which the value was not j- or b-qualified.

D - a screening benchmark was not available, all detections were either j-or b-coded, and the constituent was detected in less than 10 percent of the samples.

TABLE 3-5
MRP15 SEDIMENT SCREENING RESULTS FOR HUMAN HEALTH
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL OF INTEREST	Number of Samples	Percent Detections	Maximum Concentration	Maximum Detection Limit[1]	Screening Level	Retain as COPC?	Rationale
Volatile Organic Compounds (mg/kg)							
2-Butanone	5	100	0.013	0.037	NAP	No	A
Acetone	5	100	0.097	0.037	NAP	No	A
Carbon disulfide	5	40	0.0079	0.0091	NAP	No	A
Semivolatile Organic Compounds (mg/kg)							
2-Methylnaphthalene	74	30	13	52	NAP	No	A
4-Methylphenol	19	26	0.12	0.074	310,000	No	A
Acenaphthene	74	41	91	52	NAP	No	A
Anthracene	74	35	11	52	NAP	No	A
Benzo(a)anthracene	74	89	40	5.2	1,200	No	A
Benzo(a)pyrene	74	100	32	5.2	120	No	A
Benzo(b)fluoranthene	74	99	38	5.2	1,200	No	A
Benzo(ghi)perylene	74	93	17	5.2	NAP	No	A
Benzo(k)fluoranthene	74	99	20	2.6	12,000	No	A
Butylbenzylphthalate	74	1	0.595	52	NAP	No	A,C
Carbazole	74	15	57	52	24,000	No	A
Chrysene	74	78	40	5.2	120,000	No	A
Dibenz(a,h)anthracene	74	54	7.2	5.2	120	No	A
Dibenzofuran	74	3	1.3	52	510,000	No	A,C
Fluoranthene	74	100	130	5.2	NAP	No	A
Fluorene	74	23	4.3	52	NAP	No	A
Indeno(1,2,3-cd)pyrene	74	82	12	5.2	1,200	No	A
Naphthalene	74	42	82	14	NAP	No	A
Phenanthrene	74	43	75	14	NAP	No	A
Phenol	19	89	0.18	0.028	NAP	No	A
Pyrene	74	93	83	5.2	NAP	No	A
PCBs (mg/kg)							
PCB-1248	72	57	3.5	2.7	330	Yes	F
PCB-1254	72	1	0.68	2.7	330	No	A,C
PCB-1260	72	1	0.099	2.7	330	No	A,C
Inorganics (mg/kg)							
Aluminum	21	100	14991		NAP	No	A
Chromium	21	100	29.4		91,000	No	A
Copper	25	100	91.8		NAP	No	A
Iron	21	100	28517		NA	No	E
Lead	25	100	83		400	No	A
Manganese	21	100	1099		NAP	No	A
Silver	21	24	0.247J	1.19	550,000	No	A
Zinc	25	100	261.8		NAP	No	A,E
Total Cyanide	39	3	0.68	0.58	NAP	No	A,C,D

[1] Maximum detection limit includes detection limits for reported NDs. Maximum detection limit is equivalent to the SQL.

Shaded areas indicate the constituent was detected in all samples.

A - Maximum COI concentration did not exceed screening value.

B - Maximum COI concentration exceeded screening value.

C - COI was detected at low concentrations in less than 5% of the samples collected.

D - Also, amenable cyanide was not detected (Table 3-1), indicating cyanide is not bioavailable.

E - Not retained because constituent is an essential nutrient when present at relatively low concentrations and only toxic at high doses.

F - Retained as a COPC because constituent may bioaccumulate and pose a risk through the route of fish ingestion.

G - Retained as a COPC because there was no screening level value for comparison to SQLs.

COPC - Chemical of Potential Concern

NA - Not available. ND - Not detected.

NAP - Not applicable; calculated screening level exceeds level of pure product.

TABLE 3-6
WETLAND SEDIMENT SCREENING RESULTS
FOR HUMAN HEALTH
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL OF INTEREST	Number of Samples	Percent Detections	Maximum Concentration	Maximum Detection Limit[1]	Screening Level	Retain as COPC?	Rationale
Volatile Organic Compounds (ug/kg)							
Acetone	16	63	180	14	NAP	No	A
Benzene	16	6	24	21	17,000	No	A
Chloromethane	16	13	13	21	37,000	No	A
Methylene chloride	16	6	32	21	65,000	No	A
Tetrachloroethylene	16	6	4	21	9,300	No	A
Toluene	16	6	5	21	NAP	No	A
Semivolatile Organic Compounds (mg/kg)							
Acenaphthene	23	35	26	8.1	NAP	No	A
Anthracene	23	57	62	8.1	NAP	No	A
Benzo(a)anthracene	23	91	190	8.1	1,200	No	A
Benzo(a)pyrene	23	96	160	8.1	120	No	A
Benzo(b)fluoranthene	23	96	220	0.54	1,200	No	A
Benzo(g,h,i)perylene	23	83	110	8.1	NAP	No	A
Benzo(k)fluoranthene	23	91	74	8.1	12,000	No	A
Carbazole	23	52	46	8.1	24,000	No	A
Chrysene	23	87	23	8.1	120,000	No	A
Dibenz(a,h)anthracene	23	35	1.3	110	120	No	A
Dibenzofuran	23	22	15	8.1	510,000	No	A
Fluoranthene	23	96	450	8.1	NAP	No	A
Fluorene	23	30	25	8.1	NAP	No	A
Indeno(1,2,3-cd)pyrene	23	87	120	8.1	1,200	No	A
Naphthalene	23	17	11	8.1	NAP	No	A
Phenanthrene	23	70	360	0.86	NAP	No	A
Pyrene	23	100	420		NAP	No	A
PCBs (mg/kg)							
Aroclor-1248	29	55	18	2.3	330	Yes	F
Aroclor-1254	29	76	18	4.1	330	Yes	F
Inorganic Compounds (mg/kg)							
Aluminum	16	100	36600		NAP	No	A
Chromium	16	100	54.4		91,000	No	A
Copper	16	100	69.5		NAP	No	A
Iron	16	100	27900		NA	No	E
Lead	16	100	40.7		400	No	A
Manganese	16	100	952		NAP	No	A
Zinc	16	100	163		NAP	No	A,E
Cyanide, Total	23	70	1	0.47	NAP	No	A
Cyanide, Amenable	7	0	ND	0.47	NAP	No	A

[1] Maximum detection limit includes detection limits for reported NDs. Maximum detection limit is equivalent to the SQL.

A - Maximum COI concentration did not exceed screening value.

B - Maximum COI concentration exceeded screening value.

C - COI was detected at low concentrations in less than 5% of the samples collected.

E - Not retained because constituent is an essential nutrient when present at relatively low concentrations and only toxic at high doses.

F - Retained as a COPC because constituent may bioaccumulate and pose a risk through the route of fish ingestion.

G - Retained as a COPC because there was no screening level value for comparison to SQLs.

COPC - Chemical of Potential Concern

NA - Not available.

NAP - Not applicable; calculated screening level exceeds level of pure product.

ND - Not detected.

TABLE 3-7
MRP15 SURFACE WATER SCREENING RESULTS FOR HUMAN HEALTH
ALCOA-DAVENPORT WORKS
RIVERDALE, IOWA

CHEMICAL	Number of Samples	Percent Detections	Maximum Concentration	Maximum Detection Limit[1]	Screening Level[2]	Retain as COPC?	Rationale
Volatile Organic Compounds (ug/L)							
2-Butanone	7	29	8.7	10	8,000,000	No	A
Acetone	7	57	38	10	1,500,000	No	A
Semivolatile Organic Compounds (ug/L)					610		
Fluorene	7	14	1.1	1	8,000	No	A
Inorganic Compounds (ug/L)					240		
Copper -DISS	7	14	8	10	610,000	No	A
Iron -DISS	7	71	98	40	NA	No	E
Manganese -DISS	7	100	116	10	1,200,000	No	A
Zinc -DISS	7	100	91	20	4,600,000	No	A

[1] Maximum detection limit includes detection limits reported for NDs. Maximum detection limit is equivalent to the SQL.

[2] From Appendix D

A - Maximum COI concentration did not exceed screening value.

E - Not retained because constituent is an essential nutrient when present at relatively low concentrations and only toxic at high doses.

TABLE 3-8
WETLAND SURFACE WATER SCREENING RESULTS
FOR HUMAN HEALTH
ALCOA-DAVENPORT WORKS
RIVERDALE, IOWA

CHEMICAL OF INTEREST	Number of Samples	Percent Detections	Maximum Concentration	Maximum Detection Limit[1]	Screening Level[2]	Retain as COPC?	Rationale
Semivolatile Organic Compounds (ug/L)							
Phenanthrene	3	33	0.5	10	6,000	No	A
Pyrene	3	33	2	10	3,000	No	A
PCBs (ug/L)							
Aroclor-1260	3	33	4.6	1	0.2	Yes	B,F
Inorganic Compounds (ug/L)							
Aluminum	3	100	3110		15,000,000	No	A
Chromium	3	100	4		5,000,000	No	A
Copper	3	100	10		610,000	No	A
Iron	3	100	4110		NA	No	E
Lead	3	100	6.4		15	No	A
Manganese	3	100	801		1,200,000	No	A
Zinc	3	100	74		4,600,000	No	A,E

[1] Maximum detection limit includes detection limits reported for NDs. Maximum detection limit is equivalent to the SQL.
[2] See Appendix D, except for lead, see text.

A - Maximum COI concentration did not exceed screening value.
B - Maximum COI concentration exceeded screening value.
E - Not retained because constituent is an essential nutrient when present at relatively low concentrations and only toxic at high doses.
F - Retained as a COPC because constituent may bioaccumulate and pose a risk through the route of fish ingestion.

COPC - Chemical of Potential Concern
NA - Not available.
NAP - Not applicable; calculated screening level exceeds level of pure product.
ND - Not detected.

POOL 15
MISSISSIPPI RIVER

ALCOA – DAVENPORT WORKS
Riverdale, Iowa

Woodward-Clyde
Engineering & sciences applied to the earth & its environment
Franklin, Tennessee

SCALE: Not to Scale	DRAWN BY: BL	DATE: 1/28/98	
	CHECKED BY: CMC	DATE: 1/28/98	
D:\CADFILES\ALCOA\FIGURES\FIG2-1P3.DWG		11x17: P3570(.3,.3)	

Phase III Investigation Study Areas

PROJ. NO. 95N190/120

FIG. NO. 2-1

APPENDIX A

PRELIMINARY IDENTIFICATION OF CONTAMINANTS OF CONCERN ECOLOGICAL RISK ASSESSMENT MISSISSIPPI RIVER POOL 15 RI/FS OVERSIGHT RIVERDALE, IOWA

(Jacobs Engineering Group, Inc. 1994)

U.S. ENVIRONMENTAL PROTECTION AGENCY

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY

REGIONS VI, VII, AND VIII

PRELIMINARY IDENTIFICATION OF CONTAMINANTS OF CONCERN ECOLOGICAL RISK ASSESSMENT MISSISSIPPI RIVER POOL 15 RI/FS OVERSIGHT RIVERDALE, IOWA

U.S. EPA CONTRACT NO. 68-W8-0122
U.S. EPA WORK ASSIGNMENT NO. 71-7PP8
U.S. EPA REGION VII

PREPARED BY

JACOBS ENGINEERING GROUP INC.
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(913) 492-9218
PROJECT NO. 12-0271-00

JUNE 1994

PRELIMINARY IDENTIFICATION OF CONTAMINANTS OF CONCERN RATIONALE FOR THE MISSISSIPPI RIVER POOL 15

The data used to determine the contaminants of potential ecological concern (COPECs) were derived from the September 1992 On-site Sediment Sampling Results. Phase 1A - SIS prepared by Woodward-Clyde Consultants. The list of COPECs below may be revised if further characterization of the outfalls is conducted. Surface water and sediment tables were created for metals and pesticides, semivolatile organic compounds, and volatile organic compounds. The frequency of detection and the range of detection were tabulated from the data for each contaminant that was detected. Some of the data used to select COPECs were qualified. "J" and "B" codes are estimated values. Reported values were obtained from a reading that was less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL). "P" coded data apply to PCBs and are defined as having a greater than 25 percent difference for detected concentrations between the two GC columns. The lower of the two values is reported and flagged with a "P."

