Investigation-Derived Waste Management Plan

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

SAFETY · RESPONSIBILITY · SECURITY
SRS
SAVANNAH RIVER SITE

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY UNDER CONTRACT DE-AC09-89-SR18035

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DISCLAIMER

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AOC	Area Of Contamination
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DAF	Dilution and Attenuation Factor
EPA	Environmental Protection Agency
F/H ETF	F/H-Area Effluent Treatment Facility
FIP	Field Investigation Plan
HBL	Health-Based Levels
HW	Hazardous Waste
IDW	Investigation-Derived Waste
IWT	Industrial Wastewater Treatment
MCL	Maximum Contaminant Levels
MU	Management Unit
MWMF	Mixed Waste Management Facility
PPE	Personal Protection Equipment
RCRA	Resource Conservation and Recovery Act
SDWA	Safe Drinking Water Act
SCDHEC	South Carolina Department of Health and Environmental Control
SRS	Savannah River Site
TCLP	Toxicity Characteristic Leaching Procedure
TSS	Total Suspended Solids
VOC	Volatile Organic Compounds
WSRC	Westinghouse Savannah River Company

List of Abbreviations and Units

CuFt	Cubic Feet
mg/l	milligrams per liter
pCi/g	pico Curie per gram
pCi/ml	pico Curie per milliliter
mg/kg	milligram per kilogram

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EXECUTIVE SUMMARY

This document describes the Savannah River Site (SRS) plan for the management of investigation-derived waste (IDW) generated during investigations performed under the regulatory authority of the Resource Conservation and Recovery Act (RCRA), as amended, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended. IDW includes potentially contaminated environmental media such as monitoring well purge water, well pumping test and development water, drilling mud, and soil drill cuttings. IDW also includes decontamination and rinse waters as well as equipment and personal protective equipment that have not been decontaminated. The SRS IDW management strategy is to minimize the quantity of IDW generated while cost-effectively managing the IDW which must be generated.

Two management programs are encompassed within this plan: IDW derived from contact with non-listed hazardous wastes (non-listed IDW) and that derived from contact with listed wastes (listed IDW).

- Non-listed IDW will be managed utilizing appropriate practices for concentrations not exceeding ten times (10x) the Health-Based Levels (HBLs) presented in Appendix A (Aqueous IDW), or not exceeding the HBLs in Appendix B (Non-Aqueous IDW) and through implementation of the activities identified in this IDW Management Plan for concentrations exceeding 10x HBLs in Appendix A or exceeding the HBLs in Appendix B.

  Non-listed IDW will be managed as hazardous waste if it is characteristically hazardous.

  The choice of 10 as a multiplier for determining the action levels for non-listed aqueous IDW is based on employing a prudent approach to the management of IDW which is protective of human health and the environment. This management approach is discussed further in Section 2.2.

- Listed IDW containing constituents exceeding HBLs listed in Appendix A (aqueous IDW) or Appendix B (non-aqueous IDW) will be managed as a hazardous waste, consistent with EPA's Contained-In Policy.

These programs are consistent with EPA guidance for management of IDW and are protective of human health and the environment.

SRS has already taken actions to develop the necessary treatment capacities for the different categories of IDW. The schedules contained in Appendix C identify the major activities completed to date. The schedules are considered integral to the full implementation of the IDW Management Plan. In addition, SRS is pursuing innovative technologies and practices as described in this Plan to reduce the volume of IDW that is generated. This approach will reduce the potential for worker exposure and will minimize material handling activities. These innovative technologies and practices will be introduced to the EPA and South Carolina Department of Health and Environmental Control (SCDHEC) for implementation at SRS.

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1.0 INTRODUCTION

SRS has implemented a comprehensive environmental program to maintain compliance with environmental regulations and mitigate impacts to the environment. One element of the environmental program is the investigation of inactive waste units. Environmental investigations typically employ activities such as drilling and excavating, which produce Investigation-Derived Waste (IDW). IDW may include purge water, soil cuttings, drilling fluids, well pumping test and development water, decontamination solutions, contaminated equipment, and personal protection equipment (PPE). In cases where investigations confirm the presence of contamination and the IDW contains waste constituents in concentrations high enough to be of environmental or health concern, special management procedures are warranted.

This IDW Management Plan describes specific SRS initiatives for IDW management. The goal is the development of a plan for prudent management of IDW from environmental investigations that is protective of human health and the environment.

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2.0 IDW MANAGEMENT

IDW management at SRS is divided into two programs: management of IDW generated from non-listed sources and management of IDW generated from listed sources. Within these two programs, IDW is further defined as either aqueous IDW (purge water or other aqueous solutions resulting from the groundwater monitoring and sampling programs) or non-aqueous (solid phase) IDW resulting from waste unit investigation activities. Management levels for the various IDW categories are presented in Appendices A and B of this Plan. An overview of this IDW Management Plan, which considers IDW generated from both inside the area of contamination (AOC) and outside the AOC is illustrated in Figure 2-1. The schedules contained in Appendix C are integral to the full implementation of the IDW Management Plan.

2.1 IDW Management: General Practice Guidelines

The SRS guidance for managing IDW is related to the type of waste being generated during environmental investigations and the location of the work site, i.e., inside the AOC or outside the AOC. The AOC is defined as the area inside the limits of known contamination. The limits are defined after research of documentation indicate buried waste, surface spills, waste releases, etc., or from direct evidence of surface waste or contamination at the work area. The AOC boundaries are approximated by orange ball markers posted at the corners of the waste units. In other cases, the AOC boundary is defined by the approved closure plan or other legally binding agreements for an operating, closing, or closed Hazardous Waste Management Facility.

The following implementation guidance is appropriate whether the source of IDW is listed or non-listed:

IDW Generated Inside the AOC:

- SRS will place non-aqueous IDW into management units inside the AOC. The management unit will be constructed so that the bottom of the management unit is no closer than ten (10) feet from the known water table as illustrated in Figure 2-2. The IDW will remain in the management unit and will be dispositioned consistent with the final remedial actions for the waste unit.

IDW Generated Outside the AOC:

Consistent with EPA guidance (Document #9345.3-03FS, "Guide to Management of Investigation-Derived Wastes"), it will not be presumed that IDW solids resulting from core borings or well drilling operations outside the AOC are hazardous unless positive evidence (records or other documentation) indicate otherwise. In all cases, best professional judgment and available information will be utilized in conjunction with the following guidance to determine the appropriate management actions for IDW which is generated outside the AOC.

- If it is known from document research that the drilling site is located over a contaminated groundwater plume (or hydrologically downgradient of a waste unit), then IDW resulting from penetration into the contaminated zone will be containerized at the work site and a representative sample collected for analysis. SRS will use laboratory analyses to determine whether the IDW is managed as hazardous until field screening methodologies are demonstrated and determined to be effective. Upon receipt of laboratory analyses, IDW will be dispositioned in accordance with the appropriate actions as delineated in Section 2.2 or Section 2.3.

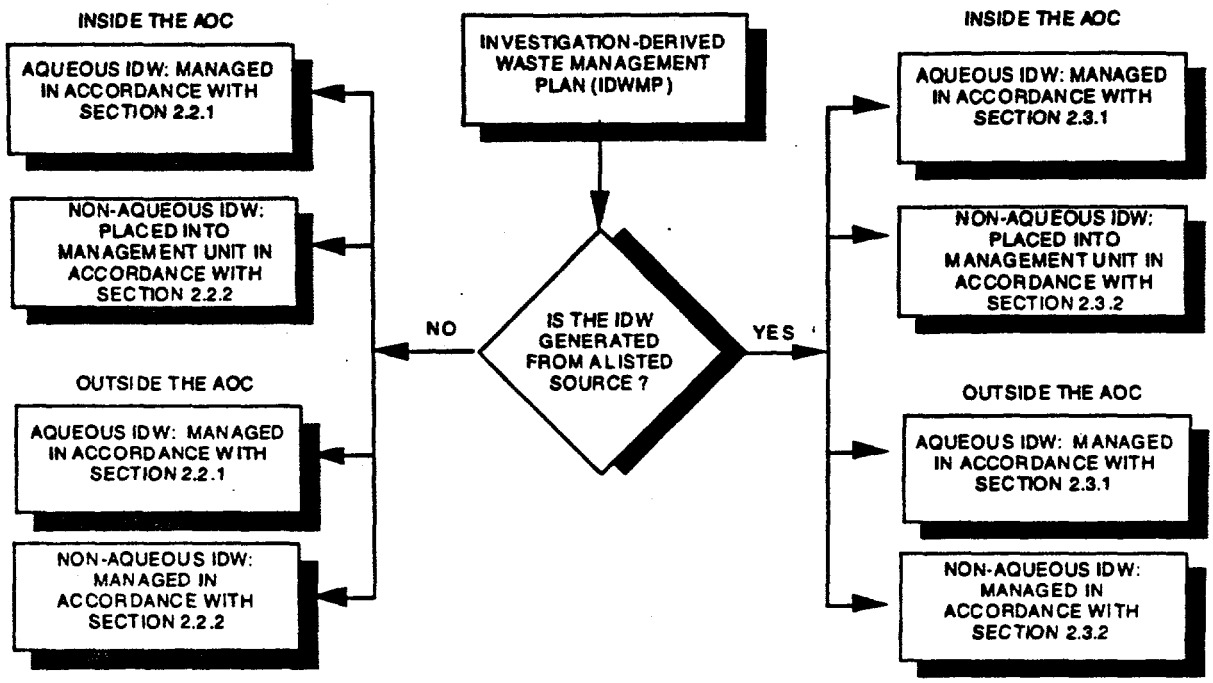
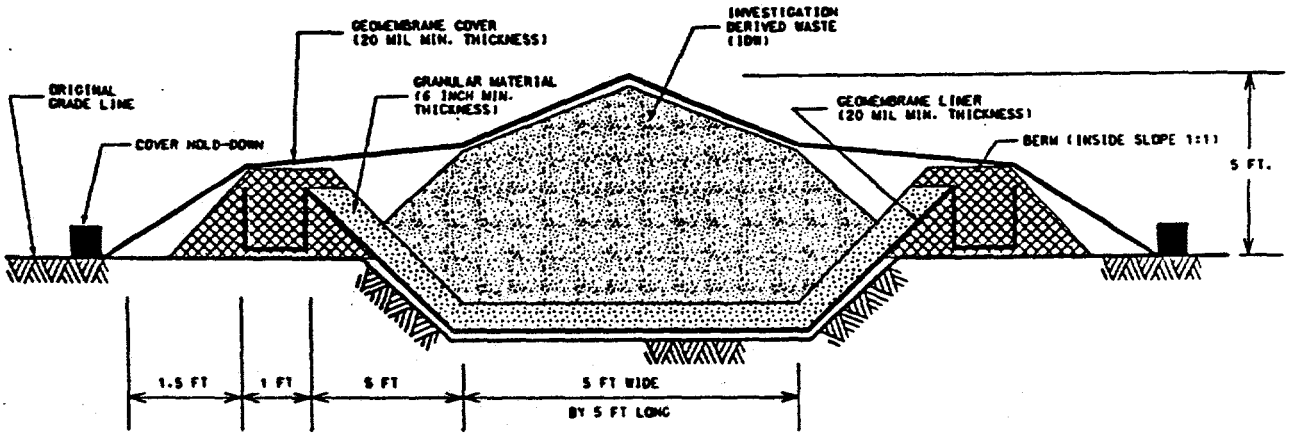


Figure 2-1. Investigation-Derived Waste Management Plan



NOTES:

1. ASSUMPTION - DESIGN IS FOR 3 WELLS WITH A 225 CUBIC FEET VOLUME OF IDW PER WELL.
2. TRUCK ACCESS RAMP NOT SHOWN.
3. CUT VOLUME EQUALS FILL VOLUME.
4. SKETCH IS NOT DRAWN TO SCALE.
5. MANAGEMENT UNIT WILL BE CONSTRUCTED SO THAT THE BOTTOM OF THE MANAGEMENT UNIT IS NO CLOSER THAN TEN FEET FROM THE WATER TABLE.

Figure 2-2. IDW Management Unit at Area of Contamination (AOC) (Typical)

- If it is known from document research that positive evidence does not exist that hazardous constituents were disposed in the vicinity of the work site and the work is being conducted at a location where there are no upgradient waste units and no contamination is expected, the IDW will be managed using appropriate practices such as land application.

Example: Assume a core boring operation is needed in the greater A/M Area, which is known to have underlying groundwater with contamination from F001 listed constituents. At this example location outside the AOC, records indicate groundwater contamination is at a depth of 100 feet. Also, assume the boring will be to a depth of 80 feet. No other records indicate contamination in this area within the 80 foot depth. The drill cuttings from this operation would be considered clean and placed in the immediate vicinity using appropriate practices such as land application.

If the core boring operation includes a plan modification to drill to a depth below 100 feet, into the contaminated groundwater, then the drill cuttings from the contaminated zone would be containerized and analysis would be performed. The containerized soils would be labeled as hazardous and managed appropriately. If the analytical results indicate concentrations of hazardous constituents are below applicable management levels (see Appendix B), the drill cuttings would be disposed by using appropriate practices such as land application. If the analytical results indicate concentrations of hazardous constituents are above the applicable management levels (see Appendix B), the container would be managed as hazardous waste. The 90-day staging period would start when waste is first placed in drums for quantities greater than 55 gallons. This IDW would be labeled as a hazardous waste, staged and sent to a treatment/storage/disposal facility within the 90-day time frame.

Containerization methods of suspect IDW will be dependent upon the type and volume of material, and will be specifically detailed in the unit-specific work plan. A unit-specific table will be developed and included in the unit work plan as a guide to show what containers are to be used for various media and volumes. An example table is presented in Table 2-1.

Table 2-1 - Typical IDW Containerization Methods

MEDIA TYPE	CONTAINER TYPE	STAGING METHOD	CONTAINER CAPACITY
Soils/solids, PPE	Skid Pan Drum	Adjacent to Work Site	2,100 Gallons/280 CuFt 55 Gallons/7.65 CuFt
Water/Slurries, Drilling Fluids	Drum	Adjacent to Work Site, on pallet with secondary containment	55 Gallons/7.65 CuFt

During specific work plan development, a review of this table would be conducted to determine the appropriate method of containerization and staging based on media, estimated volume, and location of the work (inside or outside of the AOC). For large volumes of homogeneously contaminated soils, a skid pan may provide better containerization and management than 55-gallon drums.

Two procedures will be developed, or the existing procedures will be revised, and incorporated within the Westinghouse Savannah River Company (WSRC) 3Q-Environmental Compliance Manual. Copies of the "draft" procedures will be provided within three (3) months of finalization of the IDW Management Plan to EPA and SCDHEC addressing the following issues:

(1) IDW Staging Requirements: This procedure will encompass the appropriate requirements for establishing an IDW staging area, including posting requirements, maintenance and operation of the staging area, and closure of the staging area. The procedure will also identify the appropriate references for guidance depending on the outcome of the laboratory analyses.

(2) IDW Surface Water Runoff Control: This procedure will address control of surface water runoff toward local wetlands or surface water drainage ditches. The current SRS monitoring well purging practice is to employ discharge hoses to minimize erosion and to control flow direction.

The procedure will document the appropriate discharge methods during monitoring well purging operations and will include directing the purge water away from ecologically sensitive areas.

Open boreholes resulting from drilling activities will be abandoned by filling with cement grout from the bottom of the hole to the ground surface in accordance with approved WSRC procedures.

Purge Water from New Wells

Purge water from new monitoring well installations will be managed in accordance with the following guidance, as applicable:

- If a new well is both downgradient of a waste unit and upgradient of a well where purge water requires containerization, then purge water from the new well will be containerized until analytical results justify removal of the new well from the purge water containerization list.

- If a new well is known to be or is potentially downgradient (accounting for possible radial flow from the source area) of a waste unit and upgradient of wells where purge water does not require containerization, but one well monitoring this unit does require containerization, then purge water from the new well will be containerized until analytical results justify removal of the new well from the purge water containerization list.

- If no downgradient or upgradient wells monitoring the waste unit are contaminated, then purge water from the new well will not be containerized unless subsequent analytical results justify addition of the new well to the purge water containerization list.

- If the new well is being installed at a waste unit without wells monitoring the target aquifer of the new well, then purge water from the new well will be containerized until analytical results justify removal of the new well from the purge water containerization list.

- In all other cases, if the new well is being installed for background or other evaluation purposes where no waste unit exists, then purge water from the new well will not be containerized until analytical results justify addition of the new well to the purge water containerization list.

Radionuclides in Non-aqueous IDW

Fay and Pickett (1987) have defined background activity levels produced by naturally-occurring radionuclides from U-238 and Th-232 decay chains and from K-40 in shallow surface soils at the Savannah River Site. These mean values for background are: 9.70 total pCi/gram from the U-238 series, 9.32 total pCi/gram from the Th-232 series, and 0.537 pCi/gram from K-40. Fay and Pickett also established a background value of 0.145 pCi/gram for fission product Cs-137, which has resulted from atmospheric fallout.

Holcomb (1995) has described the impact of the magnitude of the background activity levels on residential preliminary remediation goals (PRGs) established from soil ingestion and exposure and based on the 1E-06 cancer risk. When compared to Fay and Pickett's mean activity levels, the activity of each of the following naturally-occurring radionuclides exceeds the 1E-06 based PRGs (ingestion, exposure): K-40, Pa-234, Pb-214, Bi-214, Ra-228, Ac-228, Pb-212, Bi-212, and Tl-208. It is most important to note that the background activity of Tl-208, or that from Ra-228 plus daughters, even exceeds the 1E-04 risk based industrial PRG for soil.

The sources for these comparably high levels are from the minerals gorceixite and monazite (Thayer, 1983; Looney, 1990). It is quite possible that naturally-occurring activities in soils interlayered with thin seams or nodules of these minerals could easily exceed the background levels of Fay and Pickett.

Current protocol describes establishing background levels as part of the characterization of specific waste sites at SRS. For soils, the process includes activity indicator screening by gross alpha and gross non-volatile beta-gamma counting. Soils exceeding trigger levels of 20 pCi alpha/gram and/or 50 pCi non-volatile beta-gamma/gram are further characterized for individual radionuclide contributors. These trigger levels have permitted quantifying fractional or greater pCi/gram levels of naturally-occurring radionuclides while establishing the presence of less-than-detectable levels (< 1 pCi/gram) of fission and activation products (Holcomb, 1995).

These screening trigger levels were set in a cooperative effort between personnel from the Analytical Development Division at the Savannah River Technology Center (SRTC), and from the Environmental Restoration Department. The trigger levels take into consideration the Fay and Pickett background levels, instrument limits of detection combined with practical counting times, and data requirements tempered by the need to minimize analytical costs.

The following protocol will be used for the radionuclide quantification of soil generated as IDW at the individual sites. If nonaqueous IDW is generated outside an AOC and/or evidence suggests that no potential radiological contaminants of concern are above SRS background concentrations at the operable unit, the soil screening trigger levels of 20 pCi alpha/gram and/or 50 pCi non-volatile beta-gamma/gram are adequate. If a work site under investigation (e.g., operable unit, AOC, environmental media impacted by operable unit releases) has a potential for radiological contamination, the unit specific work plan will identify the potential radiological contaminants of concern and the analytical approach. IDW with potential radiological contaminants of concern exceeding the IDW screening levels in Appendix B shall be managed in accordance with the IDW Plan.

Tritium Contaminated Media

The primary reason for alternate management strategies for tritiated wastewater is the lack of any practical treatment technology. Tritium's chemical reaction properties are indistinguishable from

those of hydrogen, and its physical-chemical effects on properties such as viscosity and boiling point are so small that existing separation technology cannot remove enough tritium from any given waste stream for the treated effluent to meet drinking water standards, which are the most conservative protectors of human health. Thus, an alternative strategy is necessary to ensure protection of human health and the environment.

Mixing with nontritiated water and radioactive decay are the only two practicable means of reducing dose from any given volume of tritiated wastewater. Enhancing evapotranspiration and soil infiltration in the immediate vicinity of the source of tritiated groundwater combines these two dose-reduction methods in a prudent and cost-effective way that is also consistent with the As Low As Reasonably Achievable (ALARA) method of controlling radioactive releases. Note, however, that SRS IDW management requirements are triggered by the most restrictive requirement applicable to any constituent present in the material; thus, if the contaminated medium contained both tritium and an organic compound, and the organic levels exceeded the applicable action level, management would be required. The only case in which tritiated media do not require management is if they meet all the following requirements:

- No other constituent exceeds applicable action levels.
- Tritium activity levels are below safe exposure levels.

Because worker exposure to tritiated wastewater for a 40-hour work week is permissible at levels of 4.0E05 pCi/ml, a reasonable conservative estimate for IDW management limits applicable to SRS workers would be 8.0E05 pCi/ml (since samplers are potentially exposed no more than 50% of the time). Note that protective measures to prevent unauthorized visitors to SRS prevent acute exposure to nonworkers.

Neither future nor chronic exposure is possible from tritiated wastewater releases, due to tritium's behavior in the environment:

- no measurable bioaccumulation in humans (half-life of 7-10 days)
- no measurable bioaccumulation in ecological receptors
- no measurable accumulation in nonliving environmental receptors
- identical transportation through the hydrologic cycle, compared to water
- relatively short half-life, 12.7 years

Tritiated IDW releases may partition into air; transpiration; soil moisture; surface runoff; and groundwater. Sampling procedures preclude surface runoff for all IDW. Of the remaining media receptors, dose impacts for evaporated and transpired tritium are identical. Similarly, soil moisture and groundwater (during groundwater transport) have identical dose impacts. Finally, in case groundwater reaches surface water discharge before decay, a surface water dose impact must be considered. Of these three, groundwater releases have the least impact (zero dose), followed by air releases and reaching maximum dose (in terms of both maximum individual and population doses) in surface water releases. Because tritium is not treated by wastewater treatment facilities, and all such facilities at SRS discharge into Savannah River contributing streams, treatment of tritiated IDW will result in some minor increase in dose contribution. Present practices result in >30% loss by evapotranspiration as well as entrainment for significant lengths of time (in terms of tritium half-lives) as soil moisture and groundwater.

For further detailed analysis of groundwater flow patterns in the vicinity of SRS reactors see FINAL REPORT: Numerical Simulation of Groundwater Flow and Contaminant Transport at the K, L, and P Areas of the Savannah River Site, Aiken, South Carolina, Camp Dresser & McKee Inc., WSRC-RP-89-1198. For general discussions of the environmental impact of discharging

tritiated wastewaters at SRS, see Environmental Information Document: Reactor Seepage Basins (U), WSRC-RP-90-1299.

