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OPERABLE UNIT 3 REMEDIAL INVESTIGATION/FEASIBILITY STUDY COMMENT RESPONSE PACKAGE

12/13/95

DOE-0313-96
DOE-FN EPAS
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RESPONSES

Department of Energy
Fernald Environmental Management Project
P. O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 648-3155

DEC 13 1995

DOE-0313-96

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V - SRF-5J
77 W. Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

OPERABLE UNIT 3 REMEDIAL INVESTIGATION/FEASIBILITY STUDY COMMENT RESPONSE PACKAGE

The comment response package enclosed to this letter provides responses to both the U.S. Environmental Protection Agency (U.S. EPA) and the Ohio Environmental Protection Agency (OEPA) comments received for the initial submittal of the Operable Unit 3 (OU3) Remedial Investigation/Feasibility Study (RI/FS) Report and Proposed Plan. The package is arranged in five sections: An introduction, U.S. EPA Comments and Responses, OEPA Comments and Responses, a discussion of document changes not directly linked to the EPA comments, and change pages available for this submittal. Also enclosed is a complete revision of the Proposed Plan with changes highlighted.

All change pages associated with the recalculated source term and risk values are not provided at this time; however, a thorough discussion of the anticipated results are included in the comment response package. These changed pages will be included with the final draft copy of the RI/FS. The package thoroughly describes the location and nature of all changes to provide reviewers with the ability to approve the document.

If you or your staff have any questions, please contact John Hall at (513) 648-3118.

Sincerely,

Johnny Reising

Johnny W. Reising
Fernald Remedial Action
Project Manager

FN:Hall

Enclosures: As Stated

cc w/encs:

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CORRESPONDENCE REVIEW RECORD SHEET

E-7397

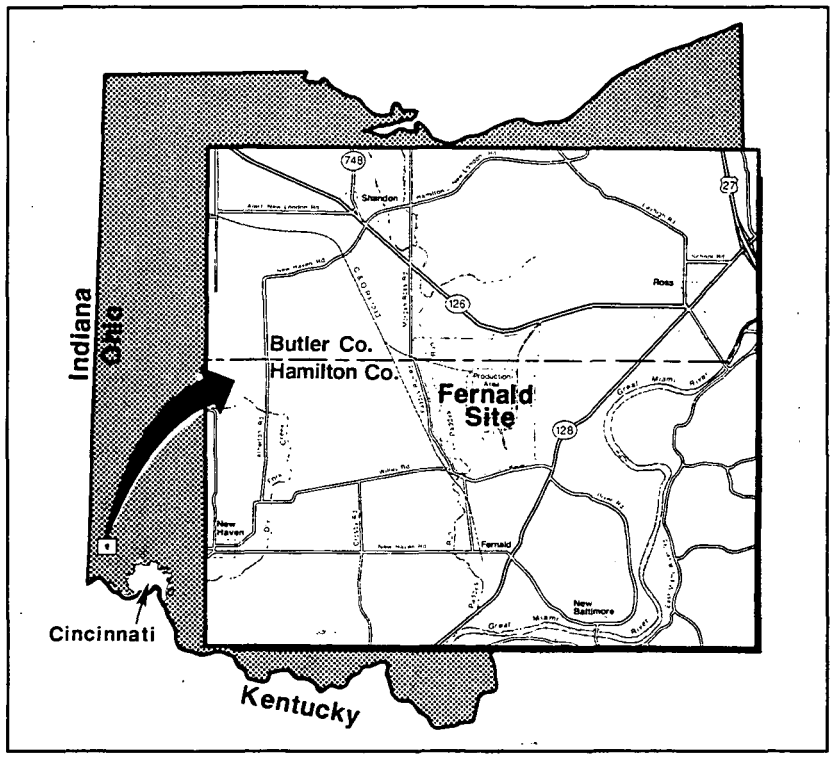
United States
Department of Energy
Fernald Environmental Management Project

Fernald Area Office
P.O. Box 538705
Cincinnati, Ohio 45253-8705

Proposed Plan for the Operable Unit 3 Final Remedial Action

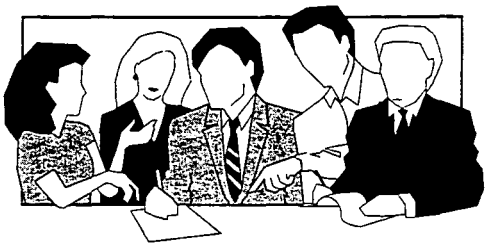
Treatment and Disposition of Buildings and Structures at Fernald

DECEMBER 1995



This Proposed Plan Will Describe for You:

- The background of Operable Unit 3;
- The outcome of the Remedial Investigation and Feasibility Study process for Operable Unit 3;
- The three cleanup alternatives considered;
- DOE's preferred alternative for final remedial action;
- How to participate in the selection/modification of the preferred alternative; and
- Where to get more information.



You are invited to a public meeting
to discuss the alternatives being considered for the final cleanup of Operable Unit 3 at the Fernald Environmental Management Project. The U.S. Department of Energy (DOE), together with the U.S. and Ohio Environmental Protection Agencies (EPAs), encourage public participation in the decision-making process for the remediation of the Fernald site. Representatives from DOE and U.S. and Ohio EPAs will be present to discuss the alternatives, including the preferred alternative, answer questions, and accept comments. The meeting is scheduled for **{date, time, and location to be determined}**

Note to Reviewers: Text that has been modified based on U.S. EPA and Ohio EPA comments on the September 1995 draft of this Proposed Plan is highlighted for easy reference.

INTRODUCTION

This *Proposed Plan for the Operable Unit 3 (OU3) Final Remedial Action* summarizes information presented in the *OU3 Remedial Investigation/Feasibility Study (RI/FS) Report*. This summary includes a discussion of the types and levels of contamination within OU3 and a discussion of the remedial alternatives evaluated for treatment and disposal of materials generated during the OU3 interim remedial action. Finally, this Proposed Plan identifies the preferred remedial alternative for the safe and cost-effective treatment and disposition of these building materials.

OU3 includes buildings (both production and administrative), equipment, unused uranium and thorium products, residues, and wastes associated with the former Production Area at the Fernald

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Environmental Management Project (FEMP), a former uranium processing facility owned by the U.S. Department of Energy (DOE). The previously approved interim remedial action, which is currently underway, consists of the decontamination and dismantlement of all structures in OU3. The preferred final remedial alternative, discussed in more detail later in this document, involves selected material treatment, on-property disposal of OU3 material that presents minimal ***risk*** to human health, and off-site disposal of material that is highly contaminated. Environmental media, such as soils and groundwater underlying or in the vicinity of OU3, are being addressed within the scope of Operable Unit 5. Accordingly, this Proposed Plan does not address remediation of environmental media.

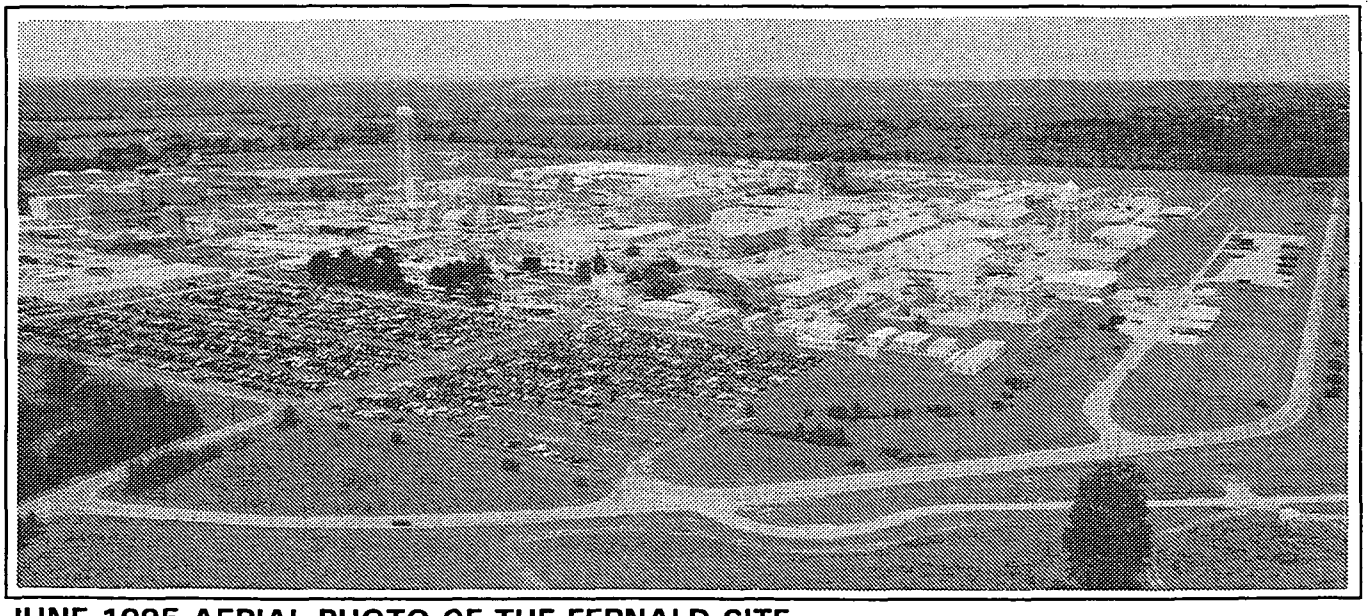
The remainder of this plan will present the rationale for proposing the preferred remedy, background information, and the proposed path forward for achieving final cleanup of OU3. This Proposed Plan is issued in accordance with the ***Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980***, as amended, and structured to solicit public involvement in the selection of the final remedy for OU3. Public involvement opportunities will be discussed on pages 19 and 20.

*Note: explanations of terms shown in **bold italics** are provided in the glossary on pages 21 and 22 of this Proposed Plan.*

SITE BACKGROUND

The FEMP was originally known as the Feed Materials Production Center (FMPC) and was constructed in the 1950s as part of the atomic weapons complex. The 1,050-acre site is located near the village of Fernald, Ohio, approximately 17 miles northwest of Cincinnati. The site's primary mission was to process uranium into metal products, which were shipped to other DOE and Department of Defense facilities for defense activities. Production operations began in 1952 and continued until the facility was closed in 1989, due to the declining demand for uranium metals.

Concerns about the impact that production operations and waste storage activities were having on human health and the environment were evident before production was suspended. Contaminants were released to the environment primarily through air emissions, wastewater discharges, leaks, and spills. In 1985, the U.S. Environmental Protection Agency (U.S. EPA) issued a Notice of Noncompliance to the DOE, which led to the signing of a Federal Facility Compliance Agreement in 1986. This agreement marked the initiation of the ***RI/FS*** to investigate environmental concerns at the Fernald site and to identify the most promising cleanup actions. In 1989, the Fernald site was included on the U.S. EPA's ***National Priorities List*** of sites requiring urgent cleanup attention. In 1990, a Consent Agreement was signed by U.S. EPA and DOE; this document detailed a schedule for conducting the RI/FS process and identified five ***operable units***. Operable units are established based on physical proximity of contaminated areas, similar types or amounts of contamination, or the potential for similar remedial technology types to be used in cleanup activities, among other criteria. The operable units, as currently defined, are as follows:



JUNE 1995 AERIAL PHOTO OF THE FERNALD SITE

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- Operable Unit 1 (OU1) consists of six waste pits, a burn pit, a clearwell, and associated liners and berms;
- Operable Unit 2 (OU2) consists of two lime sludge ponds, two flyash piles, a disposal area containing construction rubble (the "South Field"), and a solid waste landfill;
- Operable Unit 3 (OU3), which consists of all building, structures, and equipment at Fernald, is discussed in detail in the next section;
- Operable Unit 4 (OU4) consists of four concrete storage silos, associated facilities, and stored wastes; and
- Operable Unit 5 (OU5) includes environmental media, such as soils and groundwater, not associated with other operable units.

Additional information about the operable units, as well as the remedial decisions made for each of them, is available through the Public Environmental Information Center (see page 20).

The DOE Fernald Area Office, as the lead agency, is responsible for oversight of the cleanup at Fernald in accordance with provisions of CERCLA. All remedial decisions reached for the Fernald site are subject to approval by the U.S. EPA, with input from Ohio EPA and the public.

OPERABLE UNIT 3 DESCRIPTION

OU3 consists of the former Production Area and production-associated buildings and equipment. This area includes a fenced, 136-acre tract of land near the center of the Fernald site and contains many buildings, containerized materials, storage pads, roads, railroad tracks, above- and below-ground tanks, and utilities. OU3 also includes an administrative area with several office buildings, a parking lot, several impoundments, ponds, rainwater collection basins, and a sewage treatment plant. Environmental media are addressed as part of OU5 but are important considerations because they are potential pathways between sources of contamination in OU3 and off-site ***receptors***.

Most OU3 remediation materials are typical of building materials used during the 1950s for industrial type construction. OU3 building materials have been divided into nine material categories, as shown in the table on this page, based on their physical properties and/or configurations, and then further divided into ***segregation categories*** based on regulatory waste classification (e.g., ***hazardous waste***, low-level radioactive waste, etc.).

VOLUMES OF MATERIALS IN OU3

OU3 Material Category	Volume (ft^3)
Accessible Metals	63,400
Inaccessible Metals	1,740,000
Process-Related Metals	151,000
Painted, Light-Gauge Metals	7,150
Concrete	4,700,000
Brick	20,700
Non-Regulated Asbestos-Containing Materials	71,300
Regulated Asbestos-Containing Materials	80,200
Miscellaneous Materials	704,000
Product, Residues, and Special Materials	1,730,000
Total	**9,270,000**

Note: Divide numbers by 27 to convert volumes from cubic feet to cubic yards.

Also shown in the table, a tenth material category, termed "Product, Residues, and Special Materials," contains all non-building materials in OU3, such as nuclear product, ***hold-up material*** (i.e., product left inside machinery and buildings when production was shut down in 1989), wastes generated during daily decontamination activities, and "legacy" wastes. ***Legacy wastes*** are containerized waste materials which remained when production ceased, such as low-level radioactive waste, hazardous waste, and mixed waste (hazardous waste mixed with low-level radioactive waste). These non-building materials and wastes are currently being addressed through programmatic ***removal actions***, which are discussed later in this Proposed Plan. These removal actions will be included within the scope of the final remedial action ***Record of Decision (ROD)***.

The buildings, equipment, and other facilities within OU3 show concentrations of radiological and other hazardous substances at levels which represent a potentially unacceptable long-term threat to human health and the environment.

OU3 Interim Remedial Action

Although DOE maintains an active maintenance program, the former uranium processing facilities are at or beyond their design life and in a state of

advancing deterioration. These current conditions present an increasing probability of further releases of hazardous substances to the environment in the event of structural collapse or other failure mechanisms.

For these reasons, DOE and U.S. EPA signed a Record of Decision for Interim Remedial Action (IROD) in July 1994. The IROD calls for the decontamination and dismantlement of all above- and below-ground improvements, including all buildings and support structures, to reduce any potential threat posed by these facilities. It also calls for the removal of equipment and machinery that have no identifiable role to support the site cleanup mission and removal of product, residues, and wastes. According to the IROD, the building debris and resultant waste would primarily be placed in interim storage until a final remedial decision is made, although some limited material disposition could occur. That decision will be made based on public comments received on the three alternatives offered in this Proposed Plan.

As part of the ***remedial design*** of the interim remedial action, a schedule for Fernald building dismantlement was submitted in June 1995 to the U.S. EPA and Ohio EPA in the *OU3 Remedial Design Prioritization and Sequencing Report*. This 31-year schedule, which was subsequently approved by the EPAs, was based on the anticipation of reduced funding levels. However, recent cleanup successes at Fernald, coupled with strong support from the public and other stakeholders, have led the U.S. Congress and DOE to endorse greater funding for the final cleanup of Fernald. Therefore, a ten-year dismantlement schedule can be anticipated. The first dismantlement project under the interim remedial action, Plant 4 (the Hydrofluorination Plant), is currently underway. Under the accelerated schedule, several other plants are anticipated to be dismantled starting in 1996.

OU3 Final Remedial Action

The final remedy will address treatment and final disposition of the materials and wastes resulting from performance of the interim remedial action. The two actions will be combined to provide a unified remediation approach to OU3. Under the IROD, all buildings and structures will be dismantled and the resulting materials will be segregated into ten material categories. The material categories (as described on page 3) will be evaluated for treatment and disposition options. However, as the figure on the following page illustrates, the materials placed within the "Product, Residues, and Special Materials" category will be handled and dispositioned off-site under existing removal actions. All items within the shaded area of the figure have been previously addressed as indicated and are not evaluated within the *OU3 RI/FS Report*. The final remedy for OU3 will determine the appropriate treatment and disposition of the materials generated by the dismantlement of OU3 buildings. The final remedy will be cost-effective, implementable, and protective of human health and the environment and will accommodate the application of new, more effective technologies which may emerge during the OU3 final remedial action.

In July 1995, the Fernald Citizens Task Force issued a recommendation on the disposal of soils, construction rubble, and other waste materials with relatively low levels of contamination in an on-property disposal facility. The Task Force, a DOE site-specific advisory board comprised of local residents and community leaders, is chartered to make recommendations to DOE and the EPAs about future courses of action, cleanup levels, and waste disposition options, including future land uses for the Fernald site.

Integration of the Interim and Final Remedial Actions

The scope of the interim remedial action, as set forth in the IROD, consists primarily of the removal of gross surface contamination from material in facilities, dismantlement of facilities, limited off-site disposal for non-recoverable/non-recyclable remediation materials, and interim storage for the majority of resulting remediation materials until the OU3 final remedial action ROD is issued. The scope of the final remedial action encompasses the handling, treatment, and final disposition of OU3 materials not dispositioned under the IROD. Once the remedy is selected, requirements specifically related to that remedy will be integrated into the remainder of the interim remedial action to allow seamless execution of both the interim and final remedial actions.

Several elements developed to support the final remedial action may need to be incorporated into the interim remedial action. For example, any restrictions on the size of material prior to disposition, as required by the selected remedy, would be incorporated into the design specifications of the remaining dismantlement projects under the IROD. Since the implementation of the final remedial action may influence interim remedial action activities, the remedial design and remedial action work plans for the final remedial action would be integrated documents, representing both the OU3 interim and final remedial actions.

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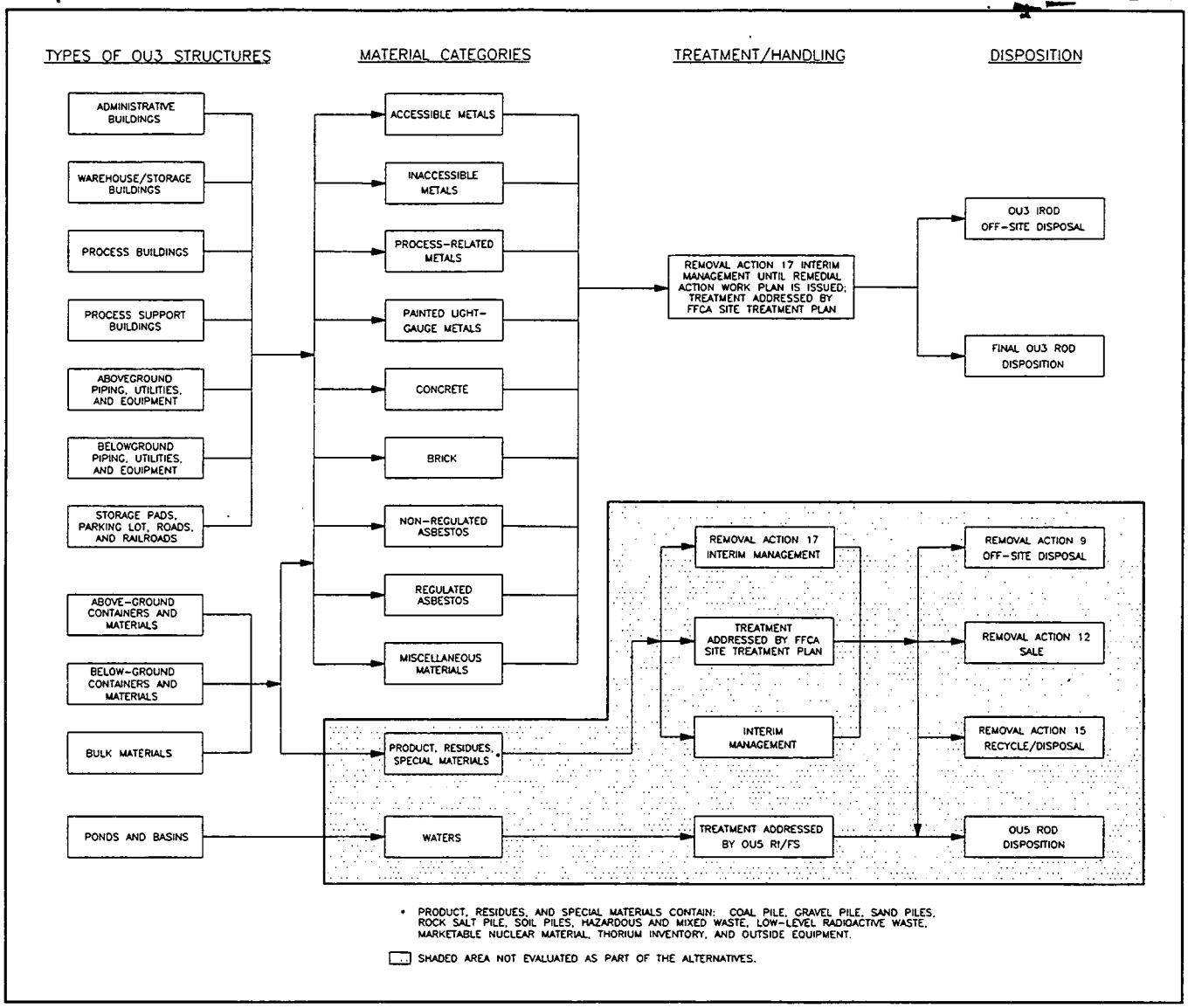

APPROACH TO OU3 MATERIAL MANAGEMENT

REMOVAL ACTIONS RELATED TO THE FINAL REMEDIAL ACTION

Removal actions are conducted to mitigate an immediate threat to human health and the environment, including actions necessary to monitor, assess, or evaluate the threat. Of the thirty FEMP removal actions, four are considered "programmatic," since the scope of the activities applies to OU3 as a whole rather than targeting specific physical locations. The four programmatic removal actions are discussed below. Each of these removal actions will be incorporated into the OU3 final remedial action ROD and will be performed throughout the remediation of OU3. The other OU3 removal actions are discussed in greater detail in Section 1 of the *OU3 RI/FS Report*.

Removal Action 9: Removal of Waste Inventories

This waste shipping program was initiated in August 1985, before the RI/FS process was initiated at Fernald. Removal Action 9 is a large-scale waste shipment program, which primarily involves transferring inventoried and newly generated wastes for off-site disposal. The program includes characterization of waste materials, treatment to meet the ***waste acceptance criteria*** of the off-site disposal facilities, and transport in a manner that ensures full compliance with DOE Orders and Department of Transportation requirements. This removal action also governs the treatment and disposition of mixed wastes and polychlorinated biphenyls (PCBs) in accordance with the *Site Treatment Plan*.

In late 1994, a new strategy was developed for managing waste materials that remained when production ceased (also called legacy wastes). This strategy was to continue waste management programs and removal actions as they currently exist to quickly reduce the volume of (and, therefore, the risks associated with) Fernald waste through off-site disposal. Because of this approval, issues related to the treatment and disposition of legacy wastes have not been evaluated in the *OU3 RI/FS Report*.

As of July 1995, approximately 589,000 drum equivalents (i.e., the amount of material that would fit in one 55-gallon drum) had been shipped to the Nevada Test Site (NTS) for final disposal. These waste shipments include legacy wastes as well as wastes generated through cleanup activities. Removal Action 9 will continue as a distinct program within the OU3 final remedial action until these wastes have been fully dispositioned.

Removal Action 12: Safe Shutdown

The Safe Shutdown Program was initiated in July 1991, while the site was being officially closed as a production facility. This removal action involves planning, engineering, and program control for the proper removal and disposition of uranium products and hold-up materials, residues, excess supplies, chemicals, and associated process equipment. This removal action also provides for the isolation and de-energizing of former production-related equipment and utilities.

The primary objective of the Safe Shutdown Program is to remove materials from previously operated production equipment to reduce the overall risk posed by the facilities. After the materials are characterized, they are placed in approved storage configurations and transported to NTS under Removal Action 9.

Another significant objective of this removal action is to identify other customers or users for Fernald equipment and nuclear products. For instance, some equipment in Plants 5 and 6 is being transferred to OU4 for use in remediation activities. Off-site customers are being sought as well. The equipment will be decontaminated as necessary prior to being transported off-site. Safe Shutdown Program activities will continue as necessary throughout the interim and final remedial actions. In preparation for building dismantlement, Safe Shutdown has been completed in Plants 4 and 1, is nearing completion in Plant 9, and has commenced in the Pilot Plant and Plant 5.

Removal Action 17: Improved Storage of Soil and Debris

The primary goal of Removal Action 17 is to establish a site-wide management concept and implementation strategy for soil and debris storage at Fernald. Soils and debris generated by construction and removal action activities have been stored in accordance with this removal action. Removal Action 17 is being conducted to provide improved storage for this waste material and to establish procedures for managing future soil and debris storage. The scope of this removal action will continue during the interim remedial action for OU3. Generated materials will be retained in storage until the OU3 final remedial action ROD specifies a disposition option for debris and the OU5 ROD specifies disposition for soils.

Removal Action 26: Asbestos Removal

The asbestos abatement program was established to mitigate potential release and migration of asbestos during routine facility maintenance. Abatement within this program includes in situ repairs, encasement and encapsulation, and removal of asbestos-containing material.

Asbestos removal is also the first step in building decontamination and dismantlement. Therefore, Removal Action 26 will continue for OU3 facilities during the interim remedial action. The scope of this removal action will also be incorporated into the OU3 final remedial action ROD.

OUTCOME OF THE RI/FS

Issuance of the IROD had a significant impact on the data requirements for the OU3 RI/FS. Since the IROD already established the requirement for dismantlement of OU3 structures, the remaining tasks, were field characterization and determination of final disposition requirements for the materials remaining after the interim remedial action is complete. Collected data were used to determine:

- Accurate media volume and weight estimates for various waste classifications, which were used to determine the treatment and disposal needs, costs, implementability, and environmental impact of each alternative.
- Waste characteristics and potential treatability of various media to reduce waste volume, toxicity, or contaminant mobility.
- ***Source term*** estimates for contaminants in OU3 material.

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- ***Leachability*** of contaminants from OU3 materials for use in the preparation of waste acceptance criteria for potential on-property disposal.

The sampling approach used for the characterization study was to collect one ***intrusive sample*** from each major medium (concrete, asphalt, acid brick, masonry, transite, and steel coatings) in each defined process area at the location of greatest known radiological and/or chemical contamination. Each major media sample was then, in general, analyzed for all radiological and chemical contaminants of potential concern. More than one sample was collected if there were distinct areas of chemical and radiological contamination. Confirmatory field screening was conducted in representative buildings that were considered uncontaminated and, therefore, not sampled.

In addition to major media sampling, samples of supplemental media were collected, including loose material (e.g., residues, floor sweepings, sediment, sludges, etc.), unknown liquids, and heating, ventilation, and air conditioning (HVAC) filters. These samples were used to support major media sampling results or to confirm assumptions.

The data obtained from these sample analyses were used in conjunction with other data to determine the ***constituents of concern (COCs)*** within OU3 building materials. COCs are those contaminants that may substantially contribute to risks to human health and the environment. COCs are usually determined in the RI/FS process as part of a baseline risk assessment. However, the IROD has already determined that remedial action is necessary. In addition, the *Site-Wide Characterization Report* has already documented the general level of risk from the current condition of OU3. Therefore, the development of a baseline risk assessment as part of the *OU3 RI/FS Report* would have little added value. Since no baseline risk assessment was performed for the *OU3 RI/FS Report*, COCs were determined for each OU3 medium by comparing maximum detected concentrations against risk-based values for direct contact. This conservative approach ensures that all potentially significant risks to human health and the environment are considered.

Consistent with the production history at Fernald, the most common (and highest levels of) radionuclide contaminants found within OU3 major media were uranium-238 (and its decay products, uranium-234, thorium-230, and radium-226), uranium-235 (and its primary decay product, actinium-227), and thorium-232 (and its decay products, radium-228 and thorium-228). The most common (and highest levels of) inorganic chemical contaminants found within OU3 major media were lead, chromium, cadmium, and mercury. The most common (and highest levels of) organic chemical contaminants were 1,4-dichlorobenzene, hexachlorobutadiene, nitrobenzene, and tetrachloroethene.

A contaminant source term was developed for each COC in OU3, considering the projected volume and weight of the materials. Calculations of the contaminant source terms were based on the assumption that the maximum contaminant concentration within a medium in a process area provided a conservative estimate of the contaminant level for the entire process area.

The most meaningful way to develop the source terms was to group OU3 materials into ten distinct categories, which are listed in the table on page 3. The ten categories were then further subdivided into segregation categories to allow for evaluation of treatment and disposition options. The table on the top of page 8 shows the quantity and characterization of materials per material category.

The disposition of the material category termed "Product, Residues, and Special Materials" is being addressed under existing approved programs. The significant quantities within this category include various soil piles (almost one million cubic feet) and drummed wastes (approximately 620,000 cubic feet). The soil piles have been addressed within the OU5 Feasibility Study and will be dispositioned according to the OU5 ROD. For the drummed wastes, Removal Action 9 (discussed previously on pages 5 and 6) is the mechanism for off-site disposition. These materials will continue to be disposed of off-site in accordance with the approved removal action work plan. Therefore, the volumes within this material category have not been included further in this evaluation.

Remedial action objectives are established to mitigate the potential threat posed by contaminants to human health and the environment. These objectives are developed based on characterization information contained in Section 3 of the *OU3 RI/FS Report* and are consistent with provisions in the National Contingency Plan as well as U.S. EPA guidance.

For Fernald operable units that address environmental media, such as soils and groundwater, remedial action objectives reflect the conditions that may remain in place without causing unacceptable risk to human health or the environment. For OU3, there will be no material left in place; as stated in the IROD, all buildings, equipment, products, and wastes

SUMMARY OF OU3 WASTE VOLUMES AS ESTIMATED BY CATEGORY (IN CUBIC FEET)

OU3 Material Category	Potentially Hazardous/ Mixed Waste	Regulated PCBs (TSCA)	Low-Level Radioactive Waste	Below *Baseline*	Total
Accessible Metals	0	0	63,400	0	63,400
Inaccessible Metals	0	14,900	1,730,000	0	1,740,000
Process-Related Metals	0	0	151,000	0	151,000
Painted Light-Gauge Metals	49	0	7,100	0	7,150
Concrete	0	0	541,000	4,160,000	4,700,000
Brick	5,280	0	15,400	0	20,700
Non-Regulated Asbestos-Containing Materials	0	0	71,300	0	71,300
Regulated Asbestos-Containing Materials	0	0	80,200	0	80,200
Miscellaneous Materials	0	0	163,000	541,000	704,000
Product, Residues, and Special Materials	56,000	0	1,670,000	105	1,730,000
Total	61,300	14,900	4,490,000	4,700,000	9,270,000

will be removed and placed in interim storage pending a final remedy decision. Residual contamination will not exist after remediation of OU3 is complete. Therefore, in general, the remedial action objectives are as follows:

- Remediate OU3 to mitigate the potential exposure of human and environmental receptors to contaminants; and
- Implement the final disposition of OU3 materials in a manner that ensures potential receptors are protected from the contaminants.

These objectives are achieved by establishing waste acceptance criteria for the disposal facilities, both on-property and off-site. Waste acceptance criteria, which are specifications and conditions under which waste can be accepted for disposal, include regulatory standards, facility design information, and risk-based analyses. For the on-property disposal facility, the waste acceptance criteria for OU3 were based on the OU2 and OU5 feasibility study modeling, and then adjusted to apply to OU3-specific materials.

Of the OU3 COCs, only uranium and technetium-99 were identified as having the potential to exceed acceptable groundwater levels beneath the on-property disposal facility. Experimental lab studies were conducted to determine uranium and technetium-99 leachability from various construction materials. For conservativeness, samples of OU3 materials with highest technetium-99 and uranium concentrations were used. The results of the studies demonstrated that uranium concentrations that leached from all test samples were well below acceptable levels for on-property disposal. Conservative modeling also showed that the small volume of OU3 materials that were not tested for uranium leachability were also acceptable for on-property disposal. Therefore, all uranium-contaminated materials, with the exception of highly contaminated process materials, can be safely disposed of in the on-property disposal facility.

On the other hand, the studies showed that technetium-99 has the potential to leach at levels that could impact groundwater. Modeling was then used to determine that a safe level of technetium-99 within the on-property disposal facility is 105 grams. This modeling used the conservative assumption that technetium-99 would completely leach out of the on-property disposal facility over a 70-year span (which is considered by EPA to be an average human lifespan). Therefore, an allowable mass of 105 grams was adopted as the OU3 on-property waste acceptance criteria for technetium-99. Specific details on the development of the waste acceptance criteria for the on-property disposal facility are provided in Appendix G of the *OU3 RI/FS Report*.

Waste acceptance criteria for the off-site disposal facilities are derived from the relevant permits and

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licenses of those facilities. Specific values for a representative facility are detailed in Appendix F of the *OU3 RI/FS Report*.

REMEDIAL ALTERNATIVES

One goal of CERCLA is to select remedial actions, or an appropriate combination of methods, that protect human health and the environment, maintain protection over time, and minimize the amount of untreated waste. This goal reflects the preference for treatment over ***engineering controls*** and/or ***administrative controls*** to reduce toxicity and/or mobility of contaminants whenever practical to ensure that material remaining on-property can be reliably controlled over time. However, for secondary threat materials, or wastes that pose a relatively low long-term threat, U.S. EPA allows the use of engineering controls or a combination of engineering and administrative controls, where appropriate. Surface decontamination of buildings and structures will be performed during the interim remedial action. Based on the projected residual contamination of remediation materials following dismantlement, the decontamination steps associated with that process, and the results of treatment technology evaluation, the OU3 wastes are principally considered to be secondary threat materials. The OU3 remedial strategy provides for further treatment on a selected basis as necessary to ensure protectiveness during the final remedial phase.

The remedial alternatives were developed based on technology types and process options that were identified to achieve remedial action objectives. The primary focus of the alternative development was disposition rather than treatment. Treatment was evaluated as required to facilitate meeting the waste acceptance criteria for final disposal. Therefore, administrative and engineering controls were the primary bases on which alternatives were developed. Administrative controls have been established by the OU5 response actions. Engineering controls for on-property or off-site disposal are also limited because of the few facilities capable of disposing of radiologically contaminated materials.

Three alternatives for the final remedial action have been developed and are summarized below:

Alternative 1 -- No Further Action

This alternative is required by CERCLA so that a basis for comparison exists for any cleanup alternatives identified. Alternative 1, called the "No Further Action Alternative," assumes that the interim remedial action proceeds to completion and places all generated materials within a hypothetical interim storage area. The interim storage area would contain uncovered piles of accessible metals, inaccessible metals, concrete, and transite. All other materials would be staged in containers. At the completion of the interim remedial action, maintenance of the interim storage area would be terminated. Thus, materials would be exposed to the environment with potential releases of contamination to environmental media. Within an unmaintained area, no mechanisms would be employed to prevent trespassers from entering the area. Because of commitments to the public by DOE and U.S. EPA, the IROD specifically commits to performing a final remedial action that involves the disposition of OU3 materials. However, Alternative 1 is retained as a baseline against which the effectiveness of the other alternatives may be compared.

Alternative 2 -- Selected Material Treatment, On-Property Disposal, and Off-Site Disposition

As stated above, most OU3 remediation materials contain low levels of contaminants and are therefore not a principal threat. For these materials, the remedial strategy calls for disposition, using administrative and engineering controls, in an on-property disposal facility.

The RI/FS process estimated that the total amount of technetium-99 in OU3 materials is approximately 127 grams. However, leachability study data, supplemented with conservative modeling assumptions, showed that the maximum amount of technetium-99 for OU3 materials that could safely be stored in the on-property disposal facility is 105 grams. In order to not exceed this 105-gram limit for the on-property disposal facility, those materials that have the highest amounts of technetium-99 will be packaged and transported to NTS or an off-site commercial disposal facility.

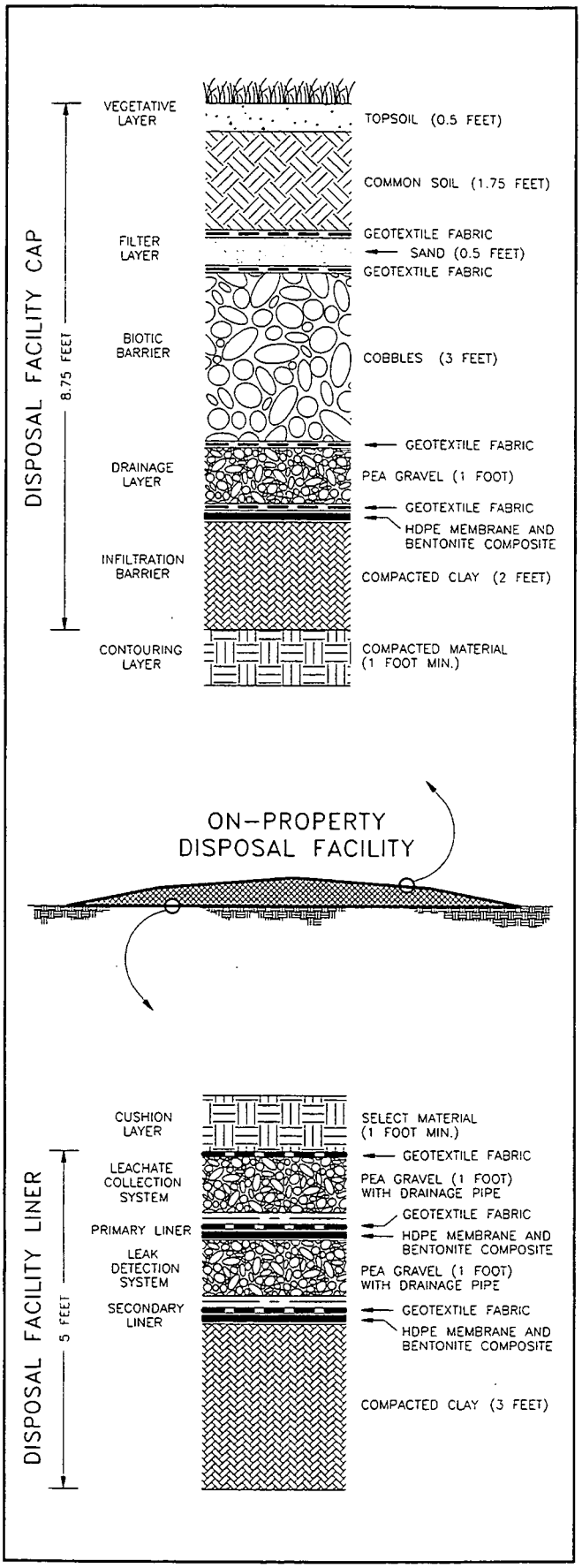
Process-related metals, acid brick, product, residues, and special materials generally have high concentrations of several contaminants, including technetium-99. By administratively deciding to disposition these materials off-site, the technetium-99 source term remaining in materials considered for on-property disposal is 116 grams. Of all materials contributing to this source term, the most significant contributor is concrete with a total 102 grams. In order to further reduce the amount of technetium-99 going into the on-property disposal facility, Alternative 2 includes scabbling the top inch of the three most contaminated concrete areas within OU3: the enriched uranium casting area in Plant 9; the uranium machining area in Plant 9; and the muffle furnace area in Plant 8. The removal and off-site disposition of this concrete would reduce the total

amount of technetium-99 going into the on-property disposal facility to 59 grams, which is 44 percent below the 105-gram allowable mass limit.

Under Alternative 2, most of the OU3 remediated materials would be permanently dispositioned in an on-property disposal facility, which would be designed and constructed in accordance with the relevant requirements of the Resource Conservation and Recovery Act and the Uranium Mill Tailings Remediation Control Act. As described in the OU2 ROD, the facility would feature a multi-layer capping system, including a vegetative soil layer, a filter layer, a biotic barrier, a drainage layer, and an infiltration barrier. The disposal facility would also feature a multi-layer liner that would include a leachate collection system, primary and secondary liners separated by a leak detection system, and a low-permeability compacted clay layer. The layers of both the cap and liner would be separated by geotextile fabrics and high-density polyethylene (HDPE) and bentonite composites for added protection. The drawing on the right depicts a possible multi-layered capping and liner system for the on-property disposal facility. The disposal facility would prevent contaminant migration to the air and surface water and is modeled to protect groundwater for a 200- to 1,000-year performance period.

Key elements of Alternative 2 are summarized below:

- Provide for ***unrestricted release*** of materials, as economically feasible, for recycling, reuse, or disposal at a commercial landfill;
- Administratively disposition process-related metals and brick off-site because of the high concentration of COCs generally found in these materials;
- Remove identified material as necessary to achieve the technetium-99 mass-based waste acceptance criteria for on-property disposal and dispose of it off-site;
- Dispose of all remaining wastes in the on-property disposal facility (along with wastes generated by OU2 and OU5);
- Treat materials, where required, to meet the waste acceptance criteria for the off-site disposal facility;
- Impose administrative controls through deed restrictions and access controls; and
- Incorporate post-remediation activities that include long-term monitoring and maintenance of the



MULTI-LAYERED LINER AND CAPPING SYSTEM FOR THE ON-PROPERTY DISPOSAL FACILITY

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ALTERNATIVE 2 MATERIAL DISPOSITION QUANTITIES (IN CUBIC FEET)

OU3 Material Category	On-Property Disposal	Unrestricted Release	Off-Site Disposal	Total
Accessible Metals	63,400	0	0	63,400
Inaccessible Metals	1,740,000	0	0	1,740,000
Process-Related Metals	0	0	151,000	151,000
Painted, Light-Gauge Metals	7,150	0	0	7,150
Concrete	4,700,000	0	2,190	4,700,000
Brick	0	0	20,700	20,700
Non-Regulated Asbestos-Containing Materials	71,300	0	0	71,300
Regulated Asbestos-Containing Materials	80,200	0	0	80,200
Miscellaneous Materials	163,000	541,000	0	704,000
Total	**6,830,000**	**541,000**	**174,000**	**7,540,000**

on-property disposal facility and operation of a groundwater monitoring network to evaluate the performance of the on-property disposal facility.

A summary of the disposition paths for OU3 materials is presented in the table above. As shown in this table, approximately 6.83 million cubic feet of OU3 materials (not including product, residues, and special materials) would be disposed of directly in the on-property disposal facility. Approximately 541,000 cubic feet of miscellaneous materials are not contaminated and could be released for unrestricted reuse, disposed of in a commercial landfill, or also included in the on-property disposal facility. Another 174,000 cubic feet are to be disposed of at NTS or an off-site commercial disposal facility.

Implementation of Alternative 2 would rely on coordination with other Fernald remedial actions to provide certain elements, including the on-property disposal facility, long-term monitoring, and security.

The OU3 interim action started generating debris with the removal of pipe insulation from Plant 4 in the summer of 1995. If Alternative 2 is selected, remediation materials from Plant 4 (and following projects) would stay in interim storage for approximately two to three years until the on-property disposal facility is engineered, constructed, and begins accepting OU3 materials. At that time, the movement of remediation materials from interim storage to the disposal facility (as well as newly-generated debris from on-going dismantlement projects) would be prioritized to reduce interim storage requirements.

Alternative 3 -- Selected Material Treatment and Off-Site Disposal

The primary difference between Alternatives 2 and 3 is the disposal location for OU3 materials. Under this alternative, all remediation materials would be dispositioned at an off-site disposal facility. Key elements of the alternative are summarized below:

- Provide for unrestricted release of materials, as economically feasible, for recycling, reuse, or disposal at a commercial landfill;
- Treat materials, where required, to meet the waste acceptance criteria for the off-site disposal facility; and
- Dispose of wastes in an off-site disposal facility if waste acceptance criteria are met.

Like Alternative 2, 541,000 cubic feet of miscellaneous materials, which are not contaminated, could be released or disposed of in a commercial landfill. The remaining material (seven million cubic feet) would be disposed of at NTS or an off-site disposal facility.

Implementation of Alternative 3 would rely on coordination with other Fernald remedial actions to provide for certain elements, including the waste shipment facilities, and the fencing and security prescribed under administrative controls. For this alternative, any rail shipment of materials off-site would be coordinated with the rail shipments occurring for OU1.

COMPARISON AND EVALUATION OF ALTERNATIVES

To provide a basis for selecting the preferred remedial action alternative, each alternative is evaluated against specific U.S. EPA criteria. These criteria are described in the shaded box to the right.

The first two criteria are "threshold" criteria, meaning that they must be attained if the alternative is to be considered further in the evaluation and selection process. The one notable exception is that waivers to ***applicable or relevant and appropriate requirements (ARARs)*** can be obtained in accordance with 40 CFR 300.430 (f)(1)(ii)(C), as long as protectiveness of human health and the environment can still be demonstrated. The next five criteria form the basis for the comparative analysis of viable remedial alternatives. These five are called "primary balancing" criteria because they are used to evaluate the relative tradeoffs among the alternatives that pass the threshold criteria. The last two criteria are "modifying" criteria because DOE and U.S. EPA may modify the preferred alternative or select another response action based on comments received during the public comment period.

Overall Protection of Human Health and the Environment

This criterion addresses the means by which a potential remedy would reduce, eliminate, or control the risks posed by OU3 materials to human health and the environment. The methods used to achieve an adequate level of protection may include engineering controls, waste treatment techniques, or other controls such as restriction on the future use of the site. Total elimination of risk is often impossible; however, a remedy must minimize risk to ensure human health and the environment are protected.

Under Alternative 1, all OU3 materials at the site would be stored without continued maintenance. Over the long-term, exposure of these materials to the weather would lead to unacceptable releases to the environment. This alternative would not protect human health or the environment. Alternative 2 would employ conservative design considerations from other engineered disposal facilities, including Uranium Mill Tailings Remediation Control Act standards and Resource Conservation and Recovery Act regulations, to ensure the long-term performance of the disposal facility. These standards would require the use of multilayered capping and lining systems, the development of contaminant- and material-specific waste acceptance criteria, and the use of a design which ensures protectiveness for 200 to 1,000 years. These design considerations would

EVALUATION CRITERIA

The following criteria are based on guidance published by the U.S. EPA and are used to evaluate each of the possible remedial action alternatives. The first seven criteria are discussed more thoroughly in this Proposed Plan along with how the criteria apply to each alternative. The last two criteria, *State Acceptance* and *Community Acceptance*, will be addressed during the public comment period.

1. *Overall protection of human health and the environment* addresses whether an alternative eliminates, reduces, or controls threats to public health and the environment.

2. *Compliance with ARARs* addresses whether an alternative meets federal and state environmental laws and regulations.

3. *Short-term effectiveness* considers the time needed for an alternative to achieve remedial response objectives and the risks posed to workers, residents, and the environment during the remedial action.

4. *Long-term effectiveness and permanence* considers the ability of an alternative to protect public health and the environment long after remedial action is complete.

5. *Reduction of toxicity, mobility, or volume through treatment* evaluates an alternative's use of treatment to reduce the harmful nature of contaminants, their ability to move in the environment, and the amount, or volume, of contamination present.

6. *Implementability* addresses the feasibility of an alternative, both from a technical and an administrative standpoint.

7. *Cost* considers the amount of money it will take to design, construct, operate, and maintain the alternative.

8. *State acceptance* addresses comments made by the Ohio EPA concerning the alternatives considered.

9. *Community acceptance* addresses the formal comments made by the public on the alternatives being considered. You can voice your opinion as a member of the public either by completing the attached comment sheet and sending it to DOE, or by speaking at the public meeting on **{date to be determined}**. At the end of the public comment period, DOE will respond to questions and comments. These responses will become part of the Record of Decision document.

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supplement the natural containment capabilities of the existing site geology to ensure the long-term performance of the disposal system. Alternative 3 would also protect human health and the environment because all OU3 materials would be removed from Fernald and dispositioned off-site.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This criterion determines whether a selected remedy will meet all related federal, state, and local requirements. These requirements may specify maximum concentrations of chemicals that can remain at a site, specify design or performance requirements for treatment technologies, and impose restrictions that may limit potential remedial activities at a site because of its location.

Because of anticipated releases from ongoing storage, Alternative 1 would not comply with ARARs. Alternative 2 would comply with all identified ARARs or meet the requirements of an ARAR waiver of the State of Ohio solid waste disposal facility siting requirements [OAC 3745-27-07(H)(2)(c)and(d)]. To be granted the waiver, the DOE would be required to adopt an engineering design for the facility which, when coupled with existing site geologic conditions, would attain a standard of performance that is equivalent to that required under State of Ohio solid waste disposal facility siting requirements. Alternative 3 would comply with all ARARs.

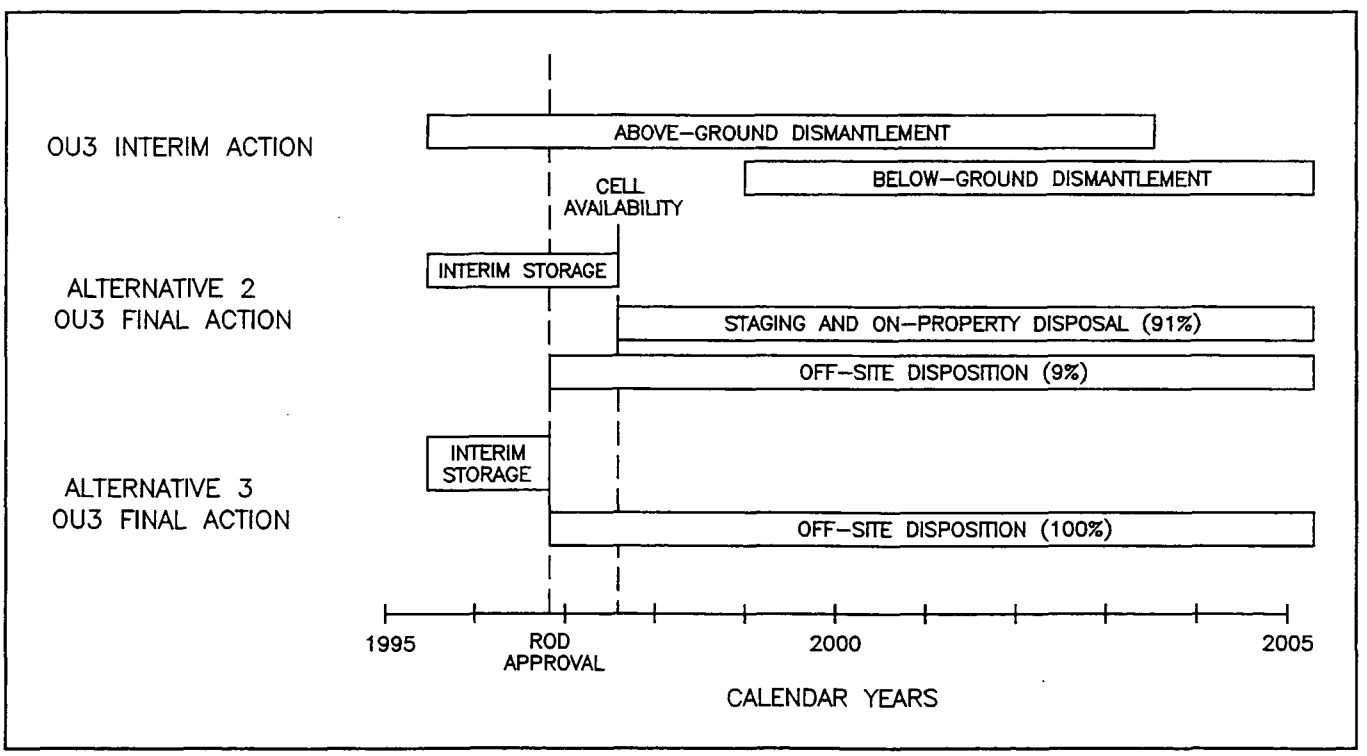
Short-Term Effectiveness

This criterion evaluates the potential impacts of the alternative to workers, the public, and the environment.

Alternative 1 presents no short-term impacts since no worker action would occur. Risks from radiological and chemical exposures from both Alternatives 2 and 3 are within acceptable levels. The most significant element of the short-term effectiveness of Alternatives 2 and 3 is the risk associated with projected injuries related to mechanical hazards. These risks are greater for Alternative 3 than Alternative 2 due to the greater number of manhours associated with weighing, certifying, and loading containers for off-site shipment. Additionally, the increased number of shipments off-site associated with Alternative 3 raises the risk for potential accidents. The schedule, as shown below, illustrates the overlap of the final remedial action and the interim remedial action. This schedule is based on site remediation under a DOE budget scenario that would enable the completion of OU3 remediation in approximately ten years.

Long-Term Effectiveness and Permanence

This criterion evaluates the ability of a potential remedy to reliably protect human health and the environment over a long period of time after the remedial goals have been accomplished.



COMPARISON OF SCHEDULES FOR THE ALTERNATIVES (ACCELERATED CASE ASSUMPTION)

Alternative 1 would present an unacceptable magnitude of risk remaining at Fernald and would provide the most limited amount of reliability and permanence. Long-term risks to potential trespassers from uncontrolled storage of contaminated materials would exceed acceptable risk levels. Both Alternatives 2 and 3 achieve high levels of protectiveness and permanence. The implementation of Alternative 2 would rely on engineering and administrative controls to ensure the long-term performance of the remedy and maintain the protection of human health and the environment over time. Long-term monitoring activities are currently proposed by other approved remedial actions and would continue for OU3. For Alternative 3, the removal of all materials to off-site disposal locations would ensure the long-term protection of human health and the environment at Fernald. Under Alternative 3, no long-term requirements for continued administrative controls, surveillance, or maintenance would be necessary for OU3.

Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion assesses how effectively a proposed remedy will address the contamination problem. Factors considered include the nature of the treatment process, the amount of hazardous materials that will be destroyed by the treatment process, how effectively the process reduces the toxicity, mobility, or volume of waste, and the type and quantity of contamination that will remain after treatment.

Alternative 1 would provide no reduction in contaminant toxicity, mobility, or volume. Furthermore, by placing all materials into permanent storage without continued maintenance, the mobility of the contaminants would increase over time and would lead to eventual releases to the environment. For Alternatives 2 and 3, mixed wastes would be treated through solidification or encapsulation to meet land disposal restrictions and would thereby reduce the contaminant mobility. Because the same quantity of material would be treated, the reduction of toxicity, mobility, or volume would be the same for Alternatives 2 and 3.

Implementability

This criterion addresses the relative ease or difficulty with which a remedy can be put in place. Factors affecting implementability include materials and services.

Alternative 1 is the most readily implementable, since it requires no additional action beyond the implementation of the OU3 IROD. Because of the approval and construction of a site-wide on-property disposal facility for OU2 and OU5, Alternative 2 would be easier to implement than Alternative 3. The construction of an on-property disposal facility is considered readily implementable through the use of existing technologies and construction methods. Furthermore, under Alternative 2, a small portion of the OU3 materials would be dispositioned off-site, and would thus require truck transportation. For Alternative 3, implementation would require coordination with OU1 to transport OU3 material to the representative off-site disposal facility. This quantity to be transported off-site currently exceeds Fernald's shipping capacity. Considerable coordination would be required between DOE and various states and municipalities to facilitate the transportation of such large quantities of materials. Due to the large quantity of material to be disposed and the extended duration of the project, the available capacity for off-site disposal at current facilities or facilities yet to be constructed is unclear. For these reasons, Alternative 3 is considered less implementable than Alternative 2.

Cost

This criterion includes capital costs for design and construction as well as projected long-term maintenance costs. The cost is considered and compared to the benefit that will result from implementing the remedy.

Two methods are used to present costs associated with implementing each of the alternatives. As shown in the "Summary Table for the Evaluation of Alternatives" on page 16, the first method illustrates the costs in current fiscal year (1995) dollars. In other words, if the entire cost of the alternative was paid during the 1995 fiscal year, then that cost would be considered to be in current year dollars. However, because of inflation, work performed in the future will undoubtably cost more than work performed today.

To account for this and the time value (or investment potential) of money, a second cost estimating approach is used, called present worth analysis. Present worth analysis calculates the amount of money that would have to be invested today to pay for the cleanup over the years of implementation. The real interest rate applied in the present worth analysis is determined by the Federal Government's Office of Management and Budget to be 4.8 percent, based on an investment interest rate minus the rate of inflation.

No additional cost is associated with Alternative 1 since no additional action would be required. Current

estimates indicate that Alternative 2 would cost $93 million in current year dollars, which is equivalent to a present worth cost of $70 million. Due to the higher costs associated with off-site transportation and disposal, the cost of Alternative 3 is estimated to be $185 million in current year dollars. This equates to a present worth cost of $143 million.

State Acceptance

State acceptance and/or concerns regarding the *OU3 RI/FS Report* and Proposed Plan have been incorporated in the final version of those documents. Any additional concerns identified during the public comment period will be incorporated in the final ROD and responsiveness summary.

Community Acceptance

During the public comment period, interested members of the public can voice their opinion on which parts of the alternative they support, which parts they may have reservations about, and which parts they oppose. Public comments may be submitted in writing using the attached comment sheet, or verbally during the public meeting. Community acceptance will be assessed after the public comment period and will be addressed in the ROD.

PREFERRED REMEDIAL ALTERNATIVE

Based on the comparative evaluation presented above and summarized on page 16, U.S. EPA and DOE have identified Alternative 2, *Selected Material Treatment, On-Property Disposal, and Off-Site Disposition,* as the preferred remedial alternative. This alternative calls for the release of certain items, such as equipment, tools, etc., to other DOE sites or as scrap material to the extent practicable. All OU3 materials that remain at Fernald following the interim remedial action will be evaluated, based on material type and contaminant levels, to determine the least-cost disposition option.

Alternative 2 is recommended because it provides a remedy which is reliable over the long term, is less costly, and is readily implementable. All short-term exposures from the preferred alternative are estimated to be within acceptable limits. Also, the alternative would be in compliance with all ARARs or meet the requirements of an ARAR waiver of the State of Ohio solid waste disposal facility siting requirements [OAC 3745-27-07(H)(2)(c)and(d)].

The DOE will continue to assess the viability of emerging technologies to support the selected remedy in a more cost effective and equally or more protective manner.

SUMMARY OF RISKS FOR THE PREFERRED ALTERNATIVE

Note to Reviewers: At the time of this submittal, the risk calculations had not been revised. However, this section will be updated in the final version of this Proposed Plan to reflect changes that resulted from U.S. EPA and Ohio EPA.

The proposed action was analyzed for potential health effects on the general public and workers and for general environmental impacts. Potential health impacts were analyzed for two general types of receptors: remediation workers involved in the proposed action; and the general public. An assessment of both radiological and chemical contaminants was performed to support this summary. Both potential ***doses*** and risks were developed as estimates; dose represents the amount of exposure to a contaminant that an individual receives, while risk is the affect of that dose and equals the chance of additional cancer incidence. The potential risks to the general public, the workers, and the environment are summarized in the following sections.

Health Effects: General Public

For the general public, two hypothetical receptors (an off-site resident and an individual along the primary transportation route) were assessed for radiological and chemical contaminants under maximum exposure situations. Based on this assessment, it is estimated that the total risk to each receptor, under the preferred alternative, is expected to be lower than the EPA acceptable risk range of 10^{-4} (one in ten thousand) to 10^{-6} (one in a million). The estimated risk to the maximally exposed off-site resident due to radionuclide inhalation associated with the preferred remedial alternative is about 1.9×10^{-6}, which represents a one in 530,000 chance of additional cancer incidence. The risk due to inhalation of chemicals is about 5.8×10^{-8} (one in 17 million). These potential risks would be minimized by implementing a combination of engineering (dust suppression) and administrative (physical barriers) controls.

Risks to the maximally exposed member of the public along the off-site transportation route are a result of direct radiation exposure and equal about 3.1×10^{-9} (one in 320 million) for incident-free transport. Under a potential traffic accident, the risks to the maximally exposed member of the public could be 1.2×10^{-7} (one in 8.3 million) chance of additional cancer incidence. These risks are below the EPA risk range and are, therefore, acceptable.

SUMMARY TABLE FOR THE EVALUATION OF ALTERNATIVES

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Selected Material Treatment, On-Property and Off-Site Disposal	Alternative 3 Selected Material Treatment and Off-Site Disposal
Overall protection of human health and the environment	Not protective of human health and the environment.	Provides overall protection of human health and the environment.	Provides overall protection of human health and the environment.
Compliance with ARARs	Not compliant because no further action would likely result in exposures to the public and releases to the environment.	Compliant with all ARARs or meets the requirements of an ARAR waiver of the State of Ohio solid waste disposal facility siting requirements.	Compliant with all ARARs.
Short-term effectiveness	No short-term risks since no action would be taken.	All radiological and chemical exposures are estimated to be within acceptable limits. This alternative presents lower short-term risks associated with mechanical hazards than Alternative 3.	All radiological and chemical exposures are estimated to be within acceptable limits. Greater mechanical hazards than Alternative 2 due to injuries from transporting all materials to off-site disposal facilities.
Long-term effectiveness and permanence	Not protective in the long-term. Would result in unacceptable long-term risks to the public.	Is protective of human health and the environment through site geology, engineering, and administrative controls. However, Alternative 2 is less effective and permanent in the long-term than Alternative 3.	Is the most effective and permanent since all contaminated material would be removed from Fernald with no long-term requirements for continued administrative controls, surveillance, or maintenance activities.
Reduction in toxicity, mobility, or volume through treatment	Due to unmaintained storage of dismantled debris, contaminant mobility is expected to increase.	Potentially treats 5,280 cubic feet of material to meet land disposal restrictions for off-site disposal and 50 cubic feet of material to meet criteria for on-property disposal.	Potentially treats 5,330 cubic feet of material to meet land disposal restrictions for off-site disposal.
Implementability	Easier to implement than Alternatives 2 or 3 because no action occurs.	Easier to implement than Alternative 3 because this alternative only requires placement of OU3 materials into an on-property disposal facility already being constructed for OU2 and OU5 materials.	Hardest alternative to implement because it is dependent on whether agreements are reached with off-site disposal facilities to accept waste. Considerably more coordination would be required with state and local authorities along transportation routes. The volume of material would also require a longer time period to complete shipments.
Current year (1995) cost (in millions)	$0	$93	$185
Present worth cost (in millions)	$0	$70	$143
State Acceptance	Will be documented in the ROD and responsiveness summary.	Will be documented in the ROD and responsiveness summary.	Will be documented in the ROD and responsiveness summary.
Community Acceptance	Will be addressed when comments are received from the public.	Will be addressed when comments are received from the public.	Will be addressed when comments are received from the public.

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Health Effects: Workers

Potential health impacts were analyzed for three types of Fernald workers: remediation workers involved in the loading, inspection, and movement of containerized material within the Fernald site boundaries; administrative support staff at Fernald referred to as non-remediation workers; and truck drivers who transport wastes to off-site disposal facilities.

The dose to the maximally exposed remediation worker as a consequence of direct radiation and inhalation of radionuclides is estimated to be 360 millirem per year, which is 14 times below the safe limit for occupational workers of 5,000 millirem per year, as specified in DOE Order 5480.11. These occupational doses are based on a remediation worker standing one meter away from waste containers and piles while inspecting them for eight hours per day, 250 working days per year. For comparison purposes, an average individual in the United States receives a radiation dose of about 300 millirem per year from natural ***background radiation***.

Based on the annual dose of 360 millirem and a ten-year schedule, the total project risk to a remediation worker from radionuclides would be about 2.8×10^{-3} (one in 360). The associated chemical risk to a remediation worker, based on inhalation, would be 9.8×10^{-7} (one in a million) for the entire ten-year action.

The non-remediation worker is an administrative worker who is located 380 meters from cleanup activities. Because of this distance, the annual dose of 0.01 millirem to non-remediation workers from inhalation of airborne radionuclides and direct radiation is considerably lower than the dose to the remediation worker. Based on a ten-year schedule, the total project risk to a non-remediation worker would be about 6.6×10^{-7} (one in 1.5 million) from radionuclides and 6.0×10^{-7} (one in 1.7 million) from chemicals.

The third type of worker is a truck driver, who is conservatively assumed to transport every container destined for off-site disposal. The cumulative dose from radiological direct exposure for this maximally exposed driver is estimated at 2,200 millirem over the duration of the ten-year project. The associated total project risk for this truck driver is 1.7×10^{-3} (one in 590).

Because of worker protection including engineering, administrative, and monitoring controls that would be used during the preferred alternative, all exposures to the three types of workers would remain within acceptable levels. In addition, the risks from inhalation for both remediation and non-remediation workers may be overestimated by two orders of magnitude. These risks were calculated using the conservative assumption that all contaminants within OU3 concrete would become airborne as the concrete is placed in the on-property disposal facility. However, dust suppressants would be used to control contaminants from becoming airborne.

Another consideration when determining project risk to workers is mechanical hazards (industrial accidents) associated with site remediation activities. The number of accidents from on-property activities estimated from the preferred remedial alternative is approximately 15 injuries and less than one fatality. Mechanical hazards associated with transporting waste materials are estimated to result in less than one injury to members of the public and truck drivers combined.

Environmental Effects

The preferred alternative would produce overall positive environmental impacts because disposing of the contaminated material generated during the interim remedial action would reduce the potential for releases to the environment. Also, cleanup activities would allow for the majority of the Fernald site to be returned to some form of beneficial use, like an undeveloped park.

SITE-WIDE INTEGRATION OF REMEDIES

Of the five operable units at Fernald, OU3 is chronologically the last to issue a Proposed Plan for public comment. Each of the operable unit FS reports has provided a progressive evaluation of the projected Fernald site-wide remedy, using the best information available at the time, to predict post-remediation site conditions. This site-wide remedy incorporates the selected or preferred alternative for each operable unit, as appropriate. The intent of the analysis is to progressively monitor the interfaces among the operable units to ensure that the final adopted site-wide remedy would be well thought out, would be cost effective, and would ensure the long-term protection of human health and the environment.

The *OU3 RI/FS Report* includes an evaluation employing the preferred OU3 alternative in conjunction with the selected remedies for other operable units listed in the table on the top of page 18.

REMEDIES ADOPTED TO COMPLETE SITE-WIDE ANALYSIS

Operable Unit	Key Components
OU1 - Waste Pits	• Excavation of pit contents, caps, berms, and lining system • Excavation of contaminated soil underlying pits and placement of soil and oversized debris meeting the waste acceptance criteria in the on-property disposal facility • Drying of excavated soil and waste, as required • Shipment of excavated material (including soils and debris not meeting the waste acceptance criteria of the on-property disposal facility) by rail to off-site disposal facility • Decontamination and demolition of all OU1 structures and support facilities
OU2 - Other Waste Units	• Excavation of waste materials and adjacent contaminated soil • Shipment to off-site disposal facility of material not meeting waste acceptance criteria of on-property disposal facility • Placement of excavated material meeting waste acceptance criteria in on-property disposal facility
OU4 - Silos 1-4	• Removal and vitrification of waste inventories • Off-site disposal of vitrified waste • Excavation of contaminated soil and placement of soil and oversized debris meeting the waste acceptance criteria in the on-property disposal facility • Decontamination and demolition of silo structures and support facilities • Placement of rubble and debris in on-property disposal facility
OU5 -Environmental Media	• Excavation and consolidation of contaminated soil and sediment • Disposal of soil and sediment meeting waste acceptance criteria in the on-property disposal facility • Off-site disposal of soil and sediment not meeting waste acceptance criteria of on-property facility • Extraction and treatment of contaminated groundwater • Collection and treatment of contaminated stormwater • Decontamination and demolition of support facilities used during remedial activities • Recycling/reuse of generated debris and equipment to the extent practical • Disposal of all materials remaining after closure of the on-property disposal facility at an off-site disposal facility
Continuing Site-wide Issues	• Long-term environmental monitoring program for the Fernald site • Continued maintenance and surveillance of the on-property disposal facility • Performance of reviews of site conditions by EPA every five years • Continued federal ownership of on-property disposal facility area • Restrictions placed in FEMP property deed pertaining to future uses of the site

Material with higher levels of contamination, deemed to represent the principal threat at the site, would be treated (if required) and shipped off-site for disposal. Material exhibiting lower contaminant concentrations distributed over a larger volume, termed a secondary threat, would be permanently disposed of at the Fernald site in one central engineered disposal facility.

The analysis of the adopted site-wide remedy performed for the OU3 RI/FS included a risk analysis of the post-remedial site conditions. The purpose of this risk analysis was to determine whether the clean-up levels of the site-wide remedy would ensure the long-term protection of hypothetical recreational users and off-site farmers. This risk analysis examined the long-term performance of the disposal facility and the potential risks to future human receptors. The risks are due to residual concentrations of contaminants remaining at the site in soil and groundwater following the certified completion of remedial actions at Fernald.

The results of this risk analysis indicate that the adopted site-wide remedy would provide a maximum estimated risk to a future recreational user of the Fernald site within the 10^{-6} (one in a million) range. The maximum calculated risk to a hypothetical off-site farmer located immediately adjacent to the Fernald site for a 70-year lifetime would be within the 10^{-5} (one in 100,000) range.

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In the unlikely event the projected administrative controls (i.e., continued federal ownership, deed restrictions, etc.) established to maintain the adopted land use were to fail, the maximum incremental risk a hypothetical on-property farmer would receive from the post-remediation site conditions was in the 10^{-4} (one in 10,000) range.

In completing the RI/FS for OU3 and the other Fernald operable units, DOE has acknowledged that uncertainties exist which may affect the course of remedial actions once field work is underway. Uncertainties can be managed by emphasizing conservatism for any assumptions made and by planning for additional data evaluation and assessment as the remedial actions are implemented. By acknowledging the existence of uncertainties, bounding assumptions on the conservative side, and planning for an iterative approach to implementation of the remedial actions, DOE and Fernald stakeholders can move forward with the decision-making process.

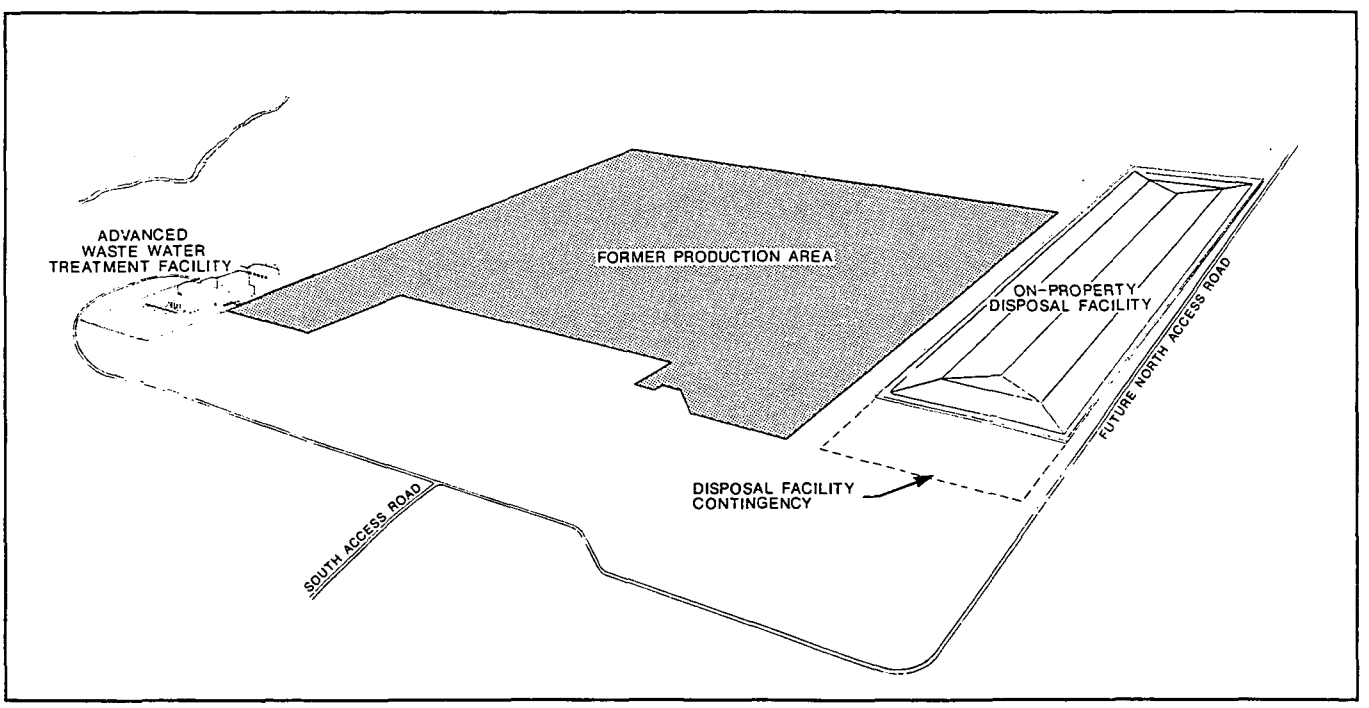
An artist's rendition of the appearance of the site following implementation of the adopted site-wide remedy is shown below. The proposed engineered disposal facility is estimated to be 3,700 feet (including contingency) by 800 feet and range in height from approximately 40 to 65 feet (including the cap, which is shown on page 10). The size of the facility is based upon the consolidation of about 2.5 million cubic yards of contaminated soil and construction debris from all operable units, with Operable Units 1 and 4 contributing a small portion of soil and debris.

The overall conclusion of the evaluation completed for the adopted site-wide remedy was that, collectively, the selected or preferred alternative for each operable unit would provide for the protection of human health and the environment over the long-term (i.e., up to or beyond 1,000 years). The evaluation further concluded that the adopted site-wide remedy would attain the adopted land use objective (i.e., restricted use of Fernald for industrial and recreational purposes) and provide for the long-term protection of the water quality in the Great Miami Aquifer.

COMMUNITY PARTICIPATION

DOE encourages public participation in the selection of the preferred alternative for the cleanup of OU3. Members of the public are encouraged to read and provide comments on the *OU3 RI/FS Report* and this Proposed Plan. The *OU3 RI/FS Report* describes the remedial action alternatives, based on field characterization, and describes the advantages and disadvantages of each alternative.

A final remedy selection for the disposal of OU3 materials will be made with consideration of stakeholder input. Based upon comments and information received, the preferred remedial alternative may be modified, another alternative identified in this Proposed Plan may be selected, or a new alternative may be selected.



ARTIST'S RENDITION OF THE FERNALD SITE FOLLOWING SITE-WIDE CLEANUP

The Public Environmental Information Center, or PEIC, houses the ***Administrative Record,*** which is the official repository for documentation related to the RI/FS process at Fernald. The public is invited to review information on the OU3 RI/FS and other Fernald activities at the PEIC. The PEIC address and operating hours are:

Fernald Environmental Management Project
Public Environmental Information Center
10845 Hamilton-Cleves Highway (S.R. 128)
Harrison, OH 45030
phone: (513) 738-0164
fax: (513) 648-3081

Monday	9:00 a.m. - 7:00 p.m.
Tuesday	9:00 a.m. - 4:30 p.m.
Wednesday	9:00 a.m. - 4:30 p.m.
Thursday	9:00 a.m. - 7:00 p.m.
Friday	9:00 a.m. - 4:30 p.m.
Saturday	9:00 a.m. - 1:00 p.m.
Sunday and Holidays	Closed

For timely information on Fernald-related meetings and documents available for public comment or inspection, call the Fernald community information line at (513) 648-6272.

The OU3 public comment period will be open from ____ to _____. Any changes to these dates will be announced in the local media and posted at the PEIC (see the shaded box above).

THE NEXT STEP

Following the public comment period and associated public meeting, and assuming public acceptance of the preferred alternative, the DOE and U.S. EPA, with concurrence from Ohio EPA, will sign the OU3 final remedial action ROD. The ROD will describe the selected action and will include a responsiveness summary that provides responses to comments received during the public comment period and demonstrates how the remedy was modified by public input. After the document is signed, a plan for performing the remedial design and remedial action will be prepared. Once the design is complete, the final remedial action can begin.

This publication was printed on paper that is manufactured with at least 50% reclaimed fiber.

Public Comment Period

DOE and U.S. EPA will hold a 30-day public comment period for the Operable Unit 3 Proposed Plan from (?) to (?) **{to be scheduled}**. The comment period provides an opportunity for local residents and interested parties to express their views and concerns on the remedial alternatives being considered. Copies of the OU3 RI/FS Report and this Proposed Plan are available in the Fernald Administrative Record and at the U.S. EPA regional office in Chicago, Illinois.

Public Meeting

DOE, in coordination with the U.S. and Ohio EPAs, will also hold a public meeting during the public comment period to discuss the alternatives and to answer questions. The meeting is scheduled for **{date, time, and location to be determined}**. Written and oral comments will be accepted during the meeting.

Submitting Your Comments

Your comments on the final remedy for OU3 may be either presented at the public meeting or sent (via mail or fax) to either of the following addresses or fax numbers:

Mr. Gary Stegner
Public Information Director
DOE Fernald Area Office
P.O. Box 538705
Cincinnati, OH 45253-8705
phone: (513) 648-3153
fax: (513) 648-3073

Mr. James Saric
Remedial Project Manager
U.S. EPA Region V (HSF-5J)
77 West Jackson Blvd.
Chicago, IL 60604-3590
phone: (312) 886-0992
fax: (312) 353-4788

The Ohio EPA is also participating in the remedy selection process. For additional information concerning the State of Ohio's role in the Fernald cleanup process, contact:

Mr. Tom Schneider
Fernald Project Manager
Ohio EPA
401 East Fifth St.
Dayton, OH 45402-2911
phone: (513) 285-6466
fax: (513) 285-6404

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GLOSSARY

Accessible Metals: a material category comprised of metals with large, accessible surface areas and thicknesses greater than or equal to 1/4-inch. This category also includes structural steel and decking.

Administrative Controls: the elimination of hazards through administrative means, such as management, procedures, record-keeping, and assessments. Administrative controls are not intended to physically stop individuals from entering hazardous areas or to remove hazards.

Administrative Record: the Administrative Record contains documentation of CERCLA-related activities for each operable unit. The documents in the Administrative Record are used to make decisions in Fernald's remediation program, as well as for short-term protective measures (removal actions) implemented until a final remediation plan can be put into effect. The Administrative Record is made available for public review so that community members have the opportunity to provide comments to the DOE on proposed cleanup activities at the Fernald site. The Administrative Record for the Fernald site is located at the Public Environmental Information Center.

Applicable or Relevant and Appropriate Requirements (ARARs): federal and state (usually included if they are more strict) standards that are legally applicable, or relevant and appropriate, at a Superfund site. ARARs, specifically, are cleanup standards, controls, and other measures which are borrowed from existing regulations to protect the environment.

Background Radiation: the radiation in the natural environment, including cosmic rays and radiation from naturally radioactive elements, both inside and outside the bodies of humans and animals. Many of the radiological and all of the inorganic contaminants present at Fernald exist naturally in measurable concentrations in all environmental media. The background concentration of each contaminant varies from point to point within a range for each material.

Baseline: an estimated concentration which is based on sampling data and literature values that represents a background level for an analyte in a material.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA): CERCLA is a Federal law, passed in 1980 and modified in 1986 (called SARA), that addresses the cleanup of contaminant releases to the environment. At Fernald, the DOE is the responsible party and is remediating the site with oversight from the U.S. EPA. The relevance of SARA to the Fernald site is that SARA contains provisions for setting up the Administrative Record as a vehicle for public involvement in cleanup activities.

Constituent of Concern (COC): chemical and/or radiological contaminants present within the operable unit that pose a risk of cancer or other adverse effects to human health and the environment as a result of exposure to the contaminants.

Dose: a term to describe the amount of exposure to a contaminant an individual receives. Exposures include inhalation (breathing), ingestion (swallowing), and external contact (touching).

Engineering Controls: the elimination of hazards through mechanical means or process design, which physically prevent entry, minimize hazards, or create some kind of barrier.

Hazardous Waste: a waste material exhibiting the characteristics of ignitability, corrosivity, reactivity, or toxicity or listed in 40 CFR 261, "Protection of Environment/Solid Waste/Resource Conservation and Recovery Act" or identified in applicable state regulations.

Hold-Up Material: feed stock, intermediate product material, and residual process material remaining in and on process equipment (i.e., clinging to the surfaces of the various pumps, pipes, vessels, or other equipment surfaces).

Inaccessible Metals: a material category consisting of metals with primarily inaccessible surface areas. This category includes non-process piping, conduit/wire, electrical fixtures, miscellaneous electrical items, doors, and other materials.

Intrusive Sample: a sample that is collected by disturbing the surface of the material from which the sample is to be collected. An example would be chipping concrete off a block, drilling through wood, or digging into the ground. A non-intrusive sample, in contrast, would be obtained by wiping the surface of the material.

Leachability: describes how readily a contaminant dissolves in a liquid (like rainwater).

GLOSSARY (continued)

Legacy Wastes: a term used at Fernald for the inventory of waste that was generated during the years of Fernald production (before 1989). Legacy wastes include containerized low-level radioactive waste, hazardous waste, mixed waste, and TSCA wastes (i.e., asbestos and PCBs). All materials generated after 1989 that are similar in nature to the production-related wastes will be handled as if they are legacy wastes.

National Priorities List (NPL): U.S. EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. EPA is required to update the NPL at least once a year.

Non-Regulated Asbestos-Containing Material: a material category consisting of non-friable asbestos-containing materials, such as transite building siding and roofing, insulating bricks on boilers, and old floor tile.

Operable Unit: an operable unit (OU) can represent a number of separate activities undertaken as part of a Superfund site cleanup. At Fernald, five operable units make up the site for the purposes of cleanup. Each operable unit is defined based on a reasonable grouping or area of problems.

Painted Light-Gauge Metals: a material category consisting of painted metals less than or equal to 1/8 inch thick. All painted metals are assumed to have lead-based paint present. This category includes ductwork, louvers, metal interior and exterior wall panels, metal roof panels, and sheet lead.

Receptor: a person, animal, or plant exposed to cancer-causing or toxic agents which may cause health problems.

Record of Decision (ROD) and Interim Remedial Action Record of Decision (IROD): RODs and IRODs are public documents that explain which cleanup alternative(s) will be used at CERCLA sites.

Regulated Asbestos-Containing Material: a material category comprised of asbestos-containing material found in a loose or "friable" state. The largest source at Fernald is piping and ductwork insulation.

Remedial Action: the implementation of the action determined in the Record of Decision and represents the last phase of a Superfund site cleanup.

Remedial Design: the technical analysis and procedures that follow the selection of a site remedy, resulting in a detailed set of plans and specifications for implementation of the remedial action.

Remedial Investigation/Feasibility Study (RI/FS) Reports: two reports that are usually developed concurrently. The RI is conducted for collection of data and site characterization to determine the necessary remedial action and support the evaluation of remedial alternatives. The FS is conducted to define the objectives of the response action, develop remedial action alternatives, and undertake an initial screening and detailed analysis of the alternatives. For OU3, the RI/FS is being presented as a single document since the IROD and subsequent modification of the RI/FS Work Plan Addendum precludes much of the content normally presented in the RI and FS documentation.

Removal Action: a short-term, immediate action taken to address releases of hazardous substances that require a quick response.

Risk: the conversion of a dose value to an expected effect on living organisms is reported as a risk. Under CERCLA, risk is generally meant to indicate the probability for specific health effects as a result of dose.

Segregation Categories: the further subdivision of the ten OU3 material categories based on regulatory criteria and contaminant characteristics.

Source Term: the estimated amount of a contaminant present in a material.

Unrestricted Release: the release of materials for unrestricted use to a non-radiologically controlled environment.

Waste Acceptance Criteria: a set of specifications and conditions under which disposal facilities can accept waste. These criteria include (but are not limited to) packaging, external radiation levels, and analytical documentation.

COMMENT SHEET

DOE is interested in your comments on the cleanup alternatives being considered in the Operable Unit 3 Proposed Plan, including the preferred alternative. Please use the space provided below to write your comments, then fold, staple or tape, and mail this form. DOE must receive your comments on or before the close of the public comment period on (?), 1996. If you have questions about the comment period, please contact Gary Stegner, the DOE Fernald Area Office Public Information Director, at (513) 648-3153.

Name:_____

Address:_____

City:_____ **State/Zip:**_____

Phone:_____

MAILING LIST ADDITIONS:

Please add my name to the Fernald Mailing List to receive additional information on the cleanup progress at the Fernald Environmental Management Project:

YES____ **NO**____

For More Information

Additional information or related cleanup documents are available to the public at the following location:

Public Environmental Information Center
JAMTEK Building
10845 Hamilton-Cleves Highway
Harrison, Ohio 45030
phone: (513) 738-0164
fax: (513) 648-3081

fold here

fold here

Name_____

Address_____

_____

Note: The final version of this Proposed Plan will have a postage pre-paid comment response sheet.

Mr. Gary Stegner
Public Information Director
DOE Fernald Area Office
U.S. Department of Energy
P.O. Box 538705
Cincinnati, Ohio 45253-8705

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RESPONSE TO UNITED STATES ENVIRONMENTAL PROTECTION AGENCY AND OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENTS ON THE DRAFT OU3 REMEDIAL INVESTIGATION AND FEASIBILITY STUDY REPORT AND THE DRAFT PROPOSED PLAN FOR THE OU3 FINAL REMEDIAL ACTION

DECEMBER 14, 1995

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SECTION I

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SECTION I

INTRODUCTION

SECTION I
INTRODUCTION

The Department of Energy has completed its review of the US EPA and OEPA comments received on the draft OU3 RI/FS and PP documents. Responses to those comments are contained in this document. In total, DOE received 152 comments, 72 from US EPA and 80 from OEPA.

The purpose of this document is to present DOE's responses to comments received on the OU3 RI/FS/PP documents and to explain how the documents will be modified when submitted in final form. Because the majority of comments received required only clarification and/or expansion to existing sections, DOE has provided written responses and change pages for affected sections. DOE believes that this document adequately addresses received comments; therefore it is unnecessary to reproduce all four volumes of the RI/FS/PP. The structure and scope of this comment response document reflects an approach that resulted from discussions held by conference call with the regulators on November 28, 1995.

As you are aware, the final document will include the incorporation of data ("new data") not entirely complete or evaluated in the draft RI/FS/PP submittal on September 11, 1995 ("draft data"). The data set has now been finalized. The amount of new data since the initial submittal represents only a small fraction of the entire set (~1 percent), and no maximum result for any analyte in any medium has changed. Based on the new data set, small statistical variations have occurred to baseline values and to the Appendix A comparison of data to reference criteria. These small statistical variations have no effect on the RI/FS document conclusions or the alternative analysis and recommendation in the PP.

Several comments were received regarding the assumptions used to develop the source term. Some of these comments (US EPA Specific Comments 10,11,31,34,35; OEPA Specific Comments 23-25 and 56-59) were addressed by providing additional information and clarification in the response to the comment, some (US EPA Specific Comments 32,33; OEPA Specific Comments 53-55) were addressed by additional sensitivity analysis, and some (US EPA General Comment 6 and Specific Comment 29) required a modification that produced a change to the source term.

Non-sampled components were assumed to be uncontaminated and baseline values were applied to materials in that component. For components that were not sampled for health and safety reasons, the source term methodology applies actual results from functionally-related components to all materials in the non-sampled component in question. US EPA Specific Comment 29 correctly identifies that this approach was not followed in some cases. For the following non-sampled components, baseline values were erroneously applied: 4B, 5F, 30B, and 6E. For the revised source term, actual data from functionally-related components are now applied to these non-sampled components.

The volumes of materials requiring handling as mixed waste are lower than those presented in the September submittal. These volumes changed based on a refined approach to the application of analytical results to component materials (see OEPA General Comment 1

response). The impact of this change is minimal and will be reflected in cost estimate and short-term risk assessment change pages.

This introduction is followed by US EPA comments and the responses generated to address comments in Section II. Section III presents OEPA comments and the generated responses. Actions in Sections II and III identify when a change page has been generated as a result of a received comment. All comments are presented in this document as they were received. No renumbering or modification to the received comments has occurred. Section IV discusses additional DOE revisions needed for technical accuracy that have been rippled through the entire document. Appendix A presents all change pages resulting from this process.

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SECTION II

SECTION II

US EPA COMMENTS AND RESPONSES

SECTION II
US EPA COMMENTS AND RESPONSES

GENERAL COMMENTS

Commenting Organization: US EPA Commentor: Saric
Section #: Proposed Plan Page #: NA Line #: NA
Original General Comment #: 1
Comment: The proposed plan indicates that the land use objective adopted for the Fernald Environmental Management Project (FEMP) is to create an undeveloped park. The U.S. Department of Energy (DOE) should discuss the reason for adopting this land use objective. The proposed plan provides only limited information regarding development of other land use alternatives. DOE will need to develop and evaluate such alternatives, especially those providing long-term economic development opportunities. Information regarding DOE's plans to develop and evaluate land use alternatives should be included in the proposed plan.