Available regulatory levels utilized in selecting the COPEC were limited, particularly for sediment samples. For surface water, Ambient Water Quality Criteria and Iowa Water Quality Standards were utilized to determine the COPECs. Criteria used for sediment were the Effects Range Low (ER-L) and the Effects Range Medium (ER-M) from *The Potential for Biological Effects of Sediment-sorbed Contaminants Tested in the National Status and Trends Program (National Oceanic and Atmospheric Administration).* No background surface water or sediment samples were collected. In the absence of site-specific background levels, typical background levels of inorganic chemicals in oven-dried soils were included in the sediment tables to provide a reference concentration for general comparison. It is recognized that the levels in the oven-dried soils are not site-specific. Also, these concentrations in terrestrial soils are not directly comparable to aquatic sediments. These background levels in soil were used in conjunction with the ER-L and ER-M levels in selecting the COPECs.

The following factors were considered in selecting the COPECs:

Criteria Available

- If the contaminant was detected at least once at a concentration exceeding any of the criteria, it was identified as a COPEC. If a contaminant was detected at concentrations below the listed criteria, it was not selected as a COPEC. This factor overrides all others listed below. The one exception to this rule is with nickel in sediment (see Table 4).

Criteria Unavailable

- For volatile and semivolatile organic compounds, if at least one detection for a particular contaminant was not "J"-coded, that contaminant was selected as a COPEC.

- A contaminant was selected as a COPEC if all the detections for a particular contaminant were "J" or "B" - coded and the contaminant was detected in over 10% of the samples.

- If all the detections for a particular contaminant were "J" or "B" - coded and less than 10% of the samples had hits then the contaminant was not selected as a COPEC.

- In the case of inorganic contaminants, if no criteria were available and the contaminant was known to be of low toxicity, it was not selected as a COPEC at this time (e.g., magnesium). Those contaminants that had detections in most or all of the samples and had medium to high toxicity risks were identified as COPECs (e.g., manganese in surface water and sediment). In the case of the sediment samples, if no criteria were available, the contaminant significantly exceeded the reference soil concentration, and was of questionable toxicity, then it was selected as a COPEC. These selections may be revised when and if site-specific background levels become available.

The following exceptions and special considerations were made when selecting inorganic contaminants:

- Although aluminum is not a highly toxic contaminant, since Mississippi River Pool 15 is adjacent to and receives waste water from the Aluminum Company of America, and since the concentrations of aluminum are very high both in the surface water and sediment, it was selected as a COPEC at this time.

The list below summarizing the COPECs may be revised as additional information, such as site-specific background levels or additional regulatory levels, becomes available.

METALS AND PESTICIDES

aluminum
chromium
copper
iron
lead
manganese
mercury
silver
zinc
cyanide
aroclor 1248
aroclor 1254
aroclor 1260

VOLATILE ORGANIC COMPOUNDS

acetone
benzene
bromodichloromethane
2-butanone
carbon disulfide
chloromethane
1,2-dichloroethene
methylene chloride
tetrachloroethene
toluene
1,1,1-trichloroethane
trichloroethene
vinyl chloride
xylene

SEMIVOLATILE ORGANIC COMPOUNDS

acenaphthene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(g,h,i)perylene
butylbenzylphthalate
carbazole
chrysene
dibenz(a,h)anthracene
dibenzofuran
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
4-methylphenol
naphthalene
phenanthrene
phenol
pyrene

Following consensus of the COPECs, species-specific toxicological information for each COPEC will be researched and summarized. This information will then be used in preparing an ecological risk assessment for MRP15.

TABLE 1
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SURFACE WATER - METALS AND PESTICIDES
(ppb)

CONTAMINANTS	FREQUENCY OF DETECTION[1]	RANGE OF DETECTION	AWQC ACUTE FRESHWATER	AWQC CHRONIC FRESHWATER[2]	IOWA RECORDS ACUTE[3]	IOWA RECORDS CHRONIC[3]	CHEMICAL SELECTED AS COPEC?
Aluminum	19/23	127B - 51,900	pH dependent[4]	pH dependent	N/A	N/A	Yes[a]
Arsenic	9/23	3B - 15.6	360*[4]	190*[4]	360	200	No[b]
Barium	21/23	7B - 442	N/A	N/A	N/A	N/A	No[d]
Beryllium	2/23	2B - 2B	130+[2]	5.3+[2]	N/A	N/A	No[b]
Chromium*	4/23	3B - 65	16[2]	11[2]	60	40	Yes[a]
Copper	11/23	5B - 493	18**[2]	12**[2]	60	35	Yes[a]
Iron	17/23	238 - 19,600	N/A	1,000[2]	N/A	N/A	Yes[a]
Lead	14/23	1.1B - 25.6	83[2]	3.2[2]	200	30	Yes[a]
Magnesium	23/23	12,100 - 52,200	N/A	N/A	N/A	N/A	No[d]
Manganese	23/23	35 - 1,620	N/A	N/A	N/A	N/A	Yes[c]
Mercury	3/23	0.23 - 0.25	2.4[2]	0.012[2]	6.5	0.05	Yes[a]
Nickel	2/23	17B - 19B	1,400[2]	160**[2]	5,800	650	No[b]
Vanadium	3/23	15B - 40B	N/A	N/A	N/A	N/A	No[d]
Zinc	5/23	38 - 232	120**[2]	110**[2]	500	450	Yes[a]
Cyanide	5/23	6 - 12.9	22[2]	5.2[2]	45	10	Yes[a]

TABLE 1
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SURFACE WATER - METALS AND PESTICIDES
(ppb)

CONTAMINANTS	FREQUENCY OF DETECTION[1]	RANGE OF DETECTION	AWQC ACUTE FRESHWATER	AWQC CHRONIC FRESHWATER[2]	IOWA RECORDS ACUTE[3]	IOWA RECORDS CHRONIC[3]	CHEMICAL SELECTED AS COPEC?
Aroclor 1248	4/23	1.1 - 1.4	N/A	0.014[4]	2	0.0004	Yes[a]
Aroclor 1254	2/23	1.1 - 1.5P	N/A	0.014[4]	2	0.0004	Yes[a]
Aroclor 1260	1/23	4.6	N/A	0.014[4]	2	0.0004	Yes[a]

* Chromium (VI) standards are used.
\+ Insufficient data to develop criteria. Value presented is Lowest Observed Effect Level (LOEL).
** Hardness dependent criteria (100mg/L $CaCO_3$ used)

a. Detected at a concentration exceeding listed criteria.
b. No detected concentrations exceed listed criteria.
c. Contaminant is of moderate to high toxicity.
d. Contaminant does not have a high toxicity.
e. Selected since Aluminum Company of America (ALCOA) directly affects the outfalls and the concentrations are very high.

1. Woodward-Clyde Consultants, September 1992, Onsite Sediment Sampling Results, Phase IA - SIS, prepared for Aluminum Company of America (ALCOA), Davenport Facility, Riverdale, Iowa.
2. U.S. Environmental Protection Agency, May 1991, Ambient Water Quality Criteria for the Protection of Aquatic Life, from Water Quality Criteria Summary (poster).
3. The Bureau of National Affairs, Inc., April 19, 1991, Iowa Water Quality Standards.
4. Office of Science and Technology, Standards and Applied Science Division, Office of Water, U.S. Environmental Protection Agency, December 1992, Revised Water Standards.

TABLE 2
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SURFACE WATER - SEMIVOLATILE ORGANIC COMPOUNDS
(ppb)

CONTAMINANTS	FREQUENCY OF DETECTION[1]	RANGE OF DETECTION	AWQC ACUTE FRESHWATER[2]	AWQC CHRONIC FRESHWATER[2]	CHEMICAL SELECTED AS COPEC?
Anthracene	1/23	0.5J	N/A	N/A	No[d]
Benzo(a)anthracene	2/23	0.6J - 2J	N/A	N/A	No[d]
Benzo(a)pyrene	2/23	0.6J - 2J	N/A	N/A	No[d]
Benzo(b) fluoranthene	3/23	0.9J - 4J	N/A	N/A	Yes[c]
Benzo(k)fluoranthene	2/23	1J - 1J	N/A	N/A	No[d]
Bis(2-ethylhexyl)phthalate	1/23	1J	400	360	No[b]
Chrysene	2/23	0.9J - 2J	N/A	N/A	No[d]
Fluoranthene	4/23	1J - 6J	3,980*	N/A	No[b]
Phenanthrene	5/23	0.5J - 3J	/p/ 30	/p/ 6,3	No[b]
Phenol	1/23	2J	10,200*	2,560*	No[b]
Pyrene	5/23	0.6J - 6J	N/A	N/A	Yes[c]
2,4,6-Trichlorophenol	4/23	0.8J - 6J	N/A	970*	No[b]

* Insufficient data to develop criteria. Value presented is Lowest Observed Effect Level (LOEL)
/p/ Proposed criteria.
\- No lown criteria available.

TABLE 3
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SURFACE WATER - SEMIVOLATILE ORGANIC COMPOUNDS
(ppb)

a. Detected at a concentration exceeding listed criteria.
b. No detected concentrations exceed listed criteria.
c. Over 10% of samples had hits; all these detected concentrations were "J" or "B" - coded.
d. Less than 10% of samples had hits; all detected concentrations were "J" or "B" - coded.

1. Woodward-Clyde Consultants, September 1992, Onsite Sediment Sampling Results, Phase IA - SIS, prepared for Aluminum Company of America (ALCOA), Davenport Facility, Riverdale, Iowa.
2. U.S. Environmental Protection Agency, May 1991, Ambient Water Quality Criteria for the Protection of Aquatic Life, from Water Quality Criteria Summary (poster).

TABLE 3
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SURFACE WATER - VOLATILE ORGANIC COMPOUNDS
(ppb)

CONTAMINANTS	FREQUENCY OF DETECTION[1]	RANGE OF DETECTION	AWQC ACUTE FRESHWATER[2]	AWQC CHRONIC FRESHWATER[2]	IOWA RECORDS ACUTE[3]	IOWA RECORDS CHRONIC[3]	CHEMICAL SELECTED AS COPEC?
Acetone	1/23	12	N/A	N/A	N/A	N/A	Yes[e]
Bromodichloromethane	7/23	2J - 8J	N/A	N/A	N/A	N/A	Yes[c]
Chloroform	13/23	3J - 9J	28,900*	1,240*	N/A	N/A	No[b]
Chloromethane	1/23	7J	N/A	N/A	N/A	N/A	No[d]
1,1-Dichloroethane	1/23	4J	N/A	N/A	N/A	N/A	No[d]
1,2-Dichloroethene	10/23	2J - 1,700	N/A	N/A	N/A	N/A	Yes[e]
Tetrachloroethene (PCE)	10/23	2J - 4,300	N/A	N/A	N/A	N/A	Yes[e]
Toluene	1/23	12	17,500*	N/A	2,500	50	No[b]
Trichloroethene (TCE)	6/23	8J - 200J	N/A	N/A	N/A	N/A	Yes[e]
Vinyl Chloride	3/23	4J - 170	N/A	N/A	N/A	N/A	Yes[e]

* Insufficient data to develop criteria. Value presented is Lowest Observed Effect Level (LOEL).

a. Detected at a concentration exceeding listed criteria.
b. No detected concentrations exceed listed criteria.
c. Over 10% of samples had hits; all these detected concentrations were "J" or "B" - coded.
d. Less than 10% of samples had hits; all detected concentrations were "J" or "B" - coded.
e. At least one detection is not "J" - coded.