The greatest potential for exposure of tritium to both the biosphere and human health results from discharge into surface streams that eventually reach the Savannah River. Releases strictly to the air result in a more limited exposure potential. Releases to the ground, which include at least a small component of air release due to evapotranspiration, result in the minimum exposure potential to human health and the environment. In all three scenarios, the small tritium inventory and relatively low activity levels of tritiated purge water result in an extremely small dose. Therefore, any purge water containing only tritium will be discharged to the ground in the vicinity of the well. This management option results in the least impact to human health and the environment. Note that a conservative tritium inventory of all SRS monitoring well purge water, assuming 4 samples/year, is below 5 Curies/year. Rinse and decontamination water combined with well development water will contain less tritium than purge water. Thus, tritiated wastewaters from all IDW will not exceed 10 Curies/year. For comparison, the average throughput of the F/H Effluent Treatment Facility (F/H ETF) is roughly 1000 Curies/year. The existing throughput of tritium through the F/H ETF does not have a measurable impact on the biosphere and little impact on human health. Drinking water supplies originating in downstream Savannah River water are not compromised by SRS discharges of tritiated water. The concentration of tritium in the Savannah River, just downstream from the Site, due to SRS operations is 0.17 of the limit set by the Drinking Water Standard (DWS) of 20,000 pCi/l. The concentration at downstream water supplies is about 0.13 of the DWS.

Purge water containing tritium and another constituent (for non-listed, exceeding 10x HBLs in Appendix A; for listed, exceeding the HBLs in Appendix A), will be managed according to the protocol for the other constituent.

Personal Protection Equipment (PPE)

Decontaminated PPE will be considered below HBL criteria and, therefore, will either be laundered and reused or routinely disposed. Decontamination equipment will either be reused, decontaminated and routinely disposed, or managed within the AOC until dispositioned during final remedial actions for the waste site. PPE contaminated by tritium alone will be decontaminated once completely dry. Other equipment that cannot be decontaminated will be segregated from cleaned materials and evaluated for appropriate disposal.

2.2 Management of IDW From Non-Listed Sources

The SRS IDW Management Strategy is to minimize the quantity of IDW generated while cost effectively managing the IDW which must be generated. The apparent inconsistency of managing listed aqueous IDW at action levels lower than the non-listed aqueous IDW is justified based on the volume difference, and thus cost difference, requiring management. This prudent approach is protective of human health and the environment and is consistent with the Contained-In Policy. Thus, the SRS IDW Management Plan includes two segments for the management of aqueous IDW: one segment for listed aqueous IDW in accordance with the action levels specified in Appendix A, and the second segment for nonlisted aqueous IDW to action levels derived by applying a Dilution and Attenuation Factor (DAF) to the Appendix A levels.

A minimum DAF of 10 was chosen as a default for two main reasons: first the DAF of 10 is based on extensive modeling and field studies by EPA (see pages 13-14 in EPA/540/R-94/101, Soil Screening Guidance, 12/94; and EPA/540R-94/102, Technical Background Document for Soil

Screening Guidance, 12/94). A DAF of 10 accounts for the effects of transport from materials released into the environment as they interact with the biosphere, soil, air, soil moisture, and groundwater. Higher DAF values are appropriate for many constituents other than tritium, which warrants a high DAF due to both site-specific conditions and physical properties.

Further technical justification is provided when considering that EPA established, by extensive analysis and validation, the TCLP levels for metals and organics in the Toxicity Characteristics Revisions final rule (the TCLP rule) in 55 FR 11798 (3/29/90). EPA technically justified using MCLs as a starting point for developing regulatory levels, stating: "EPA maintains that the MCLs, when they exist, are the most appropriate health criteria to use as the starting point for developing regulatory levels (55 FR 11813)".

Based upon the application of the EPA CML model as applied to landfills, EPA also technically justified a Dilution and Attenuation Factor (DAF) of 100 for all TCLP (characteristic) constituents. SRS recognizes that the DAF of 100 is based upon disposal of the material in question in a worst case management RCRA Subtitle D-like landfill scenario. The scenario assumed is quite conservative. Since levels exceeding the health-based criteria might be disposed in areas considered less protective than the leaking landfill scenario in the EPA CML, SRS is choosing a DAF of 10 rather than 100.

Secondly, a DAF was chosen because soil studies at SRS have concluded that direct discharge of purge water at the well site does not increase substantially the concentrations of hazardous constituents. These studies concluded that after repeated applications of inorganic-contaminated groundwater, TCLP constituents would not exceed regulatory levels. Analysis of inorganic constituents have been conducted in two similar studies that include "Proposed Metal Study for the Purge Water Management Program, WSRC-RP-90-783, August 1990", and "Application of Inorganic Contaminated Ground Water for Soils and Compliance with Toxicity Characteristics Regulations, WSRC-MS-91-120". The latter study identified two surface soils types ubiquitous at SRS (Lakeland and Orangeburg soils) and on which tests were conducted to determine the retention ratios of TCLP constituents onto the soils. This study was conducted in both the laboratory with spiked water samples (with TCLP constituents) on SRS soil samples and in the field (in-situ) at a number of well sites with unspiked well purge water containing TCLP constituents. These studies conclude that soil adjacent to SRS monitoring wells that receive purge water will not accumulate inorganics such that they become a hazardous waste according to the RCRA TCLP definition. The effects of volatile organics transport from purge water released onto the ground surface results in interactions with the biosphere, soil, air, and soil moisture. Even though field screening instrumentation is qualitative, i.e. organic vapor analyzers (FID) and photovac detectors (PID), the sensitivity of these instruments is adequate to support inferences that little or no retention of organics in the soil is expected or will be observed.

The volumes of IDW purge water requiring management, and thus the associated costs, are also relevant. The lower the action level, the larger the volume and cost of the resulting material requiring management with no commensurate improvement in risk reduction being realized. The transition from the preceding IDW management strategy at SRS (generally using 100 x MCLs for action levels) to the proposed IDW plan (DAF of 10 for aqueous IDW unless tritium is present for areas without listed waste and no DAF for listed waste areas) approximately triples the volume of material requiring management. Uniformly applying a DAF of 1 for all areas would increase sixfold the volume of material requiring management, compared to the DAF of 10.

Further, justification of the DAF of 10 for nonlisted aqueous IDW based on volumetric constraints, treatability/implementability constraints, and fate and transport appear below:

a. Volumetric Constraints: The total estimated purge water volume at SRS is 441,000 gallons generated annually from all groundwater monitoring wells. Approximately 9% (39,000 gallons) is being containerized and processed at the M1 air stripper and the remaining 91% (402,000 gallons) is discharged to the ground. Of the 441,000 gallons total purge water volume, approximately 183,000 gallons will require management assuming the action levels of the Revision 2 IDW Management Plan are employed. Of the 183,000 gallons, a subvolume each of 62,000 gallons will be processed at the F/H ETF upon completion of facility modifications in accordance with Appendix C; and 94,000 gallons will be treated at the M1 air stripper. There is no current treatment capacity for the remaining 27,000 gallons of listed/radioactive purge water. A favorable response to the letter of November 4, 1994 will enable this purge water to be accommodated by the F/H ETF. Alternately, as described in the IDW Management Plan, Section 4.2 "Listed-Radioactive Aqueous IDW Management", a treatment capacity must be engineered and constructed to process this purge water volume.

If the IDW management approach is to containerize and process all purge water at HBLs (i.e. DAF of 1), the volume requiring management is 361,000 gallons. Of this volume, a subvolume each of 94,000 gallons will be treated at the M1 air stripper, and 27,000 gallons of listed/radioactive purge water, with the increased volume of 240,000 gallons of nonlisted purge water at the F/H ETF.

The following Table 2-2 summarizes the volumes of IDW requiring management under the scenarios: (1) current practice, (2) practice required by IDW Management Plan Revision 2 with nonlisted IDW purge water managed at 10x HBLs in Appendix A, (3) practice required by IDW Management Plan Revision 2 and management of nonlisted IDW purge water at HBLs in Appendix A.

TABLE 2-2 - ANNUAL PURGE WATER SUMMARY (Gallons)

	Current Practice 100 X HBLs	IDW Plan Revision 2, nonlisted at 10x HBLs in Appendix A	IDW Plan Revision 2, nonlisted at HBLs in Appendix A
Listed (containerized) -			
with Radioactive Constituents (MWMF)	N/A	27,000 (6%)	27,000 (6%)
without Radioactive Constituents (A/M Area, Sanitary Landfill)	39,000 (9%)	94,000 (21%)	94,000 (21%)
Nonlisted (containerized) -			
with Radioactive and without Radioactive Constituents, Metals (Burial Ground)	N/A	62,000 (14%)	240,000 (55%)
Discharge to Ground in Well Vicinity	402,000 (91%)	258,000 (59%)	80,000 (18%)
TOTAL	441,000 (100%)	441,000 (100%)	441,000 (100%)

In summary, the management of IDW nonlisted purge water at 10x HBLs versus at HBLs results in a significant volume reduction of 178,000 gallons (240,000 - 62,000) that would require management on an annual basis. This volume translates into a $ 815,000 cost avoidance on an annual basis.

b. Treatment/Implementability Constraints: This volume increase of 178,000 gallons does present significant implementability constraints. Logistical problems also become significant; areas with

large-scale groundwater impacts already have much infrastructure in place, such as graveled and graded roads. However, lowering action levels below a DAF of 10 would trigger management requirements at many additional areas, most of which lack adequate access or present other logistical difficulties. Some, such as the TNX Area (next to the Savannah River), remote sites in parts of the A/M Area, and the Sanitary Landfill (areas adjacent to Upper Three Runs Creek), present ecological concerns as well: infrastructure improvements (i.e., road access) necessary to manage IDW would potentially damage the associated wetlands and at a minimum would require extensive permitting periods.

Additional relevant implementability constraints are as follows:

(1) Purchase of three additional tanker trucks would be required to collect and transport the increased volume (178,000 gallons) of purge water to the F/H Effluent Treatment Facility (F/H ETF).
(2) Assignment of three additional full-time drivers and at least one backup driver for the tanker trucks.
(3) Assignment of additional sampling crews to collect the purge water. It should be noted that the 178,000 gallon volume increase results from the need to collect purge water from an additional 536 wells.
(4) Regrade and gravel twelve (12) miles of well access roads to allow the tanker trucks to get to currently inaccessible wells sites.
(5) Perform additional road maintenance to allow continuous access by the tanker trucks.
(6) Assignment of additional facility operations personnel for unloading the tanker truck at the F/H ETF.
(7) Perform additional vehicle service maintenance on an annual basis.

These constraints also incur an increased administrative burden (i.e. training requirements, procedures, etc.) which must be accommodated on an annual basis.

c. Fate and Transport: The above noted volume, cost, and implementability constraints limit DOE's ability to manage the purge water without discharge at the well site. As noted previously, soil studies at SRS have concluded that direct discharge of purge water at the well site does not increase substantially the concentrations of hazardous constituents (Proposed Metal Study for the Purge Water Management Program, WSRC-RP-90-783, August 1990, and Application of Inorganic Contaminated Ground Water for Soils and Compliance with Toxicity Characteristics Regulations, WSRC-MS-91-120). Further, these studies conclude that soil adjacent to SRS monitoring wells that receive purge water will not accumulate inorganics such that they become a hazardous waste according to the RCRA TCLP definition.

Additionally, based on extensive modeling and field studies by EPA (discussed in EPA/540/R-94/101, Soil Screening Guidance, 12/94), supportive guidance has been developed for the selection and application of soil screening levels (SSLs) by the use of tools such as groundwater fate and transport models (from Ground Water Modeling Compendium, U.S.EPA, 1994, and Framework for Assessing Ground Water Model Applications, U.S.EPA, 1994). Methodologies in the Soil Screening Guidance included utilizing risk exposure pathways, considering background contamination, applying a dilution attenuation factor (DAF), as well as developing fate and transport modeling to identify levels of contamination requiring a response action.

2.2.1 Aqueous IDW From Non-Listed Sources

SRS will manage non-listed aqueous IDW resulting from well development and from the

groundwater monitoring and sampling program in one of two ways as shown in Figure 2-3.

A list of SRS groundwater wells requiring purge water containerization is routinely generated and updated from a review of the historical groundwater quality database. For non-listed purge water, individual well purge water volumes with constituent concentrations exceeding the 10x HBLs in Appendix A will be containerized and treated at existing SRS treatment facilities that operate in accordance with applicable regulatory requirements. Individual volumes with constituent concentrations that do not exceed 10x HBLs in Appendix A will be discharged to the ground within the immediate area of generation. Aqueous IDW containing constituents that exceed the RCRA Toxicity Characteristic Leaching Procedure (TCLP) levels will be managed as a hazardous waste.

Decontamination solutions and rinsates from washing of sampling tools and PPE may include soap and water, isopropyl alcohol for volatile organic compound (VOC) stripping, and nitric acid for residual metals stripping. The dilute soap and water solutions will be discharged to the ground surface and the alcohol solutions will be allowed to evaporate. The nitric acid solutions will be neutralized and discharged at the site of generation. In all cases, the volume of decontamination solutions will be minimized.

2.2.2 Non-Aqueous IDW From Non-Listed Sources

Non-aqueous IDW is defined as those wastes generated from waste unit investigation activities which may or may not exceed the management levels in Appendix B. Non-aqueous IDW includes: soil cuttings, drilling fluids, well development water with total suspended solids greater than 100 mg/L (see "Drilling Fluids" discussion Section 2.2.2) contaminated equipment, and PPE. SRS will manage these wastes as depicted in Figure 2-4 and as discussed in the following paragraphs.

Soil Cuttings

Soil cuttings are defined as unconsolidated soil materials accumulated at the work site during environmental drilling or site characterization activities. Soils cutting are typically dry to moist sediments removed from the shallow subsurface but may include sediments from shallow semi-saturated zones (i.e., perched water-table zones) in the subsurface.

Soil cuttings and other non-aqueous IDW generated inside the AOC will be placed into management units (MU) inside the AOC, as previously described in Section 2.1. The MU will be constructed as illustrated in Figure 2-2. The IDW will remain in the MU and will be dispositioned during time of final remedial actions.

Soil cuttings generated outside the AOC will be field screened for constituents of concern based upon process knowledge as discussed in Section 2.0. For constituents where field screening methods have not been developed to measure to the applicable health-based management levels, samples will be collected for laboratory analysis. Non-aqueous IDW with constituents of concern exceeding the management levels in Appendix B, but below TCLP levels, will be placed in a management unit within the related AOC, or disposed at SRS in accordance with the applicable requirements of the Westinghouse Savannah River Company (WSRC) 3Q-Environmental Compliance Manual and the WSRC Waste Acceptance Criteria Manual. Non-radioactive IDW meeting these criteria will be disposed in an appropriately permitted facility such as a sanitary landfill and suspect radioactive contaminated IDW will be disposed of in the Solid Waste Complex. Other appropriately permitted units such as inert material landfill units or industrial waste disposal units may be evaluated for use on a case-by-case basis. As noted in the implementation schedule (Appendix C) "Select Non-Hazardous Disposal Units" specific sites at SRS will be identified.

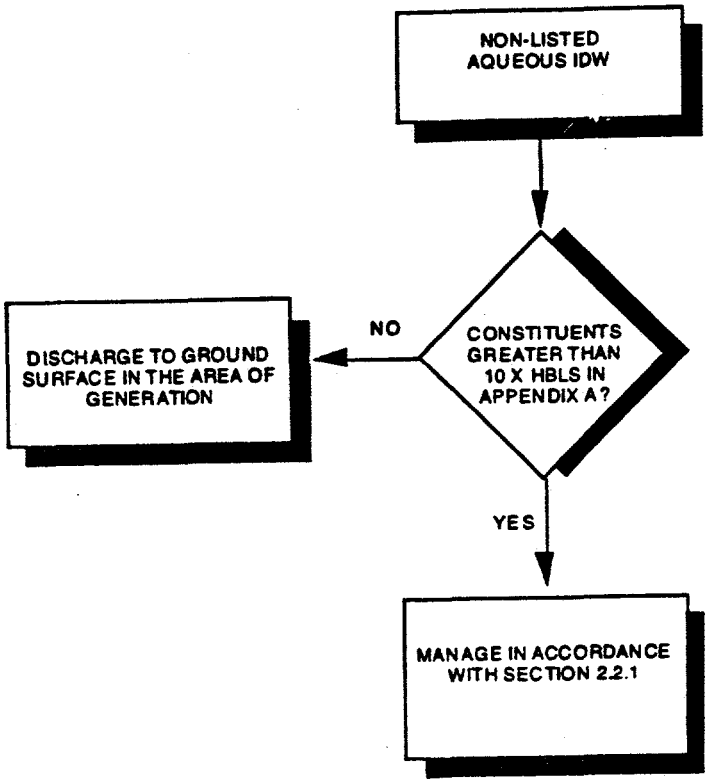


Figure 2-3 Aqueous IDW Management From Non-Listed Sources

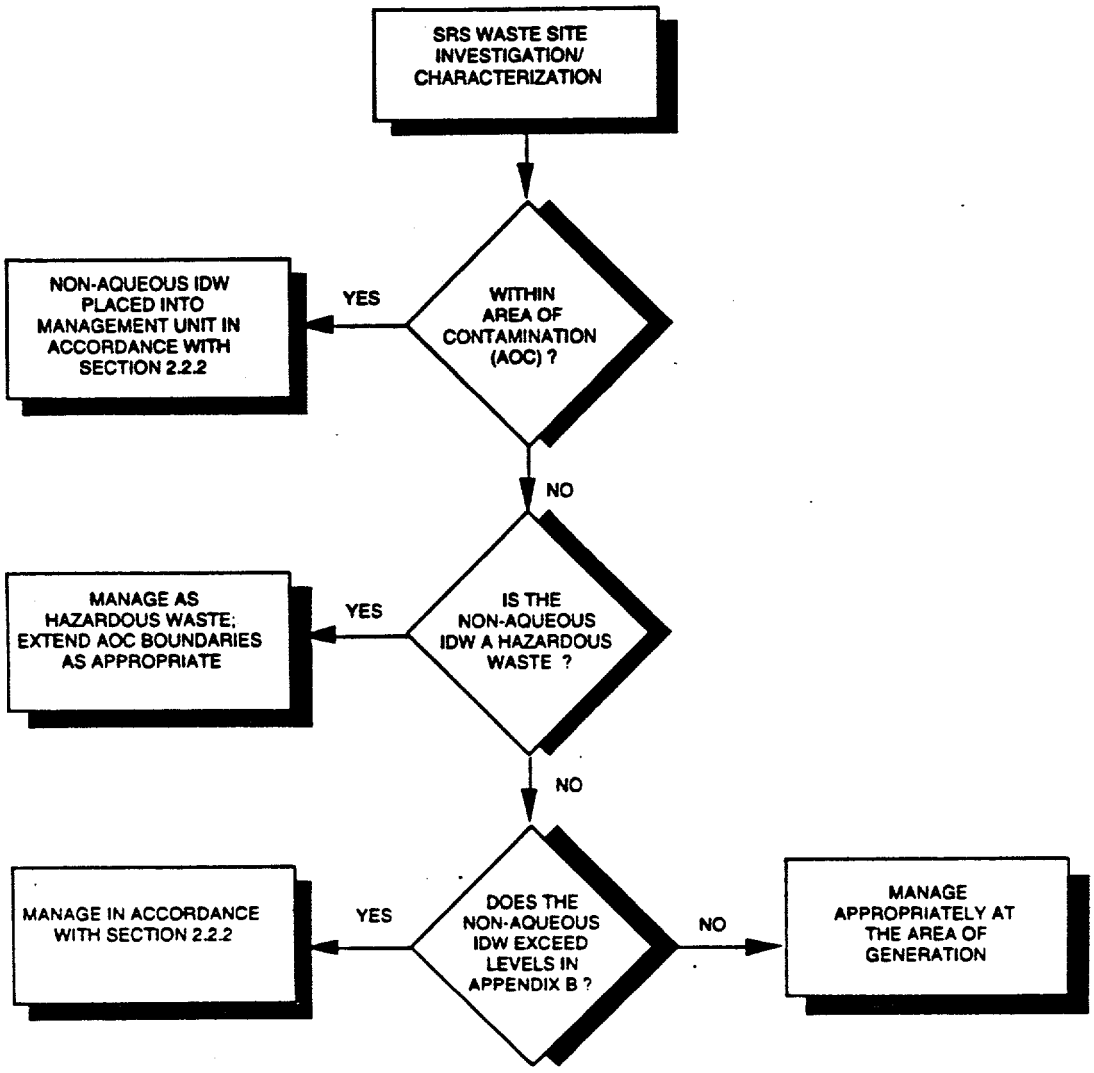


Figure 2-4 Non-Aqueous IDW Management From Non-Listed Sources

Non-aqueous IDW with constituent levels exceeding the TCLP levels will be managed as a hazardous waste. If justified, the AOC boundaries will be extended and the non-aqueous IDW will be placed into management units inside the AOC. The soil cuttings that do not exceed the management levels in Appendix B will remain at the area of generation. Soil cuttings contaminated with tritium only will also remain at the area of generation.

Non-aqueous IDW with constituent levels exceeding the TCLP levels will be managed as a hazardous waste. If appropriate to facilitate management of IDW, the approximate AOC boundaries as defined based on the orange markers, will be reevaluated to consider whether the AOC boundaries are actually larger than the area defined by the orange markers. If justified, the AOC boundaries will be extended and the non-aqueous IDW will be placed into a MU inside the AOC. The soil cuttings that do not exceed the management levels contained in Appendix B will remain at the area of generation. Soil cuttings contaminated with tritium only will also remain at the area of generation.

At closed RCRA units, or areas where the extent of contamination is not clearly defined, or in areas with difficult or limited access, non-aqueous IDW exceeding the levels in Appendix B will be staged in containers and characterized for final disposition. IDW with constituent concentrations levels less than the levels in Appendix B will be managed using appropriate practices such as land application.

Drilling Fluids

Drilling fluids (including well development water) will be field screened at intervals dependent upon unit-specific conditions. Field screening intervals will be identified in unit-specific work plans (if developed) for the respective waste units. Where field screening methods have not yet been developed for detection of constituents of concern at the levels in Appendix B, samples will be collected for laboratory analysis.

Well development water with constituent concentrations exceeding the levels contained in Appendix B will be managed and treated at existing industrial waste water treatment facilities at SRS. In the study that was conducted to assess the ability of the F/H Area Effluent Treatment Facility (ETF) to process the various IDW, it was determined that the primary concern is the amount of very fine solids from the drilling fluids and well development water. The technical assessment of this concern is that the F/H ETF can readily handle waters with less than 100 mg/l total suspended solids (TSS). If the TSS exceeds this level the decision to process the water would have to be made on a case to case basis, and if the level of TSS is greater than 1000 mg/l, the F/H ETF will not accept the shipment. Therefore, since the drilling fluids and well development waters contain significant quantities of fine suspended solids, a pre-treatment process to clarify these waters will be required prior to processing at the ETF. Pilot scale process development work will be required; however, there is the highest level of confidence that the clarification process outlined below will be sufficient.

After the well has been installed, the drilling fluid and well development water will be pumped into a clarifier-type tank. Lime or an anionic polymer may be added to enhance the flocculation of the suspended solids. After the solids have been allowed to settle, the clarified water will be decanted and pumped into a tanker truck for transportation to the appropriate ETF. The solids residue in the bottom of the clarifier-type tank will be dispositioned with the other solids from the drilling operation.

Any drilling and decontamination fluids containing only tritium will not be containerized and treated. If drilling and well development fluids are contaminated with tritium and another

constituent which exceeds levels in Appendix B, it will be managed according to the protocol for the other constituent.