Response: The Proposed Plan incorrectly stated that the undeveloped park is the adopted future land use for the site. Using the OU5 FS approach, the future use of the undeveloped park scenario was used as the basis for the analysis of post-remedial site risks. The undeveloped park scenario is one of many scenarios that are consistent with the Fernald Citizens Task Force recommendations, as detailed in their July 1995 final report entitled "Recommendations on Remediation Levels, Waste Disposition, Priorities, and Future Use."

Action: The text on Page 18 of the Proposed Plan has been simplified to correctly state that "the purpose of the risk analysis was to determine whether the cleanup levels of the sitewide remedy would ensure the long-term protection of hypothetical recreational users and off-site farmers."

Commenting Organization: US EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 2
Comment: Throughout the documents, references are made to U.S. Environmental Protection Agency (US EPA) and Ohio Environmental Protection Agency (OEPA) waivers that will need to be obtained from these agencies. The references are general and should be revised to identify the specific agency granting each waiver and the specific regulations to be covered by the waiver.

Response: Appendix C, "Potentially Applicable or Relevant and Appropriate Requirements (ARARs) and Other Requirements to be Considered (TBC)", identifies the only waiver being sought - a waiver to the OEPA disposal facility siting requirements, with the specific regulatory citations. Many of the references to ARARs waivers are generic statements of the need to seek waivers if ARAR compliance cannot be attained. Changes have been made in the appropriate text locations with the citations noted and references made to the Appendix C waiver request.

Action: The text on Page 6-11, Line 17-19, has been revised to "Alternative 2 would comply with all identified ARARs or meet the requirements for a US EPA waiver of Ohio solid waste disposal facility siting criteria [OAC 3745-27-07 (H)(2)(c)and(d)] (see Appendix C, Section C.2)."

Related text throughout the RI/FS report has been revised to reflect the new language above. Specifically the text has been revised on: Page 1-8, Line 12; Page 5-6, Line 32; Page 5-22, Line 30; Page 6-1, Lines 21 and 32; Page 6-2, Line 15; Page 6-12, Line 7; Page 6-24, Line 31; Page 6-34, Line 22; Page 6-37, Line 11; Page C-2, Line 38; and Page C-3, Line 15.

Commenting Organization: US EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 3
Comment: The OU3 (OU3) remedial investigation/feasibility study (RI/FS) report incorporates the results of interactions between DOE and US EPA, and it provides justification for the on-site disposal and off-site disposal alternative as the preferred alternative. The three remedial action alternatives are analyzed in terms of the nine evaluation criteria. However, the means by which treatment and disposal technologies will be incorporated in the decontamination and disposition of OU3 remediation materials is unclear. DOE should estimate the reduction in toxicity, mobility, or volume of waste and the change in the disposal location that would result from use of the chemical treatment and physical treatment technologies that have been retained for further evaluation. In addition, the impact of the five disposition technologies on the cost estimate for the preferred alternative should be discussed.

Response: The method of incorporating the final disposition decision into the D&D action has been included in the report.

As presented in Section 4.3.1 of this report, the significant portion of treatment of OU3 materials (gross decontamination) will take place during the OU3 interim remedial action. This action will be completed by a remediation subcontractor in accordance with the OU3 Interim RD/RA Work Plan and subsequent project-specific implementation plans. The application of further treatment technologies in the final action would result in the reduction of the mobility of the contaminants through solidification and encapsulation processes. However, the final volume is expected to increase.

The application of treatment technologies under the final remedial action could influence the final disposal location of the treated waste forms. If treatment occurs at off-site locations, then the material would be shipped to the representative commercial facility or the NTS for disposal. However, if treatment occurs on-property, then the treated materials would be dispositioned in the on-property disposal facility.

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Each of the five disposition options have been considered within the cost appendix. The use of the on-property disposal facility has resulted in the lowest alternative cost estimate for OU3 through the use of a sitewide disposal facility. The impact of utilizing the off-site disposal locations of NTS and the representative commercial disposal facility increased the net cost of the preferred alternative. If recycling were to be applied, then the preferred alternative estimated cost would increase dramatically. However, the proposed use of a commercial solid waste disposal facility has resulted in a lower cost estimate for the preferred alternative. If materials do not meet the unrestricted release criteria under DOE Order 5400.5, then they would be dispositioned in the on-property disposal facility at a slightly higher final cost for the alternative.

Action: Section 5.3.2, Page 5-12, Lines 30-32 has been replaced by the following:

The selected alternative for the final remedial action of OU3 will require integration with the ongoing interim remedial action to ensure the coordinated remediation of the buildings and structures. This coordination will occur within the implementation plan for each D&D complex. Some of these coordination activities are currently ongoing. For example, on all future implementation plans (Plant 9/Thorium complex and after), the RI/FS size constraints as detailed in Appendix G will be utilized as the sizing requirements for all materials generated by the D&D subcontractor. Additionally, the Plant 9/Thorium complex implementation plan is in the process of being modified to address the surface concrete removal in process areas 2 and 4. The implementation plan for each D&D complex will be modified as appropriate to incorporate the future selected remedy in the OU3 final ROD.

Commenting Organization: US EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 4
Comment: Ongoing removal actions (RA) provide insight regarding the implementability and cost of Alternatives 2 and 3. The document lacks discussion of lessons learned from RAs associated with OU3, such as RAs 9, 12, 17, 19, and 26. Evaluation of the implementability and cost of Alternatives 2 and 3 will benefit from the lessons learned from the RAs. For example, RA 19 (Plant 7 Dismantling) serves as a pilot project for decontamination and dismantling (D&D) of other OU3 structures and reveals problems regarding the implementability of Alternatives 2 and 3. About 400 tons of the original 761 tons of structural steel sent to the Alaron Facility for decontamination and subsequent free release was returned to FEMP. The D&D methods used to cut the steel for packaging twisted a large portion of the steel, leaving inaccessible areas that could not be decontaminated for unrestricted reuse. The return of the steel raises a general concern that such unforeseen obstacles will affect the implementability of Alternatives 2 and 3. DOE should incorporate a discussion of lessons learned from ongoing RAs that identifies potential obstacles affecting the implementability of Alternatives 2 and 3; for example, the discussion should identify any potential delays or problems in transporting, disposing of, or recycling OU3 remediation materials.

Response: Agreed. The lessons learned from other projects are directly applicable to the ongoing D&D actions. Specifically, the recycling of Plant 7 structural steel has highlighted the interconnection of the D&D actions with the treatment and disposal of the generated materials.

At this time, the only treatment that has the potential to impact the D&D methodology is recycling. As demonstrated from recycling the Plant 7 structural steel, the D&D methodology of implosion did not significantly impact the ability to recycle; however, the use of insufficiently sized shear to cut the steel by resulted in torsional distortion of the structural steel beams. The recyclability of the structural steel beams was impacted since the contract for the recycling activities had specified that the straight beams be delivered for decontamination. These lessons have been incorporated into the performance of the interim action via revised project-specific design specifications to be provided to future D&D subcontractors.

As stated above, under US EPA General Comment #3, requirements from the preferred alternative will be incorporated into the D&D complex implementation plans.

Action: The text in the respective implementability sections for Alternative 2 (Page 6-23) and Alternative 3 (Page 6-30) has been revised to incorporate lessons learned from the on-site removal actions.

Commenting Organization: US EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 5
Comment: The document provides only limited information regarding interim storage of OU3 remediation materials. The document should provide additional information regarding the space available for interim storage, the estimated amount of remediation materials requiring or potentially requiring interim storage, and the planning and tracking associated with interim storage of remediation materials.

Response: The scope of the final remedial action does not include the interim storage of OU3 materials. The limited interim storage of OU3 materials generated during the interim remedial action has been prescribed by the OU3 ROD for Interim Remedial Action. The locations and methods used to store the materials are presented in the Removal Action No. 17 Work Plan (Revision 3), supporting site procedures, and the Priority Sequencing Report for OU3.

The Removal Action No. 17 Work Plan will administer the interim storage of OU3 materials until the approval of the OU3 Final Remedial Action Work Plan. At that time, the Removal Action No. 17 Work Plan will be administratively incorporated into the Final Removal Action Work Plan so that interim-stored materials may continue to be properly managed. It should be noted that the content of the Removal Action No. 17 Work Plan may be revised to incorporate improved material management methodologies. Revisions may occur either prior to the approval of the Final Remedial Action Work Plan or subsequent to the approval.

Action: The text on Page 1-1, Line 15 has been modified as follows: "As discussed in the IROD, the post-D&D materials either will be dispositioned off-site or placed in interim storage on-property until a final remedial action decision can be made for permanent disposition".

The text from the second paragraph above has been added to Page 1-15, Line 29.

The text on Page 1-17, Line 20 was modified as follows: "Of the OU3 waste streams presented, the remediation materials, which were placed in interim storage under the interim remedial action, constitute the largest quantity and constitute the only waste stream to be evaluated as part of the alternatives for this RI/FS."

Commenting Organization: US EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 6
Comment: The specific comments presented below recommend that DOE modify its assumptions regarding the estimated mass of contaminants and hence the source terms used in developing the waste acceptance criteria (WAC). DOE should address the specific comments relating to the assumptions and should modify the resulting input values used in developing the WAC.

Response: Specific comments 10, 11, and 31-35 relating to the source term are addressed individually and impacts of modifications to the source term discussed. The source term has been recalculated incorporating modified assumptions and the data set finalized after the submittal of the September RI/FS Report. It is important to note that the source term has minimal impact on the development of the waste acceptance criteria (WAC). The primary use of source terms in the WAC development process was to identify the post-remediation COCs. In this step, both actual estimates and maximum source term estimates, for OU3 materials considered for on-property disposal, were compared to an allowable contaminant mass for OU3 materials in the on-property disposal facility. The allowable contaminant mass is based on leaching potential and contaminant mobility. In all cases except technetium-99 and uranium, the maximum source term was less than the allowable mass (see Table G-8). Therefore, only technetium-99 and uranium were identified as post-remediation COCs. Because the maximum technetium-99 and total uranium source terms exceeded the allowable mass, further evaluation occurred in Appendix G to establish the respective approaches to WAC, independent of the estimated source terms. Within Appendix G, source terms are used for comparison purposes only and are not used to establish any WAC. Revised source terms have been incorporated into Tables G-8 and G-9 in Appendix G and the comparisons have been updated.

Action: Comments relating to the source term and WAC development have been addressed in the specific comment responses.

Commenting Organization: US EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 7
Comment: Because the RI/FS report and proposed plan are for the final remedial action for OU3, the essential result of the activities should be that all materials deemed to be "safe" or "below baseline," whether treated or not, are actually below the prescribed risk levels. The final remedial action should include screening and analysis procedures to ensure that all materials are below these levels. This is especially important for components and portions of components that were not sampled during the RI/FS because they were believed to be uncontaminated or because they were inaccessible without partial demolition.

Response: The intent of the Work Plan Addendum (WPA) was not to sample every building or every wall within components, but to identify and characterize the predominant sources of contamination within OU3. The determination of which components would or would not be sampled was detailed in Section D.3.4.1 of the WPA and was based on detailed inspections, review of existing data, and process knowledge. The WPA defined the non-sampled components as "components having at most isolated pockets of low levels of contamination." The WPA committed to the radiological screening of all non-sampled components by the end of the field sampling program. If the results of the radiological screening exceeded the screening criteria for sampling, then confirmatory sampling would be performed. Based on the detailed inspection, existing radiological surveys, and process knowledge, non-sampled components have minimal impact on the total contaminant mass associated with OU3. The only impact from these materials if a potential error occurred in applying below baseline valves would be associated with the material containing elevated levels of technetium-99. Based on the history within the components and Table D.9.0-1 of the WPA, these non-sampled components have very little potential for elevated contaminant levels. However, even if elevated levels were contained in one or more of these components, the net impact on the preferred alternative is minimal due to the conservative approach taken in all facets of the evaluation. Therefore, whether the concentrations associated with these buildings is actually "below baseline" is not significant to the decision making process.

In general, these materials will be dispositioned within the on-property disposal facility where a specific WAC has been determined for technetium-99. Based on the conservative methodology utilized in development of the RI/FS Report, DOE feels that screening and analysis to support waste disposition activities is not necessary. Based on activities the approach of applying hot spot values throughout process areas and applying component category maximums to non-sampled areas, the technetium-99 contaminant mass has been conservatively overestimated. The small potential for isolated areas to be at higher levels would not significantly impact the total source term or the determination of acceptability for the on-property disposal facility.

Action: No action.

Commenting Organization: US EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 8

Comment: Based on comparison and evaluation of the alternatives, the document identifies cost as a reason that Alternative 2 is the preferred alternative. The estimated lump sum costs for Alternatives 2 and 3 are discussed throughout the document. The estimated total cost for Alternative 2 is about $100,000,000 less than that for Alternative 3; specifically, the estimated total costs are $90,000,000 and $190,000,000 for Alternatives 2 and 3, respectively. (In Section 6.4.2.5, the estimated total cost for Alternative 2 is $93,000,000.) However, the cost estimates do not include the costs that OU3 would contribute to the design, construction, material placement, maintenance, and monitoring associated with the on-property disposal cell. In Section 6.4.2.5, these additional costs are provided as a unit rate for disposal ($3.05 per cubic foot) and a unit rate for operation and maintenance (O&M) of the cell ($1.12 per cubic foot). Table 6-1 indicates that the volume of material to be disposed of in the on-property disposal cell for Alternative 2 is 6,300,000 cubic feet. Therefore, the additional costs associated with the on-property disposal cell for Alternative 2 are $19,200,000 for disposal and $7,800,000 for O&M. In addition, the cost estimates do not consider costs associated with potential delays and problems in transporting, disposing of, or recycling OU3 remediation materials. DOE should provide a more detailed evaluation of the costs associated with Alternative 2. In particular, the cost estimate for Alternative 2 should be adjusted to include the costs that OU3 would contribute to the on-property disposal cell. Also, DOE should explain how the unit rate for disposal and the unit rate for O&M of the on-property disposal cell were obtained. Finally, consistent cost estimates should be presented throughout the document.

Response: With the presentation of costs in three different locations of the document, some inconsistent numbers were presented as a result of rounding to two significant digits. The cost estimate in Appendix E presented the Alternative 2 cost as $92,792,600 (Table E-4). Based on the conceptual design of Alternative 2 and the +50 percent/-30 percent accuracy required in the FS, the cost numbers were presented in the Proposed Plan and the detailed evaluation as two significant digits ($93,000,000). Similarly, the Alternative 3 cost of $193,809,700 was rounded to $190,000,000. These rounded numbers were presented throughout the document. All cost numbers have been corrected to be consistent.

The Alternative 2 cost estimate of $93,000,000 represented the total cost for OU3 and included the cost that OU3 would contribute to the on-property disposal facility. The unit rate cost used under Alternative 2 for the on-property disposal facility was an all-inclusive rate. The unit rate of $3.05 per cubic foot included costs for engineering, construction (cap and liner), material placement, construction management, radiological safety, engineering support during construction, equipment for material placement, equipment maintenance, and air and radon monitoring. This unit rate was calculated from the total cost applied over the 2.5 million cubic yards of material. The operation and maintenance cost (O&M) was based on maintenance and monitoring activities over a 30-year period at $1,200,000 per year for the entire disposal facility. This corresponded to a unit rate of $1.12 per cubic foot for OU3 materials. These rates were based on the

cost estimate presented in the OU2 Feasibility Study and the conceptual design of the disposal facility.

The disposal cost unit rates were based on calculating construction costs over an approximate ten-year period ($276 million case), ranging from fiscal year 1997 through 2007, and a 33 year period, ranging from fiscal year 1997 through 2030. During early development of the OU3 RI/FS Report, a 33-year schedule was utilized for costing purposes based on the approved interim remedial action schedule (Prioritization and Sequencing Report). With the development of the $276 million case (Rev. 1), the schedule presented in the RI/FS document and the cost estimate was revised to reflect the overall site goal of completing remediation under an accelerated program. However, the unit rate cost for material disposal was not changed to reflect streamlining the program. The net impact was an overestimation of costs associated with implementing Alternative 2 as a result of using a higher unit rate for disposal. The unit rate for disposal based on the $276 million case is $1.83 per cubic foot. The overall net impact of using the lower number would decrease the alternative cost by approximately $8,000,000, which is within the range of accuracy required by the FS. Therefore, to be conservative in estimating Alternative 2 costs, the unit rate of $3.05 will continue to be used.

To account for potential delays in all facets of the work including material transportation, treatment, and placement, a risk budget was calculated for each alternative. The risk budget represents the impact from a 50 percent chance of overrunning the project. This approach to estimating encompasses the potential for delays in performing the work. For Alternative 2, the risk budget was 23 percent (17,600,000) and for Alternative 3 was 24 percent (37,600,000). This risk budget has been included into the total cost for each alternative.

Action: Based on revision of volumes and source terms, the cost estimates in Appendix E including recycling costs, have been updated. As a result of the revision, new cost numbers have been made consistent throughout the document, that is, $93,000,000 for Alternative 2 and $185,000,000 for Alternative 3. This revision is reflected on Page ES-6, Line 15; Page 6-38, Lines 5 and 14; Page 6-42, Table 6-2; and Page 6-44, Table 6-4. Revisions were also made throughout Appendix E based on revised volume and cost information.

SPECIFIC COMMENTS

Commenting Organization: US EPA Commentor: Saric
Section #: Proposed Plan Page #: 11 Line #: NA
Original Specific Comment #: 1
Comment: The proposed plan states that, based on the projected construction period for the on-property disposal cell, it is assumed that remediation materials will be in interim storage for 3 years. DOE should clarify the fact that the on-property disposal cell(OU2) is 3 years away from construction and that 3 years is an adequate amount of time for interim storage of remediation materials that will be placed in the on-property disposal cell.

Response: Agreed. The dismantlement of Building 4A, which is the first structure to be removed under the OU3 interim remedial action, has generated and will generate D&D materials that will be placed into interim storage until it can be placed in the on-property disposal facility. The generation of these materials started with the removal of asbestos-containing pipe insulation (Category H) in June 1995. It is anticipated, based on projected levels of funding, that placement of soil and debris into the on-property disposal facility will begin in September 1997. Since it will take several months to place the "backlogged" remediated soil and debris that will have been in interim storage during this period (in addition to the on-going material generation), the OU3 RI/FS Report and the Proposed Plan have used the estimate of three years as an adequate duration for interim storage.

Action: The text on Page 11 of the Proposed Plan has been modified to read: "The OU3 interim action started generating debris with the removal of pipe insulation from Plant 4 in the summer of 1995. If Alternative 2 is selected, remediation materials from Plant 4 (and following projects) would stay in interim storage for approximately two to three years until the on-property disposal facility is engineered, constructed, and begins accepting OU3 materials. At that time, the movement of remediation materials from interim storage to the disposal facility (as well as newly-generated debris from on-going dismantlement projects) would be prioritized to reduce interim storage requirements."

Also, the figure at the bottom of Page 13 of the Proposed Plan has been modified to show the approximate timing of the availability of the on-property disposal facility to accept OU3 materials. Also, that figure (as well as Figure 5-1) has been modified to correctly distinguish between "interim storage" and "staging" of remediation materials.

Commenting Organization: US EPA Commentor: Saric
Section #: Executive Summary Page #: ES-5 Line #: 9
Original Specific Comment #: 2
Comment: The text states that available recycling options are prohibitively expensive; however, the option to recycle is retained and could be incorporated into the remedy when it is determined to be cost effective or desirable. As with RA 19 (Plant 7 Dismantling), the cost of recycling is not the only factor prohibiting recycling of OU3 remediation materials. The text should be revised to address all factors that limit recycling of OU3 remediation materials.

Response: Agreed. Several factors in addition to cost limit recycling as a viable option for materials generated by the D&D actions. Only a few of the materials within OU3 are viable for recycling; the significant volumes are associated with metal materials in material categories A through D. For many of these materials, inaccessible surfaces will exist where residual contamination cannot be detected or removed. These materials cannot be surveyed for radiological contamination to be released for unrestricted use under DOE Order 5400.5 (NUREG 1.86), preventing successful unrestricted recycling of the material.

Other factors limiting recycling include the few vendors performing recycling, liability for release of materials, and limited uses for contaminated materials. At

this time, few companies perform recycling of radiologically contaminated materials and as a result, minimal competition exists to reduce the costs. Additional factors that are limiting the number of companies willing to perform recycling is the requirement for the company to accept potential liability for the release of the materials. Finally, for the materials that cannot be effectively released for unrestricted use, no market currently exists for the processing of or reuse of contaminated materials.

It is DOE's intent to be consistent with the forthcoming DOE national policy on recycling; however, at this time the policy has not been drafted, but once issued, the Fernald site will perform remedial actions in accordance with the policy. DOE is committed to the cost-competitive recycling and reuse of materials as well as waste minimization.

Specifically, DOE will continue over the life of the D&D of the Former Production Area to aggressively evaluate existing and emerging recycling technologies and markets to identify opportunities for cost-competitive application at the FEMP. DOE also believes that while cost is a driving factor in making project-specific recycling decisions other factors such as stakeholder input are relevant and should be considered as well.

Action: The sentence on Page ES-5, Line 9, has been modified from "Current evaluations indicate that available recycling options are prohibitively expensive, however..." to "Current evaluations indicate that recycling is not a viable option based on limited survey capabilities for inaccessible surfaces, few vendors performing recycling, liability for release of materials, limited uses for contaminated materials, and prohibitively expensive recycling unit rates. However..."

Further, this language has been added to the discussion in Section 4, Page 4-8, Line 6; Appendix E, Section E.3.1, Page E-5, Line 7; and Page E.I-5, Line 3.

Commenting Organization: US EPA Commentor: Saric
Section #: 2.3.2.1 Page #: 2-9 Line #: 18 to 21
Original Specific Comment #: 3
Comment: The text lacks a detailed explanation regarding how the locations for collection of toxicity characteristic leaching procedure (TCLP) samples were chosen. The text should also explain why such a small number of TCLP samples were collected for analysis. The number of TCLP samples collected represents less than 4 percent of the total media type samples collected for acid brick and concrete chips. The text should include a justification for the limited number of samples collected for TCLP analysis and a discussion on the reasoning behind the collection of the eight TCLP samples.

Response: Agreed. Section 2 has been revised to include additional information on determining sample locations. Section 2 was also modified to add a discussion of the original purpose for the collection of these samples.

The original purpose for collection of leachability samples was primarily to gather data for risk assessment needs. These samples were to be used to evaluate the

leachability of contaminants into the soil from the post D&D concrete/acid brick slabs. These samples were not planned to be used to make characteristic hazardous waste determinations (other FEMP programs were established for this purpose). When the WPA was written, only a limited number of samples were needed to gain this information. From the number of samples collected, a representative leachate value for concrete/acid brick would be calculated.

The TCLP method was chosen over less aggressive leaching methods to provide a conservative leachate value. The leachate samples from the TCLP method were analyzed for radionuclides, TAL Inorganics, and TCL Organics using the same methods as other OU3 samples to provide comparative information on all OU3 contaminants of concern (not just RCRA constituents).

Following the cancellation of the OU3 stand-alone baseline risk assessment, a decision was made to use these data (which had already been collected) for a different purpose. The data were evaluated to provide an indication of what levels of contamination in these media may be potentially classified as hazardous under RCRA per the hazardous characteristic criteria in 40 CFR 261, Subpart C.

Action: Incorporated discussion of original purpose and method for determining leachability sample locations from WPA, Page D-9.7, into Page 2-9, Lines 10-12.

Commenting Organization: US EPA Commentor: Saric
Section #: 2.6.1.2 Page #: 2-17 Line #: 40 to 42
Original Specific Comment #: 4
Comment: This sentence should be deleted from the text because it does not apply to the validation problems.

Response: Agreed.

Action: The sentence in question has been deleted from Page 2-17, Lines 40-42;

Commenting Organization: US EPA Commentor: Saric
Section #: 2.6.2.1 Page #: 2-18 Line #: 3
Original Specific Comment #: 5
Comment: The text cites 1988 and 1991 editions of US EPA guidelines for data validation. Although they were current when the RI/FS was planned, these guidelines have been superseded by new editions dated February 1994. DOE should use the new guidelines for future work, such as the actual remediation, and should modify the text citations if the 1994 editions were used.

Response: The 1994 edition of the US EPA guidelines for data validation was not used in the validation of the OU3 RI/FS data. This information has been passed to the FEMP data validation group.

Action: No action.

Commenting Organization: US EPA Commentor: Saric
Section #: 3.2.1 Page #: 3-9 Line #: 34 to 36
Original Specific Comment #: 6
Comment: The text states that "five constituents inadvertently reported by analytical laboratories for several of the media samples were excluded because they were not planned in the WPA and there was a limited number of sample results." The text implies that results were excluded because the sample size was small and because the analyses were not originally planned in the work plan amendment (WPA). The text should clearly explain whether the five constituents can be excluded without losing important data.

Response: Agreed. The five analytes have been fully evaluated in the COC development process.

Action: The referenced sentence was deleted and the five analytes were included in the COC development in Section 3.2 (Page 3-9, Lines 32-37). Appendix A changes include Page A-9 (Lines 27-28), Table A-5, and Table A.V-2.

Commenting Organization: US EPA Commentor: Saric
Section #: Table 3-6 Page #: NA Line #: NA
Original Specific Comment #: 7
Comment: The table lists contaminants of concern (COC), but some of the COCs are enclosed in brackets. DOE should add a footnote to the table explaining the significance of the brackets or should delete the brackets.

Response: Agreed.

Action: Added footnote explaining brackets to Table 3-6 and corresponding Table A-6.

Commenting Organization: US EPA Commentor: Saric
Section #: 3.4 Page #: 3-12 Line #: 25
Original Specific Comment #: 8
Comment: The text contains detailed discussions of the relatively few COCs that are considered to be "more significant" and that are therefore carried forward in the discussions of the various components of OU3. The COC selections appear to be reasonable; all selected COCs were found at relatively high concentrations in at least one sample. However, it would be more useful if the document discussed the many COC listed in Table 3-6 but not considered to be "more significant." This additional discussion need not be as detailed as that already present. A matrix-style table similar to Table 3-5 and some text explaining the criteria for not designating COCs as "more significant" would suffice for most cases. The few borderline cases would require more discussion.

Response: Agreed. A better explanation of the COCs not considered "more significant" would be helpful and appropriate and is included.

Action: The sentence beginning on Page 3-13, Line 10, has been replaced with the following: "Each COC, whether or not it is considered more significant, and the

associated reasons for such designation are presented in Table 3-8." The phrase "along with the reasons they are considered more significant" has been deleted from the last sentence of that paragraph. Table 3-8 has been expanded to include all COCs and designate those considered "more" and "less" significant and the reasons for such designation.

Commenting Organization: US EPA Commentor: Saric
Section #: 3.4.3.3 Page #: 3-22 Line #: 2 - 6
Original Specific Comment #: 9
Comment: Section 3.4.3.3 discusses chromium contamination at OU3 and references Figure 3-10. Figure 3-10 depicts the volume of material considered to be potentially hazardous because of chromium contamination. However, the description in the text of what is depicted in Figure 3-10 does not match what is actually depicted in the figure. For example, the text states that masonry accounts for nearly 90 percent of the volume of material considered to be potentially hazardous because of chromium contamination. However, Figure 3-10 attributes a much smaller percentage to masonry and the largest percentages to acid brick and transite. The text or Figure 3-10 should be corrected, as appropriate.

Response: Agreed that the description of Figure 3-10 does not match the figure.

Action: All figures and descriptions have been reviewed for consistency and corrected. In addition, the amount of material considered potentially hazardous has been changed pursuant to Ohio EPA Comment #1.

Commenting Organization: US EPA Commentor: Saric
Section #: 3.5 Page #: 3-35 Line #: NA
Original Specific Comment #: 10
Comment: Several inconsistencies exist between the source terms appearing in Tables 3-13, 3-14, 3-15, and 3-16 and the text of Section 3.5. For example, Table 3-13 shows concrete waste of 20,100 kilograms (kg), and Section 3.5.4.2.1 shows concrete waste of 17,000 kg; Table 3-14 shows brick waste of 2.5 kg, and Section 3.5.4.2.2 shows brick waste of 25 kg; Table 3-15 shows chromium in concrete waste of 3,180 kg, and Section 3.5.4.2.3 shows chromium in concrete waste of 31,890 kg; and Table 3-16 shows lead with crud and dust waste of 16,000 kg, and Section 3.5.4.2.4 shows lead with crud and dust waste of 1,600 kg. These inconsistencies should be corrected. Also, DOE should discuss the effects that these discrepancies have had on determining contaminant mass and WAC.

Response: Agreed. Typographical errors in placement of commas were made. Also, tables and text noted seem inconsistent on the surface, because of the table organization, i.e., the material category for concrete encompasses concrete, masonry, and asphalt. However, the text discussed discrete materials within the concrete material category, such as concrete and asphalt. Since the information in these tables was not organized to provide discrete material source terms but was organized as summary tables, the reported values were inconsistent between the text and tables. There was no effect on the determination of contaminant mass or WAC as discussed in the response to US EPA General Comment #6.

Action: In Section 3.5.4, Pages 3-32 through 3-36 have been revised to incorporate revised source term numbers and to be consistent with tables and figures. The source term by material category and component category are now graphically represented in Figures 3-17 through 3-34.

Commenting Organization: US EPA Commentor: Saric
Section #: 3.6.1 Page #: 3-40 Line #: 9-37
Original Specific Comment #: 11
Comment: The text assumes a 1.0 percent "holdup layer" of uranyl nitrate hexahydrate (UNH) for the interior of process piping and a 0.1 percent holdup layer of UNH for the interior of process equipment. This holdup material is a major source of uranium contamination and may have a significant impact on the remedial action or the WAC for the on-property disposal cell. DOE does not state the basis for the assumed percentages of UNH holdup material. DOE should provide quantitative data to support its assumptions. Also, Line 34 states that the assumption of 10 percent UNH holdup is overly conservative. DOE should clearly state how the amount of UNH holdup in the interior of process equipment was estimated and the rationale for its approach.

Response: DOE acknowledges US EPA's concern on the manner in which holdup material is calculated for the uranium source term estimation. To address this concern and that of OEPA Comment # 53, it is first necessary to clarify two potential misunderstandings.

The text in Section 3.6.1 describes a sensitivity analysis assuming holdup material in process piping and process equipment. The sensitivity analysis was performed to assess the relative impact of specific assumptions on the source term. The actual assumption used in calculation of the source term is stated in section 3.5.2.1 on Page 3-31. The fourth bullet states that the source term calculation uses a 10 percent holdup layer assumption of uranyl nitrate hexahydrate (UNH) within process piping and a 1 percent holdup layer assumption for the interior of process equipment. These percentages are based on process knowledge estimates. While holdup material is indeed the major source of uranium, its quantity has little effect on the remedial action. Holdup material will be removed from piping and equipment and placed in FS Material Category J. Material Category J is not considered for on-property disposal. Additionally, as described in the response to US EPA General Comment #6, the source term has minimal impact on the WAC for on-property disposal.

UNH was chosen to represent the holdup material on a sitewide basis. Over many years of use, the interior of process piping and equipment accumulated material, and this buildup contained significant percentages of uranium and water. UNH is 43 percent uranium by weight, and has been known to coat the interior of process piping and equipment. A single compound used to represent all holdup material is practical and appropriate given the relatively large uncertainty that is inherent with this task. The 43 percent uranium content also represents a more typical concentration than would a high uranium content compound such as UF_4 (~75 percent) or the low uranium content residues (~5 percent).

The text states that the 10 percent holdup layer of UNH within process piping is overly conservative. The conservative nature of this assumption is validated through examination of recent data generated via Safe Shutdown (Removal Action No. 12) activities within Plant 4. The following material quantities were collected from Plant 4 during implementation of D&D activities. The material identified represents materials removed from piping and ductwork; however, to be conservative, it will be assumed that all this material was removed only from piping. This material would correspond to Material Category B and C materials. DOE estimates that the material remaining in the piping after completion of Safe Shutdown activities will not exceed 5 percent of what was removed.

Material	Weight in Pounds	Weight in Kilograms	Density of Material	Volume in Cubic Meters	Volume in Cubic feet
UF_4	15826	7185	6.7 g/cc	1.072	37.9
UO_2	3084	1400	10.97 g/cc	0.128	4.5
U_3O_8	1403	637	8.38 g/cc	0.076	2.7
UO_3	1590	722	7.3 g/cc	0.099	3.5
All material	21903	9944		1.375	48.6

Conversions - 0.454 kg/pound, 0.3048 m/ft

Process piping in Plant 4 can be broken down into three diameters - 2 inches and less (92,748 linear feet), between 2 1/2 inches and 4 inches (15,564 linear feet), and greater than 4 inches (10,260 linear feet). The linear feet for each group is converted to cubic feet using pipe diameters of 2, 4, and 6 inches for the three groups. The volume of the smaller piping is calculated at 2,023 cubic feet, the middle size pipe volume is calculated at 1,358 cubic feet, and the larger pipe volume is calculated at 2,015 cubic feet. The total volume of all Plant 4 piping is 5,396 cubic feet. Using the convention identified in the Sitewide Waste Inventory Forecasting and Tracking System (SWIFTS) that 90 percent of all piping in process and process support category structures are considered to be process piping, the total volume of process piping in Plant 4 is calculated to be 4,856 cubic feet.

During the D&D of Plant 4, a quantity of process piping was removed and placed in closed containers. Using the best available estimates, this piping was calculated (using the average weight and diameter of the overall piping) to be about 850 linear feet or about 75 cubic feet. This amount of piping removed from the total volume of piping reported in the above table leaves 4,781 cubic feet of process piping. It should be noted that the 850 linear feet of piping removed from the calculation represents only 2 percent of all Plant 4 process piping, contains less than 20 percent by volume holdup material, and would not significantly affect the calculated holdup quantity.

Approximately 48.6 cubic feet of holdup materials were removed from Plant 4 process piping. DOE estimates an additional 5 percent of the material removed will

remain in the piping, bringing the total holdup quantity to 51 cubic feet. When compared to the total volume of process piping in Plant 4 (4,781 cubic feet), the percentage of holdup for all Plant 4 process piping is calculated at 1.1 percent. Therefore, the estimate of the holdup material at 10 percent for the process piping is very conservative.

The 1 percent estimate for process equipment holdup is based on the relatively limited cavity space available within the equipment and the low likelihood that significant contamination was allowed to buildup in process equipment. These two factors, coupled with the actual holdup material determined for Plant 4 process piping, verify the conservativeness of the process equipment holdup estimate.

Action: Appendix B.2.3.1, Pages B-6 and 7, have been revised to provide further support for the holdup assumption.

Commenting Organization: US EPA Commentor: Saric
Section #: 5.2.2 Page #: 5-7 Line #: 15
Original Specific Comment #: 12
Comment: The text states that "because limited quantities of soil are available until the OU5 remediation of the former production area, OU3 materials may require temporary storage prior to placement in the on-property facility." DOE should provide details on the duration of temporary storage and on the types of temporary storage facilities that will be provided.

Response: As presented in the response for US EPA General Comment #5, detailed information concerning the interim storage of OU3 materials falls outside the scope of this document. Please reference the Removal Action No. 17 Work Plan (Revision 3) and supporting site procedures, and the OU3 Prioritization and Sequencing Report.

Action: "Temporary" was changed to "interim" for clarity; see change Page 5-7, Line 16.

Commenting Organization: US EPA Commentor: Saric
Section #: 5.2.4 Page #: 5-9 Line #: 7
Original Specific Comment #: 13
Comment: The text states that institutional controls and long-term monitoring measures are not evaluated in the document because the measures specified in the OU2 and OU5 record of decision (ROD) are adequate for OU3 remediation materials. However, the text should incorporate a discussion of the specific institutional controls required by the OU2 and OU5 ROD that apply to interim storage of OU3 remediation materials.

Response: The long-term monitoring measures and the institutional controls for perpetual federal ownership of the site do not pertain to the interim storage of OU3 materials. The anticipated time frame during which the materials will be stored (primarily 1995 through 1997) will not exceed the duration of the anticipated ten-year remediation schedule. Current, ongoing monitoring programs and institutional controls will be

used for the interim storage of OU3 materials. Supplemental monitoring of the interim-stored materials is discussed in the Removal Action No. 17 Work Plan.

Action: The term "long-term" has been placed preceding "institutional controls" on Page 5-9, Line 6.

Commenting Organization: US EPA Commentor: Saric
Section #: 5.3.2 Page #: 5-12 Line #: 9
Original Specific Comment #: 14
Comment: The text indicates that an estimate of the OU3 remediation materials requiring interim storage is presented in Table 5-1. Table 5-1 identifies the quantity of materials generated by D&D of above-grade elements of Plants 4A, 1A, and 9A and projected to be in interim storage from 1995 to 1997. The text should be revised to indicate whether Plant 7 materials not accepted for unrestricted release are included in the estimate. The table should be revised to include a more comprehensive estimate of the volume of remediation materials projected to be in interim storage throughout the remediation activities.

Response: Agreed. Approximately half of the Plant 7 structural steel has been sent back to the FEMP from an off-site recycling contractor. These material volumes will be placed into interim storage in addition to the OU3 interim remedial action materials.

The volumes presented in Table 5-1 represent the OU3 materials anticipated to be generated prior to initiating waste placement in the on-property disposal facility.

Action: The Plant 7 material volumes have been added to Table 5-1. Any text concerning which building materials will be placed in interim storage has been revised to include Plant 7.

Commenting Organization: US EPA Commentor: Saric
Section #: 5.4 Page #: 5-13 Line #: 33
Original Specific Comment #: 15
Comment: The text indicates that the administrative requirements of the Interim Record of Decision (IROD) specify that OU3 remediation materials are not to be kept in an interim storage configuration for an extended period of time. The text should be revised to clarify that the materials are projected to remain in interim storage from 1995-1997.

Response: This sentence is located at the beginning of a general discussion on the approach to alternative development. The sentence was not intended to present a timeframe for interim storage. It was presented only to reiterate the requirements of the IROD.

Action: No action.

Commenting Organization: US EPA Commentor: Saric
Section #: 5.4 Page #: 5-14 Line #: 15
Original Specific Comment #: 16
Comment: The text states that, in accordance with the IROD, materials generated from dismantling of former production facilities will not remain in on-property interim storage for an indefinite time. The text should provide more detailed information regarding the duration of interim storage of various OU3 remediation materials. In addition, the text should address the overall planning needed for coordinating the interim storage of remediation materials from other OUs. The text should be revised to include a discussion of the major interim storage needs and the estimated durations of storage. Moreover, the text should reference Table 5-1 (after the table has been revised) to provide a more comprehensive summary of the volumes of remediation materials to be maintained in interim storage and the associated storage durations. In addition, DOE should consider providing figures in the document that display interim storage space availability and the volumes of remediation materials requiring interim storage at various times throughout the 10-year remediation schedule.

Response: Please see the respective responses for US EPA General Comment #5 and US EPA Specific Comment #14.

Action: Please refer to the respective actions for US EPA General Comment #5 and US EPA Specific Comment #14. Additionally, the text in Lines 15 and 16 on Page 5-14 has been deleted.

Commenting Organization: US EPA Commentor: Saric
Section #: 5.5.2.1 Page #: 5-20 Line #: 15
Original Specific Comment #: 17
Comment: The text states that the interim storage facility would be used only for Plant 4A, 1A, and 9A remediation materials. The text should identify the location and duration of interim storage for remediation materials from Plant 7 (RA 19).

Response: Please see the respective responses for US EPA General Comment #5 and US EPA Specific Comment #14.

Action: Please refer to the respective actions for US EPA General Comment #5 and US EPA Specific Comment #14.

Commenting Organization: US EPA Commentor: Saric
Section #: 5.5.2.1 Page #: 5-23 Line #: 31
Original Specific Comment #: 18
Comment: The text states that about 26,800 truck trips would be required to convey the OU3 remediation materials to the on-property disposal cell. The text should be revised to include the estimated truck volume or weight used to calculate the estimated number of truck trips.

Response: Agreed. The number of on-property truck shipments is directly related to the number of roll-off boxes that will be required to transport all applicable materials to

the on-property disposal facility. The cost estimated for Alternative 2 assumed that all materials, with the exception of some Category D materials, would be transported to the on-property facility in roll-off boxes. The excluded Category D materials (lead flashing) will be placed into B-12 metal boxes during the IROD D&D activities since additional treatment of these materials may be required.

The number of roll-off boxes required to transport OU3 materials was based upon either the weight capacity or the internal volume of a roll-off box. The density and bulking factors of specific materials determined if the weight or volume capacity of the ROB were to be used. For example, the estimated number of ROBs needed to ship structural steel was based upon the internal volume of a roll-off box, which is 810 ft^3 structural. Likewise, the estimated number of ROBs to ship concrete was based on the weight capacity of the ROBs, which is 33,000 pounds.

A summary of the number of roll-off boxes per material category required to transport OU3 materials is presented in Appendix E, Table E-22 of the RI/FS report. Based on the revision of the cost estimate, the number of containers used in the project has changed and is now 29,000 number of on-property truck trips.

Action: The text on Page 5-23, Line 31 has been revised to reflect the information presented above. The estimated number of truck shipments has been revised to 29,000 to provide continuity between the Section 5 text and Table E-22. Additionally, a reference to Table E-22 has been included in the Page 5-23 text.

Commenting Organization: US EPA Commentor: Saric
Section #: Table 5-3 Page #: 5-37 Line #: NA
Original Specific Comment #: 19
Comment: The FS category column of the table does not include a category description. The table should be revised to include the category description.

Response: Agreed.

Action: Table 5-3 has been modified to include the FS category description.

Commenting Organization: US EPA Commentor: Saric
Section #: 6.3.2.5 Page #: 6-22 Line #: 19
Original Specific Comment #: 20
Comment: The text states that the estimated total cost benefit to implementing Alternative 2 instead of Alternative 3 would be $80,000,000. The text should be revised to explain how this total cost benefit value was derived.

Response: Agreed. The text does not compare the estimated total cost benefit of implementing Alternative 2 instead of Alternative 3. The text in Line 19, Page 6-22, states, "estimated total cost benefit to the CMSA of implementing Alternative 2 would be $77,000,000." The general parameters of developing the estimated total cost benefit were presented in Lines 14-16 on Page 6-22. The specific costs of these parameters (i.e, on-property disposal costs, materials containers, on-property

labor, etc.) were drawn from Appendix E, Table E-4 and summed to provide an estimated total cost benefit of implementing Alternative 2.

Action: The socioeconomic and land use section has been revised to include the additional information discussed in the response to this comment. Text within the section has also been reorganized to improve readability. See change Page 6-22, Line 13.

Commenting Organization: US EPA Commentor: Saric
Section #: 6.4.2.4 Page #: 6-37 Line #: 19 to 23
Original Specific Comment #: 21
Comment: Section 6.4.2.4 compares the implementability of Alternatives 1 through 3. The implementability of Alternative 3 as compared to that of Alternative 2 is not well explained. The text should be revised to discuss (1) the potential administrative difficulties of coordinating shipments of waste with state and local authorities whose jurisdictions lie along waste transportation routes and (2) the uncertainty of reaching agreements with off-site disposal facilities.

Response: Agreed.

Action: The text on Page 6-37, Lines 11-23 has been revised to include additional information pertaining to the implementability comparison between Alternative 2 and Alternative 3.

Commenting Organization: US EPA Commentor: Saric
Section #: A.4.2.1.5 Page #: A-19 Line #: 12
Original Specific Comment #: 22
Comment: The text states that U-234 abundances indicate that just two samples contain the elevated U-234 ratios indicative of two percent U-235 enriched uranium. The text should consider the fact that minor count differences near the sample detection limit result in high relative variances in ratios of the lighter isotopes to U-238. Also, uranium enrichment is defined in terms of U-235 content. Therefore, the text should use the U-235 result and not the U-234 result to define whether a particular sample is enriched, depleted, or normal.

Response: The uranium industry typically uses mass spectroscopy to determine the enrichment of uranium. The convention of expressing enrichment in terms of percentage of uranium-235 (by weight) is based on this analytical technology. The reviewer correctly points out that uranium-234 results of "mass spectroscopy" analyses are typically more variable than uranium-238 or uranium-235. However, the uranium isotopic data presented in the OU3 report are not mass spec results.

The data quality objectives for this project require that the analyses be of sufficient quality to determine the risk of exposure to uranium. The risk from uranium is dependent on the activities of its isotopes. Alpha spectroscopy provides a direct measure of this activity and was therefore selected as the method of choice for this task. Uranium-238 and uranium-234 make up the bulk of the activity in uranium, while uranium-235 is a minor contributor to the total alpha activity of uranium produced by diffusion cascades, regardless of its enrichment. Its quantification is

further complicated because the uranium-235 spectral peak is sandwiched between the uranium-238 and uranium-234 peaks. This often results in the tail of the uranium-234 peak over-lapping the uranium-235 peak. When this happens, it produces an upward bias of the uranium-235 results. Finally, uranium-235 activity is much lower than the uranium-234 activity in all uranium passed through the cascade enrichment process. This means uranium-235 will approach the instrument detection limit before uranium-234. Thus one expects uranium-235 alpha spectroscopy data to be more variable at low activity concentrations than corresponding uranium-234 data.

It is for these reasons that uranium-234 was selected to detect uranium enrichment at the site. DOE does not feel that uranium-235 activities produced by commercially available alpha spectrographic analyses should be used to directly calculate the degree of uranium-235 enrichment in uranium found at the FEMP.

Action: The following text was inserted on Page A-19, Line 7:

"The uranium production industry typically uses mass spectroscopy to determine the enrichment of uranium. However, the data quality objectives for this project require that the analyses be of sufficient quality to determine the risk of exposure to uranium. The risk from uranium is dependent on the activities of it isotopes. Alpha spectroscopy provides a direct measure of this activity and was therefore selected as the method of choice for this task."

Commenting Organization: US EPA Commentor: Saric
Section #: A.I.2 and A.I.3 Page #: A.I-3 to A.I-7 Line #: NA
Original Specific Comment #: 23
Comment: Section A.I.3 defines baseline concentrations of radionuclides, and Section A.I.2 defines baseline concentrations of metals. However, different statistical tests and criteria are used in the two sections. For example, the Kolmogorov-Smirnov test and the Shapiro-Wilkes test are used for normality, Rosner's test and Dixon's test are used for outliers, and a 95 percent UCL on the mean and a 95th percentile of the distribution are used for the baseline criterion for defined distributions. The statistical tests are practically identical in their results, but the 95th percentile criterion will exceed the 95 percent UCL on the mean criterion. DOE should be consistent in its statistical practices unless it can provide a reason for using varying practices.

Response: Baseline concentrations for concrete and steel coatings (metals and radionuclides) have been recalculated using Kolmogorov-Smirnov for distribution and Rosner for outliers. For concrete, the 95th percentile has been defined as the baseline concentration for both metals and radionuclides. Inadvertently, the source term correctly used the 95th percentile in its calculations for the September submittal. No distributions or outlier changes occurred when re-evaluating the datasets. No table changes involving data distribution or outliers are necessary in this appendix.

The baseline concentration for steel coatings has been defined differently. Because of the nature of the data and the non-uniformity of paint in general (lead based

versus non-lead based, different colors), the UCL of the mean value will be used for the baseline concentration for steel scrapings. For example, the steel scrapings contained data from both lead based paint (lead values as high as 367,000 ppm) and non-lead based paint. If the 95th percentile of the data set was used for lead, the baseline concentration would be representative of lead based paint. Since not all paint at the FEMP is lead based, this baseline concentration is inappropriate for much of the paint on site.

Also, other metal concentrations in paint vary greatly because of color. The 95th percentile as a baseline concentration would be representative of a specific color for some paints. In other words, the baseline concentration for chromium would be representative of a color which had high chromium values. Because not all paint at the FEMP is the same color, the baseline concentration in these cases is inappropriate for much of the paint on site. Therefore, the UCL of the mean in steel coatings is a more appropriate baseline value to use.

Action: The data used to calculate baseline concentrations for concrete and steel coatings have been re-evaluated using one test (Kolmogorov-Smirnov) for distribution and one test (Rosner) for outliers. Section A.I.3.3, Pages A.I-7 and A.I-8, has been edited to reflect these changes.

Section A.7.1 of Appendix A contains the information used to recalculate concrete radionuclide baseline concentrations for trace metals and radionuclides. The data have been evaluated in the same statistical manner, and both the trace metals and radionuclides used the 95th percentile as the baseline concentration. This information is summarized in Tables A-9 through A-12.

Commenting Organization: US EPA Commentor: Saric
Section #: A.I.2.3 Page #: A.I-6 Line #: 10
Original Specific Comment #: 24
Comment: This text states that the 95th percentile is used as the baseline (background) criterion for undefined distributions although the 95 percent upper confidence limit (UCL) on the mean is used for normal and lognormal distributions. This practice will elevate the criteria for data sets with undefined distributions. As a numerical example, given a typical data set of 27 samples with a normal distribution and a standard deviation of half the mean, the 95 percent UCL on the mean of this data set is the 65th percentile; more samples or a smaller relative standard deviation would result in a lower percentile as the confidence limit on the mean. DOE should either (1) revise the baseline criteria for defined and undefined distributions to make them comparable, as is the case in Section A.I.3.3, or (2) include an explanation of the impact of using the 95 percentile as the baseline criterion for undefined distributions on the calculated risks and development of WACs.

Response: The equation and text in Section A.I.2.3 for the baseline criteria of undefined distributions were incorrect. The baseline concentration for undefined distributions uses the 95 percent Upper confidence Limit (UCL) of the median value of the data set for steel scraping samples. For normal and lognormal distribution of the data, the baseline concentration is calculated using the UCL of the mean value of the data set (equations in Section A.I.2.3). The baseline criteria for all distributions of

steel coating data are comparable by using the UCL of the median value of the data set for an undefined distribution and the UCL of the mean value for normal and lognormal distributions.

Action: The equation for calculating the UCL of the median has replaced the 95th percentile determination in Section A.I.2.3 (Page A.I.7, Lines 1-3), and the appropriate text has been edited (Page A.I.6, Lines 8-12).

Commenting Organization: US EPA Commentor: Saric
Section #: A.I.4 Page #: A.I-13 Line #: 6
Original Specific Comment #: 25
Comment: The text cites Table A.I-14 for representative steel compositions but the table is not present in the document. DOE should include the table, which should address both common steels used in structural members and concrete-reinforcing bars and unusual alloys used both in high-temperature and low-temperature, corrosion-resistant process vessels and piping.

Response: Agreed.

Action: Table A.I-14 has been included and modified to provide composition information on the unusual alloys Inconel and Monel.

Commenting Organization: US EPA Commentor: Saric
Section #: Tables A.1-4 and A.1-5 Page #: A.I-18 and A.I-19 Line #: NA
Original Specific Comment #: 26
Comment: Tables A.I-4 and A.I-5 have some distributions listed as "undefined." For each table, a footnote or the accompanying text should explain that the data sets involved were poor matches to both the normal and lognormal distributions.

Response: Agreed.

Action: The following footnote was added to Tables A.I.-4 and A.I-5: undefined distribution - data set did not match either a normal or lognormal distribution

Commenting Organization: US EPA Commentor: Saric
Section #: A.II.2.1.3 Page #: A.II-6 Line #: 20
Original Specific Comment #: 27
Comment: The text references Figures A.II-1 through A.II-3 as showing natural decay chains. However, these figures depict observed activities of Am-241 and Cs-137. DOE should include the decay chain figures (and renumber subsequent figures) or delete the reference.

Response: Agreed.

Action: The words "Figures A.II-1 through A.II-3"on Page A.II-6, Line 20, were changed to "Exhibits A.II-1 through A.II-3," and the three decay chains were inserted as exhibits between the tables and figures in the back of Attachment A.II.

Commenting Organization: US EPA Commentor: Saric
Section #: A.II.2.1.4 Page #: A.II-7 Line #: 25
Original Specific Comment #: 28
Comment: The text provides a useful discussion of secular equilibrium. However, the statement that the concentrations of the decay products would approach the concentration of the parent is inaccurate. The word "concentrations" should be changed to "activities." Also, DOE should consider adding a statement that the concentrations of various radionuclides with the same activity will vary considerably, with the concentrations being proportional to the half-lives.

Response: The text is referring to activity per unit mass or volume and not mass per unit mass or volume.

Action: On Page A.II-7, Line 25, the text was changed from "...its decay products would be present in concentrations approaching that of..." to "...the activity concentrations of its decay products would approach that of..."

Commenting Organization: US EPA Commentor: Saric
Section #: A.IV.2.2 Page #: A.IV-15 Line #: 7
Original Specific Comment #: 29
Comment: Section A.IV.2.2 discusses the Plant 4 Warehouse, which was formerly used to store uranium compounds. DOE collected no samples here because high background radiation readings precluded the planned hot spot survey. With no further evidence, DOE concluded that the structure contains only baseline concentrations of contaminants. This conclusion is premature; contamination in this building could be contributing to the high background readings. The Plant 4 Warehouse should be considered to be contaminated with an unknown level of radioactivity until it is proven otherwise. The same comment applies to the Plant 5 Covered Storage Pad (discussed in Section A.IV.2.4), which stores uranium residue waste, and all other components of OU3 where radioactive or hazardous materials have been present and planned sampling was not carried out.

Response: DOE agrees that these components should not have had baseline values applied for the determination of the contaminated mass source term. In evaluating this comment, a total of four unsampled components were identified as having radiological screening activities exceeding the OU3 RI sampling criteria, but having baseline values applied to estimate the contaminated mass source term for the component. These components include: the Plant 4 Warehouse (4B), the Plant 5 Covered Storage Pad (5F), the Drum Storage Warehouse (30B), and the Plant 6 Electrostatic Precipitator (North)(6E). In all cases, the component was not sampled for safety (ALARA) reasons.

Process knowledge should have been used to identify surrogate components whose analytical results would be applied to the unsampled, contaminated, components. This same technique was used to characterize the unsampled Quonset Hut #1 (60), Quonset Hut #2 (61), and (Old) Plant 5 Warehouse (65) by applying results from the Thorium Warehouse (64).

Action: The component writeups in A.IV (Pages A.IV-15, 16, 25, and 97), have been modified for these four components identifying the surrogate components substituted (see below) for the baseline values. Also, Page 3-31 has been added to Section 3.5.2.2, Page 3-31, and Page B-15 in Appendix B.3.2 explaining the rationale for all six components.

DOE has revised the source term calculations by applying analytical results from surrogate components to the components listed above. The General In-Process Warehouse (71) analytical results were used to characterize the Plant 4 Warehouse (4B), the Plant 5 Covered Storage Pad (5F), and the Drum Storage Warehouse (30B). The General In-Process Warehouse (71) was chosen as a surrogate because the radiological results (i.e., elemental uranium and technetium-99) from this component were the maximum radiological results for Component Category 2 - Warehouse and Storage Buildings. The Plant 6 Electrostatic Precipitator (South) (6C) was used to characterize the Plant 6 Electrostatic Precipitator (North) (6E).

Commenting Organization: US EPA Commentor: Saric
Section #: A.IV.3.13 Page #: A.IV-114 Line #: 5
Original Specific Comment #: 30
Comment: Section A.IV.3.13 discusses investigation of the Rotary Kiln/Drum Reconditioning Building. The text notes that this component was sampled even though surface survey results were well below the sampling criteria. The actual analytical results exceeded baseline criteria by factors as large as four (for elemental uranium). This implies that the sampling criteria are too high and that other areas designated as "baseline" during the surface survey may also be contaminated at levels well above baseline criteria. In determining disposal options for various materials in OU3, DOE should ensure that every material meets appropriate criteria either by sampling and analyzing the material or by revising the sampling criteria to include an adequate margin of safety.

Response: The Rotary Kiln/Drum Reconditioning Building is considered an anomaly in the OU3 sampling program. After the WPA was approved, it was learned that the interior wall of the Rotary Kiln/Drum Reconditioning Building (8C) was originally the exterior wall of a major processing plant, the Recovery Plant (8A). The concrete pad surrounding the Recovery Plant was used to store process material and residues. The knowledge of these possible sources of contamination superseded the sampling criteria and prompted the intrusive sampling. The samples were collected in the floor next to this north wall.

There was no information on any other non-sampled components that dictated superseding the radiological surveys and OU3 sampling criteria. Based on the Rotary Kiln/Drum Reconditioning Building (8C) being an anomaly, DOE does not believe that this invalidates the OU3 sampling criteria. DOE believes that the WPA sampling approach provided an adequate margin of safety. Please see the response to US EPA General Comment #7 for additional explanation.

Action: The component specific writeup for the Rotary Kiln/Drum Reconditioning Building (8C), Page A.IV-114, was modified to include the reason for sampling.

Commenting Organization: US EPA Commentor: Saric
Section #: B.2.1 Page #: B-3 Line #: 30
Original Specific Comment #: 31
Comment: The text states that the surface of accessible steel can be easily decontaminated. Recent decontamination efforts involving Plant 7 structural steel (discussed in a DOE letter dated September 27, 1995) indicate that the surface of accessible steel may not always be easily decontaminated. Based on this experience, DOE should revise the statement and other parts of the RI/FS report where ease of steel decontamination is assumed.

Response: Agreed. It was not intended for the text to imply that the surface of accessible steel can always be "easily" decontaminated.

Action: The text on Page B-3, Lines 30-33, has been revised to read, "....The surface of accessible metals are accessible for application of physical surface decontamination techniques, as well as, subsequent radiological surveys prior to disposition.".

Commenting Organization: US EPA Commentor: Saric
Section #: B.2.3.6 Page #: B-9 Line #: 2
Original Specific Comment #: 32
Comment: The text assumes that all concrete below grade is uncontaminated and applies baseline values to this material. Below-grade concrete accounts for 40 percent of the concrete and about 20 percent of the material in material category E. The soils and perched groundwater in the production area have significant levels of radiologic and organic contamination. This contamination is in direct contact with below-grade concrete, indicating that the assumption that all below-grade concrete is uncontaminated is incorrect. DOE should modify its assumption and should recalculate the source term and the uranium WAC using contaminated below-grade concrete.

Response: Agreed. The effect of applying subsurface soil values to below-grade concrete should be investigated, and the impact on the source term evaluated. A sensitivity analysis was completed using the maximum subsurface soil results (depth of 5-10 feet) from beneath Plants 6, 2/3, 9 and Plant 1 Pad were applied to below-grade concrete associated with components in Plant 6, 2/3, 9 and the Plant 1 Pad. The concrete foundation and footers were assumed to extend into the perched groundwater zone and to be contaminated throughout the concrete material, thus all of the below-grade concrete in Plants 6, 2/3, 9, and the Plant 1 Pad were assumed to be completely contaminated.

Maximum subsurface soil results (3-5 feet) were applied to below-grade concrete for all other components, based on the assumption that the foundations extended approximately 5 feet down. The top one inch of concrete was assumed to be contaminated, the remaining 7 inches were assumed to be relatively uncontaminated. Baseline values were applied to this volume of concrete.

The result of this sensitivity analysis is an increase in the elemental uranium and technetium-99 source term by less than one hundredth of a percent. Thus, the

assumption applied to below-grade concrete was adequate in calculating the source term.

Perched groundwater results were not used for two reasons: 1) There is no partitioning coefficient available for relating the concentration of contaminants in the groundwater to solid samples (all work has been to determine the amount that leaches from solid samples); and 2) In many cases the contaminant levels in the subsurface soil are greater (on a strictly ppm basis), indicating the adsorption effects of the soil, and therefore provide more conservative results.

Action: To further evaluate the impact of applying subsurface soil results to below-grade concrete, subsurface soil samples located within the production area have been evaluated and compared to the baseline values used in determination of contaminant mass for below-grade concrete. Section B.6.1.12 has been added on Page B-39 to discuss the impact of applying OU5 subsurface soil results to below-grade concrete. This sensitivity analysis has also been summarized in Section 3.6.1., Page 3-40 and 3-41.

Commenting Organization: US EPA Commentor: Saric
Section #: B.3.2 Page #: B-15 Line #: 8
Original Specific Comment #: 33
Comment: The text states that application of maximum contaminant values to unsampled materials may result in an unrealistic source term. However, using the baseline value for below-grade concrete will result in a source term value that is biased low. DOE should re-evaluate the source term for below-grade concrete.

Response: Agreed. See response to US EPA Specific Comment #32.

Action: See action to US EPA Specific Comment #32.

Commenting Organization: US EPA Commentor: Saric
Section #: B.3.6 Page #: B-16 Line #: 23
Original Specific Comment #: 34
Comment: Estimating the mass of metals in the transite by multiplying the leachate result by 20 liters per kilogram will likely underestimate the total mass of metals. To reliably estimate the mass of metals in the transite, DOE should sample and analyze the transite materials.

Response: Agreed. The 20 L/kg value reported in the text was an error and has been corrected to reflect the 60L/kg actually used.

Action: The text on Page B-16, Line 23 has been revised to read "... by 60 L/kg.".

Commenting Organization: US EPA Commentor: Saric
Section #: B.7 Page #: B-35 Line #: 31
Original Specific Comment #: 35
Comment: The text states that materials such as holdup, dust, and interior crud will be "removed." It appears that the contaminant mass associated with these materials was not used in calculating the WAC. DOE should explain what "removed" refers to and how these materials affect calculation of the WAC.

Response: Ninety percent of all process piping and process equipment is assumed available for on-property disposal. It is assumed that, during cleanup activities, of this 90 percent, all holdup materials in process piping and process equipment will be removed and drummed for off-site disposal, leaving the metal piping and equipment available for potential on-property disposal; thus in the source term, the volume of material representing the holdup from process piping and equipment is categorized in Material Category J, and the metal piping and equipment is categorized in Material Category B. It is assumed that 10 percent of process piping and equipment will be heavily contaminated and not easily cleaned of holdup, crud or dust. These materials (including the holdup, dust, and crud) are categorized as process-related metals in Material Category C and are assumed to be dispositioned off-site. Dust present on the surface of process piping and process equipment is assumed to be 5 mil thick. During gross decontamination cleanup activities, it is assumed that 4 mil of dust would be removed leaving a 1 mil dust residue on the surface of the piping or equipment. The volume associated with the 4 mils of dust removed would be placed in Material Category J for potential off-site disposal.

Materials which are assumed to be removed as part of cleanup activities were used in determination of contaminant mass. Since these materials are categorized in Material Category J (destined for off-site disposal) they were not considered in the WAC development process. Further clarification on the relationship of the source term to the WAC development process is provided in the response to US EPA General Comment #6.

The assumptions associated with holdup, dust, paint and CRUD are discussed, including assumptions related to the amount of material remaining after possible cleanup, removal or decontamination procedures. Figures B-4, B-5, and B-6 provide logic diagrams of the categorization of piping, ductwork,equipment, and the associated layers and coatings associated with these materials. Process piping is assumed to contain a 10 percent holdup consisting of crystallized UNH (43 percent uranium), a 1 percent CRUD layer, and a 5 mil surface dust layer.

Action: No action.

Commenting Organization: US EPA Commentor: Saric
Section #: C Pages #: Table C-1, C-2 and C-5 Line #: NA
Original Specific Comment #: 36
Comment: Appendix C discusses potential applicable or relevant and appropriate requirements (ARAR) and other criteria to be considered. Tables C-1 and C-2 appear to miscategorize promulgated regulations as other criteria to be considered for OU3. This occurs for several regulations in each table. In most cases, the

same regulations are categorized as ARARs for other OUs. Promulgated regulations may be ARARs but not other criteria to be considered. Tables C-1 and C-2 should be reviewed, and these apparent discrepancies should be corrected. In addition, Table C-5 identifies the Toxic Substances Control Act (TSCA) Polychlorinated Biphenyl (PCB) Spill Cleanup Policy as being relevant and appropriate to OU3. The TSCA PCB Spill Cleanup Policy is not considered to be promulgated even though it has been published in the *Federal Register*. This policy should be identified as other criteria to be considered.

Response: The National Oil and Hazardous Substances Pollution Contingency Plan specifies that the "other criteria to be considered" consist of advisories, criteria, or guidance that were developed by EPA, other Federal agencies, or states that many be useful in developing CERCLA remedies. While the regulations in question are fully promulgated and would not be included as "other criteria to be considered" under EPA guidance, a more liberal interpretation of the definition was taken; these regulations are not applicable or relevant and appropriate for this response action. Therefore, they have been deleted for the OU3 FS Options. With regard to the PCB Spill Policy, it was identified as "other criteria to be considered" in Table C-3; Table C-5 was revised to be consistent with Table C-3 and the US EPA comment.

Action: Table C-1, C-2, and C-5 have been revised; see change pages C-11, C-14, C-16, C-17, C-22, C-24, C-28, C-30, and C-39.

Commenting Organization: US EPA Commentor: Saric
Section #: C.1 Page #: C-1 Line #: 7
Original Specific Comment #: 37
Comment: The text references Section 300.68(i)(1) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). However, Section 300.68 does not exist in the most recent version (September 15, 1994) of the NCP. The correct NCP reference appears to be Section 300.430(f)(ii)(B). The NCP reference should be corrected.

Response: Agreed.

Action: Text has been revised on page C-1, line 7.

Commenting Organization: US EPA Commentor: Saric
Section #: Table D-1 Page #: D-37 Line #: NA
Original Specific Comment #: 38
Comment: The table provides a description of truck transport for the rail transport process option and a description of rail transport for the truck transport process option. The process option descriptions should be corrected in the table.

Response: Agreed.

Action: Table D-1 on Page D-37 has been corrected to provide the correct descriptions.

Commenting Organization: US EPA Commentor: Saric
Section #: G.1.2 Page #: G-3 Line #: 24
Original Specific Comment #: 39
Comment: The text states that the final design of the cell will be the controlling factor in determining the final acceptance criteria for on-property disposal of OU3 remediation materials. Any change in the acceptance criteria should be approved by US EPA. In addition, DOE should provide additional information on how the final design of the cell will affect the acceptance criteria determined in the OU3 RI/FS.

Response: Agreed. The OU3 WAC development process was based on many assumptions regarding the final design of the on-property disposal facility. The intent of the OU3 WAC development process was to make conservative modeling assumptions that would bound the impact of variances in the final design from the assumptions made in the OU3 RI/FS Report, so that WAC would remain valid throughout the design stages. As the design of the disposal facility at the time of OU3 WAC development was based on the conceptual design from the OU2 and OU5 Feasibility Study Reports, it was anticipated that the design would change. One key assumption regarding the disposal facility which may be confirmed or modified during the design process relates to the footprint of OU3 materials in the disposal facility. In general, a wider footprint would reduce the level of conservativeness of the OU3 WAC. However, it is expected that the safety factor of the current OU3 WAC will still be acceptable given the possible ranges of the final dimensions. Since the final design of the on-property disposal facility will not be available in time to be incorporated in the RI/FS Report, the OU3 WAC presented in the draft report will not be revised throughout the OU3 RI/FS process. Due to the inherent overall level of conservativeness, DOE does not anticipate the need for revising the WAC established in the RI/FS Report when the final design of the on-property disposal facility is completed. In any case, it is understood that any change in the OU3 WAC would require regulatory approval. Any additional WAC applicable to OU3 debris established during the final design of the facility will be met by OU3 materials, as addressed in response to OEPA Comment #33.

Action: This statement (Page G-3, Lines 24-26) has been replaced with the following text: "The final design of the facility may stipulate acceptance criteria for debris in addition to the WAC established in this report. Any additional WAC applicable to OU3 debris that are developed during the final design and approved by the regulatory agencies will be met in order to dispose OU3 debris in the on-property disposal facility."

Commenting Organization: US EPA Commentor: Saric
Section #: G.4.2 Page #: G-14 Line #: 7
Original Specific Comment #: 40
Comment: The text states that the effects of engineering controls were not considered during the first bounding step to identify postremediation COCs. This statement contradicts the statements on Pages G-17 and G-19 (Lines 23 and 7, respectively) that refer to the travel time through the landfill liner. As stated, the landfill liner is an apparent engineering control. DOE should conduct the first bounding step (that is, travel time) without use of engineering controls.

Response: Agreed. The effects of engineering controls should not be and were not considered in the travel time screening step. However, there is a discrepancy in the text as noted by the commentor. The text referenced on Page G-14 is correct, and the other citations have been corrected.

Action: The bulleted item on Page G-17 has been corrected to read: "Identifying potential breakthrough COCs by determining COC travel times through the underlying overburden under the natural infiltration rate (i.e., 6 in/yr)." The sentence on Lines 6-9 on Page G-19 has been corrected to read, "The remaining ten contaminants have the potential to migrate through the overburden to the aquifer under natural conditions within the 1,000-year period and, therefore, are considered potential breakthrough COCs based on characteristics of the individual contaminants."

Commenting Organization: US EPA Commentor: Saric
Section #: G.4.3.1.3 Page #: G-22 Line #: 15
Original Specific Comment #: 41
Comment: To distinguish between the allowable contaminant mass in the disposal cell for OU3 materials independent from other contaminant sources in the disposal cell, DOE uses a combination of methods. For the OU3 materials, DOE strictly applies the 70-year rule to determine the mass of contaminants available to migrate to the environment; for other materials, DOE bases its estimate of the mass of contaminants available to migrate to the environment on initial soil leachate concentrations. The inconsistent use of methodologies reduces the amount of conservativeness built into the decision process. DOE should complete the analysis by consistently applying the 70-year rule.

Response: Contaminant leachability is material-specific due to different physical and chemical conditions of the contaminated materials. The WAC development process for OU3 materials followed the general procedure in Figure 5-11 of the OU5 RI, which presented an approach for estimating contaminant-specific leachability for different materials. Based on this chart, the preferred method of estimating leachate concentrations is based on actual material-specific (e.g., in-situ leachate, perched water, and TCLP). Since contaminant-specific leachability from contaminated soil were determined for OU5 soils using site-specific batch tests and TCLP , this was used to calculate leachate concentrations for soil.

It is expected that the contaminant leachability from construction debris is different from soil, and no literature values are available for constituent-specific leachability from construction debris. The last option in Figure 5-11 of the OU5 RI is to utilize the 70-year rule to estimate contaminant leachability for the materials with unknown leachabilities. Consistent with this approach, the 70-year rule was applied only to OU3 materials as the most conservative assumption.

Action: No action.

Commenting Organization: US EPA Commentor: Saric
Section #: H.3 and Tables H-9, H-10, H-12 Page #: NA Line #: NA
Original Specific Comment #: 42
Comment: The text in this section presents a number of inconsistent values for various parameters used in the exposure point concentration and risk estimations. For example, Line 17 on Page H-17 presents residential exposures of only 8 hours per day and 250 days per year. These values are the same as the occupational exposures rather than the usual 24 hours per day and 350 or 365 days per year for residential exposures. Table H-9 presents the distance from the center of the on-property disposal cell to an on-property remediation worker as 1,100 meters but that to an off-site resident as only 500 meters. Table H-10 presents the volume of an intermodal transportation container (ITC) as 675 cubic feet, although the ITC dimensions presented (including a 6.4-foot height) indicate a volume of 1,024 cubic feet and the standard ITC dimensions (including an 8-foot height) indicate a volume of 1,280 cubic feet. Table H-10 also presents a steel bulking factor of 16.8 but a concrete bulking factor of 1.3. The steel bulking factor might be applicable to a carefully placed stack of structural members of the same size but would not be applicable to a random pile of mixed-size pieces. DOE should correct the errors and resolve the discrepancies described above.

In addition, Table H-12 lists only the posted inhalation toxicity values. Therefore, no such values are listed for most of the nonradionuclide contaminants, presenting an underestimation of the related risk. DOE should address the implications of omitting these toxicity values from the risk estimation in the discussion of uncertainty in Section H.5.

Response: The five points identified in the comment are individually addressed below:

a) The exposure durations utilized in this short-term risk assessment mirror the actual durations anticipated for receptor exposures. In operating the on-property disposal facility, waste placement operations are expected to occur 8 hours per day for 260 days per year. OU3 impacts to air quality are expected only during waste placement within the on-property disposal facility. Therefore, the receptor exposure durations were equivalent to these durations after subtracting a 2 week vacation period away from the site for each receptor. The resulting exposure duration for each receptor is 8 hours per day and 250 days per year.

b) This section addresses the distance from the disposal facility to the receptors (Table H-9). The apparent discrepancy is that the distance from the disposal facility to the non-remediation worker is a longer distance than the distance to the public resident. This is based on the location of the disposal facility on the north and east side of the property, with the eastern edge approximately 300 feet from the property boundary. The non-remediation worker consists of administrative personnel and are located in the center of the administrative area. It was assumed that the administrative personnel would remain at the same location throughout remedial actions. In contrast, the public resident is situated at the property boundary Line. Therefore, the distance to the public resident is shorter than the distance to the non-remediation worker. The remediation worker is assumed to be within the disposal facility where airborne contamination is generated.

c) This section addresses Table H-10 and the ITC volumes. Agreed. The interior volume of 675 ft^3 is a mistake. However, the dimensions for the ITC as detailed in Table H-10 are correct and represent the exterior dimensions of the container. The correct interior volume for the container is 766 ft^3.

External Dimensions: 20.00 ft L x 8.00 ft W x 6.40 ft H = 1024 ft^3.
Internal Dimensions: 19.25 ft L x 7.1 ft W x 5.6 ft H = 766 ft^3.

This value will be corrected in both the cost and risk estimates.

d) The steel bulking factor represents the conversion from the unbulked volume of steel to the quantity that would fit within a container. The bulking factor of 16.8 was developed based on Plant 7 during containerization of the structural steel. In this section, the bulking factor is being used to estimate the quantity of steel in a specified space for calculation of direct radiation. For a random pile of mixed-size pieces, this value would likely increase, which would decrease the amount of steel in any given space. This would result in a decrease of the radiological concentrations in a given volume of the pile and correspondingly reduce the direct radiation exposure to the receptors. Therefore, the bulking factor of 16.8 will be used for this estimate.

e) This section addresses the requested uncertainty analysis of toxicity values. Agreed. The uncertainty discussion will be expanded in Section H.5.

Action: a) Incorporate an explanation of the exposure duration into the text on Page H-17, Line 39.

b) In evaluating this comment response, DOE identified an error in the distances used for the non-remediation worker and the public resident receptors. The values have been changed to 380 meters for the non-remediation worker and 215 meters for the public resident. These values have been incorporated into the revised risk assessment values. Page H-11, lines 19, 20, and 31, and Table H-9 have been modified.

c) Table H-10 has been modified to represent the ITC volume as 766 ft^3 and this change has been incorporated into the risk assessment and the cost estimate for Alternative 3 in Appendix E.

d) No action.

e) The uncertainty discussion in Section H.5 has been expanded. See change Page H-34.

Commenting Organization: US EPA Commentor: Saric
Section #: H.4.1.5 Page #: H-30 Line #: 17
Original Specific Comment #: 43
Comment: Section H.4.1.5 and Table H-23 show lower estimated risks to the public along transportation routes for Alternative 3, which includes off-site transportation of all remediation materials from OU3, than for Alternative 2, which includes off-site

transportation of a small fraction of the materials. Similar results are presented for transportation accident risk in Section H.4.1.6 and Table H-26. These counterintuitive results may be due to the reliance on road transportation in Alternative 2 and the extensive use of inherently safer rail transportation in Alternative 3. DOE should discuss the reasons for the discrepancies between the risk results for the two alternatives. If the different transportation mode is the primary reason, DOE should consider modifying Alternative 2 to include use of rail transportation for all long-distance waste shipments.

Response: The transportation risk to the off-site public is lower for Alternative 3 than Alternative 2 because of the receptors and exposure scenarios for rail vs. truck shipments. Because Alternative 2 assumes shipment by truck of materials that are above WAC, a higher average concentration is placed in close proximity to the receptors for a longer duration. The risk to the public is lower from rail shipment than from the same amount of material shipped by truck.

Under Alternative 2, off-site shipment is currently estimated by truck because of the reduced volume requiring shipment. However, under the $276 million case schedule, it is expected that OU1 rail shipment activities will coincide with OU3 shipments. As possible, the shipment of OU3 materials will be performed in conjunction with OU1 rail shipments. This language has previously been incorporated into Section 5 and 6 of the document.

Action: No action.

Commenting Organization: US EPA Commentor: Saric
Section #: J.1 Page #: J-1 Line #: 25-27
Original Specific Comment #: 44
Comment: DOE fails to define cumulative impacts as defined by NEPA. To be consistent with 40 CFR, §1508.7, DOE should add the following sentence to the beginning of this paragraph: "In this evaluation, efforts have been made to further quantify environmental impacts resulting from the incremental impact of the proposed action when added to other past, present, and future actions." If DOE uses the NEPA definition of cumulative impact, the analysis in Appendix J would be more thorough and would more fully meet the spirit of NEPA.

In addition, as a result of focusing on the impacts of simultaneous remediation activities only, DOE fails to identify the cumulative impacts associated with future uses of or activities at the site. DOE should evaluate the cumulative impacts of future site uses or activities where appropriate.

Response: Agreed. The OU3 FS is an integrated CERCLA/NEPA evaluation. DOE's revised secretarial policy on NEPA requires inclusion of only the substantive aspects of NEPA. However, DOE agrees that opportunities exist to expand the text and further define cumulative impact as appropriate.

Action: The requested insert was incorporated on Page J-1, Line 25. Additional analysis was supplied throughout the text where appropriate.

Commenting Organization: US EPA Commentor: Saric
Section #: J.1, J.3 Page #: NA Line #: NA
Original Specific Comment #: 45
Comment: The first paragraph of Section J.1 defines the terms "representative alternative," "preferred alternative," and "selected alternative." However, throughout the appendix, other terms such as "selected remedy" and "leading remedial alternative" are used. In one instance on Page J-10, Line 30, the phrase "preferred alternatives selected remedies" is used and conveys a confused meaning. The terms "selected alternative" and "preferred alternative" should be used consistently in the manner defined in Section J.1, whose uses of the terms most closely match the meanings defined by the National Environmental Policy Act (NEPA).

Response: Agreed. The text has been reviewed for inconsistencies.

Action: Page J-10, Line 18, the word "remedy" has been replaced with "alternative".

Page J-10, Line 24, has been revised to read, "The selected alternative for OU2 and OU5 and the representative alternative for OU3 involves.."

Page J-10, Line 32, will be revised to read, "When the selected alternatives in the OUs 1, 2, 4, and 5 RODs are combined with the representative alternative for OU3, it is likely..."

Commenting Organization: US EPA Commentor: Saric
Section #: J.1.3 Page #: J-3 Line #: 13 to 17
Original Specific Comment #: 46
Comment: DOE should use the NEPA definition of cumulative impacts as well as other NEPA definitions in 40 CFR Parts 1500 through 1508 (also see Specific Comment #44).

Response: Agreed.

Action: Revised text has been inserted on Page J-3, Lines 13-14, "The detailed evaluation in this cumulative impact analysis includes incremental impacts of the proposed action when added to other past, present, and future actions. The actions on immediate adjacent lands to the FEMP site which are not..."

Additional analysis has been supplied throughout the text where appropriate to reflect the definition of cumulative impacts.

Commenting Organization: US EPA Commentor: Saric
Section #: J.3 Page #: NA Line #: NA
Original Specific Comment #: 47
Comment: NEPA refers to the use of "mitigating measures" to reduce potential adverse impacts of either selected or preferred alternatives. The term "mitigating measures" should be used when preventive actions are proposed to counter

potential adverse impacts (see 40 CFR §1508.20). However, the term "mitigating measures" is rarely used in Appendix J.

In addition, NEPA allows for mitigating measures to be outlined in a ROD as long as it is clear that all alternatives were considered. It must also be clear that all practicable means to avoid or minimize environmental harm from the selected alternative have been adopted. If such means have not been adopted, a discussion as to why they were not adopted should be included in the ROD (see 40 CFR §§1505.2(b) and 1505.2(c)).

Response: Agreed.

Action: The text has been revised as follows on Page J-10, Line 1: "the" has been replaced with "conducting." The following text has been inserted on Line 2 after the number 2005: "All on-property actions will avoid or minimize environmental impacts to the extent practicable. Mitigative measures will be employed to minimize adverse impacts."

The use of mitigative measures has been clarified and addressed throughout the text as appropriate.

On Page J-10, Line 14, the words "However, appropriate excavation techniques and controls" have been replaced with "Mitigative measures."

Commenting Organization: US EPA Commentor: Saric
Section #: J.1.3 Page #: J-3 and J-4 Line #: 35 - 38; 1 and 2
Original Specific Comment #: 48
Comment: Groundwater is used for agricultural purposes in the FEMP area. Therefore, DOE should discuss the cumulative impact or potential impacts of contaminated groundwater being applied to crops.

Response: Agreed.

Action: The following text has been inserted on Page J-4 to reflect potential impacts of groundwater use on off-site receptors.

"The cumulative groundwater impact to the health of off-site receptors was summarized in the OU5 RI/FS and FS reports. The RI/FS baseline risk assessment evaluated more current conditions and the FS CRARE risk assessment evaluated future residual conditions.

The Off-Property RME Farmer (Farmer) was evaluated as a maximally exposed off-site receptor. The highest estimated cancer risk (ILCR) to the off-property farmer was 1.5×10^{-3}. Pathways included in the RI/FS baseline risk assessment included drinking water, and dermal contact while bathing, as well as the use of groundwater in growing fruits and vegetables and raising cattle and the ultimate ingestion of these food products.

The CRARE risk assessment also evaluated the off-site receptors for groundwater exposure, however the impact of groundwater on food products was not evaluated separately. Thus, the groundwater pathways included in the FS CRARE risk assessment included drinking water and dermal contact. The estimated cancer risk (ILCR) to the off-property farmer was 1.81×10^{-5}."

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.1 Page #: J-11 Line #: 5 to 6
Original Specific Comment #: 49
Comment: The text indicates that "appropriate spill prevention and response procedures will ensure impacts related to spills are negligible." DOE should identify specific mitigating measures (see 40 CFR §1508.20) to address spills and should identify the specific spill prevention and response procedures that are being considered.

Response: Agreed.

Action: Page J-11, Lines 3, 4, and 5 have been revised to read: "Spills would be expected to affect only localized areas; therefore, impacts on surface soil from spills would likely be minor. Appropriate spill prevention and response procedures would be performed in accordance with the site standard operating procedure (SSOP-0067) entitled "Spill Incident Reporting and Clean-Up" and site plan #2194 entitled "Spill Prevention Control and Countermeasure Plan" (SPCC). If spills are encountered, mitigative measures such as adequate containment dikes and use of absorbent pads would be employed to minimize adverse impacts."

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.2 Page #: J-11 Line #: 23 to 32
Original Specific Comment #: 50
Comment: The discussion of how the on-property disposal cell will impact groundwater is inadequate. DOE should provide a thorough analysis of the potential impacts on groundwater and should identify specific mitigating measures for such impacts (see 40 CFR §1508.20).

Response: Agreed.

Action: Lines 28-32 on Page J-11 have been deleted and replaced with "The on-property disposal facility has been determined to be protective through conservative modeling assumptions. The modeling utilized to establish the uranium waste acceptance criteria for the on-property disposal facility was based on the natural protection of the gray clay located under the proposed location of the on-property disposal facility and did not consider the additional protection due to the synthetic membranes in the engineered disposal facility, the clay liner, or the leachate collection and leak detection system. The Leachate Collection and Detection Systems, combined with appropriate maintenance activities, would be the primary mitigative measures for the disposal facility."

The following text has been added to Page J-11, Line 29 after the word implemented: "A groundwater monitoring and contingency plan will be developed during the remedial design process."

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.2.1 Page #: J-12 Line #: 27 to 32
Original Specific Comment #: 51
Comment: The discussion of long-term impacts on surface water quality focuses on the impacts of remediation activities. DOE should identify potential impacts of future site land uses on surface water and should identify specific mitigating measures. In addition, DOE should identify specific mitigating measures (see 40 CFR §1508.20) to address the impacts of remediation activities on surface water quality.

Response: Agreed. Specific mitigative measures to minimize impacts to surface water quality were identified on Page J-12, Line 23 of the RI/FS Report.

Action: The following text has been included to address impacts of future land use on Page J-12, Line 8:

"Future land use of the FEMP has not been determined. A land use scenario of an undeveloped park was used in the Operable Unit 5 FS for risk assessment purposes to determine final remediation levels. These final remediation levels establish the permissible concentration of contaminants which could remain at the site following the completion of remedial actions, presenting a potential for exposure and risk to future users of the FEMP. The degree of exposure and risk associated with remaining concentrations would be directly linked to the type and duration of future land use. Future land uses contemplating direct contact for longer intervals would be expected to yield a higher calculated exposure and risk than would future uses which involve less opportunities for long-term exposure. DOE will work with the local communities during remedial design on establishing a final land use for the FEMP property. Mitigative measures to minimize long-term impacts will be considered upon establishing final land use."

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.3 Page #: J-13 Line #: 13
Original Specific Comment #: 52
Comment: The text states that "engineering controls would be employed to keep these levels as low as reasonably achievable." This statement implies that mitigating measures have been considered, but the text does not identify them. DOE should identify the specific mitigating measures (see 40 CFR §1508.20) alluded to as "engineering controls."

Response: Agreed.

Action: The following text has been added to Page J-13, Line 13: "Engineering controls, such as dust suppressants and revegetation, would be employed.."

Additional text referring to mitigative measures has been included where appropriate.

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.3 Page #: J-14 Line #: 11-13
Original Specific Comment #: 53
Comment: This sentence states that air monitoring will be conducted to ensure that emission levels do not exceed National Emission Standards for Hazardous Air Pollutants (NESHAP). However, no information is given on what actions would be taken if such standards are exceeded. DOE should discuss the actions to be taken in the event that NESHAP are exceeded and should identify specific mitigating measures (see 40 CFR §1508.20) to reduce the impacts of such exceedances.

In addition, this paragraph does not discuss the potential impacts of future land uses. DOE should provide an analysis of future land uses at the site in accordance with NEPA (see 40 CFR §1508.7).

Response: Agreed.

Action: The following text has been added on Page J-14, Line 10, after the word standard: "If emission levels are exceeded, a compliance strategy would be prepared to assess the impact. The purpose of the compliance strategy is to remain in compliance with applicable regulations and to ensure non-compliant conditions do not reoccur.

The following text has been added on Page J-14, Line 28, after the acronym CRARE: "The assumed future land use of an undeveloped park would not impact air quality."

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.4 Page #: J-14 Line #: NA
Original Specific Comment #: 54
Comment: This section does not discuss the impacts of remedial activities on migratory wildlife. DOE should discuss migration routes and the impacts that remedial activities may have on wildlife during annual periods of migration.

Response: Agreed.

Action: The following text has been inserted on Page J-15, Line 13 after the word site: "since the approximate 100 acre northern woodland represents the majority of woodland and wetland habitat on the site and is not expected to be impacted. Impacts to migratory bird species would be minimal since the FEMP is not a primary stopover for these species."

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.4 Page #: J-16j-22 Line #: 1 to 2
Original Specific Comment #: 55
Comment: This sentence states that "the cumulative effects [which should be "impacts"] would be beneficial in the long term by reducing or eliminating exposure to wastes." It is unclear how the cumulative impacts will be beneficial over time and who or what would be benefited. This sentence should be revised to clarify these matters.

Response: Agreed.

Action: Page J-16, Lines 3-4, has been revised to read, "The cumulative impacts would be beneficial in the long term by reducing or eliminating exposure of biotic resources to wastes, reducing the potential for contaminant transfer through the food chain."

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.4.1 Page #: J-16 Line #: 5 to 11
Original Specific Comment #: 56
Comment: The text contains the same ambiguous statement as is identified in Specific Comment #54. This sentence should be revised to clarify its meaning.

Response: Agreed.

Action: A sentence has been added to Page J-16, Line 8 after the word crayfish, "Since the FEMP is not a primary stopover for threatened and endangered migratory birds, minimal impacts would occur to these species."

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.5 Page #: J-16 Line #: 14 to 21
Original Specific Comment #: 57
Comment: The text states that mitigating measures "would be executed if impacts are expected to occur," but no specific measures are identified. DOE should identify specific mitigating measures (see 40 CFR §1508.20) to limit potential impacts on wetlands and water. If no impacts are expected, DOE should state this and support the assertion.

Response: Agreed.

Action: Additional text has been added to Page J-16, Line 21 after the word measures, "(placement of silt fences, minimization of heavy equipment traffic)"

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.5 Page #: J-16 Line #: 23 to 30
Original Specific Comment #: 58
Comment: This text states that the greatest wetland impact could result from siting a disposal facility and from excavation activities. DOE should further discuss its

plans to site a disposal facility in a designated wetland. In addition, DOE should identify specific mitigating measures (see 40 CFR §1508.20) to reduce potential wetland impacts.

Response: Agreed. Only minor wetland impacts would occur based on revisions to the disposal facility design. Approximately 0.65 acres of drainage ditch wetlands are expected to be impacted. Measures to avoid and minimize impacts to wetlands were considered prior to the final siting of the disposal facility.

Action: The following text have been deleted on Page J-16, Line 24: "in the forested wetland in the northern part of the site and".

The words, "The greatest" have been deleted from Page J-16, Line 25.