TABLE 3
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SURFACE WATER - VOLATILE ORGANIC COMPOUNDS
(ppb)

1. Woodward-Clyde Consultants, September 1992, Onsite Sediment Sampling Results, Phase IA - SIS, prepared for Aluminum Company of America (ALCOA), Davenport Facility, Riverdale, Iowa.
2. U.S. Environmental Protection Agency, May 1991, Ambient Water Quality Criteria for the Protection of Aquatic Life, from Water Quality Criteria Summary (poster).
3. The Bureau of National Affairs, Inc., April 19, 1991, Iowa Water Quality Standards.

TABLE 4
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPEC)
SEDIMENT - METALS AND PESTICIDES
(ppm)

CONTAMINANTS	FREQUENCY OF DETECTION[1]	RANGE OF DETECTION	REFERENCE CONCENTRATIONS[1]	ER-M NOAA VALUES[2]	ER-L NOAA VALUES[2]	CHEMICAL SELECTED AS COPEC?
Aluminum	64/64	4,420 - 52,300	71,000	N/A	N/A	Yes[a]
Arsenic	64/64	0.99B - 9	6	85	33	No[b]
Barium	64/64	27.2B - 259	500	N/A	N/A	No[d]
Beryllium	59/64	0.46B - 2.5	6	N/A	N/A	No[d]
Cadmium	34/64	0.7B - 2.5	0.06	9	5	No[b]
Chromium	63/64	12 - 92.8	100	145	80	Yes[a]
Cobalt	64/64	2.6B - 12.4B	8	N/A	N/A	No[d]
Copper	64/64	10.6 - 2,150	20	390	70	Yes[a]
Iron	64/64	6,400 - 213,000	38,000	N/A	1,000	Yes[a]
Lead	64/64	7.8J - 5520J	10	110	35	Yes[a]
Magnesium	64/64	2,420 - 33,800	5,000	N/A	N/A	No[d]
Manganese	64/64	83.7J - 962J	850	N/A	N/A	Yes[c]
Mercury	13/64	0.13 - 4.5	0.03	1.3	0.15	Yes[a]
Nickel	54/64	8B - 35.9	40	50	30	No[d]
Selenium	15/64	0.53B - 1.4	0.2	N/A	N/A	No[d]
Silver	10/64	1.4B - 4.9	0.1	2.2	1	Yes[a]
Thallium	11/64	0.25B - 0.63	0.1	N/A	N/A	No[d]

TABLE 4
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPEC)
SEDIMENT - METALS AND PESTICIDES
(ppm)

CONTAMINANTS	FREQUENCY OF DETECTION[1]	RANGE OF DETECTION	REFERENCE CONCENTRATIONS*	ER-M NOAA VALUES[2]	ER-L NOAA VALUES[2]	CHEMICAL SELECTED AS COPEC?
Vanadium	64/64	7.8B - 40.5	100	N/A	N/A	No[d]
Zinc	63/64	32.1 - 418	50	270	120	Yes[e]
Cyanide	23/64	0.6J - 2.4	N/A	N/A	N/A	Yes[e]
Aroclor 1248**	62/64	56P - 77,000	N/A	400†	50†	Yes[e]
Aroclor 1254**	61/64	61P - 13,000	N/A	400†	50†	Yes[e]

* No background samples have been collected for the ALCOA or MRP15 sites. These values are typical background concentrations of oven-dried soils.
** Values reported in parts per billion.
† Value is total PCBs.

a. Detected at a concentration exceeding listed criteria.
b. No detected consentrations exceed listed criteria.
c. Contaminant is of moderate to high toxicity and/or exceeds reference concentration.
d. Contaminant does not have a high toxicity and did not significantly exceed the reference concenctration (if applicable).
e. Selected since Aluminum Company of America (ALCOA) directly affects the outfalls and the concentrations are high.
f. Only one sample of nickel minimally exceeded the ER-L level and all the samples are below the reference concentration. All detected concentrations of the surface water samples are well below the listed criteria. Thus nickel was not selected as a COPEC at this time.

1. Woodward-Clyde Consultants, September 1992, Onsite Sediment Sampling Results, Phase IA - SIS, prepared for Aluminum Company of America (ALCOA), Davenport Facility, Riverdale, Iowa.

2. National Oceanic and Atmospheric Administration Technology Memorandum NOS/OMa 52, Potential for Biological Effects of Sediment-sorbed Contaminants Tested in the National Status and Trends Program, Long, E.R. and L.G. Morgan, 1991. Values Reported are ER-L and ER-M (effects range low and effects range medium).

TABLE 5
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SEDIMENT - SEMIVOLATILE ORGANIC COMPOUNDS
(ppb)

CONTAMINANTS	FREQUENCY OF DETECTION[1]	RANGE OF DETECTION	ER-M NOAA VALUES[2]	ER-L NOAA VALUES[2]	CHEMICAL SELECTED AS COPEC?
Acenaphthene	46/64	31J - 30,000J	650	150	Yes[a]
Anthracene	55/64	61J - 67,000J	960	85	Yes[a]
Benzo(a)anthracene	60/64	53J - 200,000	1,600	230	Yes[a]
Benzo(a)pyrene	60/64	32J - 160,000	2,500	400	Yes[a]
Benzo(b)fluoranthene	62/64	45J - 250,000	N/A	N/A	Yes[a]
Benzo(g,h,i)perylene	46/64	35J - 130,000	N/A	N/A	Yes[a]
Benzo(k)fluoranthene	60/64	28J - 93,000	N/A	N/A	Yes[a]
Bis(2-ethylhexyl)phthalate	2/64	5,200J - 5,500J	N/A	N/A	No[d]
Butylbenzylphthalate	3/64	100J - 2,200	N/A	N/A	Yes[a]
Carbazole	52/64	25J - 67,000	N/A	N/A	Yes[a]
Chrysene	62/64	45J - 250,000J	2,800	400	Yes[a]
Dibenz(a,h)anthracene	31/64	40J - 32,000J	260	60	Yes[a]
Dibenzofuran	33/64	25J - 19,000J	N/A	N/A	Yes[c]
3,3'-Dichlorobenzene	1/64	320J	N/A	N/A	No[d]
Di-n-butylphthalate	2/64	290J - 1,200J	N/A	N/A	No[d]

TABLE 5
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SEDIMENT - SEMIVOLATILE ORGANIC COMPOUNDS
(ppb)

CONTAMINANTS	FREQUENCY OF DETECTION[1]	RANGE OF DETECTION	ER-M NOAA VALUES[2]	ER-L NOAA VALUES[2]	CHEMICAL SELECTED AS COPEC?
Fluoranthene	61/64	120J - 590,000J	3,600	600	Yes[a]
Fluorene	43/64	30J - 31,000J	640	35	Yes[a]
Indeno(1,2,3-cd)pyrene	46/64	32J - 120,000	N/A	N/A	Yes[a]
2-Methylnaphthalene	1/64	330J	670	65	Yes[a]
4-Methylphenol	5/64	140J - 3,800J	N/A	N/A	Yes[a]
Naphthalene	17/64	32J - 12,000J	2,100	340	Yes[a]
Phenanathrene	64/64	48J - 420,000	13,800	225	Yes[a]
Phenol	8/64	36J - 6,200J	N/A	N/A	Yes[a]
Pyrene	63/64	40J - 520,000	2,200	350	Yes[a]

- No background levels are available at this time.

a. Detected at a concentration exceeding listed criteria.
b. No detected concentrations exceed listed criteria.
c. Over 10% of samples had hits; all these detected concentrations were "J" or "B" - coded.
d. Less than 10% of samples had hits; all detected concentrations were "J" or "B" - coded.
e. At least one detection is not "J" - coded.

1. Woodward-Clyde Consultants, September 1992, Onsite Sediment Sampling Results, Phase IA - SIS, prepared for Aluminum Company of America (ALCOA), Davenport Facility, Riverdale, Iowa.

TABLE 5
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SEDIMENT - SEMIVOLATILE ORGANIC COMPOUNDS
(ppb)

2. National Oceanic and Atmospheric Administration Technology Memorandum NOS/OMa 52, Potential fpr Biological Effects of Sediment-sorbed Contaminants Tested in the National Status and Trends Program, Long E.R., and L.G. Morgan, 1991. Values reported are ER-L and ER-M (effects range low and effects range medium).

TABLE 6
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SEDIMENT - VOLATILE ORGANIC COMPOUNDS
(ppb)

CONTAMINANTS	FREQUENCY OF DETECTION[1]	RANGE OF DETECTION	CHEMICAL SELECTED AS COPEC?
Acetone	20/64	89 - 15,000	Yes[2]
Benzene	2/64	24 - 61	Yes[2]
2-Butanone	11/64	12J - 240	Yes[2]
Carbon Disulfide	7/64	3J - 30	Yes[2]
Chloroform	1/64	5J	No[4]
Chloromethane	7/64	5J - 270	Yes[2]
1,1-Dichloroethane	4/64	5J - 8J	No[4]
1,2-Dichloroethene	7/64	6J - 160	Yes[2]
Methylene Chloride	3/64	12U - 630J	Yes[2]
Tetrachloroethene (PCE)	11/64	3J - 86	Yes[2]
Toluene	10/64	2J - 5,900	Yes[2]
1,1,1-Trichloroethane	6/64	12J - 30	Yes[2]
Trichloroethene (TCE)	8/64	5J - 25	Yes[2]
Vinyl Chloride	1/64	35	Yes[2]
Xylene	5/64	2J - 58	Yes[2]

TABLE 6
IDENTIFICATION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN (COPECs)
SEDIMENT - VOLATILE ORGANIC COMPOUNDS
(ppb)

- NOAA ER-L and ER-M values do not apply to volatiles.
- No criteria or background concentrations are available at this time.

a. Detected at a concentration exceeding listed criteria.
b. No detected concentrations exceed listed criteria.
c. Over 10% of samples had hits; all detected concentrations were "J" or "B" - coded.
d. Less than 10% of samples had hits; all detected concentrations were "J" or "B" - coded.
e. At least one detection is not "J" - coded.

1. Woodward-Clyde Consultants, September 1992, Onsite Sediment Sampling Results, Phase IA - SIS, prepared for Aluminum Company of America (ALCOA), Davenport Facility, Riverdale, Iowa.

APPENDIX B

COMPARISON OF BACKGROUND INORGANIC CONCENTRATIONS

TABLE B-1
COMPARISON OF METALS CONCENTRATIONS IN SEDIMENTS BETWEEN REFERENCE AREA AND ADJACENT TO ALCOA FACILITY
ALCOA DAVENPORT WORKS, RIVERDALE, IOWA
September/October 1995

SAMPLE ID	Aluminum (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Lead (mg/kg)	Silver		Zinc (mg/kg)
							(mg/kg)[1]	SQL[2]	
REFERENCE AREA AND TRIBUTARIES									
S001A-0R-R00	6290	11.8	8.46	11100	540	10.7	ND	0.844	47.7
S004A-0R-R00	8900	15	10	12600	477	8.19	ND	0.742	49.4
S01DA-0R-R00	5420	17.2	10.1	11600	393	13.1	ND	0.796	45.6
S007A-0R-R100	1860	5.23	2.75	5460	273	3.75	ND	0.642	15.9
S006A-0R-R125	4420	9.02	6.02	9350	499	6.88	ND	0.825	32.2
S003A-0R-R25	5800	11.5	8.59	7760	213	6.06	ND	0.678	34.4
S005A-0R-R75	8030	14.8	11.9	13400	423	9.61	ND	0.785	41.1
S01A-DCK-R00	1260	6.06	2.31	4230	215	3.6	ND	0.592	12.2
S001A-CROW CREEK	9660	14.4	11.7	13600	462	11.6	ND	0.773	45.1
S001A-PIGEON CREEK	9000	13.9	13.4	14800	834	11.9	ND	0.873	53.7
Outfall 006									
S004A-006D-R00	11526	29.4	76.2	28517	533	75.8	0.204J	0.765	261.8
S0D1A-01B-R00	11228	23.5	49.0	24917	900	24.9	0.081UJ	1.190	130.9
S002A-01B-R00	10367	18.9	31.0	17571	1077	16.4	ND	1.037	105.3
S005A-01B-R00[1]	11691	18.1	20.8	17883	1080	17.8	ND	1.157	94.0
S006A-01B-R00[1]	9324	14.6	12.7	13257	976	12.0	0.176J	0.880	12.7
Outfall 005									
S003A-01C-R00	7761	14.2	12.3	13350	496	12.0	ND	0.758	59.2
S0D7A-01C-R00	7773	13.9	14.4	13631	677	11.2	ND	0.746	60.3
S004A-01C-R100	9223	16.3	16.0	16616	609	18.3	ND	0.759	80.4
Outfall 004									
S0D4A-01C-R00	12077	16.4	91.8	12220	529	16.9	0.054UJ	0.781	71.2
S006A-01C-R100	9325	14.6	23.5	14095	551	83.0	0.036UJ	0.809	67.5
S007A-01C-R25	12091	17.6	38.5	17085	477	17.7	0.029UJ	0.814	84.3
S008A-01C-R00[1]	14991	19.2	19.7	13658	1099	12.8	0.237J	1.185	58.3
S010A-01C-R25[1]	14526	20.7	35.5	15797	848	17.4	ND	1.160	77.0