2.3 Management of IDW From Listed Sources

SRS is implementing a program for the management of IDW from listed sources to achieve consistency with the Contained-In Policy. The fundamental principle of this program is that if a hazardous waste is contained in another media such as soil or groundwater, that combination is also to be managed as a hazardous waste. Thus, aqueous and non-aqueous IDW which contain listed constituents exceeding the levels in Appendix A or B will be managed as a hazardous waste.

For both aqueous and non-aqueous IDW, a phased-in implementation program is proposed and is further discussed in Section 4.2. This phased approach necessitates interim management activities as discussed in this sub-section until the appropriate SRS treatment systems and infrastructure can be established for full implementation.

IDW purge water generated outside the AOC which contains listed constituents exceeding the levels in Appendix A will be managed as a hazardous waste. IDW purge water generated inside the AOC which contains listed constituents exceeding the levels in Appendix A will be managed as a hazardous waste. Non-aqueous IDW generated outside the AOC which contains listed constituents exceeding the levels in Appendix B will be managed as hazardous waste. Non-aqueous IDW generated inside the AOC will be placed in a MU inside the AOC. Figure 2-5 illustrates the logic of this approach.

The mechanics for managing IDW purge water and non-aqueous IDW generated from non-listed sources as discussed in Sections 2.2.1 and 2.2.2, respectively, are applicable for the management of IDW generated from listed sources. The details are not repeated in this section. SRS will perform interim management of IDW generated from these waste units as detailed below.

2.3.1 Aqueous IDW From Listed Sources

A/M Area

SRS will continue to manage purge water in the A/M Area, a known source of listed hazardous waste at SRS. Individual purge water volumes with listed constituent concentrations exceeding the levels in Appendix A will be managed and treated at the M-1 Air Stripper facility. Individual volumes with constituent concentrations less than the levels in Appendix A will be discharged to the ground within the immediate area.

Sanitary Landfill

Another source known to have received listed hazardous waste at SRS is the Sanitary Landfill. Individual purge water volumes with constituent concentrations exceeding the levels in Appendix A will be treated at the M-1 Air Stripper facility as long as the constituents present are permitted for treatment at this facility. Individual volumes with constituent concentrations less than the levels in Appendix A will be discharged to the ground within the immediate area.

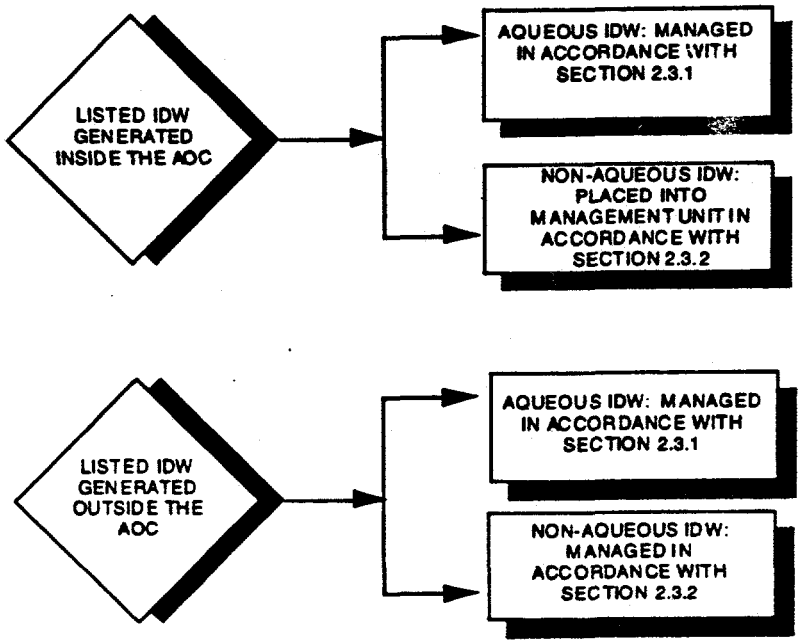


Figure 2-5. IDW Management From Listed Sources

Mixed Waste Management Facility (MWMF)

Another source known to have received listed hazardous waste is the Mixed Waste Management Facility (MWMF). Characterization of contamination at the MWMF is being conducted pursuant to RCRA Interim Status regulations (R.61-79.265) through the Field Investigation Plan (FIP) for the Burial Grounds Complex. The methods contained in Phase I of the FIP, which has been approved by SCDHEC (Gorman to Cook, October 6, 1994), will continue to be employed throughout the unit-specific field work duration since this field activity is currently in progress and is being performed under an approved work plan.

Treatment facilities do not currently exist at SRS that are capable of treating purge water from the MWMF wells since it contains both listed and radioactive constituents. Section 4.2, entitled "Management Implementation for IDW from Listed Sources," provides a description of the alternative options SRS is pursuing and a schedule for implementation.

2.3.2 Non-Aqueous From Listed Sources

The mechanics for managing non-aqueous IDW generated from non-listed sources as discussed in Section 2.2.2 are applicable for the management of IDW generated from listed sources. The management levels for non-aqueous IDW are different from the levels for aqueous IDW. Management levels for non-aqueous IDW are contained in Appendix B. The details of non-aqueous IDW management are not repeated in this section.

3.0 IDW MINIMIZATION

IDW minimization is a fundamental component of the SRS program to manage by-products of unit investigations. Efforts in this area will reduce the volume of waste materials that must be managed. The program builds on existing SRS initiatives of IDW management and includes the following elements:

Well Minimization

The ability to characterize groundwater conditions using fast, reliable methods is crucial is IDW minimization. To support this strategy, SRS has tested and is in the process of further assessing characterization methods which will maximize the efficiency of these types of investigations while minimizing the number of monitoring well installations.

As an example, SRS has conducted a field evaluation of a prototype device (the Hydropunch™) that provides a less invasive technique for collecting groundwater samples. The evaluation resulted in regulatory approval to use the Hydropunch™ (and similar devices) as a screening tool for waste unit characterizations. This method provides additional data for locating permanent monitoring wells for assessment and plume definition. The Hydropunch™ has subsequently been used at several sites in M Area, D Area, K Area, and at the Sanitary Landfill.

Purge Water Reduction

Several methods are being evaluated to potentially reduce the amount of purge water generated during sampling activities at SRS:

- micropurging—Using dedicated low-flow sampling devices to selectively remove only water in the well directly opposite the well screen versus conventional method of evacuating the entire column of water standing in the well and mixing in flow with stagnant water. Experimentation is currently being considered to evaluate the accuracy and reliability of analytical data collected following micropurging.

- two inch diameter wells—SRS has performed a feasibility evaluation of the Grundfos Redi-Flo2™ variable rate, two-inch submersible pump, to determine if this pump performs effectively inside a two-inch well. Consequently, in certain cases, SRS began efforts in 1994 to step down from the four-inch diameter wells to two-inch diameter well installations; e.g. A/M Area. Two-inch diameter wells require less water to be purged during well development and prior to groundwater sampling. Where applicable, SRS will continue to install two inch diameter monitoring wells.

- packer equipment—The use of a casing packer to seal the upper portion of a well from the screened interval would reduce the amount of stagnant water that requires purging prior to sampling. Purge water from newly installed wells that fails HBL criteria action level criteria could be fitted with a packer that isolates the screened zone. SRS is currently evaluating methods for retrofitting existing wells with packers. The use of packer equipment would be limited to 4-inch diameter wells screened below the water table containing contaminants in concentrations above HBL criteria.

Less Invasive Drilling Techniques

Technologies consisting of direct push methods of data collection (e.g., cone penetrometer testing) and sonic drilling are being evaluated. These technologies provide real-time geophysical, hydrological, and geochemical data that allow for design improvements in monitoring well networks. Improved monitoring well network design results in fewer permanent wells needed to obtain the necessary data, thus reducing the amount of IDW generated from well installation.

Waste Minimization Drilling Techniques

SRS intends to determine the feasibility of drilling techniques which produce less IDW than techniques currently in general use. These techniques include the reverse air rotary drilling method. This water/mud-free method can yield less liquid and slurry-type IDW and allow recovery of drilling-related solids.

Sample Reduction/Optimization

Reduction in sampling frequency reducing the number of analytical parameters, and possibly removing selected wells from monitoring networks are options that are being evaluated. Each reduction will be evaluated in terms of regulatory compliance and data needs.

SRS will continue to solicit input from industry on potential IDW minimization technologies via avenues such as vendor forums and technology information exchange meetings.

Pore Water Analysis

In an effort to shorten the turnaround time for IDW analysis and characterization, SRS will be evaluating the use of pore water analysis. Pore water would be extracted from a non-aqueous IDW sample and analyzed, in lieu of analysis of the total constituent concentrations in the non-aqueous matrix. SRS proposes to use an approach similar to the one listed below, to determine the appropriate management for IDW.

1. Acquire a representative sample of non-aqueous IDW.
2. Add distilled water, if necessary, to saturate the IDW sample.
3. By filtration, express sufficient aqueous subsample to analyze for constituents deemed potentially present.
4. Sample aqueous subsample according to the approved well monitoring protocol (e.g., container type and volume, preservative) used by the SRS Environmental Monitoring Section.
5. Analyze aqueous subsample by approved methods for constituents deemed potentially present.
6. Manage non-aqueous material according to the management category appropriate to the aqueous subsample, as determined by the analytical results.

4.0 IMPLEMENTATION SCHEDULE

Implementation of this management plan in a reasonable and timely fashion is crucial to its success. Implementation will include the following modifications to the current SRS approach and procedures, to enhance the ability to manage IDW in a proper and efficient manner protective of human health and the environment. SRS proposes that the field activities currently in process under existing approved RFI/RI work plans will continue in force through the unit-specific field work duration.

4.1 Management Implementation for IDW From Non-Listed Sources

The following activities will be required prior to managing IDW generated from non-listed sources. A schedule for these activities is included in Appendix C, in the section entitled "Non-Listed Radioactive Aqueous IDW Management."

F/H Effluent Treatment Facility (F/H ETF) Modification

The F/H Effluent Treatment Facility serves SRS operations by treating water from various process activities and stormwater management. A transfer station has been designed to allow for the transfer of purge water from tanker vehicles to the F/H ETF (Note: the design has been completed). This modification includes piping additions to the exterior of the facility, but will not require process modifications. [Note: The material to construct the transfer station has been procured.] The industrial wastewater treatment (IWT) permit modification has been submitted to SCDHEC for approval and is required prior to the start of construction of the transfer station.

Treating purge water at the F/H ETF is dependent on two factors: modifying the F/H ETF to receive the water and purchasing a tanker truck to collect the water. The tanker truck contract was awarded in September 1994. The tanker is estimated to arrive at SRS approximately seven months (vehicle fabrication time) from contract placement. Current estimates place the tanker at SRS in April 1995. Thus, SRS has moved forward to complete the design and award the tanker truck contract. The IWT Permit was approved in December 1994 and construction commenced in January 1995. Phased-in management of the non-listed radioactive purge water will commence in July 1995.

Phased-in management is necessary since containerizing and treating the purge water during well sampling takes longer than discharging the purge water directly to the ground surface. SRS will be required to collect and treat in the F/H Effluent Treatment Facility purge water from over 250 wells. Since all of the wells have to be sampled on a quarterly basis, the schedule to sample all wells on time is very ambitious. SRS plans to phase in the collection and treatment of purge water by beginning with one third of the wells the sampling quarter after the tanker truck is received. The next sampling quarter, purge water from two thirds of the wells will be collected and treated, and finally, in the third sampling quarter, and all quarters thereafter, all purge water requiring containerization will be collected and treated. Phasing in the collection of purge water will allow SRS to confirm that the regulatory required sampling program will not be compromised, and will allow necessary adjustments to the purge water collection program.

4.2 Management Implementation for IDW From Listed Sources

The following activities will be required prior to managing purge water generated from listed sources. Schedules for these listed IDW management activities are included in Appendix C in the sections entitled "Listed Non-Radioactive Aqueous IDW Management" and "Listed Radioactive Aqueous IDW Management".

SRS will manage purge water from a known source of listed hazardous waste, as well as other contaminated media that is known to contain listed hazardous waste constituents, as a hazardous waste. SRS will continue to maintain compliance with applicable Department of Transportation and RCRA Subtitle C requirements for the IDW tanker truck. The purge water tanker truck is placarded when aqueous IDW is present and is brought to the A/M Area purge water disposal facility (for VOC contaminated groundwater) for processing. The tanker truck is unloaded within the same shift that the aqueous IDW is accumulated. If the vehicle cannot be unloaded within the same shift, the tanker truck is placed in a designated staging area located within M-Area. These routine operations are conducted in compliance with the applicable RCRA Subtitle C requirements.

Listed Non-Radioactive Aqueous IDW Management

Purge water at A/M Area wells with constituent concentrations exceeding HBLs will continue to be managed as IDW and will be treated at the M-1 Air Stripper facility. Management of purge water from the Sanitary Landfill with VOC constituent concentrations exceeding HBLs will begin in accordance with the schedule in Appendix C.

Listed Radioactive Aqueous IDW Management

Treatment capacity does not currently exist at SRS for the processing of purge water which contains both listed and radioactive constituents. Not withstanding the previously discussed "F/H Effluent Treatment Facility (F/H ETF) Modification", the F/H ETF cannot process purge water which contains both listed and radioactive constituents due to the "Derived-From Rule". SRS has submitted a request for interpretation of the March 24, 1986 Federal Register for review and disposition by EPA and SCDHEC which could potentially provide for the treatment at the F/H ETF of purge water which contains listed and radioactive constituents. In parallel with the preparation of the submittal to EPA and SCDHEC, SRS has completed a preliminary engineering study to evaluate the treatment alternatives for this waste stream and has concluded that a system consisting of a granular activated carbon unit and an accumulation tank would be a viable approach for removing the listed constituents to below the levels in Appendix A. These permitted systems are not currently available at SRS and thus the necessary engineering, procurement, and construction must be scheduled. SRS will continue the engineering of the system while awaiting the EPA and SCDHEC disposition of the request for interpretation. The necessary engineering procurement and construction will be performed in accordance with the schedule in Appendix C.

REFERENCES

55 FR 11813, 1990. Vol. 55, No. 61.

55 FR 11798, 1990. Toxicity Characteristics Revisions.

58 FR 48092, 1993. Land Disposal Restrictions for Newly Identified and Listed Hazardous Wastes and Hazardous Soils. Section 260.42.

Bergren, C. L., et. al., Application of Inorganic Contaminated Groundwater for Soils and Compliance With Toxicity Characteristic Regulations. WSRC-MS-91-120, August 1991.

Bergren, C. L., et. al., Proposed Metal Study for the Purge Water Management Program. WSRC-RP-90-783, August 1990.

Camp Dresser & McKee Inc., WSRC-RP-89-1198, FINAL REPORT: Numerical Simulation of Groundwater Flow and Contamination Transport at the K, L, and P Areas of the Savannah River Site, Aiken, S.C.

EPA (U.S. Environmental Protection Agency), 1994. Groundwater Modeling Compendium. Washington, DC.

EPA (U.S. Environmental Protection Agency), 1994. Framework for Assessing Groundwater Applications. Washington, DC.

EPA (U.S. Environmental Protection Agency), 1994. Soil Screening Guidance. Document #EPA/540/R-94/101, Washington, DC.

EPA (U.S. Environmental Protection Agency), 1994. Technical Background Document for Soil Screening. Document #EPA/540/R-94/102, Washington, DC.

EPA (U.S. Environmental Protection Agency), 1991. Guide to Management of Investigation-Derived Waste. Document #9345.3-03FS, Washington, DC.

Fay, W.M. and J.B. Pickett, DPST-87-260, Documentation of 1982 Soil Analyses to Determine the Natural Background Radioactivity in SRP Surface Soils, January 29, 1987, E. I. du Pont de Nemours & Co., Inc., Savannah River Laboratory, Aiken, SC.

Gorman, A.(SCDHEC) to Cook, J.W. (WSRC), October 6, 1994. Letter regarding Mixed Waste Management Facility Field Investigation Plan.

Holcomb, H. P., ECSD-SGS-95-0020, Radionuclide Background Levels in Production Unimpacted SRS Soils Versus Soil PRGs (U), January 10, 1995, Site Geotechnical Services Dept., Westinghouse Savannah River Co., Savannah River Site, Aiken, SC.

Looney, B. B., et. al., WSRC-RP-90-1031, Geochemical and Physical Properties of Soils and Shallow Sediments at the Savannah River Site (U), August 31, 1990, Westinghouse Savannah River Co., Savannah River Site, Aiken, SC.

Thayer, P. A., GHBX-33(83), Results of Natural Uranium Resource Evaluation (NURE) Detailed Sampling in the Aiken County, South Carolina Area, November 1983, E. I. du Pont de Nemours & Co., Inc., Savannah River Laboratory, Aiken, SC.

WSRC-RP-90-424-1 Tritium in the Savannah River Site Environment (U), Savannah River Site, Aiken, SC.

WSRC Manual-3Q, Current Version. Environmental Compliance Manual. WSRC 3Q, Savannah River Site, Aiken, SC.

WSRC-RP-90-1299, Environmental Information Document; Reactor Seepage Basins (U), Savannah River Site, Aiken, SC.

WSRC Manual-1S, Savannah River Site Waste Acceptance Criteria Manual, Revision 2, February 28, 1992.

APPENDIX A

SRS INVESTIGATION-DERIVED WASTE MANAGEMENT PLAN (U):

HEALTH-BASED LEVELS FOR

AQUEOUS IDW

CONTAINERIZATION DETERMINATIONS

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INTRODUCTION

This table applies to aqueous IDW only and lists constituents used to determine whether or not aqueous IDW requires containerization and subsequent management, in some cases as RCRA hazardous waste. Note that radionuclides are included in this list because health-based levels have been promulgated for at least some of them, even though they are not hazardous according to the definition of the South Carolina Hazardous Waste Management Regulations (SCHWMR) R.61-79.

Most numerical limits are based on Primary Drinking Water Standards (PDWS) of the Safe Drinking Water Act (SDWA) promulgated as Maximum Contamination Levels, (MCLs). Note that enforceable MCLs supersede proposed MCLs for any given constituent and that interim MCLs apply only to the two radionuclides for which activity-based limits are tabulated: Strontium-90 and Tritium, in Table A of R61-58.5L(2). Note also that Beta radiation's MCL is not activity-based; the table presents the best technical judgment of a limit appropriate for SRS constituents of concern and is annotated Est. PDWS. Enforceable MCLs are annotated as PDWS in the rightmost column of the following table; interim MCLs are annotated as Int. PDWS. The limit for Cu (copper) is a Treatment Technology standard rather than an MCL and SO_4 (sulfate) is based on a deferred MCL. These are annotated , respectively, as PDWS TT and Def. PDWS. Proposed MCLs, which are not yet enforceable, are annotated as Prop. PDWS.

MCLs conflict or are absent for a few SCHWMR constituents; in these cases, limits are set at 0.01 times the SCHWMR Toxicity Characteristic Leaching Protocol (TCLP) limit for constituents present in the TCLP list in Table 1 of R.61-79 §261.24 or are set at the values in Table 1 of R.61-79 §264.94(a)(2), as appropriate. The former are annotated as TCLP/100 and the latter as SCHWMR. Note that limits for three TCLP constituents are Practical Quantitation Limits (PQL) rather than health-based limits (see footnote 3); these limits cannot be reduced without falling below the PQL and are thus transferred into the Appendix unchanged. These three constituents (2,4-Dinitrotoluene, Hexachlorobenzene, and Pyridine) are annotated as TCLP (POL).

Limits for most remaining constituents are set to the current values of the EPA Region III's Preliminary Remediation Goals (PRG) for tap water, annotated as EPA-III PRG. A few limits represent estimated SRS background levels based on those typically observed in SRS monitoring wells; such values were used if and only if no health-based standard could be found or inferred and are annotated as Technical.

Several regulatory sources are cited as the basis for numerical limits. The order of priority for cases in which a limit is set for a particular constituent in multiple citations is as follows:

1) SCHWMR, which includes pH; toxic metals; and TCLP constituents;
2) SDWA, which includes MCLs and interim MCLs; Treatment Technology limits (MCL alternative); proposed MCLs; and deferred MCLs (i.e., sulfate);
3) PRGs;
4) Best technical estimate of SRS background values for the few remaining constituents.

NOTES

1) Units represent either activity (picoCuries, or pCi) or mass (milligrams, mg, or nanograms, ng) per liter (L) or milliliter (mL).

2) EMS designators are used internally within the SRS groundwater database.

3) The CAS number is from the Chemical Abstracts Service Registry and is unique to each identified chemical or mixture of chemicals. Some analytes lack CAS numbers due to non-uniqueness (e.g., an analyte which groups all compounds containing a particular ion or element, such as metals).

4) The chemical name tabulated is that which is in common use and may not match the CAS name. Some analytes have been reported in multiple EMS designators, such as 2HXONE and MIBK; in all such cases, the CAS number, if defined, is identical.

5) A summary of the columns in this table is as follows, from left to right:

   a) EMS Designator used internally at SRS, 1-6 alphanumeric characters.
   b) Numerical limit applicable to aqueous IDW used in the calculation of whether or not the material requires containerization or treatment.
   c) Unit of measurement applicable to the numerical limit in the previous column.
   d) Chemical name in common use.
   e) CAS number, for cross-verification between chemical names that may differ between source documents.
   f) Source of the numerical limit applied: PDWS; TCLP; Technical; etc.