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.6.6 Page #: J-20 to J-22 Line #: NA
Original Specific Comment #: 59
Comment: The text in Line 33 on Page J-20 states that increased traffic flow will be "possibly the greatest environmental impact." At the end of each paragraph, DOE should describe the impacts that the increased traffic is likely to have. Furthermore, DOE should identify specific mitigating measures for the impacts described.

Response: Agreed.

Action: Page J-20, Line 32, has been revised to read: "The activity with potentially the greatest direct effect on local residents from concurrent implementation of OU remedial activities is the increased traffic flow from waste shipment."

On Page J-21, Line 2, the word "backfill" has been inserted after the word "of".

On Page J-21, Line 13, the heading "Transport of Waste for Off-Site Disposal" has been deleted.

The following text has been added on Page J-22, Line 2: "This increase in traffic flow would impact local residents from increased noise and dust."

Commenting Organization: US EPA Commentor: Saric
Section #: J.3.7 Page #: J-22 Line #: 28-32
Original Specific Comment #: 60
Comment: The text states that an archaeological survey of the FEMP property would be performed and that the Ohio Historic Preservation Office and Department of Transportation would be consulted to identify cultural resources. However, Page J-23 states that these agencies were contacted and did not consider future remedial actions at the site to be in conflict with their interests. These statements appear to contradict each other. DOE should provide a reference for each conclusion stated in Section J.3 that was based on an agency referral. If no agency has made the

determinations presented in this section, the NEPA process has not been completed.

Response: Agreed.

Action: The paragraph on Page J-22, Line 25 has been revised to read, "Pursuant to Section 106 of the National Historic Preservation Act, DOE must take into account the effects of remedial activities on historic properties. An Historic property is defined as any prehistoric or historic building, archeological site, structure, or object that is listed or eligible for listing on the National Register of Historic Places. DOE must also afford the Advisory Council on Historic Preservation (the Council) a reasonable opportunity to comment on the effects of a project to historic properties. To accomplish this, DOE is developing a process for the survey, avoidance, and mitigation of historic properties in conjunction with the Ohio Historic Preservation Office (OHPO) and the Council. For archeological sites, DOE will survey for historic properties within uncontrolled areas prior to the initiation of remedial action and consult with OHPO and the Council regarding appropriate mitigation actions. For all buildings and structures, DOE will document the architecture and history of the primary facilities, using existing information whenever possible. These two approaches to compliance with Section 106 of the National Historic Preservation Act are being developed through two separate Programmatic Agreements with OHPO and the Council, as promulgated in 36 CFR 800.13."

Commenting Organization: US EPA Commentor: Saric
Section #: L.0 Page #: L.0-3 Line #: 21
Original Specific Comment #: 61
Comment: The text defines the laboratory qualifier "B" as being applicable only to organic analyses. However, almost every Page of inorganic analysis results (beginning with Page L.2-256, the first Page) includes the qualifier "B." DOE should define this qualifier as it applies to inorganic analysis results.

Response: Qualifier "B" applies to both organic and inorganic analysis. This sentence is an error.

Action: The last sentence pertaining to the "B" qualifier on Page L.0-3, Lines 20-21 has been deleted.

Commenting Organization: US EPA Commentor: Barwick
Section #: Proposed Plan Pages #: 13, 2d para and 15, 5th para Line #:
Original Specific Comment #: 62
Comment: Replace "except those excluded upon receipt of a waiver from the US EPA" with "or meet the criteria for invoking a waiver under 40 CFR 399.430 (f) (1) (ii) (C)."

Response: Agreed.

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Action: The suggested text has been incorporated into the text on top of Page 12 of the Proposed Plan.

Commenting Organization: US EPA Commentor: Barwick
Section #: Proposed Plan Page #: 17, 1st full para
Original Specific Comment #: 63
Comment: DOE states that worker exposure is expected to be 360 millirem per year. Later, DOE states that background exposure is 300 millirem per year and that that is 2,300 times greater than the estimated worker exposure. It may be that DOE has included background exposure in the worker exposure estimate but that is not clear. As written, it appears that DOE is stating that 300 millirem is 2,300 times greater than 360 millirem. At a minimum, this paragraph needs clarification.

Response: Agreed. The Proposed Plan text is incorrect as written.

Action: The last sentence of this paragraph has been modified to read "For comparison purposes, an average individual in the United States receives a radiation dose of about 300 millirem per year from natural background radiation."

Commenting Organization: US EPA Commentor: Barwick
Section #: Proposed Plan Page #: 18, 1st full para
Original Specific Comment #: 64
Comment: The Fernald Citizens Task Force has recommended an undeveloped park and DOE, US EPA, and OEPA have all stated they will consider that, and other, Task Force recommendations. However, no future land use has been "adopted" for the Fernald site as may be implied in this paragraph. Please revise accordingly.

Response: Agreed.

Action: See the response to US EPA General Comment #1.

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SECTION III

SECTION III

OEPA COMMENTS AND RESPONSES

SECTION III
OEPA COMMENTS AND RESPONSES

GENERAL COMMENTS

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: General Comment Pg #: Line #: Code: M
Original Comment #: 1
Comment: As stated in previous comments on several DOE submittals, Ohio EPA believes that no characteristic hazardous waste should be dispositioned in the on-site disposal facility. Ohio EPA's position on this issue has been consistent as part of our acceptance of the USEPA waiver of the siting criteria. Ohio EPA maintains that characteristic waste by its nature is principal threat material due to its high concentration of hazardous substances and their significant mobility from the associated media. Treatment options are readily available for such material and will be utilized on-site for similar material. In keeping with the statutory preference for treatment to reduce toxicity, mobility and volume these materials should be treated prior to on-site disposal. Ohio EPA believes the document should be revised to clarify which portions of the "mixed waste" referred to within the text are defined as such because of listed vs. characteristic determinations and how the characteristic wastes will be treated prior to on-site disposal.

Response: In response to OEPA's concern regarding the disposal of characteristic waste in the on-property disposal facility, DOE recognizes that the CAMU rule-making requires several decision steps to ensure that a protective remedy has been identified and can be reliably implemented. For the RCRA constituents of concern (COCs) that are present in the OU3 materials, these decision steps -- contained in Section 264.552 of the CAMU rule -- can be summarized as follows: 1) *the remedy must be protective of human health and the environment* - accomplished for OU3 through the waste acceptance criteria development process contained in Appendix G of the RI/FS Report; 2) *the remedy must minimize the potential for future release* - accomplished through using a conservative WAC development process, application of engineering controls in the on-property disposal facility, and the additional protection provided by the site's hydrogeological features; and 3) *the remedy must enhance long-term effectiveness through the application, as appropriate, of treatment technologies that reduce toxicity, mobility, or volume of wastes that will remain in place after closure of the CAMU*; as cited in the preamble for the CAMU rule, this decision step is analogous to the preference under CERCLA for treatment-based remedies.

As stated in the preamble to the CAMU rule, the decision to apply cost-effective treatment at a site should be a case-by-case decision that considers waste- and site-specific factors. DOE believes that several actions have already occurred or are underway to promote this objective. Most notable is the Safe Shutdown program. The Safe Shutdown program readies buildings for demolition. In doing so the inherently waste-like material is removed from the buildings. All material being removed is being characterized and waste appropriately characterized as RCRA hazardous is being managed as such with off-site disposal. In addition, a majority of the RCRA Hazardous Waste Management Units within the Former Production Area Buildings have been or are being clean closed. Wastes generated by the clean closure process that are appropriately determined to be RCRA

hazardous wastes are being segregated for off-site disposal. Upon review of the site characterization data contained in this RI/FS Report, coupled with the inherent waste forms to be disposed as a result of the D&D activities, two material types (lead flashing and acid brick) have been identified where a reasonable potential exists for the material to qualify as RCRA characteristic waste. In the OU3 RI/FS Report, no wastes have been identified as RCRA listed wastes.

Recognizing that a protective remedy has been proposed for the OU3 materials, coupled with the desire on the part of DOE to satisfy the statutory preference for treatment, these two materials will be segregated during D&D activities and the portions of these materials that qualify as RCRA characteristic waste will be treated. Since the acid brick has been administratively segregated for off-site disposal, the waste acceptance criteria for the accepting off-site facility will apply. The lead flashing will be preferentially segregated for treatment before disposition either on- or off-site.

These two material categories were identified by reviewing a combination of existing analytical data and process knowledge related to individual waste categories. Specifically, this information was reviewed to reasonably establish the representative characteristics of the segregatable waste volumes. EPA guidance regarding procedures for RCRA waste characterization (OSWER Directive 9938.4-03) states that waste sampling should "reflect the average properties of the universe from which the samples were obtained." As applied to the OU3 material evaluation, the "waste universe" was defined to be like materials that are to be (or could readily be) segregated during D&D. Examples include concrete floors within a building, lead rivets and associated flashing collected during building dismantlement and structural steel. Existing data and/or process knowledge was then applied to these identifiable and segregatable waste streams to evaluate the potential for characteristic hazardous waste. This process identified the two waste streams noted above.

Other waste streams were eliminated from consideration, again using analytical data and/or process knowledge, to determine that the average characteristics of the material in question were not indicative of RCRA hazardous characteristics. Two examples are offered as to how individual waste streams were eliminated. The first example relates to lead-lined valves. Such valves are sporadically located throughout the buildings. Barring some other reason, there is no engineering or construction related reason why these valves need to be segregated. Such an activity would, in fact, be labor intensive with associated costs. Given that, the valves are most appropriately considered to be part of the process piping rather than a separate waste stream. While on a highly localized basis the valves are a material that could demonstrate a RCRA characteristic for lead, the average characteristics of the waste stream of which the valves are most appropriately considered a part of, would not demonstrate the characteristic.

The second example relates to concrete slabs. One objective of the RI/FS sampling program for concrete was to determine the vertical migration of contaminants into the concrete. As detailed in the RI/FS Report, the vertical profile of contaminant migration in concrete slabs is representative of an asymptotic curve with higher concentrations in the first ½ inch and decreasing concentrations at depth. The remediation of the concrete slabs will generate a waste form that includes all of the concrete slab and not separate

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waste streams by depth. While on a highly localized basis, surface areas of concrete could demonstrate a RCRA characteristic, the average characteristics of the entire waste stream would not demonstrate RCRA characteristics.

DOE believes that there is no reasonable basis to conclude that an increased potential for the presence of RCRA characteristic waste exists within other material categories. Therefore, no additional analytical data will be required to screen for the presence of characteristic waste before placement of OU3 materials in the on-property disposal facility.

Action: Section 3, Page 3-20, Lines 5-13, 33-34; Page 3-21, Lines 5-10, 30; Page 3-22, Lines 1-6, 27; Page 3-23, Lines 1-3, 25-26, 31-34; Pages 3-24, Lines 1-2, 25-26, 32-33; Page 3-25, Lines 10-11, 15-16, 27, 33-34; Page 3-26, Lines 22-23; Page 3-27, Lines 1-4, 24-29; Page 3-28, Lines 8-18; Page 3-29, Lines 24-30; Figures 3-8, 3-9, 3-10, 3-11, 3-12, 3-13, 3-14, 3-14a, 3-16, 3-16a: Appendix A, Page A-40, Lines 5-6; Page A-40, Lines 17-18; Page A-44, Lines 4-5; Page A-44, Lines 12-13; Page A-45, Lines 20-21; Page A-46, Lines 6-7; Page A-47, Lines 1-5; Page A-49, Lines 16-17; Page A-52, Line 34; Page A-54, Lines 3-4; Page A-56, Lines 5-6; Page A-62, Lines 8-10; Page A-67, Lines 20-21; Page A-82, Lines 11-12, 22-24; Page A-83, Lines 1-3, 17-18; Page A.II-27, Lines 4-6; Page A.II-28, Lines 15-17; Page A.II-32, Lines 27-28; Page A.II-33, Lines 15-17; Page A.II-36, Line 20; Page A.II-43, Lines 14-15; Page A.II-96, Lines 20-23; Page A.II-97, Lines 1-6, 15-18; Page A.II-97a, Lines 7-8; Page A.II-98, Lines 11-14, 27-29; Page A.II-100, Lines 10-13; Page A.II-101, Lines 5-8; Page A.III-5, Lines 16-19; Page A.III-6, Lines 3-5; Page A.III-14, Lines 6-10; Page A.III-15, Lines 2-5; Page A.III-35, Lines 17-21; Page A.III-41, Lines 18-20; and Page A.III-41a, Lines 1-2 have been modified to identify the material types that are potentially mixed waste as lead flashing and acid brick.

The resulting segregation category volumes have been incorporated into the alternatives as potentially mixed wastes that require treatment (as needed) prior to disposal.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: General Comment Pg #: Line #: Code: M
Original Comment #: 2
Comment: Ohio EPA is concerned with DOE's apparent lack of commitment to recycling and reuse of materials generated through D&D operations under OU3. Statements such as," the most economical disposition option will be utilized", provide Ohio EPA no confidence that materials will be recycled. At an on-site disposal rate of $4.17 per ft^3, it is unlikely any material will be recycled. It will always be cheaper to dispose on-site. Is DOE's position within this document consistent with DOE's national/programmatic commitment or lack thereof to recycling and reuse of materials?.

Response: It is DOE's intent to be consistent with the forthcoming DOE national policy on recycling; however, at this time the policy has not been drafted, but once issued, the Fernald site will perform remedial actions in accordance with the policy. DOE is committed to the cost-competitive recycling and reuse of materials as well as waste minimization. Numerous examples are available as demonstration of this concept in action at the FEMP and within OU3 already, including ongoing efforts to locate customers for salvageable

equipment and products, proposals to utilize existing facility slabs for interim storage operations following D&D, and ongoing recycling initiatives for contaminated and non-contaminated materials. Other examples include recycling of laserjet toner cartridges and office paper, lead batteries, fluorescent lights, and Plant 7 lead at SEG. An ongoing waste minimization program has also minimized packaging materials entering the processing side through alternative work practices to minimize wastes which must be considered contaminated. The FEMP has also been active in the past year in decontaminating and releasing unused steel materials for subsequent recycling operations.

The DOE strives to maintain recycling as an option to be considered for each material at the time of it's intended generation and will continue to evaluate recycling on a case by case basis within each D&D complex implementation plan. Specifically, DOE will continue over the life of the D&D of the Former Production Area to aggressively evaluate existing and emerging recycling technologies and markets to identify opportunities for cost-competitive application at the FEMP. DOE also believes that while cost is a driving factor in making project-specific recycling decisions, other factors such as stakeholder input are relevant and should be considered as well.

Action: The following text has been inserted on Page E-5, Line 12, and E.I-5, Line 3 as a new paragraph with a portion added to Page 4-8, Line 6: "However, cost represents only one factor in the evaluation of recycling as a viable alternative to disposal. Other factors limiting recycling include limited survey capabilities for inaccessible surfaces, few vendors performing recycling, liability for release of materials, and limited uses for contaminated materials. At this time, few companies perform recycling of radiologically contaminated materials and as a result, minimal competition exists to reduce the costs to be incurred. Additional factors that are limiting the number of companies willing to perform recycling is the requirement for the company to accept potential liability for the release of the materials. Finally, for the materials that cannot be effectively released for unrestricted use, no market currently exists for the processing of or reuse of contaminated materials."

The following text has been added to Page 4-8, Line 9; Page E-5, Line 26; and Page E.I-5, Line 13: While currently available cost data suggest recycling is significantly more expensive than disposal it should be noted that as new technologies or markets become available this could change. DOE also recognizes that, while cost is a driving factor in making project-specific recycling decisions, other factors such as stakeholder input are relevant and should be considered as well. DOE will continue over the life of the D&D of the Former Production Area to aggressively evaluate existing and emerging recycling technologies and markets to identify opportunities for cost-competitive application at the FEMP.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: NA Pg #: NA Line #: NA Code: major
Original Comment #: 3
Comment: DOE failed to consider reuse of contaminated and non-contaminated materials on-site rather than disposal of them. The document must be revised to include a discussion of the potential reuse opportunities for OU3 materials on-site and a commitment to do so when at all possible. Such uses could include crushed concrete as aggregate for new concrete

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projects or as road beds, structural steel in the construction of new remediation facilities, etc.

In addition, it is Ohio EPA's expectation that DOE will develop a team to assess potential areas of waste reduction, recycling and re-use. This team should extend across the boundaries of the individual OUs and should be empowered to make decisions that will obligate the cooperation the OUs. Other duties of this team should include developing and researching ways of reducing wastes when remediation structures are designed. In other words, haul roads, process buildings, storage pads and structures should all be designed to maximize the potential for recycling and minimize the volume to be dispositioned as waste. Ohio EPA personal are available to assist in this effort.

Response: DOE is committed to reusing materials generated from remediation activities to the maximum extent practical. Because of the potential future land uses retained within the OU5 ROD and the Fernald Citizen's Task Force Recommendation, the materials considered for potential reuse would have to be demonstrated as a "clean" material to support potential direct contact with members of the public. For materials that can be demonstrated clean, potential reuse options include construction of permanent roads and use as rip-rap in the final site grading. Further evaluation of the potential reuse of materials will be considered by the Fernald site integration team to ensure a consistent approach to both recycling and reuse.

The OEPA offer to assist in this manner is appreciated. In the near future, the Fernald Citizen's Task Force is expected to evaluate recycling and reuse of materials and they would value input from the OEPA personnel.

Action: An evaluation of reuse has been added to Section 4, Page 4-8, Line 13.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Pg #: Line #: Code: M
Original Comment #: 4
Comment: Based upon the comments included herein, Ohio EPA believes it is inappropriate to consider shipping D&D wastes off-site for disposal at a commercial solid waste facility. Ohio EPA believes more beneficial uses such as bike paths, road beds, etc. can be found for noncontaminated materials generated during D&D. Several potential liabilities are associated with disposal at a commercial solid waste facility not the least of which is public acceptability.

Response: At this time, the future use of the facility has not been finalized. The selection of the release of these materials to a solid waste disposal facility for the purpose of providing an actual basis for costing does not preclude the reuse of these materials in a beneficial manner. DOE will continue to evaluate potential reuses of materials to minimize the quantity of material requiring disposal. The responses to General Comment #2 and General Comment #3 also provide discussions of this concept. Also, see OEPA Specific Comment #17.

Action: Page 5-19, Line 4, has been changed from "...could be reused within the DOE complex..." to "...could be reused at the Fernald site or within the DOE complex.... Beneficial reuse opportunities will continue to be evaluated throughout the action to minimize the quantity of waste to be disposed."

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: NA Pg #: NA Line #: Code: M
Original Comment #: 5
Comment: The details of the interim storage of OU3 materials prior to final disposition have been deferred to Removal Action # 17. However , it is Ohio EPAs expectation that this storage will address the control of air-borne contamination, particularly from the asbestos containing material.

Response: Interim storage of D&D materials falls under the scope of the interim remedial action, and is implemented by Removal Action (RvA) No. 17. On October 10, 1995, Revision 3 of the RvA No. 17 Work Plan was submitted to the Agencies for review and approval. This revision will allow outside, uncovered, bulk storage of certain categories of materials based on projected disposition, cleaning during the decontamination and dismantlement process, and resultant minimal environmental impact. Section 4 of the draft RvA No. 17 Work Plan (Revision 3) addresses the very low potential for airborne contamination and potential mitigation measures. Note that friable asbestos containing materials are not suitable for outside bulk storage, and therefore, will be containerized.

Action: No Action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: General Comment Pg #: Line #: Code: M
Original Comment #: 6
Comment: Ohio EPA has expressed a concern over the ability of DOE to coordinate disposal activities around the soil to debris ratio required for the on-site disposal facility. Ohio EPA believes that significant problems are likely in coordinating the two materials into the cell. Additionally, it is inappropriate to bring in clean borrow to make up the difference in materials for disposal as is suggested within the document (Sec. 5.2.2). It is Ohio EPA's position that DOE should develop contingencies for the point at which such a coordination failure occurs. Two apparent contingencies are the disposal of such excess debris off-site and/or the use of a crusher to reduce the OU3 debris to meet ASTM soils specifications thus eliminating the need for additional soil.

Response: Coordinating the disposal of several waste streams from several operable units is an activity which will require careful planning regarding all aspects of the on-property disposal facility design and construction. As a first step toward facilitating project coordination, the regulatory agencies have taken part in restructuring remedial action planning at the FEMP to encompass projects rather than managing parts of projects. Coordinating soil and debris placement in the on-property disposal facility will be conducted as part of the Soils Remediation Project. Although obtaining the proper soil to debris ratio will be necessary when

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coordinating material placement activities for the on-property disposal facility, it is not anticipated that material placement will be delayed due to coordination issues. OU3 debris is estimated to comprise only about ten percent of the total volume of waste to be disposed in the facility. If there is a shortage of soils in the future that would delay debris placement, interim storage measures in conformance with the requirements of Removal Action No. 17 will be used until the correct soil to debris ratio is obtained. Based on the $276 million plan (Rev. 1) and OU2 schedules, material placement will begin by September of 1997. Since berms are no longer required in the preliminary design of the disposal facility, the quantity of soil initially required for construction of the facility is lower than originally expected. Therefore, debris could be placed earlier which would minimize the need for storage space. Also, debris could be placed in the disposal facility on a just-in-time basis soon after the start of waste placement activities. Based on this plan, sufficient storage space exists to satisfy debris staging requirements, with the potential for a debris staging area within the disposal facility footprint.

It is agreed that it would be inappropriate to bring in clean borrow to use as fill if soils are unavailable to meet a minimum required soil to debris ratio. This reference will be removed from Section 5.2.2. The primary contingency when the correct soil to debris ratios could not be obtained when disposing debris on a just-in-time basis is to utilize existing storage space to the maximum extent. The current preferred alternative does not preclude disposal of OU3 debris in a regulated off-site facility. However, it is not expected that this will be required since the overwhelming majority of the materials to be placed in the disposal facility are soils.

While considering contingencies for managing excess debris, crushing concrete to reduce it to meet ASTM soil specifications is not a preferred option by DOE for several reasons. Primarily, these reasons are based on protection of human health and the environment and the ALARA concept. The majority of concrete that will be generated during D&D activities and soil excavation will be large blocks of concrete contaminated at low levels. In general, contaminants associated with the concrete will be somewhat stabilized within the cement matrix. Crushing the debris would immediately release contaminants from their "semi-stabilized" conditions. Increased airborne emissions would unnecessarily increase worker exposures. Crushed concrete placed in the disposal facility could also increase the risks of contaminant transport to the aquifer. Since the facility is being designed to avoid saturated conditions, unlike leachability studies performed to support the RI/FS documents, infiltration water would only be in contact with concrete surfaces, and leaching would be a function of the exposed surfaces. Therefore, the less surface area exposed, the less contaminants would leach. The cement in concrete blocks naturally enhances contaminant stability within the concrete matrix, and crushing the concrete would cause increased risks without additional benefits. DOE does not feel this would be appropriate action when temporary staging of the debris on existing storage space would be a solution to a temporary shortage of soils.

Action: In Section 5.2.2, the reference to using clean off-site borrow as fill for the on-property disposal facility during periods of excess debris awaiting placement has been removed (Page 5-7, Lines 13-15).

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: General Comment Pg #: Line #: Code: M
Original Comment #: 7
Comment: DOE should more explicitly make use of data on estimated and actual waste volume generation from the completed and on-going D&D removal actions. A short discussion within Section 4 regarding knowledge gained from these removals would provide the reader additional confidence in the assumptions used throughout the document. Such data could provide a mechanism for model validation.

Response: Completed and on-going removal actions have already added important refinements to volume and cost estimates during the development of the draft OU3 RI/FS Report. For example, the bulking factor for structural steel, which had been estimated to be 23.7, was revised to 17 based on results from the dismantlement of Plant 7. DOE is dedicated to continuing the refinement of site-specific estimates as remedial actions progress.

Other ongoing D&D programs have had additional impacts on the assumptions utilized in this Report. As detailed in USEPA Specific Comment #11, material generation information has been incorporated into the source term calculations and are detailed in Appendix B.

Action: Please refer to the action for US EPA General Comment #4.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: General Comment Pg #: Line #: Code: C
Original Comment #: 8
Comment: The document refers to ARARs that are "excluded" or "precluded" by the USEPA waiver of such ARARs. Such language is confusing and should be revised. Ohio EPA recommends DOE incorporate the approved language from the OU2 ROD for all references to the waiver of Ohio EPA siting criteria.

Response: The waiver language used was taken directly from the OU2 ROD with minor adaptations to reflect OU3-specific aspects. See response for US EPA General Comment #2.

Action: Refer to action for US EPA General Comment #2.

SPECIFIC COMMENTS

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: G Pg #: Glossary 3 Line #: Code: c
Original Comment #: 9
Comment: Please modify the definition of "Federal Facilities Compliance Agreement" to reduce the possibility that the reader may infer that FFCAs apply only to the FEMP.

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Ohio EPA suggests that the phrase "pertaining to DOE facilities including the FEMP " be used instead of the phrase "pertaining to the FEMP".

Response: Agreed.

Action: The text on Page G-3 was modified as follows: "an agreement between the US EPA and the DOE pertaining to DOE facilities, including the FEMP, to. . . ."

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Exe.Sum Pg #: ES-5 Line #: 27-29 Code: C
Original Comment #: 10
Comment: This paragraph suggests the 100 g mass WAC for Tc-99 applies only to OU3 materials into the cell yet the Proposed Plan on Page 9 states, "the maximum amount of technetium-99 that could be safely stored in the on-site disposal facility is 105 grams." The text of the RI/FS and the Proposed Plan must be clarified. If the mass limit is for the cell as a whole, the documents need to discuss the mass contribution to the cell expected from the other operable units and how that affects the "conservatism" of the 59 gram contribution from OU3.

Response: Agreed. The information cited on Page ES-5 of the Executive Summary correctly states that the technetium-99 mass limit for OU3 materials is approximately 100 grams (105 grams specifically). In the WAC development process presented in Appendix G, technetium-99 contributions from other materials estimated to leach in a 70-year period (to be consistent with the 70-year rule applied to OU3 materials) were subtracted out from the total technetium-99 mass allowed to leach within a 70-year period from the disposal facility . This approach, as summarized in Table G-7, was used to determine that the allowable mass for OU3 materials specifically is 105 grams. Figure 5-5 illustrates that, by disposing certain materials off-site to meet this criterion, combined with application of best management practices to further reduce the mass of technetium-99 in OU3 materials destined for on-property disposal, the estimated technetium-99 mass in the remaining OU3 materials is 59 grams. Therefore, DOE feels that limiting the technetium-99 mass to 59 grams in OU3 materials when it has been demonstrated that 105 grams is a safe limit for OU3 materials is sufficiently conservative. It is agreed that the statement referenced in the Proposed Plan is not clear.

Action: The statement on Page 9 of the Proposed Plan has been modified to read, "the maximum amount of technetium-99 for OU3 materials that could be safely stored in the on-property disposal facility is 105 grams." The Executive Summary has not been modified.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.1.3 Pg #: 1-6 Line #: 28-29 Code: C
Original Comment #: 11
Comment: The document is unclear on defining when additional mixed wastes generated under OU3 that are to be treated consistent with the FFCA requirements. The text should

discuss why all OU3 mixed wastes would not be treated in a manner similar to the mixed wastes treated under the FFCA. The text should provide additional detail on the criteria for treating materials via the FFCA treatment facilities to be developed on-site.

Response: Agreed. The document has been clarified to state that mixed waste generated by the OU3 remedial actions will be treated in accordance with the STP.

Action: Page 1-6, Line 28 was changed from "If future mixed wastes generated by the OU3 remedial actions are similar in composition to legacy mixed wastes, DOE proposes..." to "If OU3 remedial actions generate mixed wastes, DOE proposes...."

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.1.3 Pg #: 1-7 Line #: 1 Code: C
Original Comment #: 12
Comment: Revise the text to state that Ohio EPA has issued Director's Findings and Orders to assure implementation of the STP.

Response: Agreed. The DF&O's were issued October 4, 1995; the text was revised accordingly.

Action: Page 1-7, Line 1-2, was modified to read: "OEPA issued an order to assure implementation of the STP on October 4, 1995."

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 1.2.2.1 Pg #: 1-12 Line #: 19 Code: C
Original Comment #: 13
Comment: Isn't the OU3 Remedial Design Prioritization and Sequencing Report (PSR) to be revised based upon the $276 million/yr budget, 10 year plan? If so please include a schedule within the text which states at what point this document will be submitted by DOE to the regulatory agencies.

Response: The PSR provides a sequence and schedule by which the above-grade portions of all OU3 components will be decontaminated and dismantled. DOE does not intend to fully revise the PSR to reflect the new budget scenario. However, as stated in a letter from Johnny Reising, DOE-FN, to Jim Saric, US EPA, and Tom Schneider, Ohio EPA, on October 23, 1995, DOE will provide a proposed schedule for submittal of draft implementation plans to support the accelerated remediation scenario; this will be done within 90 days of the finalization of the FY 1996 budget. The schedule will be reevaluated on an annual basis based on authorized funding, and resubmitted if necessary. Since the PSR was developed as a companion document for the interim remedial action, specific details are outside the scope of this document.

Action: No Action.

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Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Table 2-4 Pg #: Line #: Code: C
Original Comment #: 14
Comment: No data were collected for Inaccessible metals yet according to Figure 5-3 they are the second largest volume of material to be generated and disposed of in the on-site disposal facility. The lack of data from this material category should be included within the Data Limitations (Table 3-210) discussion as well as its impact on WAC determination.

Response: An explanation for the lack of data from inaccessible metals has been added to the Operable Unit 3 Data Limitations discussion (Table 3-21) as requested.

No data were collected for inaccessible metals per Section 4.3.3 of the WPA. This section of the Data Quality Objective states that no intrusive samples were planned for any metals other than structural steel because of the limited options for treatment or recycle and reuse. The structural steel samples consisted of steel coatings (paint and rust). No actual metals were sampled because the contaminated portion of the structural steel was expected to be the exterior coatings. However, to determine a contaminant mass source term for this material, the following assumptions and existing analytical data were used:

- The analytical results from the paint collected from the most contaminated location on the structural steel I-beams (typically at the base of the I-beam) were applied to the surface of all painted metals from the same component. A 10 mil thickness of paint was assumed.

- The exterior of all unpainted metals was assumed to contain a 5 mil dust layer. As above, the analytical results from the paint samples were used to determine the contamination in the dust layer.

- The interior surface of both process piping and process equipment were assumed to contain a one percent CRUD layer. As above, the analytical results from the paint samples were used to determine the contamination in the CRUD layer.

- The interior surface of both process piping and process equipment were assumed to contain UNH holdup. The UNH is assumed to contain 43 percent elemental uranium. For process piping, a ten percent by volume holdup is assumed. For process equipment, a one percent by volume holdup is assumed.

Based on these assumptions, the contaminant mass source term for the inaccessible metals is considered to be conservative. During D&D actions, a visual inspection will be implemented to effectively segregate material category B and C based on process residues and holdup material (see OEPA comment #26 for additional detail). Any materials containing visible process material after washing will be dispositioned off-site under Material Category C. Therefore, the conservative assumptions used in the source term calculations over estimate the mass of contaminants expected to be disposed within the on-property disposal

facility. For these reasons, the determination that these materials are acceptable for on-property disposal is also conservative.

This approach to contaminant mass source term development for inaccessible metals has no effect on the WAC development process. The relationship of the source term to the WAC development process is discussed in the response to US EPA General Comment #6.

Action: Table 3-21 has been modified to include discussion concerning the lack of data for inaccessible metals.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.2.1 Pg #: 3-9 Line #: 34 Code: C
Original Comment #: 15
Comment: This paragraph states that five constituents were inadvertently reported by analytical laboratories for several samples. Why not include a qualitative discussion of these constituents within this section regarding COCs instead of excluding this data.

Response: See response to US EPA Specific Comment #6.

Action: See action for US EPA Specific Comment #6.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3 Pg #: 3-14 Line #: 21 Code: E
Original Comment #: 16
Comment: Please re-check the concentrations listed in the phrase"from 0.0263 ug/g to 52,0000". There appears to be at least one typographic error.

Response: Agreed. There is a typographical error.

Action: "52,0000" has been changed to "520,000".

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3 Pg #: 3-15 Line #:6 through 9 Code: c
Original Comment #: 17
Comment: This section does not answer the question, " What is the disposition of the asphalt?" It is unclear from this discussion whether asphalt is proposed to be disposed of off-site as a free release material or whether it is destined for the OSCF.

Response: Agree that the RI/FS should clearly indicate the disposition of all materials. However, Section 3 of the document provides a summary of the results of the RI/FS characterization program and projects weights and volumes of contaminated material according to regulatory waste classifications. Section 5 presents the

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development and description of alternatives for final disposition of OU3 material. Therefore, material disposition is not presented in Section 3.

To respond to the question posed, Alternative 2 will disposition the asphalt road material to the on-property disposal cell. This disposition pathway has been changed for this revision of the RI/FS Report. Because the concrete baselines have changed, considerably more OU3 material exceeds these levels.

Action: The referenced sentences have been deleted and asphalt has been included in Figures 3-4 through 3-7 and 3-15.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3 Pg #: 3-17 Line #: 2 Code: c
Original Comment #: 18
Comment: Please amplify the statement that "thorium-230 contamination attributable to fuel processing operations is expected in areas of the site that were associated with these operations". Please state exactly which areas are involved or supply a reference to another part of this report which provides such information.

Response: This section is intended to provide an overview of thorium-230 results. Elemental thorium was processed at the FEMP for use by the Thorium Breeder Reactor Program prior to its cancellation. This thorium contained thorium-232, thorium-230, and thorium-228. DOE has provided individual examples supporting the initial statement, but a complete listing is not considered appropriate at this level of discussion. The level of detail requested is available in the Operable Unit 3 RI/FS Work Plan Addendum (DOE 1993a). This information is now referenced in the text.

Action: The following changes were made in the text:
1) Page 3-16a, Line 1, was changed by inserting the phrase "..., such as Plant 1,..." after the word "site". The Line now reads "...is expected in older areas of the site, such as Plant 1, which housed the ore preparation... 2) The two sentences beginning on Page 3-17, Line 1 have been changed to read "Thorium-230 was also introduced to the site by thorium processing operations. Thorium-230 contamination attributable to these thorium processing operations is expected in areas of the site that were associated with these operations, such as the Pilot Plant and Plant 9 (DOE 1993a).

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.4.3.3 Pg #: 3-21 Line #: 16 Code: E
Original Comment #: 19
Comment: Revise "cadmium" to state "chromium."

Response: Agreed.

Action: Changed "cadmium" to "chromium" in on Page 3-21, Line 18.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.4.3.4 Pg #: 3-22 Line #: 17 Code: E
Original Comment #: 20
Comment: Please revise this sentence to read "There is no Part **B** Screening Level for lead.

Response: Agreed.

Action: The sentence on Page 3-22, Line 21, was revised to read "...Part B Screening Level..."

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3 Pg #: 3-25 Line #: 5 Code: c
Original Comment #: 21
Comment: It is not Ohio EPAs experience that hexachlorobutadiene is a constituent of cutting oils. Are there any other possibilities for the source of this substance?

Response: There may have been additional uses for hexachlorobutadiene at the FEMP. According to The Condensed Chemical Dictionary, hexachlorobutadiene is used as "a heat-transfer liquid, transformer and hydraulic fluid, and wash liquor for removing C4 and higher hydrocarbons." Often, heat transfer oils are used in cutting and cooling oils. The heat transfer properties may have been utilized in a machining lubricant, but the Heaxachlorobutadiene may also have been a degreaser constituent used in nearby operations.

Action: Revised the sentence on Page 3-25, Line 5, as follows: "Hexachlorobutadiene may have been used in cutting oils, cooling oils, transformers, hydraulic fluids, or solvents used to clean heavier hydrocarbons from some of the equipment."

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.4.7 Pg #: 3-27 Line #: 27-28 Code: C
Original Comment #: 22
Comment: This paragraph suggests there are approximately 43,000 ft^3 of mixed waste within OU3, yet Line 29 on Page 3 of the Executive Summary suggests there are 163,000 ft^3 and Table 5-5 states there is 106,000 ft^3. DOE should review the data, determine the appropriate volume, its impact upon cost, etc. and revise the document as appropriate.

Response: All three volumes were correct for the September submittal in the way in which they were used in the text. The 43,000 ft^3 of material considered potentially mixed waste was based on the application of data only to the specific media sampled in the characterization study. The 163,000 ft^3 volume represented the volume calculated when data was applied to nonsampled media. This volume included the 43,000 ft^3 volume. The 106,000 ft^3 volume presented in Section 5

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represented the 163,000 ft^3 volume minus the material not considered for on-site disposal (i.e., Category J Material). These volumes have been revised consistent with the response.

Action: Revisions were made to reflect the new volumes on Page ES-3, Line 29; ES-4, Line 3; Page 3-27, Line 30; Page 3-28, Line 8-11; and Table 5-5.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3 Pg #: 3-30 Line #:12 Code: e
Original Comment #: 23
Comment: Please define "CRUD" in the list of acronyms.

Response: Agreed. CRUD was defined in the acronym list in Appendix B; however, it was inadvertently left out of the general acronym list.

Action: CRUD has been added to the general acronym list for the OU3 RI/FS.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3 Pg #: 3-33 Line #: Code: e
Original Comment #: 24
Comment: The first two paragraphs have several incomplete sentences and sentence fragments.

Response: Agreed.

Action: The paragraphs in Section 3.5.4.1, on Page 3-33, have been rewritten to eliminate incomplete sentences and sentence fragments.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.5.4.1.2 Pg #: 3-34 Line #: Code: c
Original Comment #: 25
Comment: There appear to have been several typographic errors in the contaminant masses listed. The materials that are said to contribute one percent of the contaminant mass collectively appear to total much greater than one percent.

Response: Agreed. Several typographical errors occur in the text on Page 3-34, Lines 1-3.

Action: The text on Page 3-34, has been corrected and revised to incorporate recalculated source term values.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Table 3-1 Pg #: Line #: Code: C
Original Comment #: 26
Comment: It is still unclear to the reader how the determination of process-related metals is made versus inaccessible metals. The text or table should clarify exactly what piping is included in inaccessible metals but not process-related (e.g. is water supply pipe and sanitary waste pipe process related?). Additionally, why does "process equipment" occur under the inaccessible metal category rather than the "process-related metals category. How will such determinations be made during D&D if they are not much clearer within this and future documents?

Response: Agree that how materials are grouped into material categories should be more clear. The document has been modified to include the approach for segregating materials between inaccessible metals and process-related metals during the D&D operations. The exact determination of which type of piping will be segregated into each category is unknown at this time. It is anticipated that water supply and sanitary waste piping would be inaccessible; however, the specific determination of all piping in these categories cannot be made without visually inspecting the pipe itself, since the use of the categorization as process-related is an outcome associated with failing the visual inspection for visible process materials.

The intent of Material Category C is to administratively segregate materials containing holdup or process residues from placement within the on-property disposal facility. To account for this, the approach that is being utilized during the D&D activities is to inspect all piping, ductwork, and equipment (items contained in Material Categories B and C) for visible process material.

Action: Page 3-5, Line 17, has been modified to reference Appendix B.2 for definitions of material categories and Appendix B.7 for a description of how materials are assumed to be segregated for the purposes of the RI/FS.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Table 3-1 Pg #: Line #: Code: C
Original Comment #: 27
Comment: It would seem likely that vitrified clay piping is "process-related" and should be administratively dispositioned off-site. Such clay piping is typically used to convey process waste underground. The reviewer believes the waste line to the Pilot Plant sump was made of clay pipe and this pipe certainly contained materials that should be dispositioned off-site.

Response: Consistent with the response in OEPA Specific Comment #26, clay piping will be inspected during remediation. If process residues and/or holdup are determined, they will be segregated as process-related metals for off-site disposal. However, at the FEMP, vitrified clay piping has typically been used to convey dilute

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wastewaters, such as rainwater. The pipe feeding into the Pilot Plant sump was actually made of duriron piping (a cast metal product).

Action: No action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Table 3-21 Pg #: Line #: Code: C
Original Comment #: 28
Comment: With 50 percent of the Tc-99 data qualified as estimated concentrations, Ohio EPA has significant concerns with the conservatism of DOE's decision to use 59 grams as the Tc-99 limit for OU3. These data concerns and questions regarding mass contributions from other operable units suggests additional administrative conservatism should be built into the disposition of OU3 wastes. Ohio EPA believes DOE should provide a graphical summary of Tc-99 mass by building or process area. This summary should be used to develop an ALARA approach to reduce the mass of Tc-99 entering the on-site disposal facility. It is Ohio EPA's intention to develop a practical method of limiting the possibility of exceeding the mass based WAC without incurring additional analytical expenses.

Response: Figures 3-17 through 3-34 provide a graphical representation of the source term by component and material. Tables B-12 and B-13 provide the specific information requested on technetium-99 source terms by building. DOE is currently using this and other information to develop a practical method of limiting the possibility of exceeding the mass based technetium-99 WAC. For example, administrative controls, described on Pages 5-26 through 5-27, will be used to ensure the technetium-99 placed in the on-property disposal cell will be below the 105 g technetium-99 mass limit for Operable Unit 3 material. Additionally, the philosophy of ALARA will continue to be applied to the process determining the preferred deposition of material. This ALARA approach has already identified actions which reduce the OU3 technetium-99 contribution to the final on-property inventory, as illustrated by the examples provided on Page 5-28. These particular actions limit the amount of technetium-99 from OU3 going into the cell to 59 g. This is less than 60 percent of the proposed OU3 technetium mass limit, which already has safety factors built into it. It is anticipated that additional efforts to limit the source term will be encouraged by the continued application of ALARA as the remedial process continues.

Action: Figures 3-17 through 3-34 have been added to Section 3.5.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 4.3.2 Pg #: 4-7 Line #: 12-16 Code: C
Original Comment #: 29
Comment: It is unlikely that screening of materials will be acceptable for unrestricted release and disposal at a commercial landfill. Landfills within the State of Ohio cannot accept wastes with radiological concentrations above background, thus the burden of proof for disposal of wastes from Fernald would be substantial and include more than screening with a radiological instrument.

Response: For non-porous materials, criteria prescribed by DOE Order 5400.5 (equivalent to NUREG 1.86) provides a basis to permit unrestricted release of materials. DOE contends that OU3 materials that meet this criteria is acceptable for release to a commercial sanitary landfill. For porous materials, DOE recognizes that before any remediation material from OU3 could be available for unrestricted release, it must be adequately demonstrated, with data, that such an action is appropriate. This will include using, as defined on a case-by-case basis, testing protocols subject to US and Ohio EPA review and approval. In addition, DOE recognizes that the regulatory agencies will review associated data with respect to agreed upon unrestricted release criteria to confirm that unrestricted release of specific material is appropriate.

DOE believes it is appropriate to maintain the ability to release materials that are essentially free of contamination and for which the unrestricted release process can be implemented economically. As noted on Page 4-7, Lines 1 through 10, few remediation materials derived from the former Production Area will meet unrestricted release criteria. However, it is anticipated that materials from the Administrative Area (not a radiologically-controlled area) will readily meet the criteria for unrestricted release (substantiated by data and surveys from the OU3 Field Investigation Program).

Action: The text on Page 4-6, Lines 27-29, has been modified to reflect that materials will be required to meet the unrestricted release criteria prescribed in DOE Order 5400.5 prior to being released to a solid waste disposal facility and that further evaluation is necessary for porous materials.

To reflect this strategy, Category E material that is below baseline has been removed from this evaluation as being disposed of at a commercial sanitary landfill. See change Pages 5-29, Line 5; Page 5-32, Line 32; Tables 5-5 and 5-6; Page E-5a, Line 11; and Page E-7, Lines 32 and 33.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 4.3.2 Pg #: 4-7 Line #:24-27 Code: C
Original Comment #: 30
Comment: The paragraph should include a discussion of the fact that the Plant 7 cost estimates will be high since an obvious lack of customer requirement definition occurred during the implementation of this technology evaluation. The fact that, significant quantities of steel were returned because of bending and crushing caused by demolition methods will impact the cost estimates. Had different demolition techniques or shipment preparation methods been implemented the costs may well have been lower.

Response: The general recycling rates developed for the OU3 RI/FS report were derived from the recycling costs from the Plant 7 dismantling project. This project was based upon a firm-fixed contract with an off-site commercial recycler that assumed the structural steel members to be straight.

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It is noted that alternative demolition techniques (specifically, utilization of a larger, more powerful shear) may have lowered or at least met the firm-fixed cost of recycling. For this reason, the RI/FS Report chose to utilize the Alaron values as representative of a reasonable recycling cost had the materials met the original recycling specifications (i.e., if all steel beams had been straight).

Please see response to US EPA General Comment #4.

Action: Please refer to the action for US EPA General Comment #4.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5.2.1 Pg #: 5-5 Line #: 7-8 Code: C
Original Comment #: 31
Comment: As stated in Ohio EPA's previous general comment, the Agency's concern relates to the material being contaminated with elevated levels of hazardous substances with a high degree of mobility coupled with the preference for treatment of such materials. Ohio EPA is asserting that DOE should commit to additional treatment of this material, as it is consistently managed as waste requiring treatment throughout the country.

Response: See response for OEPA General Comment #1.

Action: See action for OEPA General Comment #1.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5.2.1 Pg #: 5-5 Line #: 31-33 Code: C
Original Comment #: 32
Comment: It is unclear why DOE believes that it is appropriate to delay categorizing materials as listed or characteristic until implementation of the remedy. The purpose of a Remedial Investigation is to characterize the materials to be managed by the preferred alternative. As suggested by the above referenced lines, all the data necessary to make such a determination already exists. This determination should be completed within this RI/FS.

Response: Agreed. This determination will be made in Section 3 of the RI/FS Report as detailed in OEPA General Comment #1.

Action: See action for OEPA General Comment #1.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5.2.2 Pg #: 5-6 Line #: Code: C
Original Comment #: 33
Comment: OU3 must commit to meet additional WACs to be developed during design of the OSDF.

Response: Agreed. OU3 will meet WAC as established by OU2 during the design of the on-property disposal facility.

Action: The following sentences has been added to Page 5-6, Line 18: "During design of the on-property disposal facility, additional WAC may be developed that are applicable to OU3 materials. If additional WAC are developed, OU3 would implement these WAC in determining the acceptability of its materials for on-property disposal."

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5.2.2 Pg #: 5-6 Line #: Code: C
Original Comment #: 34
Comment: The section should include a discussion of on-site disposal facility size restrictions for waste acceptance. Additionally, a discussion of how such restrictions will be met should be included.

Response: Agreed.

Action: The following text has been included at the end of Section 5.2.2 on page 5-7: Additional coordination issues pertain to the size restrictions of material that may be scheduled to be placed into the on-property disposal facility. Size restrictions have been developed through sitewide coordination efforts. The sizing of OU3 materials that may be disposed of the on-property facility will be accomplished during the D&D phase under the IROD. The sizing criteria will be included as a project-specific design specification for the remediation subcontractor. Please reference Appendix G, Section G.3.2 and Table G-2 of this report for detailed information concerning material size restrictions.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5.2.2 Pg #: 5-7 Line #: 11-17 Code: C
Original Comment #: 35
Comment: As stated in Ohio EPA's general comments, the text should include a discussion of the use of a crusher or off-site disposal contingency for potential failures in material coordination.

Response: See response to OEPA General Comment #6.

Action: Please refer to the action for OEPA General Comment #6.

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Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5 Pg #: 5-12 Line #: 10-11 Code: c
Original Comment #: 36
Comment: Does the phrase "commencement of final remedial action" mean "disposal in the OSDF"?

Response: This section of the document is discussing remedial actions in a general format and not alternative specifically. Based on the expected date of approval of the OU3 ROD, in late 1996, the final remedial action could not begin until 1997 regardless of which alternative is selected. The specified phrase means the beginning of those activities that may be included in the final remedial action regardless of which alternative is selected. Therefore, "disposal in the OSDF" would be equivalent to "commencement of final remedial action" under the assumption that the on-property disposal facility is selected to disposition OU3 materials.

Action: No action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5 Pg #: 5-9 Line #: 8 Code: c
Original Comment #: 37
Comment: Are the five-year reviews referred to here, the reviews that the NCP requires USEPA to conduct under CERCLA or are these reviews being performed independently by DOE?

Response: The five-year review will be performed by the US EPA, in conjunction with the DOE and the OEPA, as required by CERCLA and the NCP.

Action: "CERCLA" has been added to the sentence to clarify the review; see change page 5-9.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5.3.2 Pg #:5-12 Line #: 23-27 Code: C
Original Comment #: 38
Comment: Include a discussion of how the material volumes for disposal at the representative commercial disposal facility were estimated.

Response: The text in Lines 23-27 on Page 5-12 presents how materials scheduled for disposal at the NTS have been estimated using bulking factors, which is subsequently defined. The estimates of materials that have been scheduled for dispositioning at the representative commercial disposal facility have used unbulked volumes. This information is provided in the text in Lines 16-21 on Page 5-12.

Action: No action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5 Pg #: 5-19 Line #: 3rd bullet Code: c
Original Comment #: 39
Comment: This phrase is rather awkward. Please replace it with" Remove materials as necessary to achieve the mass-based WAC for technetium-99 and dispose of off-site.

Response: Agreed.

Action: Replaced text as requested; see Change Page 5-19, Line 17. This change has also been incorporated into the Proposed Plan on Page 10.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5.5.2 Pg #: 5-24 Line #: 10-15 Code: C
Original Comment #: 40
Comment: The text should include a more substantial discussion of the requirements for disposal of ACM and the associated increase in disposal costs associated with such requirements. Examples of such cost should include containerization, additional personnel protection and training and impacts to other disposal operations.

Response: DOE acknowledges OEPAs concern that the unit cost of handling and placing waste in the disposal facility would be higher for irregularly shaped debris or debris with special placement requirements (e.g., regulated ACM) than soils. Two unit rates were used to develop the cost estimate for disposing OU3 debris in the on-property disposal facility. The disposal rate of $3.05/ft^3 was inclusive of facility design, construction, material placement, maintenance, and monitoring during construction. The disposal rate of $1.12/ft^3 was inclusive of all monitoring and maintenance for the facility after construction completion. Out of all activities included in these unit rates, material placement is the only activity which would result in higher costs for debris than soils. Average material placement costs, considering costs for equipment and equipment operators only, represent less than 10 percent of the total unit rate of $4.17/ft^3. Since waste placement costs are a small percent of the overall disposal costs, increasing the waste placement cost would have a minimal effect on the overall on-property disposal alternative costing.

In addition to the small impact debris placement costs have on the total disposal costs, the OU3 cost estimate was conservative since it assumed a 33-year duration for on-property material disposal. Based on the anticipated $276 million plan (Rev. 1) schedule, additional savings could be realized through reduced site preparation activities and support requirements. This would result in a disposal unit rate of $1.83 in comparison to the $3.05 rate utilized in the RI/FS report. Therefore, the costs currently presented in the RI/FS still provide an upper bound on the costs for implementing Alternative 2.

Action: The text on Page 5-24 has been revised to point out examples of the additional requirements for handling ACM, which include: using asbestos-trained personnel to load ACM for transport from the interim storage area to the on-property disposal

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facility staging area (as necessary) and hand-placing ACM in the on-property disposal facility.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5.5.2 Pg #: 5-24 Line #: 24-25 Code: C
Original Comment #: 41
Comment: CERCLA calls for perpetual monitoring of waste left on-site. Please see the previously approved OU2 ROD for acceptable language on this subject and revise appropriately.

Response: The long-term monitoring of wastes remaining on-site will be addressed by OU5. Specifically, Section 9.1.7 of the OU5 draft ROD discusses long-term monitoring of the on-property disposal facility.

Within this discussion, OU5 states, "Long-term environmental monitoring will also be conducted as part of the selected remedy. This monitoring will be designed to detect and quantify, to the extent practical, releases from the site attributable to the implementation of remedial actions and will include monitoring of the air, surface water and groundwater pathways. Monitoring devices providing real-time or near real-time data will be evaluated and applied, if practical. Monitoring will also be conducted following the completion of remedial actions to assess the continued performance of the remedy; groundwater monitoring will be continued for, at a minimum, the area of the disposal facility. The type and frequency of monitoring activities will be established during remedial design, with necessary modifications to the program applied during or following remedy implementation."

The key components for institutional controls and monitoring under the OU5 selected remedy pertinent to OU3 include:

- Continuation of access controls at the FEMP, as necessary, during the conduct of remedial actions. Property ownership will be maintained by the federal government of the area comprising the disposal facility and associated buffer areas.

- Maintenance of the on-property disposal facility will be performed to ensure its long-term performance and the continued protection of human health and the environment.

- Conduct an environmental monitoring program during and following remedy implementation to assess the short- and long-term effectiveness of remedial actions.

Action: The text in line 27, page 5-24 has been modified to reflect the above information.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5.5.2.1 Pg #: 5-25 Line #: 16 Code: C
Original Comment #: 42
Comment: It seems that working around the clock or at least extending working hours during the spring to summer months would help to expedite the placement of waste materials into the disposal cell, as well as help to off-set any delays which may occur during the winter shutdown months.

Response: Comment acknowledged (comment originated from text on Page 5-24, not 5-25). However, operations of the on-property disposal facility is outside the scope of the OU3 RI/FS.

Action: This suggestion and concern has been forwarded to the OSDF design organization.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5.5.2 Pg #: 5-29 Line #: 8-13 Code: C
Original Comment #: 43
Comment: These materials would also have to meet Ohio EPA requirements regarding the disposal of radiologically contaminated material within solid waste landfills. The text should include a discussion of such requirements and their impact on this disposition alternative.

Response: Please see the response to OEPA Specific Comment #29.

Action: Please refer to the action for OEPA Specific Comment #29.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 5 Pg #: Table 5-1 Line #: Code: c
Original Comment #: 44
Comment: The ratio of unbulked volume to bulked volume for FS Category A Accessible Metals is very much lower than this ratio for the other categories. Please re-check this.

Response: The bulking factor for Material Category A is 16.8. This value reflects the quantity of void space associated with containerizing structural steel. The numbers in Table 5-1 are correct.

Action: No Action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Table 5-5 Pg #: Line #: Code: C
Original Comment #: 45
Comment: This table seems to contradict the text which suggests that Painted Light-Gauge metals are not considered hazardous wastes. Please clarify this discrepancy.

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Response: The estimated 50 ft^3 of Painted Light-Gauge Metal (Category D) represents lead flashing, which is a Category D constituent, that is expected to be generated during the D&D of OU3 structures. The lead flashing was included in the category definition at a time when painted light-gauge metal was anticipated to potentially be a RCRA waste. However, data collected by the other on-site programs has determined otherwise. The lead, however, as a stand-alone material, would be considered a RCRA characteristic waste. Please refer to Table 3-1 for a complete listing of materials in the Painted Light-Gauge Metals category and Table 3-2 for associated estimated volumes.

Action: No action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Figure 5-4 Pg #: Line #: Code: C
Original Comment #: 46a
Comment: Please update this figure to be consistent with the current OU2 design (e.g., no dog-leg on the cell).

Response: Agreed. Figure 5-4 was a conceptual design representation of the on-property disposal facility footprint, based on the OU2 Feasibility Study Report and the OU2 predesign investigation findings. This figure will be replaced with the footprint defined in the OU2 draft preliminary design (30 percent).

Action: The current Figure 5-4 and Figure G-1 drawings have been replaced with an updated drawing.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 6.3.2.3 Pg #:6-14 Line #: 6-8 Code: C
Original Comment #: 46b
Comment: Please refer to OU2 ROD for acceptable language regarding long-term monitoring of the disposal facility.

Response: Please see the response to OEPA Specific Comment #41.

Action: Please refer to the action for OEPA Specific Comment #41.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Figure 5-5 Pg #: Line #: Code: C
Original Comment #: 47a
Comment: This figure represents that 7,290,000 cubic feet of material with an average concentration of 2.9 pCi/g will contain 59 grams of Tc-99. Given this data it is difficult to believe that an additional 59 or more grams of Tc-99 will not be contributed by the other operable unit wastes being disposed of in the cell. Based upon this information and that previously presented in these comments Ohio EPA does not believe the Tc-99 WAC is sufficiently conservative.

Response: The estimated contribution of technetium-99 in the leachate from all other materials in the disposal facility (other than OU3 materials) in a 70-year period was factored into the calculations which determined the technetium-99 allowable mass of 105 grams for OU3 materials. See response to OEPA Specific Comment #10 for further explanation.

Action: See action for OEPA Specific Comment #10.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 6.3.2.6 Pg #: 6-24 Line #: 26-34 Code: C
Original Comment #: 47b
Comment: This section should include a discussion of the administrative difficulty in getting material disposed at an off-site sanitary landfill.

Response: Agreed.

Action: The text on Page 6-24, Line 34 and Page 6-25, Line 1 has been modified to include the requirement for administrative agreements between the DOE and a commercial sanitary landfill. The text has also been revised to reiterate that the materials scheduled to be dispositioned at a commercial sanitary landfill would be require to meet the unrestricted release criteria presented in DOE Order 5400.5.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 6.3.2.7 Pg #: 6-25 Line #: Code: C
Original Comment #: 48
Comment: Since cost would appear to be DOEs primary reason for selecting Alternative 2 as the preferred alternative, additional detail needs to be included within this section. Details should include the per cubic yard or foot costs for disposal and maintenance, additional costs for OU3 materials such as ACM and TSCA wastes, off-site costs for disposal including representative commercial facilities for LLW and sanitary waste, treatment cost, etc.

Response: Cost is not the only reason for selection of Alternative 2. Additional clarification has been added to the other evaluation criteria in Section 6. Additionally, the unit rates used in the cost estimate have been added to this section for additional information. Please see the respective responses for OEPA Specific Comment #40 and US EPA General Comment #8.

Action: Please refer to the respective actions for OEPA Specific Comment #40 and US EPA General Comment #8. Text has been included on Page 6-25, Line 21 and Page 6-33, Line 2 to provide unit rate information for the respective disposal options.

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Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 6.4.1.1 Pg #: 6-34 Line #: 12-15 Code: C
Original Comment #: 49
Comment: In most scientific analyses 80 percent certainty is not considered high and is often consider unacceptable for drawing conclusions. Ohio EPA recommends deletion of the term "high."

Response: Agreed. However, please note that the text stated "(> 80 percent)."

Action: The term "high" has been deleted; see Page 6-34, Line 13.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 6.4.2.5 Pg #: 6-38 Line #: 8-11 Code: C
Original Comment #: 50
Comment: It would seem appropriate that the per unit costs for OU3 be substantially higher than the costs of wastes from other operable units. We base this assertion on the unique handling and disposal requirements of the OU3 wastes. OU3 materials will be a major limiting factor in the operation of the facility and thus should appropriately bear an additional burden of cost.

Response: See the respective responses for OEPA Specific Comment #40 and US EPA General Comment #8.

Action: Please refer to the respective actions for OEPA Specific Comment #40 and US EPA General Comment #8.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Appendix A Pg #: A-67 Line #: 20 Code: c
Original Comment #: 51
Comment: Please discuss the significance of the phrase "samples... will be considered potentially hazardous".

Response: Based on OEPA General Comment #1, no concrete will be considered characteristically hazardous; therefore, the sentence does not apply.

Action: Sentence deleted, Page A-67, Line 20-21.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Appendix A Pg #: Figure A-13 Line #: Code: e
Original Comment #: 52
Comment: Please add a clarifying legend explaining the significance of the two bold horizontal lines in the Figure.

Response: The two horizontal lines in Figure A-13 indicate the isotopic percent enrichments that occur for both U235 and U234 in uranium that has been enriched

to 1.3 percent U235 by the gaseous diffusion process. The upper line is the U235 enrichment (1.3 percent) and the lower line is the corresponding U234 enrichment.

Action: Each line has been labeled by adding "eU235" and "eU234" next to the lines on the vertical axis of the figure.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: B.2.3.1 Pg #: B-7 Line #: 18-21 Code: C
Original Comment #: 53
Comment: DOE has not provided a sufficient basis for the percent CRUD and holdup within this section . These numbers seem low to the reviewer. Were measurements used to make these determinations? What experience was used to make these assumptions? Additionally, the sensitivity analysis only evaluated scenarios where less material existed rather than larger quantities leaving to question the impact of an underestimation of these percentages.

Response: The percent CRUD and holdup assumptions discussed in Appendix B are conservatively based on the best available process knowledge. The response to US EPA Specific Comment #11 provides discussion regarding material holdup quantities present in Plant 4 piping, process equipment, and ductwork. Based on data available from the D&D of Plant 4, approximately one percent holdup was determined to be present in Plant 4 piping, providing confirmation that a 10 percent holdup in process piping is conservative. There was no separation of CRUD material from holdup material during the D&D process for Plant 4, so no quantitative data is available to validate the percentage CRUD applied to process piping or equipment. However, by definition, CRUD is corrosion (corroded material from the pipe), rust, and other undefined debris, which accumulates in the interior of piping or equipment over time, and would not be expected to be a significant part of the material remaining within piping. Because process piping and equipment in Plant 4 was found to contain approximately a one percent holdup and because CRUD and holdup were not separated, it seems reasonable to assume that any CRUD layer present would be at the most equal to but most probably less than one percent. The assumption of applying a one percent CRUD layer to process piping and equipment is thus reasonable for use in determination of contaminant mass.

Action: No action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: B.2.3.5 Pg #: B-8 Line #: 17-20 Code: C
Original Comment #: 54
Comment: An assumption concerning the percentage of CRUD and holdup material within the clay piping should be included within the source term calculations. It is likely that substantial CRUD exists within the pipes and contains elevated levels of radionuclides. Assuming the pipe is at baseline values will result in underestimating the source term. DOE should revise the calculations of the source term an incorporate an estimate for CRUD and/or holdup within the clay pipe.

Response: It is extremely unlikely that significant holdup or CRUD would exist in the clay piping. If a 10 percent holdup layer was assumed for clay piping, the source term for total uranium would increase by approximately 532 kg, less than one hundredth of a percent. The overall source term for total uranium is approximately 7.8 million kg, therefore the addition of 532 kg to the source term is relatively insignificant. The technetium-99 source term would not be affected by the addition of a UNH holdup layer in clay piping. The addition of a 1 percent CRUD layer would result in less than one hundredth of a percent increase to the total uranium or technetium-99 source term calculated, and is thus insignificant.

Action: The impact of applying a 10 percent holdup and a one percent CRUD layer to clay piping has been evaluated in a sensitivity analysis and added as B.6.1.12 and summarized in Section 3.6.1, Page 3-40. Because the impact is insignificant, the source term has not been changed to reflect this revised assumption.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: B.2.3.6 Pg #: B-9 Line #: 1-3 Code: C
Original Comment #: 55

Comment: It is unlikely that below grade concrete is at baseline values. Substantial soil and perched groundwater contamination exists within the production area. Spills and releases of contaminants have resulted in significant migration of contaminants through the soil column. It is likely these contaminants also migrated into the below-grade concrete. Assuming these materials are not contaminated will result in a significant underestimation of the source term. DOE should revise the calculations to include an assumption of contamination within the below-grade concrete.

Response: This comment has been addressed in response to US EPA Specific Comment #32.

Action: Please see the action for US EPA Specific Comment #32.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: B.2.3.8 Pg #: B-9 Line #:16-18 Code: C
Original Comment #: 56
Comment: The use of Plant 4 data is important but the statement that a "moderate quantity of dust" was found does not provide any useful information. More detail concerning the Plant 4 results and how they were used should be included. The document states that more dust was found on the inside than the outside so DOE concluded that they would assume dust only on the inside surface of the duct. The basis for such a conclusion is unclear since the Plant 4 data suggested that dust occurred on both surfaces. These assumptions should be revisited and the source term calculations revised as appropriate.

Response: Agreed that the use of the term moderate is vague. During the development of the September OU3 RI/FS document, quantitation of material within ductwork in Plant 4 was not readily available, thus a qualitative discussion was given. In order

to calculate a contaminant mass for ductwork, a 10 mil dust layer was assumed to be present on the interior surface of ductwork. A dust layer was not assumed on the exterior surface of ductwork since exterior contamination, both radiological and inorganic, is conservatively estimated by applying results to a 10 mil layer of paint. All ductwork is assumed to have a 10 mil thick exterior layer of paint.

In the D&D of Plant 4, holdup materials were removed from piping, equipment, and ductwork and drummed as one material, thus, no quantitative results for holdup from ductwork were available.

Action: Text has been modified to discuss Plant 4 data more completely in B.2.3.8, Page B-9.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: B.2.3.12 Pg #: B-10 Line #: 14-17 Code: C
Original Comment #: 57
Comment: DOE has failed to justify the assumption that below-grade piping will be clean. Based upon data from the soils and perched water within the production area it would seem appropriate to assume the piping is contaminated. Unless DOE has data to support the assumption that the below-grade piping is clean then the source term calculations should be revised based upon contaminated below-grade piping.

Response: Below-grade piping is generally made of nonporous material (usually carbon steel) which is resistant to contaminant penetration from surrounding soils or perched ground water; thus, invasive contamination to the exterior surface of below-grade piping is unlikely. It is also assumed, based of the inherent nonprocess function of below-grade piping, that interior contamination would be insignificant.

Action: No Action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: B.5.1.5.1 Pg #: B-22 Line #: 22 Code: C
Original Comment #: 58
Comment: The source term for masonry would appear to be a typo. If not, significant revision to the document is required.

Response: The source term value for technetium-99 in masonry, on line 22, is a typographical error. The source term associated with masonry should have been reported in the September submittal as 0.0005 kg, not 0.3 kg as stated in the text. Based on the revised source term the new value is 0.0002 kg.

Action: Text on page B-22, line 22, has been corrected to incorporate the revised source term values for masonry. Revised source term values are summarized in Section 3.5.4, Pages 3-32 through 3-36. The submittal of the draft final OU3 RI/FS, will contain all revised source term values in Appendix B for all materials and parameters.

030108

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: B.6.1.8 Pg #: B-29 Line #: 34-35 Code: C
Original Comment #: 59
Comment: A substantial discrepancy occurs between this section and section B.2.3.1. Percent CRUD and holdup are based upon interior volume of the pipe and equipment in B.2.3.1 and based upon weight in B.6.1.8. Additionally, B.6.1.8 only discusses the one percent layer of CRUD. Additionally, the basis for using surface paint to represent the concentration of radionuclides in CRUD is unclear. It seems likely that the concentration within the piping CRUD would far exceed that of a surface paint. DOE should revise the text of B.2.3.1 and B.6.1.8 appropriately and discuss the impact of such revisions. DOE should provide a basis for the use of surface paint results to represent CRUD contamination levels.

Response: There is a typographical error in the text for the calculation of holdup; holdup is calculated based on interior volume of piping and equipment.

Section B.6.1.8, Page B-29, provides a discussion of the impact of applying a one percent and a 0.1 percent CRUD layer to process piping and equipment. The following sections, B.6.1.9 and B.6.1.10 provide discussion of the impact of applying either a one percent or a 10 percent holdup to process piping and equipment.

Paint scrapings were usually taken from the base of I beams, based on hot spot determination through surveying. Application of this data to the interior CRUD layer is reasonable given that the nature of this material is assumed to be corrosion and rust and since it would be expected that elevated levels of inorganic and radiological contaminants would be present in these locations. The interior of some piping and equipment may be contaminated with higher levels of radiological constituents than represented by paint concentrations; however, overall, the application of a one percent CRUD layer (using exterior paint data) to all process piping and equipment (including that less contaminated) in addition to a one or 10 percent holdup layer would on average be conservative.

Action: The discrepancy between Section B.2.3.1, Page B-7, and B.6.1.8, Page B-29, in the discussion of calculation of holdup has been corrected in the text.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: E.3.2 Pg #: E-5 Line #: Code: C
Original Comment #: 60
Comment: This section describes surveying to comply with DOE Order 5400.5 yet fails to include costs for determining compliance with Ohio regulations regarding disposal of radiologically contaminated materials in a solid waste facility. It is likely additional analytical sampling will be required to conclude no above background radiological contamination exists. With this addition to Ohio EPA's previous comments concerning DOE's assumption regarding "below-baseline" materials, significant revisions to this cost estimate are required.

Response: See response to OEPA Specific Comment #29.

Action: See action for OEPA Specific Comment #29.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: E.4.2.3 Pg #: E-8 Line #: 33-34 Code: C
Original Comment #: 61
Comment: The basis for assuming small quantity disposal costs is unclear. Regardless of the volume being disposed of from OU3 DOE Fernald should receive a large quantity discount based upon the total volume from the site. Additionally, all disposal activities at Envirocare should be coordinated with OU1 to prevent the development of redundant shipping activities. Incorporation of the OU3 Envirocare waste streams into the OU1 shipments is necessary regardless of their volume.

Response: Under Alternative 2, it was assumed that OU3 materials would be shipped to Envirocare by truck because of the small volume. However, it is expected that coordination activities with OU1 are possible and would be pursued to the maximum extent during the remedial action. OU3 will coordinate the shipment of material to Envirocare with OU1 to not only reduce cost, but also to maximize the use of personnel, facilities, and knowledge in all shipments. This will lower the overall costs for OU3 as well as expedite the shipment of the material. This information and approach was included in the September version of the RI/FS Report on Page 5-29, Line 26-28.

Action: No action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: E.4.4 Pg #: E-10 Line #: 14-16 Code: C
Original Comment #: 62
Comment: Materials regulated under TSCA are proposed for disposal into the on-site cell therefore this assumption is incorrect. The additional cost for disposal and long-term monitoring for such materials must be incorporated into the cost analysis. Specifically, additional long-term monitoring (e.g., sampling for PCBs in leachate) will be incurred by on-site disposal of these materials.

Response: Agreed. The intent of the assumption was to state that the transformers would be flushed by the Safe Shutdown project and, therefore, flushing costs would not be included within this assessment. Based on preliminary assessments, it is believed that all PCB containing transformers on-site have been collected under the FEMP PCB program. To support a conservative approach, the transformers will continue to be considered PCB wastes; however, prior to generation, all transformers will be inspected as part of the DEC team activities. Only if transformers are identified as containing PCBs and these transformers are placed in the on-property disposal facility would long-term monitoring for PCBs be performed. Contingency has been included in the estimated cost for long-term monitoring to account for any PCB monitoring.

Action: The assumption on Page E-10, Line 15, has been modified to read "...therefore, no costs associated with flushing are assumed under Alternatives 2 and 3."

000110

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: E.4.4 Pg #: E-11 Line #: 41-42 Code: C
Original Comment #: 63
Comment: The assumption that OU3 wastes will require the same cost for disposal and monitoring as all other materials going to the on-property disposal facility is inappropriate. The costs in terms of materials handling and disposal requirements will be much greater for the OU3 material than soils from other units. The OU3 material will drive soil excavation rates, cell operations, etc. The cost per unit for OU3 material should be substantially higher than that for soils from other units. Additional information must be provided with regard to costs for material handling time during disposal, special operations for PCB and ACM wastes, increased monitoring costs for OU3 constituents, additional cell design requirements to accommodate OU3 waste, additional cell management and coordination requirements to meet soil to debris ratios, etc.

Response: See response to OEPA Specific Comment #40.

Action: See action for OEPA Specific Comment #40.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: E.I Pg #: Line #: Code: C
Original Comment #: 64
Comment: This section provided insufficient detail to justify the exclusion of recycling for structural steel. The section should be revised to include actual data from the Plant 7 study, vendor bid sheets and specifications, and projected cost savings resulting from increased volume supply to the recycler. Additionally, DOE should include consideration of revised demolition methods to reduce the amount of unusable steel and methods to reduce the amount of on-site handling (e.g., CDF to queue area to shipping area to stage for vendor).

Response: Agreed. Cost analysis alone was not the basis for excluding recycling within the developed alternatives. This additional information has been added to this section as detailed in OEPA General Comment #2. Note that the cost evaluation performed in this section has been developed for preliminary assessment purposes. The viability of recycling will continue to be evaluated on a case-by-case basis, and as appropriate, D&D methods will be evaluated if recycling is to be implemented for a given complex and can be modified if necessary.

The information that OEPA has requested from the Plant 7 recycling project (i.e., vendor bid sheets and specifications) is confidential and is unavailable for publishing consistent with site and DOE procurement policies.

The material handling as detailed on the estimate sheets represents the movement of an empty container from the central distribution facility (CDF) to the queue area within the work zone. The CDF is the receiving and staging point for all empty containers. Within the queue area, the containers are loaded by the subcontractor and then moved to the

staging area for off-site shipment. On-property handling of the materials is being reduced to the maximum extent possible.

Action: See the action for OEPA General Comment #2.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Table E.I-3 Pg #: Line #: Code: C
Original Comment #: 65
Comment: Why is ROB maintenance/survey so much higher for this table than that in Table E.I-4?

Response: The number of loads calculated in Table E.I-4 was incorrect and will be increased to 1,312.

Action: Table E.I-4 has been modified to make the tables consistent. The text in the attachment E.I was modified to reflect this change.

Commenting Organization: OEPA Commentor: GeoTrans, Inc.
Section #: G.4.3.1.1 Pg. #: G-18 Line #: 20-33 Code: G
Original Comment # 66
Comment: The time of travel screening calculations should include the transport inputs parameters, including thickness of vadose zone (L1 and L2), hydraulic conductivity (K1 and K2) and retardation factor (R1 and R2). The rate of infiltration, 6 inches per year, seems reasonable.

Response: Calculated input parameters used for the OU5 travel time screening are provided in Table F.3.5-3 of the OU5 RI. Since the OU5 calculations were used for OU3 screening, it is not necessary to reproduce the input parameters in the OU3 RI/FS Report. However, the resulting travel times calculated in the OU5 RI will be added to Table G-3 to address OEPA Specific Comments #s 67 and 74.

Action: A reference to the travel time calculation input parameters in Table F.3.5-3 of the OU5 RI has been added to the text on G-18, and the calculated travel times for each COC have been added to Table G-3.

Commenting Organization: OEPA Commentor: GeoTrans, Inc.
Section #: G.4.3.1.1 Pg. #: G-19 Line #: 5 Code: G
Original Comment # 67
Comment: In the OU5 RI, the time of travel calculations are presented for the screening results (Table F.3.5-4, OU5 RI). Similar results for OU3 should be included in Table G-3 for ten COC's which did not pass.

Response: See response to OEPA Specific Comment #66.

Action: See action for OEPA Specific Comment #66.

000112

Commenting Organization: OEPA Commentor: GeoTrans, Inc.
Section #: G.4 Pg. #: Table G-4 Line #: Code: E
Original Comment # 68
Comment: Appears to be a typo on total uranium OU5 WAC. The value of 1.03×10^3 should be 1.33×10^3.

Response: The OU5 total uranium WAC is correctly reported in Table G-4 as 1.03×10^3 μg/g, as presented in Section 9.0 of each the draft final OU5 ROD and the final OU2 ROD.

Action: No Action.

Commenting Organization: OEPA Commentor: GeoTrans, Inc.
Section #: G.43.1.2 Pg. #: G-19 Line #: 18 Code: G
Original Comment # 69
Comment: Table G-4 references OU5 WAC values from Table F.5-8 in the OU5 FS (Draft Final 3/22/95), but there was not a value reported for tetrachloroethene.

Response: Agreed. The soil WAC for tetrachloroethene was taken from Table F.5.I-9 in the OU5 FS.

Action: A reference to Table F.5.I-9 of the OU5 FS has been added to the text on Page G-19, which discusses the values reported in Table G-4.

Commenting Organization: OEPA Commentor: GeoTrans, Inc.
Section #: G.4.2 Pg. #: Line #: Code: G
Original Comment # 70
Comment: The development of WAC for OU5 assumed the disposal cell dimensions are 1000 ft x 1000 ft. For OU3, the disposal cell has redesigned to 400 ft x 2,700 ft. Please explain how modeling results from OU5 are applicable to the development of WAC's for OU3.

Response: The only OU5 modeling results used in the OU3 FS are the travel time calculations in the COC screening process. However, the disposal facility dimensions were not needed in the travel time calculations. Therefore, changes of the disposal facility dimensions do not affect the calculated travel times through the overburden.

Action: No action.

Commenting Organization: OEPA Commentor: GeoTrans, Inc.
Section #: G.4.3.1.2 Pg. #: G-20 Line #: 29-31 Code:
Original Comment # 71
Comment: Typo: The K_d for Technetium 99 is listed as 0.62, but in Table G-5 is reported as 0.60.

Response: Although the estimated K_d for technetium-99 of 0.62 L/kg was presented in the referenced report, a rounded (and more conservative) value of 0.6 L/kg was used in the modeling.

Action: The text has been modified to present the rounded value of 0.6 L/kg for the technetium-99 K_d on Page G-20, Line 31.

Commenting Organization: OEPA Commentor: GeoTrans, Inc.
Section #: G.4.3.1.2 Pg. #: G-20 Line #: 20-33 Code:
Original Comment # 72
Comment: The text discusses the change in the value of K_d assumed for technetium 99 as compared to OU5 RI, but does not discuss the change to the value of total uranium. This has changed from 15 (Table F.3.4-4, OU5 RI) to 3. Please explain.

Response: The final K_d value of uranium in the grey clay layer determined by OU5 was 3.1 L/kg as presented in Section F.1.5.4 (titled "Summary of Revisions in Technical Approach Between RI and FS) of the OU5 FS. This lower and more conservative value was determined by model calibrations against the lysimeter data and was used for the OU5 uranium CPRG and WAC development. This value was subsequently adopted in the OU3 RI/FS Report (i.e., Table G-5). Since this value was consistent with the value used in OU5 WAC development, no explanation was provided.

Action: No Action.

Commenting Organization: OEPA Commentor: GeoTrans, Inc.
Section #: G.I.6.4 Pg. #: G.I-22 Line #: 2-28 Code:
Original Comment # 73
Comment: The process of technetium diffusion into cores is modeled using the analytical solution for one-dimensional diffusion. The variables include time, diffusion coefficient, source concentration and distance from surface. In fitting the lab measurements, it would appear that the source concentration was fitted. The fitted source concentration values should be reported and compared with experimental measurements.

Response: The source concentrations reported on these figures were determined by extrapolating the diffusion curve to the concentration at the surface of the concrete ($x = 0$). Since characterization results are not available at the exact surface of the cores, the extrapolated results cannot be compared with actual results.

Action: The following text has been added to the last paragraph in Section G.I.6.4 on Page G.I-22, Line 28, for clarification: "The initial or source concentrations were estimated by extrapolating the diffusion model curve back to $x = 0$ (i.e., the surface of the floor). However, these extrapolated source concentrations cannot be verified since characterization results are not available at the exact surface ($x = 0$). Source concentrations estimated in Figures G.I-28 and G.I-29 are presumed to have been generated by spill events."

000114

Commenting Organization: OEPA Commentor: GeoTrans, Inc.
Section #: G.4.3.1.1 Pg. #: G.-18 Line #: 29-31 Code:
Original Comment # 74
Comment: The travel velocity calculations are not provided in detail here, but can be inferred from the screening results. The following observations are offered.

For tetrachloroethene, the "30 times half-life" is 135 years, thus contaminants must have been predicted to have reached the water table within this time period. Focusing on the slowest residence region, namely the gray clay, the K_d is 1.8. Assuming a porosity and bulk density, the retardation is estimated to be approximately 12. To travel through 20 feet of clay, the water velocity should be on the order of 0.6 ft/year. This is the same order of magnitude, but less than the OU5 velocities on Table F.3.5-3.

For nitrobenzene, the sorption is approximately 3 times less and the half-life is about 3 time less. The results are consistent with tetrachloroethene.

The tables should be expanded to include either the time of travel or the travel velocity.

Response: See response to OEPA Specific Comment #66.

Action: See action for OEPA Specific Comment #66.

PROPOSED PLAN

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Proposed Plan Pg #: 3 Line #: Table Code: e
Original Comment #: 75
Comment: The public is familiar with volumes expressed in the units of "cubic yards" from their experiences with OU5. The use of "cubic feet" will very likely cause at least some confusion. In lieu of changing all the units in this document and the RI/FS, please provide a conversion that expresses the volumes in cubic yards.

Response: Agreed.

Action: A footnote has been added to page 3 of the Proposed Plan that provides the conversion.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: PP Pg #: 8 Line #: Code: C
Original Comment #: 76
Comment: The table incorrectly presents a total of 1,710,000 cubic feet for inaccessible metals when the two categories sum to 1,714,900 cubic feet. Please revise the table.

Response: Due to the relative certainty of the volume estimates, all volumes in the Proposed Plan tables have been rounded to the nearest three significant figures.

Therefore, the addition of multiple volumes are also rounded to the nearest three significant figures.

Action: No Action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: PP Pg #: 8 Line #: Code: C
Original Comment #: 77
Comment: The text states that a "safe level of technetium-99 within the on-property disposal facility is 105 grams" yet the RI/FS suggests this is the quantity for OU3 materials within the cell. As stated in previous comments DOE must address this inconsistency.

Response: See response to OEPA Specific Comment #10.

Action: See action for OEPA Specific Comment #10.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: PP Pg #: 15 Line #: Code: C
Original Comment #: 78
Comment: The Preferred Remedial Alternative language states that material will be evaluated "to determine the least-cost disposition option" yet the text fails to discuss what factors will be evaluated in determining cost. Will lost resources costs, reuse costs, etc. be used in such a calculation? Such detail should be provided for the public or at a minimum the formula for such calculations should be referenced.

Response: The intent of the referenced sentence is to allow for the flexibility for pursuing recycling (and other potential cost-saving initiatives) throughout the remedial action. The specific criteria that may be used to calculate costs for the myriad of possible future cost-saving opportunities would not be best addressed in the Proposed Plan. The regulators will be notified of any anticipated revisions to the disposition of OU3 material (e.g., segregating structural steel for recycling, etc.).

Action: No Action.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: PP Pg #: 19 Line #: Code: C
Original Comment #: 79
Comment: The figure should be updated to be consistent with current disposal cell design direction.

Response: Agreed.

Action: The figure and associated text on Page 19 have been revised to reflect the latest design of the On-Property Disposal Facility.

000116

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: Appendix C Pg #: Line #: Code: C
Original Comment #: 80
Comment: Please include these ARAR discrepancies within the revised OU3 text:

1.) 40 CFR 61.150-61.155-Asbestos waste disposal
2.) ORC 3734.02(i)-Air emissions from HW facilities
3.) ORC 3734.02.7(a,b)-Prohibits commingling of LLW with solid waste **(off-site disposal only)**
4.) ORC 3734.03-prohibits open dumping or burning
5.) ORC 6111.04-prohibits pollution of waters of the state
6.) ORC 6111.07a,c-prohibits failure to comply with water pollution control requirements
7.) OAC 3745-56-51(A through F) hazardous waste piles
8.) OAC 3745-56-54 a,b-hw piles
9.) OAC 3745-56-56 a,b-hw piles
10.) OAC 3745-56-57 a,b,c-hw piles
11.) OAC 3745-56-58 a,b,c-hw piles
12.) OAC 3745-56-59 a-hw piles
13.) OAC 3745-27-05-prohibits open burning and open dumping
14.) 40 CFR Part 257.3-3-prohibits water pollution from a solid waste facility

Response: Agreed. Modifications have been made to Appendix C where appropriate.

Action: The following have been included, as applicable, in Appendix C:

1) 40 CFR 61.150-61.155 - listing already present on Table C-1, p. C-14 has been expanded.
2) ORC 3734.02(i) - added to Table C-3, HWM (General Facility Standards), p. C-24. OU5-A; OU3 Options - R for Alt. 2 & 3.
3) ORC 3734.02.7 (a,b) - add to Table C-3, General, p. C-22. OU5-A; OU3 Options - A for Alt. 3.
4) ORC 3734.03 - added to Table C-3, SWD (Facility Operations), p. C-30. OU5-A; OU3 Options - A for Alt. 2.
5) ORC 6111.04 - note as A for OU5; R for OU3 Options (Alts. 1-3) p. C-28.
6) ORC 6111.07 a,c - combined with OAC 3745-33-05 (p. C-28)

The following have not been included:

7)-12) OAC 3745-56 - not pertinent to this action
14) 40 CFR 257.3-3 - already included (Table C-3, p. C-30) (also A for OU5)
Number 13 will be combined with No. 4 (Table C-3, p. C-30)

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000118

SECTION IV

SECTION IV

ADDITIONAL DOE REVISIONS

SECTION IV
ADDITIONAL DOE REVISIONS

OTHER CHANGES TO THE RI/FS REPORT

In addition to the changes made to the draft OU3 RI/FS based on US EPA and OEPA comments, other modifications have been made to the document. The primary changes result from incorporating new data, the revised source term, and related material quantity estimates into the rest of the document. These modifications have been rippled into Sections 5 and 6 and the cost, risk, WAC development, and CRARE appendices, as well as the Proposed Plan. The characterization data set has been finalized since the September submittal, and the revised document will include the final and complete data set. This section details the changes made to the document based on DOE internal review.

RI ISSUES

The major impact to the RI portion of the RI/FS document includes corrections made to several source term assumptions that were incorrectly applied for the September submittal and the integration of new data received after submittal of the September document.

Source Term

Other modifications to the source term were made based on discrepancies discovered after the September submittal. The following corrections were made for the revised source term:

- Correct the distribution of weight and volume by depth for masonry. An error in the weight associated with each depth interval erroneously over estimated the source term associated with masonry for all analytes by approximately 30 percent. The source term values reported in Section 3.5.4.1.2, page 3-34 and B.5.1.5.1, page B-22 have been modified to account for this error.

- Correct the weight distribution factor for ceiling demolition from 0.1 to 1.0. The source term calculation methodology was correct in the September submittal; however, the erroneous factor allowed only 10 percent of the volume of OU3 ceiling demolition to be considered in the calculation. This error had the effect of underestimating the source term for ceiling demolition by 90 percent. The source term values reported in Section 3.5.4, Pages 3-32 through 3-36, have been modified to account for this error.

- Correct the holdup value applied for process equipment from 10 percent to 1 percent. This error had the effect of overestimating the source term for uranium in process equipment by a factor of 10. The source term values reported in Section 3.5.4 pages 3-32 through 3-36 have been modified to account for this error.

The source term has been recalculated, using the new data set, based on these modifications to the assumptions. Table IV-1 contains a comparison of the September source term values by COC to the revised source term values by COC. Representative source term summary tables (Tables 3-9, 3-10, 3-11, B-2, B-3, B-4, B-6, B-7, B-10, B-12, B-15, and B-22) have been recreated and are included in this document as change pages. Due to the accelerated turnaround time required, all of the source term tables planned for revision have not been included in this document. However, all tables will be recreated and submitted with the Draft Final document after regulator review of this comment response document.

Characterization Data

Appendix A of the RI/FS document contains detailed discussions on the draft data set. DOE has proposed, in agreement with the regulators, not to modify the detailed discussions in the current text in Appendix A beyond addressing received comments. Rather, DOE has statistically compared the new data set to the draft data set and determined the ramifications of additional data (and/or draft data revised through the validation process) to be insignificant to the RI/FS characterization summary and alternative development. Most importantly, only 1 percent of the analytical results have changed due to the new data set and no maximum values for any analyte in any media have changed. A new Section A.7 has been added to Appendix A to present the results of this comparison.

Specific changes have also been made to Section 3 of the RI/FS document to reflect the new data set. Section 3.4, pages 3-12 through 3-29 have been updated to show revised sample counts, number of detects, arithmetic and geometric means, and material volumes exceeding reference criteria. Additionally, all Section 3 figures have been revised to reflect these changes.

The raw data in Appendix L has been updated to include the new data for the Draft/Final RI/FS document submittal; however, because the new data does not correspond exactly to the detailed data discussions in Appendix A (which are based on the draft data), an identifier will be included in the revised Appendix L analytical results that alerts the reader of a revised value. As a cross-reference, a separate table will be created for Appendix L that lists only results from the draft data set that were replaced by the new data set. This table will be included in the Draft/Final RI/FS document submittal. This approach, proposed by DOE and accepted in concept by the regulators, has saved numerous manhours of work updating the detailed Appendix A writeups and, at the same time, will provide access for reviewers to the revised analytical results on which the conclusions of the document are based.

FS ISSUES

The major impact to the FS portion of the RI/FS document reflects revising source term and material quantity estimates in the WAC development, short-term risk, alternative cost estimates, and CRARE appendices. These changes are discussed below.

000121

Source Term Impacts on the FS

The changes to the source term as a result of modifications discussed above and the EPA comments have been incorporated into the WAC development, short-term risk assessment, and CRARE sections of the document. The impacts of source term changes to the WAC development section of the document consists of updating Tables G-8 and G-9 to reflect the new source term values for potential breakthrough COCs. As stated in US EPA General Comment #6, the source term has minor impacts on the development of WAC. The primary use of source terms in the WAC development process was to identify the post-remediation COCs and to identify the critical material categories; source terms are used for comparison purposes only.

Within the short-term risk assessment, the source term is used in calculating average COC concentrations for the materials to assess the proposed actions. With the change of the source term, the average concentrations used in calculating receptor risks have changed. Tables H-1 through H-6 have been updated to reflect the revised source terms.

Table I-4 of the CRARE Appendix has also been updated to reflect the revised source terms. These estimates are used as a comparison only and do not affect the outcome of the CRARE evaluation.