TABLE B-1
COMPARISON OF METALS CONCENTRATIONS IN SEDIMENTS BETWEEN REFERENCE AREA AND ADJACENT TO ALCOA FACILITY
ALCOA DAVENPORT WORKS, RIVERDALE, IOWA
September/October 1995

SAMPLE ID	Aluminum (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Manganese (mg/kg)	Lead (mg/kg)	Silver (mg/kg)[1]	Silver SQL[2]	Zinc (mg/kg)
Outfall 003									
S0D3A-01C-R00	6402	18.6	13.8	11313	732	10.0	ND	0.693	56.2
S013A-01C-R125	5903	16.2	13.4	10431	548	15.4	ND	0.714	59.4
Outfall 002									
S014A-01C-R00	8511	15.0	18.9	12420	445	12.1	0.096UJ	0.796	59.9
S0D1A-01C-R00	5237	11.6	14.2	10898	550	11.2	ND	0.741	55.2
S0D1B-01C-R00	7569	13.6	9.2	11868	492	11.8	ND	0.704	63.3
S015A-01C-R00	8876	15.7	24.2	13761	744	13.2	0.247J	0.794	71.3
Outfall 001									
S001A-01D-R00	7164	18.2	14.8	12727	523	12.0	0.045UJ	0.853	63.7
S0D1A-01D-R00	3386	8.6	9.0	7496	394	7.9	0.054UJ	0.668	73.1
S002A-01D-R00	4357	8.3	8.1	9225	429	10.0	0.031UJ	0.694	50.9
REFERENCE AREA									
MEAN	6064	11.9	8.5	10390	433	8.5	0.378		37.7
SD	2934	4	4	3589	183	3.4	0.046		14
MEAN + 3SD	14865	24	20	21156	983	18.7	0.515		80
DOWNSTREAM FROM OUTFALLS									
MEAN	9059	16.5	25.8	14488	669	20.0	0.251		78.0
MAX	14991	29.4	91.8	28517	1099	83.0	0.580		261.8

Shaded cells are additional data that were derived from lab reports for the above constituents but were not requested by EPA.

[1] For nondetects, one-half the detection limit was used

[2] The detection limit is presented only for silver. There were no nondetects for any of the other constituents.

SQL - sample quantitation limit

TABLE B-2
COMPARISON OF TOTAL AND AMENABLE CYANIDE BETWEEN REFERENCE AREA AND ADJACENT TO ALCOA FACILITY

Statistic[1]	TOTAL CYANIDE		AMENABLE CYANIDE	
Area	**Reference/Tribs**	**Areas 1A-1C**	**Reference/Tribs**	**Areas 1A-1C**
MIN	0.15	0.19	0.15	0.19
MEAN	4.18	0.24	3.89	0.22
MAX	27.00	0.68	27.00	0.29
SD	8.46	0.11	8.57	0.03
Mean + 3SD	29.55		29.59	
Percent Detects	60	4.5	40	0.0
Count	**DATA**			
1	*0.20*	*0.25*	*0.20*	*0.25*
2	*0.15*	*0.20*	*0.15*	*0.20*
3	1.20	*0.20*	1.10	*0.20*
4	*0.21*	*0.19*	*0.21*	*0.19*
5	27.00	*0.26*	27.00	*0.26*
6	0.65	*0.21*	0.65	*0.21*
7	0.79	*0.27*	*0.20*	*0.27*
8	*0.21*	*0.22*	*0.21*	*0.22*
9	9.00	*0.29*	9.00	*0.29*
10	2.40	*0.19*	*0.20*	*0.19*
11		*0.19*		*0.19*
12		*0.19*		*0.19*
13		*0.19*		*0.21*
14		*0.19*		*0.19*
15		0.68		*0.19*
16		*0.20*		*0.20*
17		*0.19*		*0.19*
18		*0.29*		*0.29*
19		*0.18*		*0.18*
20		*0.20*		*0.20*
21		*0.21*		*0.21*
22		*0.19*		*0.19*

[1] One-half the detection limit used for nondetects, as noted by values in italics

APPENDIX C

ECOTOXICOLOGICAL SCREENING BENCHMARKS

TABLE C-1
ECOTOXICOLOGICAL SCREENING BENCHMARKS IN SEDIMENTS
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL OF INTEREST	ECOLOGICAL SEDIMENT SCREENING BENCHMARKS (in order of priority, left to right)						APPLICABLE BENCHMARK
	Effects Range Low, Freshwater[1] (mg/kg)	EPA ECOTOX	ORNL	NSCSI Draft	1995 Ontario LEL	EqP[2]	
Volatile Organic Compounds (ug/kg)							
2-Butanone			270			209	270
Acetone			8.7[3]			2600	2600
Carbon disulfide			0.85[5]	31			0.85
Chloromethane						17900	17900
Methylene chloride			370				370
Tetrachloroethene		940[4]	410	18000			940
Toluene		670[4]	50	4500			670
Semivolatile Organic Compounds (mg/kg)							
2-Methylnaphthalene						34.3	34.3
4-Methylphenol					0.67		0.67
Acenaphthene		0.62	1.3	1.3			0.62
Anthracene	0.01		0.027	0.041	0.22		0.01
Benzo(a)anthracene	0.019		0.11	1.4	0.32		0.019
Benzo(a)pyrene	0.084	0.43	0.14	45	0.37		0.084
Benzo(b)fluoranthene	0.037			11			0.037
Benzo(ghi)perylene	0.013				0.17		0.013
Benzo(k)fluoranthene	0.037			3.8	0.24		0.037
Butylbenzylphthalate		11[6]	11	171			11
Carbazole						22.5	22.5
Chrysene	0.03			45	0.34		0.03
Dibenz(a,h)anthracene	0.01				0.06		0.01
Dibenzofuran		2[6]	0.42	30			2
Fluoranthene	0.033	2.9	6.2	6.2	0.75		0.033
Fluorene	0.01	0.54[6]	0.54	1.7	0.19		0.01
Indeno(1,2,3-cd)pyrene	0.03				0.2		0.03
Naphthalene	0.013	0.48[6]	0.24	11			0.013
Phenanthrene	0.027	0.85	1.8	1.8	0.56		0.027
Phenol			0.031[7]		0.42		0.031
Pyrene	0.04	0.66		0.59	0.49		0.04

TABLE C-1
ECOTOXICOLOGICAL SCREENING BENCHMARKS IN SEDIMENTS
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA

CHEMICAL OF INTEREST	ECOLOGICAL SEDIMENT SCREENING BENCHMARKS (in order of priority, left to right)						APPLICABLE BENCHMARK
	Effects Range Low, Freshwater[1] (mg/kg)	EPA ECOTOX	ORNL	NSCSI Draft	1995 Ontario LEL	EqP[2]	
PCBs (mg/kg)							
PCB-1248			1		(0.03)		1
PCB-1254			0.81		(0.06)		0.81
PCB-1260			4500	0.00014	(0.005)		4500
Inorganics (mg/kg)							
Aluminum	14000[7]						58000[8]
Chromium	39	81[8]		145	26		39
Copper	41	34		390	16		41
Iron	20%				20000		200000
Lead	55	47		110	31		55
Manganese	730				460		730
Silver			1	2.2	1		1
Zinc	110	150		270	120		110
Amenable Cyanide[9]							1
Total Cyanide[9]							5

Blank spaces indicated no benchmarks are available.

( ) : Tentative guidelines

[1] Ingersoll et al (1995).

[2] : Based on 1.5% organic carbon and ASTER Toxicity Values

[3] See text: a recalculated value of 2.6 mg/kg (based on 1.5% oc) was calculated as a benchmark based on ASTER Koc

[4] Calculated based on secondary chronic value

[6] SQB calculated from WQB or AWQC fresh values

[7] See text: ER-L value for aluminum determined to be unreliable, ER-M (58,000) is used

[8] Value is for total of all ionic forms

[9] Soil/Sediment target concentrations from The Netherlands Ministry of Housing Physical Planning and Environment, *Environmental Quality Standards for Soil and Water*. 1991. Value presented for amenable cyanide is based on a target value for free cyanide.

TABLE C-2
ECOTOXICOLOGICAL SCREENING BENCHMARKS IN SURFACE WATER
ALCOA-DAVENPORT WORKS, RIVERDALE, IOWA
September/October 1995

CHEMICAL OF INTEREST	WATER SCREENING BENCHMARKS (in order of priority, left to right)[a]						Applicable Screening Benchmark (ug/L)
	IOWA WQC (ug/L)	EPA WQC (ug/L)	EPA ECOTOX (ug/L)	ORNL (ug/L)[1]	AQUIRE (ug/L)	ASTER (ug/L)	
Volatile Organic Compounds							
2-Butanone				282170		263418	263418
Acetone				507640		612992	507640
Semivolatile Organic Compounds							
Fluorene			3.9[2]		8		3.9
Phenanthrene		6.3	6.3[3]	200			6.3
Pyrene						61	61
PCBs							
Aroclor 1260				<1.3			1.3
Inorganic Compounds							
Aluminum -DISS	3290	87		460			3290
Chromium -DISS	40	180[4,5]	180[4,5]	44			40
Copper -DISS	35	21[4,5]	21[4,5]	0.23			35
Iron -DISS		1000	1000	158			1000
Lead -DISS	30	6.1[4,5]	6.1[4,5]	12.26			30
Manganese -DISS				120[2]			120
Zinc -DISS	450	190[4,5]	190[4,5]	30			450

DISS - Dissolved

[1] Lowest chronic toxicity value

[2] GLWQI Tier II Value (calculated for EcoTox)

[3] Final chronic value, per EPA Proposed Sediment Criteria Documents

[4] Hardness dependent criteria (200 mg/L $CaCO_3$ used)

[5] Adjusted to reflect dissolved metal criteria

[a] In the absence of other values, the lowest of the ORNL, AQUIRE or ASTER value was used as a screening benchmark, regardless of the order presented in the table.

APPENDIX D

CALCULATION OF HUMAN HEALTH SCREENING VALUES FOR SURFACE WATER AND SEDIMENT IN MRP15 AND WETLANDS

The selection of human health constituents of potential concern (COPCs) included a screening of constituents of interest (COIs) based on comparison to conservative screening criteria for exposure to surface water and sediment in MRP15 and the on-site wetlands. Screening criteria, or risk-based concentrations (RBCs), were calculated for an adolescent swimmer exposed through dermal contact with, and incidental ingestion of, surface water and sediment while swimming.

Relevant human exposure pathways for exposure to surface water and sediment which were identified in the Conceptual Site Model (CSM) for the Alcoa-Davenport Works (Geraghty & Miller, Inc. 1995) include wading in shallow water along the shoreline and ingesting fish from MRP15. Site workers may contact sediment while cleaning precipitators for the River Water Treatment Plant (FSA Unit CWM-09). Fishermen wading near the shoreline may contact surface water and/or ingest fish caught from this area.