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
111TCE	0.2	mg/L	1,1,1-Trichloroethane	000071-55-6	PDWS
112TCE	0.005	mg/L	1,1,2-Trichloroethane	000079-00-5	PDWS
11DCLE	0.81	mg/L	1,1-Dichloroethane	000075-34-3	EPA-III PRG
11DCE	0.007	mg/L	1,1-Dichloroethylene	000075-35-4	PDWS
124TCB	0.07	mg/L	1,2,4-Trichlorobenzene	000120-82-1	PDWS
12DB3P	0.0002	mg/L	1,2-Dibromo-3-chloropropane	000096-12-8	PDWS
12DBE	7.50E-07	mg/L	1,2-Dibromoethane	000106-93-4	EPA-III PRG
12DCLB	0.6	mg/L	1,2-Dichlorobenzene	000095-50-1	PDWS
12DCLE	0.005	mg/L	1,2-Dichloroethane	000107-06-2	PDWS
12DCLP	0.005	mg/L	1,2-Dichloropropane	000078-87-5	PDWS
T12DCE	0.1	mg/L	1,2-trans-Dichloroethylene	000156-60-5	PDWS
OXYLEN	10	mg/L	1,2-Xylene	000095-47-6	PDWS
MXYLEN	10	mg/L	1,3-Xylene	000108-38-3	PDWS
14DCLB	0.075	mg/L	1,4-Dichlorobenzene	000106-46-7	PDWS
25OCCB	0.0005	mg/L	2,2',3,3',4,4',5,5'-Octachlorobiphenyl	001335-36-3	PDWS
26HPCB	0.0005	mg/L	2,2',3,4,4',5,6-heptachlorobiphenyl	001335-36-3	PDWS
25HPCB	0.0005	mg/L	2,2',3,4,5,5',6-Heptachlorobiphenyl	001335-36-3	PDWS
25HXCB	0.0005	mg/L	2,2',3,4,5,5'-Hexachlorobiphenyl	001335-36-3	PDWS
245PCB	0.0005	mg/L	2,2',4,5,5'-Pentachlorobiphenyl	001335-36-3	PDWS
2255CB	0.0005	mg/L	2,2',5,5'-Tetrachlorobiphenyl	001335-36-3	PDWS
225TCB	0.0005	mg/L	2,2',5-Trichlorobiphenyl	001335-36-3	PDWS
2345CB	0.0005	mg/L	2,3,4,5-Tetrachlorobiphenyl	001335-36-3	PDWS
C3TCDD	4.30E-04	ng/L	2,3,7,8-TCDD (Dioxin)	001746-01-6	EPA-III PRG
24DCB	0.0005	mg/L	2,4"-Dichlorobiphenyl	001335-36-3	PDWS
245TCP	4	mg/L	2,4,5-Trichlorophenol	000095-95-4	TCLP/100
246TCP	0.02	mg/L	2,4,6-Trichlorophenol	000088-06-2	TCLP/100
24D	0.07	mg/L	2,4-D	000094-75-7	PDWS
DCAA	0.024	mg/L	2,4-Dichlorophenylacetic Acid		Technical
24DNT	0.13	mg/L	2,4-Dinitrotoluene	000121-14-2	TCLP (PQL)
2CLP	0.18	mg/L	2-Chlorophenol	000095-57-8	EPA-III PRG
2HXONE	0.033	mg/L	2-Hexanone	000591-78-6	Technical
4CL3MP	618	mg/L	4-Chloro-3-methylphenol	000059-50-7	Technical
4NP	2.3	mg/L	4-Nitrophenol	000100-02-7	EPA-III PRG
ACET	3.7	mg/L	Acetone	000067-64-1	EPA-III PRG
AC225	113	pCi/L	Actinium-225	014265-85-1	Prop. PDWS
AC227	1.27	pCi/L	Actinium-227	014952-40-0	Prop. PDWS
AC228	3270	pCi/L	Actinium-228	014331-83-0	Prop. PDWS
AL	37	mg/L	Aluminum	NO CAS RN	EPA-III PRG
ALDIS	37	mg/L	Aluminum, Dissolved	NO CAS RN	EPA-III PRG
ALTOT	37	mg/L	Aluminum, Total	NO CAS RN	EPA-III PRG
AM241	6.34	pCi/L	Americium-241	014596-10-2	Prop. PDWS
AM	4	pCi/L	Americium-241/243	NO CAS RN	Prop. PDWS
AM242	5340	pCi/L	Americium-242	013981-54-9	Prop. PDWS
AM242M	1.27	pCi/L	Americium-242m	013981-54-9(m)	Prop. PDWS
AM243	6.37	pCi/L	Americium-243	014993-75-0	Prop. PDWS
NH3	1	mg/L	Ammonia	007664-41-7	EPA-III PRG

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
NH3N2	1.65	mg/L	Ammonia as Nitrogen	007664-41-7	EPA-III PRG
SB	0.006	mg/L	Antimony	NO CAS RN	PDWS
SBDIS	0.006	mg/L	Antimony, Dissolved	NO CAS RN	PDWS
SBTOT	0.006	mg/L	Antimony, Total	NO CAS RN	PDWS
SB122	810	pCi/L	Antimony-122	014374-79-9	Prop. PDWS
SB124	563	pCi/L	Antimony-124	014683-10-4	Prop. PDWS
SB125	1940	pCi/L	Antimony-125	014234-35-6	Prop. PDWS
SB126	544	pCi/L	Antimony-126	015756-32-8	Prop. PDWS
SB126M	58500	pCi/L	Antimony-126m	015756-32-8(m)	Prop. PDWS
SB127	818	pCi/L	Antimony-127	013968-50-8	Prop. PDWS
SB129	3090	pCi/L	Antimony-129	014331-88-5	Prop. PDWS
AS	0.05	mg/L	Arsenic	NO CAS RN	PDWS
ASDIS	0.05	mg/L	Arsenic, Dissolved	NO CAS RN	PDWS
ASTOT	0.05	mg/L	Arsenic, Total	NO CAS RN	PDWS
AS73	7850	pCi/L	Arsenic-73		Prop. PDWS
AS74	1410	pCi/L	Arsenic-74		Prop. PDWS
AS76	1060	pCi/L	Arsenic-76		Prop. PDWS
AS77	4330	pCi/L	Arsenic-77		Prop. PDWS
AT217	4.27E+08	pCi/L	Astatine-217	017239-90-6	Prop. PDWS
ATZ	0.003	mg/L	Atrazine	001912-24-9	PDWS
BA	2	mg/L	Barium	NO CAS RN	PDWS
BADIS	2	mg/L	Barium, Dissolved	NO CAS RN	PDWS
BATOT	2	mg/L	Barium, Total	NO CAS RN	PDWS
BA131	2950	pCi/L	Barium-131	014914-75-1	Prop. PDWS
BA133	1520	pCi/L	Barium-133	013981-41-4	Prop. PDWS
BA133M	2620	pCi/L	Barium-133m	013981-41-4(m)	Prop. PDWS
BA137M	2150000	pCi/L	Barium-137m	013981-97-0(m)	Prop. PDWS
BA139	13800	pCi/L	Barium-139	014378-25-7	Prop. PDWS
BA140	582	pCi/L	Barium-140	014798-08-4	Prop. PDWS
C6H6	0.005	mg/L	Benzene	000071-43-2	PDWS
BAPYR	0.0002	mg/L	Benzo(a)pyrene	000050-32-8	PDWS
BE	0.004	mg/L	Beryllium	NO CAS RN	PDWS
BEDIS	0.004	mg/L	Beryllium, Dissolved	NO CAS RN	PDWS
BETOT	0.004	mg/L	Beryllium, Total	NO CAS RN	PDWS
BE7	43500	pCi/L	Beryllium-7	013966-02-4	Prop. PDWS
B2EHP	0.006	mg/L	Bis(2-ethylhexyl) Phthalate	000117-81-7	PDWS
BI206	656	pCi/L	Bismuth-206	015776-19-9	Prop. PDWS
BI207	1010	pCi/L	Bismuth-207	013982-38-2	Prop. PDWS
BI210	1010	pCi/L	Bismuth-210	014331-79-4	Prop. PDWS
BI211	156000	pCi/L	Bismuth-211	015229-37-5	Prop. PDWS
BI212	5200	pCi/L	Bismuth-212	014913-49-6	Prop. PDWS
BI213	15000	pCi/L	Bismuth-213	015776-20-2	Prop. PDWS
BI214	18900	pCi/L	Bismuth-214	014733-03-3	Prop. PDWS
B	3.3	mg/L	Boron	N/A	EPA-III PRG
BDIS	3.3	mg/L	Boron, Dissolved	N/A	EPA-III PRG
BTOT	3.3	mg/L	Boron, Total	N/A	EPA-III PRG

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
BR82	3150	pCi/L	Bromine-82	014686-69-2	Prop. PDWS
BRCLM	0.048	mg/L	Bromochloromethane	000074-97-5	Technical
BRDCLM	0.1	mg/L	Bromodichloromethane	000075-27-4	PDWS
CHBR3	0.1	mg/L	Bromoform	000075-25-2	PDWS
CD	0.005	mg/L	Cadmium	NO CAS RN	PDWS
CDDIS	0.005	mg/L	Cadmium, Dissolved	NO CAS RN	PDWS
CDTOT	0.005	mg/L	Cadmium, Total	NO CAS RN	PDWS
CD109	227	pCi/L	Cadmium-109	014109-32-1	Prop. PDWS
CD115	958	pCi/L	Cadmium-115	014336-68-6	Prop. PDWS
CD115M	339	pCi/L	Cadmium-115m	014336-68-6(m)	Prop. PDWS
CA45	1730	pCi/L	Calcium-45	013966-05-7	Prop. PDWS
CA47	846	pCi/L	Calcium-47	001439-99-2	Prop. PDWS
CF252	16.2	pCi/L	Californium-252		Prop. PDWS
CCL4	0.005	mg/L	Carbon Tetrachloride	000056-23-5	PDWS
CARB11	99200	pCi/L	Carbon-11	014333-33-6	Prop. PDWS
C14	3200	pCi/L	Carbon-14	014762-75-5	Prop. PDWS
C15	6.69E+06	pCi/L	Carbon-15	015929-23-4	Prop. PDWS
CE141	1890	pCi/L	Cerium-141	013967-74-3	Prop. PDWS
CE143	1210	pCi/L	Cerium-143	014119-19-8	Prop. PDWS
CE144	261	pCi/L	Cerium-144	014762-78-8	Prop. PDWS
CE147	1890	pCi/L	Cerium-147		Prop. PDWS
CS131	22800	pCi/L	Cesium-131	014914-76-2	Prop. PDWS
CS134	81.3	pCi/L	Cesium-134	013967-70-9	Prop. PDWS
CS134M	1.01E+05	pCi/L	Cesium-134m	013967-70-9(m)	Prop. PDWS
CS135	794	pCi/L	Cesium-135	015726-30-4	Prop. PDWS
CS136	518	pCi/L	Cesium-136	014234-29-8	Prop. PDWS
CS137	119	pCi/L	Cesium-137	010045-97-3	Prop. PDWS
CS138	25600	pCi/L	Cesium-138	015758-29-9	Prop. PDWS
CLDAN	0.002	mg/L	Chlordane	000057-74-9	PDWS
CL36	1850	pCi/L	Chlorine-36	013981-43-6	Prop. PDWS
CL38	21200	pCi/L	Chlorine-38	014158-34-0	Prop. PDWS
CLC6H5	0.1	mg/L	Chlorobenzene	000108-90-7	PDWS
C2H5CL	8.6	mg/L	Chloroethane	000075-00-3	EPA-III PRG
CHCL3	0.1	mg/L	Chloroform	000067-66-3	PDWS
CH3CL	0.0014	mg/L	Chloromethane	000074-87-3	EPA-III PRG
CR	0.1	mg/L	Chromium	NO CAS RN	PDWS
CRDIS	0.1	mg/L	Chromium, Dissolved	NO CAS RN	PDWS
CRTOT	0.1	mg/L	Chromium, Total	NO CAS RN	PDWS
CR51	38000	pCi/L	Chromium-51	014392-02-0	Prop. PDWS
C12DCE	0.07	mg/L	cis-1,2-Dichloroethylene	000156-59-2	PDWS
CO	2.2	mg/L	Cobalt	NO CAS RN	EPA-III PRG
CODIS	2.2	mg/L	Cobalt, Dissolved	NO CAS RN	EPA-III PRG
COTOT	2.2	mg/L	Cobalt, Total	NO CAS RN	EPA-III PRG
CO57	4870	pCi/L	Cobalt-57	013981-50-5	Prop. PDWS
CO58	1590	pCi/L	Cobalt-58		Prop. PDWS
CO58M	64900	pCi/L	Cobalt-58m		Prop. PDWS

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
CO60	218	pCi/L	Cobalt-60	010198-40-0	Prop. PDWS
CU	1.3	mg/L	Copper	NO CAS RN	PDWS TT
CUDIS	1.3	mg/L	Copper, Dissolved	NO CAS RN	PDWS TT
CUTOT	1.3	mg/L	Copper, Total	NO CAS RN	PDWS TT
CU64	11900	pCi/L	Copper-64	013981-25-4	Prop. PDWS
CSOL	2	mg/L	Cresols	001319-77-3	TCLP/100
CM242	133	pCi/L	Curium-242	015510-73-3	Prop. PDWS
CM243	8.3	pCi/L	Curium-243	015757-87-6	Prop. PDWS
CM4344	8.3	pCi/L	Curium-243/244	NO CAS RN	Prop. PDWS
CM244	9.84	pCi/L	Curium-244	013981-15-2	Prop. PDWS
CM245	6.23	pCi/L	Curium-245	015621-76-8	Prop. PDWS
CM246	6.27	pCi/L	Curium-246	015757-90-1	Prop. PDWS
CM247	6.79	pCi/L	Curium-247	015758-32-4	Prop. PDWS
CM248	1.67	pCi/L	Curium-248	015758-33-5	Prop. PDWS
CYN	0.2	mg/L	Cyanide	000057-12-5	PDWS
DCB	0.033	ng/l	Decachlorobiphenyl	001335-36-3	Technical
DNBP	3.7	mg/L	Di-n-butyl Phthalate	000084-74-2	EPA-III PRG
DNOP	0.73	mg/L	Di-n-octyl Phthalate	000117-84-0	EPA-III PRG
DBRCLM	0.1	mg/L	Dibromochloromethane	000124-48-1	PDWS
CL2BZ	0.6	mg/L	Dichlorobenzenes	025321-22-6	PDWS
CCL2F2	0.39	mg/L	Dichlorodifluoromethane	000075-71-8	EPA-III PRG
DEP	29	mg/L	Diethyl Phthalate	000084-66-2	EPA-III PRG
DY165	15100	pCi/L	Dysprosium-165	013967-64-1	Prop. PDWS
DY166	830	pCi/L	Dysprosium-166	015840-01-4	Prop. PDWS
ENDRN	0.002	mg/L	Endrin	000072-20-8	PDWS
ER169	3640	pCi/L	Erbium-169	015840-13-8	Prop. PDWS
ER171	3800	pCi/L	Erbium-171	014391-45-8	Prop. PDWS
ETC6H5	0.7	mg/L	Ethylbenzene	000100-41-4	PDWS
EU152	841	pCi/L	Europium-152	014683-23-9	Prop. PDWS
EU154	573	pCi/L	Europium-154	015585-10-1	Prop. PDWS
EU155	3590	pCi/L	Europium-155	014391-16-3	Prop. PDWS
EU156	600	pCi/L	Europium-156	014280-35-4	Prop. PDWS
FPH	>12	pH	Field pH	NO CAS RN	SCHWMR
FPH	<2	pH	Field pH	NO CAS RN	SCHWMR
F	4	mg/L	Fluoride	016984-48-8	PDWS
F18	39500	pCi/L	Fluorine-18	013981-56-1	Prop. PDWS
FR221	32600	pCi/L	Francium-221	015756-41-9	Prop. PDWS
FR223	3410	pCi/L	Francium-223	015756-98-6	Prop. PDWS
GD153	4680	pCi/L	Gadolinium-153	014276-65-4	Prop. PDWS
GD159	2760	pCi/L	Gadolinium-159	014041-42-0	Prop. PDWS
GA67	7020	pCi/L	Gallium-67	014119-09-6	Prop. PDWS
GA72	1190	pCi/L	Gallium-72	013982-22-4	Prop. PDWS
GE71	4.36E+05	pCi/L	Germanium-71	014374-81-3	Prop. PDWS
AU196	3660	pCi/L	Gold-196	010043-49-0	Prop. PDWS
AU198	1310	pCi/L	Gold-198	014914-16-0	Prop. PDWS
ALPHAG	15	pCi/L	Gross Alpha	NO CAS RN	PDWS

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
HF181	1170	pCi/L	Halfnium-181		Prop. PDWS
HPCL	0.0004	mg/L	Heptachlor	000076-44-8	PDWS
HPCLE	0.0002	mg/L	Heptachlor Epoxide	001024-57-3	PDWS
CL6BZ	0.13	mg/L	Hexachlorobenzene	000118-74-1	TCLP (PQL)
CL6BP	0.0005	mg/L	Hexachlorobiphenyl	001335-36-3	PDWS
HCBD	0.005	mg/L	Hexachlorobutadiene	000087-68-3	TCLP/100
CL6CP	0.05	mg/L	Hexachlorocyclopentadiene	000077-47-4	PDWS
CL6ET	0.03	mg/L	Hexachloroethane	000067-72-1	TCLP/100
HO166	981	pCi/L	Holmium-166	013967-65-2	Prop. PDWS
IN113M	52400	pCi/L	Indium-113m	014885-78-0(m)	Prop. PDWS
IN114	976000	pCi/L	Indium-114	001398-55-0	Prop. PDWS
IN114M	323	pCi/L	Indium-114m	001398-55-0(m)	Prop. PDWS
IN115	35.1	pCi/L	Indium-115	014191-71-0	Prop. PDWS
IN115M	16400	pCi/L	Indium-115m	014191-71-0(m)	Prop. PDWS
I122	2.11E+05	pCi/L	Iodine-122	018287-75-7	Prop. PDWS
I123	10700	pCi/L	Iodine-123	015715-08-9	Prop. PDWS
I125	151	pCi/L	Iodine-125	014158-31-7	Prop. PDWS
I126	81	pCi/L	Iodine-126	014158-32-8	Prop. PDWS
I129	21	pCi/L	Iodine-129	015046-84-1	Prop. PDWS
I130	1190	pCi/L	Iodine-130	014914-02-4	Prop. PDWS
I131	108	pCi/L	Iodine-131	010043-66-0	Prop. PDWS
I132	8190	pCi/L	Iodine-132	014683-16-0	Prop. PDWS
I133	549	pCi/L	Iodine-133	014834-67-4	Prop. PDWS
I134	21400	pCi/L	Iodine-134	014914-27-3	Prop. PDWS
I135	2340	pCi/L	Iodine-135	014834-68-5	Prop. PDWS
IR190	1010	pCi/L	Iridium-190	014981-91-0	Prop. PDWS
IR192	957	pCi/L	Iridium-192	014694-69-0	Prop. PDWS
IR194	1040	pCi/L	Iridium-194	014158-35-1	Prop. PDWS
FE55	9250	pCi/L	Iron-55	014681-59-5	Prop. PDWS
FE59	844	pCi/L	Iron-59	014596-12-4	Prop. PDWS
ISBAL	1.8	mg/L	Isobutyl Alcohol	000078-83-1	EPA-III PRG
ISODR	0.083	mg/L	Isodrin	000465-73-6	Technical
ISOPHR	0.071	mg/L	Isophorone	000078-59-1	EPA-III PRG
ISAFRO	1	mg/L	Isosafrole	000120-58-1	Technical
LA140	652	pCi/L	Lanthanum-140	013981-28-7	Prop. PDWS
PB	0.05	mg/L	Lead	NO CAS RN	SCHWMR
PBDIS	0.05	mg/L	Lead, Dissolved	NO CAS RN	SCHWMR
PBTOT	0.05	mg/L	Lead, Total	NO CAS RN	SCHWMR
PB203	5060	pCi/L	Lead-203	014687-25-3	Prop. PDWS
PB209	25300	pCi/L	Lead-209	014119-30-3	Prop. PDWS
PB210	1.01	pCi/L	Lead-210	014255-04-0	Prop. PDWS
PB211	12800	pCi/L	Lead-211	015816-77-0	Prop. PDWS
PB212	123	pCi/L	Lead-212	015092-94-1	Prop. PDWS
PB214	11800	pCi/L	Lead-214	015067-28-4	Prop. PDWS
LIN	0.0002	mg/L	Lindane	000058-89-9	PDWS
LU177	2550	pCi/L	Lutetium-177	014265-75-9	Prop. PDWS

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
MCRES	2	mg/L	m-Cresol	000108-39-4	TCLP/100
MN52	733	pCi/L	Manganese-52	014092-99-0	Prop. PDWS
MN54	2010	pCi/L	Manganese-54	013966-31-9	Prop. PDWS
MN56	5640	pCi/L	Manganese-56	014681-52-8	Prop. PDWS
HG	0.002	mg/L	Mercury	NO CAS RN	PDWS
HGDIS	0.002	mg/L	Mercury, Dissolved	NO CAS RN	PDWS
HGTOT	0.002	mg/L	Mercury, Total	NO CAS RN	PDWS
HG197	5760	pCi/L	Mercury-197	013981-51-6	Prop. PDWS
HG203	2390	pCi/L	Mercury-203	013982-78-0	Prop. PDWS
MEXCLR	0.04	mg/L	Methoxychlor	000072-43-5	PDWS
CH2CL2	0.005	mg/L	Methylene Chloride	000075-09-2	PDWS
MEK	2	mg/L	Methylethyl Ketone	000078-93-3	TCLP/100
4ME2PE	2.9	mg/L	Methylisobutyl Ketone	000108-10-1	EPA-III PRG
MIBK	2.9	mg/L	Methylisobutyl Ketone	000108-10-1	EPA-III PRG
MO99	1830	pCi/L	Molybdenum-99	014119-15-4	Prop. PDWS
NDNBA	0.012	mg/L	N-Nitrosodi-N-Butylamine	000924-16-3	EPA-III PRG
NDNPA	0.0096	mg/L	N-Nitrosodi-N-Propylamine	000621-64-7	EPA-III PRG
NETA	0.00045	mg/L	N-Nitrosodiethylamine	000055-18-5	EPA-III PRG
NDMA	0.0013	mg/L	N-Nitrosodimethylamine	000062-75-9	EPA-III PRG
NETMEA	0.1	mg/L	N-Nitrosoethylmethylamine	010595-95-6	EPA-III PRG
NAP	1.5	mg/L	Naphthalene	000091-20-3	EPA-III PRG
ND147	1250	pCi/L	Neodymium-147	014269-74-0	Prop. PDWS
ND149	11700	pCi/L	Neodymium-149	015759-81-2	Prop. PDWS
NP236	5960	pCi/L	Neptunium-236	015700-36-4	Prop. PDWS
NP237	7.06	pCi/L	Neptunium-237	013994-20-2	Prop. PDWS
NP238	1390	pCi/L	Neptunium-238	015766-25-3	Prop. PDWS
NP239	1680	pCi/L	Neptunium-239	013968-59-7	Prop. PDWS
NP240	23100	pCi/L	Neptunium-240	015690-84-3	Prop. PDWS
NP240M	1.74E+05	pCi/L	Neptunium-240m	015690-84-3(m)	Prop. PDWS
NI	0.1	mg/L	Nickel	NO CAS RN	PDWS
NIDIS	0.1	mg/L	Nickel, Dissolved	NO CAS RN	PDWS
NITOT	0.1	mg/L	Nickel, Total	NO CAS RN	PDWS
NI59	27000	pCi/L	Nickel-59	014336-70-0	Prop. PDWS
NI63	9910	pCi/L	Nickel-63	013981-37-8	Prop. PDWS
NI65	8810	pCi/L	Nickel-65	014833-49-9	Prop. PDWS
NB93M	10500	pCi/L	Niobium-93m	007440-03-1(m)	Prop. PDWS
NB94	707	pCi/L	Niobium-94	014681-63-1	Prop. PDWS
NB95	2150	pCi/L	Niobium-95	013967-76-5	Prop. PDWS
NB95M	2390	pCi/L	Niobium-95m	013967-76-5(m)	Prop. PDWS
NB97	23500	pCi/L	Niobium-97	018496-04-3	Prop. PDWS
NB97M	1.37E+06	pCi/L	Niobium-97m	018496-04-3(m)	Prop. PDWS
NO3	10	mg/L	Nitrate as Nitrogen	014797-55-8	PDWS
NO3NO2	10	mg/L	Nitrite + Nitrate as Nitrogen	NO CAS RN	PDWS
NO2	1	mg/L	Nitrite as Nitrogen	014797-65-0	PDWS
NB	0.02	mg/L	Nitrobenzene	000098-95-3	TCLP/100
N13	1.52E+05	pCi/L	Nitrogen-13		Prop. PDWS