Material Volume Estimates

As a result of the revised source term, material volume estimates have also changed. As described in Appendix B of the RI/FS Report, the material volumes are based on SWIFTS volumes that are utilized within the source term model to calculate the contribution to volume and weight from paint, dust, CRUD, and holdup layers. The contribution of these volumes and weights are added to the SWIFTS values to estimate the total volume and weight and associated source term. The volumes resulting from the source term modifications have been incorporated throughout the document and include: Sections 5 and 6; Appendices E (cost estimate), G (waste acceptance criteria), H (short-term risk assessment), and I (CRARE); and the Proposed Plan.

Flowcharts

As a result of modifications to the quantities of materials considered potentially mixed wastes and modifications to material disposition pathways, the flowcharts contained in Appendix E have been modified. The modifications include corrections to reflect the revised segregation category volumes and updated volume estimates from Appendix B. In addition, below baseline materials in Material Category E (Concrete) are no longer detailed under the unrestricted release option. Treatment has also been added before any characteristic waste identified as being disposable in the on-property disposal facility (some Category D materials).

Waste Acceptance Criteria and CRARE

The WAC development appendix has been updated to reflect the new source term and quantity estimates. Since the source term estimates for all potential breakthrough COCs are within the same order of magnitude and in most cases they decreased from the previous

submittal, in general, the only impact on the WAC development process described in Appendix G is increasing the level of conservativeness of the WAC development process. Tables G-1, G-8, and G-9 have been updated to reflect these changes.

Source term estimates (converted to moles/liter) were also used as input into the geochemical model for the cement leachate endmember in Appendix G.II. The differences between September and December source term estimates are given in Table 1 below. Estimates for uranium, technetium-99, chromium, and mercury have decreased slightly, while neptunium-237 has increased slightly. The strontium-90 source term for December is about 2.7 times the September value.

TABLE IV-2
DIFFERENCE IN SEPTEMBER AND DECEMBER SOURCE TERMS

Element/Nuclide	September (moles/liter)	December (moles/liter)	Difference [a] (moles/liter)
Uranium	1.59E-03	1.55E-03	-0.04E-03
Technetium-99	7.48E-09	7.42E-09	-0.06E-09
Neptunium-99	1.76E-09	1.87E-09	0.11E-09
Strontium-90	2.04E-13	5.60E-13	3.56E-13
Chromium[b]	9.35E-04	9.33E-04	-0.02E-04
Mercury	7.93E-07	7.80E-07	-0.13E-07

(a) Difference is December - September
(b) Hexavalent chromium only

Differences reported in Table IV-2 would have no effect on the reported solubility concentrations for uranium, neptunium, and mercury in the cement leachate end member. That is, the solubility of $CaUO_4$, NpO_2, and HgO control leachate concentration for these elements - not the source term concentration. Technetium-99, strontium-90, and chromium leachate concentrations would change slightly, as these elements are not predicted to be controlled by solubility at a pH of 12.7 for the given source term concentration (Table IV-2). However, since these revised estimates would represent insignificant changes in the geochemical model output and the 70-year rule was used to demonstrate that protectiveness criteria would be met if the entire source terms of all potential breakthrough COCs (except uranium and technetium-99) would be disposed in the on-property disposal facility, the geochemical model was not re-run using the revised source terms. This information is provided in an explanatory footnote on Table G.II-2.

Other than revisions to Appendix G based on revised source term and quantity estimates, the data set associated with the leachability study presented in Appendix L.6 and summarized in Attachment G.I has been finalized since the September submittal of the OU3 RI/FS Report. Several minor data changes and corrections have been incorporated into the appropriate tables in Attachment G.I and are included as change pages in Appendix A of this comment/response

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package. Tables in Appendix G.I that were affected include Tables G.I-3, G.I-6, G.I-7, G.I-8, G.I-12, G.I-13, and G.I-15. Tables G.I-13 and G.I-15 also reflect corrected formulas for the geometric mean of the leaching coefficients. Appendix L.6 has also been finalized and will be incorporated into the draft final version of the OU3 RI/FS Report.

Alternative Cost Estimates

Multiple items have been updated in the cost estimate to correct inconsistencies. However, the significant changes were associated with incorporating the volumes and flowchart modifications. Other changes include:

- Increasing the off-site burial rate at the Nevada Test Site from $12.60 per cubic foot to $17.00 per cubic foot to reflect FY1996 costs.
- Increasing labor unit rates to reflect FY1996 divisional costs (these rates were increased for certification and weighing.
- Eliminating the packaging safety factor for the container volume calculations. This factor has been included in the bucking factor calculations.
- Removing below baseline Category E material from un-restricted release considerations. These materials are costed for on-property and off-site disposal under Alternative 2 and 3 respectively.

As a result of modifications to volumes, all tables and figures contained in Appendix E including Attachments E.I and E.II have been modified. These tables are included in Appendix A of this comment response document. Due to the extensive changes to the cost estimate and the computer software generating the reports, these tables have not been generated in redline/strikeout mode. The tables have been replaced in their entirety.

Short-term Risk Assessment

The short-term risk assessment has been impacted by the revision of volumes and source terms. Based on the modification of the source term, the average concentrations have been modified. These change pages are included in Tables H-1 through H-6. For these tables, corrections have not been redlined, instead the entire table has been replaced. Changes occurred to the source terms, weights, volumes, and average concentrations. At the time of this submittal, the risk calculations have not been revised; however, for the next submittal of the RI/FS Report, Appendix H will be updated to reflect the changes incorporated as a result of US and Ohio EPA comments. Specifically, the assessment will be revised to reflect volumes, numbers of containers, and numbers of off-site shipments. In response to US EPA Specific Comment #42, the distances to the nonremediation worker and off-property resident were modified.

Table IV-3 contains a qualitative impact assessment of the changes to be incorporated into the short-term risk assessment appendix and the anticipated results. In general, three major changes will be incorporated into the appendix revision:

- the average radiological concentrations decreased slightly,
- the distances to the nonremediation worker and the public receptors from exposure activities were decreased, and

- the number of truck shipments to NTS decreased for both alternatives.

As a result of these changes, the risk values are anticipated to both increase and decrease. Off-site shipment risks will decrease due to the reduction of the number of shipments to NTS under both alternatives. In contrast, due to the reduction of the distance from exposure activities to the receptors, Alternative 2 inhalation risks from on-property disposal will increase. All risk values are anticipated to remain at or below the 10^{-6} risk range.

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Table IV.1
Comparison of Source Term Values by Constituent of Concern *

Sort Class	Parameter	September-95 Source Term (kg)	December-95 Source Term (kg)	Percent Difference
INORGANICS				
	Antimony	770	741	-3.77
	Arsenic	2090	2070	-0.96
	Barium	24600	24400	-0.81
	Beryllium	399	397	-0.50
	Cadmium	765	761	-0.52
	Chromium	2470000	2470000	0.00
	Copper	182000	182000	0.00
	Lead	101000	102000	0.99
	Manganese	863000	862000	-0.12
	Mercury	28.3	27.8	-1.77
	Nickel	1730000	1730000	0.00
	Selenium	24.3	23.2	-4.53
	Silver	2960	2920	-1.35
	Thallium	93.7	93.2	-0.53
	Vanadium	6700	6620	-1.19
	Zinc	36500	36500	0.00
PESTICIDES & PCBs				
	alpha-Chlordane	0.0789	0.04	-49.30
	Aroclor-1248	0.0784	0.0443	-43.49
	Aroclor-1254	16.7	8.46	-49.34
	Aroclor-1260	10.5	5.3	-49.52
	Dieldrin	0.0164	0.00825	-49.70
	gamma-Chlordane	0.0841	0.0426	-49.35
RADIOISOTOPES				
	Americium-241	0.0000227	0.0000227	0.00
	Cesium-137	0.00000101	0.000000746	-26.14
	Lead-210	0.0000314	0.0000314	0.00
	Neptunium-237	0.0695	0.0734	5.61
	Plutonium-238	0.0000349	0.0000362	3.72
	Plutonium-239/240	0.00115	0.000967	-15.91
	Plutonium-241	0.0000146	0.0000146	0.00
	Polonium-210	0.000000442	0.000000441	-0.23
	Radium-226	0.00614	0.00599	-2.44
	Radium-228	0.00000978	0.0000102	4.29
	Strontium-90	0.00000292	0.00000798	173.29
	Technetium-99	0.127	0.127	0.00
	Thorium, Total	0	0	0.00
	Thorium-228	0.00000132	0.00000143	8.33
	Thorium-230	0.144	0.148	2.78
	Thorium-232	4320	3720	-13.89
	Uranium, Total	4630000	510000	-88.98
	Uranium-233/234	9.58	1.37	-85.70
	Uranium-234	5.47	5.27	-3.66
	Uranium-235/236	9700	499	-94.86
	Uranium-238	1370000	92200	-93.27

Table IV.1 (Continued) *

Sort Class	Parameter	September-95 Source Term (kg)	December-95 Source Term (kg)	Percent Difference
SEMIVOLATILE				
	1,4-Dichlorobenzene	94.2	94.2	0.00
	2,4-Dinitrotoluene	0	0	0.00
	Benzo(a)anthracene	2.2	2.2	0.00
	Benzo(a)pyrene	0.246	0.246	0.00
	Benzo(b)fluoranthene	0.195	0.195	0.00
	Benzo(k)fluoranthene	0.00842	0.00842	0.00
	bis(2-Ethylhexyl)phtha	6.31	6.31	0.00
	Carbazole	0.00147	0.00147	0.00
	Chrysene	6.9	6.9	0.00
	Dibenzo(a,h)anthracen	0	0	0.00
	Hexachlorobutadiene	81.6	81.6	0.00
	Indeno(1,2,3-cd)pyren	0	0	0.00
	N-Nitroso-di-n-propyla	0	0	0.00
	Nitrobenzene	155	155	0.00
	Pentachlorophenol	0	0	0.00
VOLATILE				
	Benzene	0	0	0.00
	Styrene	0.0354	0.0354	0.00
	Tetrachloroethene	351	351	0.00

* Note: Excludes source term contribution from inventory and soil piles.

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TABLE IV-3

Qualitative Impact Assessment of Changes on the OU3 Short Term Risk Assessment

Parameter	Risk							
	Direct Exposure		Inhalation		Offsite Shipment (Carcinogenic)		Offsite Shipment (Mechanical Hazards)	
	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3
Average Radioactive Concentrations, pCi/m^3	Ds	Ds	Ds	Ds	Ds	Ds	n/a	n/a
Average Chemical Concentrations, ppm	n/a	n/a	NC	n/a	n/a	n/a	n/a	n/a
Usable ITC Weight, lbs	NC	NC	n/a	n/a	NC	NC	n/a	n/a
Usable Drum Weight, lbs	NC	NC	n/a	n/a	n/a	n/a	n/a	n/a
Usable B-12 Box Weight, lbs	Us	Us	n/a	n/a	Us	Us	n/a	n/a
Usable B-25 Weight, lbs	NC	NC	n/a	n/a	NC	NC	n/a	n/a
Usable LMB Weight, lbs	NC	NC	n/a	n/a	NC	NC	n/a	n/a
Usable ROC Weight, lbs	NC	NC	n/a	n/a	NC	NC	n/a	n/a
Pile Sizes, ft^3	NC	NC	n/a	n/a	n/a	n/a	n/a	n/a
Exposed Surface during Cell filling (ft^2)	NC	NC	NC	NC	n/a	n/a	n/a	n/a
Remediation Worker Exposure Distance, m	NC	NC	NC	NC	NC	NC	n/a	n/a
Nonremediation Worker Exposure Distance, m	D	D	D	D	n/a	n/a	n/a	n/a
Public at Site Boundary Exposure Distance, m	D	D	D	D	n/a	n/a	n/a	n/a
Exposure duration, yrs (adult)	NC	NC	NC	NC	n/a	n/a	n/a	n/a
Exposure duration, yrs (child)	n/a	n/a	NC	NC	n/a	n/a	n/a	n/a
Disposal Cell Fill Rate (yd^3/week)	n/a	n/a	NC	NC	n/a	n/a	n/a	n/a
Distance to Off-site Disposal Facilities, miles	n/a	n/a	n/a	n/a	NC	NC	NC	NC

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TABLE IV-3

Qualitative Impact Assessment of Changes on the OU3 Short Term Risk Assessment

Parameter	Risk							
	Direct Exposure		Inhalation		Offsite Shipment (Carcinogenic)		Offsite Shipment (Mechanical Hazards)	
	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3	Alt 2	Alt 3
Number of Shipments to Envirocare by Rail (ITCs)	n/a	n/a	n/a	n/a	n/a	Us	n/a	Us
Number of Shipments to NTS by Truck (LMBs)	n/a	n/a	n/a	n/a	D	D	D	D
Number of Shipments to Envirocare by Truck (B-12s)	n/a	n/a	n/a	n/a	NC	n/a	NC	n/a
Number of Shipments to Envirocare by Truck (B-25s)	n/a	n/a	n/a	n/a	NC	n/a	NC	n/a
Results								
Impact on Risk to Remediation Worker from Previous Submittal	NC	NC	NC	NC	D	D	D	D
Impact on Risk to Nonremediation Worker from Previous Submittal	Us	Us	U	U	n/a	n/a	n/a	n/a
Impact on Risk to Adult Public from Previous Submittal	Us	Us	U	U	D	D	D	D
Impact on Risk to Child Public from Previous Submittal	n/a	n/a	U	U	D	D	D	D

Notes:
1) n/a - Parameter not applicable to determination of risk.
2) U - Value overall has increased from previous submittal.
3) D - Value overall has decreased from previous submittal.
4) NC - Value has not changed from previous submittal.
5) ITC - Intermodal Transport Container
6) ROB - Roll-off Box
7) LMB - Large Metal Box
8) subscript 's' stands for 'slightly'

APPENDIX A

CHANGE PAGES

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FRONT MATTER

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LIST OF ACRONYMS AND ABBREVIATIONS

ACM	asbestos containing materials
AIRFA	American Indian Religious Freedom Act
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
ASL	analytical support level
ATTIC	Alternative Treatment Techniques Information Center
AWWT	Advanced Wastewater Treatment (facility)
BDN	biodenitrification
BSL	biodenitrification surge lagoon
CAMU	corrective action management unit
CDD	chlorinated dibenzo p-dioxins
CDF	chlorinated dibenzofurans
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFOI	Census of Fatal Occupational Injuries
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
cm	centimeter
cm^2	square centimeter
CMSA	Consolidated Metropolitan Statistical Area
COC	constituent of concern
CRARE	comprehensive response action risk evaluation
CRUD	corrosion/rust/undefined debris
DAPP	diamyl-amyl phosphate
D&D	decontamination and dismantlement
dB	decibel
dBA	A-weighted decibel
DFO	Director's Findings and Orders
DOE	United States Department of Energy
DOT	United States Department of Transportation
dpm	disintegrations per minute
DQO	data quality objective
EIS	environmental impact statement

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Drum Equivalent - the amount of material required to fill a 55-gallon drum. This measurement is commonly used when referring to waste storage or shipment.

Dry Process Area - a process area in which acidic or caustic substances were not used; therefore, corrosive conditions are not expected. See also Wet Process Area.

Engineering Controls - the elimination of hazards through mechanical means or process design; apparatus and/or mechanisms which physically prevent entry, minimize hazards, or create some kind of barrier.

Federal Facilities Compliance Agreement - an agreement between the US EPA and the DOE pertaining to DOE facilities, including the FEMP, to: (1) ensure compliance by DOE with existing environmental statutes and implementation of regulations to include the Clean Air Act, RCRA, and CERCLA at the FEMP; and (2) to ensure environmental impacts associated with past and present activities at the FEMP are thoroughly investigated, and appropriate remedial response action is taken as contemplated by CERCLA.

Free Release - the release of materials, for unrestricted use, from DOE control to a non-DOE controlled environment. All free release materials must meet release criteria set forth in Nuclear Regulatory Commission Regulation 1.86 and DOE Order 5400.5.

Hazard Index (HI) - an index used as a measure of the potential for contaminants to present unacceptable noncarcinogenic toxic effects.

Hazard Quotient (HQ) - the ratio of a chemical's actual or potential dose via one pathway to a reference dose set by US EPA.

Hazardous Waste - a waste material exhibiting the characteristics of ignitability, corrosivity, reactivity, or toxicity or listed in 40 CFR 261, "Protection of Environment/Solid Waste/RCRA" or identified in applicable state regulations.

Hazardous Waste Management Unit (HWMU) - a contiguous area of land on or in which hazardous waste is placed, or the largest area in which there is significant likelihood of mixing hazardous waste constituents in the same area. Examples of hazardous waste management units include a surface impoundment, a waste pile, a land treatment area, a landfill cell, an incinerator, a tank and its associated piping and underlying containment system, and a container storage area.

High-Level (Radioactive) Waste - highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation. The waste material at the FEMP is not classified as high-level waste.

Holdup Material - feed stock, intermediate product material and process residual material remaining in and on process areas (i.e., clinging to the surfaces of the various pumps, pipes, vessels or other equipment surfaces) as a result of production activities.

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Unbulked Material Volume - the volume of a waste material in its smallest reducible form without continuous physical manipulation to maintain its size. Unbulked volumes are used to estimate the amount of space required for OU3 materials in the on-property disposal facility. See also Bulked Material Volume.

Unrestricted Release or Recycling - the release of materials for unrestricted use to a non-radiologically controlled environment in accordance with NRC Regulation 1.86 and DOE Order 5400.5. See also Restricted Release or Recycling.

Visible Process Material - visible process residues (green salt, yellow cake, etc.) on the interior or exterior surfaces of materials that are obvious to the eye and which, if rubbed, are easily removed. Stains, rust, corrosion and flaking paint do not qualify as visible process material.

Waste - any material which is not being recovered or recycled.

Waste Acceptance Criteria (WAC) - a set of specifications and conditions under which disposal facilities can accept waste. These criteria include (but are not limited to) packaging, external radiation levels and analytical documentation.

Waste Stream - the total flow of solid waste from homes, businesses, institutions, and manufacturing plants that are burned or disposed of in landfills, or segments thereof such as the "residential waste stream."

Wet Process Area - a process area where acidic and caustic substances were used, which created potential corrosive conditions. See also Dry Process Area.

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of the volume and weight of these materials are concrete-like materials or steels (60 percent asphalt, concrete, masonry, and transite) and (20 percent structural steel, piping and equipment). Another ten percent is inventory material (i.e. product, thorium, and drummed wastes), which was either in inventory when production operations ceased or has been (or will be) generated as a result of risk reduction and safe shutdown activities prior to the final remedial action. A significant portion of the final ten percent of material is bulk material (excavated soils, a coal pile, gravel, rock salt and sand). These latter types of material (inventory and bulk material) are not considered part of this RI/FS, since they are either being dispositioned as part of on-going, approved programs (inventory), are not wastes (bulk material), or are actually considered under other operable unit decisions (soils).

The data obtained from field characterization are evaluated and summarized in this document for use in decision-making. Chemical and radiological data resulting from the field program are presented in the RI/FS Report in several manners and levels of detail: initially as raw data, demonstrating the range of information collected for OU3; on a constituent-specific basis, to gain an understanding of the types of contaminants present in OU3 materials; as data organized around specific structures (i.e, components), to facilitate an understanding of contamination associated with individual structures; and by media, to allow consideration of material categories as a basis for decision-making.

Eighty-nine ~~Ninety-four~~ percent of OU3 concrete, the single largest material type is uncontaminated. The contamination within the remaining material ranges from minimally contaminated, in many administrative and support facilities and at lower depths in most facilities, to highly contaminated in former production and process-related areas. Consistent with expectations based on the former production mission at the site, by far~~,~~ the highest levels and most extensive contamination is associated with uranium. The highest levels of uranium contamination are associated with residual material remaining in piping and equipment. As mentioned above, this primary-risk material is being removed and dispositioned as part of approved, on-going programs and is not part of the evaluation process in this report.

Technetium-99 (a trace impurity in recycled uranium) and thorium-230 (an impurity in ores and ore concentrates processed at the site) levels are also significant. Technetium-99 is a concern because it was detected in over ~~70~~ 75 percent of all samples and is relatively mobile in the environment. Thorium-230 is a concern because it presents a potential inhalation risk during remedial activities. Secondarily, there are isolated instances of chemical contamination that result in a limited amount of OU3 materials (~~163,000~~ 61,300 cubic feet) being considered as mixed waste. A portion of the mixed waste (~~50,000~~ 5,330 cubic

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feet of acid brick and lead flashing) has been characterized as such because TCLP analytical results exceed regulatory limits. The remainder has been assumed

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characterized as such based on analytical results from the RI/FS sampling program and process knowledge. ~~because TCLP analytical results exceed regulatory limits. The remainder has been assumed to be mixed waste based on conservative interpretation of analytical results.~~ 56,000 cubic feet of material in current inventory has been characterized based on process knowledge and other sampling results.

The chemical and radiological data collected from the field program were used in conjunction with other data to determine constituents of concern (COCs). A total of 60 COCs was identified for OU3 based on comparisons of results to regulatory and safety screening criteria. For each of the 60 COCs, a source term, or total mass is calculated using information on the concentrations of the COC in the different materials and the masses of these materials in OU3. This process is relatively involved, given the 74 different material types in OU3 requiring individual approaches for source term estimation. The source terms, combined with disposition options defined in the remedial alternatives, are utilized as a basis for estimating potential long-term impacts of the OU3 materials on human health and the environment.

To support the development of media-specific alternatives by the feasibility study, the numerous OU3 materials are grouped into ten distinct material categories based on similar inherent properties and configuration. These categories are further sub-divided into segregation categories based on regulatory status (low level waste, hazardous waste, mixed waste, PCB waste, and baseline) to evaluate treatment and disposition options.

REMEDIAL ALTERNATIVES

The data and results presented in this document are utilized to develop, screen, and perform detailed evaluation of remedial alternatives. In this RI/FS Report three alternatives have been identified and evaluated: Alternative 1 - No Further Action; Alternative 2 - Selected Material Treatment, On-Property Disposal, and Off-Site Disposition; and Alternative 3 - Selected Material Treatment and Off-Site Disposition. Each of the action alternatives includes the option to recycle materials and release clean materials for unrestricted uses. Each of the action alternatives is defined consistent with meeting the Remedial Action Objectives (RAOs) for OU3; mitigate the potential exposure of human and environmental receptors and implement remedies in a manner which ensures protectiveness of potential receptors. The results of the alternative evaluation support identification of a preferred alternative within the OU3 Proposed Plan (PP).

Alternative 1, the no further action alternative, represents a baseline condition for evaluation purposes and assumes no further remedial activity after completion of the interim remedial action. The D&D

property disposal of most materials with a portion of wastes being dispositioned to off-site disposal facilities, including off-site local landfills. A portion of the materials; those that exhibit characteristic properties under RCRA, would require treatment in accordance with land disposal restriction (LDR) requirements prior to off-site disposal. Under Alternative 3, all remediation materials would be dispositioned off-site to both disposal facilities and local sanitary landfills. No OU3 materials would remain at the FEMP after completion of Alternative 3.

The two action alternatives were defined to retain future flexibility to select a variety of sub-options in the remedy. For example, recycling is an option within each of the action alternatives. Current evaluations indicate that ~~available~~ recycling ~~options are prohibitively expensive, however the option to is not a viable option based on limited survey capabilities for inaccessible surfaces, few vendors performing recycling, liability for release of materials, limited use for contaminated materials, and prohibitively expensive recycling unit rates. However, the option to~~ recycle is retained and could be incorporated into the remedy when determined cost effective and/or desirable. Comparative evaluation of the alternatives has determined that selection of options internal to the alternative definition can be done without affecting the overall protectiveness of the alternative (e.g. treatment of mixed waste materials on-property or off-site).

In evaluating the alternatives, the COCs defined from the original characterization results are further screened based on the specific aspects of each alternative. For both alternative 2 and 3, the COC list is evaluated against waste acceptance criteria (WAC) at the off-site disposal facilities to determine acceptability to receive OU3 materials. For on-property disposal (Alternative 2), the 60 COCs were further screened to ten that could potentially leach from the on-property disposal facility into the underlying Great Miami Aquifer during the performance period of the facility. Of these ten, only two (uranium and technetium) are sufficiently abundant in the materials that could be disposed in the facility to have the potential to reach levels of concern in the aquifer.

To determine the potential for OU3 uranium and technetium contamination to reach levels of concern in the aquifer, studies were developed to determine the specific leachability of these contaminants from the primary OU3 materials. The results of these studies were then used to establish protective levels (WAC) for uranium and technetium in OU3 media for on-property disposal. These studies demonstrated that uranium is relatively non-leachable from OU3 media, resulting in a WAC for uranium greater than any sample result for construction media from the OU3 field program. Conversely, technetium was found to be highly mobile, resulting in a need to limit the contribution of technetium from OU3 materials in

A detailed evaluation of each alternative versus the NCP evaluation criteria was performed. The alternative evaluation identified the no further action alternative as having unacceptably high risks in the long-term due to the potential for a trespasser to be exposed at levels above the 10^{-4} to 10^{-6} risk range and the potential for environmental releases from unmaintained materials left in permanent storage. The no action alternative also does not comply with ARARs, and hence fails to pass the threshold criteria screening. For the two action alternatives, the evaluation established that each is acceptable in terms of long-term risks. The Alternative 2 evaluation determined that the use of multilayered capping and lining systems and the development of contaminant- and material-specific WAC, would ensure the long-term protection of the Great Miami Aquifer underlying the on-property disposal facility. These design considerations would supplement the natural containment capabilities of the existing site geology to ensure the long-term performance of the disposal system. To allow on-property disposal of the OU3 material over the aquifer, the receipt of a waiver from the State of Ohio solid waste disposal facility siting requirements [OAC 3745-27-07(H)(2)(c)and(d)] would be required from the US EPA and has been requested for OU3 wastes in this document (see Appendix C, Section C.2). Alternative 2 meets all other ARARs; Alternative 3 meets all ARARs.

The NCP preference for treatment has been addressed in two ways for OU3. The OU3 interim action addresses treatment of OU3 materials through in situ gross decontamination actions. The OU3 final action utilizes treatment on a supplemental basis to ensure protectiveness and to meet WAC.

The alternatives were also comparatively evaluated to highlight the benefits and drawbacks of each. Both of the action alternatives meet the requirements of being effective and permanent in the long-term and reducing toxicity, mobility, and/or volume through treatment. However, for the remaining three balancing criteria of short-term effectiveness, implementability, and cost, Alternative 2 presents a less risky, easier to implement, and cheaper alternative. Alternative 2 would result in lower estimated industrial accidents; would be easier to implement, since materials would go directly to an on-property disposal facility being constructed for OU2 and OU5 wastes; and would cost significantly less to implement (~~approximately~~ $~~90~~93 million versus a cost of $~~190~~185 million for Alternative 3). Each of the action alternatives could be implemented concurrent with the D&D schedules associated with the IROD, with the exception of a period of interim storage necessary under Alternative 2 prior to the availability of the on-property disposal facility.

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SECTION 1

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1.0 INTRODUCTION

This report documents the results of the Remedial Investigation/Feasibility Study (RI/FS) for Operable Unit 3 (OU3), one of five OUs at the United States Department of Energy (DOE) Fernald Environmental Management Project (FEMP). OU3 consists of the former Production Area and production support buildings, unused uranium and thorium products, and equipment from the former production of uranium and thorium metals. Many of the deteriorating production buildings, production support buildings, and equipment are radiologically and/or chemically contaminated. This RI/FS Report characterizes the contamination in OU3 and, based on these results, evaluates final remedial alternatives that will ensure protection of public health and the environment.

In June 1994, the DOE and the United States Environmental Protection Agency (US EPA[1]) jointly signed the OU3 Record of Decision for Interim Remedial Action (IROD) (DOE 1994a). The IROD was a provision established in the OU3 RI/FS Work Plan Addendum (WPA) (DOE 1993a) to accelerate the OU3 cleanup schedule. The IROD allowed DOE to begin decontamination and dismantlement (D&D), as applicable, of all buildings, equipment, and other above- and below-grade improvements. As discussed in the IROD, the ~~The~~ post-D&D materials either will be dispositioned off-site or placed in interim storage on-property until a final remedial decision can be made for permanent disposition. The IROD has resulted in a three-year acceleration of the D&D schedule. D&D activity has already begun within OU3; one building has been dismantled and another is currently being decontaminated. By taking the initiative in accelerating the schedule, DOE is able to adopt a unique approach to this RI/FS.

In cooperation with the EPAs, DOE has been able to expedite final remedy selection for OU3 in several respects. The Initial Screening of Alternatives Report, a preliminary evaluation of remedial alternatives, generally submitted as a separate document, was incorporated into the alternative development and evaluation process presented in this document. Additionally, the Sitewide Characterization Report (DOE 1992a) and the IROD provided adequate documentation of the general level of risk to human health and the environment posed by current OU3 conditions. Consequently, a stand-alone baseline risk assessment for OU3 was not required. DOE also proposed that nuclear materials and wastes (i.e., legacy wastes) be disposed off-site through existing programs and removal actions, since prior evaluations outside the RI/FS have determined the merit of these disposition

[1]For the reader's convenience and to reduce confusion, the term "EPAs" is used where a joint reference to the United States and State of Ohio Environmental Protection Agencies is required.

Comprehensive Sitewide OU. If the risk assessment indicates the residual risk following remedial action implementation exceeds protective levels, then a sitewide FS will be issued, which will focus on determining what, if any, supplemental actions must be taken to reduce overall site risks to acceptable levels.

Consistent with DOE policy, the FEMP is integrating the requirements of the National Environmental Policy Act (NEPA) into the RI/FS process. On June 13, 1994, DOE issued a NEPA compliance policy, entitled the "Secretarial Policy on the National Environmental Policy Act," which allows for reliance on the CERCLA process to meet the procedural requirements of NEPA (DOE 1994b). Therefore, DOE has supplemented the evaluations contemplated in the RI/FS guidance to accommodate the incorporation of NEPA values in preparation of RI/FS documentation.

1.1.3 Sitewide Regulatory Issues

A statutory framework for the treatment, storage, and disposal of hazardous waste was established by the Resource Conservation and Recovery Act (RCRA). The State of Ohio, through its designated agency, the Ohio Environmental Protection Agency (OEPA), has been authorized by US EPA to enforce most provisions of RCRA regulations for facilities within Ohio, including the FEMP. The FEMP continues to store inventories of hazardous waste containing radiological constituents (termed mixed waste). These mixed-waste inventories remain because of limited or nonexistent treatment and disposal capacity. Only the hazardous waste component of mixed waste is managed under RCRA. Because of the lack of disposal alternatives, the FEMP applied for and obtained a permit from the State of Ohio for the storage of these mixed wastes under the terms of Ohio's hazardous waste regulations.

A program is being established to address the management of mixed wastes. The Federal Facility Compliance Act (FFCA) requires that a FEMP Site Treatment Plan (STP), addressing all mixed wastes at the site which are subject to land disposal restrictions (LDRs) under RCRA, be submitted to the EPAs. If ~~future mixed wastes generated by the~~ OU3 remedial actions generate ~~are similar in composition to legacy~~ mixed wastes, DOE proposes to treat these wastes in accordance with the STP. The term "legacy waste" is defined by DOE as the inventory of LLW hazardous, TSCA wastes (e.g., asbestos, PCBs), and mixed waste that was generated by production activities at the site. Decisions regarding treatment of new mixed waste types, if any, generated by OU3 remedial activities, will be made through the CERCLA process and will be indicated in future updates to the STP. The final

proposed STP was submitted to the EPAs for review and approval in March 1995; OEPA ~~will~~ issued an order to assure implementation of the STP on October 4, 1995.

To accommodate potential on-property disposal of RCRA wastes, the FEMP would utilize the RCRA Subtitle C Corrective Action Management Unit (CAMU) provisions for on-property disposal of debris as remediation waste. Under this strategy, specific waste acceptance criteria (WAC, i.e., specific requirements and conditions under which a facility may accept waste) that are deemed protective of human health and the environment would have to be met so that the waste could be placed in an on-property disposal facility in lieu of meeting LDRs. If disposal of materials contaminated with RCRA-regulated constituents would result in unacceptable risks to human health and the environment, these materials would either be treated prior to placement in an on-property disposal facility or be shipped off-site for disposal.

Programs related to the Toxic Substances Control Act (TSCA), the Clean Air Act, and the Clean Water Act are also ongoing at the FEMP. An active FEMP program exists for the storage and disposal of polychlorinated biphenyls (PCBs) in accordance with TSCA requirements. The FEMP has permits, which are required under the Clean Air Act, to operate active sources of atmospheric emissions and will continue to renew those permits for active sources that are not related to specific CERCLA activities. An active National Pollutant Discharge Elimination System (NPDES) permit (pursuant to the Clean Water Act) covers water discharges from the site to the Great Miami River, and the permit is expected to remain in place as long as activity continues at the site. Other regulatory issues associated with NEPA, including cumulative impacts, mitigative measures, irreversible and irretrievable commitment of resources, short-term uses, and long-term productivity, are addressed in appendices to this RI/FS Report.

1.2 SCOPE AND ROLE OF OPERABLE UNIT 3

OU3 is one of the five OUs being addressed by the RI/FS process at the FEMP. The focus for the OU3 remedy decision is narrowed by past and pending remedy decisions for the OUs, as discussed below:

- OU3 IROD (DOE 1994a) - Documented the decision that no future mission existed for the buildings and structures in their current state. As a consequence, DOE and US EPA agreed to conduct D&D for all above- and below-grade buildings and facilities, with the provision for interim storage and/or limited off-site disposition of generated debris. The IROD provided that the final OU3 ROD would establish the strategy for the final disposition of the debris generated from the interim remedial action.

- OU4 ROD (DOE 1994c) - Provided for off-site disposal of the highly contaminated silo materials and the disposition of OU4 construction debris consistent with OU3 construction debris.

- OU1 ROD (DOE 1994d) - Established that the LLW and mixed production processing waste stored in the FEMP waste pits would be dispositioned off-site (at a commercial disposal facility). The OU1 ROD also provided that oversized pit debris and processing facilities debris would be dispositioned in a manner consistent with OU3 debris.

- OU2 ROD (DOE 1995a) - Established permanent on-property disposal at the FEMP. To accommodate on-property disposal of OU2 waste, the OU2 ROD includes a US EPA waiver ~~of two~~ of State of Ohio ~~S~~Solid ~~W~~Waste ~~D~~Disposal ~~F~~Facility siting ~~criteria~~ ~~requirements~~ [OAC 3745-27-07(H)(2)(c)and(d)] which are Applicable or Relevant and Appropriate Requirements (ARARs).

- OU5 draft ROD (DOE 1995b) - Established final site cleanup levels for soil and groundwater, and defined the soil WAC for on-property disposal of LLW and mixed waste, and proposed a CAMU to be used in concert with the proposed on-property disposal facility.

OU3 is chronologically the last of the FEMP OUs to issue a RI/FS Report. As a result, past and pending decisions for the other FEMP OUs affect the options to be considered for the final disposition of OU3 materials.

In the preamble to the NCP, the US EPA discussed the balance between the statutory preference for treatment of all materials to the extent "technically feasible" and the ability to rely on the "use of engineering and institutional controls" for managing risk (55 Federal Register 46, pp. 8701, March 8, 1990). US EPA specifically recognized the difficulties presented by its preference for treatment of all contamination, indicating that it expects to place a priority on the use of treatment to address the principal threats posed by a site, wherever practicable. For wastes that pose a relatively low, long-term threat (commonly termed "secondary threat" materials), or in instances where treatment is impracticable, US EPA expects the use of engineering controls or a combination of engineering and institutional controls, where appropriate.

As evidenced in the OU RODs that have been issued, the FEMP has generally taken a balanced approach in its remediation strategy, consistent with the remediation framework laid out in the NCP. The premise behind the FEMP balanced approach is that high-concentration waste materials, considered to represent the principal threat at the site, will be treated and dispositioned at off-site locations, whereas higher volume, low-concentration waste materials, considered to represent a

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full compliance with DOE Orders, Department of Transportation shipping requirements, and NTS WAC. As of July 1995, approximately 589,000 drum equivalents have been transferred from the FEMP to the NTS for disposal. The FEMP currently maintains an inventory of LLW, mixed waste, and PCB wastes generated as a result of production operations, facility maintenance, upgrades, and cleanup activities. Under Removal Action No. 9, these inventories will be removed. Mixed waste will be treated in accordance with the STP under the FFCA. Removal Action No. 9 will continue to disposition materials generated by the Safe Shutdown Program throughout the interim remedial action and will be incorporated into the final ROD.

Removal Action No. 12 - Safe Shutdown. This removal action was created to provide the planning, engineering, and program control for the proper disposition of all nuclear product and in-process residue materials, excess supplies, chemicals, and associated process equipment that were abandoned in place when the FEMP stopped production in 1989. After materials are removed, they are transported to NTS under Removal Action No. 9 or they are placed in interim storage pending final disposition under the final remedial action. This removal action also provides for the isolation and de-energizing of former production-related equipment and utilities. In addition, this removal action provides for the identification of customers for Fernald equipment and nuclear products. On a component basis, Safe Shutdown will be completed prior to the start of interim remedial activities for that component. On a programmatic basis, Safe Shutdown will be incorporated into the final remedial action.

Removal Action No. 17 - Improved Storage of Soil and Debris. Improved Storage of Soil and Debris was initiated to provide controlled storage of excess contaminated soils and debris generated during maintenance, construction, removal, and remedial actions at the FEMP through a soil and debris management plan. This removal action establishes procedures for the management and storage of soil and debris that will be generated through the interim remedial action. The revised draft work plan for this removal action is to be submitted to the EPAs in September 1995. The management approach outlined by this removal action will continue to be used throughout the interim remedial action for debris retained at the site.

The Removal Action No. 17 Work Plan will administer the interim storage of OU3 materials until the approval of the OU3 Final Remedial Action Work Plan. At that time, the Removal Action No. 17 Work Plan will be administratively incorporated into the Final Remedial Action Work Plan so that interim-stored materials may continue to be properly managed. It should be noted that the content of

the Removal Action No. 17 Work Plan may be revised to incorporate improved material management methodologies. Revisions may occur either prior to the approval of the Final Remedial Action Work Plan or subsequent to the approval.

Removal Action No. 26 - Asbestos Abatement Program. The Asbestos Abatement Program at the FEMP was established to mitigate potential asbestos release and migration. Abatement within this program includes in situ repairs, encasement, encapsulation, and removals. The activities are a necessary step prior to initiating D&D activities. Transite (wall and roof sheeting made of a mixture of asbestos and cement), other nonfriable (fixed) asbestos-containing materials, and undamaged friable (loose) asbestos will remain within the buildings, facilities, or structures after completion of this removal action. Currently, only nonfriable asbestos can be transported to NTS under Removal Action No. 9; friable asbestos is retained in interim storage and managed under TSCA requirements pending final disposition under the final remedial action.

Hazardous Waste Management Units

Ohio hazardous waste regulations provide a regulatory framework for the operation and closure of hazardous waste treatment, storage, and disposal units, termed hazardous waste management units (HWMUs). The term HWMU is defined in 40 CFR 260.10 as "a contiguous area of land on/in which hazardous waste is placed, or the largest area in which there is significant likelihood of mixing hazardous waste constituents in the same area." There were originally 54 HWMUs at the FEMP; of these, 50 were located in OU3. Since the initial identification, nine of the OU3 HWMUs were reclassified by the EPAs as solid waste management units (SWMUs), leaving 41 HWMUs in OU3. The HWMUs continue to be managed under RCRA; however, final closure of a number of these units will be initiated through implementation of response actions under the CERCLA process. Those HWMU wastes not addressed through CERCLA response actions will be managed under the terms of the Stipulated Amended Consent Decree and Ohio hazardous waste regulations. The Ohio hazardous waste regulations that are included in its authorized program are enforced in lieu of the federal RCRA regulations.

Table K-1, of Appendix K, provides additional information on HWMUs and SWMUs and summarizes the closure status of all HWMUs in OU3. The majority of these units are integral components of former Production Area structures or facilities (comprising OU3). As identified in Table K-1, the FEMP is pursuing closure of 14 OU3 HWMUs in accordance with Ohio hazardous waste regulations. Final dismantlement of the structural components of these 14 HWMUs will be performed concurrently

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cleanup will be achieved in conjunction with the conduct of the final remedial action for OU3, as well as the remedial action for OU5. Appendix K provides additional information on this process.

1.2.3 Scope of Operable Unit 3 Remedy Decision

As a result of previous agreements and ongoing remediation, the scope of OU3 for this RI/FS Report has been narrowed to building materials, copper piles, the coal pile, and other construction piles (sand, gravel). All other items have been removed from the scope of this report by being addressed under existing approved programs. For the coal pile and other construction piles, it is anticipated that these materials will be completely depleted through operation and construction activities prior to completion of remediation. Therefore, it is not expected that any of these piles will remain for remediation. The copper scrap pile has been addressed under Removal Action No. 15 by being containerized. However, the final disposition of the containerized copper will be addressed in this document. The items remaining within the scope of the RI/FS Report are the building materials, which represent the significant volume of materials within OU3.

Figure 1-5 shows the multiple program approach that describes the disposition of the items discussed in the previous two sections. Presented are the OU3 component categories, the waste streams generated by removal actions and D&D projects, the treatment and handling requirements, and the disposition options for these waste streams. Of the OU3 waste streams presented, the remediation materials, which were placed in interim storage under the interim remedial action, constitute the largest material quantity and ~~constitute~~ is the only waste stream to be evaluated as part of the alternatives for this RI/FS. The various site removal actions and programs described above handle treatment and disposition of the other waste streams.

1.3 ORGANIZATION OF REPORT

This RI/FS Report consists of an Executive Summary, six sections comprising the main report, and supporting appendices. A brief overview of the content of the RI/FS Report is provided below.

The Executive Summary summarizes the findings, content, and conclusions of the RI/FS Report, including identification of COCs and analysis of the remedial alternatives.

Section 1, Introduction, presents a site overview and remediation history, discusses sitewide regulatory issues, defines the scope and role of OU3, presents a description and history of OU3, and outlines the remedial strategy and the scope of the OU3 remedy decision.

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SECTION 2

components were collected from the 0-0.5 inch interval. Masonry and acid brick from locations in both wet and dry components were also collected from the 0-0.5 inch interval. A bushing tool was used to remove the top half inch of concrete and masonry in situ.

All 294 concrete chip, acid brick, and masonry samples were analyzed at ASL D for radionuclides and TAL inorganics. In addition, 14 of the samples were analyzed for PCBs at ASL D.

Toxicity Characteristic Leaching Procedure (TCLP) Testing on Concrete Chips, and Acid Brick. Eight samples were collected from concrete and acid brick throughout the site for TCLP leaching tests. ~~The results from these tests are used to provide an indication of what levels of contamination in these media may be potentially classified as hazardous under RCRA per the hazardous characteristic criteria in 40 CFR 261, Subpart C (described in Appendix A).~~ Originally, in the WPA, these leachability samples were primarily to support the OU3 stand-alone baseline risk assessment needs in developing data for leachable contaminants. The locations for collection of these samples, as identified in the WPA, were based on the following criteria:

- The medium represents a major medium in the operable unit,
- The process type represents a general class of contamination types,
- The location is readily accessible to field crews for sampling, and
- The sample is likely to exhibit contamination of concern.

Following the cancellation of the OU3 stand-alone baseline risk assessment, this data (which had already been collected) was evaluated to provide an indication of what levels of contamination in these media may be potentially classified as hazardous under RCRA per the hazardous characteristic criteria in 40 CFR 261, Subpart C (described in Appendix A). These data will also be beneficial to the RI/FS in evaluating remedial alternatives and decontamination methods. SW-846 Method 1311, TCLP, was used to determine the leaching potential of the chemical and radiological constituents. Samples were collected from the following components: Plant 1 Pad (74T - concrete), Ore Refinery Plant (2A - concrete and acid brick), Metal Production Plant (5A - concrete), Pilot Plant Wet Side (13A -concrete and acid brick), and the Pilot Plant Wet Side (13A - concrete and acid brick). Regardless of whether the process area was considered wet or dry, sample collection depths were 0 - 0.5 inch. The TCLP extracts were analyzed at ASL D for target compound list (TCL) volatile organics, TCL semi-volatile organics, TAL inorganics, and radionuclides. In Table 2-5, these samples are listed under either Concrete Chips or Acid Brick.

guidelines, giving the user a level of confidence for each reported result. The level of validation was determined based on the following definitions:

- **ASL B (Chemical Analyses Only, not Radiological)**
  Validation is performed using summary forms (raw data not reviewed) and is based on requirements in SW-846 or other non-CLP Statement of Work. Verification of laboratory calculations is not required. Analytical data analyzed at ASL B is typically validated at ASL B. In the OU3 characterization program, ASL B validation was performed for TCLP analyses of transite samples.

- **ASL C (Chemical and Radiological Analyses)**
  Validation for chemical analyses is performed using summary forms and is based on requirements in CLP Statement of Work. Verification of laboratory calculations or calibration is not required.

  Validation for radiological analyses is performed using summary forms and raw instrument data as needed. Requirements are based on FEMP Radioanalytical Services Task Orders. Verification of laboratory calculations or initial calibrations is not required.

  ASL C validation is typically performed for analytical data analyzed at either ASL C or D. If problems are detected during the ASL C validation, the validation may be upgraded to ASL D.

  In OU3 characterization program, ASL C validation was performed for the majority (up to 90 percent) of chemical and radiological analyses.

- **ASL D (Chemical and Radiological Analyses)**
  Validation for chemical analyses is performed using summary forms and raw data. Requirements are based on CLP Statement of Work. Verification of at least ten percent of laboratory calculations and all calibrations are required.

  Validation for radiological analyses is performed using summary forms and raw instrument data. Requirements are based on FEMP Radioanalytical Services Task Orders. Verification of at least ten percent of laboratory calculations and all initial calibrations is required.

  ASL D validation is typically performed for analytical data analyzed at ASL D. In many cases, ASL D validation is only performed on a portion (e.g., ten percent) of the data with the remaining data validated at ASL C. The results of the more extensive validation is used to support the findings of the ASL C validation. ~~If problems are detected during the ASL D validation, it may result in the necessity to upgrade the ASL C validation to ASL D.~~

  In the OU3 characterization program, ASL D validation was performed for at least ten percent of chemical and radiological analyses.

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10. Piping, Utilities, and Equipment - Below-ground
11. Ponds and Basins

Some categories (such as administrative and support buildings) are expected to be minimally contaminated; thus primarily, confirmatory samples were collected. Other categories (such as the process and process support buildings) are more complex and are expected to be more contaminated; therefore, more samples were collected. Descriptions of contamination within individual components, discussed in Appendix A, are organized according to component categories to maintain the structure initiated in the WPA (DOE 1993a). A description of these component categories, and the components within them, is included in Appendix A.

3.1.1.2 Material Types/Categories

The construction materials comprising the buildings, structures, and associated facilities in OU3 have been classified into ~~consist of~~ 74 material types or descriptions (i.e., concrete walls, asphalt, masonry, drywall, etc.). These material types have been grouped into ten categories according to, in most cases, similar physical characteristics to support potential disposition treatment options, as discussed in Sections 4 and 5. These material types and categories are shown on Table 3-1, defined in Appendix B.2, and their application to the actual segregation of OU3 materials described in Appendix B.7.

3.1.1.3 Material Mass/Volume Estimates

As detailed in Appendix B, an inventory of volumes and weights associated with these materials has been compiled into a database, referred to as SWIFTS. The weights and volumes of material comprising OU3 are summarized from this database in Appendix B and further summarized in Table 3-2. In total, OU3 is estimated to contain approximately 9.3 million ft^3 of material weighing approximately 454,000 tons. As shown on Figure 3-2, more than 50 percent of the volume and over 70 percent of the weight of this material is concrete-like material (i.e., asphalt, concrete structures, masonry, and transite). As indicated in Appendix B, the largest amount of this material (nearly 50 percent) is associated with at-grade floors and pads, and more than 40 percent is below-grade (foundations, electrical duct banks, drainage structures, etc.). The next most prevalent material is steel (structural, piping and equipment), which accounts for more than 20 percent of the total volume (ten percent of the total weight). A significant amount of the material associated with OU3 is inventory (product, thorium, and drummed wastes - see Attachment A.IV for an accounting). This material was either in inventory when production operations ceased or has been (or will be) generated as a result of activities to mitigate risks within OU3. As discussed in Section 1, this material is being discussion in this section consolidates information across

- High tonnages of purified uranium in solid (uranium metal, black oxide - uranium oxide [U_3O_8], brown oxide - uranium dioxide [UO_2], orange oxide - uranium trioxide [UO_3], and green salt - uranium tetrafluoride [UF_4]); semi-solid (uranium hexafluoride [UF_6]); and liquid (uranyl nitrate [$UO_2(NO_3)_2$] solution) forms.
- Intermediate tonnages of uranium ores and ore concentrates, containing primarily the isotopes of uranium and its progeny (thorium-230 and radium-226), as well as a wide variety of impurities (see discussion of thorium series and inorganic contaminants below).
- Relatively low volumes of recycled uranium residues and scraps containing fission products (strontium-90, technetium-99, and cesium-137) and activation products (americium-241, neptunium-237, plutonium-238, plutonium-239/240, plutonium-241, and uranium-236).

The FEMP also produced 369,000 kilograms (400 tons) of thorium-232 products in the late 1960s and early 1970s. The feed materials for this production were thorium compounds and metal containing thorium progeny (radium-228 and thorium-228), as well as thorium-230.

Consistent with the production history at the FEMP, the predominant radiological contaminants in OU3 are expected to be uranium and its more stable progeny (radium-226 and thorium-230), as well as small quantities of several fission and ~~activation~~ transformation products. Since thorium-232 was also refined at the FEMP, this radionuclide and its more stable progeny (radium-228 and thorium-228) are also expected.

3.1.2.2 Expected Inorganic Contaminants

Inorganic chemicals were integral to the manufacturing process at the FEMP. The predominant inorganic chemicals used in the uranium refining process at the FEMP were nitric acid, hydrochloric acid, hydrofluoric acid, magnesium metal, calcium hydroxide (lime), and calcium-magnesium carbonate (dolomite). Sodium chloride, potassium chloride, calcium carbonate and lithium carbonate were used as salts in heat treating. Magnesium fluoride (MgF_2) was also a major waste from the metal production process. In addition, the ore concentrates processed at the FEMP contained elevated concentrations (greater than one percent) of impurities such as calcium, iron, magnesium, phosphorous (as phosphorous pentoxide - P_2O_5), sodium, silicon (as silicon dioxide - SiO_2), and sulfur (as sulfate - SO_4), as well as minor concentrations of several other impurities, including arsenic, carbon (as carbonate - CO_3), molybdenum, phosphorus (as phosphate - PO_4), and vanadium (as vanadium pentoxide - V_2O_5). These impurities were concentrated up to five-fold in the waste streams through the removal of the uranium in the refining process (DOE 1995e). Finally, lead-based paints were used throughout the FEMP through the early 1990s. These paints typically

contain elevated levels of lead, as well as other metals (such as cadmium, chromium, and mercury) which are used in the paint pigments.

3.1.2.3 Expected Organic Contaminants

Several uses of organic chemicals have been identified in the history of processing operations at the FEMP. A mixture of kerosene and tributyl phosphate was used as a solvent for the extraction of uranyl nitrate following nitration of uranium ores and recoverable wastes. A similar mixture using diamyl-amyl phosphonate (DAAP) was used for thorium extraction. Other organic materials include oils (lubricating, cutting, cooling, and water-soluble), PCBs from lubricants and electrical equipment, pesticides and herbicides, and various solvents and cleaning fluids. In general, volatile organic compounds (VOCs) were used in support functions, such as maintenance activities, or were progeny of parent chemicals used at the site. Because many of the oils and oily materials were burned in incinerators at the FEMP, chlorinated dibenzo p-dioxins/dibenzofurans (CDDs/CDFs), poly-aromatic hydrocarbons (PAHs), and phenols could have been produced.

3.2 DETERMINATION OF CONSTITUENTS OF CONCERN (COCs)

COCs are those contaminants that pose a 10^{-7} or greater Incremental Lifetime Cancer Risk (ILCR) or a Hazard Quotient (HQ) greater than 0.1 to the maximally exposed individual (MEI). The ILCR is incrementally additive to the number of people that would normally be expected to develop cancer when exposed to a given level of a contaminant over a 70-year lifetime (i.e., 10^{-7} implies one person in 10,000,000). The HQ is the intake of a toxic substance through a pathway divided by the ~~total~~ acceptable intake (i.e. an HQ of 0.1 indicates an uptake of 1/10 of an acceptable limit). See Section 5 for further discussions regarding risk.

COCs are normally determined in a baseline risk assessment as part of an RI/FS study in consideration of constituent concentrations, plausible land uses, and exposure pathways. A baseline risk assessment establishes the risk to human health and the environment if no remedial action is taken. As discussed in Section 1, OU3 presents a special case to the RI/FS process and the applicability of a baseline risk assessment. The buildings, structures, and associated facilities within OU3 are being removed under an approved interim remedial action (DOE 1994a). Most of the waste material resulting from this action will be placed in interim storage until a decision is made concerning final disposition. Because DOE will not allow these wastes to remain permanently in interim storage, the focus of the OU3 RI/FS deals primarily with the final disposition of the wastes.

Because no stand-alone baseline risk assessment was performed for OU3, and because a list of COCs is required for the FS portion of this combined document, an alternate method of determining COCs was utilized. This method, similar to the method used for determining constituents of potential concern in standard baseline risk assessments, removed analytes not significantly contributing to risk while providing adequate human health and environmental protection. The primary difference is that maximum levels of each contaminant have been used to reflect the diverse nature of OU3.

The following sections summarize the COC selection process, the selection criteria, and the results of the screening process.

3.2.1 Methodology Used to Determine COCs

The knowledge of process operations and expected contamination within OU3 were used in the WPA (DOE 1993a) to develop a list of 87 potential contaminants of concern. This resulted in a list of 148 potential contaminants ~~analytes~~ to be analyzed during the RI/FS characterization study, although 175 potential contaminants ~~analytes~~ were finally included in the study (see Section 2). The results from this study were evaluated through the following four-step process to determine COCs for OU3.

1. Separate by Media

   As discussed in Section 3.1.1, OU3 construction materials have been classified into ~~consists of~~ 74 types. ~~of material.~~ As discussed in Section 2, the characterization study collected samples from 12 of these material types, representing 95 percent (by weight) of the total material in OU3. Sampling results from 11 of these were used in the COC determination. Liquids were excluded from the screening because they were obtained from points where materials would tend to collect and concentrate, and, therefore, the results are not necessarily representative. The excavated soil piles are not directly applicable to the OU3 RI/FS, since they will be dispositioned by OU5. However, they are included in the COC determination because the analytical results were not available when the OU5 RI/FS was performed. This analysis confirmed that no COCs were overlooked in the analysis performed by OU5 (See Section ~~A.3.4~~ A.2.4).

   Analytical information for each of the 11 media types (loose media, sediment, and sludge were combined) was examined for all chemical and radiological constituents specified in the WPA (1993a). In all, 175~~170~~ contaminants ~~constituents~~, consisting of 19 radionuclides ~~radiological constituents~~, 24 metals, 38~~35~~ volatile organic chemicals, 67~~66~~ semivolatile organic chemicals and 27~~26~~ pesticides and PCBs, were included in the analysis. ~~Note that five constituents inadvertently reported by analytical laboratories for several of the samples were excluded because they were not planned in the WPA and there was a limited number of sample results.~~

2. Determine Representative Concentrations

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obtain samples of the maximum contamination within these facilities (see Section 2). As a result of these factors, there is no general relationship between the expected or actual type, level, or extent of contamination within these facilities (one particular contaminant may be of concern in one area, such as PCBs in electrical substations, but not in others). Therefore, the maximum detected value for each analyte in each sampled media type was used as the representative concentration for the COC screening. This extremely conservative assumption was made to increase the sensitivity of the COC selection process, making certain that all potentially significant contributors to the risk to human health and the environment were included.

3. Compare Representative Concentrations to Part B Screening Criteria

The representative (maximum) concentration for each analyte within a medium was compared to the Part B Screening Criteria for safe levels in residential surface soil (EPA 1991). If the representative concentration in a sampled media type exceeded the Part B Screening Criteria, the constituent was considered a COC for that media type. Part B Screening Criteria were calculated at an ILCR level of one in ten million (10^{-7}) and a HQ of 0.1 (see Attachment A.V for the development of these criteria). In addition, the concentration of chemicals for which there are no Part B Screening Criteria were compared to TCLP limits. Finally, all radionuclides were considered COCs because they are Class A carcinogens.

4. Combine COCs for all Media

The final step of the COC selection process was to compile COCs for all media into a final list of COCs. If a constituent was a COC for any of the media considered, it was considered a COC for all media. Note that even COCs found exclusively in loose media and soil (media not directly related to this RI/FS) were marked for further consideration in the Sections 4, 5, and 6 of this document.

3.2.2 Results

The 60 OU3 COCs are listed on Table 3-6. These include 20 radioactive constituents, 16 inorganics, 15 semivolatile organics, three volatile organics, and six pesticides/PCBs.

3.3 REFERENCE CRITERIA FOR EVALUATION OF CONTAMINATION LEVELS

Characterization of the radiological and chemical contamination in OU3 involves comparison of constituent concentrations to known constituent-specific reference criteria. These reference criteria provide a perspective on the level of contamination within the sampled media. This is important to the characterization process because the comparison assists in the identification of dominant constituents and the media/components in which they predominate. This determination is needed to focus the remedial alternative selection process for OU3, because final disposition is partially dependent on the types, levels and locations of contamination. For instance, material with high levels

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3.3.4 Constituent-Specific TCLP Concentrations

Another reference criterion used for comparison are the constituent-specific TCLP regulatory limit (40 CFR 261.24) and 20 times the TCLP limits. The EPA has promulgated standards for classification of solid waste as hazardous. One method for determining whether solid waste is hazardous is to determine the quantity of hazardous materials that could potentially leach from a sample into the environment. This determination is made using the toxicity characteristic leachate procedure (TCLP 40 CFR 261), in which a sample is exposed to an acid environment to allow constituent leaching. The leachate is then analyzed for contaminants, and the results are compared to regulatory limits (40 CFR 261.24). Since the TCLP process yields contaminant concentrations in leachate that are 20 times more dilute than contaminant concentrations in the solid sample (see Attachment A.II for a complete description), a solid sample with a contaminant concentration exactly 20 times the TCLP limit from which all of the contaminant leaches should yield a leachate concentration equal to the regulatory limit. Furthermore, a solid sample with a contaminant concentration that is less than 20 times the TCLP limit cannot yield a leachate concentration greater than the regulatory limit. Therefore, exceedance of the 20 times the TCLP limit indicates that a material may be hazardous. Numerical values for 20 times the TCLP limit for each regulated substance are summarized in Table 3-7.

3.3.5 Constituent-Specific TSCA-Regulated Concentrations

TSCA requires that wastes containing more than 50 mg/L (ppm) of PCBs be handled and dispositioned in accordance with specified procedures (40 CFR 761). This definition of liquid TSCA wastes has been used in this RI/FS report as a reference level for evaluating the level of contamination in solid material (i.e., PCB contamination exceeding 50 mg/kg [ppm]).

3.4 DISCUSSION OF SIGNIFICANT CONTAMINATION IN OU3

As discussed in the introduction to Section 3 and in Appendix A, several levels of detail and three viewpoints have been provided for the characterization of contamination within OU3. These are required by the complexity of OU3 and the large amount of information resulting from the field characterization study.

All of the sampling results are presented in Appendix L. These data are discussed in detail in Attachment A.II for each contaminant for which analyses were performed. The information for each COC is summarized at an intermediate level in Appendix A.4 for the purpose of identifying COCs

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that, by reason of extent/ ~~or~~ level of detection and/or potential risk, are considered *more significant* than other COCs. The

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discussion in this section consolidates information across media and components, and thus provides an overview of the occurrence of these *more significant* COCs in OU3 as a whole. This information is useful for identifying those constituents that may affect FS treatment or disposal options.

3.4.1 More Significant COCs

The extensive OU3 characterization data reveal that there are a limited number of constituents detected in numerous media within several components that may affect FS treatment/disposal options. It is not implied that other COCs should be ignored; however, the available data indicate that these other constituents will not influence overall remedial decisions and, in many cases, their treatment/disposition will be coincidental with that of the more significant ones. ~~The COCs that are considered *more significant* are listed on Table 3-8.~~ Each COC, whether or not it is considered more significant, and the associated reasons for such designation are presented in Table 3-8. Each of the more significant COCs, ~~along with the reasons they are considered more significant,~~ is discussed in the following sections.

3.4.2 Summary of Results for More Significant Radiological COCs

Because of the production mission at the FEMP, the dominant contamination within OU3 is expected to be radiological (see Section 3.1.2). To characterize radiological contamination in OU3, 795 samples were collected and analyzed for elemental uranium and 19 radionuclides. Almost 89 percent of these samples were from solid media (brick, concrete chips, concrete cores, loose media, masonry chips, sediment, sludge, soil, and wood), whereas the remaining 11 percent were from liquid media and air filters.

All 20 radiological constituents are COCs because EPA has defined them as Class A carcinogens. A Class A carcinogen is one for which there is evidence of cancer in humans caused by exposure to it. The characterization results for three of these radionuclides are summarized below. More detailed discussions for all 20 radioactive constituents are included in Appendix A and Attachment A.II.

3.4.2.1 Uranium

As discussed in Section 3.1, the major purpose of the FEMP during its 37 years of production was the purification of uranium. Thus, uranium is expected to be one of the major contaminants at the site. It was anticipated that the degree of contamination within a given component would be related to its historical role in the production process and its current role in the remediation operations. For

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Uranium is a heavy metal and is chemically toxic in addition to its inherent radioactivity. Its target organ for chemical effects is the kidney. Uranium is made up of three radioactive isotopes: uranium-234, uranium-235, and uranium-238. One additional anthropogenic (man-made) isotope of uranium, uranium-236, associated with reprocessed fuel handling, is expected in trace amounts in some site locations. Because uranium is both a toxin (i.e., produces toxic effects) and a Class A carcinogen, and because it was found in elevated concentrations throughout large areas of the operable unit, uranium is considered a *more significant contaminant* of major concern in OU3. Its characterization was a major goal of this study.

Different analyses were used to characterize uranium within OU3. Total uranium analysis by kinetic phosphorescence analysis (KPA) was used to measure elemental uranium, and alpha spectral analyses were used to measure uranium-234, uranium-235/236, and uranium-238. Results from these four parameters provide information on the quantity and enrichment of uranium found within the operable unit. The geographic distributions and magnitudes of the concentration data for elemental uranium and the isotopic uranium results correlate well. To avoid a repetitious presentation, only elemental uranium results are used to characterize the geographical distribution of uranium within OU3. The isotopic data is featured in the discussion on uranium enrichment.

Elemental uranium results were reported for ~~771~~ 758 samples from solid and liquid media sampled within OU3. Uranium was detected in ~~689~~ 668 solid media samples, with concentrations ranging from ~~0.0263~~ 0.4 μg/g to 520,000 ~~52,0000~~ μg/g. It is interesting to note that about ~~38~~ 41 percent of the reported uranium concentrations in solid media exceed 500 μg/g and thus would qualify as source material under 10 CFR 20. The highest concentration of uranium was detected in loose media from the Rolling Mill Area of the Metals Fabrication Plant (6A). The arithmetic and geometric means of uranium results for solid media ~~this sample population~~ are ~~4530~~ 4800 μg/g and ~~152~~ 191 μg/g, respectively.

The baseline concentration of uranium in concrete and steel coatings (paint) serve as points of reference (see Table 3-7). This study compares concentrations in the other solid media, such as acid brick and masonry, to baseline levels of uranium in concrete. Although the concrete baseline concentration is not directly applicable in this case because it is from a different medium, it does provide a useful frame of reference. ~~Over 70~~ About 60 percent of the uranium concentrations in solid media exceed the baseline level for concrete (~~12.55~~ 6.8 μg/~~K~~g). This percentage suggests widespread uranium contamination within OU3.

Figure 3-4 presents the volume of six solid materials by media and component category containing uranium in concentrations that exceed baseline. This figure depicts ~~shows~~ concrete contributing ~~35~~ 88 percent of ~~the contaminated volume to~~ the total ~~1.1~~ of 2.7 million ft^3 above baseline. ~~Acid brick~~ Asphalt constitutes ~~four~~ 11 percent of the volume above baseline. Excluding asphalt, the largest percentage of the material volume containing uranium in concentrations above baseline levels (~~23~~ 29 percent of the total volume) is located within the Process Buildings (Component Category 3) and 13 percent is in the Warehouse and Storage Buildings (Component Category 2). ~~Asphalt has been excluded both from the figures and the discussions. The reason is because of the overwhelming volume of asphalt present in the roads and parking lots at the FEMP. The amount of contamination in the immense volume is slight.~~

The elemental and the isotopic uranium data indicate widespread uranium contamination of structural components and other solid materials within OU3. The isotopic data can also be used to determine the enrichment status of the uranium sampled. In general, uranium can be grouped into one of three categories, depending on the relative atomic abundance of the three naturally occurring isotopes (uranium-234, uranium-235, and uranium-238). The three categories are natural uranium, enriched uranium, or depleted uranium. A discussion of these three types of uranium, and the methods used to identify them, is provided in Appendix A.

In typical occupational settings, allowable exposures to soluble forms of natural and depleted uranium tend to be limited by its chemotoxicity, rather than its radiotoxicity. However, the radiotoxicity of uranium increases as its degree of enrichment increases. The level of enrichment at which radiotoxicity concerns supersede chemical toxicity concerns for soluble uranium is 1.3 percent uranium-235 enrichment (EG&G 1988). This level of enrichment has been selected as a convenient dividing line for focusing attention on samples containing significantly enriched uranium.

The majority of uranium handled at the FEMP was either natural or depleted uranium. A small fraction of the total quantity of uranium that passed through processes at the FEMP was enriched in uranium-234 and uranium-235. Based on a review of isotopic data sets from 498 sample locations, two samples contained the elevated isotopic ratios indicative of 1.3 percent uranium-235 enriched uranium. One of the two individual samples identified as containing enriched uranium came from masonry chips taken from the Nuclear Fuels Services Storage and Pump House (2E). This component was used to store enriched material received from the Nuclear Fuels Services facility in

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3.4.2.2 Technetium-99

Technetium-99 is a radionuclide produced by fissioning uranium in a nuclear reactor. After the reactor run is finished, the uranium can be recovered and sent for reprocessing. The major source of technetium in OU3 is recycled uranium from the Hanford site, as a trace contaminant not fully removed by the purification processes at Hanford.

Technetium-99 is considered a *more significant contaminant* for three reasons: 1) it is a Class A carcinogen; 2) it is mobile in the environment; and 3) it has been found throughout large areas of the site.

Technetium-99 results were reported for ~~765~~ 751 samples from all solid and liquid media sampled within the confines of OU3. Technetium-99 was detected in ~~75~~ 76 percent of the solid media samples at concentrations ranging from 0.075 to 13,000 pCi/g. The arithmetic and geometric means of this sample population are ~~139~~ 141 pCi/g and ~~5.2~~ 5.1 pCi/g, respectively. All media contained detectable levels of technetium, but the highest concentrations were associated with unknown liquids, loose media, and sediment. Technetium-99 was detected in ~~136~~ 110 components, with the highest solid media concentrations detected in the Process Buildings and the Ponds and Basins. In solid media, the maximum detected concentration of 13,000 pCi/g was found in loose media from the Rolling Mill (6A).

Figure 3-5 presents the volume of six solid materials containing technetium-99 in concentrations that exceed baseline by media and component category. This figure depicts ~~shows~~ contaminated concrete contributing ~~35~~ 89 percent of ~~the volume to~~ the total ~~contaminated~~ volume of ~~1.1~~ 2.9 million ft^3 above baseline. ~~Acid brick~~ Asphalt constitutes another ~~four~~ 10 percent of the volume above baseline. Excluding asphalt, the majority of material volume containing technetium-99 at concentrations above baseline levels (~~24~~ 28 percent of the total volume) is located within the Process Buildings (Component Category 3) and 12 percent is in the Process Support Buildings (Component Category 4).

3.4.2.3 Thorium

Thorium-230 was introduced to the FEMP in two different ways. Thorium-230 was a component of uranium ore and its residues. The FEMP handled uranium ore for a brief period of its early history. Uranium was extracted from this ore, and the remaining residues were stored in the Waste Storage Area, now known as OUs 1, 2, and 4. Thorium-230 contamination, attributable to ore processing

operations, is expected in older areas of the site, such as Plant 1, which housed the ore preparation and uranium 2

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extraction operations. Thorium-230 was also introduced to the site by thorium ~~fuel~~ processing operations. Thorium-230 contamination attributable to ~~fuel~~ these thorium processing operations is expected in areas of the site that were associated with these operations, such as the Pilot Plant and Plant 9 (DOE 1993a). In addition, storage buildings in OU3 currently house containers of thorium.

Thorium-230 is a *more significant contaminant* for three reasons: 1) it is a Class A carcinogen; 2) its low allowable air concentration for occupational exposure may make it an occupational concern during remediation; and 3) it has been found throughout large areas of the site.

Thorium-230 results were reported for 743 samples from all solid and liquid media sampled within the confines of OU3. Thorium-230 was detected in ~~88~~ 96 percent of the solid media samples. The arithmetic and geometric means of this sample population are ~~64.1~~ 64.6 pCi/g and 3.9 pCi/g, respectively. All media contained detectable concentrations of thorium-230, and levels exceeded baseline concentrations in about ~~75~~ 36 percent of the solid media sampled. The highest concentrations of thorium-230 were associated with unknown liquids, loose media, acid brick and steel coatings. Thorium-230 was detected in 134 components; the highest solid media concentrations were found in the Process Buildings (Component Category 3) and the Ponds and Basins (Component Category 11). The maximum detected concentration of 5,600 pCi/g was found in steel coatings from the Oil Centrifuge (8A).

Figure 3-6 presents the volume of six solid materials in OU3, by media and component category, containing thorium-230 in concentrations exceeding baseline. This figure depicts ~~shows~~ ~~masonry~~ concrete contributing ~~34~~ 87 percent of ~~the contaminated volume to~~ the total ~~1.1~~ of 2.4 million ft^3 above baseline. ~~Concrete~~ Asphalt constitutes ~~29~~ another 12 percent of the volume above baseline. Excluding asphalt, the majority of the material volume containing thorium-230 above baseline levels (~~18~~ 26 percent of the total volume) is located within the Process Buildings (Component Category 3) and 14 percent is in the Warehouse and Storage Buildings (Component Category 2).

3.4.2.4 Overview of Radiological Contamination in OU3

Figure 3-7 presents the volume of six solid materials in OU3, containing technetium, thorium-230, and/or uranium concentrations over their respective baseline levels, by media and component category. These three were selected for this presentation because they dominate all other radiological analytes investigated. This figure depicts ~~shows~~ ~~masonry~~ concrete contributing ~~33~~ over 89 percent of

~~the contaminated volume to~~ the total ~~1.1~~ volume of 3.0 million ft^3 above baseline. ~~This percentage reflects the heavy influence of thorium 230 on the volume estimate (see Figure 3-6). Thorium 230 in masonry would contribute 30 percent of the~~

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~~total volume even without the presence of uranium and technetium-99. Ceoncrete constitutes 18 percent of the volume above baseline~~. Uranium and technetium-99 dominate the concrete volume estimates. This is especially evident in subsurface concrete within the Process Buildings. Excluding asphalt, the highest percent of the material volume containing at least one of these radioactive constituents in concentrations above baseline levels (~~20~~ 27 percent of the total volume) is located within the Process Buildings (Component Category 3) and approximately 12 percent is located within the Warehouse and Storage Buildings (Component Category 2). ~~Component Categories 1 and 4 (the Administrative/Support Buildings and the Process Support Buildings) contained the next two highest volumes, 15 percent and 9 percent, respectively.~~

Part of the purpose of the characterization study was to determine the vertical extent of contamination in concrete. This was the primary purpose in collecting concrete core samples from three depth intervals (0 - ½ inch, ½ - 1 inch, and greater than one inch) in areas where penetration was expected to occur (i.e., wet process areas). The volume of material shown on Figure 3-7 as exceeding baseline values ~~appears to~~ indicate that there is considerable contamination below the surface of concrete. This is for two reasons: first of all, the baseline value for concrete is relatively low compared to detected results. All detected results in the top ½-inch of concrete in the process area, and ~~93~~ 92 percent of those in the second ½-inch, exceeded the baseline level. This indicates that ~~97~~ 96 percent of the top 1-inch of concrete in sampled components in these buildings exceeds the baseline.

Secondly, all concrete is assumed to be eight inches thick (see Appendix B for further details). Any contamination below a depth of one inch is assumed to be representative of the contamination to a depth of four inches (the depth below four inches is assumed to be at the baseline concentration - see Attachment A.III for justification and Appendix B for further details). The fact that this volume of concrete is eight times the volume in the top ½-inch indicates that, unless there is ~~an eight fold~~ a decrease in the level of contamination between the top ½-inch (or the second ½-inch) and the next four inches to below baseline levels, the volume of concrete exceeding baseline will increase with depth.

Detailed data are presented in Attachment A.III, and discussed in Appendix A, regarding the vertical extent of contamination in concrete. These data, combined with historical knowledge of the concrete pads and floors in OU3, suggest that contamination in most of the concrete within OU3 production areas will decrease with depth. However, the results can be unpredictable for some ~~of the~~ concrete

~~from~~ near cracks, in production areas where more soluble forms of contaminants were used, and in

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3.4.3 Summary of Results for More Significant Inorganic COCs

As described in Appendix A.2.4, several inorganic chemicals were used at the FEMP and are therefore expected contaminants in OU3. Based on this knowledge, 643 major media samples and 85 supplemental media samples were analyzed for 23 inorganic contaminants. Based on these results, 16 inorganics have been identified as COCs in OU3 (see Appendix A.3). As described in the following sections and detailed in Appendix A.4, five inorganics (barium, cadmium, chromium, lead, and mercury) are considered *more significant* in comparison to the others. The following sections describe the expected source of each of these COCs, summarize the occurrence of each in OU3, and discuss the reasons each is considered more significant. A detailed description of the expected and actual occurrence of all 23 inorganics for which analyses were performed is provided in Attachment A.II, and an intermediate summary level of the COCs in presented in Appendix A.4.

3.4.3.1 Barium

Barium is expected in OU3 primarily because it is a trace constituent in concrete (barium is often found with limestone, a component of concrete). Furthermore, barium sulfate was used as an additive in paint to improve its covering characteristics and as a pigment in white paint; barium carbonate was used in thorium extractions in the Pilot Plant; barium chloride used in heat treating operations at an off-site facility was received and converted to barium sulfate to stabilize it in the Pilot Plant; and barium compounds were involved in operations at the Preparation Plant (1A), the Graphite Furnace and Oil Burner (10D), the Coal Pile (P-005), and the Laboratory (15A). The occurrence of barium at the FEMP is expected to be widespread at relatively low concentrations associated with concrete; widespread at higher concentrations associated with paint (much of the structural steel from which steel coatings were taken are grey, and therefore contain white pigment); and in isolated areas at elevated concentrations in most media in those components where it was used in the process.

Barium is a COC because five percent of the detected results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. Barium is considered *more significant* compared to most other inorganic COCs because 33 samples (including some in major media) exceeded 20 times the TCLP limit.

Barium was detected in 98 percent of the samples of solid media, with concentrations ranging from 3.3 to 23,700 mg/kg (geometric mean of 109 mg/kg). Barium was detected in all sampled media and at the highest, and most consistently high, concentrations in a steel coatings (paint). Barium was

detected most often in process buildings (Recovery Plant [8A], Special Products Plant [9A], Pilot Plant Wet Side [13A], and Six to Four Reduction Facility #1 [54A]), but at consistently high concentrations in many components.

Concentrations of barium in ~~33~~ 34 samples exceeded 20 times the TCLP limit (2000 mg/kg) ~~and are therefore potentially hazardous~~. These ~~33~~ 34 samples include ~~24~~ 25 steel coating samples, five concrete samples, two loose media samples, one masonry sample, and one sediment sample. However, based on TCLP results, as discussed in Appendix A.III.2.6.2, no painted material is considered hazardous.

Figure 3-8 presents the volume of material associated with samples exceeding 20 times the TCLP limit for barium (2000 mg/kg) by media type and component category. This figure indicates that all of the material ~~considered potentially hazardous~~ exceeding 20 times the TCLP limit for barium is in the Process Buildings (Category 3) and that ~~87~~ 81 percent of the volume of this material is masonry. Based on TCLP results as discussed in Attachment A.II.7, no OU3 material is expected to be hazardous due to barium if representative samples are taken.

3.4.3.2 Cadmium

Cadmium is expected within OU3 primarily because it is a trace constituent in concrete, it is used as a yellow pigment in paint, and it was a minor impurity in uranium ores and ore concentrates used at the FEMP. Therefore, the occurrence of cadmium at the FEMP is expected to be widespread at relatively low concentrations in association with concrete; widespread at higher concentrations associated with paint; and in isolated areas at slightly elevated levels (up to 350 mg/kg) in most media in uranium processing facilities.

Cadmium is a COC because 20 percent of the detected results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. Cadmium is considered *more significant* compared to most other inorganic COCs because 44 samples (including some in major media) exceeded 20 times the TCLP limit.

Cadmium was detected in 42 percent of the solid media samples, with concentrations ranging from 0.11 to 558 mg/kg (median of 1.2 mg/kg). Cadmium was detected in all sampled media, except asphalt, and at the highest, and most consistently high, concentrations in steel coatings (paint). It was

Concentrations of cadmium in 44 samples exceeded 20 times the TCLP limit (20 mg/kg). ~~and are therefore potentially hazardous.~~ These 44 samples include 37 steel coatings samples, four loose

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media samples, one concrete chip sample, one masonry sample, and one sediment sample. However, based on TCLP results, as discussed in Appendix A.III.2.6.2, no painted material in OU3 is considered hazardous.

Figure 3-9 presents the volume of material associated with samples exceeding 20 times the TCLP limit for cadmium (20 mg/kg) by media type and component category. This figure indicates that 98 percent of the material ~~considered potentially hazardous~~ exceeding 20 times the TCLP limit for cadmium is in masonry in the Administrative and Support Buildings (Component Category 1) and the remainder is in the Process Buildings (Component Category 3). ~~Approximately 89 percent of the volume of material considered potentially hazardous for cadmium is masonry.~~ This is indicative of the conservative results of applying "hot spot" sampling results to entire process areas/components. The result from one sample of masonry from the Service Building (11) was applied to much of the masonry in Component Category 1 because of the limited number of samples collected in other components. Based on TCLP results, as discussed in Appendix A.II.7, no OU3 material is expected to be hazardous due to cadmium if representative samples are taken.

3.4.3.3 Chromium

Chromium is expected within OU3 for the following reasons: because it is a trace constituent in concrete, it is used as a pigment in paints, it was used as a biocide in the treatment of cooling tower water at the FEMP, it is a major constituent in stainless steel, and it was a minor impurity in uranium ores and ore concentrates used at the FEMP. Therefore, the occurrence of ~~cadmium~~ chromium is expected to be widespread at relatively low concentrations associated with concrete; widespread at elevated concentrations associated with paints; and in isolated areas at slightly elevated levels (up to 2250 mg/kg) in most media in uranium processing facilities.

Chromium is a COC because 24 percent of all results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. Chromium is considered *more significant* compared to most other inorganic COCs because 175 samples (including some in major media) exceeded 20 times the TCLP limit.

Chromium was detected in 89 percent of solid media samples collected from OU3, with concentrations ranging from 1 to 17,300 mg/kg (geometric mean of 35 mg/kg). Chromium was detected in all sampled media, with the highest levels in steel coatings (paint). Concentrations of

chromium in 175 samples exceeded 20 times the TCLP limit (100 mg/kg) (or exceeded the actual limit in the TCLP leachate of transite samples) ~~and are therefore potentially (or actually) hazardous~~. These 175 included 123 steel coatings, 21 loose media, ten sediment, eight concrete core, five

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Figure 3-10 presents the volume of material associated with samples exceeding 20 times the TCLP limit for chromium (100 mg/kg) by media type and component category. This figure indicates that ~~89~~ 83 percent of the material ~~considered potentially hazardous~~ exceeding 20 times the TCLP limit for chromium is in the ~~Administrative and Support Buildings~~ Process Buildings (Component Category ~~1~~ 3) and ~~the remainder~~ 12 percent is in the Process Support Buildings (Component Category ~~3~~ 4). ~~Nearly 90~~ Approximately 48 percent of the volume of material ~~considered potentially hazardous~~ exceeding 20 times the TCLP limit for chromium is ~~masonry~~ acid brick and nearly 22 percent is transite. Based on TCLP results, as discussed in Attachment A.II.7, only acid brick in one component (9A) is expected to be potentially hazardous due to chromium if representative samples are taken.

3.4.3.4 Lead

Lead is expected in OU3 because it is a trace constituent in concrete, lead dioxide is used in storage batteries used throughout the site, it has been used extensively in paints, and it was an impurity in uranium ores and ore concentrates used at the FEMP. Therefore, the occurrence of lead is expected to be widespread at relatively low concentrations associated with concrete; widespread at elevated concentrations associated with paints in general (lead-based paints were used extensively at the FEMP though the early 1990s) and in yellow paint more particularly; and in isolated areas at elevated levels (up to 239,000 mg/kg) in most media in uranium processing facilities.

There is no Part B Screening Level for lead. However, it is a COC and considered *more significant* compared to most other inorganic COCs because 247 samples (including some in major media) exceeded 20 times the TCLP limit.

Lead was detected in 90 percent of solid media samples collected from OU3, with concentrations ranging from 0.54 to 375,000 mg/kg (geometric mean of 77.3 mg/kg). Lead was detected in all sampled media. It was detected most often, at the highest levels, and at the most consistently high levels in steel coatings (paint). It was detected in all 135 components in which samples were collected for analysis of inorganics.

Concentrations of lead in 247 samples exceeded 20 times the TCLP limit ~~and are therefore potentially hazardous~~. These 247 samples were comprised of 131 steel coatings samples, 34 loose media, 23 masonry, 21 concrete core, 20 sediment, 13 concrete chip, and five acid brick samples. However,

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based on TCLP results, as discussed in Appendix A III.2.6.2, no painted material is considered hazardous.

Figure 3-11 presents the volume of material associated with samples exceeding 20 times the TCLP limit for lead (100 mg/kg) by media type and component category. This indicates that 84 percent of...

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the material ~~considered potentially hazardous~~ exceeding 20 times the TCLP limit for lead is in the Process Buildings (Component Category 3). ~~Over~~ 37 percent of the volume of material ~~considered potentially hazardous~~ exceeding 20 times the TCLP limit for lead is acid brick, 26 percent is in the top ½-inch of concrete, and 20 percent is in masonry. Based on TCLP results, as discussed in Attachment A.II.7, only acid brick in two components (2A and 2D) is expected to be potentially hazardous due to lead if representative samples are taken.

3.4.3.5 Mercury

Mercury is expected in OU3 primarily because it is a trace constituent in concrete, mercuric sulfide is used as a pigment in paints, and it was used in the dissolution of alloys in Plant 2/3, as well as in the Laboratory. Therefore, the occurrence of mercury is expected to be widespread at relatively low levels associated with concrete, widespread at higher concentrations associated with paint, and in isolated areas at elevated levels in most media in uranium processing facilities where it was used.

Mercury is a COC because ten percent of all samples exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. It is considered *more significant* compared to most other inorganic COCs because 50 samples (including some from major media) exceeded 20 times the TCLP limit.

Mercury was detected in 42 percent of solid media samples collected from OU3, with concentrations ranging from 0.024 to 223 mg/kg (median of 0.1 mg/kg). Mercury was detected in all sampled media, except asphalt and soil, and at the highest level in sediment, but at the most consistently high levels in steel coatings. It was detected in 74 of the 135 components ~~in~~ which samples were collected for analysis of inorganics. It was detected most often in Process and Support Buildings (Recovery Plant [8A], Main Maintenance Building [12A] and Pilot Plant Wet Side [13A]), but at consistently high levels in several components.

Concentrations of mercury in 50 samples exceeded 20 times the TCLP limit ~~and are therefore potentially hazardous~~. These 50 samples include 32 steel coatings samples, five loose media samples, six sediment samples, two masonry samples, two acid brick samples, one concrete core sample, and two concrete chip samples. However, based on TCLP results, as discussed in Appendix A.III.2.6.2, no painted material is considered hazardous.

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Figure 3-12 presents the volume of material associated with samples exceeding 20 times the TCLP limit for mercury (4 mg/kg) by media type and component category. This figure indicates that all of the material ~~considered potentially hazardous~~ exceeding 20 times the TCLP limit for mercury is in the Process Support Buildings (Component Category 4). Nearly 47 percent of the volume of material ~~considered potentially~~

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~~hazardous~~ exceeding 20 times the TCLP limit for mercury is masonry; the remainder is divided approximately equally between acid brick and the top two depth intervals (0 - ½ inch and ½ - 1 inch) in concrete cores. Based on TCLP results, as discussed in Attach A.II.7, no OU3 material is expected to be hazardous due to mercury if preventative samples are taken.

3.4.4 Summary of Key Results for More Significant Semivolatile Organic COCs~~onstituents of Concern~~

As described in Appendix A.2.4, semivolatile organic compounds were used at the FEMP and are therefore expected contaminants in OU3. Based on this knowledge, 20 major media samples and 159 supplemental media samples were analyzed for a total of 66 semivolatile organics. Based on these results, 15 semivolatiles have been identified as COCs in OU3 (see Appendix A.3). As described in the following sections and detailed in Appendix A.5, three semivolatiles -- 1,4-dichlorobenzene, hexachlorobutadiene, and nitrobenzene -- are considered *more significant* in comparison to the other semivolatile COCs. The following sections describe the expected source of these at the FEMP, if known, and summarize their occurrence. Note that most of the semivolatile compounds were used in various materials throughout the FEMP. Therefore, in most cases, their exact source and use are not known and therefore are not included in the discussions below.

A detailed description of the expected and actual occurrence of all 66 semivolatiles for which analyses were performed is provided in Attachment A.II.

3.4.4.1 1,4-Dichlorobenzene

1,4-Dichlorobenzene may have been a constituent in cutting and cooling oils used in the machining of uranium metal at the FEMP.

1,4-Dichlorobenzene is a COC because two results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. It is considered *more significant* than most other semivolatile COCs because one leachate result from ~~in~~ major media exceeded the TCLP limit~~, indicating that the material is characteristically hazardous~~.

1,4-Dichlorobenzene was detected in only 2 of ~~112~~ 110 solid media samples. It was detected in a loose media sample collected from the Green Salt Plant (4A) at a concentration of 39,000 μg/kg, well below 20 times the TCLP limit of 150,000. It was also detected in the TCLP leachate from a transite

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sample at 17.2 mg/L, exceeding the TCLP limit of 7.5 mg/L. The transite sample was collected from the Uranium Machining Area of the Special Products Plant (9A). As discussed in Attach A.II.7, no transite is expected to be hazardous if representative samples are taken.

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Note that because the volume of material associated with these samples is relatively small, a graph depicting the volume by media type and component category has not been included.

3.4.4.2 Hexachlorobutadiene

Hexachlorobutadiene may have been used in cutting oils, cooling oils, transformers, hydraulic fluids, or solvents used to clean heavier hydrocarbons from some of the equipment. ~~a constituent in cutting and cooling oils used in the machining of uranium metal at the FEMP.~~

Hexachlorobutadiene is a COC because one detected result exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. It is considered *more significant* than most other semivolatile COCs because the detected concentration in the leachate from one major media sample exceeded the TCLP limit~~, indicating that the material is characteristically hazardous~~.

Hexachlorobutadiene was detected in only 1 of ~~102~~ 111 solid media samples, with a concentration in the TCLP leachate of 14.9 mg/L, exceeding the TCLP limit of 5.0 mg/L. This transite sample was collected from the Uranium Machining Area of the Special Products Plant (9A). Based on TCLP results, as discussed in Attachment A.II.7, no transite is expected to be hazardous if representative samples are taken.

Note that because the volume of material associated with this sample is relatively small, a graph depicting the volume by media type and component category has not been included.

3.4.4.3 Nitrobenzene

Nitrobenzene may have been a constituent in cutting and cooling oils used in the machining of uranium metal at the FEMP.

Nitrobenzene is a COC because one detected result exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. It is considered *more significant* compared to most other semivolatile COCs because its concentration in the leachate from one major media sample exceeded the TCLP limit~~, indicating that the material is characteristically hazardous~~.

Nitrobenzene was detected in only 2 of ~~113~~ 111 solid media samples. It was detected in a sediment sample collected from the BDN Surge Lagoon (18A) at a concentration of 140 μg/kg, well below 20

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times the TCLP limit of 40,000 μg/kg. It was also detected in the TCLP leachate from a transite sample at a concentration of 28.3 mg/L, exceeding the TCLP limit of 20 mg/L. This transite sample was collected from the Uranium Machining Area of the Special Products Plant (9A). Based on TCLP results, as discussed in Attachment A.II.7, no transite is expected to be hazardous if representative samples are taken.