The adolescent swimmer scenario provides a more conservative exposure scenario than the relevant receptors and exposure pathways identified in the CSM, and the likelihood that this pathway would ever be complete is remote. The waters of MRP15 support heavy commercial boat and barge traffic, are often turbid, and can have flow rates in excess of 15 to 20 knots. Also, the on-site wetlands have dense vegetation and do not normally have water deep enough for swimming. Screening criteria for surface water and sediment based on a swimming adolescent scenario were used to select COPCs to be used to evaluate potential risks for the more relevant receptors and exposure pathways described above. Screening values will not be used to eliminate COIs detected in surface water that may have a potential to bioaccumulate or

biomagnify in fish (e.g., PCBs) that could result in unacceptable risk from exposure through ingestion of fish.

In order to calculate RBCs for a swimming adolescent scenario it was necessary to establish default assumptions for body weight, exposure time, exposure frequency, exposure duration, ingestion rate for surface water, ingestion rate of sediment, and exposed skin surface areas.

Reasonable maximum exposure assumptions were used when available. Referencing RAGS Part A (USEPA 1989), "Standard Default Exposure Factors" (USEPA 1991), and EPA Region IV's "Supplemental Guidance to RAGS" (USEPA 1995), the following standard default parameters were selected:

- Exposure Time[1]: 2.6 hours/day
- Exposure Frequency[1]: 7 days/year
- Body weight[2]: 45 kg
- Exposure Duration[2]: 10 years (adolescent aged 7-16)
- Surface Water Ingestion Rate[2]: 0.05 L/hr
- Sediment Ingestion Rate: 10 mg/day
- Sediment Adherence Rate: 0.2 mg/cm^2-day

The sediment ingestion rate is based on one-tenth the soil ingestion rate of 100 mg/day (EPA 1991). The 50-percentile soil adherence rate of 0.2 mg/cm^2/day (EPA 1992[3]) is used as an estimate of the rate at which sediment adheres to the skin. These sediment ingestion and adherence rates are consistent with values in the 1995 Consent Order. For exposed skin surface area, the upper percentile default values are derived using the 95th percentile values for the ages

[1] EPA. 1991. Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part B: Development of Risk-Based Preliminary Remediation Goals. Office of Solid Waste and Emergency Response, Washington, DC. EPA/600-8-91/011A.
[2] EPA 1995. Supplemental Guidance to RAGS: Region IV Bulletins Human Health Risk Assessments.
[3] EPA 1992a. Dermal Exposure Assessment: Principles and Applications, Office of Research and Development, Washington, DC. EPA/600/8-91/011B.

of concern (Exposure Factors Handbook - Review Draft, USEPA 1996). By assuming that adolescents trespassing to swim are between the ages of 7 to 16, and that the entire skin surface is exposed while swimming, the following values were derived:

	95th Percentile of Total Body Surface Area (m^2)	
Age	Males	Females
7<8	1.11	1.13
8<9	1.24	1.18
9<10	1.29	1.41
10<11	1.48	1.43
11<12	1.60	1.62
12<13	1.76	1.70
13<14	1.81	1.86
14<15	1.91	1.88
15<16	2.02	1.83
16<17	2.16	1.91
sum	16.38	15.95
mean (m^2)	1.638	1.595
mean (cm^2)	16,380	15,950

The upper bound average skin surface area for individuals ages 7 to 16 is 16,165 cm^2.

For dermal exposure to sediment the surface area of feet for adolescents ages 7 to 16 was used. The "Exposure Factors Handbook - Review Draft" (USEPA 1996) reports part specific surface areas as a percentage of total body surface area. Values for foot area were only available for the age intervals of 9 to 10 (7.58%), 12 to 13 (7.03%), 13 to 14 (8.02%) and 16 to 17 (6.93%). The average percent of surface area accounted for by feet for these age intervals is 7.39% which is equivalent to 1,194 cm^2.

The equations used to calculate surface water and sediment RBCs and a sample calculation are provided in Tables D-1 and D-2. Dermal absorption efficiencies, oral absorption efficiencies and permeability constants for human health COIs are presented in Table D-3. Constituent-specific RBC calculations for adolescent child exposures to COIs in sediment while swimming in MRP15 and wetlands are presented in Tables D-4 and D-5, respectively. RBC calculations for exposure to COIs in surface water in MRP15 and the wetlands are presented in Tables D-6 and D-7.

Table D-1. Risk-Based Concentration Equations for Surface Water Exposure to an Adolescent Swimmer in MRP15 or the On-Site Wetlands and a Sample Calculation for Aroclor 1260

ROUTE-SPECIFIC RBCs:

Oral:

$$(RBC_o)_{C\ or\ NC} = \frac{(TCR\ or\ THQ) \times BW \times (AT_C\ or\ AT_{NC})}{IR_{SW} \times ET \times EF \times ED \times [CSF_o\ or\ (1/RfD_o)]}$$

Dermal:

$$(RBC_d)_{C\ or\ NC} = \frac{(TCR\ or\ THQ) \times BW \times (AT_C\ or\ AT_{NC}) \times (1{,}000 cm^3/L)}{SSA \times PC \times ET \times EF \times ED \times [CSF_a\ or\ (1/RfD_a)]}$$

CANCER EFFECTS RBC:

$$RBC_C = \frac{1}{\frac{1}{(RBC_o)_C} + \frac{1}{(RBC_d)_C}}$$

NON-CANCER EFFECTS RBC:

$$RBC_{NC} = \frac{1}{\frac{1}{(RBC_o)_{NC}} + \frac{1}{(RBC_d)_{NC}}}$$

RBC = Minimum result of RBC_C and RBC_{NC}.

where:

AT_C	Averaging time for cancer effects, days.
AT_{NC}	Averaging time for non-cancer effects, days; ED 365 days/year.
BW	Body weight, kilograms (kg).
CSF	Cancer slope factor for oral dose, CSF_o, or dermal dose (adjusted to an absorbed dose), CSF_a exposure kg-day/milligram (mg); inverse of mg/kg/day.
ED	Exposure duration, years.
EF	Exposure frequency, days/year.

Table D-1. Risk-Based Concentration Equations for Surface Water Exposure to an Adolescent Swimmer in MRP15 or the On-Site Wetlands and a Sample Calculation for Aroclor 1260 (continued)

ET	Exposure time while swimming, hours/day.
IR_{SW}	Ingestion rate of surface water while swimming, liters (L) L/hour.
PC	Permeability constant, (cm/hour); constituent specific.
RBC	Risk-based concentration mg/L; minimum of the RBC_C (based on cancer effects) and the RBC_{NC} (based on non-cancer effects, which are based upon the appropriate route-specific RBCs (RBC_o for the oral route and RBC_d for the dermal route).
RfD	Reference dose for oral exposure RfD_o or dermal exposure (adjusted to an absorbed dose), (RfD_a) exposure, mg/kg/day.
SSA	Exposed skin surface area, cm^2.
TCR	Target cancer risk (unitless); results presented for TCR values of 10^{-4} (1 in 10,000) and 10^{-6} (1 in 1,000,000).
THQ	Target hazard quotient for non-cancer effects (unitless); results presented for THQ value of 1.

SAMPLE CALCULATION: (Aroclor 1260)

CANCER EFFECTS

Oral:

$$(RBC_o)_C = \frac{10^{-6}\times(45\,kg)\times(25{,}550\,days)}{(0.05\,L/hr)\times(2.6\,hr/day)\times(7\,days/yr)\times(10\,yrs)\times(2.0E+00\ kg\cdot day/mg)} = 6.3E-02\ mg$$

Dermal:

$$(RBC_d)_C = \frac{10^{-6}\times(45\,kg)\times(25{,}550\,days)\times(1{,}000\,cm^3/L)}{(16{,}165\,cm^2)\times(8.5E-01\,cm/hr)\times(2.6\,hr/days)\times(7\,days/yr)\times(10\,yrs)\times(2.1E+00\,kg\cdot day}$$

$$= 2.2E-04\ mg/L$$

$$RBC_C = \frac{1}{\frac{1}{6.3E-02\ mg/L} + \frac{1}{2.2E-04\ mg/L}} = 2.0E-04\ mg/L$$

Table D-1. Risk-Based Concentration Equations for Surface Water Exposure to an Adolescent Swimmer in MRP15 or the On-Site Wetlands and a Sample Calculation for Aroclor 1260 (continued)

NON-CANCER EFFECTS

Oral:

$$(RBC_o)_{NC} = \frac{1 \times (45\,kg) \times (3{,}650\,days) \times (NA\ mg/kg/day)}{(0.05\,L/hr) \times (2.6\,hrs/day) \times (7\,days/yr) \times (10\,yrs)}$$

$$= NA\,(RfD_o\ not\ available)$$

Dermal:

$$(RBC_d)_{NC} = \frac{1 \times (45\,kg) \times (3{,}650\,days) \times (1{,}000\,cm^3/L) \times (NA\ mg/kg/day)}{(16{,}165\,cm^2) \times (8.5E-01\,cm/hr) \times (2.6\,hr/day) \times (7\,days/yr) \times (10\,yr)}$$

$$= NA\,(RfD_a\ not\ available)$$

$$RBC_{NC} = \frac{1}{\frac{1}{NA} + \frac{1}{NA}} = NA$$

$$RBC = 2.0E-04\ mg/L$$

Table D-2. Risk-Based Concentration Equations for Sediment Exposure to an Adolescent Swimmer in MRP15 or the On-Site Wetlands and a Sample Calculation for Aroclor 1254

ROUTE-SPECIFIC RBCs:

Oral:

$$(RBC_o)_{C\ or\ NC} = \frac{(TCR\ or\ THI) \times BW \times (AT_C\ or\ AT_{NC}) \times (10^6\ mg/kg)}{SedIR \times EF \times ED \times [CSF_o\ or\ (1/RfD_o)]}$$

Dermal:

$$(RBC_d)_{C\ or\ NC} = \frac{(TCR\ or\ THI) \times BW \times (AT_C\ or\ AT_{NC}) \times (10^6\ mg/kg)}{SSA \times SAR \times ABS_d \times EF \times ED \times [CSF_a\ or\ (1/RfD_a)]}$$

CANCER EFFECTS RBC:

$$RBC_C = \frac{1}{\frac{1}{(RBC_o)_C} + \frac{1}{(RBC_d)_C}}$$

NON-CANCER EFFECTS RBC:

$$RBC_{NC} = \frac{1}{\frac{1}{(RBC_o)_{NC}} + \frac{1}{(RBC_d)_{NC}}}$$

RBC = Minimum result of RBC_C and RBC_{NC}.

where:

ABS_d	Dermal absorption efficiency (unitless); constituent specific.
AT_C	Averaging period for cancer effects, days.
AT_{NC}	Averaging period for non-cancer effects, days; ED 365 days/year (USEPA 1991).
BW	Body weight, kilograms (kg).
CSF	Cancer slope factor for oral dose CSF_o or dermal dose (adjusted to an absorbed dose), CSF_a exposure, kg-day/milligram (mg); inverse of mg/kg/day.
ED	Exposure duration, years.

Table D-2. Risk-Based Concentration Equations for Sediment Exposure to an Adolescent Swimmer in MRP15 or the On-Site Wetlands and a Sample Calculation for Aroclor 1254 (continued)

EF	Exposure frequency, days/year.
RBC	Risk-based concentration, mg/kg; minimum of the RBC_C (based on cancer effects) and the RBC_{NC} (based on non-cancer effects, which are based upon the appropriate route-specific RBCs (RBC_o for the oral route and RBC_d for the dermal route).
RfD	Reference dose for oral exposure, RfD_o or dermal exposure (adjusted to an absorbed dose), RfD_a exposure, mg/kg/day.
SAR	Skin adherence rate ($mg/cm^2/day$).
SedIR	Ingestion rate of sediment while wading (mg/day).
SSA	Exposed skin surface area, cm^2.
TCR	Target cancer risk (unitless); results presented for TCR values of 10^{-4} (1 in 10,000) and 10^{-6} (1 in 1,000,000).
THI	Target hazard index (unitless); results presented for THI value of 1.