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
BETAG	50	pCi/L	Nonvolatile Beta	NO CAS RN	Est. PDWS
OCRES	2	mg/L	o-Cresol	000095-48-7	TCLP/100
OS185	2460	pCi/L	Osmium-185	015766-50-4	Prop. PDWS
OS191	2380	pCi/L	Osmium-191	014119-24-5	Prop. PDWS
OS191M	14300	pCi/L	Osmium-191m	014119-24-5(m)	Prop. PDWS
OS193	1690	pCi/L	Osmium-193	016057-77-5	Prop. PDWS
O15	4.95E+05	pCi/L	Oxygen-15		Prop. PDWS
PBFB	0.06	mg/L	P-bromofluorobenzene		Technical
PCRES	2	mg/L	p-Cresol	000106-44-5	TCLP/100
PD100	1300	pCi/L	Palladium-100	015690-69-4	Prop. PDWS
PD101	13400	pCi/L	Palladium-101	015749-54-9	Prop. PDWS
PD103	6940	pCi/L	Palladium-103	014967-68-1	Prop. PDWS
PD107	36600	pCi/L	Palladium-107	017637-99-9	Prop. PDWS
PD109	2120	pCi/L	Palladium-109	014981-64-7	Prop. PDWS
PCB016	0.0005	mg/L	PCB 1016	012674-11-2	PDWS
PCB221	0.0005	mg/L	PCB 1221	011104-28-2	PDWS
PCB232	0.0005	mg/L	PCB 1232	011141-16-5	PDWS
PCB242	0.0005	mg/L	PCB 1242	053469-21-9	PDWS
PCB248	0.0005	mg/L	PCB 1248	012672-29-6	PDWS
PCB254	0.0005	mg/L	PCB 1254	011097-69-1	PDWS
PCB260	0.0005	mg/L	PCB 1260	011096-82-5	PDWS
PCB262	0.0005	mg/L	PCB 1262	001335-36-3	PDWS
CL5BP	0.0005	mg/L	Pentachlorobiphenyl	001335-36-3	PDWS
PCP	0.001	mg/L	Pentachlorophenol	000087-86-5	PDWS
PHENOL	22	mg/L	Phenol	000108-95-2	EPA-III PRG
P32	641	pCi/L	Phosphorus-32	014596-37-3	Prop. PDWS
P33	1870	pCi/L	Phosphorus-33	015749-66-3	Prop. PDWS
PT191	3810	pCi/L	Platinum-191	015706-36-2	Prop. PDWS
PT193	46100	pCi/L	Platinum-193	015735-70-3	Prop. PDWS
PT193M	3020	pCi/L	Platinum-193m	015735-70-3(m)	Prop. PDWS
PT197	3400	pCi/L	Platinum-197	015735-74-7	Prop. PDWS
PT197M	17500	pCi/L	Platinum-197m	015735-74-7(m)	Prop. PDWS
PU236	32.3	pCi/L	Plutonium-236	015411-92-4	Prop. PDWS
PU238	7.02	pCi/L	Plutonium-238	013981-16-3	Prop. PDWS
PU3839	40	pCi/L	Plutonium-238/239	NO CAS RN	Prop. PDWS
PU239	62.1	pCi/L	Plutonium-239	015117-48-3	Prop. PDWS
PU3940	62.1	pCi/L	Plutonium-239/240	NO CAS RN	Prop. PDWS
PU240	62.2	pCi/L	Plutonium-240	014119-33-6	Prop. PDWS
PU241	62.6	pCi/L	Plutonium-241	014119-32-5	Prop. PDWS
PU242	65.4	pCi/L	Plutonium-242	013982-10-0	Prop. PDWS
PU243	16400	pCi/L	Plutonium-243	015706-37-3	Prop. PDWS
PU244	6.87	pCi/L	Plutonium-244	014119-34-7	Prop. PDWS
PO210	7.46	pCi/L	Polonium-210	013981-52-7	Prop. PDWS
PO212	8.78E+13	pCi/L	Polonium-212	015389-34-1	Prop. PDWS
PO213	6.06E+12	pCi/L	Polonium-213	015756-57-7	Prop. PDWS
PO214	1.86E+11	pCi/L	Polonium-214	015735-67-8	Prop. PDWS

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
PO215	6.84E+09	pCi/L	Polonium-215	015706-52-2	Prop. PDWS
PO216	5.30E+07	pCi/L	Polonium-216	015756-58-8	Prop. PDWS
PO218	69100	pCi/L	Polonium-218	015422-24-9	Prop. PDWS
K40	300	pCi/L	Potassium-40	013966-00-2	Prop. PDWS
K42	3900	pCi/L	Potassium-42	014378-21-3	Prop. PDWS
PR142	1040	pCi/L	Praseodymium-142	014191-64-1	Prop. PDWS
PR143	1170	pCi/L	Praseodymium-143	014981-79-4	Prop. PDWS
PR144	47000	pCi/L	Praseodymium-144	014119-05-2	Prop. PDWS
PR144M	1.12E+05	pCi/L	Praseodymium-144m	014119-05-2(m)	Prop. PDWS
PM147	5240	pCi/L	Promethium-147	014380-75-7	Prop. PDWS
PM148	505	pCi/L	Promethium-148	014683-19-3	Prop. PDWS
PM148M	575	pCi/L	Promethium-148m	014683-19-3(m)	Prop. PDWS
PM149	1380	pCi/L	Promethium-149	015765-31-8	Prop. PDWS
PA231	10.2	pCi/L	Protactinium-231	014331-85-2	Prop. PDWS
PA233	1510	pCi/L	Protactinium-233	013981-14-1	Prop. PDWS
PA234	2560	pCi/L	Protactinium-234	015100-28-4	Prop. PDWS
PA234M	9.30E+05	pCi/L	Protactinium-234m	015100-28-4(m)	Prop. PDWS
PYRID	5	mg/L	Pyridine	000110-86-1	TCLP (PQL)
RA223	24.1	pCi/L	Radium-223	015623-45-7	Prop. PDWS
RA224	40.6	pCi/L	Radium-224	013233-32-4	Prop. PDWS
RA225	9.14	pCi/L	Radium-225	013981-53-8	Prop. PDWS
RA226	20	pCi/L	Radium-226	013982-63-3	Prop. PDWS
RA228	20	pCi/L	Radium-228	015262-20-1	Prop. PDWS
RN222	300	pCi/L	Radon-222	014859-67-7	Prop. PDWS
RE183	5400	pCi/L	Rhenium-183		Prop. PDWS
RE186	1880	pCi/L	Rhenium-186		Prop. PDWS
RE187	5.82E+05	pCi/L	Rhenium-187		Prop. PDWS
RE188	1790	pCi/L	Rhenium-188		Prop. PDWS
RH103M	4.71E+05	pCi/L	Rhodium-103m	007440-16-6(m)	Prop. PDWS
RH105	3720	pCi/L	Rhodium-105	014913-89-4	Prop. PDWS
RH105M	5.51E+06	pCi/L	Rhodium-105m	014913-89-4(m)	Prop. PDWS
RH106	1.24E+06	pCi/L	Rhodium-106	013967-48-1	Prop. PDWS
RB82	4.36E+05	pCi/L	Rubidium-82	014391-63-0	Prop. PDWS
RB86	485	pCi/L	Rubidium-86	014932-53-7	Prop. PDWS
RB87	501	pCi/L	Rubidium-87	013982-13-3	Prop. PDWS
RB88	29100	pCi/L	Rubidium-88	014928-36-0	Prop. PDWS
RB89	52700	pCi/L	Rubidium-89	014191-65-2	Prop. PDWS
RU103	1810	pCi/L	Ruthenium-103	013968-53-1	Prop. PDWS
RU105	4990	pCi/L	Ruthenium-105	014331-95-4	Prop. PDWS
RU106	203	pCi/L	Ruthenium-106	013967-48-1	Prop. PDWS
RU97	7960	pCi/L	Ruthenium-97	015758-35-7	Prop. PDWS
SAFROL	1	mg/L	Safrole	000094-59-7	Technical
SM147	104	pCi/L	Samarium-147	014392-33-7	Prop. PDWS
SM151	14100	pCi/L	Samarium-151	015715-94-3	Prop. PDWS
SM153	1830	pCi/L	Samarium-153	015766-00-4	Prop. PDWS
SC46	863	pCi/L	Scandium-46	013967-63-0	Prop. PDWS

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
SC47	2440	pCi/L	Scandium-47	014391-96-9	Prop. PDWS
SC48	766	pCi/L	Scandium-48	014391-86-7	Prop. PDWS
SE	0.05	mg/L	Selenium	NO CAS RN	PDWS
SEDIS	0.05	mg/L	Selenium, Dissolved	NO CAS RN	PDWS
SETOT	0.05	mg/L	Selenium, Total	NO CAS RN	PDWS
SE75	574	pCi/L	Selenium-75	014265-71-5	Prop. PDWS
SI31	10200	pCi/L	Silicon-31	014276-49-4	Prop. PDWS
AG	0.18	mg/L	Silver	NO CAS RN	EPA-III PRG
AGDIS	0.18	mg/L	Silver, Dissolved	NO CAS RN	EPA-III PRG
AGTOT	0.18	mg/L	Silver, Total	NO CAS RN	EPA-III PRG
AG105	2700	pCi/L	Silver-105	014928-14-4	Prop. PDWS
AG108	6.26E+05	pCi/L	Silver-108	014391-65-2	Prop. PDWS
AG108M	723	pCi/L	Silver-108m	014391-65-2(m)	Prop. PDWS
AG109M	1.67E+07	pCi/L	Silver-109m	014378-38-2(m)	Prop. PDWS
AG110	1.84E+06	pCi/L	Silver-110	014391-76-5	Prop. PDWS
AG110M	512	pCi/L	Silver-110m	014391-76-5(m)	Prop. PDWS
AG111	1080	pCi/L	Silver-111	015769-04-0	Prop. PDWS
SILVEX	0.05	mg/L	Silvex	000093-72-1	PDWS
NA22	466	pCi/L	Sodium-22	013966-32-0	Prop. PDWS
NA24	3350	pCi/L	Sodium-24	013982-04-2	Prop. PDWS
SR82	241	pCi/L	Strontium-82	014809-50-8	Prop. PDWS
SR85	2830	pCi/L	Strontium-85	013967-73-2	Prop. PDWS
SR85M	2.37E+05	pCi/L	Strontium-85m	013967-73-2(m)	Prop. PDWS
SR89	599	pCi/L	Strontium-89	014158-27-1	Prop. PDWS
SR90	8	pCi/L	Strontium-90	010098-97-2	Int. PDWS
SR91	2160	pCi/L	Strontium-91	014331-91-0	Prop. PDWS
SR92	3100	pCi/L	Strontium-92	014928-29-1	Prop. PDWS
STYR	0.1	mg/L	Styrene	000100-42-5	PDWS
SO4	500	mg/L	Sulfate	014808-79-8	Def. PDWS
S35	12900	pCi/L	Sulfur-35	015117-53-0	Prop. PDWS
TA182	842	pCi/L	Tantalum-182	013982-00-8	Prop. PDWS
TC95	69700	pCi/L	Technetium-95	014809-56-4	Prop. PDWS
TC95M	3120	pCi/L	Technetium-95m	014809-56-4(m)	Prop. PDWS
TC96	2050	pCi/L	Technetium-96	014808-44-7	Prop. PDWS
TC96M	1.76E+05	pCi/L	Technetium-96m	014808-44-7(m)	Prop. PDWS
TC97	32500	pCi/L	Technetium-97	015759-35-0	Prop. PDWS
TC97M	4450	pCi/L	Technetium-97m	015759-35-0(m)	Prop. PDWS
TC99	3790	pCi/L	Technetium-99	014133-76-7	Prop. PDWS
TC99M	89600	pCi/L	Technetium-99m	014133-76-7(m)	Prop. PDWS
TE125M	1490	pCi/L	Tellurium-125m	014390-73-9(m)	Prop. PDWS
TE127	7920	pCi/L	Tellurium-127	013980-49-2	Prop. PDWS
TE127M	663	pCi/L	Tellurium-127m	013980-49-2(m)	Prop. PDWS
TE129	27200	pCi/L	Tellurium-129	014269-71-7	Prop. PDWS
TE129M	524	pCi/L	Tellurium-129m	014269-71-7(m)	Prop. PDWS
TE131	26800	pCi/L	Tellurium-131	014683-12-6	Prop. PDWS
TE131M	971	pCi/L	Tellurium-131m	014683-12-6(m)	Prop. PDWS

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
TE132	580	pCi/L	Tellurium-132	014234-28-7	Prop. PDWS
TB158	1250	pCi/L	Terbium-158	015759-55-4	Prop. PDWS
TB160	815	pCi/L	Terbium-160	013981-29-8	Prop. PDWS
CL4BP	0.0005	mg/L	Tetrachlorobiphenyl	001335-36-3	PDWS
TCLEE	0.005	mg/L	Tetrachloroethylene	000127-18-4	PDWS
TCX	0.025	mg/L	Tetrachloroxylene		Technical
TL	0.002	mg/L	Thallium	NO CAS RN	PDWS
TLDIS	0.002	mg/L	Thallium, Dissolved	NO CAS RN	PDWS
TLTOT	0.002	mg/L	Thallium, Total	NO CAS RN	PDWS
TL202	3840	pCi/L	Thallium-202	015720-57-7	Prop. PDWS
TL204	1680	pCi/L	Thallium-204	013968-51-9	Prop. PDWS
TL207	4.00E+05	pCi/L	Thallium-207	014133-67-6	Prop. PDWS
TL208	2.83E+05	pCi/L	Thallium-208	014913-50-9	Prop. PDWS
TL209	3.58E+05	pCi/L	Thallium-209	015690-73-0	Prop. PDWS
TH227	403	pCi/L	Thorium-227	015623-47-9	Prop. PDWS
TH228	125	pCi/L	Thorium-228	014274-82-9	Prop. PDWS
TH229	49.3	pCi/L	Thorium-229	015594-54-4	Prop. PDWS
TH230	79.2	pCi/L	Thorium-230	014269-63-7	Prop. PDWS
TH231	4070	pCi/L	Thorium-231	014932-40-2	Prop. PDWS
TH232	88	pCi/L	Thorium-232	007440-29-1	Prop. PDWS
TH234	401	pCi/L	Thorium-234	015065-10-8	Prop. PDWS
TM170	1030	pCi/L	Thulium-170	013981-30-1	Prop. PDWS
TM171	12700	pCi/L	Thulium-171	014333-45-0	Prop. PDWS
SN	22	mg/L	Tin	N/A	EPA-III PRG
SNDIS	22	mg/L	Tin, Dissolved	N/A	EPA-III PRG
SNTOT	22	mg/L	Tin, Total	N/A	EPA-III PRG
SN113	1740	pCi/L	Tin-113	013966-06-8	Prop. PDWS
SN121	6060	pCi/L	Tin-121	014683-06-8	Prop. PDWS
SN121M	2260	pCi/L	Tin-121m	014683-06-8(m)	Prop. PDWS
SN125	446	pCi/L	Tin-125	014683-08-0	Prop. PDWS
SN126	293	pCi/L	Tin-126	015832-50-5	Prop. PDWS
MEC6H5	1	mg/L	Toluene	000108-88-3	PDWS
TOTRAD	5	pCi/L	Total Radium	007440-14-4	PDWS
TXPHEN	0.003	mg/L	Toxaphene	008001-35-2	PDWS
TBP	0.078	mg/L	Tributyl Phosphate	000126-73-8	Technical
TRCLE	0.005	mg/L	Trichloroethylene	000079-01-6	PDWS
CCL3F	1.3	mg/L	Trichlorofluoromethane	000075-69-4	EPA-III PRG
TRITIU	20	pCi/mL	Tritium	010028-17-8	Int. PDWS
W181	19000	pCi/L	Tungsten-181	015749-46-9	Prop. PDWS
W185	3440	pCi/L	Tungsten-185	014932-41-3	Prop. PDWS
W187	2660	pCi/L	Tungsten-187	014983-48-3	Prop. PDWS
U	0.02	mg/L	Uranium	NO CAS RN	Prop. PDWS
UAA	1.5	pCi/L	Uranium (Curies)	NO CAS RN	Technical
UDIS	0.02	mg/L	Uranium, Dissolved	NO CAS RN	Prop. PDWS
UTOT	0.02	mg/L	Uranium, Total	NO CAS RN	Prop. PDWS
U232	5.72	pCi/L	Uranium-232	014158-29-3	Prop. PDWS

SRS EMS Desig	Health-Based Limit	Units	Common Chemical Name	CAS Number	Source of HBL
U233	13.8	pCi/L	Uranium-233	013968-55-3	Prop. PDWS
U3334	13.8	pCi/L	Uranium-233/234	NO CAS RN	Prop. PDWS
U234	13.9	pCi/L	Uranium-234	013966-29-5	Prop. PDWS
U235	14.5	pCi/L	Uranium-235	015117-96-1	Prop. PDWS
U236	14.5	pCi/L	Uranium-236	013982-70-2	Prop. PDWS
U237	1780	pCi/L	Uranium-237	014269-75-1	Prop. PDWS
U238	14.6	pCi/L	Uranium-238	007440-61-1	Prop. PDWS
U240	1540	pCi/L	Uranium-240	015687-53-3	Prop. PDWS
V	0.26	mg/L	Vanadium	N/A	EPA-III PRG
VDIS	0.26	mg/L	Vanadium, Dissolved	N/A	EPA-III PRG
VTOT	0.26	mg/L	Vanadium, Total	N/A	EPA-III PRG
V48	644	pCi/L	Vanadium-48	014331-97-6	Prop. PDWS
VINYLA	37	mg/L	Vinyl Acetate	000108-05-4	EPA-III PRG
C2H3CL	0.002	mg/L	Vinyl Chloride	000075-01-4	PDWS
XYLEN	10	mg/L	Xylenes	001330-20-7	PDWS
YB169	1830	pCi/L	Ytterbium-169		Prop. PDWS
YB175	3110	pCi/L	Ytterbium-175		Prop. PDWS
Y88	576	pCi/L	Yttrium-88		Technical
Y90	510	pCi/L	Yttrium-90	010098-91-6	Prop. PDWS
Y91	576	pCi/L	Yttrium-91	014234-24-3	Prop. PDWS
Y91M	1.32E+05	pCi/L	Yttrium-91m	014234-24-3(m)	Prop. PDWS
Y92	2870	pCi/L	Yttrium-92	015751-59-4	Prop. PDWS
Y93	1200	pCi/L	Yttrium-93	014981-70-5	Prop. PDWS
ZN	11	mg/L	Zinc	NO CAS RN	EPA-III PRG
ZNDIS	11	mg/L	Zinc, Dissolved	NO CAS RN	EPA-III PRG
ZNTOT	11	mg/L	Zinc, Total	NO CAS RN	EPA-III PRG
ZN65	396	pCi/L	Zinc-65	013982-39-3	Prop. PDWS
ZN69	63100	pCi/L	Zinc-69	013982-23-5	Prop. PDWS
ZN69M	4220	pCi/L	Zinc-69m	013982-23-5(m)	Prop. PDWS
ZR93	5090	pCi/L	Zirconium-93	015751-77-6	Prop. PDWS
ZR95	1460	pCi/L	Zirconium-95	013967-71-0	Prop. PDWS
ZR97	650	pCi/L	Zirconium-97	014928-30-4	Prop. PDWS

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APPENDIX B

SRS INVESTIGATION-DERIVED WASTE MANAGEMENT PLAN (U):

HEALTH-BASED LEVELS FOR

NON-AQUEOUS IDW

CONTAINERIZATION DETERMINATIONS

INTRODUCTION

This table applies to non-aqueous IDW (soil and slurries) and lists chemical constituent action levels used to determine whether or not non-aqueous IDW requires containerization and subsequent management under best management practices. In some cases, non-aqueous IDW exceeding the levels listed in Appendix B that require containerization and management under best management practices may be determined to be RCRA hazardous waste and would then require further management under RCRA auspices.

Risk management of radioactive elements is discussed in Section 2.1 in the text. The final page of the table in this appendix provides IDW Screening Levels for the man-made radionuclides that are found at SRS waste units. These levels are based on isotopic analysis for samples that exceed the screening gross alpha and non-volatile beta/gamma levels described in Section 2.1. IDW containing isotopes exceeding these levels will be managed in accordance with the IDW management plan.

The risk-based levels were calculated using Risk-Based Concentration Algorithms developed by Roy L. Smith of EPA Region III (Fourth Quarter 1994, Nov. 8, 1994) for residential exposure to contaminated soil for chemicals. These algorithms are identical to those employed in the review draft of Soil Screening Guidelines (EPA/540/R-94/101, December 1994). Both cancer risk and noncancer levels are listed. The cancer risk level is set at the 1.0E-06 risk level. The noncancer hazard quotient is set at 1.0. The Soil Screening Guideline for lead of 400 mg/kg is obtained from *Revised Interim Soil Lead Guidance on Remedial Actions for Superfund Sites and RCRA Corrective Action Facilities* (OSWER Directive #9355.4-12, July 14, 1994).

Where SRS-wide soil background levels exceed the health-based levels (HBLs), the soil background level will be the HBL. SRS soil background levels for metals are derived from *Geochemical and Physical Properties of Soils and Shallow Sediments at the Savannah River Site (U)* (WSRC-RP-90-1031, August 30, 1990). The HBL is set by calculating the mean and adding two times the standard deviation of the detected concentrations, to conservatively estimate a reasonable upper-bound background value within the range of observed background values. Note, in no case will the HBL equal or exceed the maximum background value measured.

Unit-specific soil background levels are also determined for waste units at SRS. These unit-specific background values may vary greatly from (exceed) the SRS-wide background values due to unit-specific mineralogy in the sediments. This variance in unit-specific mineralogy is due to different mineralogy of parent materials for the sedimentary deposits surrounding and underlying any specific waste unit. Where the unit-specific background exceeds the SRS-wide background and the PRG/Soil Screening Guideline value, the unit-specific background value will be used as the HBL for that specific waste unit.

NOTES FOR TABLE USE:

1) Units represent mass (milligrams, mg) per kilogram (kg) of soil or activity (picoCuries, pCi) per gram (g) of soil.

2) Not all constituents included in this list are hazardous according to the definition of the South Carolina Hazardous Waste Management Regulations R.61-79.

3) The Chemical Abstract Service Registry Numbers (CASRN) are unique to each radionuclide, chemical or mixture of chemicals identified in the list.

4) Voids in the table indicate the lack of both cancer potency slope factor (SF) and noncancer reference dose (RfD) data in the IRIS and HEAST databases. The IRIS database is current as of December 1, 1994, and the HEAST publication is current as of November 1993.

5) This table is used to determine acceptable levels of contaminants in non-aqueous IDW that does not require management using best management practices. Non-aqueous IDW that exceeds these Health-Based Levels will be managed using best management practices in accordance with the IDW Management Plan.