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Note that, because the volume of material associated with these samples is relatively small, a graph depicting the volume by media type and component category has not been included.

3.4.5 Summary of Results for More Significant ~~Key~~ Volatile Organic COCs~~onstituents of Concern~~

As described in Appendix A.2.2, volatile organic compounds were used at the FEMP and are therefore expected contaminants in OU3. Based on this knowledge, 35 major media samples and 160 supplemental media samples were analyzed for a total of 33 volatile organics. Based on these results, three volatiles have been identified as COCs in OU3 (see Appendix A.3). As discussed in the following sections and detailed in Appendix A.5, tetrachloroethene is considered *more significant* compared to the other volatile COCs. The following section describes the expected source of tetrachloroethene at the FEMP and summarizes its occurrence.

A detailed description of the expected and actual occurrence of all 33 volatiles for which analyses were performed is provided in Attachment A.II.

3.4.5.1 Tetrachloroethene

Tetrachloroethene is expected in OU3 because it was used in degreasing operations at the FEMP as well as a coolant in the Pilot Plant Remelt Furnace (13A).

Tetrachloroethene is a COC because one detected result exceeded the Part B Screening Level, indicating a potential concern with direct contact. It is considered *more significant* compared to the other volatile COCs because the leachate from that same sample ~~that same result~~ exceeded the TCLP limit~~, indicating that the material is characteristically hazardous~~.

Tetrachloroethene was detected in 15 of ~~125~~ 123 samples of solid media samples, with concentrations ranging from 1.0 to 1,180,000 μg/kg (geometric mean of 82 μg/kg). Six of the detected results were in loose media, seven in concrete, one in acid brick, and two in transite. For these statistics, the transite results were obtained by multiplying the actual TCLP result by 20 (to account for the dilution effect of the TCLP test - see Appendix A.3 for further details).

Tetrachloroethene was detected in the TCLP leachate from the transite samples at a concentration of 59 mg/L, exceeding the TCLP limit of 7.0 mg/L. This transite sample was collected from the Digestion Area of the Ore Refinery (2A).

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Figure 3-13 presents the volume of material associated with samples exceeding the TCLP limit for tetrachloroethene (700 μg/kg) by media type and component category. This figure indicates, as described in the preceding paragraph, that all of the material ~~considered potentially hazardous~~ exceeding 20 times the TCLP limit for tetrachloroethene is in the Process Buildings (Component Category 3) and associated with transite. Based on TCLP results, as discussed in Attachment A.II.7, no transite is expected to be hazardous if representative samples are taken.

3.4.6 Summary of Results for Pesticide/PCB COCs

As described in Appendix A.2.2, pesticides and PCBs were used at the FEMP and are therefore expected contaminants in OU3. However, they are expected to be limited in both level and abundance. Based on this knowledge, 22 major media samples and 16 supplemental media samples were analyzed for pesticides/PCBs. Based on these results, three pesticides and two PCBs have been identified as COCs in OU3.

Of the 28 pesticide/PCB contaminants for which analyses were performed, 16 were detected. Twenty seven of the samples analyzed for pesticides/PCBs exceeded the Part B Soil Screening Levels. However, none of the samples exceeded 20 times the TCLP limit. Also, none of the samples analyzed exceeded the 50 ppm TSCA limit for PCBs (40 CFR 761). Therefore, none of the pesticides/PCBs are considered *more significant* in terms of the overall types and levels of other contaminants present in OU3.

A detailed description of the expected and actual occurrence of all 28 pesticides/PCBs for which analyses were performed is provided in Attachment A.II.

3.4.7 Overview of Chemical Contamination in OU3

Figure 3-14 presents the total volume of material in OU3 ~~considered potentially hazardous~~ exceeding 20 times the TCLP limit, as described in the preceding sections. Note that all more significant contaminants described in the preceding sections, including the semivolatiles for which individual figures were not presented in the preceding sections, have been included. A total of approximately 5329 ~~43,000~~ cubic feet of material within OU3, ~~is considered potentially hazardous because of~~ which is represented by the sampling results, exceeds 20 times the TCLP limit for one or more inorganic and organic ~~contamination~~ contaminants. ~~In reality, this material is mixed waste since it contains radiological contamination in excess of baseline levels.~~ This conservative estimate is based on actual

of this assumption is that, if the concentration of a particular contaminant in a sample from the top ½-inch of concrete in a particular process area/component exceeded 20 times the TCLP limit, the top ½-inch of all concrete in that process area/component is assumed to exceed 20 times the TCLP limit. This assumption does not consider the high probability of reduced levels of contamination elsewhere in the top ½-inch of concrete in that process area/component or at lower depths, both of which possibilities would be accounted for if truly representative samples were collected.

~~The total volume considered hazardous (43,000 cubic feet) is based on the characterization study. Note that this volume is smaller than indicated on Table 3-19, which includes the application of sampling results to media which was not sampled (see Section 3.5.1). This difference is indicative of the conservatism of applying the assumptions described in Section 3.5~~

Figure 3-14 indicates that 73 percent of the volume of ~~potentially hazardous~~ material in OU3 exceeding 20 times one or more TCLP limits is in the Process Buildings (Component Category 3), with approximately 14 and 11 percent in the Administrative and Support Buildings (Component Category 1), and Process Support Buildings (Component Category 4), respectively. Approximately 72 percent of this material is divided approximately equally between acid brick, masonry and transite, 17 percent is the top ½-inch of concrete and 11 percent the second ½-inch depth interval.

As summarized in the preceding paragraphs and detailed in Attachment A.II.7, only acid brick from three components (2A, 2D and 9A) is considered potentially hazardous based on analytical results. Applying this data to process areas/components that were not sampled or where there is no usable data results in the acid brick in five components (2A, 2D, 4A, 6A and 9A) being considered potentially hazardous. In reality, this material is mixed waste because radiological contamination exceeds baseline levels. In addition, lead flashing and a portion of the current waste inventory (see Attachment A.IV), which were not sampled as part of the OU3 RI/FS, are considered hazardous/mixed wastes.

Figure 3-14a presents the volume of OU3 material that is considered potentially mixed waste due to chemical contamination, excluding the current inventory which is not part of the OU3 decision-making process (see Section 1.1.3). Excluding current waste inventory, total of 5,329 cubic feet of OU3 material is considered mixed waste. As depicted on Figure 3-14a, over 99 percent of this material is acid brick in the process buildings (Component Category 3).

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3.4.8 Overview of Contamination in OU3

As discussed in Sections 3.4.2.4 and 3.4.7, the most significant radiological and chemical contamination in OU3 is associated with the Process Buildings (Component Category 3). Figure 3-15 presents the volume of six solid materials in the Process Building category containing technetium, thorium-230, and/or uranium concentrations over their respective baseline levels by media and component. These three were selected for this presentation because they dominate all other radiological analytes investigated in this category (see Section 3.4.2).

~~Six~~ The seven components in which most processing occurred: the Ore Refinery Plant (2A), the Green Salt Plant (4A), the Metals Production Plant (5A), the Metals Fabrication Plant (6A), the Recovery Plant (8A), the Special Products Plant (9A), and the Pilot Wet Side (13A); and the Laboratory (15A), contribute ~~74~~ 85 percent of the total volume identified as having concentrations of technetium, thorium-230, and/or uranium ~~concentrations~~ that exceed their respective baselines. Figure 3-15 ~~This figure~~ identifies ~~masonry~~ concrete below a depth of 1 inch from the Metals Fabrication Plant (6A) and the Laboratory (15A) contributing ~~16~~ 29 percent and ~~12~~11 percent, respectively, of the volume from the entire category. These two sources represent the two single largest contributions from one medium in a single component. Combined,

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they contribute ~~59~~ nearly 50 percent of the ~~contaminated volume to the~~ volume over baseline in the category and nearly 11 percent of total of ~~1.1~~ 3.0 million ft^3 above baseline. ~~The volume reflects the numbers and locations of thorium 230 samples in the process buildings, as well as the concentrations of thorium 230 in those samples. Concrete constitutes 42 percent of the total volume projection, making it the second highest contributor to the category "volume exceeding radiological baselines." Uranium and technetium 99 both influence the concrete volume estimates.~~

Figure 3-16 presents the volume of the six media types which contain hazardous contaminants on excess of 20 times the TCLP limit. Contaminants include barium, cadmium, chromium, lead, mercury, 1,4-dichlorobenzene, hexachlorobutadiene, nitrobenzene, and tetrachloroethene, as described in Section 3.4.3. Note that steel coatings have not been included in this figure, but have been included in Figure 3-15 because no painted material is expected to be characteristically hazardous (see Attachment A.III). In addition, transite has been included in Figure 3-16, but not Figure 3-15, because there were no radiological results obtained for transite, although it is assumed to be radiologically contaminated. Note also that the volumes shown on this figure include those for materials in process areas/components for which either no sampling was performed or the sampling results were rejected and therefore results from another process area/component have been used for characterization. As an example, organic contaminants were detected in excess of the TCLP limit in the leachate from only three components. As shown on the figure, transite in ten components is assumed to contain organic contamination exceeding the TCLP limit. No transite samples were collected from the other seven components; therefore the maximum result from components in the same component category (i.e., the Process Buildings) was used to characterize the contamination in the transite in those other components.

Figure 3-16 indicates that more than 70 percent of the ~~potentially hazardous~~ material in the Process Buildings exceeding 20 times one or more TCLP limits is associated with three components: the Ore Refinery Plant (2A), the Metals Fabrication Plant (6A), and the Special Products Plant (9A). These were the major production facilities at the FEMP and, as described above, are included in those components that significantly exceed baseline levels. Acid brick and transite each contribute approximately 32 percent to the total volume ~~considered potentially hazardous~~ exceeding 20 times a TCLP limit. These are followed by the top and second ½-inch of concrete, which contribute 18 and 11 percent, respectively.

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Figure 3-16a shows the distribution of potentially hazardous/mixed material with the Process Buildings (Component Category 3). Acid brick in the Metals Fabrication Plant (6A) and the Special Products Plant (9A) account for 54 percent and 27 percent of this volume, respectively. Most of the lead flashing is in the Ore Refinery Plant (2A) and the Metals Fabrication Plant (4A).

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isolated pockets of accumulated debris, although they are used to support the characterization; and because they are no part of the OU3 RI/FS decision-making process (see Section 1). These seven media constitute approximately 97 percent of the total weight of all OU3 materials. Analytical results from these materials were then extrapolated to similar OU3 materials (such as drywall, floor tile, etc.) that were not sampled. The extrapolation was based on material similarity and expected contamination similarity (process knowledge).

3.5.2 General Assumptions

The following is a summary of the primary assumptions developed and applied in determination source term. Detailed discussion of these assumptions is provided in Appendix B.2.3.

3.5.2.1 Metals

- A paint thickness of 10 mils (0.010 inch) was used as a conservative estimate of the thickness of all painted material.
- A thickness of five mil is used as an estimate of the thickness of all external dust on ductwork, piping, and equipment. Ductwork is assumed to have a 10 mil dust layer on the interior surface. Radiological contaminants in this dust are represented by paint sample results in adjacent sampled materials.
- Process piping and process equipment are assumed to have a layer of CRUD on the interior. CRUD is formed within process piping and process equipment over time from the general action of corrosion. Process piping is assumed to contain one percent of the interior volume as CRUD, whereas process equipment is assumed to contain one tenth percent of the interior volume as CRUD.
- Process piping and process equipment are assumed to have a layer of holdup. Holdup is defined as the material, primarily assumed to consist of uranyl nitrate hexahydrate (UNH) which remains after production ceased and has crystallized into a solid/semisolid mass. UNH is composed of 43 percent uranium; enrichment is not considered. Process piping is assumed to contain ten percent of the interior volume as holdup, whereas, process equipment assumed to contain one percent of the interior volume as holdup.

3.5.2.2 Analytical Result Assumption

There are 9689 components that were not sampled as part of the RI/FS characterization study since they were not considered contaminated. Baseline values (see Section 3.3.1) were applied to materials located within the components not sampled. Seven components were not sampled due to (safety) ALARA reasons because the high background radiation readings precluded sampling activities. Results from components of similar function were applied to the seven non-sampled components as described below:

results from component 71 were applied to all materials in components 4B, 5F, and 30B; results from component 6C were applied to all materials in component 6E; and finally results in component 64 were applied to all materials in components 60, 61, and 65.

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3.5.3 Material Weights and Volumes

Estimated weights and volumes of OU3 construction materials, as documented in the SWIFTS database and reported in the 1995 OU3 Estimated Materials Quantity Report (DOE 1995c), are summarized in Table 3-2. Weights and volumes by material description, component, and where applicable, process area, were copied from SWIFTS into an ORACLE database table specific to OU3. The ORACLE database table was developed to:

- Provide an unchanging record for each volume and weight of material in SWIFTS.
- Establish the link between material described in SWIFTS and analytical results from material sampled during the OU3 RI/FS characterization program and documented in the Sitewide Environmental Database (SED); and
- Calculate the weight of contaminated material from the total weight of each material, based on assumptions discussed in Appendix B.2.3.

Three different approaches were used to calculate the weight of contaminated material based on the requirement of each of the 67 construction material descriptions; weight-based, volume-based, and takeoff-quantity-based (measured quantity from drawings or blueprints). Examples of calculations used in determination of the contaminated weights for each material are contained in Appendix B.2.4.

3.5.4 Contaminant Source Term by Analyte

This section summarizes the contaminant source terms within OU3 by COCs which have a high frequency of detection and/or are important in terms of potential risk. The COCs are grouped by analyte fraction: radionuclides, inorganics, and organics. A characterization of the source term by analytical fraction for all COCs is found in Appendix B (Volume 3). Table ~~3-9B-10~~ provides the contaminant source term estimates for each individual COC.

3.5.4.1 Radionuclides

Total uranium with ~~10,800,000~~8,000,000 kg has the greatest amount of contaminant mass associated with it. ~~Sixty-nine~~Ninety-four percent of this mass (7,503,000 kg) is associated with containerized waste inventory materials and will be dispositioned separately. Of the remaining ~~316~~ percent, ~~305~~ 5 percent is associated with UNH holdup within process piping and equipment. Uranium-238 (~~90,700~~7,560,000 kg associated with containerized waste inventory), uranium-235/236 (~~95~~841,200 kg), and uranium 233/234 (nearly ~~157~~ kg) have associated source terms which are also significant.

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After total uranium, total thorium (900,000 kg) also associated with containerized waste inventory materials, has the greatest amount of contaminated mass associated with it. With the exception of total thorium,

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~~t~~Thorium-232 (~~4,3203~~,720 kg) is the only non-uranium analyte that has a source term greater than 1 kg, with technetium-99 at 0.127 kg and neptunium-237 at 0.0~~6973~~ kg. The presence of a high contaminant mass for uranium, uranium isotopes, and thorium, is expected since the FEMP processed more than 180,000 metric tons of uranium products during the years of production. The contaminant mass associated with technetium-99 is significant as discussed in Appendix A. Technetium-99 is also relatively soluble and is easily transported through water. This characteristic makes technetium-99 a concern for both risk and determination of possible disposition options. For these reasons, total uranium and technetium-99 are discussed in greater detail than other COCs in the following sections.

3.5.4.1.1 Elemental Uranium Source Term

The mass of total uranium at the site is associated with two major sources: inventory (including uranium product, thorium, RCRA, non-RCRA, and uncharacterized wastes - see Appendix A.IV) These materials are the major source of the total uranium contaminant mass and represent ~~7,510,000~~7,507,000 kg or ~~69~~94 percent of the total source term for total uranium. This material is inventoried containerized waste which is dispositioned separately. UNH associated with process piping or equipment (~~3,270,000~~447,000 kg or ~~285~~.6 percent of the total source term for uranium).

Concrete materials (~~35,400~~34,100 kg) were next, followed by paint (~~2,230~~4,820 kg), asphalt (2,570 kg), CRUD (~~2,707~~2,446 kg), dust, (~~1,390~~1,450 kg) masonry (36~~5~~4 kg), acid brick (5,36~~0~~1 kg) and wood (12.4 kg). Components in which the contaminant mass for total uranium was highest are: the Plant One Storage Pad-74T (~~7,560~~7,400 kg), the Special Products Building-9A (~~219,000~~5,895 kg), and the Metal Fabrications Plant-6A (~~504,000~~5,603 kg), correlating well with components where technetium-99 was also noted. As would be expected, most of the source term for total uranium is located in component Category 3, the process buildings. ~~Table 3-10~~Figures 3-17 and 3-18, summarizes the source term for total uranium by material category and component category, and by component and material description, respectively.

~~The presence of a high contaminant mass for uranium, uranium isotopes, and thorium is expected since the FEMP processed more than 180,000 metric tons of uranium products during its years of production. The contaminant mass associated with technetium-99 is significant, as discussed in Appendix A. Technetium-99 is water soluble and is easily transported through water. This characteristic makes technetium-99 a major concern regarding both risk and determination of possible disposition options. For these reasons, total uranium and technetium-99 are discussed in greater detail.~~

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3.5.4.1.2 Technetium-99 Source Term

The contaminant mass for technetium-99 is associated with concrete (0.0987 kg), in particular concrete slabs (0.0943 kg): collectively, ~~masonry (0.30003 kg);~~ acid brick (0.008 kg); transite (0.006 kg); asphalt (0.005 kg); paint (0.005 kg); CRUD (0.003 kg); and dust (0.001 kg) contribute about ~~one~~20 percent to the total technetium-99 source term. Finally, masonry (0.0003 kg), wood (1.045×10^{-5} kg) and the soil piles (2.50×10^{-6} kg) contribute less than one percent of the contaminant mass associated with technetium-99. The source term for technetium-99, 0.127 kg, drops to 0.125 kg when Material Category J is excluded.

Most of the technetium-99 contaminant mass is located in the following components: the Special Products Plant - 9A (0.0587 kg), the Plant One Storage Pad - 74T (0.015 kg) and the Recovery Plant - 8A (0.0075 kg). A complete accounting of the technetium-99 source term by component is presented in Table 3-11. As discussed in Appendix A, the Special Products Plant (9A), Plant One Storage Pad (74T), and the Recovery Plant (8A) are all either process-related buildings or storage areas where process-related materials were stored. The source term by material category and component category is provided in ~~Table B-13~~Figure 3-19. Most technetium-99 is associated with the process and process support buildings, with the exception of the Plant One Storage Pad, which is in Component Category 8, as shown in Figure 3-20.

3.5.4.1.3 Thorium-230 Source Term

As discussed in Section 3.4.2.3, thorium-230 is of major concern in OU3 because it is a potential inhalation hazard to remediation workers. ~~Class A carcinogen.~~ The source term for thorium-230 (0.148 kg) is, as expected, mainly associated with concrete (0.0332 kg). The source term for total thorium (8900,000 kg) is associated with inventory (as described under elemental uranium above) in material category J. As presented in Figures 3-21 and 3-22, ~~Table 3-12,~~ the source term for thorium-232 (~~43,000~~3,719 kg) is again associated predominantly with concrete materials (3533 kg).

3.5.4.2 Inorganics

Chromium (2,470,000 kg), nickel (1,730,000 kg), manganese (863,000 kg), and copper (182,000 kg) have the highest source terms, which are generally associated with the normal constituents of carbon and stainless steel present at the FEMP. Ninety percent of the source term is associated with carbon and stainless steel; the remaining five percent is associated with contamination from on-property activities (one percent), and the associated paint layer on painted materials (four percent). Carbon and stainless steel

barium (~~25~~24,000 kg), silver (3000 kg), arsenic (2,100 kg), cadmium (~~770~~760 kg), beryllium (~~400~~397 kg), and mercury (28 kg), have a wide range and are primarily associated with contamination from the production processes. Inorganics in general are present at some level throughout the process and process-related components.

3.5.4.2.1 Barium Source Term

As shown in Figures 3-23 and 3-24, ~~Table 3-13,~~ the majority of the source term for barium (24,000 kg) is associated with concrete (17,~~000~~900 kg). The remaining source term is distributed among: painted metals (~~2100~~1920 kg), asphalt (1180 kg), and acid brick (755 kg).

3.5.4.2.2 Cadmium Source Term

As shown in Figures 3-25 and 3-26 ~~Table 3-14~~, ~~58~~83 percent of the source term for cadmium (~~756~~760 kg) is associated with concrete (~~440~~630 kg). ~~Thirty two~~Five percent and ~~30~~.3 percent of the remaining source term is associated with asphalt (~~2454~~0 kg) and acid brick (~~25~~2.5 kg), respectively.

3.5.4.2.3 Chromium Source Term

As discussed previously, most of the chromium source term is associated with stainless and carbon steel metals and is not considered contaminated. Figures 3-27 and 3-28~~Table 3-15~~, presents the source term for chromium by material category. If metal and paint are excluded, the source term for chromium in concrete is still significant at ~~31,890~~2,880 kg.

3.5.4.2.4 Lead Source Term

As shown in Figures 3-29 and 3-30~~Table 3-16~~, the majority of the source term for lead (~~100~~102,000 kg) is associated with painted metals (~~79~~67,000 kg). The majority of the remaining source term for lead is associated with CRUD and dust (~~approximately 160~~029,000 kg), which is part of ~~m~~Material ~~c~~Category J.

3.5.4.2.5 Mercury Source Term

As shown in Figures 3-31 and 3-32~~Table 3-17~~, the source term for mercury (28 kg) is associated with concrete materials in ~~m~~Material ~~c~~Category E (~~169~~.4 kg). The remaining source term is associated with metals with insignificant amounts found throughout the other materials.

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determined to be COCs based on analytical results from supplemental media (loose media, sediment, sludge, soil and unknown liquids) not considered in the source term (see Appendix B). Because of the insignificant amount of source term contribution from organics, only one organic (nitrobenzene) is presented in the attached tables.

3.5.4.3.1 Semivolatile Organic Source Term

The semivolatile organic analytes (SVOCs) with the most significant contaminant mass are nitrobenzene (155 kg), 1,4-dichlorobenzene (94 kg), and hexachlorobutadiene (82 kg), associated with transite in material category G (Non-regulated ACM materials). The summary of the source term for nitrobenzene by material category is presented in ~~Table 3-18~~Figures 3-33 and 3-34. The source term for all other semivolatiles were also associated with transite, concrete, and acid brick, but in insignificant amounts.

3.5.4.3.2 Volatile Organic Source Term

Tetrachloroethene (350 kg) accounted for the majority of the volatile organic source term, associated with transite in material Category G (Non-regulated ACM materials). As in semivolatiles, the source term for all other volatiles were associated with transite, concrete, and acid brick, but in insignificant amounts.

3.5.4.3.3 Pesticides/PCBs Source Terms

The pesticides/PCBs with the most significant source terms are Aroclor-1254 (~~16.7~~8.5 kg) and Aroclor-1260 (~~10.5~~5.3 kg). Pesticides/PCBs were associated with concrete, but overall the source term is less than one percent of the total mass associated with OU3 materials.

3.5.5 Material Quantities by Segregation Category

3.5.5.1 Definition of Segregation Categories

Categories have been established to facilitate the disposition of materials generated as a result of the interim remedial action. The segregation of materials by regulatory criteria sets the framework to develop and evaluate alternatives based on disposition and treatment options. Five categories were used to segregate OU3 materials: hazardous waste, mixed waste, low level waste (LLW), PCB waste, and below baseline material.

Hazardous waste is defined by the concentration of RCRA metals or organics present in a material. The first determination in the segregation process is if a result is greater than 20 times the TCLP limit.

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(or the limit itself for transite) for any of the RCRA constituents, the associated material is considered hazardous. (See Section 3.3.4 for a discussion of 20 times the TCLP criteria.)

Next, any result above the baseline value for a radiological constituent places the material in the LLW category. Table B-9 provides a listing of baseline values by media, with baseline values for elemental uranium and technetium-99 in concrete being ~~12.55~~6.7 ug/g and 0.433 pCi/g, respectively.

Materials for which there is any single result greater than or equal to 20 times the TCLP limit with any single result above a baseline value is considered a mixed waste.

Any material for which there are PCB results, such as transformers, are considered PCB waste under TSCA. Transformers are considered PCB contaminated even after removal of PCB containing materials.

All results which are at or below radiological baseline values, and are not greater than 20 times the TCLP for a RCRA constituent are considered below baseline. These materials are considered to be uncontaminated.

3.5.5.2 Administrative Segregation of Materials

No painted material in OU3 is considered characteristically hazardous as a result of being painted with lead-based paint. This characterization of painted materials is supported by a study conducted at the FEMP DOE (1995b) to evaluate the leachability of lead-based paint on painted light-gauge metal (Appendix G). However, any paint that is removed from any surface will be considered characteristically hazardous waste unless actual TCLP results indicate otherwise. This conclusion is extended to the other toxicity characteristic (TC) metals because the maximum concentration for lead was so much higher than the maximum concentration for any of the other seven TC metals (375,000 mg/kg in lead vs 17,500 mg/kg in chromium, or 558 mg/kg for cadmium); thus, painted materials are only categorized as either LLW or below baseline.

Materials such as lead flashing, basin liners, and PPE were not sampled but are known from process knowledge to be radiologically contaminated. Lead flashing is categorized as mixed waste, basin liners and PPE are categorized as LLW. Material from the copper and soil piles are categorized as LLW based on the limited data available.

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Material from the current waste inventory, i.e., thorium waste, product, and uncharacterized waste, is all categorized as either LLW or mixed waste based on the presence or absence of RCRA constituents within the material.

3.5.5.3 Segregation of OU3 Materials

Based on the criteria discussed above, fifty~~-one~~ percent of the volume (Table 3-~~10-18~~) and sixty~~-five~~six percent of the weight (Table 3-~~11-19~~) of all OU3 materials are categorized as below baseline. Most of the remainder of materials (33 percent of the weight and ~~47~~48 percent of the volume) are categorized as LLW with ~~two~~one percent of the remaining volume categorized as mixed waste and less than one percent as either hazardous or PCB waste. ~~Concrete slabs in material category E contribute the most material to mixed waste (39,300 ft³ and 2,950 tons); nearly 45 percent of this material is concentrated in the following components: the Metals Fabrication Plant (6A), the Ore Refinery Plant (2A), the Green Salt Plant (4A), and the Recovery Plant (8A). The associated source term for technetium 99 and elemental uranium for concrete slabs within these components is 0.0094 kg and 9206 kg, respectively. This represents less than one percent of the total source term for both technetium 99 and elemental uranium. The segregation of materials by component is provided in Appendix B, attachment B.II.~~

The other waste (RCRA) group from the current waste inventory in Material Category J contributes ~~49,700~~56,000 ft³ and ~~2,720~~2,920 tons to mixed waste. This material is containerized and will be administratively dispositioned off-site.

Acid brick contributes a significant weight and volume (~~717~~370 tons and ~~10,200~~5,280 ft³, respectively) to mixed waste. Approximately 90% of this material is associated ~~with~~ the Ore Refinery Plant (2A), the Metals Fabrication Plant (6A), and the Special Products Plant (9A). The associated source term for technetium-99 and elemental uranium for acid brick within these components is 0.0004 kg and 3,178 kg, respectively. The segregation of materials by component is provided in Appendix B, attachment B.II.

3.6 DATA UNCERTAINTIES

This section discusses uncertainties and limitations of the characterization data collected under the OU3 RI/FS sampling program. The primary objective in characterizing the contamination was to collect data sufficient to support the development and evaluation of remedial alternatives.

The result of this sensitivity analysis is a significant increase in the source term for pesticides. Examples of this includes an increase in the source term for gamma-Chlordane of 7.13 percent and an increase for Dieldrin of 4.4 percent.

The impact of applying the maximum detected pesticide concentration to the top ½-inch of all at- and above- grade concrete would still result in an insignificant resulting source term. Therefore, the impact of using the current approach of applying zero values is insignificant.

- Assumption of 1.0 percent UNH Holdup on Interior of Process Piping. In this sensitivity analysis, the interior surface of all process piping is conservatively assumed to be contaminated with a one percent holdup layer of UNH consisting of 43 percent elemental uranium. This analysis was performed to assess the impact of currently applying a ten percent holdup layer of UNH.

  The result of this sensitivity analysis is a significant decrease in the elemental uranium of 88 percent.

  Therefore, the use of a ten percent UNH holdup is sufficiently conservative for use in the source term for process piping. The use of ten percent holdup is also consistent with process knowledge.

- Assumption of 0.1 percent UNH Holdup on Interior of Process Equipment. In this sensitivity analysis, the interior surface of all process equipment is conservatively assumed to be contaminated with a one percent holdup layer of UNH consisting of 43 percent elemental uranium. This analysis was performed to assess the impact of currently applying a ten percent holdup layer of UNH. The amount of material affected by this assumption and the assumption described above equals more than 30 percent material volume and more than 50 percent of the total weight.

  The result of this sensitivity analysis is a significant decrease in the elemental uranium of 85 percent.

  The use of a ten percent UNH holdup is considered overly conservative for process equipment. This is because the interior cavity of process equipment is generally much smaller than the interior diameter of piping and probably would not contain as much holdup as process piping.

- Assumption of 10 percent UNH Holdup and 1.0 percent CRUD Layer on Interior of Clay Piping. In this sensitivity analysis, the interior surface of clay piping is conservatively assumed to be contaminated with a 10 percent holdup layer consisting of 43 percent elemental uranium. A one percent CRUD layer is also assumed to be present on the interior of all clay piping. This analysis was performed to assess the impact of currently applying baseline values to clay piping. The total volume of clay piping is 94 cuft, much less than one percent of the total volume of OU3 materials.

  The result of this sensitivity analysis adds less than one hundredth of a percent to the overall source term for elemental uranium, technetium-99, chromium, mercury, and tetrachloroethene.

  The impact is insignificant to the overall source term.

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- Assumption of OU5 Subsurface Soil Results to Below-grade Concrete. In this sensitivity analysis, below grade concrete is assumed to be contaminated with levels equal to those present in subsurface soils below or near production area components. This sensitivity analysis was performed to assess the impact of currently applying baseline values to below grade concrete.

  Maximum subsurface soil results (depth of 5-10 feet) from beneath Plants 6, 2/3, 9 and Plant 1 Pad were applied to components in these plant complexes. The concrete foundations and footers are assumed to extend into the perched groundwater zone and to be contaminated throughout the concrete material, thus all of the below-grade concrete in the components associated with Plants 6, 2/3, 9 and the Plant 1 pad was assumed to be contaminated.

  Maximum subsurface soil results (3-5 feet) were applied to all remaining components, based on the assumption that the foundations extended approximately 5 feet down. The top inch of concrete was assumed to be contaminated and the maximum values were applied. The remaining 7 inches of concrete was assumed to be relatively uncontaminated and background values were applied.

  The result of this sensitivity analysis is an increase in the elemental uranium and technetium-99 by less than 0.01 percent, not a significant change in the source term.

3.6.2 Source Term Bounding Analysis

In addition to the sensitivity analyses discussed above, an estimate of maximum and minimum source terms to bound the expected results were used to validate the contamination source terms presented in Appendix B.5.

A maximum source term for representative COCs (technetium-99, elemental uranium, neptunium-237, strontium-90, lead, mercury, chromium, alpha-Chlordane, gamma-Chlordane, dieldrin, nitrobenzene,

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TABLE 3-6
CONSTITUENTS OF CONCERN[a]

Radionuclides

Americium-241
Cesium-137 + 1Daughter
Lead-210 + 2Daughters
Neptunium-237 + 1Daughter
Polonium-210
Plutonium-238
Plutonium-239/240
Plutonium-241
Radium-226 + 5Daughters
Radium-228
Strontium-90
Technetium-99
Thorium-227
Thorium-228 + 7Daughters
Thorium-230
Thorium-232
Uranium-234
Uranium-235/236
Uranium-238 + 2Daughters

Metals

Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Copper
Lead
Manganese
Mercury
Nickel

Metals (Cont'd)

[Selenium]
[Silver]
Thallium
Uranium
Vanadium
Zinc

Volatile Organics, ug/kg

[Benzene]
[Styrene]
Tetrachloroethene

Semi-Volatile Organics

1,4-Dichlorobenzene
[2,4-Dinitrotoluene]
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
[Benzo(k)fluoranthene]
[bis(2-Ethylhexyl)phthalate]
[Carbazole]
[Chrysene]
[Dibenzo(a,h)anthracene]
Hexachlorobutadiene
[Indeno(1,2,3-cd)pyrene]
[N-Nitroso-di-n-propylamine]Nitro
[Pentachlorophenol]

Pesticides/PCBs

alpha-Chlordane
Aroclor-1248
Aroclor-1254
Dieldrin
gamma-Chlordane

a Brackets represent COCs found only in extraneous media (soil and loose media).

TABLE 3-7
OU3 REFERENCE CRITERIA CONCENTRATIONS PER ANALYTE

	Part B Soil Screening [a,b,c]	OU5 Soil WAC [c,d]	20x TCLP	40x TCLP	Envirocare WAC [b,f]	Concrete Baselines	Paint Baselines	TSCA Limits
Radionuclides, pCi/g								
Americium-241	0.24					0.10	0.12	
Cesium-137	0.0021				560	0.06	0.34	
Lead-210	0.12				230,000	0.89	0.60	
Neptunium-237	0.0094	3.12E+09			2,000	0.12	0.23	
Plutonium-238	0.36				10,000	0.20	0.33	
Plutonium-239/240	0.34				10,000	0.10	0.18	
Plutonium-241	22.0					3.30	10.00	
Polonium-210	0.530				230,000	1.42	7.90	
Radium-226	0.00069				2,000	1.13	4.54	
Radium-228	0.79				1,800	0.37	2.71	
Strontium-90	2.40	5.67E+10			20,000	3.00	1.58	
Technetium-99	61.0	29			100,000	0.33	1.45	
Thorium-227	0.026					2.90	0.42	
Thorium-228	0.00074				680	0.73	4.37	
Thorium-230	5.7				15,000	1.20	15.00	
Thorium-232	6.4				680	0.57	4.21	
Uranium-234	4.8				37,000	6.83	64.00	
Uranium-235/236	0.017				770	5.14	6.80	
Uranium-238	0.11				28,000	0.71	63.00	
Uranium-Total (ug/g)	0.25	1030				4.64	176.00	
Metals, mg/kg								
Aluminum						6,332	14,371	
Antimony	11					1.00	108.76	
Arsenic	0.037		100	200		6.38	25.95	
Barium	1,900	pure product	2000	4000		67.5	3,279	
Beryllium	0.015					1.40	1.10	
Cadmium	14		20	40		2.40	66.52	
Calcium						236,031	43,358	
Chromium	140	pure product	100	200		10.50	4,540	
Cobalt	1,600					4.90	253.04	
Copper	1,000					18.5	318.65	
Iron						16,485	129,610	
Lead		pure product	100	200		5.28	239,000	
Magnesium	270,000	pure product				61,827	6,396	
Manganese	140					463	958.51	
Mercury	8.2	5.66E+04	4	8		0.03	18.04	
Nickel	550					15.90	134.74	
Potassium						1388	1,193	
Selenium	140		20	40		0.47	0.83	
Silver	140	pure product	100	200		9.30	6.40	
Sodium						821	844.02	
Thallium	1.9					0.32	NA	
Vanadium	190					21.8	21.97	
Zinc	8,200					47.5	55,005	
Volatile Organics, ug/kg								
1,1-Dichloroethane								
1,1-Dichloroethene	110		14,000	28,000				
1,1,1-Trichloroethane								
1,1,2-Trichloroethane	1,100							
1,1,2,2-Tetrachloroethane	320							
1,2-Dichloroethane	702	pure product	10,000	20,000				
1,2-Dichloroethene (total)	250,000							
1,2-Dichloropropane								

TABLE 3-7
OU3 REFERENCE CRITERIA CONCENTRATIONS PER ANALYTE

	Part B Soil Screening [a,b,c]	OU5 Soil WAC [c,d]	20x TCLP	40x TCLP	Envirocare WAC [b,f]	Concrete Baselines	Paint Baselines	TSCA Limits
2-Butanone	16,000,000	pure product	4,000,000	8,000,000				
2-Hexanone	1,100,000							
4-Methyl-2-pentanone	1,400,000	pure product						
Acetone	2,700,000	pure product						
Benzene	2,200	pure product	10,000	20,000				
Bromodichloromethane	1,000	9.03E-01						
Bromoform	8,100							
Bromomethane	38,000							
Carbon disulfide	2,700,000							
Carbon tetrachloride	490		10,000	20,000				
Chlorobenzene	550,000		2,000,000	4,000,000				
Chloroethane	550,000							
Chloroform	10,000		120,000	240,000				
Chloromethane	4,900							
cis-1,3-Dichloropropene	360							
Dibromochloromethane	760							
Ethylbenzene	2,700,000	pure product						
Methylene chloride	8,500							
Pyridine	27,000		100,000	200,000				
Styrene	2,100							
Tetrachloroethene	1,200		14,000	28,000				
Toluene	5,500,000	pure product						
Xylenes, Total	55,000,000	pure product						
trans-1,3-Dichloropropene	350							
Trichloroethene	5,800		10,000	20,000				
Trichlorofluoromethane	8,200,000							
Vinyl Chloride	34		4,000	8,000				
Semi-Volatile Organics, ug								
1,2,4-Trichlorobenzene	270,000							
1,2-Dichlorobenzene	2,500,000							
1,3-Dichlorobenzene								
1,4-Dichlorobenzene	2,700		150,000	300,000				
2,2-Oxybis(1-chloropropane)								
2,4,5-Trichlorophenol	2,700,000		8,000,000	16,000,000				
2,4,6-Trichlorophenol	5,800		40,000	80,000				
2,4-Dichlorophenol	82,000							
2,4-Dimethylphenol	550,000							
2,4-Dinitrophenol	55,000							
2,4-Dinitrotoluene	94		2,600	5,200				
2,6-Dinitrotoluene	94							
2-Chloronaphthalene	2,200,000							
2-Chlorophenol	140,000							
2-Methylnaphthalene	1,100,000							
2-Nitroaniline								
2-Nitrophenol								
3,3-Dichlorobenzidine	140							
4,6-Dinitro-2-methylphenol								
4-Bromophenyl phenyl ether	1,600,000							
4-Chloro-3-methylphenol	1,400,000							
4-Chlorophenylphenyl ether								
4-Nitroaniline	82,000	4.42E-02						
4-Nitrophenol	1,700,000							
Acenaphthene	1,600,000							
Acenaphthylene								
Anthracene	8,200,000							

TABLE 3-7
OU3 REFERENCE CRITERIA CONCENTRATIONS PER ANALYTE

	Part B Soil Screening [a,b,c]	OU5 Soil WAC [c,d]	20x TCLP	40x TCLP	Envirocare WAC [b,f]	Concrete Baselines	Paint Baselines	TSCA Limits
Benzo(a)anthracene	58							
Benzo(a)pyrene	8.8							
Benzo(b)fluoranthene	71							
Benzo(g,h,i)perylene								
Benzo(k)fluoranthene	170							
bis(2-Chloroethoxy)methane								
bis(2-Chloroethyl)ether								
bis(2-Chloroisopropyl) ether	910							
bis(2-Ethylhexyl)phthalate	4,600							
Butyl benzyl phthalate	5,500,000							
Carbazole	3,200	7.27E+04						
Chrysene	2,000							
Di-n-butyl phthalate	2,700,000							
Di-n-octyl phthalate	550,000							
Dibenzo(a,h)anthracene	8.8							
Dibenzofuran	110,000							
Diethyl phthalate	22,000,000							
Dimethyl phthalate	270,000,000							
Fluoranthene	1,100,000							
Fluorene	1,100,000							
Hexachloro-1,3-butadiene	820		10,000	20,000				
Hexachlorobenzene	40		2,600	5,200				
Hexachlorobutadiene	820	pure product	10,000	20,000				
Hexachlorocyclopentadiene	190,000							
Hexachloroethane	4,600		60,000	120,000				
Indeno(1,2,3-cd)pyrene	32							
Isophorone	67,000							
m-Methylphenol	1,300		4,000,000	8,000,000				
N-Nitroso-di-n-propylamine	9.1							
N-Nitrosodiphenylamine	13,000							
Naphthalene	1,100,000							
Nitrobenzene	14,000		40,000	80,000				
o-Methylphenol	1,400,000		4,000,000	8,000,000				
p-Chloroaniline								
p-Methylphenol (cresol)	1,400,000		4,000,000	8,000,000				
Pentachlorophenol	530		2,000,000	4,000,000				
Phenanthrene								
Phenol	16,000,000							
Pyrene	820,000							
Pesticides/PCBs, ug/kg								
4,4'-DDD	270							
4,4'-DDE	190							
4,4'-DDT	190							
beta-BHC	35							
alpha-Chlordane	49	2.89E+00	6,000	12,000				
delta-BHC								
Dieldrin	4.0							
Endosulfan II	160,000							
Endosulfan sulfate	160,000							
Endosulfan-I	160,000							
Endrin	8,200	pure product	400	800				
Endrin aldehyde	8,200							
Endrin ketone								
gamma-BHC (Lindane)	49		8,000	16,000				
gamma-Chlordane	49							

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TABLE 3-7
OU3 REFERENCE CRITERIA CONCENTRATIONS PER ANALYTE

	Part B Soil Screening [a,b,c]	OU5 Soil WAC [c,d]	20x TCLP	40x TCLP	Envirocare WAC [b,f]	Concrete Baselines	Paint Baselines	TSCA Limits
Heptachlor	14	pure product	160	320				
Heptachlor epoxide	7.0	pure product	160	320				
Methoxychlor	140,000	pure product	200,000	400,000				
Toxaphene	58	1.06E+05	10,000	20,000				
Aroclor-1016	8.3							50,000
Aroclor-1221	8.3							50,000
Aroclor-1232	8.3							50,000
Aroclor-1242	8.3							50,000
Aroclor-1248	8.3							50,000
Aroclor-1254	8.3							50,000
Aroclor-1260	8.3							50,000

Shading indicates changes.

[a] Pu-239/240 value is actually 0.34 pCi/g for Pu-239 and 0.34 pCi/g for Pu-240.

[b] U-235/236 value is for U-235 only.

[c] Alpha-chlordane only.

[d] Hexavalent chromium value.

[e] Based on natural uranium.

[f] Pu-239/240 value is for Pu-240 only.

TABLE 3-8
DESIGNATION OF CONSTITUENTS OF CONCERN

Constituent of Concern	Considered More Significant? [a]	Reason for Designation [b]
Radionuclides		
Americium-241	No	Not detected in 64 percent of all solid media samples; 77 percent of results for solid media were below Part B Reference Criteria; its total mass is below the OU3 allowable mass estimate for the disposal cell.
Cesium-137+1 Daughter	No	Not detected in 72 percent of all solid media samples; it has a relatively short half-life (30 year half-life); its total mass is below the OU3 allowable mass estimate for the disposal cell.
Lead-210+2 Daughters	No	A relatively short-lived member of the uranium-238 decay change (half-life 22 years); risks from this nuclide will be overshadowed by uranium-238 and uranium-234.
Neptunium-237+1 Daughter	No	Not detected in 64 percent of all solid media samples; its total mass is below the OU3 allowable mass estimate for the disposal cell.
Polonium-210	No	A relatively short-lived member (half-life 138 days) of the uranium-238 decay chain; its total mass is below the OU3 allowable mass estimate for the disposal cell.
Plutonium-238	No	Not detected in 57 percent of all solid media samples; 78 percent of results for solid media were below Part B Reference Criteria; its total mass is below the OU3 allowable mass estimate for the disposal cell.
Plutonium-239/240	No	Not detected in 53 percent of all solid media samples; 73 percent of results for solid media were below Part B Reference Criteria; its total mass is below the OU3 allowable mass estimate for the disposal cell.
Plutonium-241	No	Not detected in 69 percent of all solid media samples; 70 percent of results for solid media were below Part B Reference Criteria; its total mass is below the OU3 allowable mass estimate for the disposal cell.
Radium-226+5 Daughters	No	Generally present in low concentrations; areas exhibiting higher concentrations are limited in size and will be remediated based on coincident uranium concentrations, with due consideration given to other COCs like radium-226; its total mass is below the OU3 allowable mass estimate for the disposal cell.
Radium-228	No	Relatively short half-life (5.75 years). It and its long-lived parent, thorium-232 are generally present in low concentrations; areas exhibiting higher concentrations are limited in size; its total mass is below the OU3 allowable mass estimate for the disposal cell.
Strontium-90	No	Not detected in 75 percent of all solid media samples; 92 percent of results for solid media were below Part B Reference Criteria; generally present in low concentrations; relatively short-half-life (28.6 years); its total mass is below the OU3 allowable mass estimate for the disposal cell.
Technetium-99	Yes	Class A carcinogen; mobile in the environment; found throughout the FEMP.
Thorium-227	No	Relatively short-half-life (18.7 years); its total mass is below the OU3 allowable mass estimate for the disposal cell.
Thorium-228+7 Daughters	No	Relatively short half-life (1.9 years). It and its long-lived parent, thorium-232 are generally present in low concentrations; areas exhibiting higher concentrations are limited in size; its total mass is below the OU3 allowable mass estimate for the disposal cell.

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TABLE 3-8, continued

Constituent of Concern	Considered More Significant? [a]	Reason for Designation [b]
Thorium-230	Yes	Class A carcinogen; found throughout the FEMP. Its total mass is below the OU3 allowable mass estimate for the disposal cell, but it may be a occupational exposure concern during remediation (low allowable air concentration for occupational exposure).
Thorium-232	No	Generally present in low concentrations; areas exhibiting higher concentrations are limited in size; its total mass is below the OU3 allowable mass estimate for the disposal cell.
Uranium-234	Yes	Class A carcinogen; found throughout the FEMP; maximum concentration exceeds OU3 on-property disposal WAC.
Uranium-235/236	Yes	Class A carcinogen; found throughout the FEMP; maximum concentration exceeds OU3 on-property disposal WAC.
Uranium-238+2Daughters	Yes	Class A carcinogen; found throughout the FEMP; maximum concentration exceeds OU3 on-property disposal WAC.
Metals		
Antimony	No	No hazardous criteria; no WAC for on-property or off-site disposal.
Arsenic	Yes	Detected in 87 percent of all solid media samples; its concentration in 11 samples exceeded 20 times the TCLP limit.
Barium	Yes	Detected in 98 percent of all solid media samples; its concentration in 33 samples, including some in major media, exceeded 20 times the TCLP limit.
Beryllium	No	Not detected in 71 percent of all solid media samples; no hazardous criteria; no WAC for on-property or off-site disposal.
Cadmium	Yes	Detected in 42 percent of all solid media samples; its concentration in 44 samples, including some in major media, exceeded 20 times the TCLP limit.
Chromium	Yes	Detected in 89 percent of all solid media samples; its concentration in 175 samples, including some in major media, exceeded 20 times the TCLP limit.
Copper	No	No hazardous criteria; no WAC for on-property or off-site disposal.
Lead	Yes	Detected in 90 percent of all solid media samples; its concentration in 247 samples, including some in major media, exceeded 20 times the TCLP limit.
Manganese	No	No hazardous criteria; no WAC for on-property or off-site disposal.
Mercury	Yes	Detected in 42 percent of all solid media samples; its concentration in 50 samples, including some from major media, exceeded 20 times the TCLP limit.
Nickel	No	No hazardous criteria; no WAC for on-property or off-site disposal.
Selenium	No	Its concentration in no major media samples exceeded 20 times the TCLP limit; no WAC for on-property or off-site disposal.
Silver	No	Its concentration in no major media samples exceeded 20 times the TCLP limit; no WAC for on-property or off-site disposal.
Thallium	No	No hazardous criteria; no WAC for on-property or off-site disposal.
Uranium	Yes	A toxin; a Class A carcinogen; found at elevated levels throughout the FEMP.
Vanadium	No	No hazardous criteria; no WAC for on-property or off-site disposal.
Zinc	No	No hazardous criteria; no WAC for on-property or off-site disposal.
Volatile Organics		
Benzene	No	Not detected in 98 percent of all solid media samples (no liquid samples); 99 percent of all results for solid media are below Part B Reference Criteria; its maximum detected concentration was well below 20 times the TCLP limit.

000206

TABLE 3-8, continued

Constituent of Concern	Considered More Significant? [a]	Reason for Designation [b]
Styrene	No	Not detected in 92 percent of all solid media samples; 99 percent of all results for solid media were below Part B Reference Criteria; no hazardous criteria.
Tetrachloroethene	Yes	Its concentration in the TCLP leachate from one sample of transite exceeded the TCLP limit.
Semi-Volatile Organics		
1,4-Dichlorobenzene	Yes	Its concentration in the TCLP leachate from one sample of transite exceeded the TCLP limit.
2,4-Dinitrotoluene	No	Not detected in 99 percent of all solid media samples; 99 percent of all results for solid media were below Part B Reference Criteria; its concentration in no major media exceeded 20 times the TCLP limit.
Benzo(a)anthracene	No	No hazardous criteria; majority of detects were in supplemental media (56 of 60).
Benzo(a)pyrene	No	No hazardous criteria.
Benzo(b)fluoranthene	No	No hazardous criteria.
Benzo(k)fluoranthene	No	Not detected in 54 percent of all solid media samples; n hazardous criteria.
bis(2-Ethylhexyl)phthalate	No	Not detected in 66 percent of all solid media samples; 83 percent of results for solid media were below Part B Reference Criteria; no hazardous criteria.
Carbazole	No	Not detected in 67 percent of all solid media samples; 93 percent of results for solid media were below Part B Reference Criteria; no hazardous criteria.
Chrysene	No	Only 23 percent of results for solid media exceeded Part B Reference Criteria; no hazardous criteria.
Dibenzo(a,h)anthracene	No	Not detected in 86 percent of all solid media samples; 86 percent of results for solid media were below Part B Reference Criteria; no hazardous criteria.
Hexachlorobutadiene	Yes	Its concentration in the TCLP leachate from one sample of transite exceeded the TCLP limit.
Indeno(1,2,3-cd)pyrene	No	No hazardous criteria.
N-Nitroso-di-n-propylamine	No	Not detected in 99 percent of all solid media samples; 86 percent of results for solid media were below Part B Reference Criteria; no hazardous criteria.
Nitrobenzene	Yes	Its concentration in the TCLP leachate from one sample of transite exceeded the TCLP limit.
Pentachlorophenol	No	Not detected in 98 percent of all solid media samples; 98 percent of results for solid media were below Part B Screening Criteria; no samples exceeded 20 times the TCLP limit.
Pesticides/PCBs		
alpha-Chlordane	No	Not detected in 94 percent of all solid media samples; 97 percent of results for solid media were below Part B Screening Criteria; no samples exceeded 20 times the TCLP limit.
Aroclor-1248	No	Not detected in 94 percent of all solid media samples; the maximum detected concentration was well below the TSCA limit.
Aroclor-1254	No	Not detected in 62 percent of all solid media samples; the maximum detected concentration was well below the TSCA limit.
Dieldrin	No	Not detected in 85 percent of all solid media samples; no hazardous criteria.
gamma-Chlordane	No	Not detected in 91 percent of all solid media samples; no WAC for on-property or off-site disposal.

[a] An entry of "No" in this column means that other constituents will generally have a greater impact on the remedial process at the FEMP. It does not indicate that this constituent is insignificant.

[b] See Attachment A.II to Appendix A for complete description of the occurrence of all constituents.

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Table 3-9
Source Term by Constituent of Concern *

Sort Class	Parameter	Source Term (kg)
INORGANICS		
	Antimony	741
	Arsenic	2070
	Barium	24400
	Beryllium	397
	Cadmium	761
	Chromium	2470000
	Copper	182000
	Lead	102000
	Manganese	862000
	Mercury	27.8
	Nickel	1730000
	Selenium	23.2
	Silver	2920
	Thallium	93.2
	Vanadium	6620
	Zinc	36500
PESTICIDES & PCBs		
	alpha-Chlordane	0.04
	Aroclor-1248	0.0443
	Aroclor-1254	8.46
	Aroclor-1260	5.3
	Dieldrin	0.00825
	gamma-Chlordane	0.0426
RADIOISOTOPES		
	Americium-241	0.0000227
	Cesium-137	0.000000746
	Lead-210	0.0000314
	Neptunium-237	0.0734
	Plutonium-238	0.0000362
	Plutonium-239/240	0.000967
	Plutonium-241	0.0000146
	Polonium-210	0.000000441
	Radium-226	0.00599
	Radium-228	0.0000102
	Strontium-90	0.00000798
	Technetium-99	0.127
	Thorium, Total	882000
	Thorium-228	0.00000143
	Thorium-230	0.148
	Thorium-232	3720
	Uranium, Total	8020000
	Uranium-233/234	1.37
	Uranium-234	5.27
	Uranium-235/236	41200
	Uranium-238	7560000

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Table 3-9 (Continued) *

Sort Class	Parameter	Source Term (kg)
SEMIVOLATILE		
	1,4-Dichlorobenzene	94.2
	2,4-Dinitrotoluene	0
	Benzo(a)anthracene	2.2
	Benzo(a)pyrene	0.246
	Benzo(b)fluoranthene	0.195
	Benzo(k)fluoranthene	0.00842
	bis(2-Ethylhexyl)phthalate	6.31
	Carbazole	0.00147
	Chrysene	6.9
	Dibenzo(a,h)anthracene	0
	Hexachlorobutadiene	81.6
	Indeno(1,2,3-cd)pyrene	0
	N-Nitroso-di-n-propylamine	0
	Nitrobenzene	155
	Pentachlorophenol	0
VOLATILE		
	Benzene	0
	Styrene	0.0354
	Tetrachloroethene	351

* Note: Includes source term contribution from inventory and soil piles.

TABLE 3-10
SUMMARY OF MATERIAL QUANTITY VOLUME[a] BY SEGREGATION CATEGORIES
OPERABLE UNIT 3 - FEMP

	Material Type Category										
	A	B	C	D	E	F	G	H	I	J	
Component Category	Accessible Metals	Inaccessible Metals	Process-Related Metals	Painted, Light-Gauge Metals	Concrete	Brick	Non-Regulated ACM	Regulated ACM	Misc-Materials	Product, Residues and Special Materials	Totals [b]
BELOW BASELINE	0	0	0	0	4,160,000	0	0	0	502,000	0	4,660,000
LOW LEVEL	63,400	1,730,000	151,000	7,100	541,000	15,400	71,400	80,300	201,000	1,670,000	4,530,000
MIXED	0	0	0	49	0	5,280	0	0	0	56,000 [c]	61,300
PCB WASTE	0	14,900	0	0	0	0	0	0	0	0	14,900
Totals [b]	63,400	1,740,000	151,000	7,150	4,700,000	20,700	71,400	80,300	703,000	1,730,000	9,270,000

[a] All volumes are in cubic feet.

[b] Totals are rounded.

[c] Includes 10 cubic feet of inventory considered potentially hazardous.

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TABLE 3-11
SUMMARY OF MATERIAL QUANTITY WEIGHT[a] BY SEGREGATION CATEGORIES
OPERABLE UNIT 3 - FEMP

	Material Type Category										
	A	B	C	D	E	F	G	H	I	J	
Component Category	Accessible Metals	Inaccessible Metals	Process-Related Metals	Painted, Light-Gauge Metals	Concrete	Brick	Non-Regulated ACM	Regulated ACM	Misc-Materials	Product, Residues and Special Materials	Totals [b]
BELOW BASELINE	0	0	0	0	291,000	0	0	0	3,660	7.15	295,000
LOW LEVEL	15,200	25,300	2,720	1,340	29,800	1,080	3,760	1,440	886	65,300	147,000
MIXED	0	0	0	17.5	0	370	0	0	0	2,920 [c]	3,310
PCB WASTE	0	334	0	0	0	0	0	0	0	0	334
Totals [b]	15,200	25,600	2,720	1,360	321,000	1,450	3,760	1,440	4,550	68,200	445,000

[a] All weights are in tons.
[b] Totals are rounded.
[c] Includes 0.47 tons of inventory considered potentially hazardous.

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TABLE 3-21

OPERABLE UNIT 3 DATA LIMITATIONS

Data Limitation	Significance to Alternatives Evaluation	Recommended Action/Justification
Per the WPA, sample locations within sampled process areas and components are based on survey data that identify the likely location of the maximum level of contamination within a particular media. In addition, some components were not sampled, based on process knowledge and observations that indicate the contamination is not expected.	Increased uncertainty in the contamination source terms (should be conservative) and volumes of material within a particular segregation category. This increases uncertainty in the cost estimates associated with all alternatives.	No additional sampling is required to support the RI/FS process. With few exceptions, components that were not sampled were visually inspected and/or surveyed with portable instruments. Components where contamination above prescribed limits was noted were included in the sampling program. Three components that were planned to be sampled were not because of health and safety considerations. These components were characterized using similar components. With few exceptions, as noted in Appendix B, sample data within a process area/component were applied to all material within that process area/component. Since samples were collected from the locations of maximum contamination within each process area/component, the amount of a particular contaminant and the volume/weight of material within particular segregation categories is expected to be conservative. Therefore, costs associated with the final disposition of these materials will be conservative. An indication of the amount of the conservatism in the estimates of the source term of each contaminant is provided in Appendix B, and summarized in Section 3.6, by estimating the source term based on ~~both~~ the actual, minimum and maximum sampling results within each process area/component. Therefore, the data are considered sufficient to evaluate remedial action alternatives. Following remedy selection, additional sampling may be performed during RD/RA to establish the specific boundaries of areas within specific components requiring additional decontamination or treatment. This would potentially reduce the amount of material requiring treatment or other special handling.
Fifty percent of the detected technetium-99 concentrations are estimated results (i.e., qualified by a "J" designation)	Increased uncertainty associated with technetium-99 results. Its presence is not in question, but its quantity is.	Employ caution when using technetium-99 data or results based on that data.
Data for uranium-235/236 exhibit a positive bias and are more variable than that for its companion isotopes.	Uranium enrichment calculated from direct measurement of uranium-235 is suspect.	Use uranium-234 data to calculate uranium enrichment.

TABLE 3-2 (Continued)

Data Limitation	Significance to Alternatives Evaluation	Recommended Action/Justification
~~Transite was inadvertantly left out of the segregation category table for organics. This omission was due to a misapplication of the TCLP limits when determining the hazardous classification of transite.~~ Per the WPA, no data were collected for any metals.	~~The amount of material considered hazardous is underestimated. However, the total amount of transite is only 23 percent of the volume of material considered potentially hazardous, which is approximately one tenth of one percent of all OU3 materials, so the impact is insignificant.~~	~~This omission was discovered only during the final QC of the OU3 RI/FS Report. To correct the omission at that time was not practical. This will be corrected during the next draft of the OU3 RI/FS Report.~~ No additional sampling is required to support the RI/FS process. Metals were not sampled because: 1) they are non-porous and contamination is not expected to penetrate; and 2) there are limited options for treatment, recycle, or reuse. The only contamination associated with metals is paint on the exterior; dust on exterior and on the interior of ductwork; corrosion, rust and undefined debris (CRUD) on the interior, and holdup on the interior of process piping and equipment. For source term purposes, the actual constituents in the metals, as listed on Table A.I-14, were used. To determine the source term associated with the contamination, samples of paint were collected from I-beams, as described in Section 2.3.3. As discussed in Section 3.5.2, a 10-mil thickness of paint with the highest level of each constituent was assumed on all non-process metals in a process area/component. To account for the dust, a 5-mil thickness was assumed on the exterior surface of all non-painted metal and a 10-mil thickness was assumed on the interior surface of all ductwork. Radiological contamination associated with this dust was represented by the highest levels of each radionuclide in the paint samples collected from the same process area/component. One percent of the interior volume of process piping and 0.1 percent of the interior volume of process equipment were assumed to be CRUD. Contamination associated with this CRUD was represented by the highest levels of constituents in the paint samples collected from the same process area/component. Ten percent of the interior volume of process piping and one percent of the interior volume of process equipment were assumed to be holdup. This holdup was assumed to be uranyl nitrate hexahydrate (UNH), which is 43 percent uranium. As described in Appendix B.7, portions of the dust, CRUD, and holdup were assumed to be removed during decontamination activities, and segregated to Material Category J. This was done to estimate the amount of material to be segregated for final disposition. During D&D actions, all metals will be visually inspected for process residues and holdup. Any material containing visible process material after washing will be segregated into Material Category C-Process Related Metals for off-site disposal. Other metals (i.e. Accessible Metals-Material Category A, Inaccessible Metals-Material Category B, and Painted Light-Gauge Metals-Material Category D) would be segregated for disposal dictated by the remedial alternative selected for implementation.

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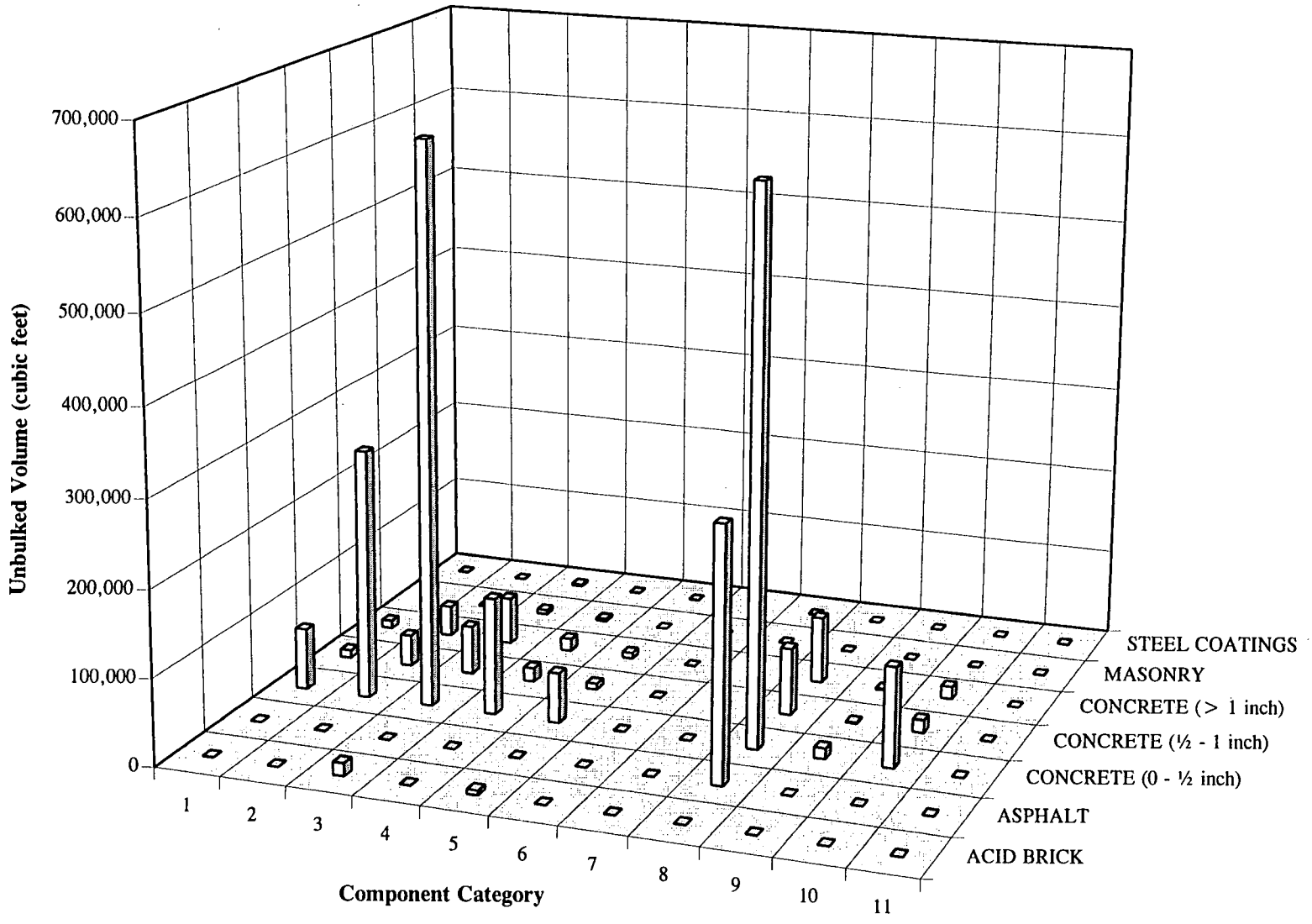

FIGURE 3-4
MATERIAL VOLUME EXCEEDING BASELINE FOR ELEMENTAL URANIUM

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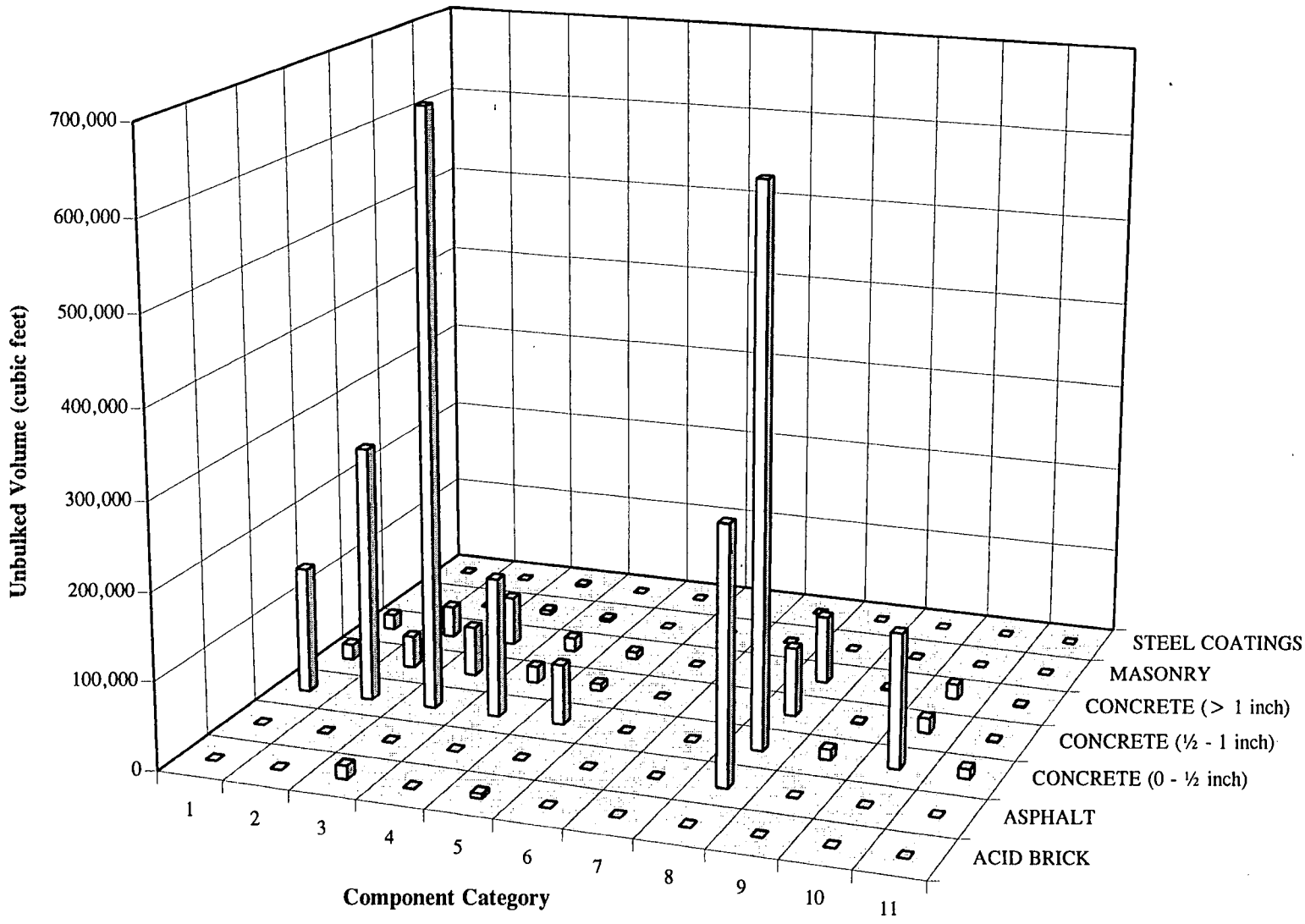

FIGURE 3-5
MATERIAL VOLUME EXCEEDING BASELINE FOR TECHNETIUM-99

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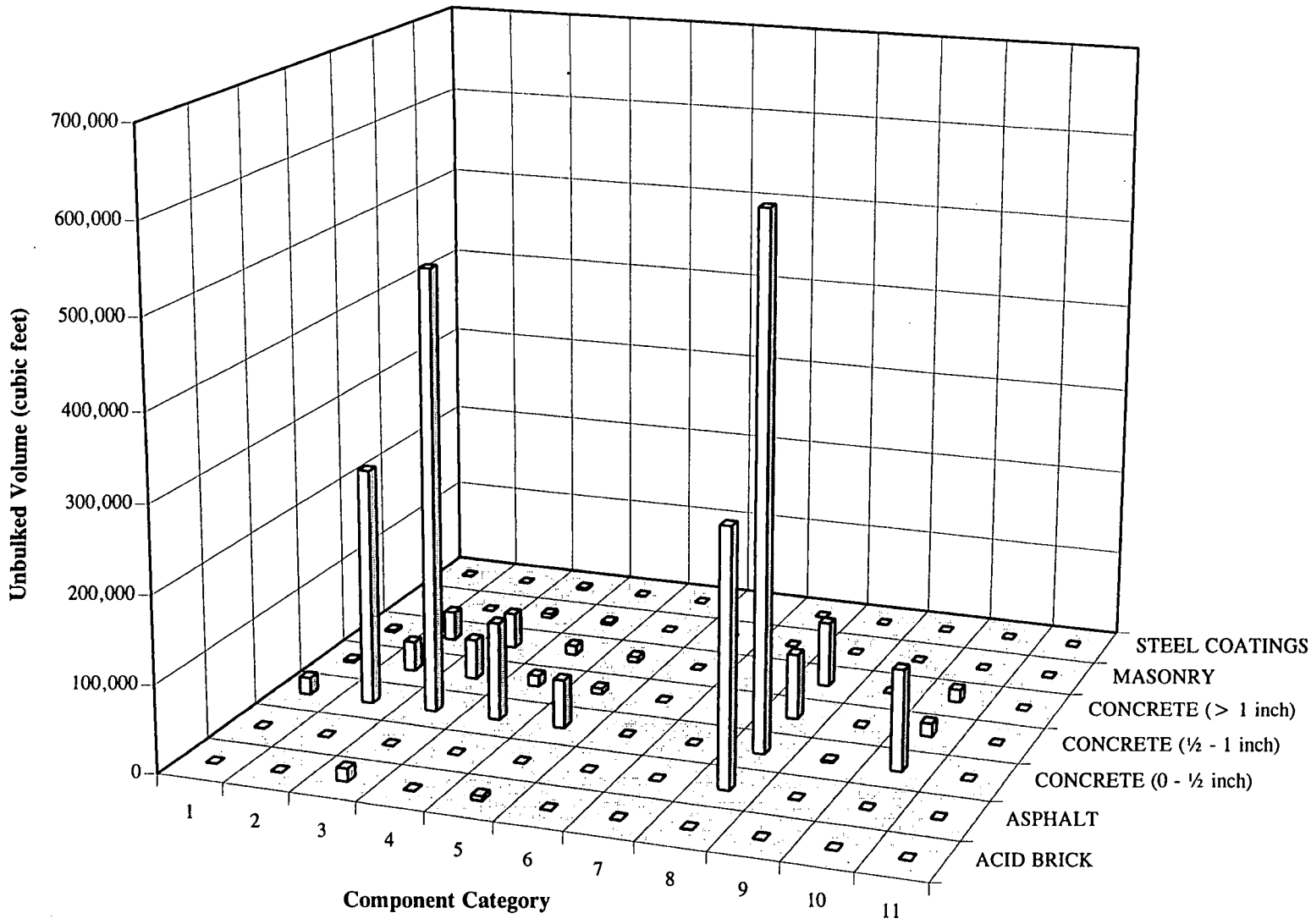

FIGURE 3-6
MATERIAL VOLUME EXCEEDING BASELINE FOR THORIUM-230

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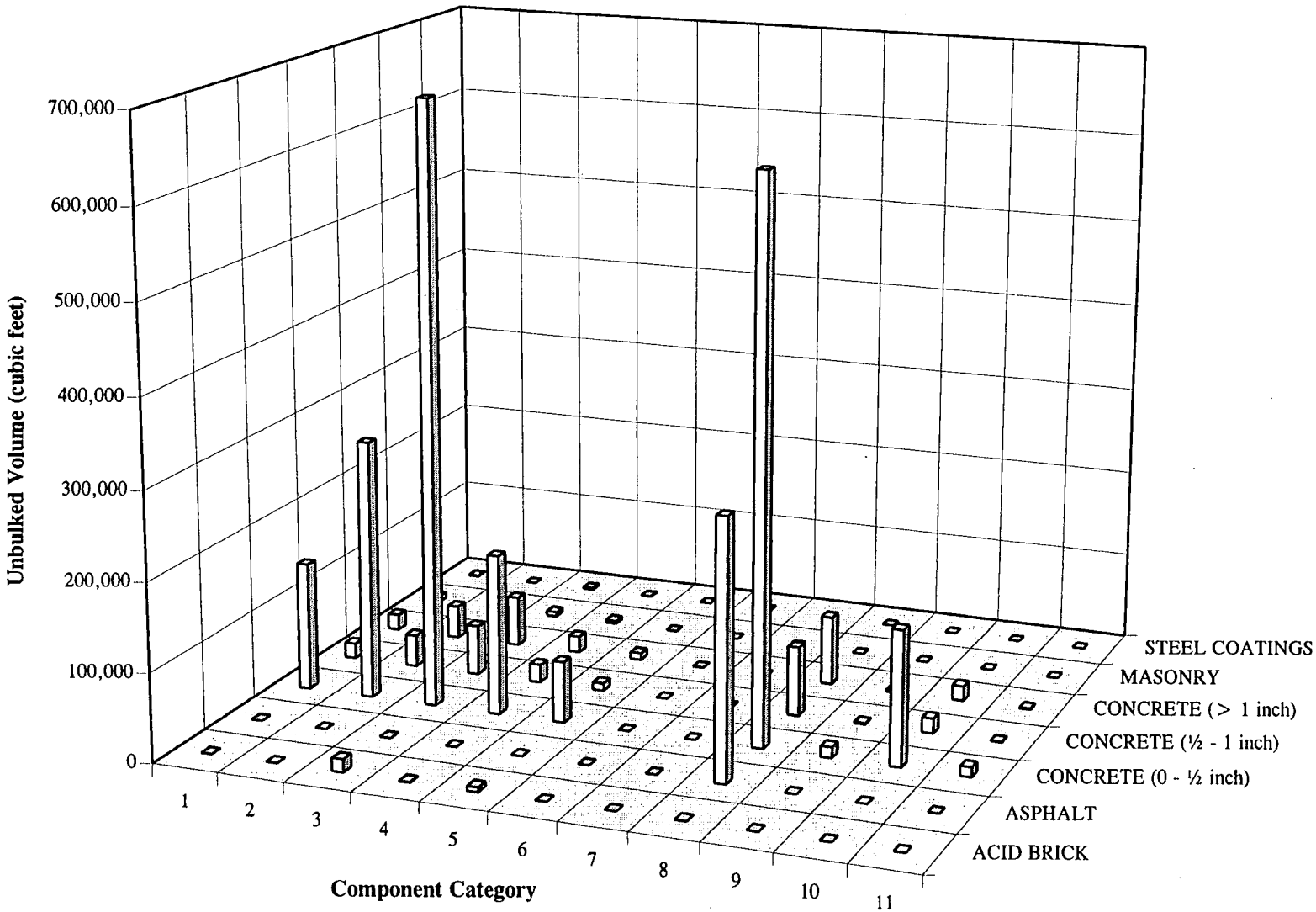

FIGURE 3-7
VOLUME OF MATERIAL EXCEEDING RADIOLOGICAL BASELINES
(for technetium-99, thorium-230 and uranium)

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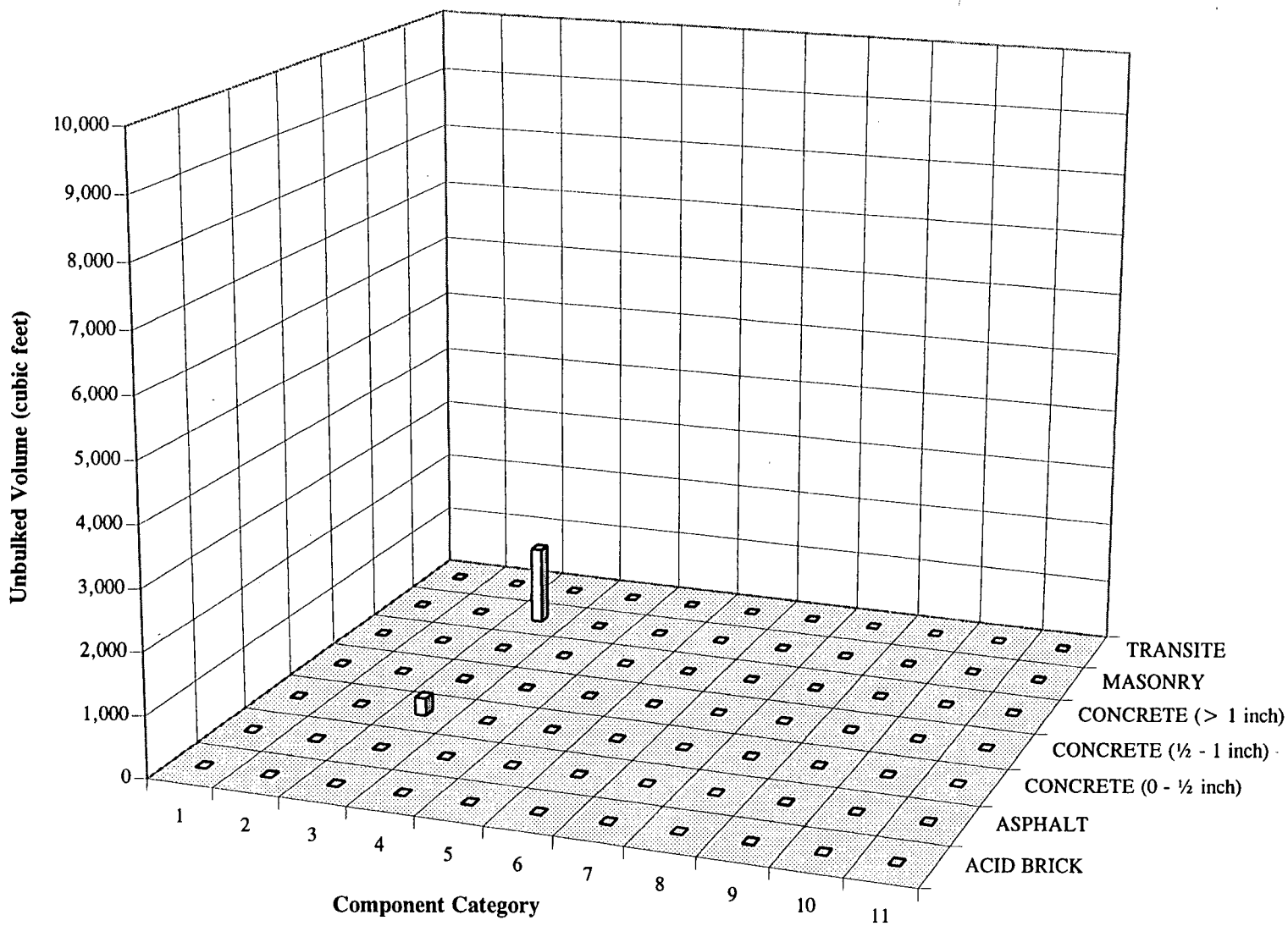

FIGURE 3-8
MATERIAL VOLUME EXCEEDING 20 TIMES THE TCLP LIMIT FOR BARIUM

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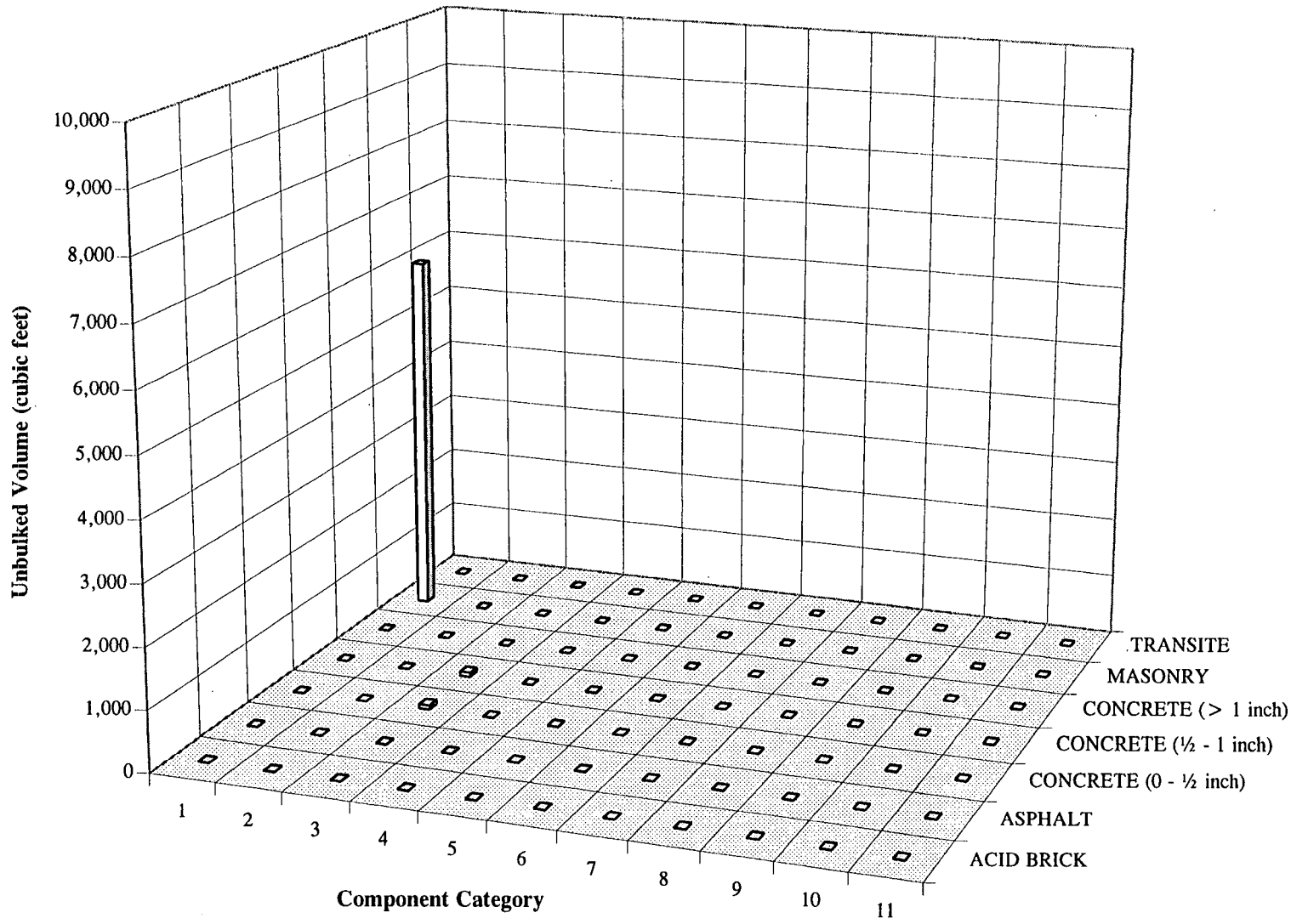

FIGURE 3-9
MATERIAL VOLUME EXCEEDING 20 TIMES THE TCLP LIMIT FOR CADMIUM

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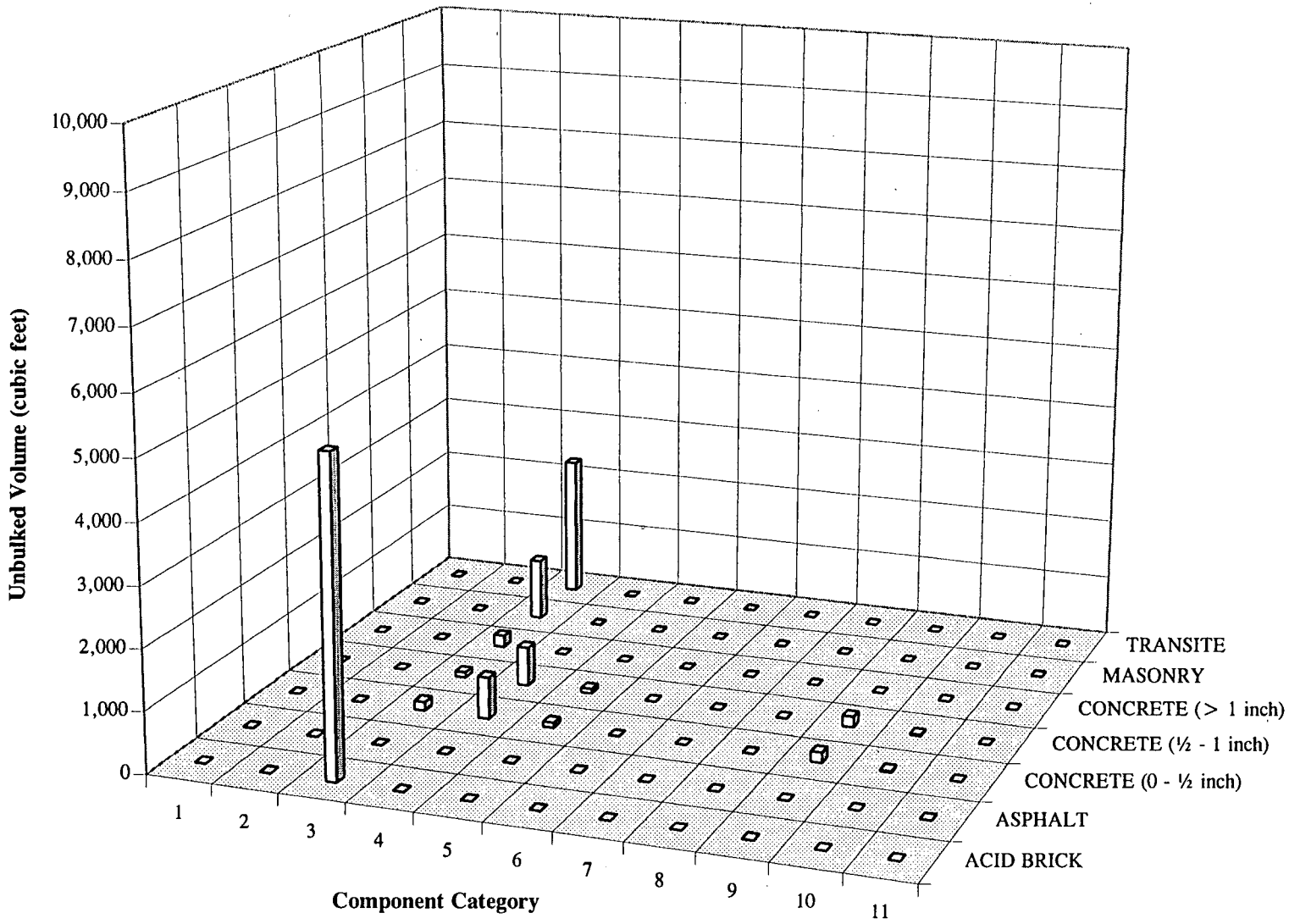