SAMPLE CALCULATION: (Aroclor 1254)

CANCER EFFECTS RBC:

Oral:

$$(RBC_o)_C = \frac{(10^{-6}) \times (45\,kg) \times (25{,}550\,days) \times (10^6\,mg/kg)}{(10\,mg/day) \times (7\,days/yr) \times (10\,yrs) \times (2.0E+00\,kg \cdot day/mg)} = 821\,mg/kg$$

Dermal:

$$(RBC_d)_C = \frac{(10^{-6}) \times (45\,kg) \times (25{,}550\,days) \times (10^6\,mg/kg)}{(1{,}194\,cm^2) \times (0.2mg/cm^2 \cdot day) \times (0.06) \times (7\,days/yr) \times (10\,yr) \times (2.1E+00\,kg \cdot day/mg}$$

$$= 545\ mg/kg$$

$$RBC_C = \frac{1}{\frac{1}{(821\,mg/kg)} + \frac{1}{(545\,mg/kg)}} = 328\,mg/kg$$

Table D-2. Risk-Based Concentration Equations for Sediment Exposure to an Adolescent Swimmer in MRP15 or the On-Site Wetlands and a Sample Calculation for Aroclor 1254 (continued)

NON-CANCER EFFECTS RBC:

Oral:

$$(RBC_o)_{NC} = \frac{(1)\times(45\,kg)\times(3{,}650\,days)\times(10^6\,mg/kg)}{(10mg/day)\times(7\,days/yr)\times(10\,yrs)\times(1/2.0E-05\,mg/kg/day)} = 4.7E+03\ mg/kg$$

Dermal:

$$(RBC_d)_{NC} = \frac{(1)\times(45\,kg)\times(3{,}650\,days)\times(10^6\,mg/kg)}{(1{,}194\,cm^2)\times(0.2\,mg/cm^2-day)\times(0.06)\times(7\,days/yr)\times(10\,yrs)\times(1/1.9E-05\,mg/kg/day)}$$
$$= 3.1E+03\ mg/kg$$

$$RBC_{NC} = \frac{1}{\frac{1}{(4.7E+03\ mg/kg)} + \frac{1}{(3.1E+03\ mg/kg)}} = 1.9E+03\ mg/kg$$

RBC = 328 mg / kg

TABLE D-3

DERMAL ABSORPTION EFFICIENCIES AND PERMEABILITY COEFFICIENTS FOR HUMAN HEALTH CHEMICALS OF INTEREST

MISSISSIPPI RIVER POOL 15

Constituent	Dermal Absorption Efficiency	Permeability Constant (cm/hr)	Oral Absorption Efficiency
VOLATILE ORGANIC COMPOUNDS			
acetone	0.1 [a]	5.7E-04 [f]	1 [i]
benzene	NA		1 [i]
2-butanone	0.1 [a]	1.1E-03 [e]	1 [i]
carbon disulfide	0.1 [a]	2.4E-02 [e]	1 [i]
chloromethane	NA		1 [i]
methylene chloride	NA		1 [i]
tetrachloroethylene	NA		1 [i]
toluene	NA		1 [i]
SEMIVOLATILE ORGANIC COMPOUNDS			
2-methylnaphthalene	0.03 [b]	1.8E-01 [e]	0.85 [b]
4-methylphenol	0.1 [a]	1.0E-03 [e]	0.85 [b]
acenaphthene	0.03 [b]	2.6E-01 [f]	0.85 [b]
anthracene	0.03 [b]	2.6E-01 [e]	0.85 [b]
benzo(a)anthracene	0.03 [b]	8.1E-01 [e]	
benzo(a)pyrene	0.03 [b]	1.2E+00 [e]	0.85 [b]
benzo(b)fluoranthene	0.03 [b]	1.2E+00 [e]	0.85 [b]
benzo(ghi)perylene	0.03 [b]	4.3E+00 [f]	0.85 [b]
benzo(k)fluoranthene	0.03 [b]	1.2E+00 [e]	0.85 [b]
butylbenzylphthalate	0.10 [a]	7.3E-02 [f]	1.0 [i]
carbazole	0.10 [a]	4.0E-02 [f]	1.0 [i]
chrysene	0.03 [b]	8.1E-01 [e]	0.85 [b]
dibenz(a,h)anthracene	0.03 [b]	2.7E+00 [e]	0.85 [b]
dibenzofuran	0.03 [b]	8.1E-01 [f]	0.85 [b]
fluoranthene	0.03 [b]	3.6E-01[e]	0.85 [b]
fluorene	0.03 [b]	2.4E-01[f]	0.85 [b]
indeno(1,2,3-cd)pyrene	0.03 [b]	1.9E+00 [e]	0.85 [b]
naphthalene	0.03 [b]	6.9E-02 [e]	0.85 [b]

TABLE D-3

DERMAL ABSORPTION EFFICIENCIES AND PERMEABILITY COEFFICIENTS FOR HUMAN HEALTH CHEMICALS OF INTEREST

MISSISSIPPI RIVER POOL 15

phenanthrene	0.03 [b]	2.3E-01[e]	0.85 [b]
phenol	0.8 [g]	5.5E-03 [e]	0.90 [g]
pyrene	0.03 [b]	4.7E-01[f]	0.85 [b]
PCBs			
PCB-1248	0.06 [c]	7.3E-01 [e]	0.95 [j]
PCB-1254	0.06 [c]	3.7E-01 [e]	0.95 [j]
PCB-1260	0.06 [c]	8.5E-01 [e]	0.95 [j]
INORGANIC COMPOUNDS			
aluminum	0.01 [a]	1.6E-04 [h]	0.27 [k]
chromium	0.01 [a]	1.6E-04 [h]	0.02 [l]
copper	0.01 [a]	1.6E-04 [h]	0.60 [m]
iron	0.01 [a]	1.6E-04 [h]	0.15 [n]
lead	0.0006 [d]	4.0E-06 [d]	0.15 [d]
manganese	0.01 [a]	1.6E-04 [h]	0.05 [o]
silver	0.01 [a]	1.6E-04 [h]	0.21 [p]
zinc	0.01 [a]	1.6E-04 [h]	0.30 [q]
cyanide	0.01 [a]	1.6E-04 [h]	0.47 [r]

NA Not available; Insufficient toxicity data

Shaded cells indicate values not applicable to calculation of RBCs, since constituent was not a COI in the medium for which an RBC is being calculated.

[a] EPA 1996. Region IX Preliminary Remediation Goal Tables.

[b] Agency for Toxic Substances and Disease Registry (ATSDR). 1991. Toxicological Profile for Benzo(a)pyrene. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[c] EPA 1992b. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Dermal Risk Assessment, Interim Guidance." Office of Emergency and Remedial Response, Washington, DC. August 18, 1992.

[d] Agency for Toxic Substances and Disease Registry (ATSDR). 1991. Toxicological Profile for Lead. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[e] EPA 1992a. Dermal Exposure Assessment: Principles and Applications. Office of Research and Development, Washington, DC. EPA/600/8-91/011B.

[f] calculated using the adjusted Bronaugh equation (EPA 1992a)

[g] Agency for Toxic Substances and Disease Registry (ATSDR). 1991. Toxicological Profile for Phenol. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[h] assumed equal to permeability coefficient for water (EPA 1992a)

[i] assumed

[j] Owens (1990)

[k] Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological Profile for Aluminum. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

TABLE D-3

DERMAL ABSORPTION EFFICIENCIES AND PERMEABILITY COEFFICIENTS FOR HUMAN HEALTH CHEMICALS OF INTEREST

MISSISSIPPI RIVER POOL 15

Constituent	Dermal Absorption Efficiency	Permeability Constant (cm/hr)	Oral Absorption Efficiency
VOLATILE ORGANIC COMPOUNDS			
acetone	0.1 [a]	5.7E-04 [f]	1 [i]
benzene	0.1 [a]	2.1e-02 [e]	1 [i]
2-butanone	0.1 [a]	1.1E-03 [e]	1 [i]
carbon disulfide	0.1 [a]	2.4E-02 [e]	1 [i]
chloromethane	0.1 [a]	4.2E-03 [e]	1 [i]
methylene chloride	0.1 [a]	4.5E-03 [e]	1 [i]
tetrachloroethylene	0.1 [a]	4.8E-02 [e]	1 [i]
toluene	0.1 [a]	4.5E-02 [e]	1 [i]
SEMIVOLATILE ORGANIC COMPOUNDS			
2-methylnaphthalene	0.03 [b]	1.8E-01 [e]	0.85 [b]
4-methylphenol	0.1 [a]	1.0E-03 [e]	0.85 [b]
acenaphthene	0.03 [b]	2.6E-01 [f]	0.85 [b]
anthracene	0.03 [b]	2.6E-01 [e]	0.85 [b]
benzo(a)anthracene	0.03 [b]	8.1E-01 [e]	
benzo(a)pyrene	0.03 [b]	1.2E+00 [e]	0.85 [b]
benzo(b)fluoranthene	0.03 [b]	1.2E+00 [e]	0.85 [b]
benzo(ghi)perylene	0.03 [b]	4.3E+00 [f]	0.85 [b]
benzo(k)fluoranthene	0.03 [b]	1.2E+00 [e]	0.85 [b]
butylbenzylphthalate	0.10 [a]	7.3E-02 [f]	1.0 [i]
carbazole	0.10 [a]	4.0E-02 [f]	1.0 [i]
chrysene	0.03 [b]	8.1E-01 [e]	0.85 [b]
dibenz(a,h)anthracene	0.03 [b]	2.7E+00 [e]	0.85 [b]
dibenzofuran	0.03 [b]	8.1E-01 [f]	0.85 [b]
fluoranthene	0.03 [b]	3.6E-01[e]	0.85 [b]
fluorene	0.03 [b]	2.4E-01[f]	0.85 [b]
indeno(1,2,3-cd)pyrene	0.03 [b]	1.9E+00 [e]	0.85 [b]
naphthalene	0.03 [b]	6.9E-02 [e]	0.85 [b]
phenanthrene	0.03 [b]	2.3E-01[e]	0.85 [b]
phenol	0.8 [g]	5.5E-03 [e]	0.90 [g]
pyrene	0.03 [b]	4.7E-01[f]	0.85 [b]

TABLE D-3

DERMAL ABSORPTION EFFICIENCIES AND PERMEABILITY COEFFICIENTS FOR HUMAN HEALTH CHEMICALS OF INTEREST

MISSISSIPPI RIVER POOL 15

PCBs			
PCB-1248	0.06 [c]	7.3E-01 [e]	0.95 [j]
PCB-1254	0.06 [c]	3.7E-01 [e]	0.95 [j]
PCB-1260	0.06 [c]	8.5E-01 [e]	0.95 [j]
INORGANIC COMPOUNDS			
aluminum	0.01 [a]	1.6E-04 [h]	0.27 [k]
chromium	0.01 [a]	1.6E-04 [h]	0.02 [l]
copper	0.01 [a]	1.6E-04 [h]	0.60 [m]
iron	0.01 [a]	1.6E-04 [h]	0.15 [n]
lead	0.0006 [d]	4.0E-06 [d]	0.15 [d]
manganese	0.01 [a]	1.6E-04 [h]	0.05 [o]
silver	0.01 [a]	1.6E-04 [h]	0.21 [p]
zinc	0.01 [a]	1.6E-04 [h]	0.30 [q]
cyanide	0.01 [a]	1.6E-04 [h]	0.47 [r]

Shaded cells indicate values not applicable to calculation of RBCs, since constituent was not a COI in the medium for which an RBC is being calculated.

[a] EPA 1996. Region IX Preliminary Remediation Goal Tables.

[b] Agency for Toxic Substances and Disease Registry (ATSDR). 1991. Toxicological Profile for Benzo(a)pyrene. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[c] EPA 1992b. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Dermal Risk Assessment, Interim Guidance." Office of Emergency and Remedial Response, Washington, DC. August 18, 1992.

[d] Agency for Toxic Substances and Disease Registry (ATSDR). 1991. Toxicological Profile for Lead. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[e] EPA 1992a. Dermal Exposure Assessment: Principles and Applications. Office of Research and Development, Washington, DC. EPA/600/8-91/011B.