6) The Health-Based Limits (HBLs) are annotated with "e" for limits derived from *Soil Screening Guidance* (EPA/540/R-94/101, OSWER Directive 9355.4-14FS, December 1994), with "b" for SRS background levels, with "c" for Region III PRG cancer risk values, and with "n" for Region III PRG noncancer hazard index values.

7) The HBLs are set according to the following priority:

   - EPA Region III PRGs/EPA Draft Soil Screening Guidelines (EPA/540/R-94/101) based on a residential exposure scenario, using a lifetime cancer risk of 1.0E-06 and a hazard quotient of 1.0. The lowest of the cancer or noncancer PRGs is selected as the HBL. If SRS-wide background levels exceed the EPA Region III PRGs/Soil Screening Guidelines, then the SRS-wide background levels are used as the HBLs. Radionuclides also consider the Practical Quantitation Limit for the isotopes in soil in determining the IDW screening level.

   - The HBL for lead is set at 400 mg/kg based on *Revised Interim Soil Lead Guidance on Remedial Actions for Superfund Sites and RCRA Corrective Action Facilities* (OSWER Directive #9355.4-12, July 14, 1994).

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
acenaphthene	83-32-9	6.00E-02				4.69E+03 n
acenaphthylene	208-96-8					
acephate	30560-19-1	4.00E-03		8.70E-03		7.34E+01 c
acetaldehyde	75-07-0		2.57E-03			
acetate, ethyl	141-78-6	9.00E-01				7.04E+04 n
acetic acid, 2,4,5-trichlorophenoxy	93-76-5	1.00E-02				7.82E+02 n
acetochlor	34256-82-1	2.00E-02				1.56E+03 n
acetone	67-64-1	1.00E-01				7.82E+03 n
acetone cyanohydrin	75-86-5	7.00E-02	2.86E-03			5.48E+03 n
acetonitrile	75-05-8	6.00E-03	1.43E-02			4.69E+02 n
acetophenone	98-86-2	1.00E-01				7.82E+03 n
acetyl chloride	75-36-5					
acifluorfen, sodium	62476-59-9	1.30E-02				1.02E+03 n
acrolein	107-02-8	2.00E-02	5.71E-06			1.56E+03 n
acrylamide	79-06-1	2.00E-04		4.50E+00	4.50E+00	1.42E-01 c
acrylate, 2-ethoxyethyl	106-74-1					
acrylate, ethyl	140-88-5			4.80E-02		1.33E+01 c
acrylic acid	79-10-7	5.00E-01	2.86E-04			3.91E+04 n
acrylonitrile	107-13-1	1.00E-03	5.71E-04	5.40E-01	2.40E-01	1.18E+00 c
adiponitrile	111-69-3					
alachlor	15972-60-8	1.00E-02		8.00E-02		7.98E+00 c
alar	1596-84-5	1.50E-01				1.17E+04 n
aldicarb	116-06-3	1.00E-03				7.82E+01 n
aldicarb sulfone	1646-88-4	1.00E-03				7.82E+01 n
aldrin	309-00-2	3.00E-05		1.70E+01	1.70E+01	3.76E-02 c
allidochlor	93-71-0					
ally	74223-64-6	2.50E-01				1.96E+04 n
allyl alcohol	107-18-6	5.00E-03				3.91E+02 n
allyl chloride	107-05-1		2.86E-04			
aluminum	7429-90-5					3.25E+04 b
aluminum phosphide	20859-73-8	4.00E-04				3.13E+01 n
amdro	67485-29-4	3.00E-04				2.35E+01 n
ametryn	834-12-8	9.00E-03				7.04E+02 n
amine, N-nitrosodiphenyl-	86-30-6			4.90E-03		1.30E+02 c
amine, n,n-diphenyl	122-39-4	2.50E-02				1.96E+03 n
amine, n-nitroso-di-n-butyl	924-16-3			5.40E+00	5.40E+00	1.18E-01 c
amine, n-nitroso-di-n-propyl	621-64-7			7.00E+00		9.12E-02 c
amitraz	33089-61-1	2.50E-03				1.96E+02 n
ammonia	7664-41-7		2.86E-02			
ammonium acetate	631-61-8					
ammonium methacrylate	16325-47-6					
ammonium sulfamate	7773-06-0	2.00E-01				1.56E+04 n
aniline	62-53-3		2.86E-04	5.70E-03		1.12E+02 c
aniline hydrochloride, 2,4,6-trichloro	33663-50-2			2.90E-02		2.20E+01 c
aniline hydrochloride, 2,4-dimethyl	21436-96-4			5.80E-01		1.10E+00 c
aniline hydrochloride, 4-chloro-2-methyl	3165-93-3			4.60E-01		1.39E+00 c
aniline, 2,4,6-trichloro	634-93-5			3.40E-02		1.88E+01 c
aniline, 2,4-dimethyl	95-68-1			7.50E-01		8.52E-01 c
aniline, 2-chloro	95-51-2					
aniline, 3-chloro	108-42-9					
aniline, 4-chloro	106-47-8	4.00E-03				3.13E+02 n
aniline, 4-chloro-2-methyl	95-69-2			5.80E-01		1.10E+00 c

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.
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n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
aniline, N,N'-diethyl	91-66-7					
aniline, n,n-dimethyl	121-69-7	2.00E-03				1.56E+02 n
aniline, n-ethyl	103-69-5					
anisidine, ortho-	90-04-0					
anthracene	120-12-7	3.00E-01				2.35E+04 n
anthracene, 7,12-dimethylbenz(a)	57-97-6					
antimony	7440-36-0	4.00E-04				3.13E+01 n
antimony pentoxide	1314-60-9	5.00E-04				3.91E+01 n
antimony potassium tartrate	304-61-0	9.00E-04				7.04E+01 n
antimony tetroxide	1332-81-6	4.00E-04				3.13E+01 n
antimony trioxide	1309-64-4	4.00E-04				3.13E+01 n
apollo	74115-24-5	1.30E-02				1.02E+03 n
aramite	140-57-8	5.00E-02		2.50E-02	2.50E-02	2.55E+01 c
aroclor 1016	12674-11-2	7.00E-05				5.48E+00 n
aroclor 1248	12672-29-6					
aroclor 1254	11097-69-1	2.50E-02				1.96E+03 n
arsenic	7440-38-2	3.00E-04		1.75E+00	5.00E+01	9.44E+00 b
arsine	7784-42-1		1.43E-05			
asbestos	1332-21-4					
assure	76578-14-8	9.00E-03				7.04E+02 n
asulam	3337-71-1	5.00E-02				3.91E+03 n
atrazine	1912-24-9	3.50E-02		2.22E-01		2.88E+00 c
avermectin b1	65195-55-3	4.00E-04				3.13E+01 n
azobenzene	103-33-3			1.10E-01	1.10E-01	5.81E+00 c
barium	7440-39-3	7.00E-02	1.43E-04			5.50E+03 e
barium cyanide	542-62-1					
baygon	114-26-1	4.00E-03				3.13E+02 n
bayleton	43121-43-3	3.00E-02				2.35E+03 n
baythroid	68359-37-5	2.50E-02				1.96E+03 n
benefin	1861-40-1	3.00E-01				2.35E+04 n
benomyl	17804-35-2	5.00E-02				3.91E+03 n
bentazon	25057-89-0	2.50E-03				1.96E+02 n
benzal chloride	98-87-3					
benzaldehyde	100-52-7	1.00E-01				7.82E+03 n
benzaldehyde cyanohydrin	532-28-5					
benzene	71-43-2			2.90E-02	2.90E-02	2.20E+01 c
benzene, 1,2,4-tribromo	615-54-3	5.00E-03				3.91E+02 n
benzene, 1,2,4-trichloro	120-82-1	1.00E-02	5.71E-02			7.82E+02 n
benzene, 1,2-dinitro	528-29-0	4.00E-04				3.13E+01 n
benzene, 1,3,5-trinitro	99-35-4	5.00E-05				3.91E+00 n
benzene, 1,3-dinitro	99-65-0	1.00E-04				7.82E+00 n
benzene, 1,4-dibromo	106-37-6	1.00E-02				7.82E+02 n
benzene, 1,4-dinitro	100-25-4	4.00E-04				3.13E+01 n
benzene, m-chloronitro	88-73-3			2.50E-02		2.55E+01 c
benzene, p-chloronitro	100-00-5			1.80E-02		3.55E+01 c
benzenethiol	108-98-5	1.00E-05				7.82E-01 n
benzidine	92-87-5	3.00E-03		2.30E+02	2.30E+02	2.78E-03 c
benzidine, 3,3'-dimethyl	119-93-7			9.20E+00		6.94E-02 c
benzidine, 3,3-dimethoxy	119-90-4			1.40E-02		4.56E+01 c
benzo(a)anthracene	56-55-3			7.30E-01		8.75E-01 c
benzo(a)pyrene	50-32-8			7.30E+00		8.75E-02 c
benzo(b)fluoranthene	205-99-2			7.30E-01		8.75E-01 c

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.

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n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
benzo(g,h,i)perylene	191-24-2					
benzo(j)fluoranthene	205-82-3					
benzo(k)fluoranthene	207-08-9			7.30E-02		8.75E+00 c
benzoic acid	65-85-0	4.00E+00				3.13E+05 n
benzothiazole, 2-(thiocyanomethylthio)-	21564-17-0	3.00E-02				2.35E+03 n
benzotrichloride	98-07-7			1.30E+01		4.91E-02 c
benzyl alcohol	100-51-6	3.00E-01				2.35E+04 n
benzyl chloride	100-44-7			1.70E-01		3.76E+00 c
beryllium	7440-41-7	5.00E-03		4.30E+00	8.40E+00	1.49E-01 c
bidrin	141-66-2	1.00E-04				7.82E+00 n
biphenthrin	82657-04-3	1.50E-02				1.17E+03 n
biphenyl, 1,1-	92-52-4	5.00E-02				3.91E+03 n
bis(2-chloroethoxy)methane	111-91-1					
bisphenol A	80-05-7	5.00E-02				3.91E+03 n
boron	7440-42-8	9.00E-02	5.71E-03			7.04E+03 n
boron trifluoride	7637-07-2		2.00E-04			
bromoacetone	598-31-2					
bromochloromethane	74-97-5					
bromodichloromethane	75-27-4	2.00E-02		6.20E-02		1.03E+01 c
bromodifluoromethane	1511-62-2					
bromoform	75-25-2	2.00E-02		7.93E-03	3.90E-03	8.05E+01 c
bromomethane	74-83-9	1.40E-03	1.43E-03			1.10E+02 n
bromophos	2104-96-3	5.00E-03				3.91E+02 n
bromotrichloromethane	75-62-7					
bromoxynil	1689-84-5	2.00E-02				1.56E+03 n
bromoxynil octanoate	1689-99-2	2.00E-02				1.56E+03 n
busan 77	31512-74-0					
busan 90	2491-38-5					
butadiene, 1,3-	106-99-0				1.80E+00	
butadiene, 2-chloro-1,3-	126-99-8	2.00E-02	2.00E-03			1.56E+03 n
butane, 1-chloro	109-69-3	4.00E-01				3.13E+04 n
butane, 2-chloro	78-86-4					
butanol, 1-	71-36-3	1.00E-01				7.82E+03 n
butanone, 2- (MEK)	78-93-3	6.00E-01	2.86E-01			4.69E+04 n
butene, 1,4-dichloro-2-	764-41-0				9.30E+00	
butylate	2008-41-5	5.00E-02				3.91E+03 n
butylchloride, t-	507-20-0					
butylphthalyl butylglycolate (BPBG)	85-70-1	1.00E+00				7.82E+04 n
butyric acid, 4-(2,4-dichlorophenoxy)	94-82-6	8.00E-03				6.26E+02 n
butyric acid, 4-(2-methyl-4-chlorophenoxy)	94-81-5	1.00E-02				7.82E+02 n
butyrolactone, gamma-	96-48-0					
cacodylic acid	75-60-5	3.00E-03				2.35E+02 n
cadmium	7440-43-9	5.00E-04				3.91E+01 n
calcium cyanide	592-01-8	4.00E-02				3.13E+03 n
caprolactam	105-60-2	5.00E-01				3.91E+04 n
captafol	2425-06-1	2.00E-03		8.60E-03		7.43E+01 c
captan	133-06-2	1.30E-01		3.50E-03		1.82E+02 c
carbaryl	63-25-2	1.00E-01				7.82E+03 n
carbazole	86-74-8			2.00E-02		3.19E+01 c
carbofuran	1563-66-2	5.00E-03				3.91E+02 n
carbon disulfide	75-15-0	1.00E-01	2.86E-03			7.82E+03 n
carbon tetrachloride	56-23-5	7.00E-04		1.30E-01	5.30E-02	4.91E+00 c

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.
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c = Cancer Risk
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n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
carbonyl sulfide	463-58-1					
carbosulfan	55285-14-8	1.00E-02				7.82E+02 n
carboxin	5234-68-4	1.00E-01				7.82E+03 n
chloral	75-87-6	2.00E-03				1.56E+02 n
chloral hydrate	302-17-0					
chloramben	133-90-4	1.50E-02				1.17E+03 n
chloranil	118-75-2			4.03E-01		1.58E+00 c
chlordane	57-74-9	6.00E-05		1.30E+00	1.30E+00	4.91E-01 c
chloride, ethyl	75-00-3		2.86E+00			
chlorimuron-ethyl	90982-32-4	2.00E-02				1.56E+03 n
chlorine	7782-50-5	1.00E-01				7.82E+03 n
chlorine cyanide	506-77-4	5.00E-02				3.91E+03 n
chlorine dioxide	10049-04-4		5.71E-05			
chlorite (sodium salt)	7758-19-2					
chloroacetaldehyde	107-20-0					
chloroacetic acid	79-11-8	2.00E-03				1.56E+02 n
chloroacetophenone, 2-	532-27-4		8.57E-06			
chlorobenzene	108-90-7	2.00E-02	5.71E-03			1.56E+03 n
chlorobenzilate	510-15-6	2.00E-02		2.70E-01	2.70E-01	2.37E+00 c
chlorobenzoic acid, p-	74-11-3	2.00E-01				1.56E+04 n
chlorobenzotrifluoride, 4-	98-56-6	2.00E-02				1.56E+03 n
chlorocyclohexane, 1,2,3,4,5-pentabromo-6-	87-84-3			2.30E-02		2.78E+01 c
chlorocyclopentadiene	41851-50-7					
chlorodifluoromethane	75-45-6		1.43E+01			
chloroform	67-66-3	1.00E-02		6.10E-03	8.10E-02	1.05E+02 c
chloromethane	74-87-3			1.30E-02	6.30E-03	4.91E+01 c
chloronaphthalene, beta-	91-58-7	8.00E-02				6.26E+03 n
chlorophenoxyacetic acid, 2-methyl-4-	94-74-6	5.00E-04				3.91E+01 n
chloropropane, 1,2-dibromo-3-	96-12-8		5.71E-05	1.40E+00	2.40E-03	4.56E-01 c
chlorpropham	101-21-3	2.00E-01				1.56E+04 n
chlorpyrifos	2921-88-2	3.00E-03				2.35E+02 n
chlorpyrifos methyl	5598-13-0	1.00E-02				7.82E+02 n
chlorsulfuron	64902-72-3	5.00E-02				3.91E+03 n
chlorthalonil	1897-45-6	1.50E-02		1.10E-02		5.81E+01 c
chlorthiophos	60238-56-4	8.00E-04				6.26E+01 n
chromium (hexavalent)	18540-29-9	5.00E-03			4.10E+01	3.91E+02 n
chromium (trivalent)	16065-83-1	1.00E+00				7.82E+04 n
chrysene	218-01-9			7.30E-03		8.75E+01 c
coke oven emissions	8007-45-2				2.20E+00	
copper	7440-50-8	3.70E-02				2.89E+03 n
copper cyanide	544-92-3	5.00E-03				3.91E+02 n
creosote, coal tar	8001-58-9					
cresol, 2,6-dinitro-p-	609-93-8					
cresol, 4,6-dinitro-o-	534-52-1					
cresol, p-chloro-m-	59-50-7					
crotonaldehyde	123-73-9			1.90E+00		3.36E-01 c
cumene	98-82-8	4.00E-02	2.57E-03			3.13E+03 n
cyanazine	21725-46-2	2.00E-03		8.40E-01		7.60E-01 c
cyanide	57-12-5	2.00E-02				1.60E+03 e
cyanogen	460-19-5	4.00E-02				3.13E+03 n
cyanogen bromide	506-68-3	9.00E-02				7.04E+03 n
cycloate	1134-23-2					

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.

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Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
cyclohexanol	108-93-0					
cyclohexanone	108-94-1	5.00E+00				3.91E+05 n
cyclohexene, 4-vinyl-1-	100-40-3					
cyclohexylamine	108-91-8	2.00E-01				1.56E+04 n
cyclopentadiene	542-92-7					
cyhalothrin/karate	68085-85-8	5.00E-03				3.91E+02 n
cypermethrin	52315-07-8	1.00E-02				7.82E+02 n
cyromazine	66125-27-8	7.50E-03				5.87E+02 n
dacthal	1861-32-1	1.00E-02				7.82E+02 n
dalapon	75-99-0	3.00E-02				2.35E+03 n
danitol	39515-41-8	2.50E-02				1.96E+03 n
ddd, 4,4'-	72-54-8			2.40E-01		2.66E+00 c
dde, 4,4'-	72-55-9			3.40E-01		1.88E+00 c
ddt, 4,4'-	50-29-3	5.00E-04		3.40E-01	3.40E-01	1.88E+00 c
decabromodiphenyl ether	1163-19-5	1.00E-02				7.82E+02 n
demeton	8065-48-3	4.00E-05				3.13E+00 n
di(2-ethylhexyl)adipate	103-23-1	6.00E-01		1.20E-03		5.32E+02 c
diallate	2303-16-4			6.10E-02		1.05E+01 c
diazinon	333-41-5	9.00E-04				7.04E+01 n
diazomethane	334-88-3					
dibenz(a,h)anthracene	53-70-3			7.30E+00		8.75E-02 c
dibenzofuran	132-64-9					
dibenzofurans, brominated	NO CASRN					
dibromochloromethane	124-48-1	2.00E-02		8.40E-02		7.60E+00 c
dibromodichloromethane	594-18-3					
dibromodiphenyl ether, p,p'-	2050-47-7					
dibromoethane, 1,2-	106-93-4		5.71E-05	8.50E+01	7.60E-01	7.51E-03 c
dicamba	1918-00-9	3.00E-02				2.35E+03 n
dichlorobenzene, 1,2-	95-50-1	9.00E-02	5.71E-02			7.04E+03 n
dichlorobenzene, 1,3-	541-73-1					
dichlorobenzene, 1,4-	106-46-7		2.29E-01	2.40E-02		2.66E+01 c
dichlorobenzidine, 3,3-	91-94-1			4.50E-01		1.42E+00 c
dichlorodifluoromethane	75-71-8	2.00E-01	5.71E-02			1.56E+04 n
dichloroethane, 1,1-	75-34-3	1.00E-01	1.43E-01			7.82E+03 n
dichloroethane, 1,2-	107-06-2			9.10E-02	9.10E-02	7.02E+00 c
dichloroethene, 1,1-	75-35-4	9.00E-03		6.00E-01	1.20E+00	1.06E+00 c
dichloroethene, 1,2- (mixed isomers)	540-59-0	9.00E-03				7.04E+02 n
dichloroethene, cis-1,2-	156-59-2	1.00E-02				7.82E+02 n
dichloroethene, trans-1,2-	156-60-5	2.00E-02				1.56E+03 n
dichlorophenol, 2,3-	576-24-9					
dichlorophenol, 2,4-	120-83-2	3.00E-03				2.35E+02 n
dichlorophenol, 2,5-	583-78-8					
dichlorophenol, 2,6-	87-65-0					
dichlorophenol, 3,4-	95-77-2					
dichlorophenol, 3,5-	591-35-5					
dichlorophenoxyacetic acid, 2,4-	94-75-7	1.00E-02				7.82E+02 n
dichloropropane, 1,1-	78-99-9					
dichloropropane, 1,2-	78-87-5		1.14E-03	6.80E-02		9.39E+00 c
dichloropropane, 1,3-	142-28-9					
dichloropropane, 2,2-	594-20-7					
dichloropropanol, 2,3-	616-23-9	3.00E-03				2.35E+02 n
dichloropropene, 1,3-	542-75-6	3.00E-04	5.71E-03	1.80E-01	1.30E-01	3.55E+00 c

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.