FIGURE 3-10
MATERIAL VOLUME EXCEEDING 20 TIMES THE TCLP LIMIT FOR CHROMIUM

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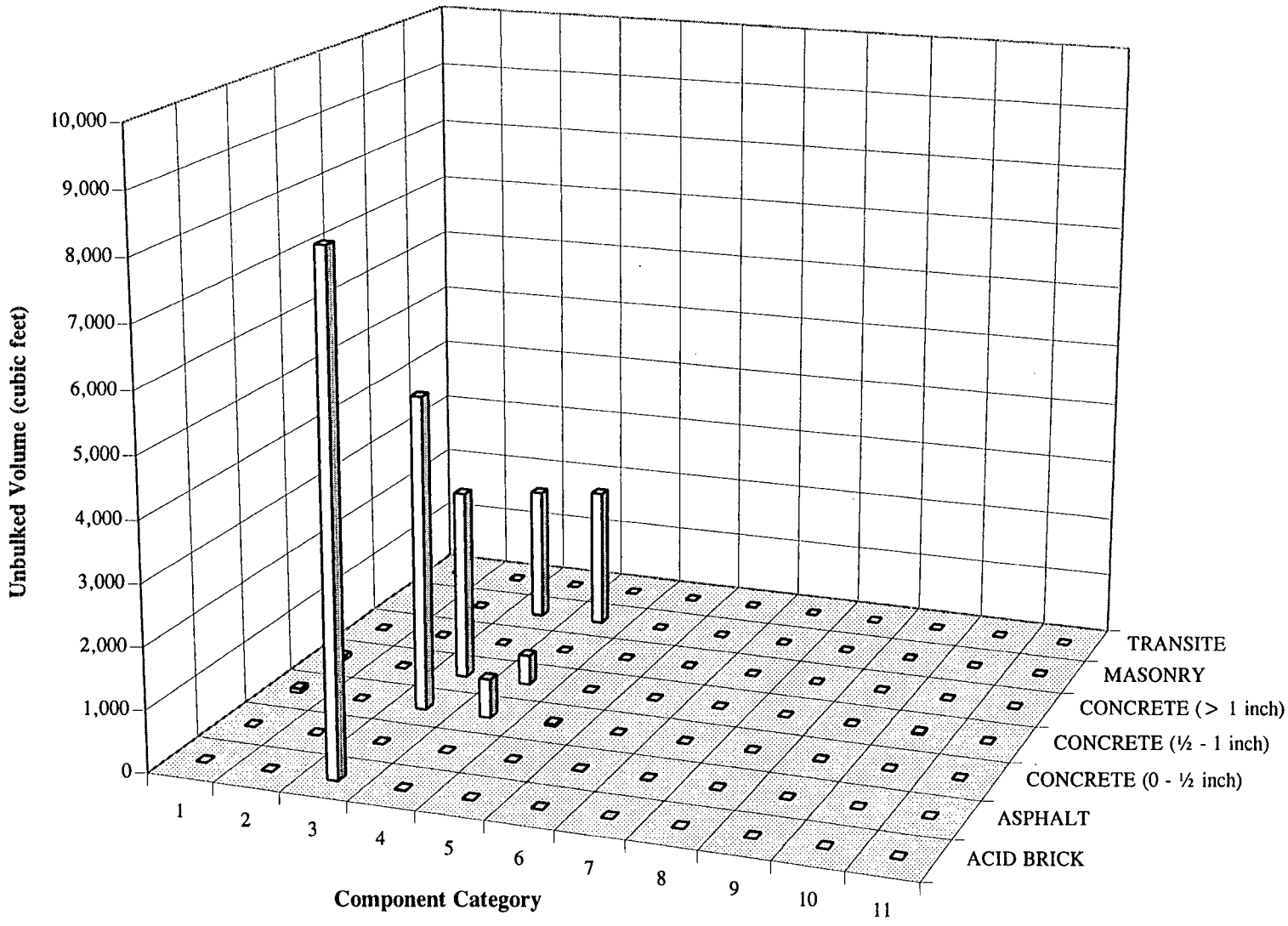

FIGURE 3-11
MATERIAL VOLUME EXCEEDING 20 TIMES THE TCLP LIMIT FOR LEAD

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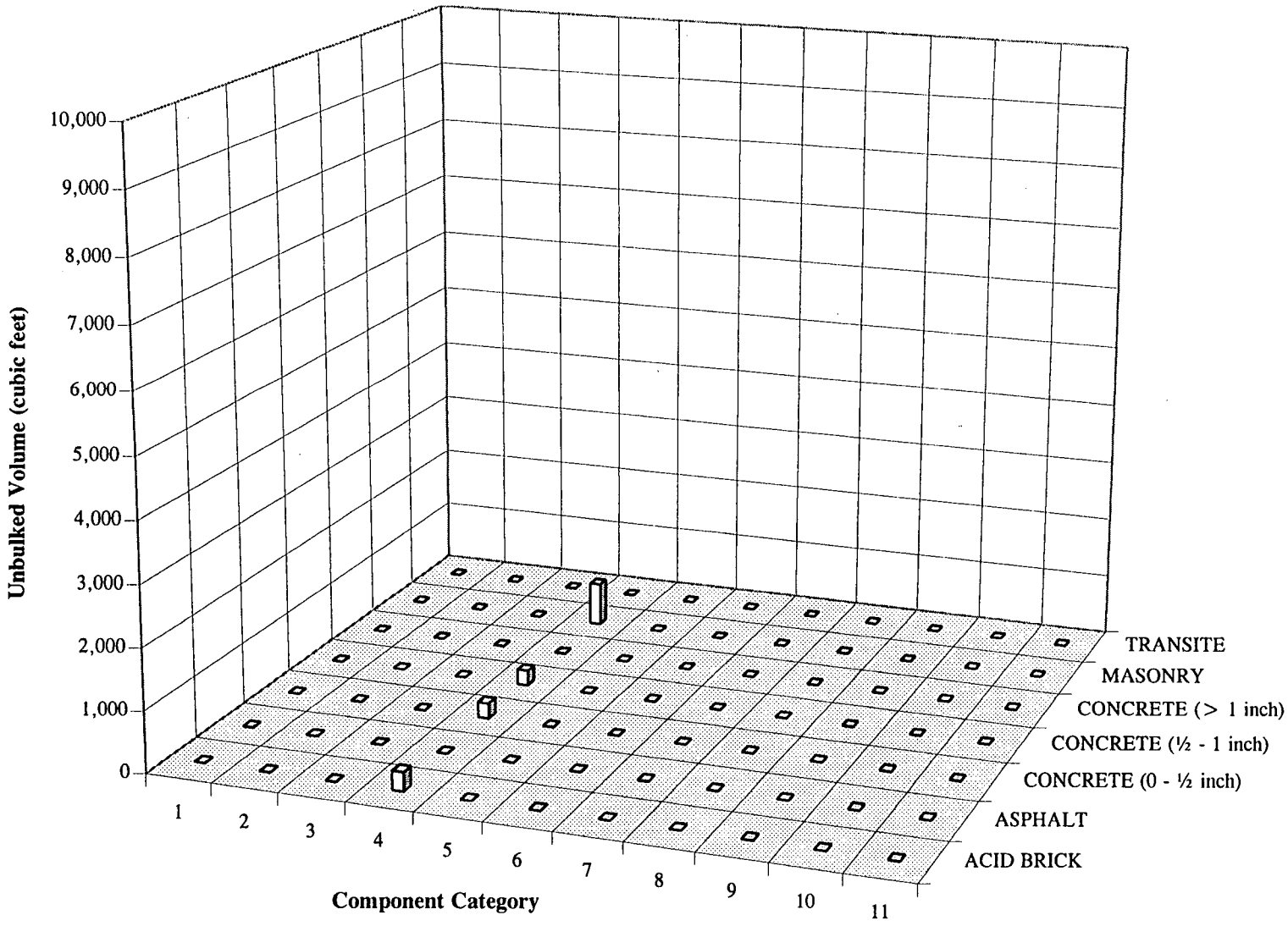

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FIGURE 3-12
MATERIAL VOLUME EXCEEDING 20 TIMES THE TCLP LIMIT FOR MERCURY

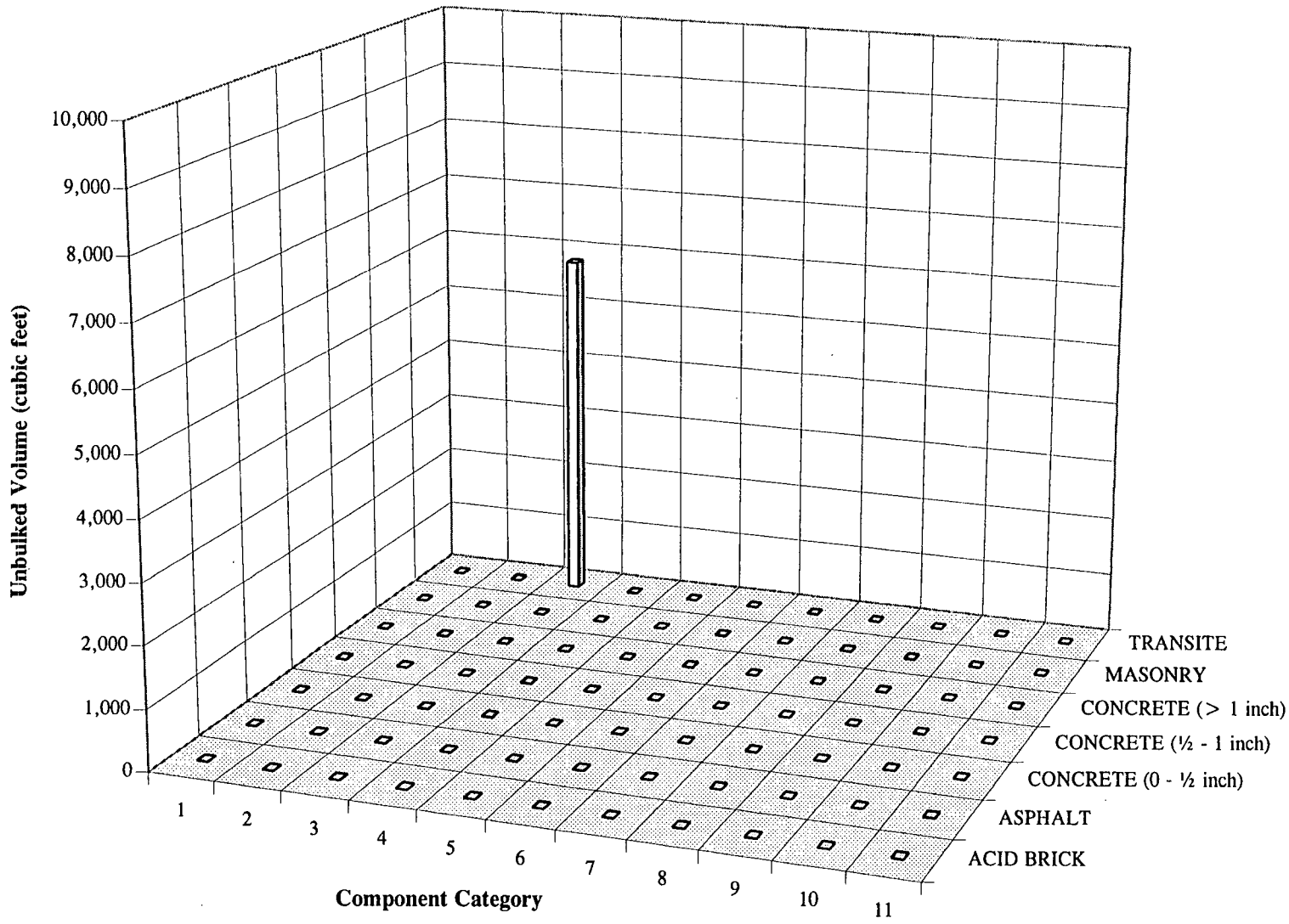

FIGURE 3-13
VOLUME OF MATERIAL EXCEEDING 20 TIMES THE TCLP LIMIT FOR TETRACHLOROETHENE

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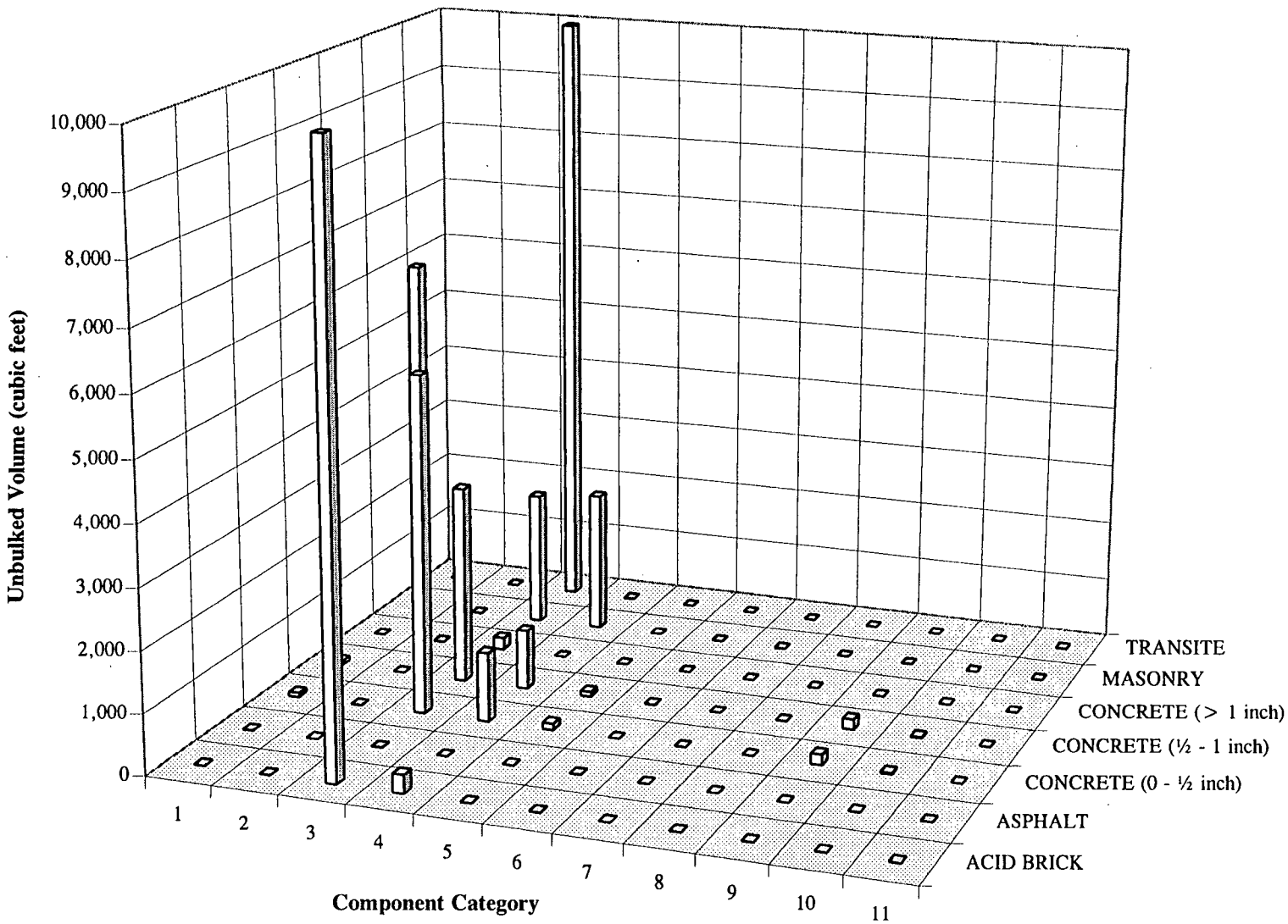

FIGURE 3-14
VOLUME OF MATERIAL EXCEEDING 20 TIMES THE TCLP LIMIT FOR ONE OR MORE CONTAMINANTS

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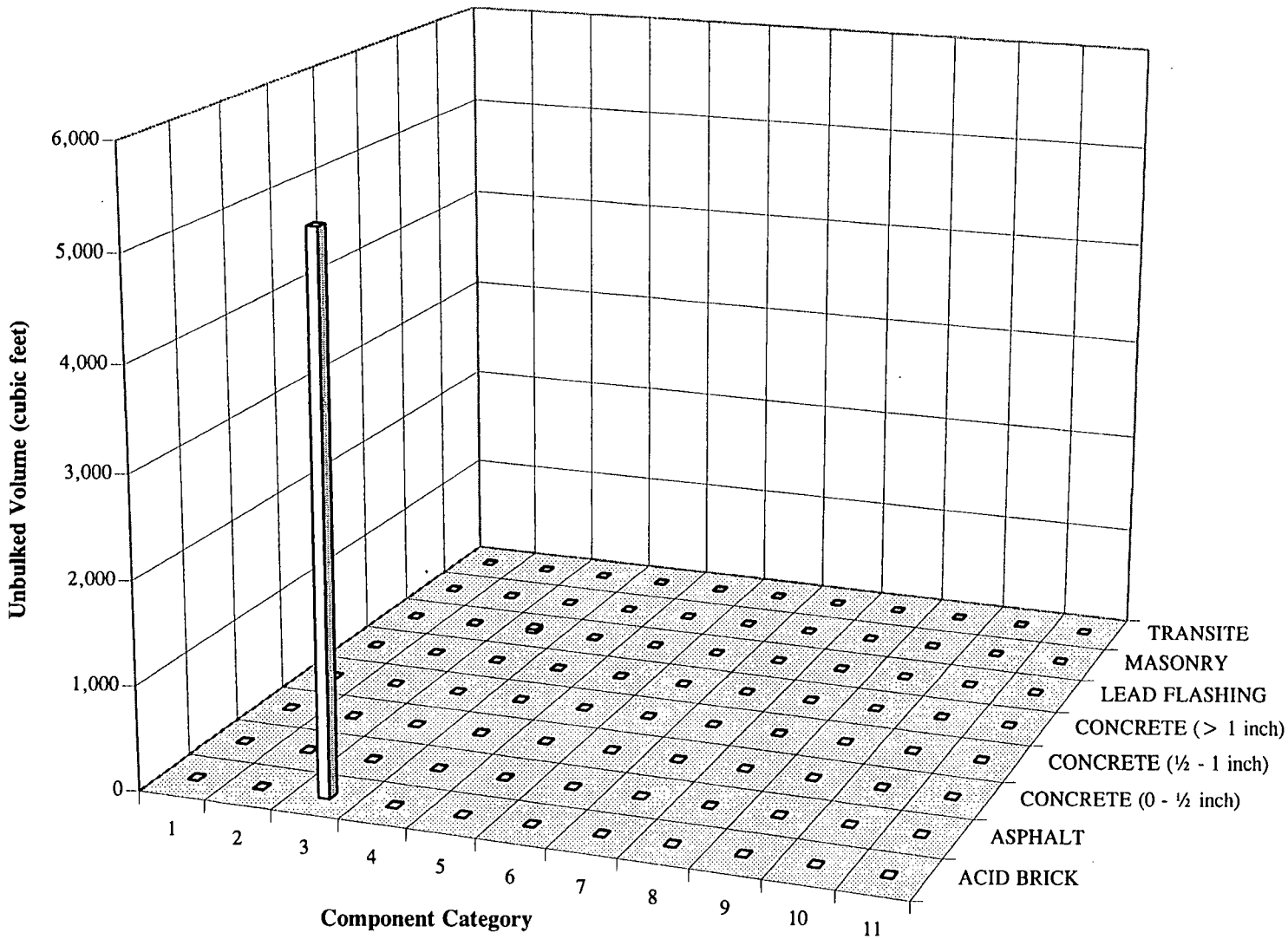

FIGURE 3-14a
VOLUME OF MATERIAL CONSIDERED POTENTIALLY HAZARDOUS

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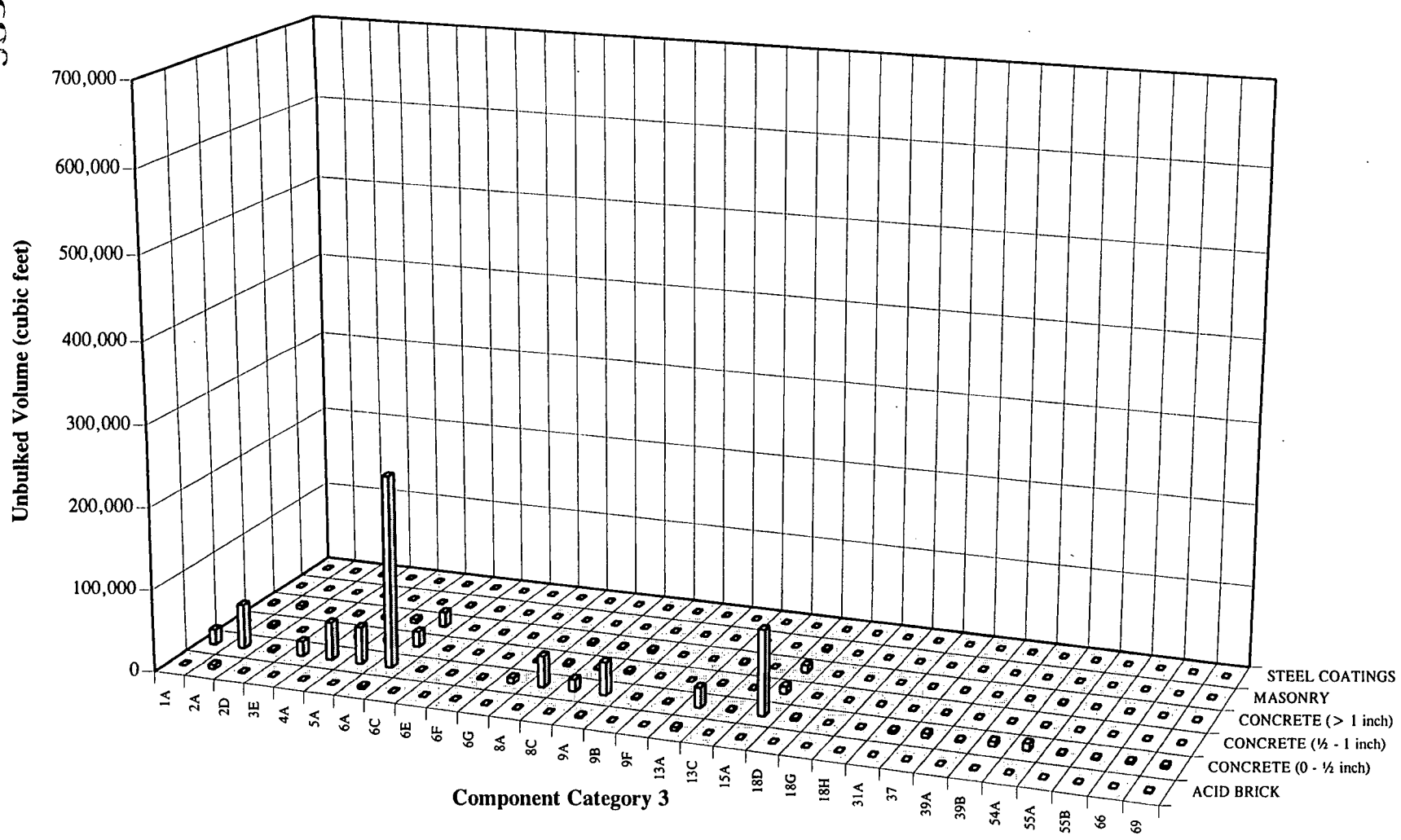

FIGURE 3-15
DISTRIBUTION OF MATERIAL EXCEEDING RADIOLOGICAL BASELINES IN COMPONENT CAREGORY 3
(for technetium-99, thorium-230, and uranium)

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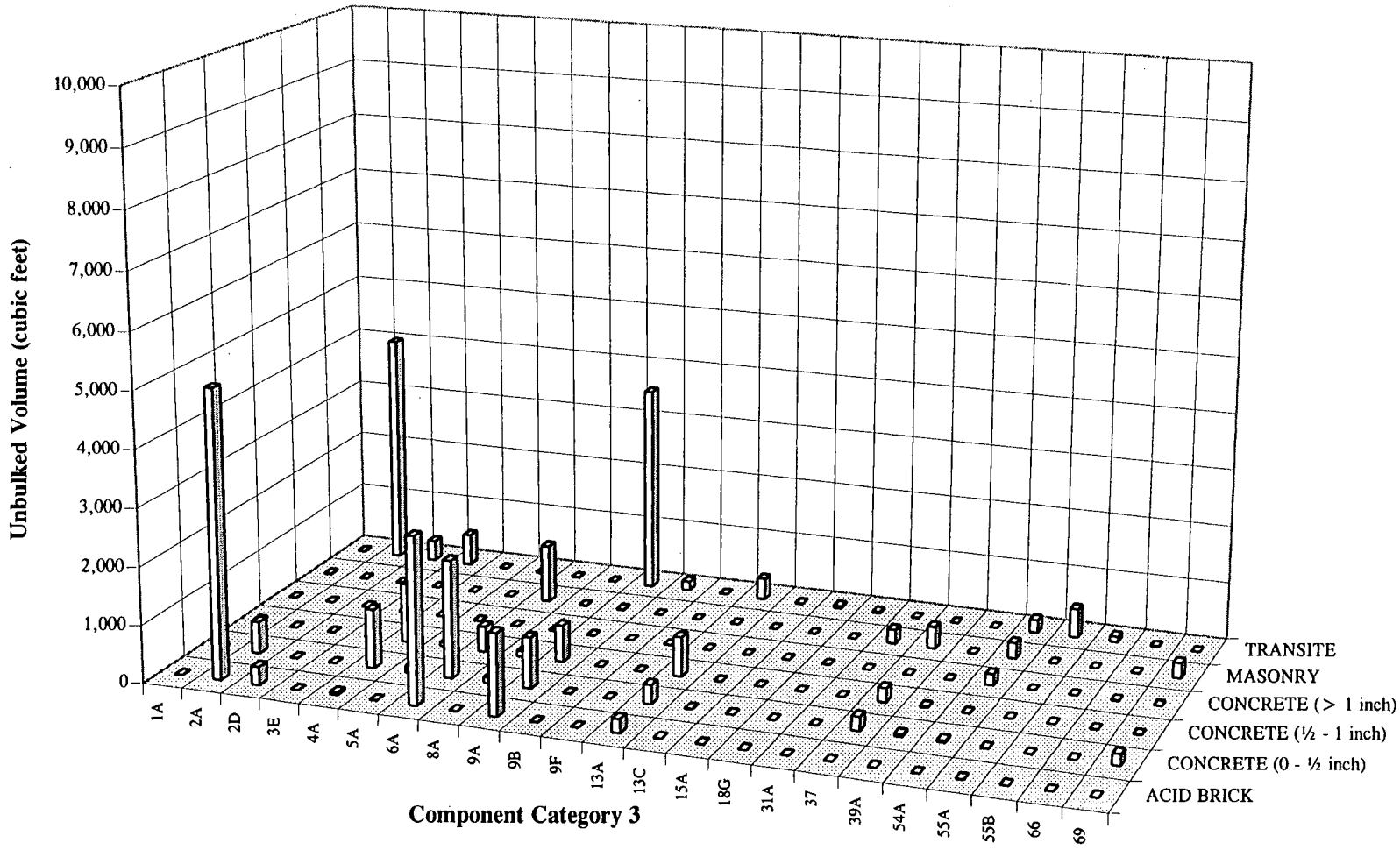

FIGURE 3-16
DISTRIBUTION OF MATERIAL WITHIN COMPONENT CATEGORY THREE EXCEEDING 20 TIMES A TCLP LIMIT

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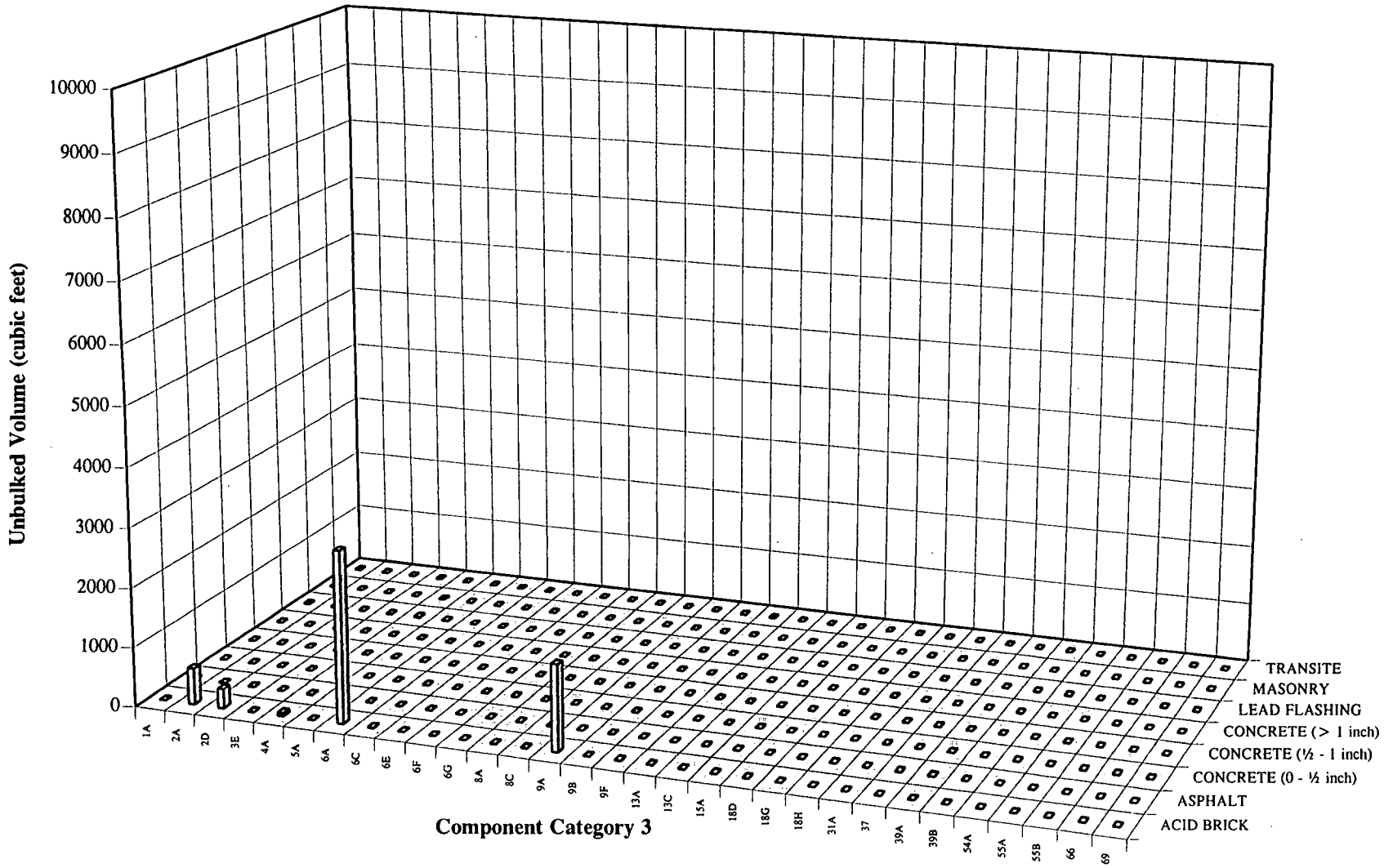

FIGURE 3-16a
DISTRIBUTION OF VOLUMES CONSIDERED POTENTIALLY HAZARDOUS FOR COMPONENT CATEGORY THREE

DRAFT

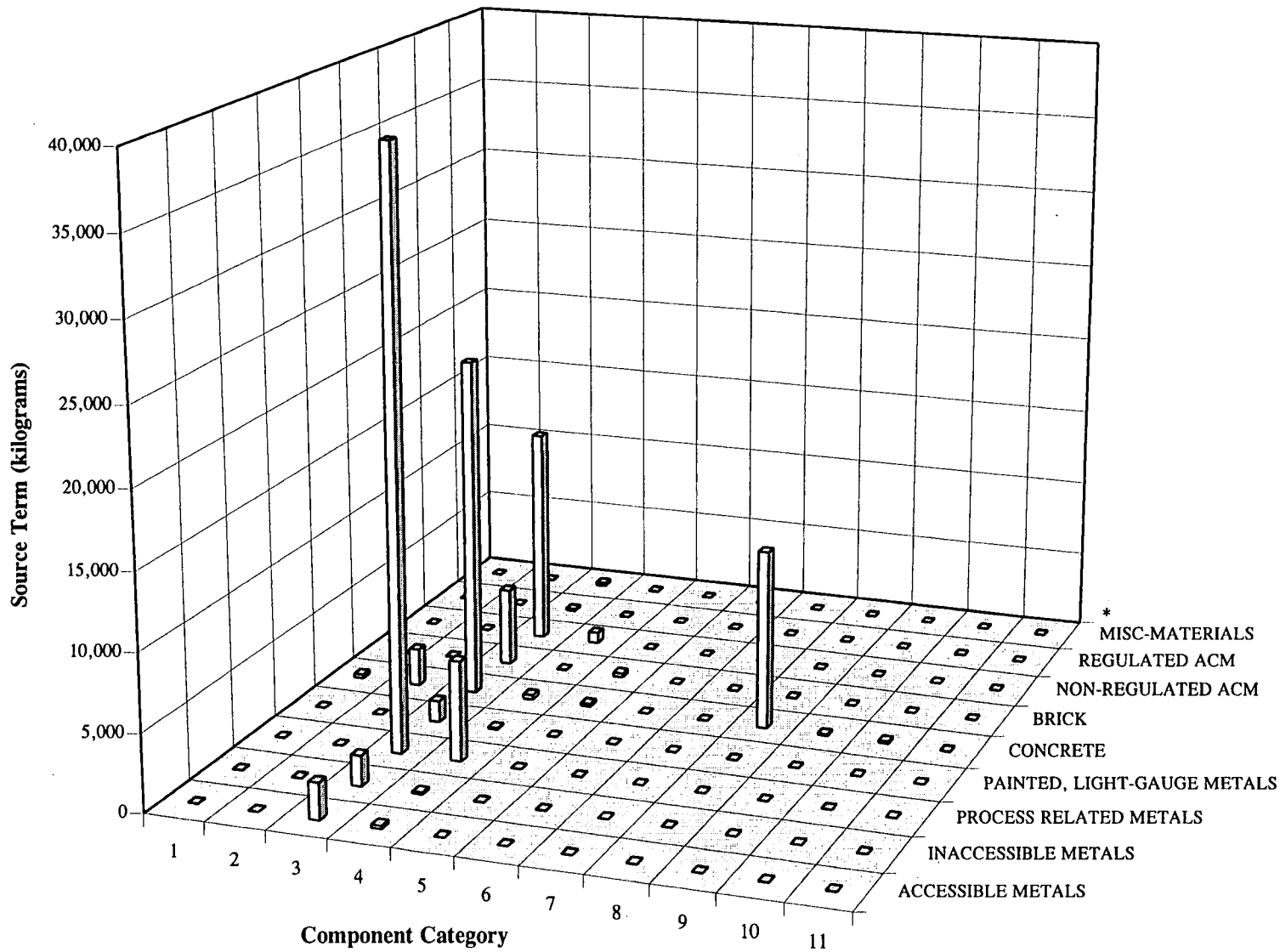

FIGURE 3-17
SOURCE TERM WEIGHTS BY COMPONENT/MATERIAL CATEGORIES FOR ELEMENTAL URANIUM

*Products, Residues, and Special Materials are excluded due to the weight in this category overshadows other materials.

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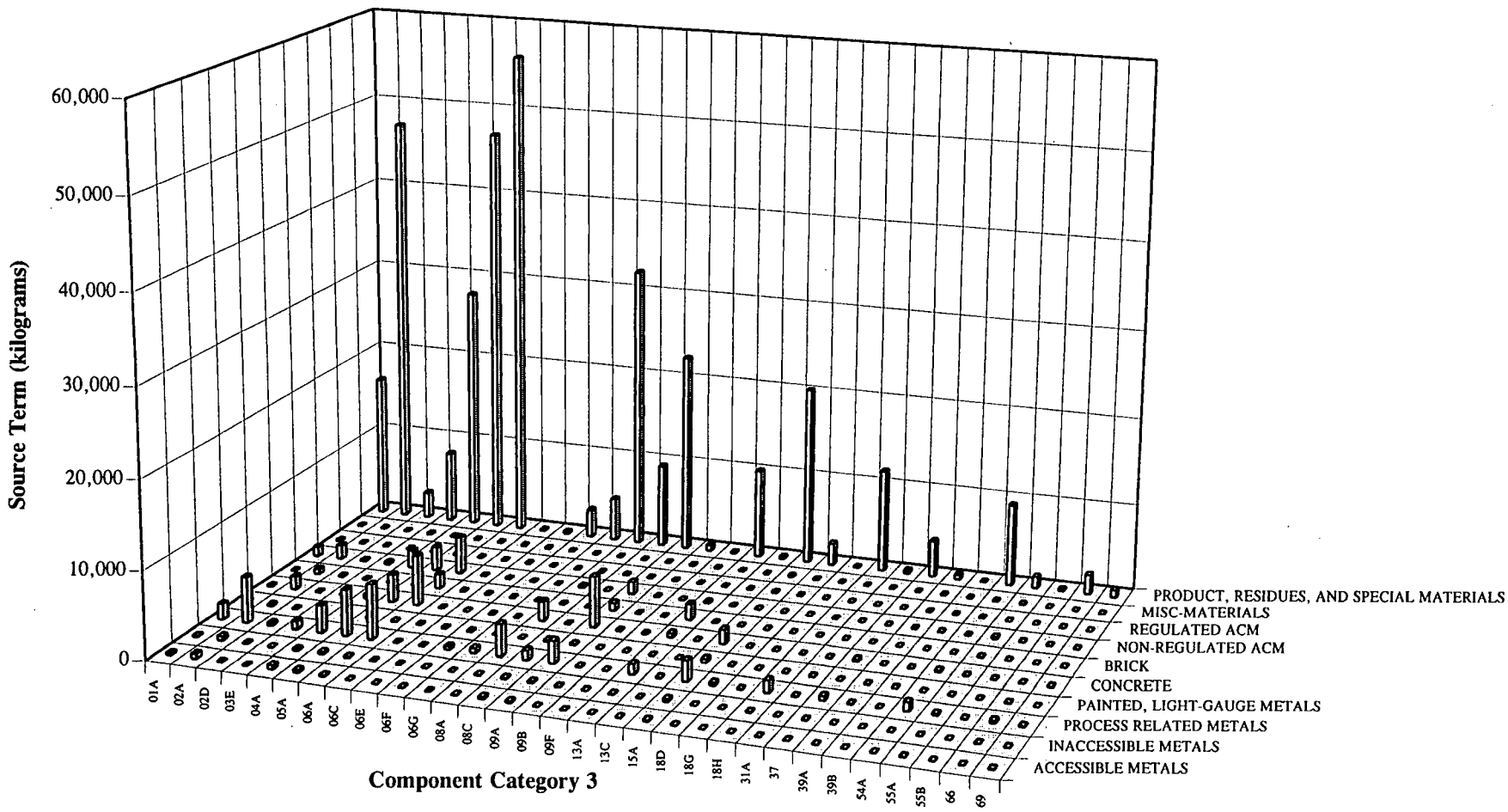

FIGURE 3-18
DISTRIBUTION OF ELEMENTAL URANIUM SOURCE TERM BY COMPONENT AND MATERIAL CATEGORY FOR COMPONENT CATEGORY THREE

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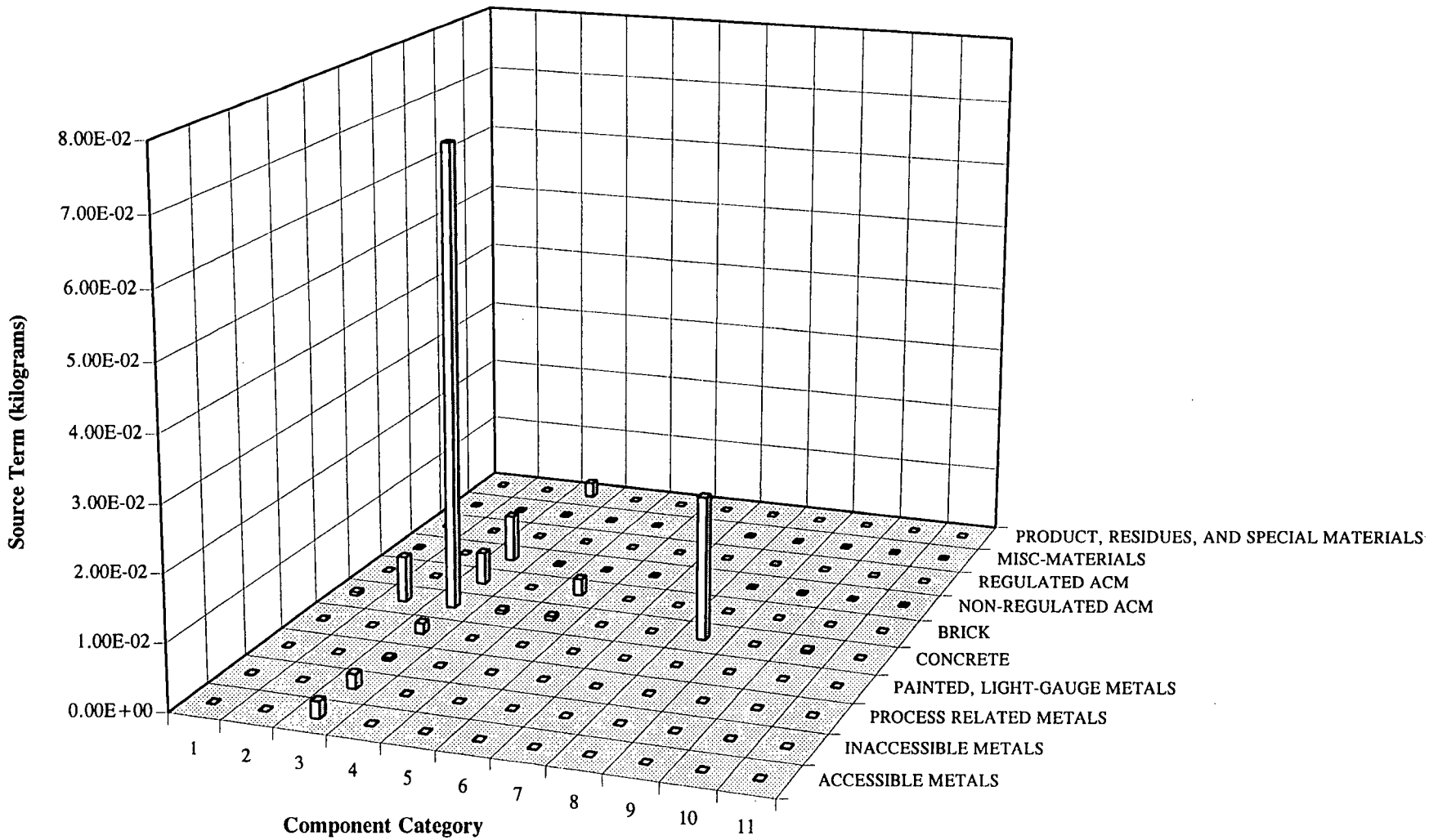

FIGURE 3-19
SOURCE TERM WEIGHTS BY COMPONENT/MATERIAL CATEGORIES FOR TECHNETIUM-99

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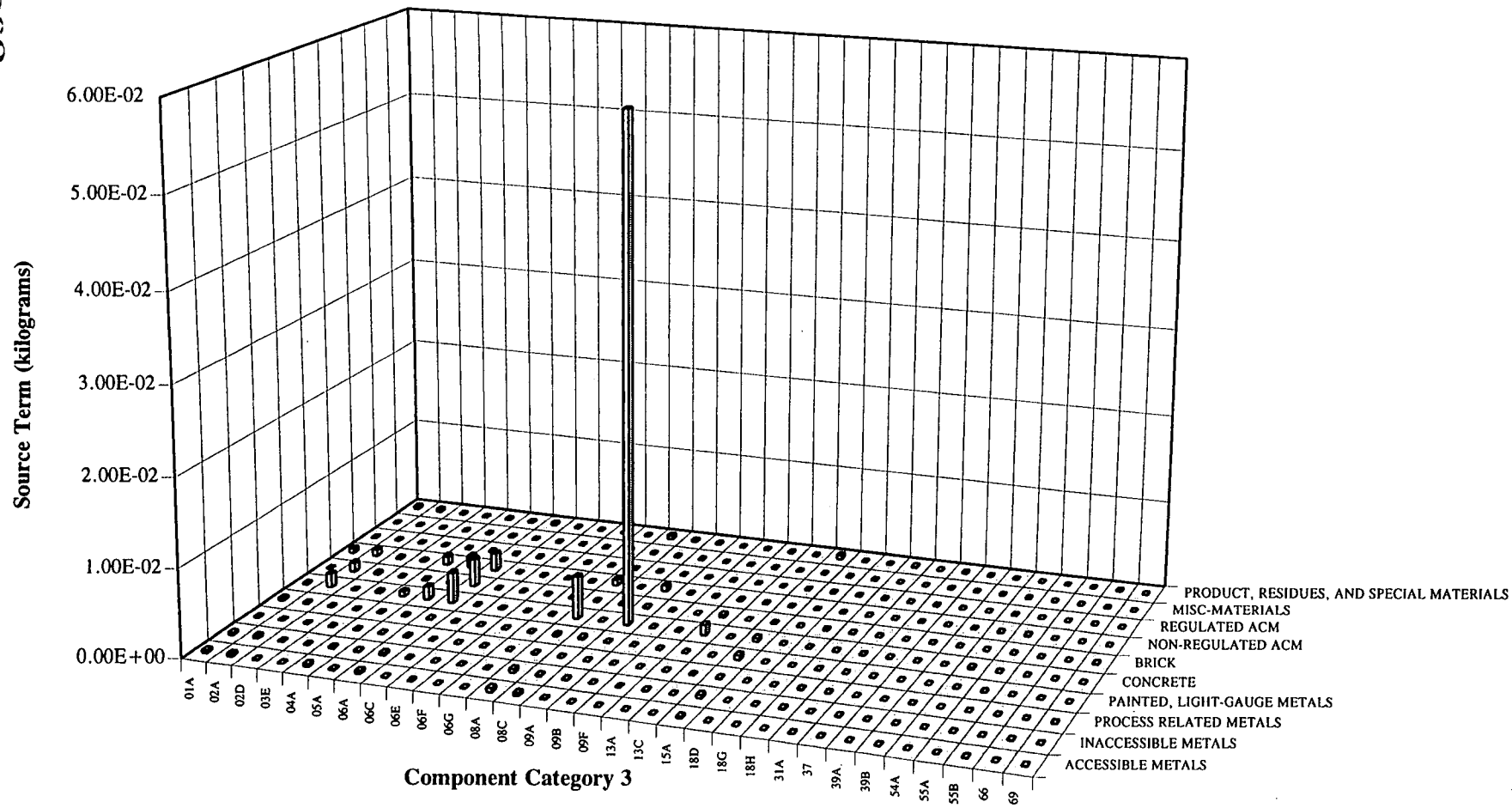

FIGURE 3-20
DISTRIBUTION OF TECHNETIUM-99 SOURCE TERM BY COMPONENT AND MATERIAL CATEGORY FOR COMPONENT CATEGORY THREE

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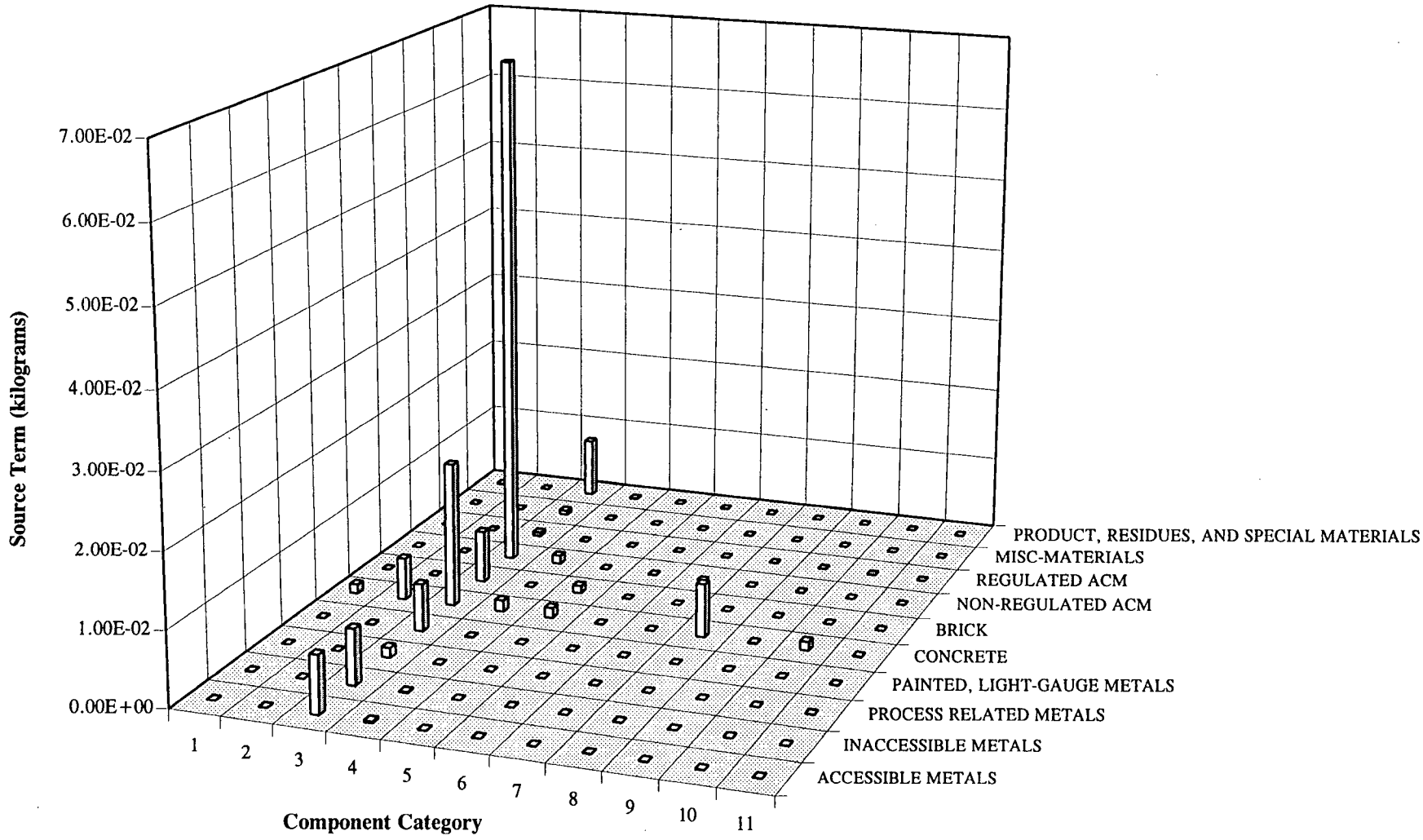

FIGURE 3-21
SOURCE TERM WEIGHTS BY COMPONENT/MATERIAL CATEGORIES FOR THORIUM-230

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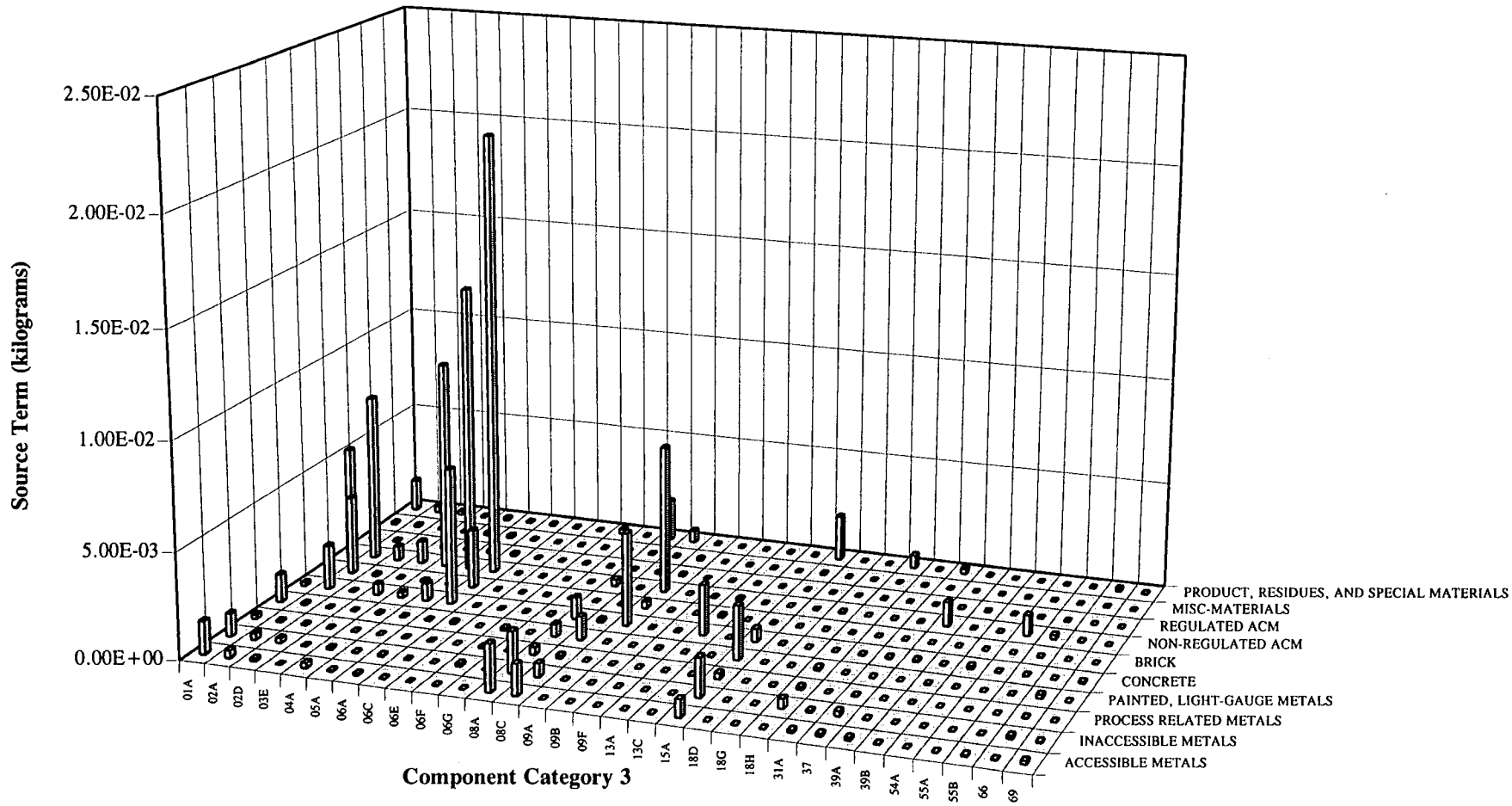

FIGURE 3-22
DISTRIBUTION OF THORIUM-230 SOURCE TERM BY COMPONENT AND MATERIAL CATEGORY FOR COMPONENT CATEGORY THREE

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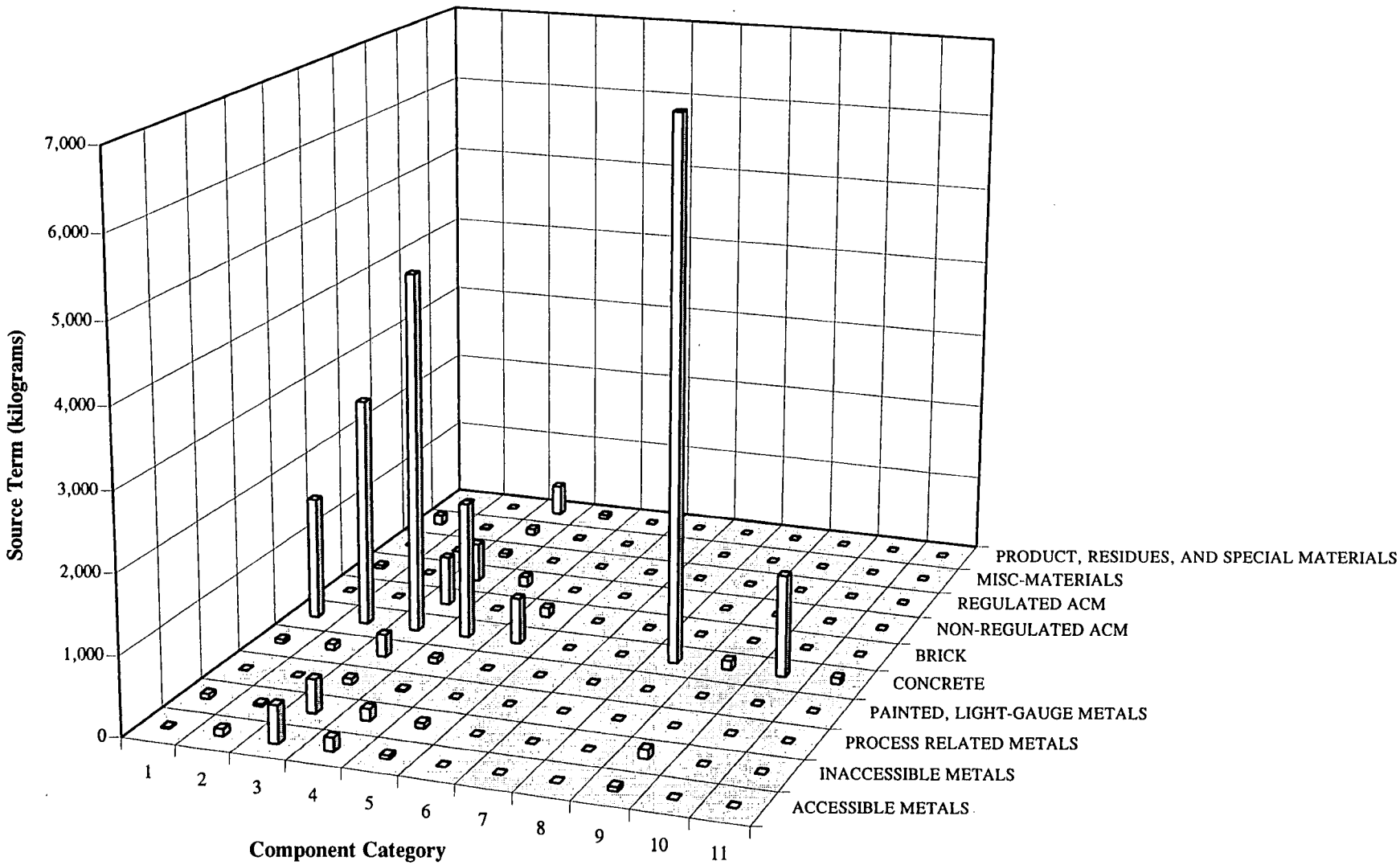

FIGURE 3-23
SOURCE TERM WEIGHTS BY COMPONENT/MATERIAL CATEGORIES FOR BARIUM

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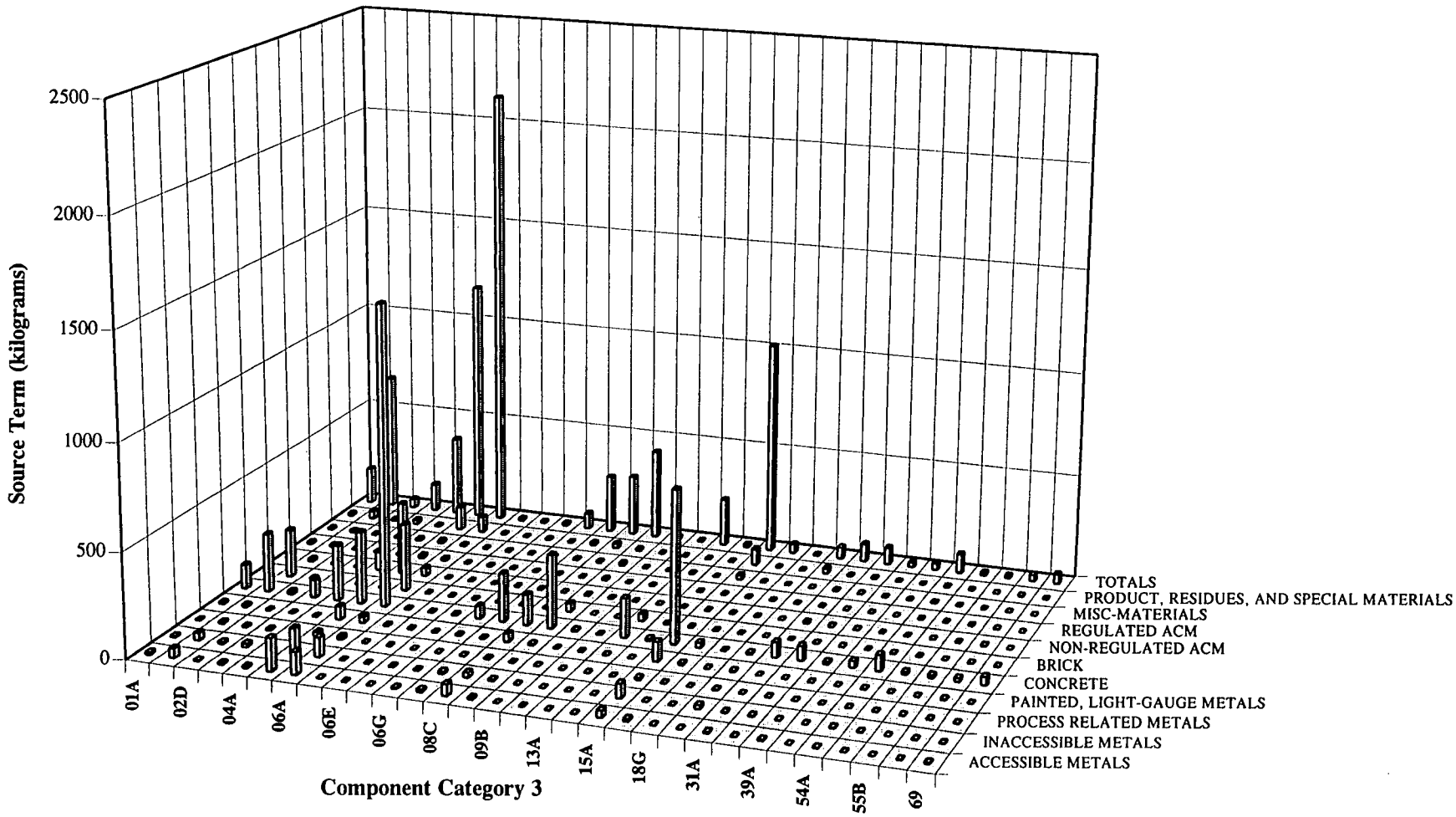

FIGURE 3-24
DISTRIBUTION OF BARIUM SOURCE TERM BY COMPONENT AND MATERIAL CATEGORY FOR COMPONENT CATEGORY THREE

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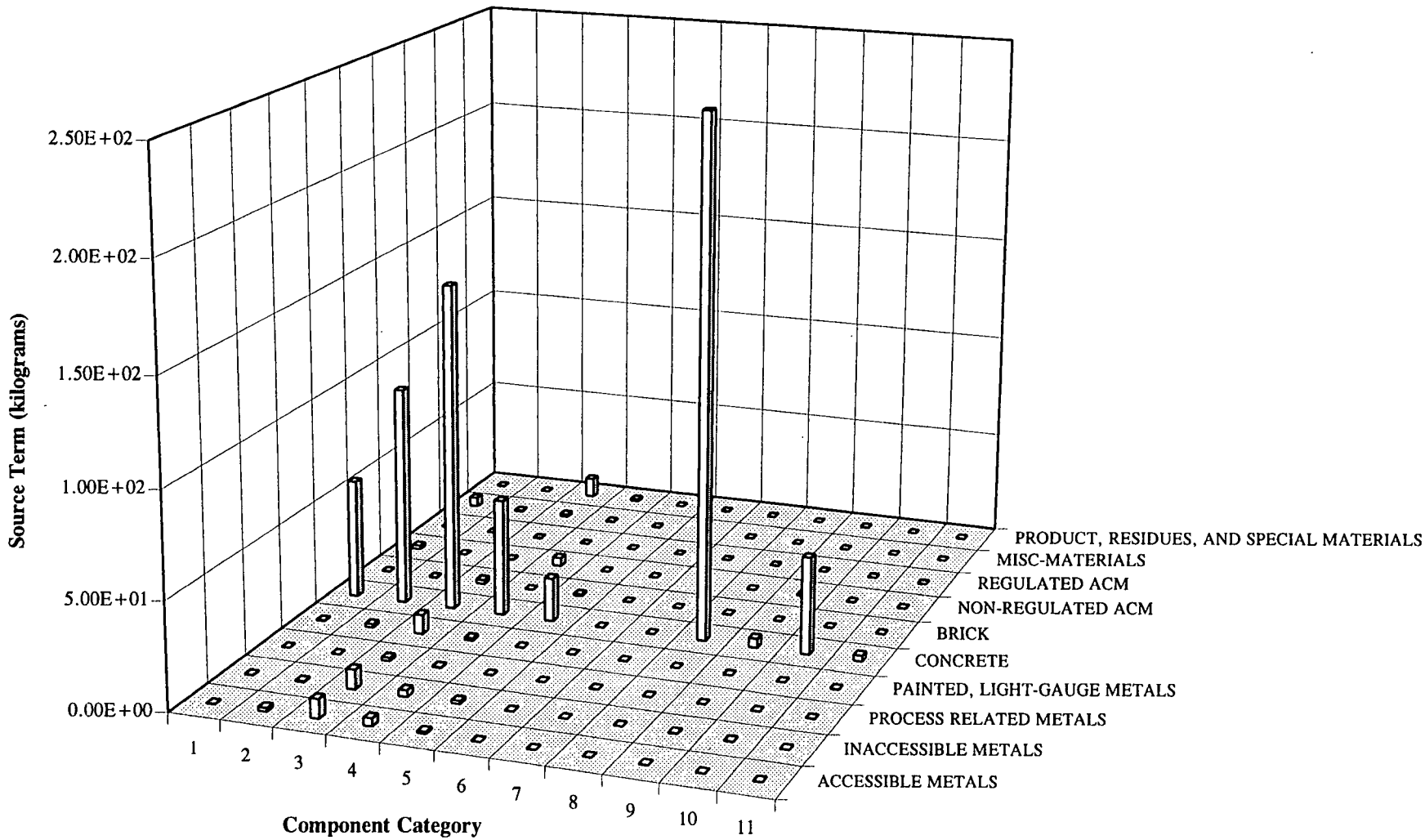

FIGURE 3-25
SOURCE TERM WEIGHTS BY COMPONENT/MATERIAL CATEGORIES FOR CADMIUM

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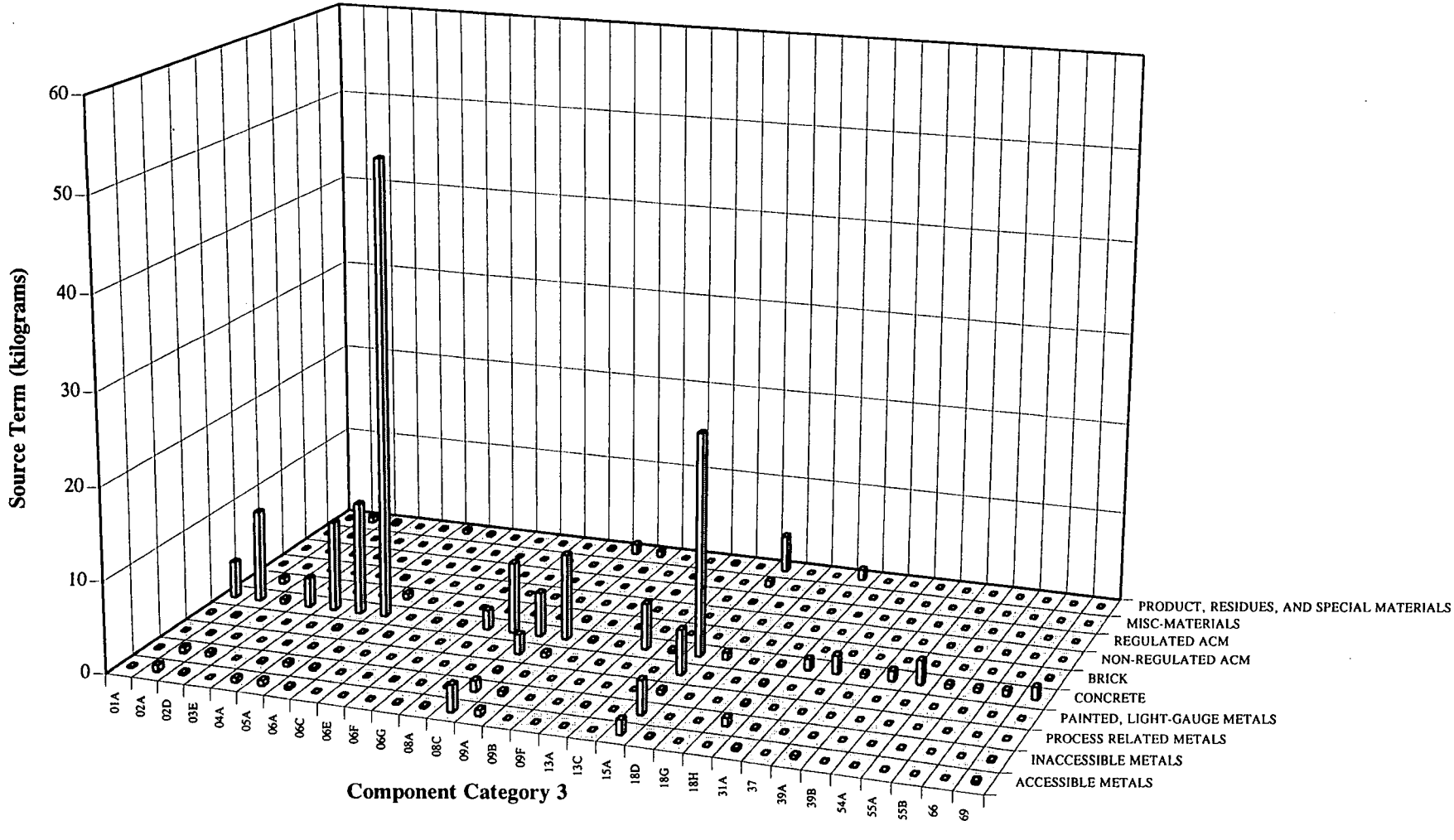

FIGURE 3-26
DISTRIBUTION OF CADMIUM SOURCE TERM BY COMPONENT AND MATERIAL CATEGORY FOR COMPONENT CATEGORY THREE

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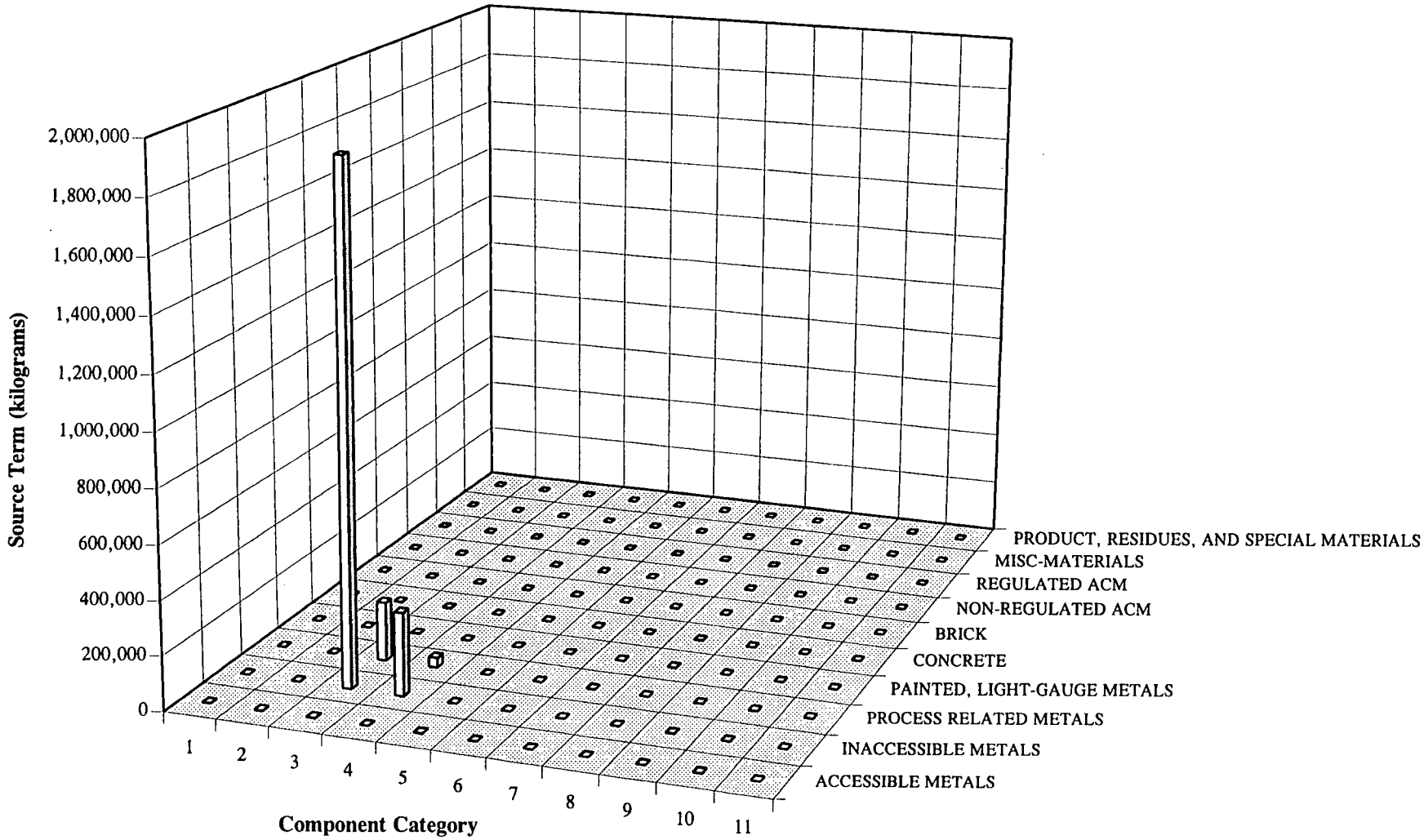

FIGURE 3-27
SOURCE TERM WEIGHTS BY COMPONENT/MATERIAL CATEGORIES FOR CHROMIUM

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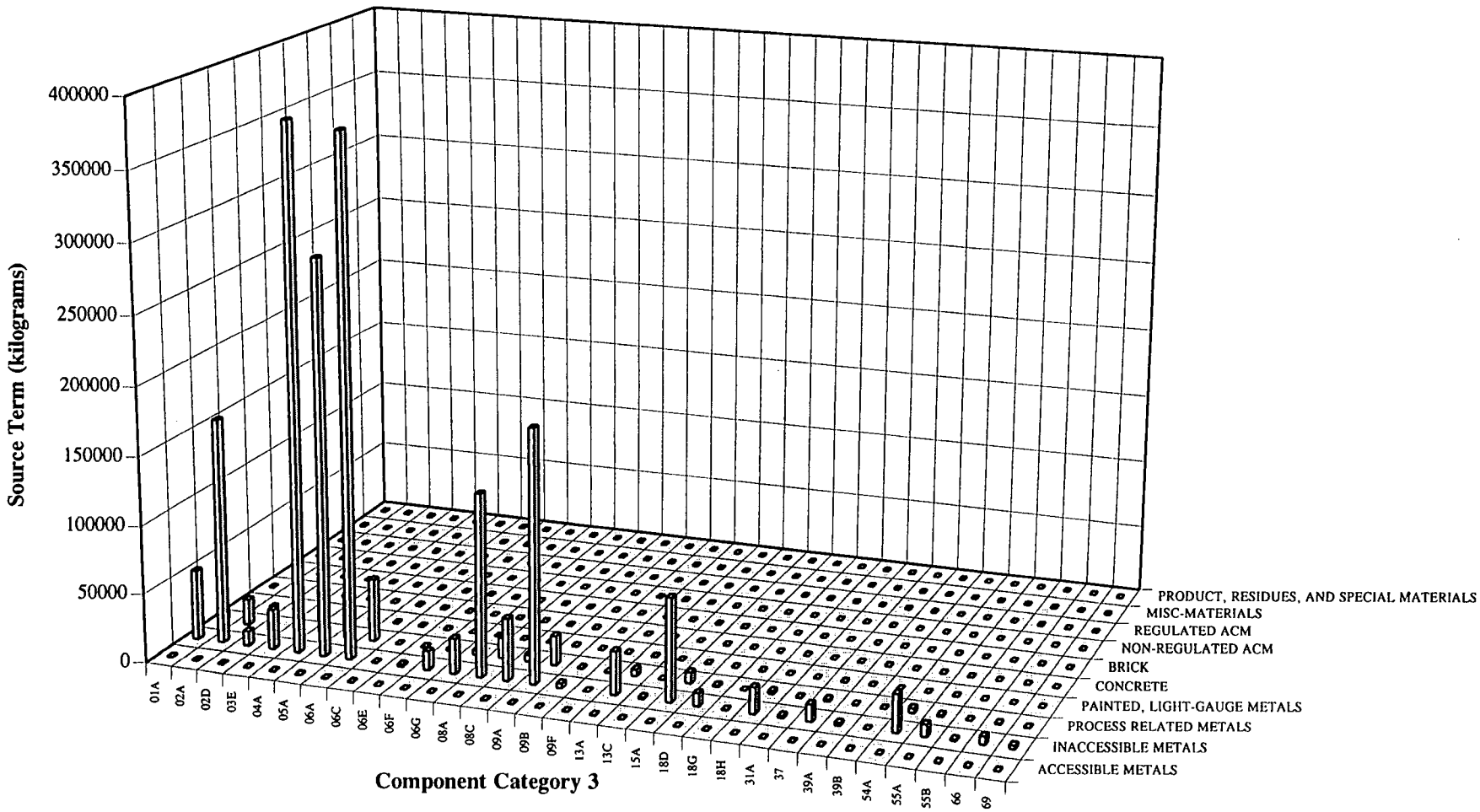

FIGURE 3-28
DISTRIBUTION OF CHROMIUM SOURCE TERM BY COMPONENT AND MATERIAL CATEGORY FOR COMPONENT CATEGORY THREE

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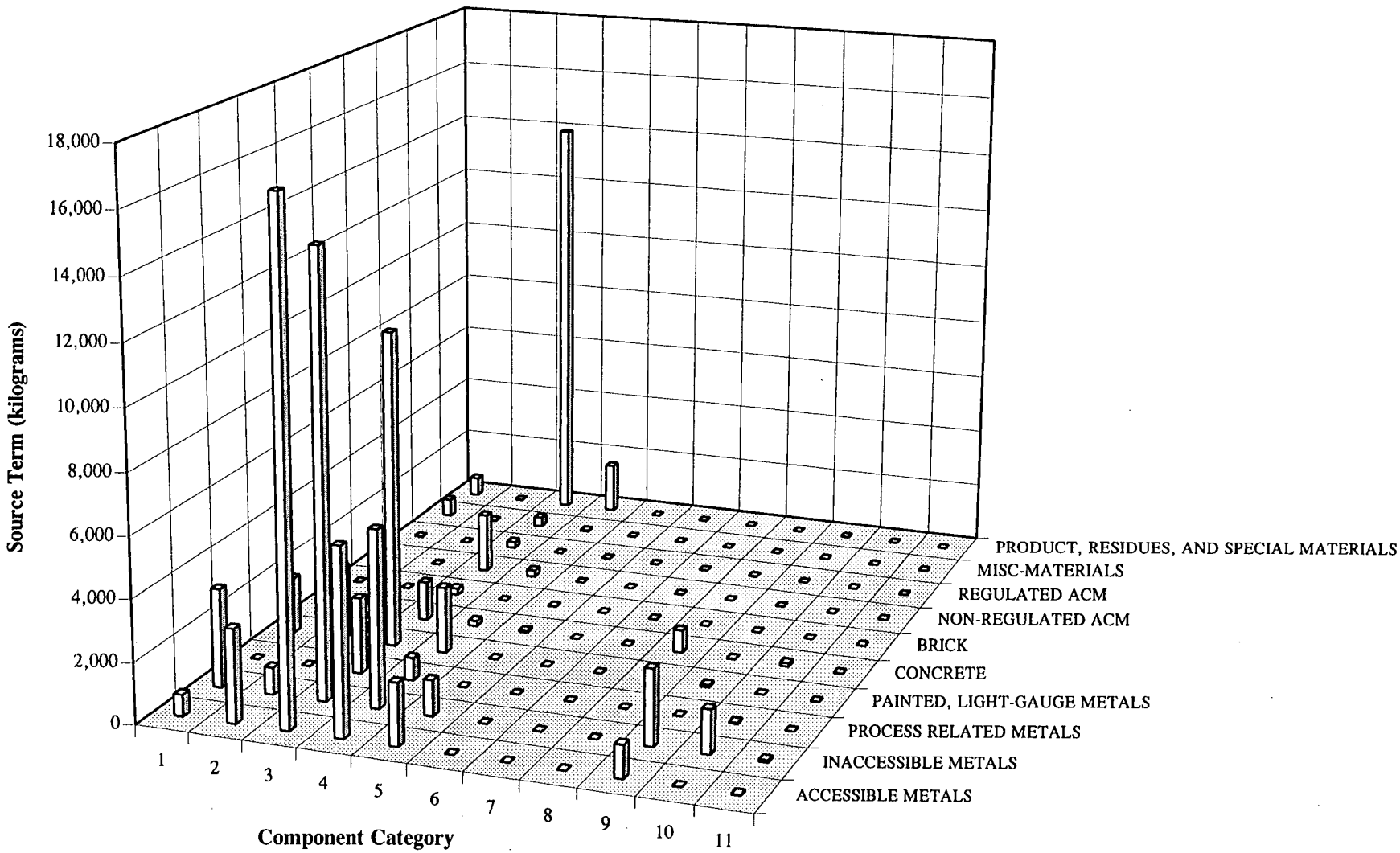

FIGURE 3-29
SOURCE TERM WEIGHTS BY COMPONENT/MATERIAL CATEGORIES FOR LEAD

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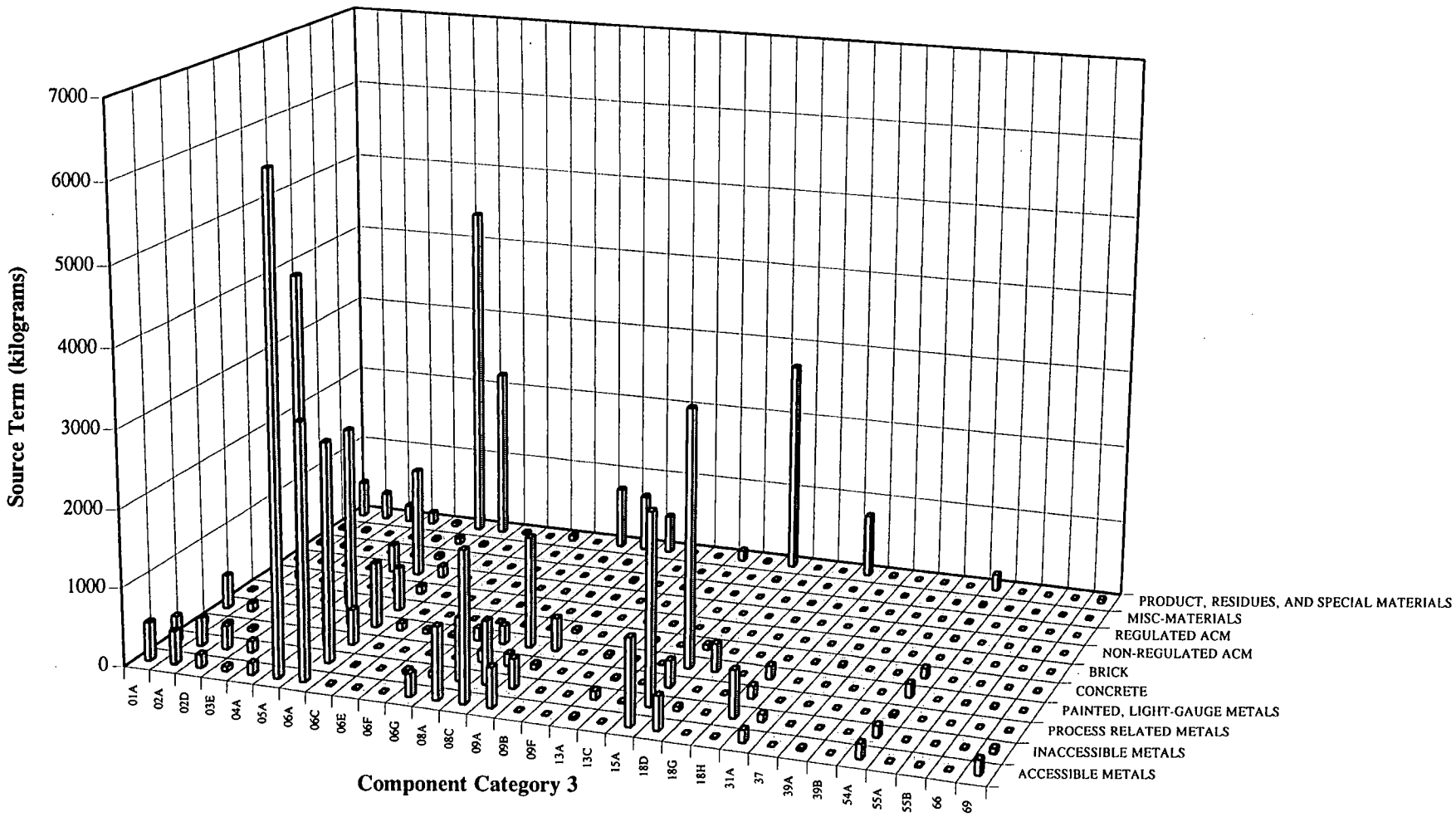

FIGURE 3-30
DISTRIBUTION OF LEAD SOURCE TERM BY COMPONENT AND MATERIAL CATEGORY FOR COMPONENT CATEGORY THREE

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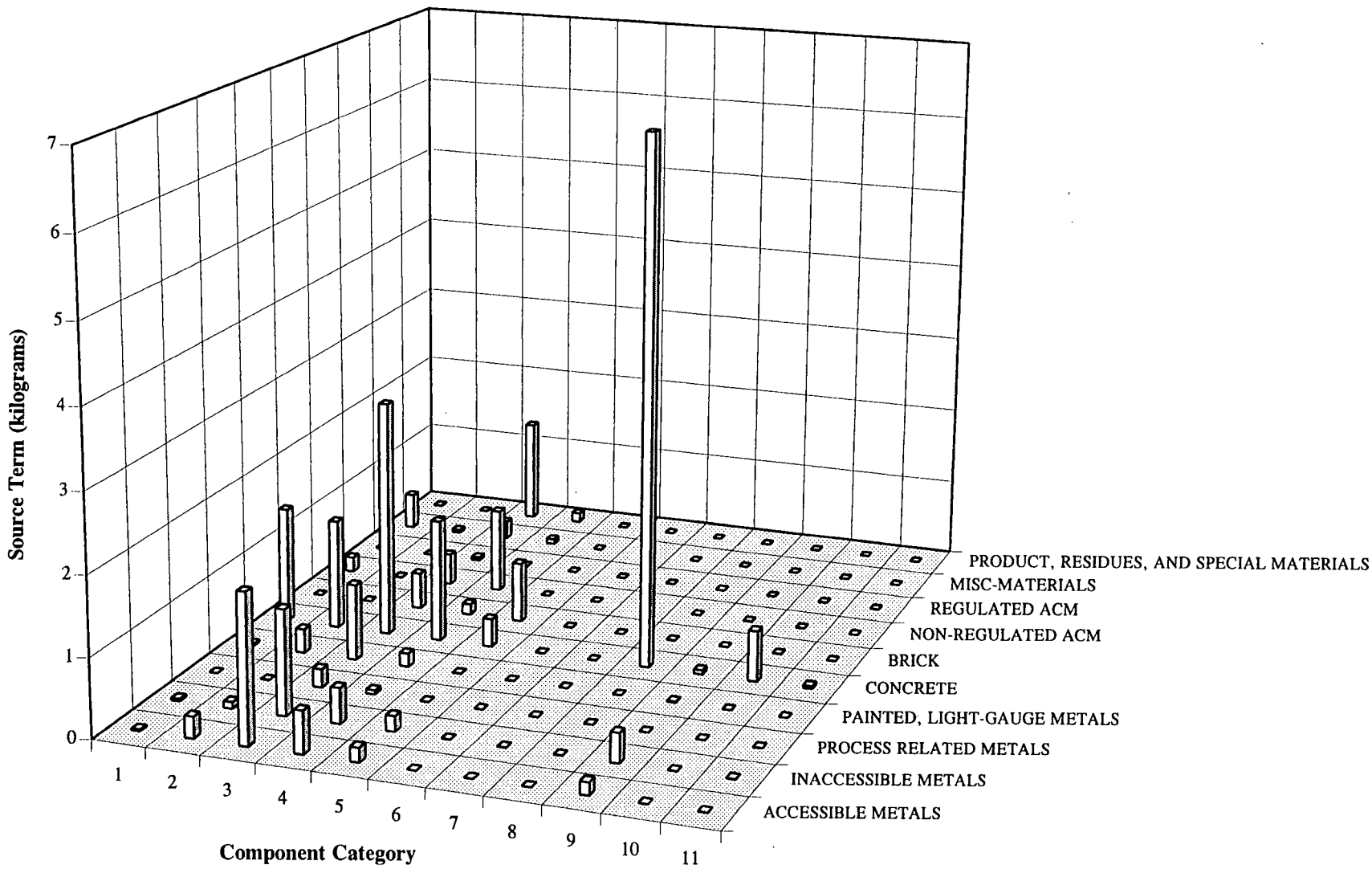

FIGURE 3-31
SOURCE TERM WEIGHTS BY COMPONENT/MATERIAL CATEGORIES FOR MERCURY

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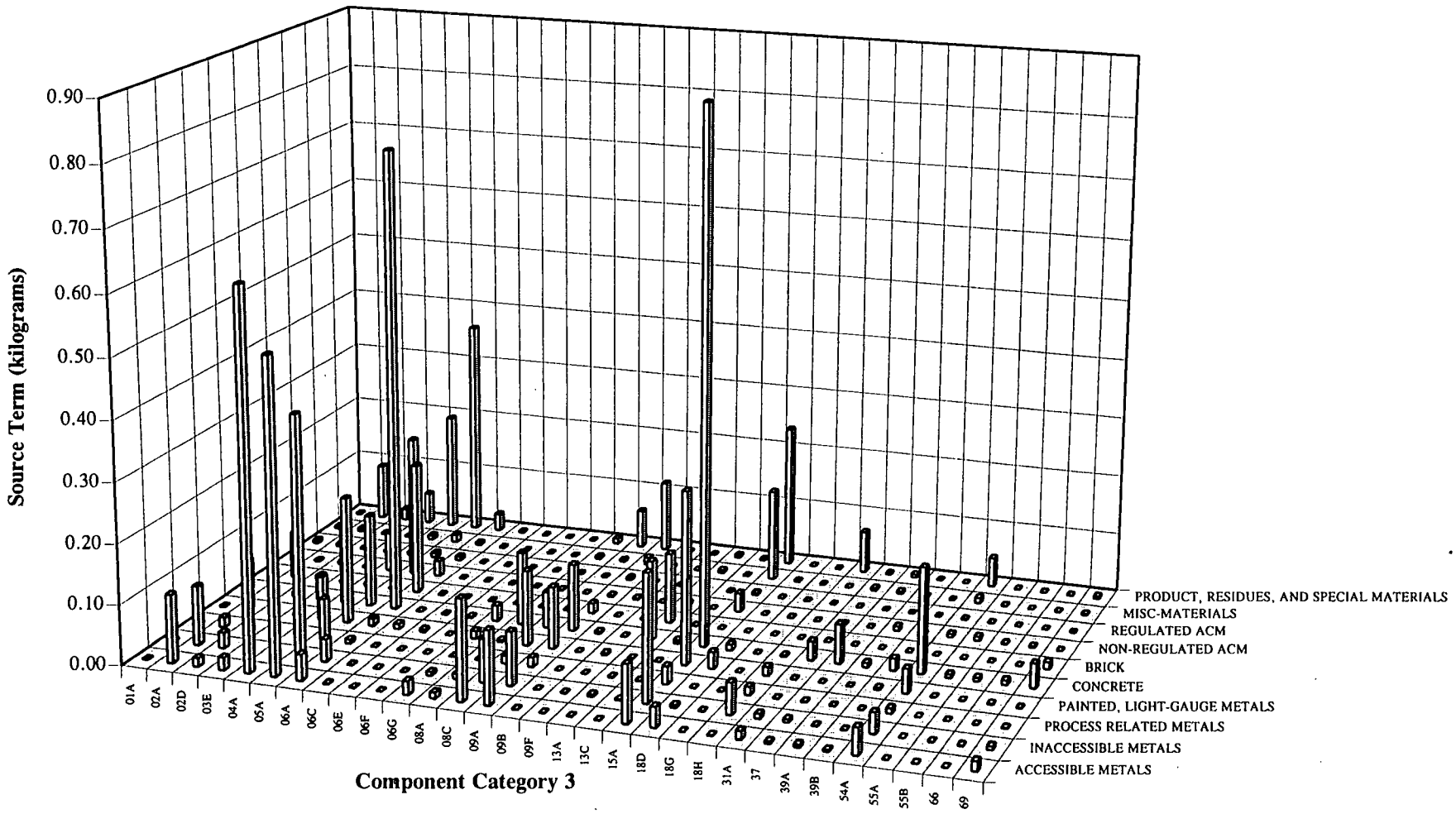

FIGURE 3-32
DISTRIBUTION OF MERCURY SOURCE TERM BY COMPONENT AND MATERIAL CATEGORY FOR COMPONENT CATEGORY THREE

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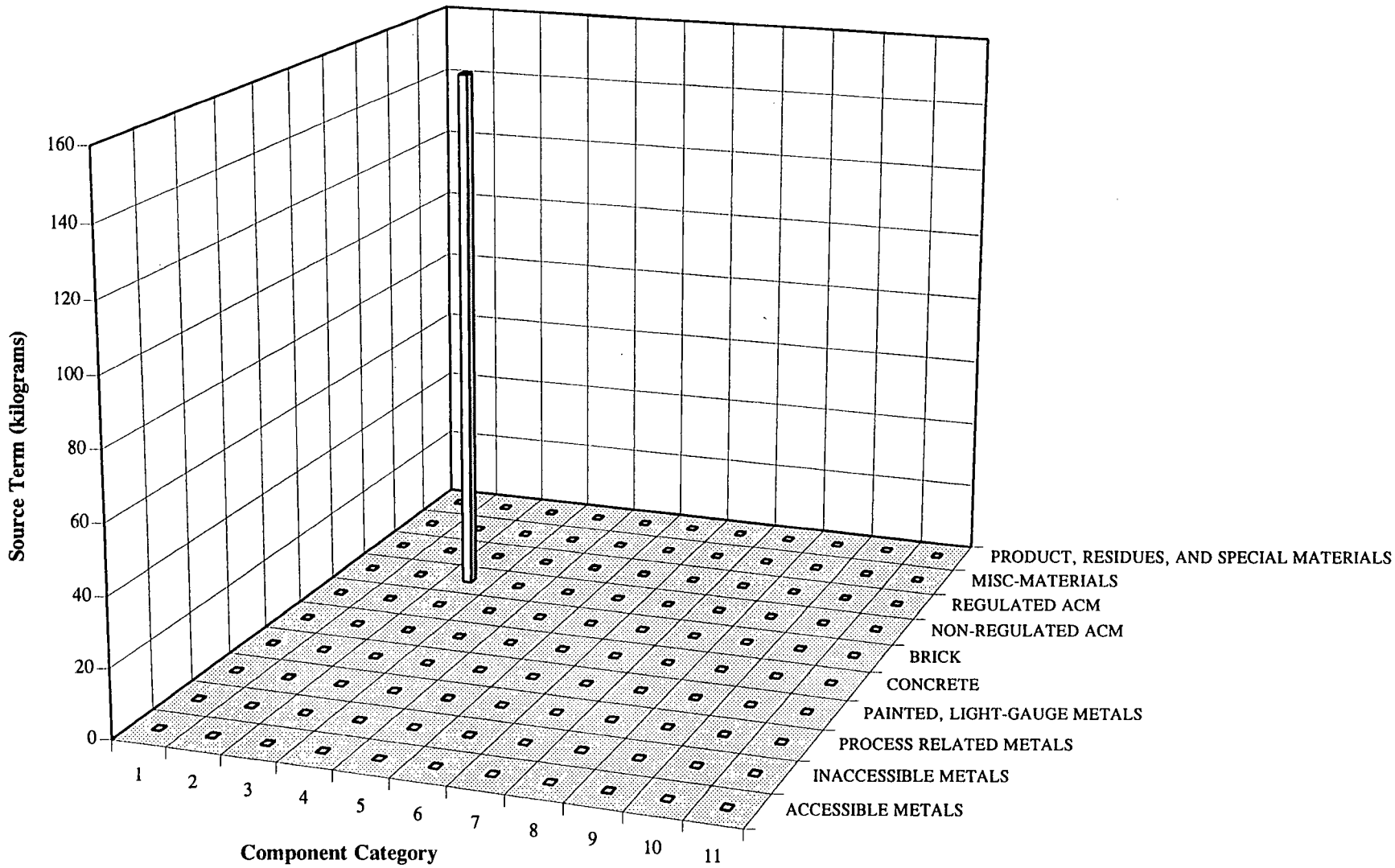

FIGURE 3-33
SOURCE TERM WEIGHTS BY COMPONENT/MATERIAL CATEGORIES FOR NITROBENZENE

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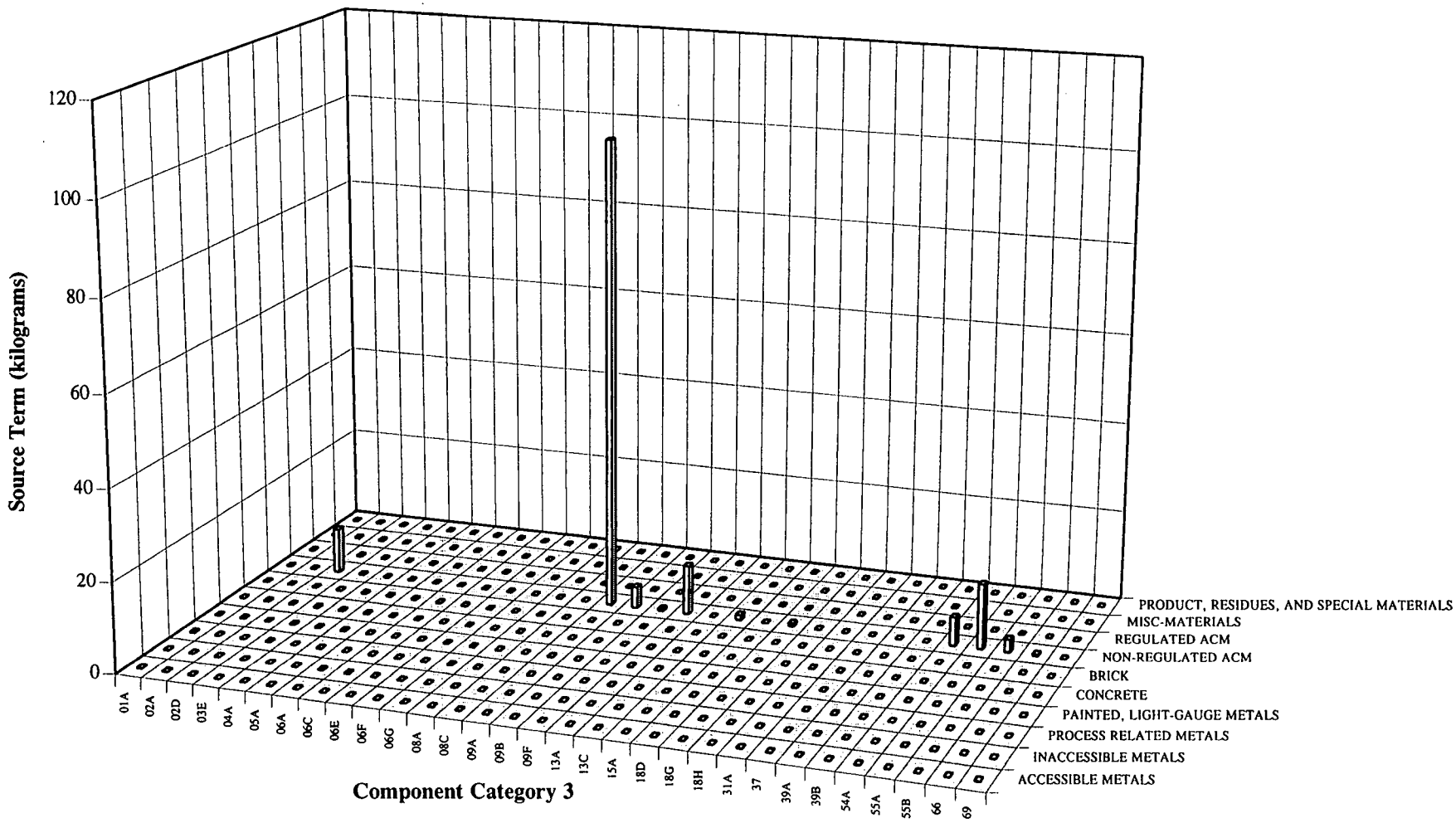

FIGURE 3-34
DISTRIBUTION OF NITROBENZENE SOURCE TERM BY COMPONENT AND MATERIAL CATEGORY FOR COMPONENT CATEGORY THREE

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Because OU3 remediation materials will consist of construction debris rather than traditional environmental media, many traditional treatment options are not applicable. Additionally, construction debris is, by definition, a solid waste and must be managed as such. Except for materials viable for unrestricted-release or recycling, debris generated by the dismantlement of an OU3 component must be managed as a waste (solid, hazardous, radiological, or mixed).