[f] calculated using the adjusted Bronaugh equation (EPA 1992a)

[g] Agency for Toxic Substances and Disease Registry (ATSDR). 1991. Toxicological Profile for Phenol. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[h] assumed equal to permeability coefficient for water (EPA 1992a)

[i] assumed

[j] Owens (1990)

[k] Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological Profile for Aluminum. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[l] Agency for Toxic Substances and Disease Registry (ATSDR). 1991. Toxicological Profile for Chromium. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[m] Agency for Toxic Substances and Disease Registry (ATSDR). 1989. Toxicological Profile for Copper. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[n] Goyer (1991)

TABLE D-3

DERMAL ABSORPTION EFFICIENCIES AND PERMEABILITY COEFFICIENTS FOR HUMAN HEALTH CHEMICALS OF INTEREST

MISSISSIPPI RIVER POOL 15

[o] Agency for Toxic Substances and Disease Registry (ATSDR). 1990. Toxicological Profile for Manganese. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[p] Agency for Toxic Substances and Disease Registry (ATSDR). 1989. Toxicological Profile for Silver. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[q] Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological Profile for Phenol. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

[r] Agency for Toxic Substances and Disease Registry (ATSDR). 1991. Toxicological Profile for Cyanide. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA.

Table D-4. Risk-Based Concentration Goal Calculations for Adolescent Child Exposure to Sediment while Swimming in MRP15, Alcoa-Davenport Works, Riverdale, Iowa.

Constituent	CANCER EFFECTS: Route-Specific RBCs Oral $(RBCo)_C$ TCR = 1E-06	CANCER EFFECTS: Route-Specific RBCs Dermal $(RBCd)_C$ TCR = 1E-06	CANCER EFFECTS: Calculated Goals RBC_C TCR = 1E-06	CANCER EFFECTS: Calculated Goals RBC_C TCR = 1E-04	NON-CANCER EFFECTS: Route-Specific RBCs Oral $(RBCo)_{NC}$ THQ = 1	NON-CANCER EFFECTS: Route-Specific RBCs Dermal $(RBCd)_{NC}$ THQ = 1	NON-CANCER EFFECTS: Calculated Goal RBC_{NC} THQ = 1	Minimum RBC [a]	ABSd	ABSo	TOXICITY VALUES: Oral CSFo (kg-day/mg)	TOXICITY VALUES: Adjusted CSFa (kg-day/mg)	TOXICITY VALUES: Oral Chronic RfDo (mg/kg/day)	TOXICITY VALUES: Adjusted Chronic RfDa (mg/kg/day)
VOCs														
2-Butanone	NC	NC	NC	NC	NAP	NAP	NAP	NAP	1.0E-01	1.0E+00	NC	NC	6.0E-01	6.0E-01
Acetone	NC	NC	NC	NC	NAP	NAP	NAP	NAP	1.0E-01	1.0E+00	NC	NC	1.0E-01	1.0E-01
Carbon disulfide	NA	NA	NA	NA	NAP	NAP	NAP	NAP	1.0E-01	1.0E+00	NA	NA	1.0E-01	1.0E-01
SVOCs														
2-Methylnaphthalene[1]	NC	NC	NC	NC	NAP	NAP	NAP	NAP	3.0E-02	8.5E-01	NC	NC	4.0E-02	3.4E-02
4-Methylphenol	NA	NA	NA	NA	NAP	412,688	310,000	310,000	1.0E-01	8.4E-01	NA	NA	5.0E-03	4.2E-03
Acenaphthene	NA	NA	NA	NA	NAP	NAP	NAP	NAP	3.0E-02	8.5E-01	NA	NA	6.0E-02	5.1E-02
Anthracene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	3.0E-02	8.5E-01	NC	NC	3.0E-01	2.6E-01
Benzo(a)anthracene	2,250	2,670	1,200	120,000	NA	NA	NA	1,200	3.0E-02	8.5E-01	7.3E-01	8.6E-01	NA	NA
Benzo(a)pyrene	225	267	120	12,000	NA	NA	NA	120	3.0E-02	8.5E-01	7.3E+00	8.6E+00	NA	NA
Benzo(b)fluoranthene	2,250	2,670	1,200	120,000	NA	NA	NA	1,200	3.0E-02	8.5E-01	7.3E-01	8.6E-01	NA	NA
Benzo(ghi)perylene[2]	NC	NC	NC	NC	NAP	NAP	NAP	NAP	3.0E-02	8.5E-01	NC	NC	3.0E-02	2.6E-02
Benzo(k)fluoranthene	22,500	26,696	12,000	NAP	NA	NA	NA	12,000	3.0E-02	8.5E-01	7.3E-02	8.6E-02	NA	NA
Butyl benzyl phthalene	NA	NA	NA	NA	NAP	NAP	NAP	NAP	1.0E-01	1.0E+00	NA	NA	2.0E-01	2.0E-01
Carbazole	82,125	34,391	24,000	NAP	NA	NA	NA	24,000	1.0E-01	1.0E+00	2.0E-02	2.0E-02	NA	NA
Chrysene	225,000	266,960	120,000	NAP	NA	NA	NA	120,000	3.0E-02	8.5E-01	7.3E-03	8.6E-03	NA	NA
Dibenz(a,h)anthracene	225	267	120	12,000	NA	NA	NA	120	3.0E-02	8.5E-01	7.3E+00	8.6E+00	NA	NA
Dibenzofuran[3]	NC	NC	NC	NC	938,571	NAP	510,000	510,000	3.0E-02	8.5E-01	NC	NC	4.0E-03	3.4E-03
Fluoranthene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	3.0E-02	8.5E-01	NC	NC	4.0E-02	3.4E-02
Fluorene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	3.0E-02	8.5E-01	NC	NC	4.0E-02	3.4E-02
Indeno(1,2,3-cd)pyrene	2,250	2,670	1,200	120,000	NA	NA	NA	1,200	3.0E-02	8.5E-01	7.3E-01	8.6E-01	NA	NA
Naphthalene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	3.0E-02	8.5E-01	NC	NC	4.0E-02	3.4E-02
Phenanthrene[2]	NC	NC	NC	NC	NAP	NAP	NAP	NAP	3.0E-02	8.5E-01	NC	NC	3.0E-02	2.6E-02
Phenol	NC	NC	NC	NC	NAP	NAP	NAP	NAP	8.0E-01	8.5E-01	NC	NC	6.0E-01	5.1E-01
Pyrene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	3.0E-02	9.0E-01	NC	NC	3.0E-02	2.7E-02

Footnotes appear on Page 2.

Table D-4. Risk-Based Concentration Goal Calculations for Adolescent Child Exposure to Sediment while Swimming in MRP15, Alcoa-Davenport Works, Riverdale, Iowa.

Constituent	CANCER EFFECTS: Route-Specific RBCs Oral	CANCER EFFECTS: Route-Specific RBCs Dermal	CANCER EFFECTS: Calculated Goals		NON-CANCER EFFECTS: Route-Specific RBCs Oral	NON-CANCER EFFECTS: Route-Specific RBCs Dermal	NON-CANCER EFFECTS: Calculated Goal	Minimum RBC [a]	ABSd	ABSo	TOXICITY VALUES: Oral	TOXICITY VALUES: Adjusted	TOXICITY VALUES: Oral	TOXICITY VALUES: Adjusted
	$(RBCo)_C$	$(RBCd)_C$	RBC_C		$(RBCo)_{NC}$	$(RBCd)_{NC}$	RBC_{NC}				CSFo	CSFa	Chronic RfDo	Chronic RfDa
	TCR = 1E-06		TCR = 1E-06	TCR = 1E-04	THQ = 1		THQ = 1				(kg-day/mg)	(kg-day/mg)	(mg/kg/day)	(mg/kg/day)
PCBs														
Aroclor-1248	821	545	330	33,000	4,693	3,112	1,900	330	0.06	9.5E-01	2.0E+00	2.1E+00	2.0E-05	1.9E-05
Aroclor-1254	821	545	330	33,000	4,693	3,112	1,900	330	0.06	9.5E-01	2.0E+00	2.1E+00	2.0E-05	1.9E-05
Aroclor-1260	821	545	330	33,000	4,693	3,112	1,900	330	0.06	9.5E-01	2.0E+00	2.1E+00	2.0E-05	1.9E-05
Inorganics														
Aluminum[3]	NA	NA	NA	NA	NAP	NAP	NAP	NAP	1.0E-02	2.7E-01	NA	NA	1.0E+00	2.7E-01
Chromium	NA	NA	NA	NA	NAP	98,259	91,000	91,000	1.0E-02	2.0E-02	NA	NA	5.0E-03	1.0E-04
Copper[4]	NC	NC	NC	NC	NAP	NAP	NAP	NAP	1.0E-02	6.0E-01	NC	NC	3.7E-02	2.2E-02
Iron	NC	NC	NC	NC	NA	NA	NA	NA	1.0E-02	1.5E-01	NC	NC	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	6.0E-04	1.5E-01	NA	NA	NA	NA
Manganese	NC	NC	NC	NC	NAP	NAP	NAP	NAP	1.0E-02	5.0E-02	NC	NC	1.4E-01	7.0E-03
Silver	NC	NC	NC	NC	NAP	NAP	550,000	550,000	1.0E-02	2.1E-01	NC	NC	5.0E-03	1.1E-03
Zinc	NC	NC	NC	NC	NAP	NAP	NAP	NAP	1.0E-02	3.0E-01	NC	NC	3.0E-01	9.0E-02
Total Cyanide	NC	NC	NC	NC	NAP	NAP	NAP	NAP	1.0E-02	4.7E-01	NC	NC	2.0E-02	9.4E-03

All concentrations are presented in milligrams per kilogram (mg/kg).

Benzo(a)pyrene CSFi was 6.1 (URi, 1.7E-03), was withdrawn - PAH memo May 1992

[1] Screening value for 2-Methylnaphthalene based on naphthalene surrogate.

[2] Screening value based on pyrene surrogate.

[3] Environmental Criteria Assessment Office

[4] Region III Risk-Based Concentration Table (USEPA 1996c)

[a] The minimum of the RBC_C ($TCR=10^{-6}$) and RBC_{NC} (THQ=1).

mg/kg Milligrams per kilogram.

NA Not available; insufficient toxicity data.

RBC Risk-based concentration goal for sediment.

NAP Not applicable; calculated concentration exceeds pure product.

NC Not a suspected carcinogen.

TCR Target cancer risk.

THI Target hazard index.

Table D-5. Risk-Based Concentration Goal Calculations for Sediment based on Adolescent Child Swimming Exposure in Wetlands, Alcoa-Davenport Works, Riverdale, Iowa.