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dichlorprop	120-36-5					
dichlorvos	62-73-7	5.00E-04	1.43E-04	2.90E-01		2.20E+00 c
dicofol	115-32-2			1.40E-01		1.45E+00 c
dicyclopentadiene	77-73-6	3.00E-02	5.71E-05			2.35E+03 n
dieldrin	60-57-1	5.00E-05		1.60E+01	1.60E+01	3.99E-02 c
diesel engine emissions	NO CASRN		1.43E-03			
diethyl sulfate	64-67-5					
diethylene glycol dinitrate	693-21-0					
diethylformamide	617-84-5	1.10E-02				8.60E+02 n
diethylphthalate	84-66-2	8.00E-01				6.26E+04 n
diethylstilbesterol	56-53-1			4.70E+03		1.36E-04 c
difenzoquat	43222-48-6	8.00E-02				6.26E+03 n
diflubenzuron	35367-38-5	2.00E-02				1.56E+03 n
diisocyanate, 1,6-hexamethylene	822-06-0		2.86E-06			
diisopropyl methylphosphonate	1445-75-6	8.00E-02				6.26E+03 n
dimethipin	55290-64-7	2.00E-02				1.56E+03 n
dimethoate	60-51-5	2.00E-04				1.56E+01 n
dimethylamine	124-40-3					
dinoseb	88-85-7	1.00E-03				7.82E+01 n
dioxane, 1,4-	123-91-1			1.10E-02		5.81E+01 c
dioxin (2,3,7,8-TCDD)	1746-01-6			1.50E+05	1.50E+05	4.26E-06 c
diphenamid	957-51-7	3.00E-02				2.35E+03 n
diquat	85-00-7	2.20E-03				1.72E+02 n
direct black 38	1937-37-7			8.60E+00		7.43E-02 c
direct blue 6	2602-46-2			8.10E+00		7.89E-02 c
direct brown 95	16071-86-6			9.30E+00		6.87E-02 c
direct lightfast blue	4399-55-7					
direct sky blue 6B	2610-05-1					
disulfoton	298-04-4	4.00E-05				3.13E+00 n
dithiane, 1,4-	505-29-3	1.00E-02				7.82E+02 n
dithiopropylcarbamate, s-ethyl-	759-94-4	2.50E-02				1.96E+03 n
diuron	330-54-1	2.00E-03				1.56E+02 n
dodecanoate, 2-ethoxyethanol	106-13-8					
dodine	2439-10-3	4.00E-03				3.13E+02 n
endosulfan	115-29-7	6.00E-03				4.69E+02 n
endothall	145-73-3	2.00E-02				1.56E+03 n
endrin	72-20-8	3.00E-04				2.35E+01 n
environmental tobbaco smoke	NO CAS RN					
epichlorohydrin	106-89-8	2.00E-03	2.86E-04	9.90E-03	4.20E-03	6.45E+01 c
epoxybutane, 1,2-	106-88-7		5.71E-03			
ethane, 1,1,1-trichloro	71-55-6					
ethane, 1,1,2-trichloro	79-00-5	4.00E-03		5.70E-02	5.70E-02	1.12E+01 c
ethane, 1,1,2-trichloro-1,2,2-trifluoro	76-13-1	3.00E+01	8.57E+00			2.35E+06 n
ethane, 1,1-difluoro	75-37-6		1.14E+01			
ethanol acetate, 2-ethoxy	111-15-9	3.00E-01				2.35E+04 n
ethanol, 2-ethoxy	110-80-5	4.00E-01	5.71E-02			3.13E+04 n
ethephon	16672-87-0	5.00E-03				3.91E+02 n
ether, 2,4,4'-trichloro-2'-hydroxydiphenyl	3380-34-5					
ether, 2-chloroethylvinyl	110-75-8					
ether, 4-bromophenylphenyl	101-55-3					
ether, bis(2-chloroethyl)	111-44-4			1.10E+00	1.10E+00	5.81E-01 c
ether, bis(2-chloroisopropyl)	39638-32-9	4.00E-02		7.00E-02	3.50E-02	9.12E+00 c

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.

b = SRS background value

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e = EPA Soil Screening Guidance (EPA/540/R-94/101, December 1994).

n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
ether, bis(chloromethyl)	542-88-1			2.20E+02	2.20E+02	2.90E-03 c
ether, chloromethylmethyl	107-30-2					
ether, diethylene glycol monobutyl	112-34-5		5.71E-03			
ether, diethylene glycol monoethyl	111-90-0	2.00E+00				1.56E+05 n
ether, ethyl	60-29-7	2.00E-01				1.56E+04 n
ether, ethylene glycol monobutyl	111-76-2		5.71E-03			
ether, nonabromodiphenyl	63936-56-1					
ether, propylene glycol monoethyl	1569-02-4	7.00E-01				5.48E+04 n
ether, propylene glycol monomethyl	107-98-2	7.00E-01	5.71E-01			5.48E+04 n
ether, triethylene glycol monobutyl	143-22-6					
ether, triethylene glycol monoethyl	112-50-5					
ethion	563-12-2	5.00E-04				3.91E+01 n
ethoprop	13194-48-4					
ethoxyethanol phosphated, 2-	68554-00-7					
ethyl carbamate	51-79-6					
ethyl p-nitrophenyl phenylphosphorothioate	2104-64-5	1.00E-05				7.82E-01 n
ethylbenzene	100-41-4	1.00E-01	2.86E-01			7.82E+03 n
ethylene cyanohydrin	109-74-8	3.00E-01				2.35E+04 n
ethylene diamine	107-15-3	2.00E-02				1.56E+03 n
ethylene glycol	107-21-1	2.00E+00				1.56E+05 n
ethylene oxide	75-21-8			1.02E+00	3.50E-01	6.26E-01 c
ethylene thiourea	96-45-7	8.00E-05		1.10E-01		5.81E+00 c
ethyleneimine	151-56-4					
ethylnitrosourea	759-73-9			1.40E+02		4.56E-03 c
ethylphthalyl ethylglycolate (EPEG)	84-72-0	3.00E+00				2.35E+05 n
express	101200-48-0	8.00E-03				6.26E+02 n
fenamiphos	22224-92-6	2.50E-04				1.96E+01 n
fluometuron	2164-17-2	1.30E-02				1.02E+03 n
fluoranthene	206-44-0	4.00E-02				3.13E+03 n
fluorene	86-73-7	4.00E-02				3.13E+03 n
fluorine (soluble fluoride)	7782-41-4	6.00E-02				4.69E+03 n
fluridone	59756-60-4	8.00E-02				6.26E+03 n
flurprimidol	56425-91-3	2.00E-02				1.56E+03 n
flutolanil	66332-96-5	6.00E-02				4.69E+03 n
fluvalinate	69409-94-5	1.00E-02				7.82E+02 n
folpet	133-07-3	1.00E-01		3.50E-03		1.82E+02 c
fomesafen	72178-02-0			1.90E-01		3.36E+00 c
fonofos	944-22-9	2.00E-03				1.56E+02 n
formaldehyde	50-00-0	2.00E-01			4.50E-02	1.56E+04 n
formaldehyde cyanohydrin	107-16-4					
formamide, n,n-dimethyl	68-12-2	1.00E-01	8.57E-03			7.82E+03 n
formic acid	64-18-6	2.00E+00				1.56E+05 n
fosetyl-al	39148-24-8	3.00E+00				2.35E+05 n
furan	110-00-9	1.00E-03				7.82E+01 n
furazolidone	67-45-8			3.80E+00		1.68E-01 c
furfural	98-01-1	3.00E-03	1.43E-02			2.35E+02 n
furium	531-82-8			5.00E+01		1.28E-02 c
furmecyclox	60568-05-0			3.00E-02		2.13E+01 c
glufosinate-ammonium	77182-82-2	4.00E-04				3.13E+01 n
glycidaldehyde	765-34-4	4.00E-04	2.86E-04			3.13E+01 n
glyphosate	1071-83-6					
halosulfuron methyl	100784-20-1					

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.

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n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
haloxyfop-methyl	69806-40-2	5.00E-05				3.91E+00 n
harmony	79277-27-3	1.30E-02				1.02E+03 n
heptachlor	76-44-8	5.00E-04		4.50E+00	4.50E+00	1.42E-01 c
heptachlor epoxide	1024-57-3	1.30E-05		9.10E+00	9.10E+00	7.02E-02 c
heptafluoropropane, 1,1,1,2,3,3,3-	431-89-0					
heptane, n-	142-82-5					
hexabromobenzene	87-82-1	2.00E-03				1.56E+02 n
hexabromodiphenyl ether	36483-60-0					
hexachlorobenzene	118-74-1	8.00E-04		1.60E+00	1.60E+00	3.99E-01 c
hexachlorobutadiene	87-68-3	2.00E-04		7.80E-02	7.80E-02	8.19E+00 c
hexachlorocyclohexane, alpha-	319-84-6			6.30E+00	6.30E+00	1.01E-01 c
hexachlorocyclohexane, beta-	319-85-7			1.80E+00	1.80E+00	3.55E-01 c
hexachlorocyclohexane, delta-	319-86-8					
hexachlorocyclohexane, epsilon-	6108-10-7					
hexachlorocyclohexane, gamma-	58-89-9	3.00E-04		1.30E+00		4.91E-01 c
hexachlorocyclohexane, technical	608-73-1			1.80E+00	1.80E+00	3.55E-01 c
hexachlorocyclopentadiene	77-47-4	7.00E-03	2.00E-05			5.48E+02 n
hexachlorodibenzo-p-dioxin	19408-74-3			6.20E+03		1.03E-04 c
hexachloroethane	67-72-1	1.00E-03		1.40E-02	1.40E-02	4.56E+01 c
hexachlorophene	70-30-4	3.00E-04				2.35E+01 n
hexamethylene diamine	124-09-4					
hexane, n-	110-54-3	6.00E-02	5.71E-02			4.69E+03 n
hexanone, 2-	591-78-6					
hexazinone	51235-04-2	3.30E-02				2.58E+03 n
hmx	2691-41-0	5.00E-02				3.91E+03 n
hydrazine	302-01-2			3.00E+00	1.70E+01	2.13E-01 c
hydrazine sulfate	10034-93-2			3.00E+00	1.70E+01	2.13E-01 c
hydrazine, 1,1-dimethyl	57-14-7			2.60E+00	3.50E+00	2.46E-01 c
hydrazine, 1,2-diethyl	1615-80-1					
hydrazine, 1,2-dimethyl	540-73-8			3.70E+01		1.73E-02 c
hydrazine, 1,2-diphenyl	122-66-7			8.00E-01	8.00E-01	7.98E-01 c
hydrogen chloride	7647-01-0		2.00E-03			
hydrogen cyanide	74-90-8	2.00E-02	8.57E-04			1.56E+03 n
hydrogen sulfide	7738-06-4	3.00E-03	2.57E-04			2.35E+02 n
hydroquinone	123-31-9	4.00E-02				3.13E+03 n
imazalil	35554-44-0	1.30E-02				1.02E+03 n
imazaquin	81335-37-7	2.50E-01				1.96E+04 n
indeno(1,2,3-cd)pyrene	193-39-5			7.30E-01		8.75E-01 c
iprodione	36734-19-7	4.00E-02				3.13E+03 n
iron	7439-89-6					4.09E+04 b
isobutyl alcohol	78-83-1	3.00E-01				2.35E+04 n
isophorone	78-59-1	2.00E-01		9.50E-04		6.72E+02 c
isopropalin	33820-53-0	1.50E-02				1.17E+03 n
isopropyl methyl phosphonic acid	1832-54-8	1.00E-01				7.82E+03 n
isoxaben	82558-50-7	5.00E-02				3.91E+03 n
lactofen	77501-63-4	2.00E-03				1.56E+02 n
lactonitrile	78-97-7					
lead	7439-92-1					4.00E+02 e
limonene, d-	5989-27-5					
linuron	330-55-2	2.00E-03				1.56E+02 n
londax	83055-99-6	2.00E-01				1.56E+04 n
malanonitrile	109-77-3	2.00E-05				1.56E+00 n

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.

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n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
malathion	121-75-5	2.00E-02				1.56E+03 n
maleic anhydride	108-31-6	1.00E-01				7.82E+03 n
maleic hydrazide	123-33-1	5.00E-01				3.91E+04 n
mancozeb	8018-01-7	3.00E-02				2.35E+03 n
maneb	12427-38-2	5.00E-03				3.91E+02 n
manganese (food)	7439-96-5	1.40E-01	1.43E-05			1.10E+04 n
manganese (water)	7439-96-5	5.00E-03	1.43E-05			3.91E+02 n
mephosfolan	950-10-7	9.00E-05				7.04E+00 n
mepiquat chloride	24307-26-4	3.00E-02				2.35E+03 n
mercuric chloride	7487-94-7					
mercury	7439-97-6	3.00E-04	8.57E-05			2.35E+01 n
merphos	150-50-5	3.00E-05				2.35E+00 n
merphos oxide	78-48-8	3.00E-05				2.35E+00 n
metalaxyl	57837-19-1	6.00E-02				4.69E+03 n
methacrylate, 2-ethoxyethyl	2370-63-0					
methacrylate, ethyl	97-63-2	9.00E-02				7.04E+03 n
methacrylonitrile	126-98-7	1.00E-04	2.00E-04			7.82E+00 n
methamidiphos	10265-92-6	5.00E-05				3.91E+00 n
methanol	67-56-1	5.00E-01				3.91E+04 n
methidathion	950-37-8	1.00E-03				7.82E+01 n
methomyl	16752-77-5	2.50E-02				1.96E+03 n
methoxychlor	72-43-5	5.00E-03				3.91E+02 n
methoxyethanol acetate, 2-	110-49-6	2.00E-03				1.56E+02 n
methoxyethanol, 2-	109-86-4	1.00E-03	5.71E-03			7.82E+01 n
methyl acetate	79-20-9	1.00E+00				7.82E+04 n
methyl acrylate	96-33-3	3.00E-02				2.35E+03 n
methyl chlorocarbonate	79-22-1					
methyl ethyl ketone peroxide	1338-23-4					
methyl hydrazine	60-34-4			1.10E+00		5.81E-01 c
methyl iodide	77-88-4					
methyl isocyanate	624-83-9					
methyl mercury	22967-92-6	3.00E-04				2.35E+01 n
methyl methacrylate	80-62-6	8.00E-02				6.26E+03 n
methyl parathion	298-00-0	2.50E-04				1.96E+01 n
methyl styrene	25013-15-4	6.00E-03	1.14E-02			4.69E+02 n
methyl styrene, alpha-	98-83-9	7.00E-02				5.48E+03 n
methyl tert-butyl ether (MTBE)	1634-04-4		8.57E-01			
methylaniline hydrochloride, 2-	636-21-5			1.80E-01		3.55E+00 c
methylaniline, 2-	95-53-4			2.40E-01		2.66E+00 c
methylcholanthracene, 3-	56-49-5					
methylcyclohexane	108-87-2		8.57E-01			
methylene bromide	74-95-3	1.00E-02				7.82E+02 n
methylene chloride	75-09-2	6.00E-02	8.57E-01	7.50E-03	1.60E-03	8.52E+01 c
methylene-bis(2-chloroaniline), 4,4'-	101-14-4	7.00E-04		1.30E-01	1.30E-01	4.91E+00 c
methylene-bis(N,N-dimethyl)aniline, 4,4'-	101-61-1			4.60E-02		1.39E+01 c
methylenebisbenzenamine, 4,4'-	101-77-9			2.50E-01		2.55E+00 c
methylenediphenyl isocyanate, 4,4'-	101-68-8		5.71E-06			
methylnitrosourea	684-93-5					
methylphenol, 2-	95-48-7	5.00E-02				3.91E+03 n
methylphenol, 3-	108-39-4	5.00E-02				3.91E+03 n
methylphenol, 4-	106-44-5	5.00E-03				3.91E+02 n
metolachlor	51218-45-2	1.50E-01				1.17E+04 n

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.

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n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
metribuzin	21087-64-9	2.50E-02				1.96E+03 n
mirex	2385-85-5	2.00E-04		1.30E+00		3.55E-01 c
molinate	2212-67-1	2.00E-03				1.56E+02 n
molybdenum	7439-98-7	5.00E-03				3.91E+02 n
monochloramine	10599-90-3	1.00E-01				7.82E+03 n
naled	300-76-5	2.00E-03				1.56E+02 n
naphthalene	91-20-3					
naphthol hydrochloride, 1-amino-2-	1198-27-2					
naphthol, 1-amino-2-	2834-92-6					
naphthoquinone, 1,4-	130-15-4					
napropamide	15299-99-7	1.00E-01				7.82E+03 n
niagra blue 4B	2429-74-5					
nickel	7440-02-0	2.00E-02				1.60E+03 e
nickel carbonyl	13463-39-3					
nickel cyanide	557-19-7					
nickel refinery dust	NO CASRN				8.40E-01	
nickel subsulfide	12035-72-2				1.70E+00	
nicotinonitrile	100-54-9					
nitrapyrin	1929-82-4					
nitrate	14797-55-8	1.60E+00				1.25E+05 n
nitric oxide	10102-43-9	1.00E-01				7.82E+03 n
nitrite	14797-65-0	1.00E-01				7.82E+03 n
nitroaniline, 2-methoxy-5-	99-59-2			4.60E-02		1.39E+01 c
nitroaniline, 2-methyl-5-	99-55-8			3.30E-02		1.94E+01 c
nitroaniline, m-	99-09-2					
nitroaniline, o-	88-74-4		5.71E-05			
nitroaniline, p-	100-01-6					
nitrobenzene	98-95-3	5.00E-04	5.71E-04			3.91E+01 n
nitrofurantoin	67-20-9	7.00E-02				5.48E+03 n
nitrofurazone	59-87-0			1.50E+00		4.26E-01 c
nitrogen dioxide	10102-44-0	1.00E+00				7.82E+04 n
nitroguanidine	556-88-7	1.00E-01				7.82E+03 n
nitromethane	75-52-5					
nitrosodiethanolamine, N-	1116-54-7			2.80E+00		2.28E-01 c
nitrosodiethylamine, N-	55-18-5			1.50E+02	1.50E+02	4.26E-03 c
nitrosodimethylamine, N-	62-75-9			5.10E+01	5.10E+01	1.25E-02 c
nitrosodiphenylamine, p-	156-10-5					
nitrosomethylethylamine, N-	10595-95-6			2.20E+01		2.90E-02 c
nitrosomethylvinylamine, N-	4549-40-0					
nitrosopyrrolidine, N-	930-55-2			2.10E+00	2.10E+00	3.04E-01 c
nitrotoluene, m-	99-08-1	1.00E-02				7.82E+02 n
nitrotoluene, o-	88-72-2	1.00E-02				7.82E+02 n
nitrotoluene, p-	99-99-0	1.00E-02				7.82E+02 n
norflurazon	27314-13-2	4.00E-02				3.13E+03 n
nustar	85509-19-9	7.00E-04				5.48E+01 n
octabromodiphenyl ether	32536-52-0	3.00E-03				2.35E+02 n
octamethylpyrophosphoramide	152-16-9	2.00E-03				1.56E+02 n
oryzalin	19044-88-3	5.00E-02				3.91E+03 n
osmium tetroxide	20816-12-0					
oxadiazon	19666-30-9	5.00E-03				3.91E+02 n
oxamyl	23135-22-0	2.50E-02				1.96E+03 n
oxyfluorfen	42874-03-3	3.00E-03				2.35E+02 n

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Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
ozone	10028-15-6					
paclobutrazol	76738-62-0	1.30E-02				1.02E+03 n
paraldehyde	123-63-7					
paraquat	1910-42-5	4.50E-03				3.52E+02 n
parathion	56-38-2	6.00E-03				4.69E+02 n
pebulate	1114-71-2	5.00E-02				3.91E+03 n
pendimethalin	40487-42-1	4.00E-02				3.13E+03 n
pentabromodiphenyl ether	32534-81-9	2.00E-03				1.56E+02 n
pentachlorobenzene	608-93-5	8.00E-04				6.26E+01 n
pentachlorocyclopentadiene	25329-35-5					
pentachloronitrobenzene	82-68-8	3.00E-03		2.60E-01		2.46E+00 c
pentachlorophenol	87-86-5	3.00E-02		1.20E-01		5.32E+00 c
pentachloropropene, 1,1,2,3,3-	1600-37-9					
pentane, n-	109-66-0					
pentanone, 4-methyl-2-	108-10-1	8.00E-02	2.29E-02			6.26E+03 n
perfluorobutane	355-25-9					
perfluoroethane	354-33-6					
perfluorohexane	355-42-0					
permethrin	52645-53-1	5.00E-02				3.91E+03 n
phenanthrene	85-01-8					
phenmedipham	13684-63-4	2.50E-01				1.96E+04 n
phenol	108-95-2	6.00E-01				4.69E+04 n
phenol, 2,3,4-trichloro	15950-66-0					
phenol, 2,3,5-trichloro	933-78-8					
phenol, 2,3,6-trichloro	933-75-5					
phenol, 2,3-dimethyl	526-75-0					
phenol, 2,3-dinitro	66-56-8					
phenol, 2,4,5-trichloro	95-95-4	1.00E-01				7.82E+03 n
phenol, 2,4,6-trichloro	88-06-2			1.10E-02	1.00E-02	5.81E+01 c
phenol, 2,4-dimethyl	105-67-9	2.00E-02				1.56E+03 n
phenol, 2,4-dinitro	51-28-5	2.00E-03				1.56E+02 n
phenol, 2,5-dimethyl	95-87-4					
phenol, 2,5-dinitro	329-71-5					
phenol, 2,6-dimethyl	576-26-1	6.00E-04				4.69E+01 n
phenol, 2,6-dinitro	573-56-8					
phenol, 2-chloro	95-57-8	5.00E-03				3.91E+02 n
phenol, 3,4,5-trichloro	609-19-8					
phenol, 3,4-dimethyl	95-65-8	1.00E-03				7.82E+01 n
phenol, 3,5-dinitro	586-11-8					
phenol, 3-chloro	108-43-0					
phenol, 4,6-dinitro-o-cyclohexyl	131-89-5	2.00E-03				1.56E+02 n
phenol, 4-chloro	106-48-9					
phenol, m-amino	591-27-5	7.00E-02				5.48E+03 n
phenol, o-amino	95-55-6					
phenol, p-amino	123-30-8					
phenol, p-nitro	100-02-7					
phenylenediamine, m-	108-45-2	6.00E-03				4.69E+02 n
phenylenediamine, o-	95-54-5			4.70E-02		1.36E+01 c
phenylenediamine, p-	106-50-3	1.90E-01				1.49E+04 n
phenylmercuric acetate	62-38-4	8.00E-05				6.26E+00 n
phenylphenol, 2-	90-43-7			1.94E-03		3.29E+02 c
phorate	298-02-2	2.00E-04				1.56E+01 n

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.
b = SRS background value
c = Cancer Risk
e = EPA Soil Screening Guidance (EPA/540/R-94/101, December 1994)
n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
phosalone	2310-17-0					
phosgene	75-44-5					
phosmet	732-11-6	2.00E-02				1.56E+03 n
phosphate, diethyl-p-nitrophenyl	311-45-5					
phosphine	7803-51-2	3.00E-04	8.57E-06			2.35E+01 n
phosphorus	7723-14-0	2.00E-05				1.56E+00 n
phthalate, N-butylbenzyl	85-68-7	2.00E-01				1.56E+04 n
phthalate, bis(2-ethylhexyl)	117-81-7	2.00E-02		1.40E-02		4.56E+01 c
phthalate, di-n-butyl	84-74-2	1.00E-01				7.82E+03 n
phthalate, di-n-octyl-	117-84-0	2.00E-02				1.56E+03 n
phthalate, dimethyl	131-11-3	1.00E+01				7.82E+05 n
phthalate, dimethyltere	120-61-6	1.00E-01				7.82E+03 n
phthalic acid, m-	121-91-5					
phthalic acid, o-	88-99-3					
phthalic acid, p-	100-21-0	1.00E+00				7.82E+04 n
phthalic anhydride	85-44-9	2.00E+00	3.43E-02			1.56E+05 n
picloram	1918-02-1	7.00E-02				5.48E+03 n
pinene, alpha-	80-56-8					
pinene, beta-	127-91-3					
pirimiphos-methyl	29232-93-7	1.00E-02				7.82E+02 n
polybrominated biphenyls	NO CASRN	7.00E-06		8.90E+00		7.18E-02 c
polychlorinated biphenyls (PCBs)	1336-36-3			7.70E+00		8.30E-02 c
polycyclic organic matter (POM)	NO CASRN					
potassium bromate	7758-01-2					
potassium cyanide	151-50-8	5.00E-02				3.91E+03 n
potassium silver cyanide	506-61-6	2.00E-01				1.56E+04 n
prochloraz	67747-09-5	9.00E-03		1.50E-01		4.26E+00 c
profluralin	26399-36-0	6.00E-03				4.69E+02 n
prometon	1610-18-0	1.50E-02				1.17E+03 n
prometryn	7287-19-6	4.00E-03				3.13E+02 n
pronamide	23950-58-5	7.50E-02				5.87E+03 n
propachlor	1918-16-7	1.30E-02				1.02E+03 n
propane, 2-chloro	75-29-6		2.86E-02			
propane, 2-nitro	79-46-9		5.71E-03		9.40E+00	
propanil	709-98-8	5.00E-03				3.91E+02 n
propargite	2312-35-8	2.00E-02				1.56E+03 n
propargyl alcohol	107-19-7	2.00E-03				1.56E+02 n
propazine	139-40-2	2.00E-02				1.56E+03 n
propham	122-42-9	2.00E-02				1.56E+03 n
propiconazole	60207-90-1	1.30E-02				1.02E+03 n
propiolactone, beta-	57-57-8					
propionic acid, 2(2,4,5-trichlorophenoxy)	93-72-1	8.00E-03				6.26E+02 n
propionic acid, 2-(2-methyl-4-chlorophenoxy)	93-65-2	1.00E-03				7.82E+01 n
propionitrile	107-12-0					
propyl alcohol, n-	71-23-8					
propylene glycol	57-55-6	2.00E+01				1.56E+06 n
propylene oxide	75-56-9		8.57E-03	2.40E-01	1.30E-02	2.66E+00 c
propyleneimine	75-55-8					
pursuit	81335-77-5	2.50E-01				1.96E+04 n
pydrin	51630-58-1	2.50E-02				1.96E+03 n
pyrene	129-00-0	3.00E-02				2.35E+03 n
pyridine	110-86-1	1.00E-03				7.82E+01 n