Any additional treatment of a material during the final remedial action would result in the further reduction of toxicity, mobility, or volume through the destruction of, or through the concentration of, contaminants into a secondary waste form. However, for OU3 materials, the resultant material would continue to be classified as a solid waste. Additional treatment would not produce complete removal of the radiological constituents for most materials because of the unique physical qualities of construction debris. This lack of complete decontamination would reduce the opportunity for recycling or reuse and would result in the continued regulated control of the materials.

4.3.2 Scenarios Requiring Further Treatment

Although additional treatment of the OU3 materials during the final remedial action will be on a supplemental basis, four scenarios have been identified where further treatment may be required. These scenarios are the drivers for the identification and evaluation of technology types and process options to be discussed in Section 4.4 of this report. The four scenarios identified for potential further treatment are as follows:

- Meeting criteria for unrestricted release to a commercial sanitary landfill,
- Recycling and,
- Meeting LDRs and WAC.

Further Treatment for Unrestricted Release

OU3 materials derived from the interim remedial action may be released on an unrestricted basis if confirmatory radiological screening and potential confirmatory sampling are conducted prior to release for disposal in a municipal sanitary landfill or a commercial construction debris landfill. Non-Porous materials would be required to meet unrestricted release criteria prescribed in DOE Order 5400.5. An evaluation will be performed within the final Remedial Design process to determine appropriate testing protocol to allow unrestricted release of porous materials subject to US and Ohio EPA approval. If areas of radiological contamination exceeding unrestricted release criteria were to be discovered during the confirmatory screening, then further treatment of the material would be

All materials will be evaluated for meeting the release criteria. However, it is anticipated that few materials from the former Production Area (materials associated with the uranium production period at the FEMP) will meet DOE material release criteria. Nevertheless, the materials within the Administrative Area, which have not been in contact with processing operations, are expected to meet the criteria. Within the Administrative Area, material Categories A (accessible metals), E (concrete), and I (miscellaneous materials) have the potential to be readily released for unrestricted disposition. These material categories have been identified as the only categories that exhibit at- or below-baseline levels of contamination, based on current data, as indicated in Table 3-26 of Section 3. Since baseline levels for these categories are less than DOE release criteria, it is assumed (for the purposes of this report) that only these volumes are eligible for unrestricted release.

The costs of screening materials for unrestricted release have been evaluated in Table E.1-2 in Appendix E of this report. These costs include screening of Category A, E, and I materials by a radiological technician, the oversight of the technician by a supervisor, and the transportation and disposal fees that would be incurred after unrestricted release eligibility is verified. Based on this estimate, it would be cost-effective to release Category A, E, and I materials from the Administrative Area, instead of placing them in an on-property disposal facility.

Further Treatment for Recyclingand Reuse

Table 4-2 presents recycling and reuse as ~~a~~ remedial technology types under the disposition GRA. Within these technology types, ~~recycling, there~~ are four ~~two~~ potential process options: restricted recycling, ~~and~~ unrestricted recycling, restricted reuse, and unrestricted reuse.

The extent to which recycling and reuse could be employed depends upon several factors, including economic feasibility, technical implementability, and marketability of the end product. Economic feasibility will typically be vendor-specific~~.~~ ~~For example,~~ ~~but~~ general rates have been developed based on recycling of steel from the Plant 7 Dismantling Project. Technical implementability will be based on the type of material, type and level of contamination, and available recycling technologies. Marketability includes the ability to sell or reuse the end product. This factor has the greatest influence on restricted recycling and restricted reuse. For these ~~this~~ options, the contaminated material would have to be used in a controlled environment. For example, surface-contaminated steel could be smelted and formed into volumetrically contaminated containers, for disposal of high-level waste, or shielding blocks for nuclear reactors. At this time, there are no such markets for these

materials. If such a market does develop, then the restricted recycling and restricted reuse of OU3 materials will be considered at that time.

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For the unrestricted recycling option, ~~the second option, decontamination for unrestricted recycling,~~ no OU3 materials other than Category A materials (Accessible Metal) are readily recyclable by this method because of material composition, recycling costs, and lack of marketability. Potential decontamination operations are suitable for Category A materials because of the structural carbon steel, accessible surfaces to allow easy surveying, and typically straight beams with limited bends. The cost of recycling Category A materials was compared to the cost of disposal. Current evaluations indicate that available recycling is not a viable option based on limited survey capabilities for inaccessible surfaces, few vendors performing recycling liability for release of materials, limited uses of contaminated materials, and prohibitively expensive recycling unit rates ~~a~~As detailed in Table E.3-1. While currently available cost data suggest recycling is significantly more expensive than disposal it should be noted that as new technologies or markets become available this could change. DOE also recognizes that, while cost is a driving factor in making project-specific recycling decisions, other factors such as stakeholder input are relevant and should be considered as well. DOE will continue over the life of the D&D of the Former Production Area to aggressively evaluate existing and emerging recycling technologies and markets to identify opportunities for cost-competitive application at the FEMP~~, the cost to recycle these materials is approximately 35 times the cost of on-property disposal and five times the cost of off site disposal. For OU3, recycling will be considered only when the cost is equal to or less than the cost of disposal.~~

Therefore, within Section 5, Section 6, and Appendix E of this document, recycling will not be considered for OU3 materials. However, treatment technologies to support the decontamination of materials will be identified, screened, and evaluated to allow for their possible inclusion into the final ROD for application if recycling becomes cost-effective compared to disposal.

As with recycling, current evaluations indicate that reuse is not a viable option. However, beneficial reuse opportunities will also continue to be evaluated throughout the action to minimize the quantity of materials to be disposed.

In addition to recycling, the beneficial reuse of materials is an option retained in this report (see Appendix D). DOE is committed to reusing materials generated from remediation activities to the maximum extent practical. Because of the potential future land uses retained within the OU5 ROD and the Fernald Citizen's Task Force Recommendation, the materials considered for potential reuse would have to be demonstrated as a "clean" material to support potential direct contact with members of the public.

For materials that can be demonstrated clean, potential reuse options include construction of permanent roads and use as rip-rap in the final site grading. The reuse of these materials will continue to be evaluated within each D&D complex implementation plan.

Further Treatment to Meet LDRs

As discussed in Section 1.1.3 of this report, the FEMP would utilize the RCRA Subtitle C Corrective Action Management Unit (CAMU) provisions to accommodate potential on-property disposal of RCRA wastes. Under this strategy, OU3 materials identified as RCRA characteristic wastes would be treated in accordance with the Site Treatment Plan to meet LDRs prior to placement in the ~~specific WAC that are deemed protective of human health and the environment would have to be met so that the waste can be placed in an~~ on-property disposal facility ~~in lieu of meeting LDRs~~. If the disposal of materials contaminated with RCRA-regulated constituents in an off-site disposal facility would result in unacceptable risks to human health and the environment, then these materials would be treated prior to placement in the ~~a~~ off-site ~~for~~ disposal facility. Treatment to meet LDRs would apply to both listed and characteristic RCRA-regulated constituents present in the OU3 material.

Table 3-26 identifies material categories and accompanying volumes of materials that have been classified as potentially hazardous or mixed wastes. These materials may require further treatment during the final remedial action to meet LDRs. Therefore, treatment technologies to support the treatment of OU3 materials to meet LDRs will be identified, screened, and evaluated.

Further Treatment to Meet WAC

As stated in the preceding section, Section 1.1.3 introduces the concept of meeting facility-specific WAC to disposition OU3 materials on-property or off-site. Appendices G and F of this report present the technical justification for using WAC as a basis for specifying the acceptable disposition of OU3 materials.

It is anticipated that any treatment required for materials to meet the on-property WAC will be applied during the interim remedial action. Materials that exceed the on-property level would be

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the OU1 and the OU4 remediation wastes are considered principal threat materials because of the nature and concentration of their constituents; treatment and off-site disposal has been selected as the remedy for these OUs. Also in accordance with this approach, relatively low concentration wastes and soils associated with OU2 and OU5 are being considered for on-property disposal. For OU3, the materials (Material Categories A-I) remaining within the scope of this RI/FS Report evaluation are predominantly low-impact materials. Potentially highly toxic or highly mobile wastes (Material Category J), representing the OU3's principal threats, are being addressed through existing removal actions and are therefore not addressed in this evaluation (see Section 1.2.2). Some hazardous and mixed wastes may be generated through D&D activities and will be addressed within each developed alternative.

Adopted remedies for the other OUs employ various waste disposal approaches and treatment technologies that are readily available and appropriate for the waste types and volumes that have been evaluated through the RI/FS process. For OU1, the remedy is to excavate and dry the pit contents and associated materials (e.g., pitliners and surrounding soils). The OU2 ROD and the draft OU5 ROD provide for the construction of an on-property disposal facility for waste materials meeting acceptance criteria. Materials exceeding the criteria for on-property disposal will be shipped to either a permitted commercial disposal facility or the NTS. For OU4, DOE has selected vitrification as the treatment technology for the silo contents and has initiated construction of a pilot vitrification plant. The pilot plant operations will be used to establish design criteria and process parameters for the full-scale facility which is expected to become operational in 1997. Vitrified materials are scheduled to be shipped to the NTS.

The site strategy for disposing of materials that contain RCRA-regulated constituents and that are subject to LDRs differs for on-property and off-site disposal (DOE 1995b). For on-property disposal of RCRA listed wastes, ~~or characteristic wastes,~~ the FEMP would use the CAMU provisions for defining compliance measures for the LDRs. Under this strategy, the remediation materials that are "remediation wastes" under 40 CFR 260.10 would be placed within the on-property disposal facility. Remediation materials identified as RCRA characteristic wastes would be treated in accordance with the STP prior to placement in the on-property disposal facility. The materials would also be required to meet specific WAC that are deemed protective of human health and the environment. This criteria refers to the maximum allowable contaminant concentration, or mass, that may be dispositioned in a particular manner. The numerical value of a WAC is specific to the material being dispositioned, the contaminant, the leachability of the contaminant in the material, and the degree to which the disposal

method must protect human and environmental receptors from additional exposure to the contaminant.

Materials that exceed the WAC for on-property disposal and are identified as listed or characteristic wastes would require further treatment in accordance with both RCRA and the FFCA, to meet LDRs. The treatment application could occur on-site, but would generally occur at an off-site facility. The material would then be dispositioned at an off-site facility.

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additional sampling would be performed, as needed, to effect proper characterization of materials when existing information is insufficient.

Consistent with the remedial action selected for each OU, cost-effective implementation of the sitewide remedy will require integrating efforts and using common, on-property facilities and treatment processes. The key interfaces among OU3 and the other OUs are discussed below.

5.2.2 On-Property Disposal Facility

As discussed in Section 5.2.1, OU3 materials include a high volume of low-contaminant-level material that is potentially suitable for on-property disposal in accordance with the sitewide balanced approach. The OU2 ROD and the draft OU5 ROD both provide for permanently disposing of excavated wastes and soils in an on-property disposal facility. Therefore, an expanded, common facility, located primarily east of the former Production Area, is proposed to accommodate all material slated for on-property disposal. In accordance with the sitewide remedial strategy, only materials that meet WAC could be accepted for disposal in the on-property disposal facility. The draft OU5 ROD has prescribed WAC for the environmental media to be placed within the on-property facility. During design of the on-property disposal facility, additional WAC may be developed that are applicable to OU3 materials. If additional WAC are developed, OU3 would implement these WAC in determining the acceptability of its materials for on-property disposal. Appendix G of this report details the development of WAC specified for OU3 materials proposed to be placed in the facility as well.

The proposed on-property disposal facility would be an above-grade cell featuring a multilayered capping system with a multilayered liner and leachate collection system. Based on currently available geological and hydrogeological data, the eastern area of the FEMP would be suitable for disposal facility construction. This area is on that portion of the property where the thickness of the subsurface gray clay is greater than 12 feet, residential wells are no closer than 1,000 lateral feet, and the site boundary is no closer than 300 lateral feet. The specific location for this facility is being determined during the OU2 remedial design process.

In general, the OU2 ROD and the draft OU5 ROD established the use of an on-property disposal facility, which requires a US EPA ~~separate~~ waiver of ~~from~~ State of Ohio solid waste disposal facility siting criteria [OAC 3745-27-07(H)(2)(c)and(d)] ~~requirements~~ for each OU. A waiver was granted to OU2 upon approval of its ROD. The granting of a waiver for OU5 is contingent upon the approval

potential migration of residual contaminants to air, surface water, and groundwater, and thus protect human health and the environment. The preliminary design of the proposed on-property disposal facility included OU3 remediation materials by increasing the capacity of the facility. Therefore, any on-property disposal alternative to be considered for OU3 will be based on the concept of a common, on-property disposal facility.

The common on-property disposal facility presents coordination issues that must be addressed in the development of the OU3 alternative for on-property disposal. Coordination issues include managing fill materials and OU3 debris remediation materials in proper proportions. The minimum required ratio of soil to debris would be approximately 2 to 1, to ensure proper compaction within the on-property facility. However, a 3 to 1 ratio is anticipated during actual on-property disposal activities. Therefore, adequate volumes of excavated soil and/or waste must be supplied through OU2 and OU5 remedial activities to facilitate OU3 material placement. ~~Otherwise, fill from other sources (off site supply) would be required; such an adjustment to the alternative would increase project cost estimates.~~ Because limited quantities of soils are available until the OU5 remediation of the former production area, OU3 materials may require interim ~~temporary~~ storage prior to placement in the on-property facility.

Additional coordination issues pertain to the size restrictions of material that may be scheduled to be placed into the on-property disposal facility. Size restrictions have been developed through sitewide coordination efforts. The sizing of OU3 materials that may be disposed of the on-property facility will be accomplished during the D&D phase under the IROD. The sizing criteria will be included as a project-specific design specification for the remediation subcontractor. Please reference Appendix G, Section G.3.2 and Table G-2 of this report for detailed information concerning material size restrictions.

5.2.3 Off-Site Disposal/Waste Shipment

As discussed in Section 5.2.1, further treatment and disposition of OU3 materials at an off-site disposal facility is an option. Therefore, the FEMP's waste shipment capacity, as well as the disposal facility's ability to accept this material over the expected duration of waste generation, must be considered in alternative development.

The respective, specific WAC for the off-site facilities are based on federal, state, and local laws and regulations, as well as on each facility's own requirements. Disposal facilities are restricted by

5.2.4 Institutional Controls and Post-Remediation Monitoring

For any necessary institutional controls and post-remediation monitoring elements, an on-property disposal alternative developed for OU3 will adopt measures stipulated in the OU2 ROD and the draft OU5 ROD. As discussed in Section 5.2.2, the basis of any OU3 on-property disposition alternative is the proposed FEMP on-property disposal facility. The OU2 ROD and the draft OU5 ROD specify the long-term institutional controls and the long-term monitoring measures for this facility. These measures include maintaining federal ownership, fencing the disposal facility, operating a groundwater monitoring network, and performing CERCLA five-year reviews. Since OU3 has no environmental media that will remain in place after the final remediation, the proposed OU2 and OU5 measures are anticipated to be adequate for OU3. Therefore, the adequacy of these institutional controls or post-remediation monitoring elements are not evaluated in this report.

5.3 STRATEGY FOR FINAL OU3 REMEDIAL ACTION

Because of its process history, and the magnitude and diversity of the materials that comprise it, mitigation of OU3's environmental threats requires a multiple-project approach that will terminate upon completion of the final remedial action. Projects preceding the final remedial action include the RCRA closures for HWMUs, CERCLA removal actions for releases and potential releases, and the interim remedial action for the D&D of OU3 components. The scope of these projects and their progress is discussed in Section 1.2.2.1. The following discussion outlines the general approach for developing the final OU3 remedial action alternatives in coordination with the OU3 multiple-program remedial strategy and for incorporating aforementioned projects into the final OU3 remedy. Key elements of the OU3 treatment and disposition strategy pertaining to integration with the interim remedial action are also addressed.

5.3.1 Remedial Strategy for Operable Unit 3 Remediation Material/Waste Streams

In summary, the OU3 RAOs call for the dispositioning of all materials remaining from the interim remedial action in a manner that restricts risks to human health and the environment to acceptable limits, as defined by the US EPA. The specific RAOs provide a framework for implementing a selected OU3 final remedial alternative. A selected remedy must comply with all ARARs, as required by CERCLA. Additionally, to evaluate conformance with the RAOs and ARARs, the identified alternatives for OU3 are developed based on remediation material categories, as discussed in Section 3 of this report.

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As discussed in Section 3, the OU3 material categories are based on the physical properties and/or configurations of the materials. Section 3.6.4 provides a further breakdown of these materials by segregation category, based on regulatory waste classification (i.e., hazardous waste, LLW, etc.). The material and segregation categorization serves as a waste management tool to determine any additional treatment and the material-specific disposition pathway. For each material category, comparisons are made of segregation categories against the criteria for on-property and off-site disposition to develop the remedial alternatives.

Figure 1-5 of this report shows the overall remediation approach that correlates the disposition of the materials from the OU3 component categories, established in the WPA (DOE 1993a), with ongoing remedial programs. The storage, treatment, and disposition of materials in Category J (Product, Residues and Special Materials) are within the scope of various ongoing removal actions and programs. These programmatic removal actions (Removal Actions Nos. 9, 12, 17, and 26) are not evaluated in this report but will be incorporated into the OU3 final remedial action. The remediation materials in Categories A - I, consisting of building materials and miscellaneous construction debris, constitute approximately 80 ~~75~~ percent of the OU3 material volume. These materials constitute the material/waste streams for which disposition alternatives are developed and evaluated.

RCRA requirements for closure of specific HWMUs in OU3 will be integrated with CERCLA remedial activities. The hazardous wastes generated by closure activities at these HWMUs during the OU3 D&D phase will fall within the Categories A - J. RCRA-regulated waste may require additional treatment during the final remedial action to comply with LDRs. This additional treatment would be consistent with that identified in the FEMP STP, for a particular hazardous/mixed waste, and the FFCA.

Since on-property disposal remedies have previously been developed for OU2 and OU5, the potential alternatives featuring on-property disposal for OU3 will be partially defined by the conditions under which OU2 and OU5 have established the facility acceptability. Therefore, it is not necessary to develop another alternative, in this report, based on the design and construction of a separate disposal facility for OU3 materials, provided it can be demonstrated that protection is achieved through placement of materials in the proposed, on-property facility. Additionally, the development and evaluation of institutional controls and monitoring elements suitable for the selected post-remediation land use objective are not necessary in this report, as these issues have been adequately addressed by the OU2 and OU5 selection process for the on-property disposal remedy. However, issues of

coordination regarding interaction of the various OU3-specific activities and interaction of OU3 activities with those of other OUs are considered.

5.3.2 Integration of the Interim and Final Remedial Actions

The scope of the interim remedial action consists primarily of D&D and interim storage of, and limited off-site disposal of, nonrecoverable/nonrecyclable materials. Remediation materials generated by ongoing D&D projects would be either stored on an interim basis or transported directly to a disposal facility. Once the disposition remedy is selected in the OU3 ROD, requirements specifically related to the selected remedy will be integrated into the remainder of the interim remedial action to allow effective segregation of materials to meet the requirements of the selected treatment and/or disposal option.

The current OU3 remedial action project schedule, which is based on a ten-year, $276 million annual budget scenario ($276 million case), specifies initiation of the OU3 interim remedial activities in 1995 and approval of the OU3 final ROD in November 1996. The implementation of the selected remedy in the final ROD would then begin in 1997 and would continue concurrently with the interim remedial action until 2005.

The $276 million case ~~ten year schedule~~ was developed in the spring of 1995 as a proposal, from the DOE to the United States Congress, to accelerate the remedial activities at the FEMP. The proposal requested the appropriation of remedial action funds in the amount of $256 million in Fiscal Year 1996, and $276 million for each of the nine years thereafter, to complete an accelerated cleanup of the FEMP. All cost, risk, and alternative evaluations in this report are based on this scenario.

It should be noted that, prior to the adoption of the $276 million case ~~ten year plan~~, a schedule for the OU3 interim remedial action had been prepared in the OU3 PSR for the above-grade D&D of OU3 components. The PSR was a requirement of the Final OU3 RD/RA Work Plan for Interim Remedial Action (DOE 1994g) to satisfy the ACA requirement for scheduling the implementation of RD/RA tasks during the OU3 interim remedial action.

The PSR had specified a duration of 31 years for the interim remedial action based on anticipated reductions in DOE project funding. The final remedial action, therefore, would have had a 31-year schedule as well. If remediation funds were to be reduced during the expected ten-year remediation effort, the project duration might possibly be increased. If so, the cost and risk evaluations in the

PSR may be drawn upon to provide guidance for D&D sequencing and remediation materials disposition.

As stated above, $276 million case ~~the ten year remediation~~ specifies initiation of the OU3 interim remedial activities in 1995. These actions would commence with the D&D of the above-grade elements of Plant 4A and would continue with the D&D of the remaining above-grade components until 2003. The removal of the below-grade OU3 elements would begin in 1999 and would also continue until 2005.

An estimation of OU3 remediation materials that would require interim storage is presented in Table 5-1. Interim storage would be required because the commencement of the final remedial action would not occur until calendar year 1997. These materials would be generated from the D&D of Plant 4A beginning in 1995. The respective D&D of Plants 1A and 9A would then follow beginning in late 1995 and ending in late 1996 or early 1997.

In addition to the materials from the D&D of Plants 1A, 4A, and 9A, materials that were generated during the D&D of Plant 7A under Removal Action 12 will also require interim storage. These materials will consist of structural steel members that have returned to the FEMP from an off-site commercial recycler. The volumes of the Plant 7A materials requiring interim storage have been included in Table 5-1.

The material volumes presented in Table 5-1 have been calculated as unbulked and bulked. The materials proposed for placement in the on-property disposal facility or a representative commercial facility have been estimated in unbulked volumes. An unbulked volume is defined as the volume of a material in its smallest reducible form without continuous physical manipulation (e.g., pressurization) to maintain its size. Unbulked volumes are used for these disposition options because it is anticipated that all void space around the unbulked materials would be filled via soil backfill and compression measures.

The materials that may require disposal at the NTS have been estimated in bulked volumes. These volumes were derived by multiplying the corresponding unbulked volumes by a bulking factor. The bulking factors represent the anticipated increase to the volume of materials as a result of containerization. The bulking factors used for these estimates were originally derived from the OU3 PP/EA and were periodically updated during the compilation of this report.

Depending on the disposition decision, requirements to support the final remedial action would be incorporated into the interim remedial action. The selected alternative for the final remedial action of OU3 will require integration with the ongoing interim remedial action to ensure the coordinated remediation of the buildings and structures. This coordination will occur within the implementation plan for each D&D complex. Some of these coordination activities are currently ongoing. For example, on all future implementation plans (Plant 9/Thorium complex and after), the RI/FS size constraints as detailed in Appendix G will be utilized as the sizing requirements for all materials generated by the D&D subcontractor. Additionally, the Plant 9/Thorium complex implementation plan is in the process of being modified to address the surface concrete removal in process areas 2 and 4. The implementation plan for each D&D complex will be modified as appropriate to incorporate the future selected remedy in the OU3 final ROD. ~~The material configuration and size restrictions (i.e., WAC for disposal facility) required by the selected remedy would be incorporated into the remaining D&D projects.~~

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In addition, the types of containers identified to support the final remedial action would be integrated into the remaining D&D projects. The configuration of remediation materials in interim storage would vary by material category and selected remedy. The potential configurations include various containers and controlled stockpiles. Descriptions and capacities of the various containers used at the FEMP are provided in Table 5-2. Depending upon the density of the materials to be containerized, each container can be limited by material volume or weight. For example, a piece of processing equipment (e.g., a furnace) may occupy greater volume than the same weight of concrete.

A key integration factor is the potential for certain D&D techniques (e.g., waterwash and scabbling) to precede a given disposition pathway for a remediation material. Once the final remedy is selected, the disposition would be considered in the development of design specifications to guide a remediation subcontractor toward appropriate dismantling techniques.

5.4 DEVELOPMENT OF ALTERNATIVES

This section discusses OU3's preliminary alternative development and screening process. The remedial alternatives address the remediation of 7,540,000 ~~7,500,000~~ ft^3 of material in Categories A - I. Category J materials, totaling 1,730,000 ~~1,800,000~~ ft^3, are addressed by existing programs and are not evaluated in this report. Preliminary alternatives are developed and assembled from the process options and technologies identified in Section 4 to achieve the RAOs. Typically, preliminary alternatives are initially screened against the short- and long-term aspects of effectiveness, implementability, and cost to reduce the number of alternatives that undergo an extensive detailed analysis. As discussed in Section 1.2.2, the submittal of a separate Initial Screening of Alternatives Report for OU3, was eliminated. Had an Initial Screening of Alternatives document been prepared, it would have consisted of the screening of technologies, the identification of alternatives, and the screening of alternatives. For OU3, the technologies screening described in Section 4 and Appendix D, along with the identification of alternatives in this section, satisfies the requirements for an Initial Screening of Alternatives Report.

The results of the technology screening and evaluation process indicate that there are few applicable technologies for containment and treatment response actions, as well as limited disposition technologies. A response action based on material containerization and long-term storage is not appropriate because of administrative requirements of the IROD, which specifies that OU3 remediation materials are not to be kept in an interim storage configuration for an extended period of time. Although many treatment technologies have been retained, most materials will not require

additional treatment prior to final disposal. The portion of OU3 materials that may require further treatment to meet the selected disposition criteria has been identified. As stated in Section 5.3.1, treatment technologies for hazardous and mixed waste materials will be in accordance with the FEMP STP and the FFCA.

Revised preliminary alternatives, presented in the modification to the WPA (DOE 1993a), were based on the interim remedial action and the roles of treatment and disposal in managing OU3 remediation materials, as discussed in Section 5.2.3. The three revised preliminary remedial action alternatives are:

- No further action,
- On-property disposal, and
- Off-site disposition.

~~In accordance with the IROD, materials from the dismantling of the former production facilities will not remain in on-property, interim storage for an indefinite time.~~ Although the "no further action" alternative cannot be implemented, it provides a baseline for comparing alternatives. Each of the two action alternatives feature recycling and unrestricted release options, when practical, as well as additional treatment, when necessary, to meet criteria for disposal. In addition, for the on-property disposal alternative, an option for off-site disposal of materials that do not meet the on-property disposal criteria is included.

The material volumes to be dispositioned during the final remedial action have been estimated in the FEMP SWIFTS database. The SWIFTS database is the official FEMP database for material estimates and is periodically updated with improved estimation data.

5.4.1 Identification of Alternatives

Although the two action alternatives primarily address on-property and off-site disposal options, the following approaches are used to develop the final alternatives.

- Recycling and unrestricted release of OU3 materials is used when practical;
- Additional treatment is applied when necessary to meet the criteria for off-site disposition at the representative commercial disposal facility; and

- Continuation of the soil and debris storage program for management of debris generated by D&D of OU3 (Removal Action No. 17);

- Continuation of the asbestos abatement program to mitigate potential release and migration of asbestos (Removal Action No. 26);

- Closure of HWMUs, as listed in Appendix K, under the integrated RCRA/CERCLA process; and

- Treatment and disposal of soil piles consistent with the draft OU5 ROD.

Elements also common to both Alternatives 2 and 3 include:

- Unrestricted release of materials meeting release criteria, as established by DOE Order 5400.5, if an appropriate disposition mechanism is available (i.e., material meets commercial landfill acceptance criteria or can be recycled),

- Possible additional treatment of materials to further reduce the mobility, volume, or toxicity of residual contaminants to allow the disposition of materials at the representative commercial disposal facility,

- Controlled recycling of materials that meet criteria for recycling/reuse of materials while maintaining radiological controls (i.e., metal recycling for use within the DOE complex), and

- Absence of a comprehensive recharacterization program conducted to support material segregation during the RD and RA phases.

5.5 DESCRIPTION OF ALTERNATIVES

This section will describe the three alternatives developed for final remediation of OU3. The following subsections will match disposal options with the series of representative technologies, or technology schemes that provide the best programmatic balance of trade-offs (e.g., on-property disposal versus off-site disposal).

The alternative descriptions and costing within this RI/FS are based on materials derived from the interim remedial action based on the $276 million case ~~a ten year schedule~~. Figure 5-1 presents a comparison of schedules for Alternatives 2 and 3.

5.5.1 Alternative 1 - No Further Action

CERCLA requires evaluation of a no-action alternative, which implies no further action even if some remedial activity has already occurred, to provide a baseline against which other remedial alternatives can be evaluated. For OU3, the No Further Action alternative represents the condition that results if

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Based on the $276 million case ~~scenario~~, the OU3 interim remedial action will start in 1995 and require approximately ten years to complete. Although the federal government will still own the FEMP when the interim remedial action is completed in 2005, the No Further Action alternative assumes that maintenance of the interim storage facilities would be terminated. These facilities and containers storing the OU3 remediation materials would no longer be maintained and eventually would deteriorate. The result would be exposure of the remediation materials to the elements, potential exposure to trespassers, and release of contamination to environmental media.

In the IROD, DOE determined, and the EPA concurred, that the interim storage of OU3 materials would not be permanent (DOE 1994a). Actions to safely and permanently dispose of OU3 remediation materials must be taken under the final ROD. This alternative is retained throughout the detailed analysis of alternatives as a baseline to support the comparative evaluation of the action alternatives.

5.5.2 Alternative 2 - Selected Material Treatment, On-Property Disposal, and Off-Site Disposition

Under Alternative 2, a majority of the OU3 remediation materials would be permanently disposed of at the FEMP by placement in an on-property disposal facility along with excavated materials generated by the remediation of OU2 and OU5. Criteria for the disposal of OU3 materials in the on-property facility was developed through contaminant fate and transport modeling based on conservative assumptions, as discussed in Appendix G. Remediation materials will be evaluated based on material category and the associated mass of each COC to determine a range of least-cost disposition options, beginning with unrestricted release and ending with off-site disposal. Materials that do not meet the criteria for unrestricted release, recycling, or on-property disposal would be permanently dispositioned of at an off-site disposal facility.

As discussed in Section 5.2.3, two off-site disposal facilities (the NTS and a representative commercial disposal facility) have been identified to potentially accept OU3 remediation materials that exceed the on-property disposal facility criteria. The NTS currently accepts only FEMP materials contaminated with LLW constituents. The representative commercial facility is licensed for the disposal of naturally occurring radioactive material (NORM), LLW, and mixed waste (MW). This facility also holds a RCRA permit allowing treatment and disposal of solid mixed waste that requires stabilization to meet LDRs. A summary of the representative commercial disposal facility WAC is presented in Table 5-4, further information on disposition requirements and criteria is provided in Appendix F.

To reduce the quantity of material requiring permanent disposal at the on-property disposal facility, the representative commercial disposal facility, or at the NTS, unrestricted release, in accordance with DOE Order 5400.5, or recycling would be employed if cost-effective and technically feasible. Materials released for unrestricted use could be reused at the Fernald site or within the DOE complex or dispositioned to a commercial recycler or a commercial sanitary landfill. Beneficial reuse opportunities will continue to be evaluated throughout the action to minimize the quantity of waste to be disposed.

Key elements of Alternative 2 are summarized below:

- Provide for unrestricted release of materials for recycling, reuse, or disposal at a commercial landfill;
- Administratively designate the off-site disposition of Category C (Process-Related Metals) and Category F (Brick) materials;
- Remove materials as necessary to achieve the mass-based WAC for technetium-99 and dispose of off-site; ~~Remove material that is above the allowable technetium-99 mass limit and dispose of off-site;~~
- Dispose of all remaining materials in the on-property disposal facility;
- Treat materials, where required, to meet the off-site disposal facility WAC;
- Characterize and monitor material when required to support final disposition selection;
- Adopt institutional controls through deed restrictions and access controls as specified in the OU2 ROD and the draft OU5 ROD;
- Adopt post-remediation activities also specified in the OU2 ROD and the draft OU5 ROD that provide:
  - Long-term monitoring and maintenance of the on-property disposal facility, and
  - Groundwater monitoring to evaluate the performance of the disposal facility;
- D&D any support facilities no longer needed with disposal as appropriate.

5.5.2.1 Detailed Description of Alternative 2

The following description of Alternative 2 is based on conceptual design. The level of engineering detail provides documentation to estimate costs and evaluate the alternative. This alternative would rely on coordination with other FEMP OUs to provide for certain elements, including design,

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Costs of these elements are estimated on a unit-cost basis or a prorated cost for OU3. If this alternative is selected, the substantive components of the design will be finalized during the remedial design phase consistent with the ROD. The key elements of Alternative 2 are described in further detail below.

Remediation Material Flow

The major efforts regarding remediation material flow under Alternative 2 would be 1) material segregation, containerization, and tracking, 2) on-property disposal, 3) off-site shipment, 4) possible further material treatment, and 5) off-site disposal. These final remedial action efforts would occur concurrently with, and would be fully integrated with, the interim remedial action. Specifically, the material segregation and containerization necessary to support the Alternative 2 disposition activities would be carried out as part of the interim remedial action to promote efficiency and minimize risks through double handling of materials. In general, all material transportation, treatment, and disposition activities occurring after materials leave the D&D work area would fall within the scope of Alternative 2. Based on the current D&D schedule, it is anticipated that the interim storage facility would only be utilized for storage of Plant 4A, 7A, 1A, and 9A remediation materials generated before the on-property disposal facility is completed (See Section 5.3.2).

During the $276 million case ~~ten-year schedule~~ for the OU3 interim remedial action, approximately 7,540,000 ~~7,500,000~~ ft^3 (unbulked) of remediation materials (Material Categories A - I) would be transported from the D&D project work zones to the interim material storage areas or directly to shipment and/or disposal operations. A breakdown of the projected dismantlement sequence is provided in the ten-year schedule. Figure 5-2 provides a summary of the projected Category E (Concrete) material to be generated annually during the ten-year D&D time frame. Figure 5-3 provides a summary ~~summery~~ of the remaining material categories to be generated annually during the ten-year time frame. Table 5-5 provides a summary of projected disposition of unbulked remediation materials by segregation category and material category based on the RI field characterization results. The classification of materials as discussed above reveals that 91 ~~86~~ percent of the materials on a volume basis, or 6,830,000 ~~6,300,000~~ ft^3, meet the criteria for on-property disposal. Of the remaining approximate volume of 715,000 ~~1,200,000~~ ft^3, 174,000 ~~214,000~~ ft^3 would exceed the on-property criteria and would require off-site disposal, whereas 541,000 ~~986,000~~ ft^3 are anticipated to meet DOE criteria for unrestricted-release and this could be dispositioned in a commercial sanitary landfill.

Materials would be handled and stored in accordance with site standard operating procedures ~~Site Standard Operating Procedure 0044, Management of Excess Soil, Debris, and Waste from a Project~~. Materials in staging, transportation, or storage areas would be segregated, based on anticipated disposition, and would be stored in multiple configurations, including stockpiles and containers (LMBs, ROBs, WMBs).

All remediation material containers would be tracked through SWIFTS. Under this system, each container used in the disposition of remediation material would be assigned an inventory identification number. When a container is filled, information pertaining to the container, the material, and its disposition would be entered into SWIFTS, which is an integrated ORACLE database system. SWIFTS provides "cradle to grave" tracking of materials and containers through routine input of data. This system can provide status of the containers and contents while stored on site until disposition occurs.

On-Property Disposal

The information presented in this section has been developed as a result of the OU2 on-property disposal facility design efforts. The information portrays a feasible approach for designing and constructing an on-property disposal facility. It should noted that the OU2 design process is ongoing and will modify, refine, and finalize the design considerations for the on-property disposal facility. The current on-property facility information will be used for the evaluation of remedial alternatives in Section 6 of this report.

The FEMP on-property disposal facility would be designed as an above-grade unit to provide permanent disposal for affected soils, wastes, and materials generated by site remedial actions, including the OU3 interim remedial action. Containment of materials in the facility would minimize the potential for direct contact or incidental ingestion/inhalation of residual contaminants. It would also prevent migration of contaminants to air and surface water, and would protect groundwater for a period of a minimum of 200 years and a maximum of 1,000 years. Since the FEMP is situated over the Great Miami Aquifer, which is a sole-source drinking water aquifer, the placement of OU3 materials in the on-property facility would require a US EPA waiver of ~~from~~ State of Ohio solid waste disposal facility siting ~~requirements~~ criteria [OAC 3745-27-07(H)(2)(c)and(d)]. A summary description of the on-property disposal facility location, design, and operation follows, with a detailed description provided in Appendix G of this report.

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materials would account for approximately ten percent of the remaining capacity. A small amount of affected materials and soils is expected from OU1 and OU4.

Figure 5-4 presents the selected location of the on-property disposal facility according to the draft OU2 Predesign Investigation and Site Selection Report for the on-property disposal facility. The facility would occupy an area of approximately 800 ft by 3,700 ~~4,300~~ ft. It would feature a multi-layer capping system, including a vegetative soil layer, a filter layer, biotic barriers, high-permeability drainage layer, and low-permeability infiltration barrier. The disposal facility would also require a multilayer liner system that would include a leachate collection layer, a primary liner, a leak detection layer, and a secondary liner.

Approximately 6,500,000 ~~6,300,000~~ ft^3 of OU3 remediation materials would be placed in the facility over a seven year period spanning the years 1997 to 2005. On average, 930,000 ~~900,000~~ ft^3 would be sent to the facility annually; however, the actual rate would depend on the progress of the former Production Area dismantlement. Approximately 39 ~~86~~ percent of the OU3 material volume would consist of LLW from various material categories. Approximately 60 percent of the OU3 material volume would consist of below baseline materials from Category E (Concrete) materials. As mentioned in Section 5.5.2.1 of this report, the on-property disposal facility would not be used for the disposal of OU3 materials from two categories: Category C (Process-Related Metals) and Category F (Brick).

Construction of the facility, as specified by the OU2 design efforts, would begin at the northern end of the designated construction site. Stormwater runoff would be collected during the facility construction and transferred to the Advanced Wastewater Treatment (AWWT) facility for treatment prior to release to the environment. Leachate collected from the disposal facility underdrain system would also be transferred from the facility to the AWWT facility for treatment before discharge to the environment.

Covered trucks, tarps, and water sprays would be employed to mitigate fugitive dust emissions during the facility construction and fill operations. Based on current designs, the OU3 remediation materials would be brought into the holding area directly from the D&D work zones or, in limited cases, from interim storage facilities. The materials would be transported in 40-ton (net capacity) RORs or dump trucks. Approximately 29,000 ~~26,800~~ truck trips would be required to convey the OU3 material to the facility. The number of on-property truck shipments is directly related to the number of roll-off

boxes that will be required to transport all applicable materials to the on-property disposal facility (refer to Table E-22 for details). From the holding area, OU3 materials and soils would either be sent directly to the facility for immediate placement or be placed in the staging area located within a vacant portion of the facility on a short-term basis to await placement.

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OU3 material would be transported using existing FEMP roads or newly constructed temporary haul roads. New roads would be constructed within the Former Production Area and old ones would be demolished as the disposal facility expands. The south entrance road to the FEMP Willey Road would be maintained throughout the remediation effort, whereas the north entrance road State Route 126 would be relocated.

Current waste placement strategies developed in the OU2 design stipulate that remediation materials would be disposed in bulk and layered between contaminated soil lifts. The soils would generally be obtained from OU5 remedial actions. Soil lifts above OU3 material layers would be compacted mechanically to achieve the specified design density. Certain OU3 materials, such as ACM and transite panels, would require special handling and placement measures during the fill operation. These requirements would include: asbestos-trained personnel to load ACM for transport from the interim storage area to the on-property disposal facility, as well as placing the ACM, by hand, in the disposal facility. To achieve stability and compacted density of the fill, a minimum soil to material ratio of 2 ~~3~~ to 1 would be specified. However, a 3 to 1 ratio is anticipated during actual on-property disposal activities. Final waste placement strategies will be developed in forthcoming OU2 remedial design documentation.

Operations regarding placement of materials in the on-property disposal facility could occur 40 hours per week, year round, weather permitting. The operations would cease if cold weather conditions prevented attainment of specified soil compaction or prevented because of adequate dust suppression. It is expected that operations would occur only nine months of the year because of compaction difficulties during the winter months.

The facility would be secured by fencing and guards during the active operations period. After completion and sealing of the facility, a permanent security fence would be completed and maintained around the facility. Signs warning against unauthorized entry would be erected. Long-term monitoring of the on-property disposal facility would be performed according to the selected remedy in the draft OU5 ROD. The types and frequency of monitoring activities will be established during the OU5 remedial design. ~~provided until the year 2035.~~

<u>Implementation of WAC for the On-Property Disposal Facility</u>

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The objective of developing contaminant-specific WAC is to ensure protection of the underlying Great Miami Aquifer since, as discussed in the OU5 ROD, the primary exposure pathway of contaminants to receptors is vertical migration through the on-property disposal facility liner system and through

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grams. Based on this conservative source term, remedial actions would be implemented to reduce the estimated quantities of technetium-99 below the 105 gram limit. This reduction would ensure the safe disposal of OU3 materials within the on-property disposal facility. Figure 5-5 summarizes the approach to implement the on-property facility WAC for OU3 materials.

Because the estimated source term exceeds the allowable mass, some OU3 materials would require removal and off-site disposal to reduce the source term by a minimum of 22 grams. Before determining which materials are necessary to remove, previously made administrative decisions have to be considered. As discussed in Section 1, under the balanced approach Categories C (Process-Related Metals) materials, Category F (Brick) materials, and Category J (Product, Residues, and Special Materials) are to be dispositioned off-site.

As a result of these administrative decisions, the technetium-99 source term remaining to be evaluated for on-property disposal would be 116 ~~117~~ grams. Of the materials contributing to this source term, the significant contributor is Category E (Concrete) materials, with 102 ~~103~~ grams. As detailed in Appendix G, the specific material that contributes the majority of the 102 ~~103~~ grams is concrete slabs, with a mass of 93.4 ~~93.8~~ grams. The mass of technetium-99 associated with the concrete slabs is isolated predominantly within the top one-half to one inch of the material, with decreasing concentrations at depth.

Given the quantity of technetium-99 in the concrete, the most efficient approach to meet the allowable mass limit is to determine the portions of concrete to be removed. To facilitate this evaluation, the concrete within each process area has been ranked to determine the location with the highest concentration and its associated technetium-99 source term. At the top of this ranking, process area 2 of Plant 9A is the location of the highest technetium-99 concentration at 8100 pCi/g in the top half-inch of concrete; the technetium-99 source term associated with this top half-inch of concrete is approximately 13 grams. To reduce the technetium-99 to below the allowable mass limit, the concrete in the top half-inch of this process area would be removed through mechanical scabbling (see Appendix D for description); the 13 grams would be removed as a result, leaving a source term of approximately 104 grams of technetium-99, which is below the allowable mass limit.

Based on the conservative source terms, the removal of the above area would meet the allowable mass limit for technetium-99; however, as a best management practice to ensure protection of human health and the environment, additional concrete removal would occur. The selection of the concrete to be

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removed would occur based on the maximum technetium-99 concentrations, with the top inch of concrete in the identified process area being removed. In ranking the concrete concentrations, two distinct ranges of sample results can be identified: values between 8,100 and 2,900 pCi/g and values below 838 pCi/g. (Appendix A contains detailed information regarding technetium-99 sample results.) To implement this approach, concrete with concentrations at or above 2,900 pCi/g of technetium-99 would be removed. The three process areas at or above this level are Plant 9A, process area 2 (as mentioned above), Plant 9A, process area 4, and Plant 8A, process area 4. The removal of an additional half-inch of concrete in Plant 9A, process area 2 and the top inch of concrete in Plant 9A, process area 4 and Plant 8A, process area 4, would reduce the total technetium-99 source-term by approximately 58 grams and would generate approximately 2,190 ft^3 of residue. As a result of this process, the remaining mass of technetium-99 estimated for disposal within the on-property disposal facility is 59 grams.

Treatment

As shown in Table 5-5, the only treatment anticipated during Alternative 2 would involve ~~various~~ treatment ~~options~~ that may be applied to mixed ~~or hazardous~~ wastes ~~and residues~~ to meet LDRs; ~~for the representative commercial disposal facility.~~ A ~~t~~Treatment processes that generally would be used, as needed, to meet LDRs is ~~are solidification and~~ encapsulation. Any treatment employing this ~~these~~ techniques would be performed either on-property or at the representative commercial disposal facility. A brief description of the material potentially to be further treated and the treatment processes follows.

~~Solidification - The solidification operation would use cement or similar reagent to create a stable matrix. The materials that may be processed would be approximately 1,420 ft^3 of mixed waste concrete residues generated by scabbling operations. The finished product would pass a TCLP analysis and meet the WAC for disposition at the designated disposal facility.~~

Encapsulation - This operation would encapsulate crushed and shredded materials within a polymer. The resulting matrix would comply with TCLP criteria of the LDRs. Material that may be processed by this facility would consist of approximately 5,280 ~~10,200~~ ft^3 of brick classified as mixed waste.

Off-Site Disposition

Materials with no contamination above background levels and contaminated materials not meeting the criteria for the on-property disposal facility would be shipped by truck transport to off-site facilities

for disposition. The FEMP can support this activity by using existing on-property truck loading facilities. Discussions of the two off-site disposition processes listed are provided below.

Off-Site Unrestricted Release/Disposal

As shown in Table 5-5, ~~498,000 ft³ of Category E (Concrete) materials and~~ 541,000 ~~488,000~~ ft³ of Category I (Miscellaneous Materials) have been characterized, using process knowledge and RI/FS sampling data, as having no contamination that exceeds baseline levels. The Category E (Concrete) materials would consist of sidewalk and parking lot debris from the Administrative Area. These materials would be loaded into ROBs and transported by truck for disposal in a local commercial sanitary landfill located approximately eight miles from the FEMP. An estimated 850 ~~2,900~~ truck loads over eight years would be required to transport this material from the FEMP to the landfill. These unrestricted release materials must be in compliance with the surface contamination guidelines found in DOE Order 5400.5. This approach has been applied in the past at the FEMP for similar materials. These materials would undergo radiation screening and would require monitoring to ensure that surface contamination is within allowable limits and would require potential sampling to assess at-depth contamination.

Off-Site Restricted Disposal

It is estimated that 174,000 ~~214,000~~ ft³ of OU3 remediation materials would be shipped to either a representative commercial disposal facility or the NTS facility over the duration of the D&D program. Depending on a material category, these materials would be containerized in LMBs, ROBs, WMBs, and B-12 boxes. Tentatively, these materials would be shipped off-site by truck. The approximate total number of truck shipments required for disposal of materials at the NTS and at the representative commercial facility would be 508 ~~650~~ and 82 ~~80~~, respectively. Each shipment would consist of one LMB for transport to the NTS and six B-12 boxes for transport to the representative commercial disposal facility. Through coordinated efforts with OU1, the off-site shipment of OU3 materials to the representative commercial disposal facility could be combined with the off-site rail shipment of OU1 remediation materials.

Support Facility Decontamination and Dismantlement

Any facilities and structures constructed to support the OU3 D&D phase and the disposition phase would likewise undergo D&D when no longer needed to support the remediation effort. It is anticipated that most of these materials would be placed in the on-property facility based on meeting the on-property disposal facility WAC. If the on-property disposal facility is not available for

5.5.3.1 Detailed Description of Alternative 3

The following description of Alternative 3 is based on a conceptual design. The level of engineering detail provides documentation for cost estimating and alternative evaluation purposes. This alternative would rely on coordination with other FEMP remedial actions to provide support for the disposition of OU3 materials, including the OU1 waste shipment facilities. Estimated costs for these elements are based on a unit cost or a prorated cost for OU3. If this alternative is selected, the substantive components of the design will be finalized during the remedial design phase consistent with the final ROD. The key elements of Alternative 3 are described in further detail below.

Remediation Material Flow

The major remediation material flow efforts occurring under Alternative 3 are 1) material segregation, containerization, and tracking; 2) possible further material treatment; and 3) off-site shipping and disposition. These final remedial action efforts would occur concurrently with, and would be fully integrated with, the interim remedial action. Specifically, the material segregation and containerization necessary to support the Alternative 3 disposition activities would be carried out as part of the interim remedial action. It is anticipated that the interim storage facility would be used for storage of Plant 4A, Plant 7A, Plant 1A, and Plant 9A remediation materials generated prior to the implementation of off-site disposition activities.

During the $276 million case ~~ten-year schedule~~ for the OU3 interim remedial action, approximately 7,540,000 ~~7,500,000~~ ft^3 (unbulked) of remediation materials would be transported from the D&D project work zones to the material storage areas or directly to shipment and/or disposal operations. A breakdown of the projected dismantlement schedule is provided in the ten-year schedule for interim remedial action. Figure 5-1 provides a summary of projected remediation material generation during the ten-year D&D time frame. Table 5-6 provides a summary of projected disposition of remediation materials on an unbulked volume basis by material category and segregation category based on the OU3 RI/FS field characterization results. It is anticipated that a majority of OU3 remediation materials would meet the WAC for the representative commercial disposal facility. A minority volume of OU3 materials will be disposed of at the NTS. These materials, Category C (Process-Related Metals), exceed the commercial facility's WAC for LLW and are not expected to be further treated in a cost-effective manner. A volume of 151,000 ~~191,000~~ ft^3 would be dispositioned at the NTS. Additionally, a volume of 541,000 ~~986,000~~ ft^3, consisting of ~~Category E (Concrete) materials and~~ Category I (Miscellaneous Materials), would meet the criteria for unrestricted-release and therefore, could be shipped to a commercial sanitary landfill for disposal. Consequently

sanitary landfill for disposal. Consequently approximately 6,850,000 ~~6,300,000~~ ft^3, or 91 ~~86~~ percent of the total unbulked volume, would be dispositioned at the representative commercial disposal facility.

Material flow diagrams presented in Appendix E (Section E.6) provide details on configuration, potential treatment, and disposition for each of the nine material categories. The Alternative 3 cost estimate is based on the indicated activities.

Material Segregation, Containerization, and Tracking

Additional treatment and disposition requirements would be identified for all material covered by each D&D project during the design phase. These requirements would be based on the available RI/FS characterization data, process knowledge, and additional sampling performed to support a particular D&D project. Some administrative decisions would be made regarding disposition for certain material categories.

The material segregation, containerization, and tracking components of Alternative 3 would be identical to Alternative 2, as discussed in Section 5.5.2.1. The container requirement would differ for the material destined for disposal at the representative commercial disposal facility, since a special container would be used for rail shipment.

Treatment

The estimated volumes that may require additional treatment prior to disposition at the representative commercial disposal facility are presented in Table 5-6.

Off-Site Disposition

Under Alternative 3, all materials, except materials with no contamination above baseline levels, would be shipped to the representative commercial facility by rail transport or to the NTS by truck transport. Improvements and additions to the existing rail loading facilities would be necessary to support this activity. These improvements are currently scheduled under the OU1 ROD. The materials that meet the criteria for unrestricted release would be shipped to a commercial sanitary landfill by truck. The FEMP could support this activity by using existing on-property truck loading facilities. Category C (Process-Related Metals) materials would be shipped, by truck, to the NTS.

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Off-Site Disposal - It is estimated that 6,850,000 ~~6,300,000~~ ft^3 of OU3 remediation materials would be shipped to the representative commercial disposal facility by rail, and 151,000 ~~191,000~~ ft^3 would be shipped to the NTS by truck over the duration of the D&D program. Off-site shipment to the representative commercial disposal facility involves packaging the materials in sealed, intermodal transport containers that comply with DOE orders and DOT requirements. Intermodal containers would be loaded on articulated spine rail cars. Each articulated rail car can hold six intermodal containers. It is estimated that 155 ~~150~~ 28-car train shipments will be required to transport all OU3 materials designated for disposal at the commercial facility. It is anticipated that the same number of truck shipments to the NTS would be the same as in Alternative 2.

Off-Site Treatment/Disposal - This component of Alternative 3 is identical to the off-site unrestricted release/disposal activity under Alternative 2.

Support Facility Decontamination and Dismantlement

Any support facilities and structures constructed to support the D&D phase and the disposition phase would be decontaminated and dismantled when no longer needed to support the remediation effort, in accordance with the same procedures implemented for the former Production Area facilities. It is anticipated that most of these materials would be dispositioned at the representative commercial disposal facility.

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TABLE 5-1

PROJECTED MATERIALS IN INTERIM STORAGE (1995 - 1997) GENERATED BY D&D OF ABOVEGRADE ELEMENTS OF PLANT 4A, PLANT 7A, PLANT 1A, AND PLANT 9A

FS Category[1]	Unbulked Volumes (ft^3)	Bulked Volumes (ft^3)	Weight (tons)
A Accessible Metals	14,820 ~~13,600~~	247,000 ~~227,000~~	3,600 ~~3,300~~
B Inaccessible Metals	206,000	691,000	4,300
C[2] Process-Related Metals	23,200	80,000	590
D Painted, Light-Gauge Metals	1,710	3,400	350
E Concrete	45,200	58,800	1,500
G Non-Regulated ACM	14,000	17,000	800
H Regulated ACM	3,000	12,000	7
I Miscellaneous Materials	16,600	30,000	370
Totals	325,000 ~~323,000~~	1,140,000 ~~1,120,000~~	11,500 ~~11,200~~

(1) No Category F materials are contained in the above-grade elements of Plant 4A, Plant 7A, Plant 1A, Plant 9A.

(2) Category C materials generated are to be dispositioned off-site as soon as practical.

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TABLE 5-2
CONTAINER DESCRIPTIONS AND CAPACITIES

Type of Containers	Exterior Dimensions (l x w x h)	Interior Volume (ft^3)	Net Weight Capacity (lbs.)	Vertical Stacking
55 gallon drum	23.5" d x 29.5" h	7.4	832	Yes, on a pallet/ 4 high indoor 3 high outdoor
~~B-12 Box~~ ~~B-25 box~~	6' x 3.9' x 2.3'	44	9,000	Yes/4 high
~~B-25 Box~~ ~~Small White Metal Box~~	6.7' x 4.6' x 3.5'	83	6,800	Yes/3 high
Large Metal Box	20' x 8' x 8.5'	1,025	35,000	Yes/2 high
Reusable Roll-off Box	23.5' x 8' x 6.5'	810	33,000	No
Intermodal Transport Containers	20' x 8' x 6.4'	675	40,500	Yes/2 high

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TABLE 5-3

ALTERNATIVE 1 TOTAL MATERIAL VOLUMES AND CONTAINER REQUIREMENTS

FS Category	Unbulked Volume (ft^3)	Bulked Volume (ft^3)	Weight (tons)	Type of Storage Configuration	Total Number of Containers/Piles
A-Accessible Metals	63,400	1,060,000	15,200	Piles	8
B-Inaccessible Metals	1,710,000	5,710,000	25,700	Piles	32
C-Process-Related Metals	191,000	649,000	3,370	Large Metal Box	503
D-Painted Light-Gauge Metals	7,150	14,300	1,360	Large Metal Box	27
E-Concrete	4,800,000	6,240,000	323,000	Piles	32
F-Brick	20,700	26,900	1,450	Small White Metal Box	426
G-Non-Regulated ACM	60,300	74,800	3,760	Large Metal Box	230
H-Regulated ACM	32,400	110,000	68	Large Metal Box	108
I-Miscellaneous Materials	564,000	1,090,000	4,230	Large Metal Box	1,713

Notes:

(1) Number of containers is calculated based on interior volume and weight restrictions for a particular container and the bulked density of the material being containerized (i.e., some material/container combinations are volume restricted, some are weight restricted).

(2) Pile dimensions were assumed to be 220' x 65' x 20'h. Number of piles was based on bulked volumes.

(3) All hazardous and mixed wastes will be containerized for storage in accordance with RCRA requirements.

(4) Respective box dimensions are presented in Table 5-2.

(5) An unbulked volume is defined as the volume of a material in its smallest reducible form without continuous manipulation.

(6) Bulked volumes are derived by multiplying corresponding unbulked volumes by a bulking factor. The bulking factors represent the anticipated increase to the volume of materials as a result of containerization.

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TABLE 5–5

PROJECTED DISPOSITION SUMMARY FOR ALTERNATIVE 2

Disposition	Segregation Category	Material Category(1)	Treatment	Volume(2) ft3 (unbulked)		
					Subtotals	Totals
On–Property Disposal Facility	Mixed Waste	D. Painted Light–Gauge Metal	Encapsulation	50	50	
	PCB Waste	B. Inaccessible Metals		14,900	14,900	
	Low–Level Waste	A. Accessible Metals		63,400		
		B. Inaccessible Metals		1,730,000		
		D. Painted Light–Gauge Metals		7,100		
		E. Concrete		541,000		
		G. Non–Regulated ACM		71,300		
		H. Regulated ACM		80,200		
		I. Miscellaneous Materials		163,000	2,660,000	
	At or Below Baseline	E. Concrete		4,160,000	4160000	6,830,000
Off–Site Disposal Facility(3)	Mixed Waste	F. Brick	Encapsulation	5,280	5,280	
	Low–Level Waste	C. Process–Related Metals(4)		151,000		
		E. Concrete		2,190		
		F. Brick		15,400	169,000	174,000
Unrestricted Release	At or Below Baseline	I. Miscellaneous Materials		541,000	541,000	541,000
				Grand Total		7,540,000

(1) Category J material volumes not included.
(2) All estimated volumes have been rounded to three significant figures.
(3) Exceeds On–Property Disposal Facility WAC
(4) All Category C materials will be dispositioned at the NTS.

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TABLE 5–6

PROJECTED DISPOSITION SUMMARY FOR ALTERNATIVE 3

Disposition	Segregation Category	Material Category(1)	Treatment	Volume(2) ft3 (unbulked)		
					Subtotals	Totals
Off–Site Disposal Facility	Mixed Waste	D. Painted Light–Gauge Metal	Encapsulation	50		
		F. Brick	Solidification	5,280		
					5,330	
	PCB Waste	B. Inaccessible Metals		14,900		
					14,900	
	Low–Level Waste	A. Accessible Metals		63,400		
		B. Inaccessible Metals		1,730,000		
		C. Process–Related Metals (3)		151,000		
		D. Painted Light–Gauge Metal		7100		
		E. Concrete		541,000		
		F. Brick		15,400		
		G. Non–Regulated ACM		71,300		
		H. Regulated ACM		80,200		
		I. Miscellaneous Materials		163,000		
					2,820,000	
	At or Below Baseline	E. Concrete		4,160,000	4,160,000	7,000,000
Unrestricted Release	At or Below Baseline	I. Miscellaneous Materials		541,000		
					541,000	
						541,000
				Grand Total		7,540,000

(1) Category J material volumes not included.

(2) All estimated volumes have been rounded to three significant figures.

(3) All Category C materials will be dispositioned at the NTS.

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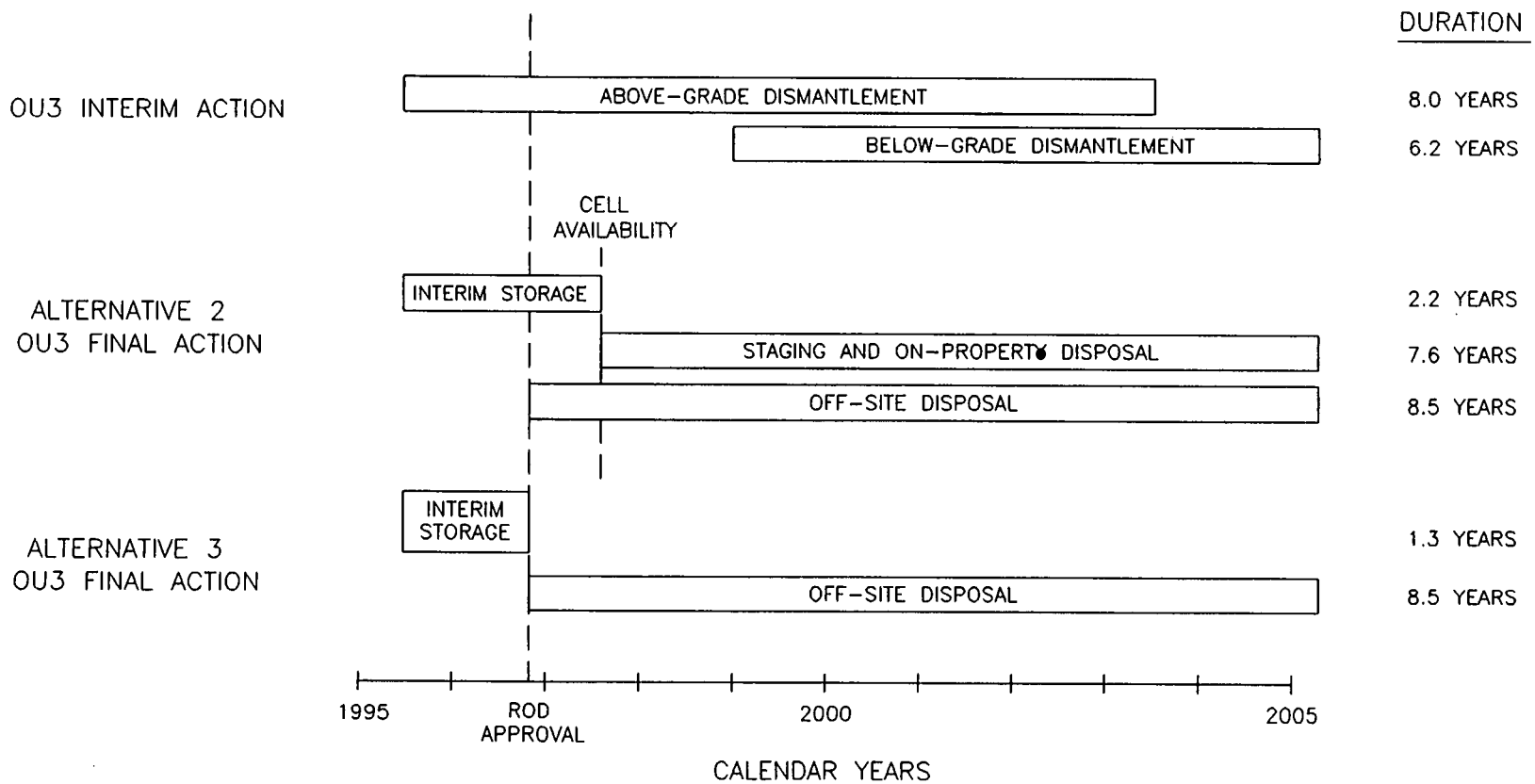

FIGURE 5-1 COMPARISON OF SCHEDULES FOR ALTERNATIVES 2 AND 3

Note: For Alternative 2, no one item will be staged for 7.6 years. Materials that are staged prior to on-property disposal facility completion will be placed in the facility upon achieving operational status.

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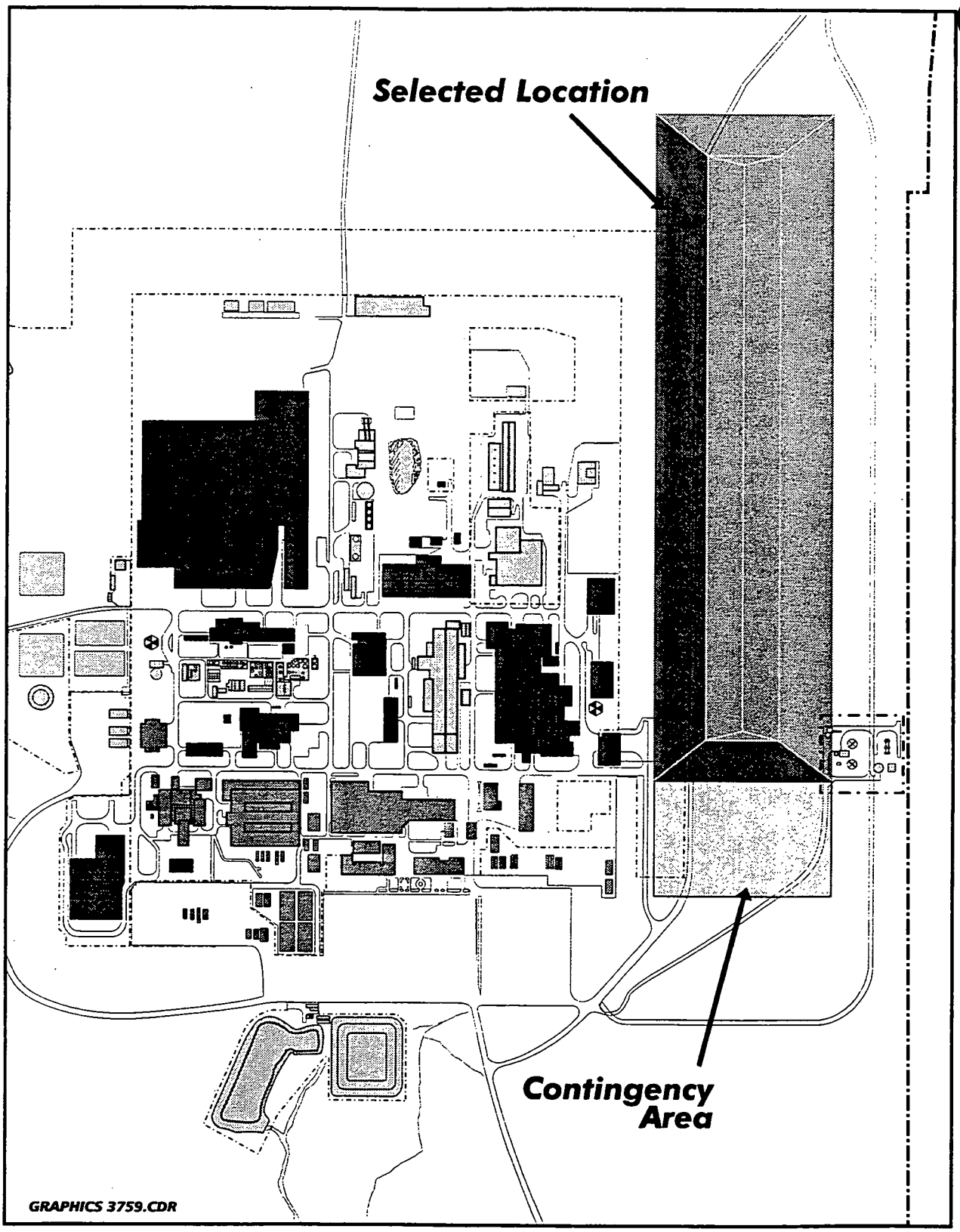

FIGURE 5-4 SELECTED LOCATION FOR THE ON-PROPERTY DISPOSAL FACILITY

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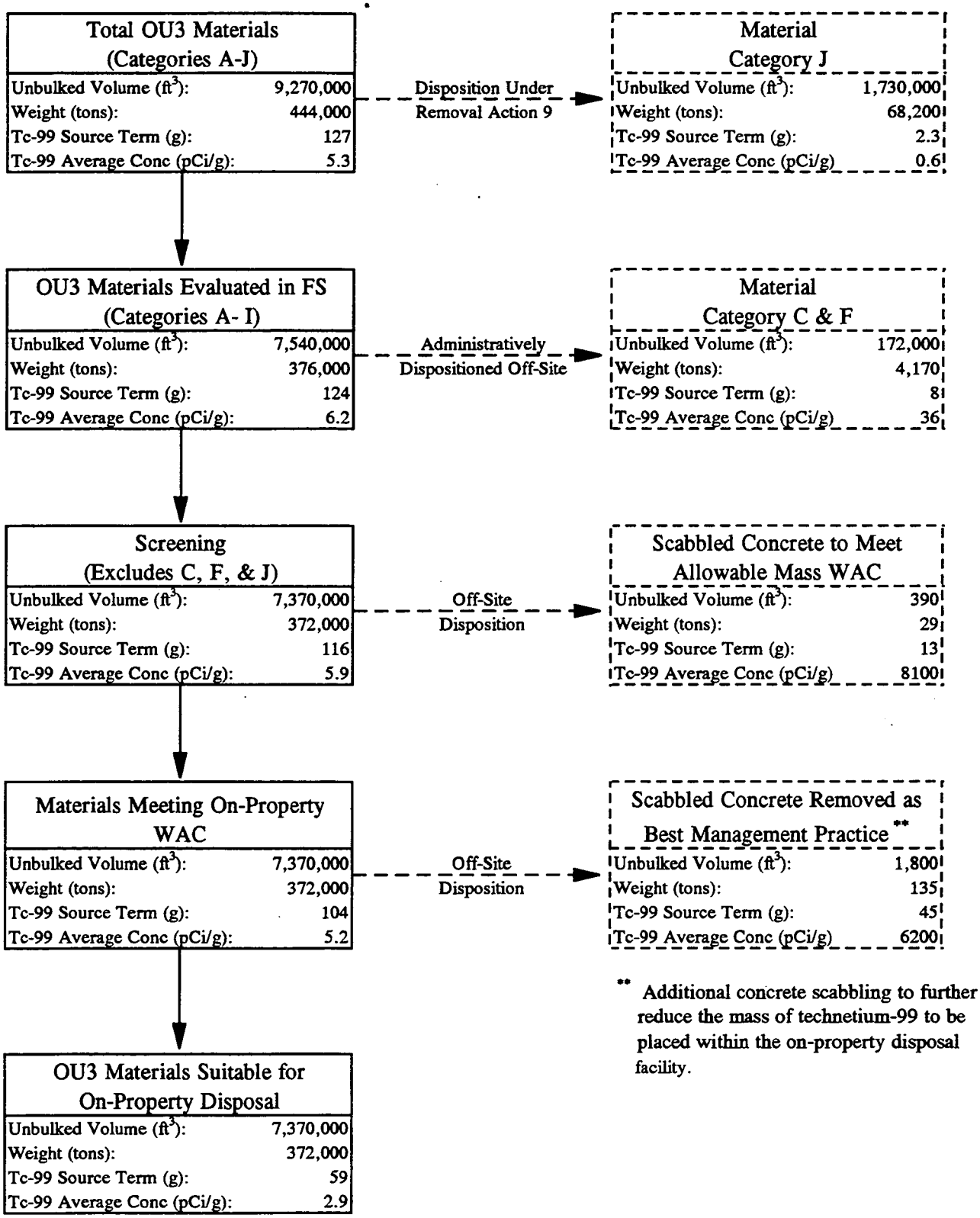

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FIGURE 5-5

SUMMARY OF ON-PROPERTY DISPOSAL FACILITY WAC IMPLEMENTATION

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SECTION 6

6.0 DETAILED ANALYSIS OF ALTERNATIVES

This section presents the detailed analysis of the remedial action alternatives that were identified in Section 5 of this report. The detailed analysis consists of six subsections. Section 6.1 describes the purpose of the detailed analysis and its importance to the CERCLA FS process. Section 6.2 provides an overview of the remedial alternatives by summarizing each one and identifying the elements that are common among all alternatives. Section 6.3 identifies and describes the NCP-required criteria used for evaluating the alternatives. The evaluation of the alternatives is conducted in Section 6.4. Section 6.5 offers a comparative analysis of the alternatives to identify the tradeoffs inherent in employing one alternative in favor of the others. Finally, Section 6.6 describes the irreversible and irretrievable commitment of resources inherent in implementing each of the alternatives.

6.1 PURPOSE OF DETAILED ANALYSIS

The detailed analysis includes a presentation and assessment of relevant information that provides the basis for selecting an alternative and preparing a ROD. By assessing each alternative according to the criteria required by the NCP, the detailed analysis identifies and emphasizes the information necessary for the remedy selection process. Careful examination of each alternative's relative advantages and disadvantages facilitates identification of a preferred remedial alternative in the OU3 PP.

6.2 NCP CRITERIA FOR EVALUATING REMEDIAL ALTERNATIVES

Specific statutory requirements for remedial actions are specified under CERCLA. These requirements include protection of human health and the environment, compliance with ARARs or meeting the requirements for a ~~not excluded by the granting of a~~ US EPA waiver, of a specified ARAR, a preference for permanent solutions which incorporate treatment as a principal element (to the maximum extent practicable) or a justification for not meeting the preference, and cost-effectiveness. The nine criteria for evaluating remedial alternatives in feasibility studies are identified in the NCP [40 CFR 300.430(e)(9)(iii)] and establish the framework for assessing whether remedial alternatives meet the necessary requirements. This section provides a summary of the nine criteria and an overview of the approach taken by this RI/FS to address them.

The first two criteria, overall protection of human health and the environment and compliance with ARARs, are known as threshold criteria. Assessments against these two criteria relate directly to statutory findings that must ultimately be made in the ROD. If a remedial alternative does not meet either of the two threshold criteria, it cannot be considered a viable option unless the requirements for

a specified waiver are met ~~is granted by the US EPA~~. The next five criteria are known as "balancing factors." They are grouped together because they represent the primary criteria upon which the detailed analysis is based. Two additional criteria, state acceptance and community acceptance, are addressed in the ROD as part of the responsiveness summary following comment on the RI/FS Report and the PP by the public and other stakeholders. Figure 6-1 shows the relationship between the screening and the seven evaluation criteria used in this section for the detailed analysis of the remedial alternatives.

6.2.1 Overall Protection of Human Health and the Environment

This evaluation criterion provides an assessment of whether an alternative achieves and maintains adequate protection of human health and the environment against unacceptable short-term and long-term risks in accordance with the remedial action objectives established in Section 4. The discussion of overall protection draws from assessments conducted under other assessment criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs or meeting the requirements for a specified ~~not excluded by the granting of a~~ US EPA ARAR waiver. The discussion focuses on the manner in which identified site risks are eliminated, reduced, or controlled through treatment, engineering, or institutional controls.

The acceptable risk levels, under CERCLA, for members of the public for known or suspected carcinogens are generally concentration levels in the environmental media that represent an upper bound of the ILCR to an individual between 10^{-4} to 10^{-6}. The RAOs previously identified in Section 4.1 were developed consistent with this criterion.

The identified RAOs account for the fact that potential OU3 contaminant sources would be reduced from current levels by the interim remedial action. The RAOs also reflect the rationale that the OU3 materials in interim storage would be permanently dispositioned, which is a primary premise of this RI/FS and requirement of the IROD.

6.2.2 Compliance with ARARs

This criterion addresses the attainment of promulgated federal and state requirements. A requirement is applicable if it is a substantive federal or state environmental protection requirement that specifically addresses a hazardous substance, pollutant, contaminant, remedial action location, or other circumstances at the site. Even if a requirement is not directly applicable, it may be considered relevant and appropriate because the situation at the site is similar to those addressed in the

result in a majority of OU3 materials generated during the interim remedial action being dispositioned in the on-property facility, provided WAC are met.

Materials that have been classified as Category C (Process-Related Metals) and Category F (Brick) materials would be administratively dispositioned off-site under this alternative. Category F (Brick) materials would be dispositioned at the representative commercial disposal facility. A portion of these materials have been identified as mixed waste, and would require treatment (i.e., encapsulation) ~~or solidification~~) to meet LDR requirements. Category C (Process-Related Metals) materials are expected to exceed WAC at the representative commercial disposal facility because of anticipated uranium and thorium compounds contained within the Category C materials. Thus, these materials will be dispositioned at the NTS.

Furthermore, a portion of Category E (Concrete) materials will be removed so that the allowable mass of technetium-99 will be met (see Section 5.5.2.1). This material will be transported to the representative commercial disposal facility for final disposition. All remaining remediation OU3 materials will be placed in the on-property disposal facility.

Alternative 2 material volume projections presented in Table 6-1 were based upon an evaluation of available data that were compiled and evaluated in Sections 2 and 3 of this report.

6.3.2.1 Overall Protection of Human Health and the Environment

Alternative 2 would meet the RAOs for OU3 and would be protective of human health and the environment. Implementation of this alternative would prevent direct access to potentially contaminated OU3 materials by either placing the materials in an on-property disposal facility or removing the materials from the site. Implementation of Alternative 2 would mitigate the potential migration of contaminants from the OU3 materials to the surrounding environmental media. Additionally, worker exposure to direct radiation above protective levels would be prevented throughout the final disposition activities through the use of personal protective equipment and personnel monitoring.

The OU3 materials that meet the on-property WAC would be covered with excavated soil and sediments from the OU5 and OU2 remedial actions to reduce risks to off-site residents. This alternative would employ conservative design considerations from other engineered disposal facilities including Uranium Mill Tailing Remediation Control Act standards and RCRA regulations to ensure

the long-term performance of the disposal facility. These standards would require the use of multilayered capping and lining systems, the development of contaminant- and material-specific WAC, and use of a design which ensures protectiveness for a minimum of 200 years to a maximum of 1,000 years. These design considerations would supplement the natural containment capabilities of the existing site geology to ensure the long-term performance of the disposal system. Further detailed discussions using the on-property disposal facility for the disposition of OU3 materials can be found in Appendix G.

Following implementation of Alternative 2, institutional controls would be maintained by OU2 and OU5 for the disposal facility to ensure continued protection of human health and the environment. Institutional controls maintained for the disposal facility area would include continued federal ownership of that portion of the FEMP to preclude homesteading, intrusive actions, or facility degradation; deed restrictions; and passive access controls (e.g., fencing) around the facility to prevent unauthorized access or use of the land.

6.3.2.2 Compliance with ARARs

Alternative 2 would comply with all identified ARARs or meet the requirements for a US EPA waiver of Ohio solid waste disposal facility siting criteria [OAC 3745-27-07 (H)(2)(c)and(d)] (see Appendix C, Section C.2) ~~Alternative 2 would comply with all ARARs except those excluded upon receipt of a waiver from the US EPA for State of Ohio solid waste disposal facility siting requirements.~~ To be granted the waivers, the FEMP would be required to adopt an engineering design for the facility which would, when coupled with existing site geologic conditions, attain a standard of performance that is equivalent to that required under the State of Ohio solid waste disposal facility siting criteria ~~requirements~~.