Constituent	CANCER EFFECTS: Route-Specific RBCs Oral $(RBCo)_C$ (TCR = 1E-06)	CANCER EFFECTS: Route-Specific RBCs Dermal $(RBCd)_C$ (TCR = 1E-06)	CANCER EFFECTS: Calculated Goals RBC_C TCR = 1E-06	CANCER EFFECTS: Calculated Goals RBC_C TCR = 1E-04	NON-CANCER EFFECTS: Route-Specific RBCs Oral $(RBCo)_{NC}$ (THQ = 1)	NON-CANCER EFFECTS: Route-Specific RBCs Dermal $(RBCd)_{NC}$ (THQ = 1)	NON-CANCER EFFECTS: Calculated Goal RBC_{NC} THQ = 1	Minimum RBC [a]	ABSd	ABSo	TOXICITY VALUES: Oral CSFo (kg-day/mg)	TOXICITY VALUES: Adjusted CSFa (kg-day/mg)	TOXICITY VALUES: Oral Chronic RfDo (mg/kg/day)	TOXICITY VALUES: Adjusted Chronic RfDa (mg/kg/day)
VOCs														
Acetone	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.1	1	NC	NC	1.0E-01	1.0E-01
Benzene	56,638	23,718	17,000	NAP	NA	NA	NA	17,000	0.1	1	2.9E-02	2.9E-02	NA	NA
Chloromethane	126,346	52,909	37,000	NAP	NA	NA	NA	37,000	0.1	1	1.3E-02	1.3E-02	NA	NA
Methylene chloride	219,000	91,709	65,000	NAP	NAP	NAP	NAP	65,000	0.1	1	7.5E-03	7.5E-03	6.0E-02	6.0E-02
Tetrachloroethylene	31,587	13,227	9,300	930,000	NAP	982,592	690,000	9,300	0.1	1	5.2E-02	5.2E-02	1.0E-02	1.0E-02
Toluene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.1	1	NC	NC	2.0E-01	2.0E-01
SVOCs														
Acenaphthene	NA	NA	NA	NA	NAP	NAP	NAP	NAP	0.03	0.85	NA	NA	6.0E-02	5.1E-02
Anthracene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.03	0.85	NC	NC	3.0E-01	2.6E-01
Benzo(a)anthracene	2,250	2,670	1,200	120,000	NA	NA	NA	1,200	0.03	0.85	7.3E-01	8.6E-01	NA	NA
Benzo(a)pyrene	225	267	120	12,000	NA	NA	NA	120	0.03	0.85	7.3E+00	8.6E+00	NA	NA
Benzo(b)fluoranthene	2,250	2,670	1,200	120,000	NA	NA	NA	1,200	0.03	0.85	7.3E-01	8.6E-01	NA	NA
Benzo(ghi)perylene[1]	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.03	0.85	NC	NC	3.0E-02	2.6E-02
Benzo(k)fluoranthene	22,500	26,696	12,000	NAP	NA	NA	NA	12,000	0.03	0.85	7.3E-02	8.6E-02	NA	NA
Carbazole	82,125	34,391	24,000	NAP	NA	NA	NA	24,000	0.1	1	2.0E-02	2.0E-02	NA	NA
Chrysene	225,000	266,960	120,000	NAP	NA	NA	NA	120,000	0.03	0.85	7.3E-03	8.6E-03	NA	NA
Dibenz(a,h)anthracene	225	267	120	12,000	NA	NA	NA	120	0.03	0.85	7.3E+00	8.6E+00	NA	NA
Dibenzofuran[3]	NC	NC	NC	NC	938,571	NAP	510,000	510,000	0.03	0.85	NC	NC	4.0E-03	3.4E-03
Fluoranthene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.03	0.85	NC	NC	4.0E-02	3.4E-02
Fluorene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.03	0.85	NC	NC	4.0E-02	3.4E-02
Indeno(1,2,3-cd)pyrene	2,250	2,670	1,200	120,000	NA	NA	NA	1,200	0.03	0.85	7.3E-01	8.6E-01	NA	NA
Naphthalene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.03	0.85	NC	NC	4.0E-02	3.4E-02
Phenanthrene[1]	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.03	0.85	NC	NC	3.0E-02	2.6E-02
Pyrene	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.03	0.85	NC	NC	3.0E-02	2.6E-02

Footnotes appear on Page 2.

Table D-5. Risk-Based Concentration Goal Calculations for Sediment based on Adolescent Child Swimming Exposure in Wetlands, Alcoa-Davenport Works, Riverdale, Iowa.

Constituent	CANCER EFFECTS: Route-Specific RBCs Oral $(RBCo)_C$ TCR = 1E-06	CANCER EFFECTS: Route-Specific RBCs Dermal $(RBCd)_C$ TCR = 1E-06	CANCER EFFECTS: Calculated Goals RBC_C TCR = 1E-06	CANCER EFFECTS: Calculated Goals RBC_C TCR = 1E-04	NON-CANCER EFFECTS: Route-Specific RBCs Oral $(RBCo)_{NC}$ THQ = 1	NON-CANCER EFFECTS: Route-Specific RBCs Dermal $(RBCd)_{NC}$ THQ = 1	NON-CANCER EFFECTS: Calculated Goal RBC_{NC} THQ = 1	Minimum RBC [a]	ABSd	ABSo	TOXICITY VALUES: Oral CSFo (kg-day/mg)	TOXICITY VALUES: Adjusted CSFa (kg-day/mg)	TOXICITY VALUES: Oral Chronic RfDo (mg/kg/day)	TOXICITY VALUES: Adjusted Chronic RfDa (mg/kg/day)
PCBs														
Aroclor-1248	821	545	330	33,000	4,693	3,112	1,900	330	0.06	0.95	2.0E+00	2.1E+00	2.0E-05	1.9E-05
Aroclor-1254	821	545	330	33,000	4,693	3,112	1,900	330	0.06	0.95	2.0E+00	2.1E+00	2.0E-05	1.9E-05
Inorganics														
Aluminum[2]	NA	NA	NA	NA	NAP	NAP	NAP	NAP	0.01	0.27	NA	NA	1.0E+00	2.7E-01
Chromium	NA	NA	NA	NA	NAP	98,259	91,000	91,000	0.01	0.02	NA	NA	5.0E-03	1.0E-04
Copper[3]	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.01	0.6	NC	NC	4.0E-02	2.4E-02
Lead	NA	NA	NA	NA	NA	NA	NA	NA	0.0006	0.15	NA	NA	NA	NA
Manganese	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.01	0.05	NC	NC	1.4E-01	7.0E-03
Zinc	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.01	0.3	NC	NC	3.0E-01	9.0E-02
Cyanide, Total	NC	NC	NC	NC	NAP	NAP	NAP	NAP	0.01	0.47	NC	NC	2.0E-02	9.4E-03

All concentrations are presented in milligrams per kilogram (mg/kg).
Benzo(a)pyrene CSFi was 6.1 (URi, 1.7E-03), was withdrawn - PAH memo May 1992
Chromium RfD_o based on 1/6 ratio of CrVI to CrIII.

[a] The minimum of the RBC_C (TCR-10^{-6}) and the RBC_{NC} (THQ=1).

[1] Screening value based on pyrene surrogate.

[2] Region III Risk-Based Concentration Table (USEPA 1996c)

[3] Environmental Criteria Assessment Office

mg/kg Milligrams per kilogram.

NA Not available; insufficient toxicity data.

RBC Risk-based concentration goal for sediment.

NAP Not applicable; calculated concentration exceeds pure product.

NC Not a suspected carcinogen.

TCR Target cancer risk.

THI Target hazard index.

Table D-6. Risk-Based Concentration Goals for Surface Water Based on Adolescent Child Swimming Exposure in MRP15, Alcoa-Davenport Works, Riverdale, Iowa.

	CANCER EFFECTS				NON-CANCER EFFECTS						TOXICITY VALUES			
	Route-Specific RBCs (TCR = 10^{-}		RBC_C		Route-Specific RBCs			Minimum	PC	ABSo	CSFo	CSFa	RfDo	RfDa
Constituent	Oral	Dermal	(TCR = 10^{-6})	(TCR = 10^{-4})	Oral	Dermal	RBC_{NC}	RBC [a]	(cm/hour)		Oral (kg-day/mg)	Adjusted (kg-day/mg)	Oral (mg/kg/day)	Adjusted (mg/kg/day)
VOCs														
2-Butanone	NA	NA	NA	NA	10,830	30,452	8,000	8,000	1.1E-03	1.0E+00	NA	NA	6.0E-01	6.0E-01
Acetone	NA	NA	NA	NA	1,805	9,796	1,500	1,500	5.7E-04	1.0E+00	NA	NA	1.0E-01	1.0E-01
SVOCs														
Fluorene	NC	NC	NC	NC	722	8	8	8	2.4E-01	8.5E-01	NC	NC	4.0E-02	3.4E-02
Inorganics														
Copper[1]	NA	NA	NA	NA	668	7,746	610	610	1.6E-04	6.0E-01	NA	NA	3.7E-02	2.2E-02
Iron	NA	NA	NA	NA	NA	NA	NA	NA	1.6E-04	1.5E-01	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	2,527	2,443	1,200	1,200	1.6E-04	5.0E-02	NA	NA	1.4E-01	7.0E-03
Zinc	NA	NA	NA	NA	5,415	31,404	4,600	4,600	1.6E-04	3.0E-01	NA	NA	3.0E-01	9.0E-02

All concentrations are presented in milligrams per liter (mg/L).

[a] The minimum of the RBC_C (TCR = 10^{-6}) and the RBC_{NC} (THQ = 1).

[1] Environmental Criteria Assessment Office

NA Not available; insufficient toxicity data.
NC Not a suspected carcinogen.
RBC Risk-based concentration goal for surface water (mg/L).
TCR Target cancer risk; RBC_C values presented for TCRs of 10^{-6} and 10^{-4}.
THQ Target hazard quotient for non-cancer effects; RBC_{NC} value presented for THQ of 1.

Table D-7. Risk-Based Concentration Goals for Surface Water Based on Adolescent Child Swimming Exposure in Wetlands, Alcoa-Davenport Works, Riverdale, Iowa.

Constituent	CANCER EFFECTS: Route-Specific RBCs (TCR = 10^{-} Oral	CANCER EFFECTS: Route-Specific RBCs (TCR = 10^{-} Dermal	CANCER EFFECTS: RBC_C (TCR = 10^{-6})	CANCER EFFECTS: RBC_C (TCR = 10^{-4})	NON-CANCER EFFECTS: Route-Specific RBCs Oral	NON-CANCER EFFECTS: Route-Specific RBCs Dermal	NON-CANCER EFFECTS: RBC_{NC}	Minimum RBC [a]	PC (cm/hour)	ABSo	TOXICITY VALUES: CSFo Oral (kg-day/mg)	TOXICITY VALUES: CSFa Adjusted (kg-day/mg)	TOXICITY VALUES: RfDo Oral (mg/kg/day)	TOXICITY VALUES: RfDa Adjusted (mg/kg/day)
SVOCs														
Phenanthrene[3]	NC	NC	NC	NC	541	6	6	6	2.3E-01	8.5E-01	NC	NC	3.0E-02	2.6E-02
Pyrene	NC	NC	NC	NC	541	3	3	3	4.7E-01	8.5E-01	NC	NC	3.0E-02	2.6E-02
PCBs														
PCB-1260	6.32E-02	2.19E-04	0.0002	0.02	NA	NA	NA	0.0002	8.5E-01	9.5E-01	2.0E+00	2.1E+00	NA	NA
Inorganics														
Aluminum[1]	NA	NA	NA	NA	18,049	94,211	15,000	15,000	1.6E-04	2.7E-01	NA	NA	1.0E+00	2.7E-01
Chromium	NA	NA	NA	NA	18,049	6,979	5,000	5,000	1.6E-04	2.0E-02	NA	NA	1.0E+00	2.0E-02
Copper[2]	NA	NA	NA	NA	668	7,746	610	610	1.6E-04	6.0E-01	NA	NA	3.7E-02	2.2E-02
Iron	NA	NA	NA	NA	NA	NA	NA	NA	1.6E-04	1.5E-01	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	4.0E-06	1.5E-01	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	2,527	2,443	1,200	1,200	1.6E-04	5.0E-02	NA	NA	1.4E-01	7.0E-03
Zinc	NA	NA	NA	NA	5,415	31,404	4,600	4,600	1.6E-04	3.0E-01	NA	NA	3.0E-01	9.0E-02

All concentrations are presented in milligrams per liter (mg/L).
Chromium RfD_o based on 1/6 ratio of CrVI to CrIII.

[a] The minimum of the RBC_C (TCR = 10^{-6}) and the RBC_{NC} (THQ = 1).

[1]Region III Risk-Based Concentration Table (USEPA 1996c)

[2]Environmental Criteria Assessment Office

[3]Screening value based on pyrene surrogate.

NA Not available; insufficient toxicity data.
NAP Not applicable; calculated concentration exceeds pure product.
NC Not a suspected carcinogen.
RBC Risk-based concentration goal for surface water (mg/L).
TCR Target cancer risk; RBC_C values presented for TCRs of 10^{-6} and 10^{-4}.
THQ Target hazard quotient for non-cancer effects; RBC_{NC} value presented for THQ of 1.