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.
b = SRS background value
c = Cancer Risk
e = EPA Soil Screening Guidance (EPA/540/R-94/101, December 1994).
n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg	
pyridine, 4-amino	504-24-5	2.00E-05				1.56E+00	n
quinalphos	13593-03-8	5.00E-04				3.91E+01	n
quinoline	91-22-5			1.20E+01		5.32E-02	c
quinone	106-51-4						
rdx	121-82-4	3.00E-03		1.10E-01		5.81E+00	c
refractory ceramic fibers	NO CASRN						
resmethrin	10453-86-8	3.00E-02				2.35E+03	n
ronnel	299-84-3	5.00E-02				3.91E+03	n
rotenone	83-79-4	4.00E-03				3.13E+02	n
savey	78587-05-0	2.50E-02				1.96E+03	n
selenious acid	7783-00-8	5.00E-03				3.91E+02	n
selenium	7782-49-2	5.00E-03				3.91E+02	n
selenium sulfide	7446-34-6						
selenourea	630-10-4	5.00E-03				3.91E+02	n
sethoxydim	74051-80-2	9.00E-02				7.04E+03	n
silver	7440-22-4	5.00E-03				3.91E+02	n
silver cyanide	506-64-9	1.00E-01				7.82E+03	n
simazine	122-34-9	5.00E-03		1.20E-01		5.32E+00	c
sodium azide	26628-22-8	4.00E-03				3.13E+02	n
sodium cyanide	143-33-9	4.00E-02				3.13E+03	n
sodium diethyldithiocarbamate	148-18-5	3.00E-02		2.70E-01		2.37E+00	c
sodium fluoroacetate	62-74-8	2.00E-05				1.56E+00	n
sodium metavanadate	13718-26-8	1.00E-03				7.82E+01	n
strontium	7440-24-6	6.00E-01				4.69E+04	n
strychnine	57-24-9	3.00E-04				2.35E+01	n
styrene	100-42-5	2.00E-01	2.86E-01			1.56E+04	n
succinonitrile	110-61-2						
sulfate, dimethyl	77-78-1						
sulfide, p-chlorophenyl methyl	123-09-1						
sulfone, p-chlorophenyl methyl	98-57-7						
sulfoxide, p-chlorophenyl methyl	934-73-6						
sulfuric acid	7664-93-9		2.00E-02				
systhane	88761-89-0	2.50E-02				1.96E+03	n
tebuthiuron	34014-18-1	7.00E-02				5.48E+03	n
temephos	3383-96-8	2.00E-02				1.56E+03	n
terbacil	5902-51-2	1.30E-02				1.02E+03	n
terbufos	13071-79-9	2.50E-05				1.96E+00	n
terbutryn	886-50-0	1.00E-03				7.82E+01	n
tetrabromodiphenyl ether	40088-47-9						
tetrachloroazoxybenzene	21232-47-3						
tetrachlorobenzene, 1,2,4,5-	95-94-3	3.00E-04				2.35E+01	n
tetrachlorocyclopentadiene	695-77-2						
tetrachloroethane, 1,1,1,2-	630-20-6	3.00E-02		2.60E-02	2.60E-02	2.46E+01	c
tetrachloroethane, 1,1,2,2-	79-34-5			2.00E-01	2.00E-01	3.19E+00	c
tetrachloroethene (PCE)	127-18-4	1.00E-02		5.20E-02	2.00E-03	1.23E+01	c
tetrachlorohydrazobenzene	71753-42-9						
tetrachlorophenol, 2,3,4,5-	4901-51-3						
tetrachlorophenol, 2,3,4,6-	58-90-2	3.00E-02				2.35E+03	n
tetrachlorophenol, 2,3,5,6-	935-95-5						
tetrachloropropene, 1,1,2,3-	10436-39-2						
tetrachlorotoluene, p-, a,a,a-	5216-25-1			2.00E+01		3.19E-02	c
tetrachlorvinphos	961-11-5	3.00E-02		2.40E-02		2.66E+01	c

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.
b = SRS background value
c = Cancer Risk
e = EPA Soil Screening Guidance (EPA/540/R-94/101, December 1994).
n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
tetraethyl dithiopyrophosphate	3689-24-5	5.00E-04				3.91E+01 n
tetraethyl lead	78-00-2	1.00E-07				7.82E-03 n
thallic oxide	1314-32-5					
thallium	7440-28-0					
thallium (I) acetate	563-68-8	9.00E-05				7.04E+00 n
thallium (I) carbonate	6533-73-9	8.00E-05				6.26E+00 n
thallium (I) chloride	7791-12-0	8.00E-05				6.26E+00 n
thallium (I) nitrate	10102-45-1	9.00E-05				7.04E+00 n
thallium (I) sulfate	7446-18-6	8.00E-05				6.26E+00 n
thallium selenite	12039-52-0					
thiobencarb	28249-77-6	1.00E-02				7.82E+02 n
thiofanox	39196-18-4	3.00E-04				2.35E+01 n
thiophanate-methyl	23564-05-8	8.00E-02				6.26E+03 n
thiram	137-26-8	5.00E-03				3.91E+02 n
tin	7440-31-5	6.00E-01				4.69E+04 n
toluene	108-88-3	2.00E-01	1.14E-01			1.56E+04 n
toluene diisocyanate, 2,4-	NO CAS RN					
toluene, 2,3-diamino	2687-25-4					
toluene, 2,3-dinitro	602-01-7					
toluene, 2,4,6-trinitro	118-96-7	5.00E-04		3.00E-02		2.13E+01 c
toluene, 2,4-diamino	95-80-7			3.20E+00		2.00E-01 c
toluene, 2,4-dinitro	121-14-2	2.00E-03		6.80E-01		9.39E-01 c
toluene, 2,5-diamino	95-70-5	6.00E-01				4.69E+04 n
toluene, 2,5-dinitro	619-15-8					
toluene, 2,6-diamino	823-40-5	2.00E-01				1.56E+04 n
toluene, 2,6-dinitro	606-20-2	1.00E-03		6.80E-01		9.39E-01 c
toluene, 3,4-diamino	496-72-0					
toluene, 3,4-dinitro	610-39-9					
toluene, m-chloro	108-41-8					
toluene, m-ethyl	620-14-4					
toluene, o-chloro	95-49-8	2.00E-02				1.56E+03 n
toluene, o-ethyl	611-14-3					
toluene, p-chloro	106-43-4					
toluene, p-ethyl	622-96-8					
toluidine, m-	108-44-1					
toluidine, p-	106-49-0			1.90E-01		3.36E+00 c
toxaphene	8001-35-2			1.10E+00	1.10E+00	5.81E-01 c
tralomethrin	66841-25-6	7.50E-03				5.87E+02 n
triallate	2303-17-5	1.30E-02				1.02E+03 n
triasulfuron	82097-50-5	1.00E-02				7.82E+02 n
tribromochloromethane	594-15-0					
tribromodiphenyl ether	49690-94-0					
tributyltin oxide	56-35-9	3.00E-05				2.35E+00 n
trichlorocyclopentadiene	77323-84-3					
trichloroethene (TCE)	79-01-6	6.00E-03		1.10E-02		5.81E+01 c
trichlorofluoromethane	75-69-4	3.00E-01	2.00E-01			2.35E+04 n
trichloropropane, 1,1,1-	7789-89-1					
trichloropropane, 1,1,2-	598-77-6	5.00E-03				3.91E+02 n
trichloropropane, 1,2,2-	3175-23-3					
trichloropropane, 1,2,3-	96-18-4	6.00E-03		7.00E+00		9.12E-02 c
trichloropropene, 1,2,3-	96-19-5	5.00E-03				3.91E+02 n
trichlorotoluene, 2,3,6-	2077-46-5					

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.
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n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW CHEMICAL NAME	CASRN	RfDo mg/kg/day	RfDi mg/kg/day	CPSo kg-day/mg	CPSi kg-day/mg	Health-Based Limit mg/kg
trichlorotoluene, alpha,2,6-	2014-83-7					
tricresol	1319-77-3					
tridiphane	58138-08-2	3.00E-03				2.35E+02 n
triethylamine	121-44-8		2.00E-03			
trifluoroethane, 1,1,1-	420-46-2					
trifluoromethane	75-46-7					
trifluralin	1582-09-8	7.50E-03		7.70E-03		8.30E+01 c
trimethyl phosphate	512-56-1			3.70E-02		1.73E+01 c
trimethylpentane, 2,2,4-	540-84-1					
trinitrophenylmethylnitramine	479-45-8	1.00E-02				7.82E+02 n
urea, n,n-dimethyl	598-94-7					
vanadium	7440-62-2	7.00E-03				5.50E+02 e
vanadium pentoxide	1314-62-1	9.00E-03				7.04E+02 n
vanadium sulfate	36907-42-3	2.00E-02				1.56E+03 n
vernam	1929-77-7	1.00E-03				7.82E+01 n
vinclozolin	50471-44-8	2.50E-02				1.96E+03 n
vinyl acetate	108-05-4	1.00E+00	5.71E-02			7.82E+04 n
vinyl bromide (bromoethene)	593-60-2		8.57E-04		1.10E-01	
vinyl chloride	75-01-4			1.90E+00	3.00E-01	3.36E-01 c
warfarin	81-81-2	3.00E-04				2.35E+01 n
xylene, 4-ethyl-o-	934-80-5					
xylene, m-	108-30-3	2.00E+00				1.56E+05 n
xylene, mixture	1330-20-7	2.00E+00				1.56E+05 n
xylene, o-	95-47-6	2.00E+00				1.56E+05 n
xylene, p-	106-42-3					
zinc	7440-66-6	3.00E-01				2.35E+04 n
zinc cyanide	557-21-1	5.00E-02				3.91E+03 n
zinc phosphide	1314-84-7	3.00E-04				2.35E+01 n
zineb	12122-67-7	5.00E-02				3.91E+03 n

Shaded RfD and CPS values obtained from Region III Risk-Based Concentration Table, Fourth Quarter 1994.
b = SRS background value
c = Cancer Risk
e = EPA Soil Screening Guidance (EPA/540/R-94/101, December 1994).
n = Hazard Index

Appendix B HBL's for Non-Aqueous IDW RADIONUCLIDES			Half-life (years)	Risk-Based PRG Level (TR = E-6) (pCi/g)	Practical Quantitation Limit (SRS EMS) (pCi/g)	Background Level (Fay&Pickett) (Mikol & Davis) (pCi/g)	IDW Screening Level (pCi/g)
Element	CAS #	Isotope					
americium	014596-10-2	Am-241	432	2.9	2		2.9
carbon	014762-75-5	C-14	5730	866	0.2		866
cesium	010045-97-3	Cs-137	30	27	0.1	0.145	27
cesium +D	010045-97-3(+D)	Cs-137 +D	30	0.02	0.1		0.1
cobalt	010198-40-0	Co-60	5.27	0.005	0.1		0.1
curium	013981-15-2	Cm-244	18.1	4.6	1		4.6
europium	014683-23-9	Eu-152	13.3	0.01	0.5		0.5
europium	015585-10-1	Eu-154	8.8	0.01	0.2		0.2
europium	014391-16-3	Eu-155	4.96	0.7	0.2		0.7
hydrogen**	010028-17-8	H-3	12.3	14245	8		14245
iodine	015046-84-1	I-129	1.57E+07	2.9	1		2.9
neptunium	013994-20-2	Np-237	2.14E+06	2.1	1		2.1
neptunium +D	013994-20-2(+D)	Np-237 +D	2.14E+06	0.1	1		1
plutonium	013981-16-3	Pu-239	87.7	3.5	1	0.006	3.5
plutonium	015117-48-3	Pu-239	2.41E+04	3.3	1	0.016	3.3
strontium	010098-97-2	Sr-90	28.6	23	1	0.005	23
strontium +D	010098-97-2(+D)	Sr-90 +D	28.6	21	1		21
technetium	014133-76-7	Tc-99	2.13E+05	887	0.5		887
thorium*	2007440-29-1	Th-232	1.41E+10	62	1	0.93	62
thorium +D*	2007440-29-1(+D)	Th-232 +D	1.41E+10	0.01	1	9.32	9.32
uranium*	013966-29-5	U-234	2.45E+05	46	1	1.05	46
uranium*	015117-96-1	U-235	7.04E+08	0.2	1	0.05	1
uranium +D*	015117-96-1(+D)	U-235 +D	7.04E+08	0.2	1		1
uranium*	007440-61-1	U-238	4.47E+09	47	1	0.69	47
uranium +D*	007440-61-1(+D)	U-238 +D	4.47E+09	1.1	1	9.70	9.7

*NOTE: Thorium and Uranium (and daughters) are naturally-occurring radionuclides that also have process use at SRS (targets or fuel for reactors) and are, therefore, included in this list.

** Tritium (H-3) is not routinely analyzed in solid-matrix waste streams because the tritium result is due to its concentration in the water present in the soil at the time of analysis and not necessarily the concentration at the time of collection.

+D = includes radioactive daughters

Practical Quantitation Limits may exceed the levels given in the table due to analytical or soil matrix effects.

Values in bold type are the levels selected as the IDW screening levels.

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APPENDIX C

SRS INVESTIGATION-DERIVED WASTE MANAGEMENT PLAN:

IDW Implementation Schedules

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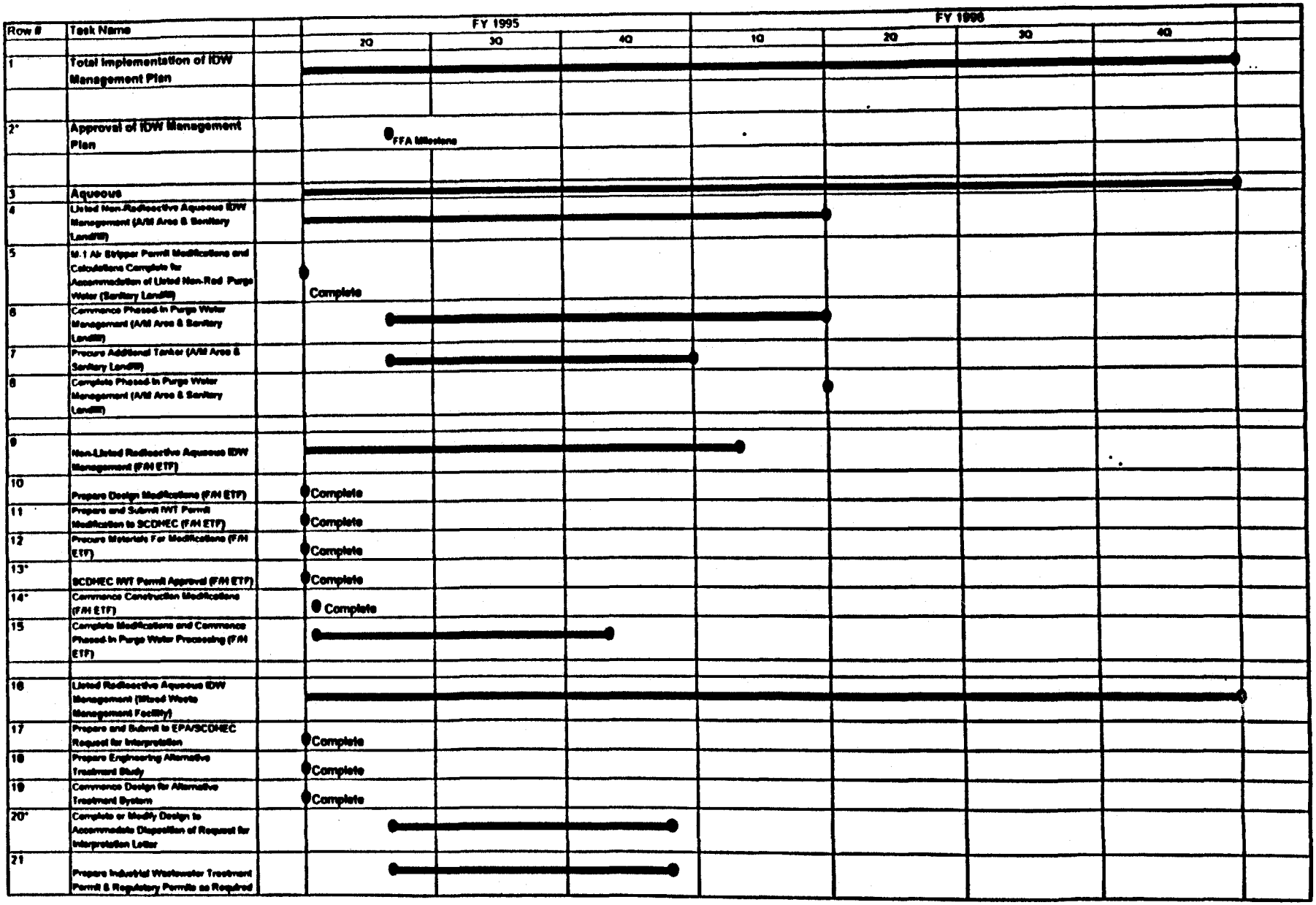
APPENDIX C
IDW MANAGEMENT PLAN IMPLEMENTATION SCHEDULE



* Activity Date/Duration Dependent on Regulatory Approvals.

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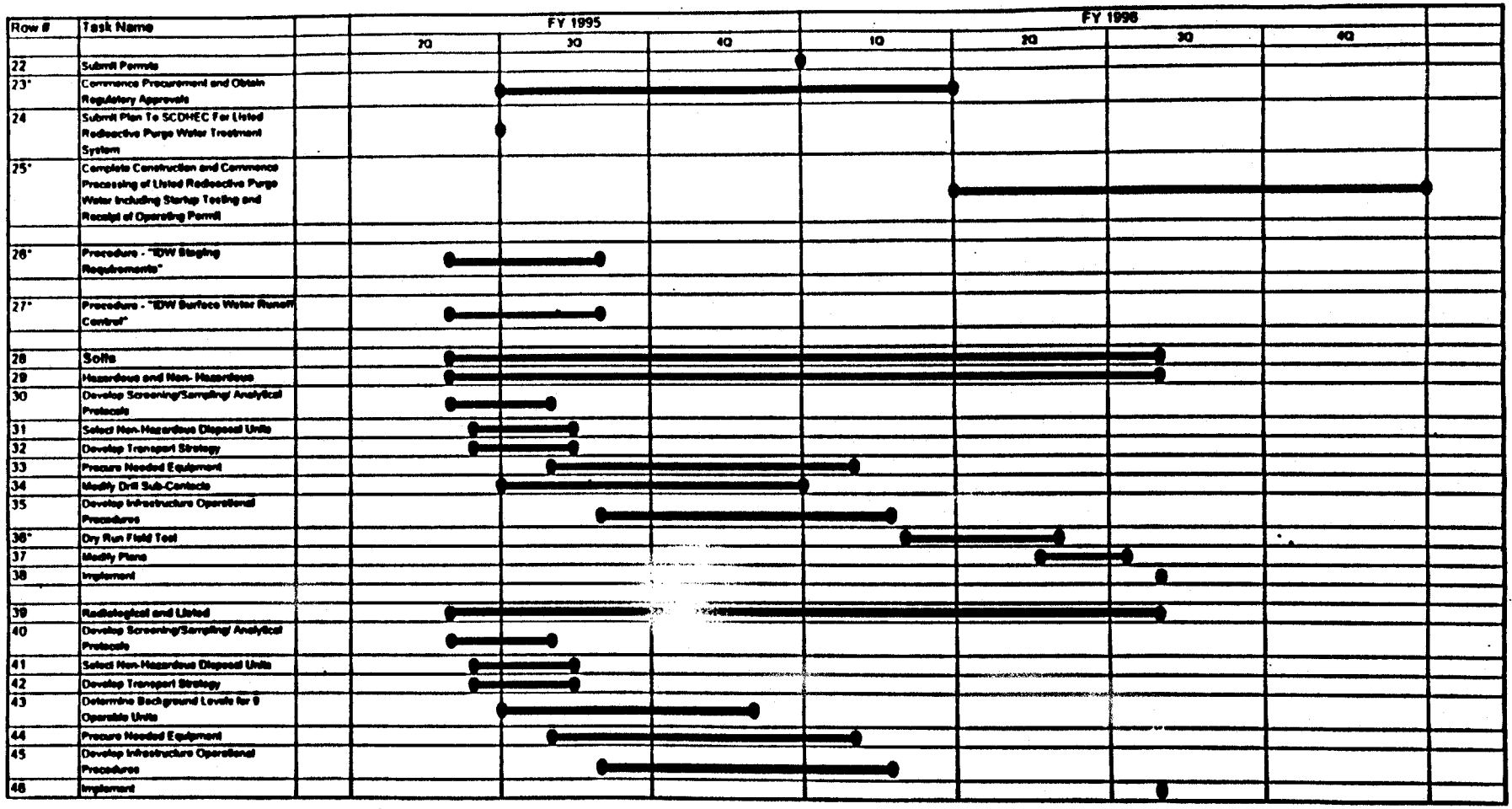
APPENDIX C [redacted]

IDW MANAGEMENT PLAN IMPLEMENTATION SCHEDULE



Row #	Task Name
22	Submit Permits
23*	Commence Procurement and Obtain Regulatory Approvals
24	Submit Plan To SCDHEC For Listed Radioactive Purge Water Treatment System
25*	Complete Construction and Commence Processing of Listed Radioactive Purge Water Including Startup Testing and Receipt of Operating Permit
26*	Procedure - "IDW Staging Requirements"
27*	Procedure - "IDW Surface Water Runoff Control"
28	Soils
29	Hazardous and Non- Hazardous
30	Develop Screening/Sampling/ Analytical Protocols
31	Select Non-Hazardous Disposal Units
32	Develop Transport Strategy
33	Procure Needed Equipment
34	Modify Drill Sub-Contracts
35	Develop Infrastructure Operational Procedures
36*	Dry Run Field Test
37	Modify Plans
38	Implement
39	Radiological and Listed
40	Develop Screening/Sampling/ Analytical Protocols
41	Select Non-Hazardous Disposal Units
42	Develop Transport Strategy
43	Determine Background Levels for 9 Operable Units
44	Procure Needed Equipment
45	Develop Infrastructure Operational Procedures
46	Implement

FY 1995: 2Q, 3Q, 4Q

FY 1996: 1Q, 2Q, 3Q, 4Q

* Activity Date/Duration Dependent on Regulatory Approvals.

2/9/95
7:32 PM