Chemical-Specific ARARs

Alternative 2 would comply with all chemical-specific ARARs and TBCs (Appendix C, Table C-1). Contaminated material meeting the on-property disposal facility WAC would be disposed of in a manner that minimizes the potential release of contaminants to the environment. The facility's liner and cap design (see Appendix G) would minimize infiltration of water into the waste materials and minimize any radon and penetrating radiation emissions. Materials exceeding the on-property disposal facility WAC would be dispositioned at the representative commercial disposal facility or at the NTS.

Any storm runoff waters associated with the final remediation action would be treated at the on-property AWWT facility to meet the Ohio Water Quality Standards ARARs (Appendix C, Table C-1), as described in the draft OU5 ROD.

Location-Specific ARARs

Alternative 2 would meet all principal location-specific ARARs discussed in Table C-2 of Appendix C, or meet the requirements for a US EPA waiver of Ohio solid waste disposal facility siting criteria [OAC 3745-27-07 (H)(2)(c)and(d)] (see Appendix C, Section C.2). ~~except those excluded by US EPA waivers for two State of Ohio solid waste disposal facility siting restrictions.~~ These criteria ~~restrictions~~ prohibit the siting of disposal facilities over: 1) sole-source aquifers designated under the Safe Drinking Water Act; and 2) aquifers capable of providing 100 gallons per minute (gpm) or more of sustained yield for consumptive use. Since the hydrogeologic conditions at the FEMP described in the draft OU5 ROD indicate that the exemption criteria for both the sole-source aquifer and the 100-gpm aquifer siting restrictions cannot be met based on the protective properties of the native geologic materials alone, waivers are required for the disposal of OU3 materials in the on-property disposal facility in consideration of engineering controls to be employed. Appendix C of this report provides details for the request of the required waivers.

Alternative 2 would comply with all location-specific ARARs for floodplains, wetlands, endangered species, and historical preservation. These ARARs would be met since the scope of Alternative 2 activities does not include the construction of new, or the expansion of current, on-property interim storage facilities.

Action-Specific ARARs

Alternative 2 would meet the action-specific ARARs (Appendix C, Table C-3). Since remediation of the FEMP will generate LLW, solid waste, hazardous waste, and PCB waste, the on-property disposal facility would be designed and constructed to accommodate this range of waste types. The action-specific ARARs listed in Appendix B of the OU2 FS identified the requirements for the design of the on-property disposal facility (DOE 1995f). These requirements were incorporated into the Alternative 2 definition discussed in Section 5 of this report. ARARs that would be met by OU3 include EPA requirements in 40 CFR 192.02(a). These requirements stipulate that a disposal facility for uranium mill tailings must be designed to protect groundwater and be effective for up to 1,000 years, to the extent reasonably achievable, and in any case, for at least 200 years.

from releases of radioactivity. By meeting the DOE requirements, this disposal facility would also satisfy the less-stringent Ohio Revised Code (ORC), RCRA, and TSCA engineering design criteria for the disposal of solid and hazardous wastes.

To accommodate potential on-property disposal of RCRA wastes, the FEMP would utilize the RCRA Subtitle C CAMU provisions for on-property disposal of OU3 materials as remediation waste. Under this strategy, ~~the on-property WAC would have to be met so that the waste could be placed in an on-property disposal facility in lieu of meeting~~OU3 materials identified as characteristic wastes (i.e., lead flashing and acid brick) will be treated in accordance with the STP to meet LDRs. All storage, management, and manifesting requirements for listed and characteristic waste would comply with RCRA requirements found in 40 CFR Parts 261, 262, and 265, and in the Ohio authorized hazardous waste program.

6.3.2.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence of Alternative 2 for containing the residual contamination remaining on OU3 materials after the interim remedial action would depend primarily on the physical integrity of the on-property disposal facility. The facility will be designed to ensure protectiveness for a minimum of 200 years to a maximum goal of 1,000 years. However, some degree of uncertainty concerning the ability of the federal government to maintain long-term (i.e., up to 1,000 years) institutional controls and the long-term performance of the engineered system does exist. However, based on available engineering data and computer modeling, the long-term effectiveness and permanence of the disposal facility would be supported.

Adequacy and Reliability of Controls

Based on current OU2 designs, the on-property disposal facility would use proven technologies and construction materials to provide protection to the public and the environment from residual contamination on materials and soils placed in the facility. Similarly designed systems are currently used for LLW disposal under DOE and Nuclear Regulatory Commission programs at other sites. As discussed in the OU2 Pre-Design Investigation Report, the disposal facility will be located at a minimum of 300 feet from the FEMP property boundary in the northeast corner of the site. The disposal facility would extend to the south for approximately ~~4,300~~3,700 feet, and would be approximately 800 feet wide. This area is located away from Paddys Run and the floodplain to minimize the potential for erosion induced by surface water. The bottom of the facility liner would be, on average, five feet below existing grade, which is well above the Great Miami Aquifer water

Cultural Resources Cultural resources at or near the FEMP are not expected to be adversely affected due to remedial activities associated with Alternative 2. However, if cultural resources at or near the FEMP are affected by the remedial activities, then the resources will be managed under one of two programmatic agreements between DOE, the Advisory Council on Historic Preservation, and the Ohio Historic Preservation Office (OHPO). These agreements will provide an alternative means of compliance with Sections 106 and 110 of the National Historic Preservation Act (NHPA) so that impacts to cultural resources due to response actions and/or associated activities performed at the FEMP may be mitigated appropriately.

No events of historical significance have occurred at the representative commercial disposal facility. A cultural resource survey for the facility was performed in August 1981 by the Archaeological Environmental Research Corporation (DOE 1984). No cultural or historical resource sites were identified at the facility. Cultural resources at the NTS would be managed consistently with the requirements of the NHPA, the American Indian Religious Freedom Act (AIRFA), and the Native American Grave Protection and Repatriation Act (NAGPRA). No cultural resources would be affected at the commercial sanitary landfill.

6.3.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 2 would provide limited, additional reduction of residual toxicity, mobility, or volume of contaminated OU3 materials through treatment. The limited scope of additional treatment of OU3 materials and the preference for using engineering and institutional controls was discussed in Section 4 of this report. As discussed in Section 4, the majority of treatment of OU3 materials will occur during the interim remedial action. It is anticipated that the majority of OU3 materials would be dispositioned in the on-property disposal facility by meeting the established WAC. However, those materials that would not meet WAC for the on-property disposal facility would be shipped off-site to the representative commercial disposal facility or the NTS. If these materials do not meet the commercial facility WAC, treatment to meet the WAC would be applied to allow disposal. Approximately 50 ft^3 of materials classified as mixed waste would require further treatment prior to placement in the on-property disposal facility. Additionally, approximately ~~11,600~~5,280 ft^3 of material ~~is~~ classified as ~~potential~~ mixed wastes would require treatment (~~solidification or~~ encapsulation) to meet LDR requirements.

potential short-term risks associated with the implementation of Alternative 2 and is included in Appendix H.

Protection of the Community During Remedial Actions

The estimated ILCR to a hypothetical receptor, representing an adult member of the public near the FEMP, due to inhalation associated with airborne releases during remedial actions, is 1.9 x 10^{-6} for radionuclides and 5.8 x 10^{-8} for chemicals. A hypothetical noncarcinogenic hazard index for an off-site child from inhalation of resuspended toxicants is 0.02. This receptor is assumed to be located at the FEMP fenceline downwind from the on-property disposal facility. Carcinogenic risks to this receptor from external radiation were screened out as insignificant because the dose rates received off-site would be lower than that received by a receptor in the Administrative Area of the site, which is estimated in the 10^{-8} risk range during remediation. The risk from inhalation of radionuclides may be overestimated by approximately two orders of magnitude because of the assumption that all concrete materials would be subject to resuspension, when actually dust suppression measures would be used.

Risk to the public along the transportation route to the off-site facilities are expected to be minimal. The ILCR calculated for an individual along the route during incident-free transportation from direct radiation is 3.1 x 10^{-9}. Because none of the materials being shipped off-site are liquid, it is expected that in the event of an accident, clean-up would be quick and efficient, and minimal exposure other than direct radiation would result.

Protection of Workers During Remedial Actions

This alternative is expected to be protective of human health based on calculations using the maximum contaminant concentrations and maximum transportation scenario volumes. Based on a conservative bounding estimate, it is estimated that a remediation worker would receive annual doses of 360 mrem from direct radiation, which is less than the annual routine condition limit of 5,000 mrem and administrative control limit of 2,000 mrem as stipulated in DOE Order 5480.4. The total ILCRs for the remediation worker are estimated at 2.8 x 10^{-3} for radionuclides and 9.8 x 10^{-7} for chemicals. Noncarcinogenic effects are estimated to result in an HI of 0.14. These estimates do not consider protective administrative and engineering controls that will be utilized during remediation activities.

The annual dose to a nonremediation worker is considerably lower, 0.011 mrem, due to a distance of approximately ~~300~~380 meters from the remedial activities. The total ILCRs for a nonremediation

are estimated at 6.6 x 10^{-7} for radionuclides and 6.0 x 10^{-7} for chemicals. The cumulative noncarcinogenic effect (HI) is 0.0025 for a nonremediation worker. Carcinogenic and noncarcinogenic risks for remediation workers are within Occupational Safety and Health Administration (OSHA) and DOE regulatory guidelines for occupational exposures. Through the use of engineering controls, health and safety procedures, and the standard practice of keeping exposures as low as reasonably achievable (ALARA), worker doses would be maintained at or below the DOE administrative control level of 2,000 mrem/year.

The cumulative dose for a maximally exposed individual transportation worker is estimated at 2,200 mrem ~~forever~~ the ~~$276 million case~~ ~~duration of the ten year project.~~ This estimate is based on the maximum exposure received while transporting materials to an off-site disposal facility. Using the EPA risk coefficient, this cumulative individual dose results in an ILCR of 1.7 x 10^{-3} for a transportation worker. This level of risk is within the Department of Transportation (DOT) guidelines for transportation workers.

The cumulative dose for a maximally exposed individual material handler at an off-site disposal facility is estimated at 2,300 mrem over the duration of the project. This estimate is based on the maximum exposure received by off-loading OU3 materials at an off-site facility. An ILCR of 1.8 x 10^{-4} has been estimated for an individual material handler.

Mechanical hazards (industrial accidents) from on-property activities for Alternative 2 may result in less than one fatality and approximately 15 injuries. Mechanical hazards during transportation are expected to result in no injuries and no fatalities to both members of the public and transportation workers combined. This is based upon the estimated number of injuries and fatalities from transportation which fall below 0.17.

Short-Term Environmental Impacts

The following subsections identify the short-term environmental impacts that are associated with implementing Alternative 2.

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Disposal of materials at the representative commercial disposal facility, the NTS, and the commercial sanitary landfill would not result in major air quality impacts. Minor increases in fugitive dust due to equipment operation may be experienced. Engineering controls and ongoing monitoring activities would be used to control air quality impacts.

Biotic Resources Limited short-term impacts to biotic resources could occur from airborne deposition of contaminants, but are expected to be minimized through the use of engineering controls. Displacement of wildlife resulting from noise related activities would also be minimal.

No short-term impacts to biotic resources are expected at the representative commercial disposal facility, the NTS, and at the commercial sanitary landfill.

Wetlands and Floodplains No short-term impacts to the wetlands and floodplains at or near the FEMP are anticipated. No short-term impacts would occur to the wetlands and floodplains surrounding the off-site facilities since no wetland or floodplain areas exist at the representative commercial disposal facility, the NTS, or the commercial sanitary landfill.

Socioeconomics and Land Use Minor socioeconomic impacts would be expected with the implementation of Alternative 2. Rather than addressing each individual county and the resources they are capable of supplying, each county's public and private expenditures were combined, producing a collective wealth for the CMSA of approximately $805,000,000 for fiscal year 1993 to 1994.

To better assess short-term impacts, it is assumed that all resources needed to implement Alternative 2, excluding off-site transportation and off-site disposal costs, would be purchased within the CMSA. Examples of the resources to be purchased within the CMSA include on-property disposal costs, material container costs, and on-property labor. The respective estimated costs for the specific resources to be purchased are presented in Appendix E, Table E-4. Based on the summation of these costs, the estimated total cost benefit to the CMSA of implementing Alternative 2 would be $70,000,000. This amount represents an increase in the collective wealth of the CMSA would of less than one percent annually over ten years, excluding the cost of off-site disposal and assuming the 1995 value of the dollar. Consequently, positive economic impacts would result from the implementation of Alternative 2.

~~Socioeconomics and Land Use—Minor socioeconomic impacts would be expected with the implementation of Alternative 2. To better assess short term impacts, it is assumed all resources needed to implement Alternative 2, excluding off site transportation and off site disposal costs, would be purchased within the CMSA. Rather than addressing each individual county and the resources they are capable of supplying, each county's public and private expenditures were combined, for a collective wealth for the CMSA of approximately $805,000,000 for fiscal year 1993 to 1994. The estimated total cost benefit to the CMSA of implementing Alternative 2 would be $70,000,000. The collective wealth of the CMSA would increase less than one percent annually over ten years, excluding the cost of off site disposal and assuming the 1995 value of the dollar. Consequently, positive economic impacts would result from the implementation of Alternative 2.~~

Other issues that merit discussion related to socioeconomic impacts are noise and transportation (see Appendix J). Because of the extensive nature of on-property transportation, some increase in noise levels in areas immediately adjacent to the FEMP may occur. In addition, traffic levels are expected to remain constant on local roads.

Short-term noise and land-use impacts to the representative commercial disposal facility, the NTS and the commercial sanitary landfill are expected to be minor. Because of these areas' population density and limited recreational and industrial use, the area will not be affected by the implementation of Alternative 2.

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The impacts on workforce population due to the implementation of Alternative 2 at the FEMP, the representative commercial facility, the NTS, and the commercial sanitary landfill will be minimal.

Cultural Resources Cultural resources will be managed pursuant to a programmatic agreement between the DOE, the Advisory Council on Historic Preservation, and the OHPO. The agreement indicates that literature review, investigation of aerial photographs, and application of a predictive model revealed that the area to be affected by the implementation of Alternative 2 exhibits surface contamination greater than (disintegrations per minute/centimeter squared) 1,000 dpm/100cm² or contains soil disturbance beyond the sterile layer. Consequently, it is assumed that no historic properties would be adversely affected by the implementation of Alternative 2. In the event an unexpected discovery of historic properties occurs during remedial activities, the protection of sensitive cultural resources would be implemented pursuant to Section 106 of the NHPA (National Historical Preservation Act), and Section 110(f) of the same act.

No impacts to cultural or historic resources at the representative off-site disposal facility are expected because no cultural or historical resources have been identified at or near the facility. Cultural resources at the NTS will be managed in accordance with NHPA, AIRFA, and NAGPRA requirements. No cultural resources at the commercial sanitary landfill will be affected.

6.3.2.6 Implementability

This alternative would be implementable. The design for the on-property disposal facility has been initiated under the OU2 ROD (DOE 1995a), which allows for construction to begin in 1996. Material placement in the facility is estimated to begin after August 1997. As a result of ongoing and past site actions, lessons learned have been developed that are critical to the implementability of this alternative. For example, as a result of off-site shipping activities under Removal Action 9, some transportation delays can be expected due to actions to remove the existing waste inventories. These delays are an expected result of limited facilities and staff to support waste certification activities. Due to the limited volume of material expected to be generated and the duration over which it will be generated (ten years), no real impacts are expected. Additionally, during the development of D&D complex-specific implementation plans, D&D methodologies will be evaluated to select the method by which impacts to the treatment or disposal of generated materials will be minimized. The following sections detail specific implementability issues.

operators, drivers, and maintenance personnel would be required. These personnel are currently available at the FEMP.

Materials exceeding the WAC for the on-property disposal facility would be transported to the representative commercial disposal facility or to the NTS by truck. The technical feasibility of implementing this alternative depends on the implementability of transportation of the materials to the off-site facilities and on compliance with the respective facilities' WAC. Based on evaluation of the OU3 materials and the relatively small volume of materials anticipated to require off-site disposal over a ten-year period, it is expected that the materials would be accepted at the representative commercial disposal facility or the NTS. The packaging and transportation personnel required to facilitate this action would be available.

The transportation of OU3 materials to the representative commercial facility and the NTS under Alternative 2 was costed assuming truck transportation. Approximately 508 truck shipments of OU3 materials to the NTS would be required in the $276 million case. This estimate is based on shipping 151,000 unbulked ft^3 (501,000 bulked ft^3) of Category C (Process-Related Metals) materials in large metal boxes (LMBs). An LMB has an internal volume of 1,025 ft^3. One loaded LMB would be shipped per trip. However, the potential to use rail transport to the representative commercial facility does exist. The materials generated during the OU1 remedial action will be shipped to the representative commercial facility via rail per the OU1 ROD (DOE 1994d). Coordinated efforts between OU3 and OU1 could result in the shipment of OU3 materials in conjunction with OU1 materials.

Any delays in the construction of the on-property disposal facility could delay implementation of this alternative. The OU3 final remedial activities will be coordinated with the remediation schedules of other FEMP OUs, particularly OU5. Coordination with OU5 would be required to ensure that a sufficient volume of soils and sediment excavated during the OU5 final remedial action would be available to provide cover of the OU3 materials subsequent to placement into the on-property facility.

Administrative Feasibility

The implementability of this alternative would be feasible once the US EPA grants a waiver of State of Ohio solid waste ~~to the on-property~~ disposal facility siting criteria [OAC 3745-27-07(H)(2)(c)and(d)]. ~~at the FEMP.~~ Since a waiver has already been issued for OU2 materials, a waiver for OU3 materials to be placed in the on-property disposal facility should be feasible. Once the

waiver is received, this alternative would meet all ARARs not excluded by the granting of the waiver, as previously discussed.

Implementability of the off-site disposal options would be based upon administrative agreements between the DOE and a commercial sanitary landfill, the representative commercial disposal facility and the NTS for shipment and

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disposal of OU3 materials. OU3 materials scheduled for disposal at the commercial sanitary landfill would be required to meet the unrestricted release criteria presented in DOE Order 5480.5. The remaining OU3 materials would have to meet the respective WAC for the other off-site facilities. Coordination with regulatory agencies and the local community before and during remedial actions would be necessary for successful implementation.

Availability of Services and Materials

The material requirements for implementing Alternative 2 would include ROBs, flatbed trucks to haul the OU3 materials to the on-property facility, front-end loaders to fill the ROBs, and tarpaulins to cover the interim-stored OU3 materials. It is anticipated that these materials would be available to implement Alternative 2. The NTS currently accepts shipments of LLW from the FEMP. It is anticipated that the NTS would continue to accept FEMP wastes during the OU3 final remedial action. The services of a representative commercial disposal facility would also be arranged as required to accept material that may be determined to exceed the on-property WAC.

Staffing needed to successfully implement this alternative includes field personnel to conduct contamination surveys and prepare materials for off-site disposal, heavy equipment operators, laborers, and administrative personnel, all of whom are expected to be available locally.

6.3.2.7 Cost

The cost to implement Alternative 2 would include the cost to place OU3 materials in the on-property disposal facility and to dispose OU3 ~~ship~~ materials in ~~to~~ the representative commercial disposal facility, the commercial sanitary landfill, and the NTS, when necessary.

As detailed in section E.4.4, the unit rate of disposal of OU3 materials in the on-property disposal facility would be $3.05/ft^3. The disposal facility maintenance unit rate would be $1.12. The disposal rate at the representative commercial disposal facility would be $32/ft^3 while the unit rate of disposal at the NTS would be $17/ft. Additionally, the rate for disposal at a commercial sanitary landfill would be $310 per ROB. Table 6-2 summarizes the costs (in 1995 dollars) of Alternative 2. It also contains the corresponding present-worth cost. The present-worth cost has been calculated using a discount rate of 4.8 percent.

The capital costs portion of Alternative 2 would include material containers, forklifts, trucks, portable scales, steel hoppers, portable light plants, and a concrete crusher. Additional capital costs would

6.3.3 Alternative 3 - Selected Material Treatment and Off-Site Disposition

Alternative 3 considers the off-site disposition of all OU3 materials. The achievement of this objective would require that the OU3 materials treated during the interim remedial action meet WAC for the representative off-site disposal facility and/or the NTS. Alternative 3 material volume projections are presented in Table 6-3.

Under Alternative 3, all OU3 materials that would not meet the criteria for unrestricted release or would be permanently dipositioned either at the representative off-site disposal facility or at the NTS. The representative commercial disposal facility is licensed to accept LLW and most mixed waste for disposal. As currently estimated, Category C (Process-Related Metals) materials are expected to exceed WAC at the representative commercial disposal facility because of anticipated uranium and thorium compounds contained within these materials. Because the materials would exceed the representative commercial disposal facility WAC, they would be transported by truck and dispositioned at the NTS. Of the remaining materials, it is expected that all would meet the representative commercial disposal facility WAC; however, any materials that would not meet WAC may be treated to meet the criteria. OU3 materials to be dispositioned at the representative commercial disposal facility would be transported by rail in conjunction with OU1 remediation wastes.

Approximately ~~150~~155 rail shipments of OU3 materials to the representative commercial disposal facility would be required. Under a unit train concept, with the train designed for FEMP waste only, each shipment would be made including OU1 wastes and OU3 wastes. This estimate is based on placing the total bulked OU3 materials into intermodal transport containers (ITCs). Each ITC has an internal volume of ~~675~~766 ft^3 and would be reused 50 times. The number of trips is based on the expectation that a unit train will leave the FEMP approximately every three weeks; with a total of 18 shipments per year. Based on the ten-year remediation schedule (see Figure 5-1), shipments would occur for approximately 8.5 years. Each railcar to be shipped could carry six ITCs. Approximately 28 rails cars would be used for each of the estimated ~~150~~155 shipments. The number of rail cars was estimated by determining that approximately ~~25~~26,000 ITC containers would be required to ship OU3 materials, on approximately 18 rail shipments per year, for 8.5 years (see Appendix E).

Approximately ~~650~~508 truck shipments of OU3 materials to the NTS would be required during the ten-year remediation efforts. This estimate is based on shipping ~~191~~151,000 unbulked ft^3 (~~649~~501,000 bulked ft^3) of Category C (Process-Related Metals) materials in large metal boxes

6.3.3.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This alternative would ~~provide limited,~~ further reduction of toxicity, mobility or volume of material contaminants through additional treatment. The additional treatment would generally be applied at the representative commercial facility prior to disposal, since the facility is licensed and equipped to perform the treatment. Approximately 5,330 ft^3 of material identified as mixed waste would require treatment (encapsulation) to meet LDRs for off-site disposal.

6.3.3.5 Short-Term Effectiveness

The short-term risks associated with Alternative 3 to members of the community would be minimized through a combination of engineering (e.g., dust suppression) and administrative controls (e.g., fencing and security). A remedial action risk assessment was conducted to assess the potential short-term risks associated with the implementation of this remedial action and is included in Appendix H.

Protection of the Community during the Remedial Actions

The potential risks to hypothetical receptors (representing members of the public near the FEMP), are expected to be insignificant because all materials will be containerized for off-site shipment during the interim remedial action, and therefore no airborne contaminants would be generated. Due to the distance to the site fenceline, dose rates to the public from OU3 materials are also minimal.

Risk to the public along the transportation route are expected to be minimal. The ILCR calculated for an individual along the route during incident-free transportation from direct radiation is 2.7×10^{-9}. Because none of the materials being shipped off-site are liquid, it is expected that in the event of an accident, clean-up would be quick and efficient and minimal exposure other than direct radiation would result.

Protection of Workers During Remedial Actions

It is estimated that an individual remediation worker would receive annual doses of 88 mrem from direct radiation, which is less than the annual routine condition limit of 5,000 mrem and administrative control limit of 2,000 mrem as stipulated in DOE Order 5480.4. Based upon the EPA risk coefficient, this dose would result in a total ILCR of 6.7×10^{-4}. It is estimated that an individual nonremediation worker could receive an annual dose of 0.11 mrem from direct radiation during the ten-year remediation. A total ILCR of 8.4×10^{-8} has been estimated for nonremediation workers.

The cumulative dose for a maximally exposed individual transportation worker is 1,800 mrem over the ten-year remediation. A total ILCR of 1.4 x 10^{-3} has been estimated for a transportation worker.

The cumulative dose for a maximally exposed individual material handler at an off-site disposal facility is 1,700 mrem over the ten-year remediation. A total ILCR of 1.3 x 10^{-3} has been estimated for a material handler.

Mechanical hazards (industrial accidents) from on-site activities may result in approximately 32 injuries and less than one fatality. These injuries would be predominantly related to person hours necessary to more ITCs to the rail line and weigh and certify the ITCs for shipment. Mechanical hazards during transportation may result in approximately two injuries and less than one fatality for transportation workers, and two injuries and less than one fatality to the public.

Short-Term Environmental Impacts

Short-term impacts to the environment for Alternative 3 would be similar to those previously identified in Alternative 2 with the differences outlined below. Discussion regarding socioeconomic impacts is found in Appendix J of this report.

Alternative 3 would increase the wealth of the CMSA by approximately one percent annually for ten years. Traffic volumes on local roads would be expected to remain consistent with current levels.

Both the representative commercial facility and the NTS are located in areas with limited human populations. Both facilities are also located in arid environments. Thus, any short-term effects of the dispositioning of OU3 material would be acceptable.

The commercial sanitary landfill is located near a metropolitan area. The facility is also located in a temperate environment. However, any short-term effects of the dispositioning of OU3 material are also anticipated to be acceptable.

6.3.3.6 Implementability

This alternative is implementable. It is anticipated that the off-site disposal facilities would be able to receive OU3 materials throughout the ten-year remediation period. As a result of ongoing and past site actions, lessons learned have been developed that are critical to the implementability of this alternative. For example, as a result of off-site shipping activities under Removal Action 9, some

transportation delays can be expected due to actions to remove the existing waste inventories. These delays are an expected result of limited facilities and staff to support waste certification activities and the combining of shipment activities with OU1 remedial actions. In addition, due to the large volume requirements for this alternative, the potential exists for the loss of a disposal facility over the long term period of the action. Additionally, during the development of D&D complex-specific implementation plans, D&D methodologies will be evaluated to select the method by which impacts to the treatment or disposal of generated materials will be minimized. The following sections detail the implementability of Alternative 3.

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6.3.3.7 Cost

The cost to implement Alternative 3 includes the cost to dispose ~~containerize and transport~~ OU3 materials in the representative commercial disposal facility and in a commercial sanitary landfill. For Alternative 3, the unit rate for disposal of OU3 materials in the representative commercial disposal facility would be $7 as OU3 materials would be combined with OU1 materials (see Section E.4.4 for details). ~~to an off-site disposal facility.~~ Table 6-4 summarizes the costs (in 1995 dollars) of Alternative 3. It also contains the corresponding present-worth costs. The present-worth cost is calculated using a discount rate of 4.8 percent.

The capital costs of Alternative 3 include material containers, forklifts, trucks, portable scales, labor, materials, fuel, utilities, and parts required to operate and maintain remediation actions, and transportation and disposal of contaminated material. No post-remediation costs are expected for Alternative 3. Appendix E provides the cost estimates for this alternative.

6.4 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section provides a comparative analysis of the remedial alternatives that were evaluated in Section 6.3. The purpose of the comparative analysis is to identify the advantages and disadvantages of each alternative relative to another, so that key tradeoffs can be identified and considered by project stakeholders and regulatory decision-makers. Highlights of the individual alternative evaluations are provided to assist decision-makers and stakeholders in identifying which alternative best qualifies as the preferred remedy for OU3.

Similar to the detailed analysis conducted in Section 6.3, the comparative analysis is conducted using seven of the nine NCP evaluation criteria as the framework for identifying technical and administrative differences among the alternatives. The remaining two criteria, state and community acceptance, are not included because these criteria cannot be assessed until after the PP has been issued and state and public comments on the preferred alternative have been received. The state and community acceptance considerations will be formally evaluated and documented in the ROD.

To facilitate the comparative analysis process, the key points discussed in this section pertaining to each of the evaluation criteria have been arrayed in tables. Table 6-5 presents a summary of the comparison of the alternatives against each of the seven evaluation criteria, including the present-worth cost and total cost of each alternative. Table 6-6 provides a summary of the projected environmental resource impacts associated with each of the alternatives under consideration.

6.4.1 Threshold Criteria

The NCP states overall protection of human health and the environment and compliance with ARARs are threshold criteria that must be attained by the selected remedial action.

6.4.1.1 Overall Protection of Human Health and the Environment

Alternative 1 would allow for continued migration of site contaminants and would not provide for protection of human health and the environment.

Alternative 2 would be protective of human health and the environment. Alternative 2 would rely on an engineered disposal facility with conservative design assumptions and the adoption of WAC that would supplement the natural containment capabilities of the existing site geology to ensure the long-term performance of the disposal system. Modeling completed for the OU5 FS on the performance of the disposal facility demonstrated a ~~high~~ certainty (> 80 percent) that concentrations in the aquifer underlying the facility would not exceed existing and proposed federal drinking water standards for 1,000 years.

Alternative 3 would also provide protection to human health and the environment. Alternative 3 would provide a high level of certainty for continued, long-term protectiveness and would require no provisions for perpetual institutional controls or five-year CERCLA reviews.

6.4.1.2 Compliance With Applicable or Relevant and Appropriate Requirements

Alternative 1 would not comply with ARARs. Alternative 2 would comply with all identified ARARs or meet the requirements for a US EPA waiver of Ohio solid waste disposal facility siting criteria [OAC 3745-27-07 (H)(2)(c)and(d)]. ~~Alternative 2 would comply with all identified ARARs, except those precluded by the granting of a waiver from the State of Ohio to allow disposal of OU3 materials in the on-property disposal facility.~~ In general, to be granted the waiver, OU3 would be required to adopt an engineering design for the facility that will, when coupled with existing site geologic conditions, ensure the long-term protection of human health and the environment and attain a standard of permanence that is equivalent to that required order State of Ohio waste disposal facility siting requirements. These measures will be implemented by OU2 for the design and construction of the disposal facility. Alternative 3 would meet all ARARs identified for the OU3 final remedial action, since all materials generated during the interim remedial action would be dispositioned at an off-site facility.

6.4.2 Primary Balancing Criteria

The NCP establishes five criteria that form the basis for the comparative analysis of viable remedial alternatives. These are the "balancing criteria," as they are used to evaluate the relative tradeoffs among alternatives that meet the threshold criteria. Alternative 1 is carried forward as the baseline alternative for comparison purposes in accordance with the NCP.

6.4.2.1 Long-Term Effectiveness and Permanence

Long-term effectiveness is evaluated through two factors: the magnitude of the residual risk remaining at the site after the cleanup and the adequacy and reliability of any required engineering or institutional controls. Alternative 1 would present an unacceptable magnitude of risk remaining at the site, and would provide the most limited amount of reliability and permanence as compared to Alternatives 2 and 3. Alternative 2 would provide permanent and reliable configuration for the material disposition ~~that is more~~ acceptable than Alternative 1, but not as acceptable as Alternative 3. The implementation of Alternative 2 would include the continuation of institutional controls and long-term monitoring activities. Alternative 3 would include the removal of all contaminated material from the site and thereby provide a greater degree of long-term effectiveness and permanence than Alternatives 1 and 2. No long-term on-property actions for continued institutional controls, surveillance, or maintenance activities would be required for OU3.

6.4.2.2 Reduction of Toxicity, Mobility, or Volume Through Treatment

As presented in Section 6.3.4 of this report, the majority of the OU3 materials to be dispositioned under the final remedial action will undergo treatment during the interim remedial action. The purpose of this treatment is to reduce the levels of removable contamination prior to dismantlement of the OU3 components.

Alternative 1 would provide no additional reduction in contaminant toxicity, mobility, or volume. Furthermore, by placing all OU3 materials into permanent storage without continued maintenance, the mobility of the contaminants would increase over time leading to eventual releases to the environment. For Alternative 2, all mixed wastes scheduled for dispositioning in the on-property disposal facility and all mixed wastes to be dispositioned off-site would be treated through ~~solidification or~~ encapsulation to meet LDRs thereby reducing the contaminant mobility. ~~Because Alternative 3 has a greater volume of material being dispositioned off site,~~ For Alternative 3, ~~would provide~~ the ~~greatest~~ reduction of toxicity, mobility, or volume by treating to meet LDRs ~~in comparison to the other alternatives.~~ would be similar to Alternative 2.

6.4.2.4 Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing the remedial alternatives.

Alternative 1 would be the most technically and administratively implementable action compared to Alternatives 2 and 3, since no further action would take place. The implementability of Alternative 2 would be more challenging than Alternative 1. However, to implement Alternative 2 would require less effort than Alternative 3, because Alternative 2 only requires the placement of OU3 materials into an on-property disposal facility already being constructed for OU2 and OU5 remediation materials.

The administrative implementability of Alternative 2 would be contingent upon OU3 meeting the requirements for and receiving a US EPA waiver of State of Ohio solid waste disposal facility siting criteria [OAC 3745-27-07(H)(2)(c)and(d)]. Contractual agreements between the FEMP and the representative commercial disposal facility and a commercial sanitary landfill, as well as the continued approval to ship materials to the NTS, would also be required. Minimal uncertainty exists with regards to securing contractual agreements with the off-site disposal facilities. The uncertainty is based on the ability of the off-site facilities to accept OU3 materials for the duration of the $276 million case.

The FEMP currently ships LLW wastes to the NTS on a regular basis. The FEMP also currently ships wastes that meet the criteria for unrestricted release to a local commercial sanitary landfill. Additionally, the DOE has been in contact with personnel from the representative commercial disposal facility. The resulting conversations have indicated that an agreement between the DOE and the facility would be probable as the facility anticipates that it will be able to accept OU3 materials from Alternative 2 activities over the duration of the $276 million case.

Off-site disposal would be subject to various local, state, and federal requirements and would require coordination efforts with jurisdictional agencies. Therefore, the contractual and coordination efforts may be time consuming, but possible.

The technical implementability of Alternative 2 would be probable, since equipment and personnel required to transport the OU3 materials from either an interim storage facility or directly from the dismantlement work zone are readily available.

The administrative implementability for Alternative 3 would be similar to that of Alternative 2 except that an on-property disposal facility would not be used. Moderate uncertainty exits concerning the shipment of all OU3 materials off-site. As with Alternative 2, an uncertainty exists of the off-site facilities to accept OU3 materials for the duration of the $276 million case. Additionally, the majority of the OU3 materials would be shipped to the representative disposal facility. Therefore, the ability of the facility to accept a larger amount of OU3 materials than under Alternative 2 would be required.

The technical implementability of Alternative 3, which would include the packaging and transportation of materials to a representative off-site disposal facility, is probable. The equipment and personnel required to complete these tasks are readily available.

~~The administrative implementability of Alternative 2 would be contingent upon OU3 receiving a waiver to disposition interim remedial action materials in the on property disposal facility. A contractual agreement between the FEMP and the representative commercial disposal facility as well as the continued approval to ship materials to the NTS, would be required. The technical implementability of Alternative 2 would highly be probable, since equipment and personnel required to transport the OU3 materials from either an interim storage facility or directly from the dismantlement work zone are readily available.~~

~~The administrative implementability for Alternative 3 would be similar to that of Alternative 2 except that an on-property disposal facility would not be used. The technical implementability of Alternative 3, which would include the packaging and transportation of materials to a representative off-site disposal facility, is probable. The equipment and personnel required to complete these tasks are readily available.~~

6.4.2.5 Cost

Cost estimates are used in the RI/FS process to provide a basis for comparison among alternatives. Estimates are typically provided to an accuracy range of +50 percent (real cost would be 50 percent higher than the estimate) to -30 percent (real cost would be 30 percent lower than the estimate) because of the uncertainties in the information used to develop them. To provide a fair basis of comparison for alternatives, cost estimates for alternatives are presented in present-worth costs. Present-worth costs reflect the quantity of money which would need to be placed in a bank today at a set interest rate, termed the discount rate, to pay for the remedial action over the life of the project.

Alternative 1 would not have any associated costs since no additional actions would occur beyond the scope of the interim remedial action.

The costs required to implement Alternative 2 would have an estimated present worth value of $70,000,000 and an estimated total cost value of $93,000,000. These costs represent the disposition of the OU3 materials in the on-property disposal facility and at off-site disposal facilities. The costs also include any treatment required for off-site disposition at the representative commercial disposal facility (see Appendix E for details). Additionally, costs that OU3 would share with the other FEMP OUs for the design, construction, material placement, maintenance, and monitoring associated with the on-property disposal facility are reflected as a unit rate for disposal ($3.05/ft^3) and a unit rate for the operation and maintenance of the cell ($1.12/ft^3).

The costs required to implement Alternative 3 would have an estimated present-worth value of ~~$150~~143,000,000 and an estimated total cost value of ~~$190~~185,000,000. These costs represent the disposition of the OU3 materials at off-site disposal facilities and include treatment required for off-site disposition.

6.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Natural resources would be permanently committed as a result of implementing the selected remedial alternative over a period of ten years. The commitment of natural resources and land corresponding to each alternative are addressed below. These commitments not only include the resources and land, but the services they provide as well.

Implementing Alternative 1 would require no further commitment of resources or services other than material storage space. Implementing Alternatives 2 and 3 would result in the permanent commitment of land at the off-site disposal facilities. A summary of resource impacts and associated quantities from implementation of remedial action alternatives is provided in Table 6-7.

Consumptive use of petroleum products (e.g., diesel fuel and gasoline) would be required for construction of final action support facilities, material transport, and on-property disposal activities of action alternatives. These materials would be available at the FEMP. Additional fuel use would result from off-site transport of the materials. However, adequate supplies are available without affecting local requirements for these products.

TABLE 6-1

MATERIAL VOLUMES[a] FOR ALTERNATIVE 2

Segregation Category	On-Property Disposal Facility	Off-Site Disposal Facilities	Unrestricted Release
Mixed Waste	50	5,280	0
PCB Waste	14,900	0	0
Low Level Waste	2,660,000	169,000	0
At or Below Baseline	4,160,000	0	541,000
Totals	6,830,000	174,000	541,000

[a] All volumes represent unbulked material volumes (ft^3).

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TABLE 6-2

ALTERNATIVE 2 COSTS

Cost Item	($) 1995 Dollars
Capital Costs	58,000,000
Staffing and Management	9,600,000
*O&M	7,600,000
Risk Budget	18,000,000
Total Cost	93,000,000
Present-Worth Cost	70,000,000

*Includes post-remediation cost required under Alternative 2.

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TABLE 6-3

MATERIAL VOLUMES[a] FOR ALTERNATIVE 3

OU3 Material Volumes (ft^3) by Segregation Category	Off-Site Disposal Facilities	Unrestricted Release
Mixed Waste	5,330	0
PCB Waste	14,900	0
Low Level Waste	2,820,000	0
At or Below Baseline	4,160,0000	541,000
Totals	7,000,000	541,000

[a] All volumes represent unbulked material volumes (ft^3).

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TABLE 6-4

ALTERNATIVE 3 COSTS

Cost Item	($) 1995 Dollars
Capital Costs	136,000,000
Staffing and Management	14,000,000
*O&M	0
Risk Budget	35,000,000
Total Cost	185,000,000
Present-Worth Cost	143,000,000

*No post-remediation cost included under Alternative 3.

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TABLE 6-5

OPERABLE UNIT 3
COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Evaluation Criteria	Alternative 1 No Further Action	Alternative 2 Selected Material Treatment, On-Property and Off-Site Disposal	Alternative 3 Selected Material Treatment and Off-Site Disposal
Overall protection of human health and the environment	Not protective of human health and the environment.	Provides overall protection of human health and the environment.	Provides overall protection of human health and the environment.
Compliance with ARARs	Not compliant because no further action would likely result in exposures to the public and releases to the environment.	Compliant with all ARARs, except those excluded upon receipt of a waiver from the U.S. EPA for the State of Ohio solid waste disposal facility siting requirements.	Compliant with all ARARs.
Short-term effectiveness	No short-term risks since no action would be taken.	All radiological and chemical exposures are estimated to be within acceptable limits. This alternative presents lower short-term risks associated with mechanical hazards than Alternative 3.	All radiological and chemical exposures are estimated to be within acceptable limits. Greater mechanical hazards than Alternative 2 due to injuries from transporting all materials to off-site disposal facilities.
Long-term effectiveness and permanence	Not protective in the long-term. Would result in unacceptable long-term risks to the public.	Is protective of human health and the environment through site geology, engineering, and administrative controls. However, Alternative 2 is less effective and permanent in the long-term than Alternative 3.	Is the most effective and permanent since all contaminated material would be removed from Fernald with no long-term requirements for continued administrative controls, surveillance, or maintenance activities.
Reduction in toxicity, mobility, or volume through treatment	Due to unmaintained storage of dismantled debris, contaminant mobility is expected to increase.	Potentially treats 5,280 cubic feet of material to meet land disposal restrictions for off-site disposal and 50 cubic feet of material to meet criteria for on-property disposal.	Potentially treats ~~more material (an additional~~ 5,330 cubic feet~~) than Alternative 2 because of~~ ~~material to meet~~ of land disposal restrictions for off-site disposal.
Implementability	Easier to implement than Alternatives 2 or 3 because no action occurs.	Easier to implement than Alternative 3 because this alternative only requires placement of OU3 materials into an on-property disposal facility already being constructed for OU2 and OU5 materials.	Hardest alternative to implement because it is dependent on whether agreements are reached with off-site disposal facilities to accept waste. Considerably more coordination would be required with state and local authorities along transportation routes. The volume of material would also require ~~a longer~~ time period to complete shipments.
Current year (1995) cost (in millions)	$0	$93	$185
Present worth cost (in millions)	$0	$70	$143

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TABLE 6-6

OPERABLE UNIT 3
COMPARATIVE ANALYSIS OF ENVIRONMENTAL RESOURCES IMPACTS

Alternative	Soil and Geology	Water Quality and Hydrology	Air Quality	Biotic Resources	Wetlands and Floodplains	Socioeconomics and Land Use	Cultural Resources	Transport Impacts
1	No further impacts	Potential for release to surface and groundwater	Potential for release to ambient air	Potential exposure to ecological receptors	Potential for release to on-property wetlands	Restriction of site future use	No impacts	No impacts
2	Up to approximately 16 acres committed to off-site disposal	Minor impacts assuming monitoring and controls	Minor impacts from fugitive dust assuming controls	No impacts	No impacts	Less than one percent annual increase in CMSA over ten years	No impacts because of identification and management	ILCR of 3.1×10^9 along the route to the off-site disposal facility
3	Up to approximately 112 acres committed to off-site disposal	Minor impacts assuming monitoring and controls	Minor impacts from fugitive dust assuming controls	No impacts	No impacts	Less than one percent annual increase in CMSA over ten years	No impacts due to identification and management	ILCR of 2.7×10^9 along the route to the off-site disposal facility

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TABLE 6-7

QUANTITIES OF NATURAL RESOURCES PERMANENTLY COMMITTED

Alternative	Land[a]	Biotic Resources[a]	Wetlands[a]
1	None Required	None Required	None Required
2	Up to 0.4 acres committed at the representative commercial disposal facility	Up to 0.4 acres of plant community (sandscale-gray molly) at representative disposal commercial facility	None Required
	Up to 2.5 acres commited at the NTS	Up to 2.5 acres of various desert shrubs	
	Up to 13 acres committed at the commercial sanitary landfill	None Required	None Required
3	Up to 96 acres committed at off-site commercial facility	Up to 96 acres of plant community (sandscale-gray molly) at off-site commercial facility	None Required
	Up to 2.5 acres commited at the NTS	Up to 2.5 acres of various desert shrubs	None Required
	Up to 13 acres committed at the commercial sanitary landfill	None Required	None Required

[a] Resource impacts occur at the FEMP unless noted otherwise.

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APPENDIX A

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A-9	Changes to the Baseline Data Set Radionuclides in Concrete
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A-11	Statistical Summary on Concrete Core Data FEMP Concrete Samples
A-12	Changes to Statistical Summary of Trace Metals in Concrete Core Data
A-13	Statistics by Analyte for all Solid Media
A-14	Summary Statistics for all Analytes by Sampled Media Type
A-15	List of Major Data Changes and Associated Impacts
A-16	Number of Detects Exceeding Reference Criteria for Solid Media
A-17	Detects Exceeding Reference Criteria for Each Media Type

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This organization allows the reader to examine the type and level of contamination within OU3 at whatever level of detail is desired.

To further aid in understanding the level and type of contamination within OU3, the discussions in Appendix A (including attachments) and Section 3 are presented from three different viewpoints: by contaminant (Attachment A.II, Appendix A.5, and Section 3.5), by sampled medium (Attachment A.III, Appendix A.6, and Section 3.6), and by component category/component (Attachment A.IV, Appendix A.7, and Section 3.7). This presentation anticipates that different readers will require not only different levels of detail regarding contamination within OU3, but also a description from different viewpoints:

- The discussions by contaminant are useful in identifying the occurrence of specific constituents within OU3; such as what potentially hazardous/mixed wastes occur and at what levels, how widespread they are, and whether or not enriched materials are an issue.
- The media presentations are useful in identifying which media are of most concern as well as the type and level of contamination within each medium.
- The descriptions of the contamination by component category/component presentation are useful in identifying which components are of most concern as well as the type and level of contamination within a particular component/component category.

Changes in the database of analytical results occurred after this Appendix was drafted in September, 1995. Because these changes do not alter the conclusions from the analysis of this data, this Appendix has not been updated to reflect the minor changes. A description of the major changes, and their impact on the data analysis or decision-making process has been added as Section A.7.

A.1 DESCRIPTION OF OPERABLE UNIT 3

The Amended Consent Agreement states that OU3 includes all structures, equipment, utilities, drums, tanks, solid waste, waste, product, thorium, effluent lines, K-65 transfer line, wastewater treatment facilities, fire training facilities, scrap metal piles, feedstocks, and coal pile at the FEMP. This section describes the physical characteristics of this extensive array of production, support, and related facilities.

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determining constituents of potential concern (CPCs) in standard baseline risk assessments, removed analytes not contributing to risk while providing adequate human health and environmental protection. This section describes the selection process, delineates selection criteria, and presents the results of the screening process. Since the soil piles, sampled as part of the RI/FS Characterization Study, were previously accounted for in the OU5 FS, a comparison between COCs found in excavated soil piles and COCs used in the OU5 FS (DOE 1995c) is also presented.

A.2.1 Overview of Selection Process

The four-step COC selection process used in OU3 is described below, graphically portrayed in Figure A-12.

STEP 1: Separation by media. COC determination was performed on nine media types. Seven of these media constitute the majority of the materials forming the infrastructure of OU3: concrete, acid brick, masonry, steel coatings, transite, asphalt, and wood. These seven media types represent the bulk of OU3 construction debris relevant to this RI/FS. Two other media types not directly related to the RI/FS were also assessed: loose media and excavated soil. Loose media, or miscellaneous debris, is not evaluated as part of this RI/FS because its media will be removed during the interim remedial action and dispositioned in accordance with on-going programs. The excavated soil piles are not directly applicable to the OU3 RI/FS as they are considered in the OU5 FS (DOE 1995c) and will be dispositioned in the OU5 Record of Decision. These soil piles are included in the COC determination that was performed in this report because the analytical results for these soil piles were not available when the OU5 RI/FS was performed. This analysis was performed to ensure that no COCs were overlooked in the analysis performed by OU5 (See Section A.2.4).

Analytical information for each of the previously mentioned media types was drawn for all chemical-specific analytical information (chemical and radiological constituents) specified in the WPA (DOE 1993). In all, 175~~170~~ constituents were included in the analysis, consisting of 19 radiological constituents, 24 metals, 38~~35~~ volatile organic chemicals, 67~~66~~ semivolatile organic chemicals, and 27~~26~~ pesticides and PCBs. As explained in the WPA sampling and analysis plan (DOE 1993a), not all media were analyzed for all compound classes.

STEP 2: Determination of Representative Concentration. Because of the variety of expected contaminant levels in the production facility and the small number of samples for some media, the maximum detected

approach takes advantage of the knowledge that historical separation techniques enriched both uranium-234 and uranium-235 simultaneously. For example, it is known that when uranium was enriched in uranium-235 from 0.72 percent to 2.96 percent, the uranium-234 content of the same uranium went from 0.006 percent to 0.03 percent (EG&G 1988). Thus if the relative isotopic abundance of one nuclide suggests the presence of enriched uranium, the relative isotopic abundance of the other should too.

The uranium production industry typically uses mass spectroscopy to determine the enrichment of uranium. However, the data quality objectives for this project require that the analyses be of sufficient quality to determine the risk of exposure to uranium. The risk from uranium is dependent on the activities of its isotopes. Alpha spectroscopy provides a direct measure of this activity and was therefore selected as the method of choice for this task.

Presently, complete sets of isotopic uranium data are available for 498 sample locations. Based on the uranium-235/236 data available, 42 of these locations were suspected of containing uranium with a 1.3 percent or greater enrichment of uranium-235. This distribution is not matched by the enrichment results indicated by examining uranium-234 abundances in the same samples. The uranium-234 abundances indicate that just two samples contain the elevated uranium-234 ratios indicative of two percent uranium-235 enriched uranium (Figure A-13). This discrepancy required additional evaluation of the uranium-234 and uranium-235 abundance data.

Figure A.2.1-2 plots both uranium-234 and uranium-235/236 activity against the attendant uranium-238 activity, and linear regressions were performed on the isotopic data. The uranium-234 verses uranium-238 activity line has a slope of 1.07 and a regression coefficient of 0.92. This ratio agrees reasonably well with the ratio of uranium-234 activity to uranium-238 activity in natural uranium (about 1.0). In contrast, the uranium-235/236 to uranium-238 activity line of the measured data has a slope of 0.12, ($r^2 = 0.78$), whereas the ratio of uranium-235 activity to uranium-238 activity in natural uranium is 0.046 (Figure A-14). This is indicative of a systematic positive bias in the uranium-235/236 analytical results.

The uranium-235/236 isotopic data depicted in Figure A-14 also appear more scattered than the uranium-324 data, indicating the uranium-235 data set has a greater variance than the uranium-234 data. Since the uranium-235 enrichment calculation is very sensitive to changes in the uranium-235/236 data, a greater variance in the uranium-235/236 data may explain why the

Arsenic was detected most often in concrete, but it was detected at the consistently highest levels in loose media and steel coatings. It was detected in 133 of 135 components in which samples were taken for analysis of inorganics. It was detected most often in processing plants (Recovery Plant [8A], Pilot Plant Wet Side [13A], and Metals Production Plant [5A]), but at the consistently highest levels in Electrical Panels and Transformers (16C) and Pilot Plant Warehouse (68).

Concentrations of arsenic in 11 samples exceeded 20 times the TCLP limit (100 mg/kg) ~~and are therefore potentially hazardous.~~ These 11 samples include five steel coatings samples, four loose media samples, one sediment sample, and the wood sample. No concrete, masonry, or acid brick samples exceeded 20 times the TCLP limit for arsenic. No OU3 major media is considered potentially hazardous due to arsenic if a representative sample were taken.

Arsenic is a COC because all of the detected results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact, and because 11 of the results exceeded 20 times the TCLP limit. However, none of the steel coating samples would be hazardous if a representative sample were taken (i.e., including the underlying steel - see Appendix A.III.2.6.2); the loose media and sediment samples are not part of the decision-making process of this RI/FS (see Section 1.0), and there is no WAC for its on-property or off-site disposal. Therefore, arsenic is considered *not as significant* compared to other inorganic COCs and is not discussed further in Section 3.5.

A.4.3.3 Summary Discussion of Barium in OU3

Barium is expected in OU3 primarily because it is a trace constituent in concrete (up to a baseline level of 50.4 mg/kg at the FEMP); because barium carbonate was used in thorium extractions in the Pilot Plant Wet Side (13A); and because barium compounds also were involved in operations at the Preparation Plant (1A), the Graphite Furnace and Oil Burner (10D), the Coal Pile (P-005), and the Laboratory (15A). Barium sulfate ($BaSO_4$) is a constituent in white paint as well as a "covering agent" used to make the paint flow easier. Therefore, the occurrence of barium is expected to be:

- Widespread in concrete, tending toward baseline concentrations;
- Widespread in painted surfaces; and
- At elevated levels in the components where it was used in the process.

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concentrations in a steel coatings. It was detected in all 135 components in which samples were taken for analysis of inorganics. It was detected most often in process buildings (Recovery Plant [8A], Special Products Plant [9A], Pilot Plant Wet Side [13A], and Six to Four Reduction Facility #1 [54A]), but at consistently high concentrations in many components.

Concentrations of barium in 33 samples exceeded 20 times the TCLP limit (2000 mg/kg) ~~and are therefore potentially hazardous.~~ These 33 samples include 24 steel coating samples, five concrete samples, two loose media samples, one masonry sample, and one sediment sample. No OU3 major media is considered potentially hazardous due to barium if a representative sample were taken.

Of these 33 samples, 23 were collected from the process buildings component category; three were collected from the process support buildings category, all from the Heavy Equipment Building (46); two samples each were collected from the warehouse/storage buildings and the above-ground containers categories; and one sample each was collected from the administrative buildings, above-ground piping, utilities and equipment, and below-ground piping, utilities, and equipment categories. All of the concrete samples exceeding 20 times the TCLP limit for barium were taken from the top half inch of concrete. Three of the five concrete samples exceeding 20 times the TCLP limit were collected from the Recovery Plant (8A); the remaining concrete samples were collected from the Special Products Plant (9A) and the Sump Pump House (13C). The single masonry sample exceeding 20 times the TCLP limit was collected from the Engine House/Garage (31A).

Barium is a COC because five percent of the detected results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact, and because of the 33 samples exceeding 20 times the TCLP limit (including five concrete and one masonry sample). Even though there is no WAC for its on-property or off-site disposal, barium is considered *more significant* compared to other inorganic COCs and is further discussed in Section 3.5.

A.4.3.4 Summary Discussion of Beryllium in OU3

Beryllium is expected within OU3 primarily because it is a trace constituent in concrete (up to a baseline level of 1.40 mg/kg at the FEMP). Therefore, the occurrence of beryllium is expected to be widespread in concrete, tending toward baseline concentrations.

As shown on Table A.II-1, beryllium was detected in only 29 percent (199 of 698) of the samples of solid media, with concentrations ranging from 0.03 to 56.3 mg/kg (median of 0.41 mg/kg).

Beryllium was detected in all sampled media, except asphalt, and at the highest concentrations in supplemental media (loose media and sediment).

Beryllium is a COC because 100 percent of the detected results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. However, it was only detected in 29 percent of the solid samples collected from OU3, there are no hazardous criteria governing its disposal in a landfill (40 CFR 261.24), and there is no WAC for its on-property or off-site disposal. Therefore, it is considered *not as significant* compared to other inorganic COCs and is not further discussed in Section 3.5.

A.4.3.5 Summary Discussion of Cadmium in OU3

Cadmium is expected within OU3 primarily because it is used as a yellow pigment in paint, it is a trace constituent in concrete (up to a baseline level of 2.40 mg/kg at the FEMP), and it was a minor impurity in uranium ores and ore concentrates used at the FEMP. Cadmium concentrations ranged from 0.006 to 0.007 percent (DOE 1994a) but were concentrated up to five times through the removal of the uranium in the refining process. Therefore, the occurrence of cadmium is expected to be:

- Widespread in concrete, tending toward baseline concentrations;
- At slightly elevated levels (up to 350 mg/kg) in most media is uranium processing facilities; and
- At elevated levels associated with paint.

As shown on Table A.II-1, cadmium was detected in 42 percent (305 of 732) of the solid media samples, with concentrations ranging from 0.11 to 558 mg/kg (median of 1.2 mg/kg). Cadmium was detected in all sampled media, except asphalt, and at the highest, and most consistently high, concentrations in steel coatings (paint). It was detected in 86 of the 135 components from which samples were taken for analysis of inorganics. It was detected most often in process buildings (Metals Production Plant [5A], Recovery Plant [8A], Pilot Plant Wet Side [13A], and Incinerator Building [39A]), and at consistently high levels in the Incinerator Building.

Concentrations of 44 samples exceeded 20 times the TCLP limit (20 mg/kg) ~~and are therefore potentially hazardous.~~ These 44 samples include 37 steel coatings samples, four loose media samples, one concrete chip sample, one masonry sample and one sediment sample. No OU3 major media is considered potentially hazardous due to cadmium if a representative sample were taken.

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As shown on Table A.II-1, chromium was detected in 89 percent (653 of 733) of solid media samples collected from OU3, with concentrations ranging from 1 to 17,300 (geometric mean of 35 mg/kg). Chromium was detected in all sampled media, with the highest levels in steel coatings.

Concentrations of chromium in 175 samples exceeded 20 times the TCLP limit (100 mg/kg)~~. and are therefore potentially hazardous.~~ These 175 samples included 123 steel coatings samples, 21 loose media samples, ten sediment samples, eight concrete core samples, five concrete chip samples, four acid brick samples, one masonry sample, one air filter sample, one transite sample, and one wood sample. Of these 175, 107 were collected from the process buildings; 26 from process support buildings; 13 from warehouse buildings; seven from above-ground containers; six from below-ground piping, utilities, and equipment; six each from above-ground piping and ponds/basins; three from administrative buildings; and one from storage pads.

The six components with the most samples exceeding 20 times the TCLP limit in the steel coatings samples were the Recovery Plant (8A) with 15; the Metals Production Plant (5A) with nine; and the Preparation Plant (1A), the Metals Fabrication Plant (6A), the Special Products Plant (9A), and the Six to Four Reduction Plant #1 (54A) with seven each. Only two of the acid brick samples, both from the Special Products Plant (9A) are considered potentially hazardous due to chromium.

Chromium is a COC because 24 percent of all results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact, and because 175 samples exceeded 20 times the TCLP limit. Even though there is no WAC for its on-property or off-site disposal, chromium is considered *more significant* compared to other inorganic contaminants and is discussed further in Section 3.5.

A.4.3.7 Summary Discussion of Copper in OU3

Copper is expected in OU3 primarily because it is a trace constituent in concrete (up to a baseline level of 11.1 mg/kg at the FEMP). Furthermore, it was present in Zircalloy-2 cladding from reactor fuel rods received from Hanford for recycling (Plant 9), and it (as copper sulfate) also was used in the WINLO process in Plant 8. In addition, it was a minor impurity in uranium ores and ore concentrates used at the FEMP. Copper ranged in concentration from 0.003 to 0.20 percent (DOE 1994a), but was concentrated up to five times through the removal of the uranium in the refining process. Therefore, the occurrence of copper is expected to be:

Maintenance Building [12A], Pilot Plant Wet Side [13A], and Six to Four Reduction Facility #1 [54A]; but at consistently high levels in many components.

Concentrations of lead in 247 samples exceeded 20 times the TCLP limit~~. and are therefore potentially hazardous.~~ These 247 samples were comprised of 131 steel coatings samples, 34 loose media samples, 23 masonry samples, 21 concrete core samples, 20 sediment samples, 13 concrete chip samples, and five acid brick samples. Of these 247 samples, 156 were collected from process buildings; 36 from process support buildings; 12 each from above-ground containers and ponds/basins; eleven each from warehouse buildings and ponds/basins; six of the samples were collected from above-ground piping, utilities and equipment; five each from storage pads and below-ground piping, utilities and equipment; three from administrative buildings; and one from bulk materials. Only two of the acid brick samples, one from the Ore Refinery Plant (2A) and one from the Metal Dissolver Building (2D), are considered potentially hazardous due to lead.

Two components, the Metals Fabrication Plant (6A) and the Pilot Plant Wet Side (13A), have lead concentrations exceeding 20 times the TCLP limit in depths to 1.0 inch in the concrete core samples collected. A third concrete core sample collected from the Pilot Plant Wet Side at a depth of 0.5 to 1.0 inch also exceeded 20 times the TCLP limit; however, the top half inch of the core sample did not. Two other components, the Preparation Plant (1A) and the Old Cooling Water Tower (3K), had lead concentrations exceeding 20 times the TCLP limit in the concrete core samples collected at depths of 0.5 to 1.0 inch; however the top half inch of the core sample did not. The Ore Refinery Plant (2A) had three samples from the top half inch of concrete which exceeded 20 times the TCLP limit. The Main Maintenance Building (12A), the Metals Production Plant (5A), and the Old North Tank Farm (19D) had two samples from the top half inch of concrete which exceeded 20 times the TCLP limit. Five other components also had one sample from the top half inch of concrete core samples collected which exceeded 20 times the TCLP limit.

Lead exceeded 20 times the TCLP limit in concrete chip samples collected in the top half inch in one component (the Pilot Plant Annex - 37) in three different samples. Concrete chip samples from three other components; the Green Salt Plant (4A), the Metals Fabrication Plant (6A), and the Recovery Plant (8A); exceeded 20 times the TCLP limit in two different samples. Four other components also had one concrete chip sample which exceeded 20 times the TCLP limit.

A.4.3.10 Summary Discussion of Mercury in OU3

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Mercury is expected in OU3 primarily because it (mercuric sulfide) is used as a pigment in paints, it is a trace constituent in concrete (up to a baseline level of 0.03 mg/kg at the FEMP), and it was used in the dissolution of alloys in Plant 2/3, as well as in the Laboratory. Therefore, the occurrence of mercury is expected to be:

- Widespread in concrete, tending toward baseline concentrations;
- At elevated levels in most media in uranium processing facilities where it was used; and
- At elevated levels associated with paints.

As shown on Table A.II-1, mercury was detected in 42 percent (299 of 712) of solid media samples collected from OU3, with concentrations ranging from 0.024 to 223 mg/kg (median of 0.1 mg/kg). Mercury was detected in all sampled media, except asphalt and soil, and at the highest level in sediment, but at the most consistently high levels in steel coatings. It was detected in 74 of the 135 components in which samples were collected for analysis of inorganics. It was detected most often in process and support buildings (Recovery Plant [8A], Main Maintenance Building [12A] and Pilot Plant Wet Side [13A]), but at consistently high levels in several components.

Concentrations of mercury in 50 samples exceeded 20 times the TCLP limit~~. and are therefore potentially hazardous.~~ These 50 samples include 32 steel coatings samples, five loose media samples, six sediment samples, two masonry samples, two acid brick samples, one concrete core sample, and two concrete chip samples. No OU3 major media is considered potentially hazardous due to mercury if a representative sample were taken.

Of the 50 samples exceeding 20 times the TCLP limit, 24 of the samples were collected from process buildings, 15 from process support buildings, five from the ponds and basins, and two each from warehouse buildings, above-ground containers, and above-ground piping, utilities, and equipment category. The Main Electrical Strainer House (26C) had a mercury concentration exceeding 20 times the TCLP limit in the top half inch in the concrete core sample collected. Both concrete chip samples were collected from the Electrical Power Center Building (3L). The masonry samples collected were from the Main Electrical Strainer House (26C) and the Digester and Control Building (25E). Two acid brick samples both collected from the Main Maintenance Building (12A) exceeded 20 times the TCLP limit for mercury.

As shown on Table A.II-1, selenium was detected in only 16 percent (96 of 601) of solid media samples collected from OU3, with concentrations ranging from 0.29 to 157 mg/kg (geometric mean of 1.1 mg/kg). Selenium was detected in all sampled media, except asphalt, with the highest concentrations detected in loose media.

Concentrations of selenium in seven samples exceeded 20 times the TCLP limit (20 mg/kg)~~. and are therefore potentially hazardous.~~ These seven samples included four loose media samples and three steel coatings samples. Six of these seven samples were collected from the process buildings and the remaining sample was collected from above-ground containers. No OU3 major media is considered potentially hazardous due to selenium if a representative sample were taken.

Selenium is a COC because one percent of the detected results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact, and because seven samples exceed 20 times the TCLP limit. However, there is no WAC for its on-property or off-site disposal, none of the steel coating samples would be hazardous if a representative sample were taken (i.e., including the underlying steel - see Appendix A.III.2), and the loose media is not part of the decision-making process of this RI/FS (see Volume 1, Section 1). Therefore, selenium is considered *not as significant* compared to other inorganic contaminants and is not discussed further in Section 3.5.

A.4.3.13 Summary Discussion of Silver in OU3

Silver is expected in OU3 primarily because it is a trace constituent in concrete (up to a baseline level of 5.42 mg/kg at the FEMP), and silver compounds were used as an algicide in the Plant 4. Silver was also associated with the photo lab and the analytical laboratory. Therefore, the occurrence of silver is expected to be:

- Widespread in concrete, tending toward baseline concentrations; and
- At elevated levels in the media in the Plant 4 heat exchanger area.

As shown on Table A.II-1, silver was detected in 36 percent (257 of 722) of solid media samples collected from OU3, with concentrations ranging from 0.17 to 1360 mg/kg (geometric mean of 1.4 mg/kg). Silver was detected in all sampled media, except asphalt and soil, at the highest levels in loose media.

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Concentrations of silver in five samples exceeded 20 times the TCLP limit (100 mg/kg)~~, and are therefore potentially hazardous.~~ These five samples include four loose media samples and one sediment sample. All of these samples were collected from process buildings. No OU3 major media is considered potentially hazardous due to silver if a representative sample were taken.

Silver is a COC because one percent of the samples exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact, and its concentration in five exceeded 20 times the TCLP limit. However, there is no WAC for on-property or off-site disposal, and loose media and sediments are not part of the decision-making process in this RI/FS (see Volume 1, Section 1). Therefore, silver is considered *not as significant* compared to other inorganic contaminants, and it is not discussed further in Section 3.5.

A.4.3.14 Summary Discussion of Thallium in OU3

Thallium is expected in OU3 primarily because it is a trace constituent in concrete (up to a baseline level of 0.32 mg/kg at the FEMP). Therefore, the occurrence of thallium is expected to be widespread in concrete, tending toward baseline concentrations.

As shown on Table A.II-1, thallium was detected in only five percent (36 of 668) of solid media samples collected from OU3, with concentrations ranging from 0.04 to 16 mg/kg (geometric mean of 0.45 mg/kg). Thallium was detected in steel coatings, concrete, masonry, loose media, and sediment, with the highest concentrations detected in concrete chips and steel coatings.

Thallium is a COC because five percent of the results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. However, there are no hazardous criteria governing its disposal in a landfill (40 CFR 261.24) and there is no WAC for its on-property or off-site disposal. Therefore, thallium is considered *not as significant* compared to other inorganic contaminants, and it is not discussed further in Section 3.5.

A.4.3.15 Summary Discussion of Vanadium in OU3

Vanadium is expected in OU3 because it is a trace constituent in concrete (up to a baseline level of 13.2 mg/kg at the FEMP), and it was a minor impurity in uranium ores and ore concentrates used at the FEMP, with concentrations ranging from 0.003 to 2.59 percent (DOE 1994a), but concentrated up to five times through the removal of the uranium in the refining process.

sections describe the expected source of each COC at the FEMP, if known, and summarize its occurrence. A detailed description of the expected and actual occurrence of all 66 semivolatiles for which analyses were performed is provided in Attachment A.II.

As described below, three semivolatiles (1,4-dichlorobenzene, hexachlorobutadiene, and nitrobenzene) are considered *more significant* in comparison to the others and, therefore, a summary of the occurrence of these contaminants within OU3 is presented in Section 3.5. Note that most of the semivolatile compounds were used in various materials throughout the FEMP. Therefore, in most cases, their exact source and use are not known and, are thus not included in the discussions below.

A.4.4.1 Summary Discussion of 1,4-Dichlorobenzene in OU3

As shown on Table A.II-1, 1,4-dichlorobenzene was detected in only two percent (2 of 112) of solid media samples, with concentrations of 39,000 and 344,000 μg/kg. These samples were of loose media and transite. The transite result, which was obtained by multiplying the actual TCLP result by 20 (to account for the dilution effect of the TCLP test) was above 20 times the TCLP limit (150,000 μg/kg)~~. and therefore considered characteristically hazardous.~~ However, no transite is considered potentially hazardous if a representative sample were taken.

1,4-Dichlorobenzene is a COC because both detected results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact, and because the one result (in transite - major media) exceeded 20 times the TCLP limit. Although there is no WAC for its on-property or off-site disposal, it is considered *more significant* compared to other organic COCs and is discussed further in Section 3.5.

A.4.4.2 Summary Discussion of 2,4-Dinitrotoluene in OU3

As shown on Table A.II-1, 2,4-dinitrotoluene was detected in only one percent (1 of 112) of solid media samples, with a concentration of 50,000 μg/kg. This sample was of loose media and exceeded 20 times the TCLP limit for 2,4-dinitrotoluene (2600 μg/kg).

2,4-Dinitrotoluene is a COC because the detected result exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact, and because the one result exceeded 20 times the TCLP limit. However, it was not detected in 99 percent of all solid media samples or in any major media samples, 99 percent of the results are below the Part B Soil Screening Level, 99 percent of the results are below 20 times the TCLP limit, and there are no WAC for on-property or off-site

samples and in no major media, there are no hazardous criteria governing its disposal in a landfill (40 CFR 261.24), and there is no WAC for its on-property or off-site disposal. Therefore, it is considered *not as significant* compared to other organic COCs and is not discussed further in Section 3.5.

A.4.4.9 Summary Discussion of Chrysene in OU3

As shown on Table A.II-1, chrysene was detected in 70 percent (71 of 101) solid media samples, with concentrations ranging from 18 to 81,000 μg/kg (geometric mean of 1370 μg/kg). Of the 71 detected results, 65 were in loose media samples, two in concrete, two in acid brick, two in asphalt, and one in wood.

Chrysene is a COC because 23 detected results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. However, only six of the detected results were in major media, there are no hazardous criteria governing its disposal in a landfill (40 CFR 261.24), and there is no WAC for its on-property or off-site disposal. Therefore, it is considered *not as significant* compared to other organic COCs and is not discussed further in Section 3.5.

A.4.4.10 Summary Discussion of Dibenzo(a,h)anthracene in OU3

As shown on Table A.II-1, dibenzo(a,h)anthracene was detected in 14 percent (14 of 101) of solid media samples, with concentrations ranging from 55 to 15,000 μg/kg (geometric mean of 1850 μg/kg). All detected results were in loose media.

Dibenzo(a,h)anthracene is a COC because all of the detected results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. However, the concentration in 86 percent of the samples was undetected, none of the detected results are in major media, there are no hazardous criteria governing its disposal in a landfill (40 CFR 261.24), and there is no WAC for its on-property or off-site disposal. Therefore it is considered *not as significant* compared to other organic COCs and is not discussed further in Section 3.5.

A.4.4.11 Summary Discussion of Hexachlorobutadiene in OU3

As shown on Table A.II-1, hexachlorobutadiene was detected in only one percent (1 of 102) of solid media samples, with a concentration of 298,000 μg/kg. The sample was of transite and exceeded 20 times the TCLP limit (10,000 μg/kg). Note the result was obtained by multiplying the actual TCLP result by 20 (to account for the dilution effect of the TCLP test). No transite is considered potentially

hazardous if a representative sample were taken.

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the actual TCLP result by 20 (to account for the dilution effect of the TCLP test) exceeded 20 times the TCLP limit. No transite is considered potentially hazardous if a representative sample were taken.

Nitrobenzene is a COC because one detected result exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact, and because its concentration in major media exceeded 20 times the TCLP limit and is characteristically hazardous. Although there is no WAC for its on-property or off-site disposal, it is considered *more significant* compared to other organic COCs and is discussed further in Section 3.5.

A.4.4.15 Summary Discussion of Pentachlorophenol in OU3

As shown on Table A.II-1, pentachlorophenol was detected in only two percent (2 of 100) of solid media samples, with concentrations of 730 and 14,000 μg/kg. Both of the detected results were found in loose media.

Pentachlorophenol is a COC because both of the detected results exceeded the Part B Soil Screening Level, indicating a potential concern with direct contact. However, the organic was not detected in 98 percent of all solid media samples or in any major media; 98 percent of the results are below the Part B Soil Screening Level; and none were above 20 times the TCLP limit, which is the hazardous criteria governing its disposal in a landfill (40 CFR 261.24). Therefore, it is considered *not as significant* compared to other organic COCs and is not discussed further in Section 3.5.

A.4.5 Volatile Organic Compound Constituent of Concern Summaries

As described in Appendix A.2.2, volatile organic compounds were used at the FEMP and are therefore expected contaminants in OU3. Based on this knowledge, 35 major media samples and 160 supplemental media samples were analyzed for a total of 33 volatile organics. Based on these results, three volatiles have been identified as COCs in OU3 (see Appendix A.3). The following sections describe the expected source of each COC at the FEMP, if known, and summarize its occurrence. A detailed description of the expected and actual occurrence of all 33 volatiles for which analyses were performed is provided in Attachment A.II.

As described below, one volatile (tetrachloroethene) is considered *more significant* in comparison to the others and, therefore, a summary of its occurrence within OU3 is presented in Section 3.5. Note that most of the volatile compounds were used in various materials throughout the FEMP. Therefore,

As shown on Table A.II-1, tetrachloroethene was detected in 12 percent (15 of 125 samples) of solid media samples, with concentrations ranging from 1.0 to 1,180,000 μg/kg (geometric mean of 82 μg/kg). Six of the detected results were in loose media, seven in concrete, one in acid brick, and one in transite. The transite, with analytical result of 59 mg/L, exceeded the TCLP limit (i.e., greater than 0.7 mg/L) in the Ore Refinery Plant (2A). No transite is considered potentially hazardous if a representative sample were taken.

Tetrachloroethene is a COC because one detected result exceeded the Part B Screening Level, indicating a potential concern with direct contact, and because the same result exceeded 20 times the TCLP limit. Although there is no WAC for its on-property or off-site disposal, it is considered *more significant* compared to other organic COCs and is discussed further in Section 3.5.

A.4.6 Pesticide/PCB Constituent of Concern Summaries

As described in Appendix A.2.2, pesticides and PCBs were used at the FEMP and are therefore expected contaminants in OU3. However, they are expected to be limited in both level and abundance. Based on this knowledge, 22 major media samples and 16 supplemental media samples were analyzed for pesticides/PCBs. Based on these results, three pesticides and two PCBs have been identified as COCs in OU3.

Of the 28 PCB/pesticide contaminants for which analyses were performed, 16 were detected during analyses of the OU3 remedial investigation samples. Twenty-seven of the samples analyzed for pesticides/PCBs exceeded the Part B Soil Screening Levels. However, none of the samples exceeded 20 times the TCLP limit. Also, none of the samples analyzed exceeded the 50 ppm limit for PCBs established by the Toxic Substances Control Act (TSCA) (40 CFR 761). The following sections discuss the frequency of detections and relative levels of detections for each pesticide/PCB COC in OU3 materials.

A.4.6.1 Summary Discussion of alpha-Chlordane in OU3

As shown on Table A.II-1, alpha-chlordane was detected in six percent (two of 35) of solid media samples, with concentrations of 5.4 and 71 μg/kg. Both of the detected results were in concrete chip samples. The maximum concentration of gamma-chlordane was also detected in one of these samples.

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This suggests that these analyte's baseline concentrations exceed the analyte's detection limits. None of the maximum sample results detected are less than the corresponding baseline or concentration. This indicates that acid brick in OU3 contains elevated levels of every radionuclide sampled.

A.5.1.2 Inorganic Contamination:

Twenty-four acid brick samples were taken from eleven components for analysis of Target Analyte List (TAL) inorganics. As shown on Table A.III-1, all of the 16 inorganic COCs for which analyses were performed were detected, except thallium. All but six (antimony, beryllium, cadmium, selenium, silver and thallium) were detected in at least 12 samples. Two inorganics (barium and manganese) were each detected in all 24 samples.

Table A.III-3 summarizes the inorganic contamination in acid brick that exceeds 20 times the TCLP limit. Ten samples exceeded one or more of the limits for chromium, lead, or mercury. Lead was detected at concentrations greater than 20 times the TCLP limit (i.e., greater than 100 mg/kg) in five samples, with concentrations up to 518 mg/kg. Chromium was detected at concentrations greater than 20 times the TCLP limit (i.e., greater than 100 mg/kg) in four samples, with concentrations up to 407 mg/kg, and mercury was detected at concentrations greater than 20 times the TCLP limit (i.e., greater than 4.0 mg/kg) in two samples, with concentrations up to 5.2 mg/kg.

The most extensive inorganic contamination is associated with the Denitration Area of the Ore Refinery Plant (2A), where results exceeded 20 times the TCLP limit for both chromium and lead. The Digestion Area and the Extraction Area of the Ore Refinery Plant (2A) also have results for lead that exceed 20 times the TCLP limit. The other components with results that exceed these limits include the Special Products Plant (9A), Pilot Plant Wet Side (13A), Metal Dissolver Building (2D), and Main Maintenance Building (12A).

TCLP Results - Inorganics

Three acid brick samples were analyzed using the TCLP test. Tables A.II-3 through A.II-6 compare the results of the TCLP analyses with those for total inorganics. Note that only analyses for which the leachate concentration was below the theoretical maximum concentration, based on all of the metal in the solid sample leaching, are considered reasonable.

Only two TCLP metals, chromium (at 127 mg/kg) and lead (at 169 mg/kg), were detected at greater than 20 times the TCLP limit in the solid sample corresponding to the sample analyzed using the

TCLP. Chromium was detected in the TCLP leachate of the respective sample at 0.116 mg/L, well below the TCLP limit of 5.0 mg/L and indicating that only two percent of available chromium leached from the solid sample. Lead was detected in the TCLP leachate of the respective sample at 0.0727 mg/L, well below the TCLP limit of 5.0 mg/L, and indicating that only one percent of the available lead leached from the solid sample.

From 0.8 percent (arsenic) to 77 percent (silver) of the TAL inorganics leached out in the TCLP test. Based on this, ~~a concentration of 20 times the TCLP limit in the solid sample will be used to conservatively estimate the amount of acid brick that is potentially hazardous.~~ only four acid brick samples are considered potentially hazardous due to inorganics; two for lead and two for chromium.

A.5.1.3 Semivolatile Organic Contamination:

Three acid brick samples from two components were analyzed for semivolatile organic constituents. Only four of the 15 semivolatile COCs [benzo(a)pyrene, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, and chrysene] for which analyses were performed were detected. Benzo(b)fluoranthene and chrysene were each detected in two samples. All other detected semivolatiles were found in only one sample.

All semivolatile COCs detected in acid brick were collected from the Northern area of the Pilot Plant Wet Side (13A) or the Digestion area of the Ore Refinery Plant (2A).

No semivolatile COC for which a TCLP limit exists was detected.

A.5.1.4 Volatile Organic Contamination:

Four acid brick samples from two components were analyzed for volatile organic constituents. Only two of the three volatile COCs (tetrachloroethane and styrene) for which analyses were performed were detected, each in one sample collected from the Northern or Central areas of the Pilot Plant Wet Side (13A).

No volatile COC for which a TCLP limit exists was detected.

A.5.1.5 Pesticide/PCB Contamination:

None of the acid brick samples were analyzed for pesticides or PCBs.

detected in the corresponding TCLP leachate at 0.0075 mg/L, well below the TCLP limit of 5.0 mg/L and indicating that only 0.14 percent of the available lead leached from the solid sample.

From 0.1 percent (iron) to 57.9 percent (sodium) of the TAL inorganics, and a maximum of 46 percent (silver) of TCLP metals, leached out in the TCLP test. Conservatively assuming that up to 50 percent of any single metal could leach out in a TCLP test indicates a hazardous screening level of 40 times the TCLP limit. This would indicate that the concentration of barium, cadmium, chromium, lead, and mercury (the only inorganics with results greater than 20 times the TCLP limit) would have to exceed 4000, 40, 200, 200, and 8 mg/kg to be potentially hazardous. Based on this, concrete chip samples from several process areas/components could be potentially hazardous, but only with regard to levels of barium, chromium, and lead.

As noted in Section 2.3, the concrete chip samples are not truly representative. In most cases, the samples were taken from the top half-inch of an assumed 8-inch thickness. Assuming the concrete below the concrete chip is at the OU3 baseline concentration for all inorganics would indicate that not even the sample with the highest lead concentration would be hazardous. This assumption is reasonable, since the concrete chip samples were taken in dry process areas where contamination is not expected to penetrate to any significant depth. Based on this, no concrete in the areas where concrete chip samples were taken is expected to be characteristically hazardous due to TCLP metals. ~~However, to be conservative, samples exceeding 40 times the TCLP limit will be considered potentially hazardous.~~

A.5.3.3 Semivolatile Organic Contamination

Eight samples from four components were analyzed for semivolatile organic constituents. Only three of the 15 semivolatile COCs for which analyses were performed were detected. Chrysene was detected in two samples, with benzo(a)anthracene and bis(2-ethylhexyl)phthalate detected in one sample.

The most extensive semivolatile COC contamination was found in concrete chip samples collected from the Uranium Machining area of the Special Products Plant (9A) and the New Drum Storage area of the Plant 1 Storage Pad (74T).

No semivolatile COCs that were detected have TCLP limits.

samples, with concentrations up to 5.2 mg/kg; and barium, cadmium, and chromium, which were detected at greater than 20 times the TCLP limit (i.e., greater than 2000 mg/kg, 20 mg/kg, and 100 mg/kg, respectively) each in one of 60 samples, with concentrations of 3820 mg/kg, 21 mg/kg, and 306 mg/kg, respectively.

The most extensive inorganic contamination is associated with the Hydrometallurgical System WINLO, and Water Treatment Area of the Recovery Plant (8A), where results exceeded 20 times the TCLP limit for chromium and lead; the Engine House/Garage (31A), where results exceeded 20 times the TCLP limit for barium and lead; and the Digester and Control Building (25E), where results exceeded 20 times the TCLP limit for lead and mercury. Other components that have at least one result that exceeds 20 times the TCLP limits include the Six to Four Reduction Facility #1 (54A), Service Building (11), Main Maintenance Building (12A), Pilot Plant Annex (37), Incinerator Building (39A), Maintenance Building (3A), Decontamination Building (69), Recovery Plant (8A), Plant 8 Maintenance Building (8B), and Plant 9 Sump Treatment Facility (9B).

TCLP Results - Inorganics

Two of the samples, both from the Six to Four Reduction Facility #1 (54A), were also analyzed for TCLP inorganics. Tables A.II-3 through A.II-6 compare the results of the TCLP analyses with those for total inorganics. Only one TCLP metal, lead, in the Autoclave Area, was detected at greater than 20 times the TCLP limit. Lead, which was the only metal with a TCLP regulatory limit detected in the TCLP analysis, was detected in the leachate at 11 mg/L, well above the TCLP limit of 5.0 mg/L. ~~Based on these results, masonry in the Six to Four Reduction Facility (54A) is considered characteristically hazardous due to lead.~~ No masonry is considered potentially hazardous due to inorganics if a representative sample were taken.

A.5.5.3 Semivolatile Organic Contamination

Two masonry samples from were taken from two components were analyzed for semivolatile organic constituents. None of the 15 semivolatile COCs for which analyses were performed were detected.

A.5.5.4 Volatile Organic Contamination

Two masonry samples from were taken from two components were analyzed for volatile organic constituents. None of the three volatile COCs for which analyses were performed were detected.

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leachate was 5.96 mg/L; the TCLP limit for chromium is 5.0 mg/L, ~~indicating that the transite in this component is characteristically hazardous.~~ No transite is considered potentially hazardous due to inorganics if a representative sample were taken.

A.5.7.3 Semivolatile Organic Contamination

Twelve samples were analyzed for the leachability of semivolatiles using the TCLP test. Only five semivolatile constituents were detected, three of which were in excess of the TCLP limits: 1,4-dichlorobenzene (17.2 mg/L detected compared to a TCLP limit of 7.5 mg/L), hexachlorobutadiene (14.9 mg/L detected compared to a TCLP limit of 0.5 mg/L), and nitrobenzene (28.3 mg/L detected compared to a TCLP limit of 2.0 mg/L). All three results were found in the same sample of transite in the Special Products Plant (9A). If a representative sample were taken, no transite is expected to be hazardous due to semiviolatiles.

A.5.7.4 Volatile Organic Contamination

Only two volatile constituents were detected, tetrachloroethene and 2-butanone. Tetrachloroethene was the only detected result that exceeds the TCLP limit at 59 mg/L (compared to a TCLP limit of 0.7 mg/L). This sample was collected from the Ore Refinery Plant (2A). No transite is expected to be potentially hazardous for volatiles if a representative sample were taken.

A.5.7.5 Pesticide/PCB Contamination

None of the transite samples were analyzed for pesticides or PCBs.

A.6 COMPONENT CATEGORY LEVEL CHARACTERIZATION

The purpose of this section of the appendix is to present the characterization of OU3 on a component category basis, as opposed to an analyte basis or media basis.

The data collection strategy of the WPA was based, in part, on the grouping of the 233 OU3 components into 11 component categories based on similarity of structure and/or function. The categories are listed below with the section numbers where the characterization within each is summarized listed in parenthesis:

- Category 1: Administrative and Support Buildings (A.6.1),
- Category 2: Warehouse/Storage Buildings (A.6.2),
- Category 3: Process Buildings (A.6.3),
- Category 4: Process Support Buildings (A.6.4),
- Category 5: Containers/Containerized Material - Aboveground (A.6.5),

Supplemental Media

Ninety samples were collected from five supplemental media: air filters (26 samples), loose media (23), sediment (two), sludge (one), and unknown liquids (38). All radioactive constituents were detected in air filters except americium-241, plutonium-239/240, strontium-90, and technetium-99. All radioactive constituents were detected in loose media, sediment, and unknown liquids. All radioactive constituents were detected in sludge except neptunium-237. Elemental uranium and uranium isotopes exhibit the highest concentrations in these media. Other radionuclides found in high concentrations in at least one media include lead-210, polonium-210, plutonium-238, radium-228, technetium-99, thorium-228, thorium-230, and thorium-232. All radioactive constituents detected in supplemental media were also detected at least once in another media from the category.

A.6.3.2 Summary of Inorganic Contamination

Acid Brick

From the Process Buildings component category, 17 samples of acid brick were collected for inorganic analyses from six components. Thallium was the only inorganic COC not detected. The maximum concentrations of all but three (beryllium, manganese, and vanadium) were above the respective concrete baseline. The most significant of these were copper (collected from the Zirno Decladding area of the Special Products Plant [9A]) and lead (collected from the Denitration area of the Ore Refinery Plant [2A]), which exceeded the baseline by factors of 150 and 160, respectively. The mean concentration of nine of the 15 detected COCs was greater than the concrete baseline. The most significant of these was lead, which exceeded the concrete baseline by a factor of 35. The following samples exceeded 20 times the TCLP limit:

Exceeds 20 times TCLP:	Building:	Process Area:
Chromium	Special Products Plant (9A)	Zirno Decladding
	Special Products Plant (9A)	Triple Beta Heat Treating
	Ore Refinery Plant (2A)	Denitration
	Pilot Plant Wet Side (13A)	Northern
Lead	Metal Dissolver Building (2D)	West Metal Dissolution
	Ore Refinery Plant (2A)	Dinitration
	Ore Refinery Plant (2A)	Extraction
	Ore Refinery Plant (2A)	Digestion

Only four of these (two from 9A and one each from 2A and 2D) are considered potentially hazardous.

Concrete Chips

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A.7 Data Changes

This section describes the data changes that occurred from the time statistics were calculated for the September 1995 Draft of the OU3 RI/FS through completion of the December 1995 Comment Response Document. As noted in the letter transmitting the RI/FS, the cutoff date for data to be included in the Draft was July. Therefore, a small portion of the radiological data had not been validated and the comprehensive quality review and check of the database was not complete at that time. As a result, a few changes have occurred.

This section briefly describes these changes and evaluates their impacts on the RI/FS Report. The impact evaluation answers three questions:

- Do changes affect the results obtained by the original COC selection process?
- Do changes affect the relative importance of the COCs?
- Do changes affect the disposal volume estimates or the disposition of any wastes?

A.7.1 History of Recent Changes

A.7.1.1 Changes in Baseline Media Concentrations

As detailed in Attachment A.I and summarized in Section 3.3.1, baseline levels were determined for concrete and coatings on structural steel as a reference for identifying OU3 materials that are considered not contaminated. Changes to these baseline levels have occurred as a result of the changes to the database.

A.7.1.1.1 Baseline Concentrations for Radionuclides in Concrete

The baseline concentrations for radionuclides in concrete were recalculated due to additional concrete core data received from the analytical laboratories following the July cutoff date. Initially, all non-process concrete core samples with validated values for the bottom core depth were included in the data set. After the receipt of the new concrete core data, the concrete baseline data set was re-evaluated. Concrete cores which had elevated contamination in the top one-half inch were excluded from the new data set. The new data and re-evaluation of all samples resulted in seven samples being added to the baseline data set and six samples that were originally included being removed (see Table A-9). The statistical evaluation of the data set (distribution and outlier test) is outlined in Section A.I.3.3. Table A-10 lists the outliers removed from the baseline data set and identifies those that are different from the September Draft (revised from Table A.I-10). Table A-11 presents the revised

statistical information and baseline concentrations for radionuclides in concrete resulting from these changes (revised from Table A.I-12).

A.7.1.1.2 Baseline Concentrations for Inorganic Chemicals in Concrete

The values used for baseline concentrations of trace metals in concrete were changed from the 95 percent upper confidence limit (UCL) on the mean to the 95th-percentile to be consistent with the methodology used for radiological baseline data. There were no changes in the baseline data set, data distributions, or statistical outliers. The recalculated values are listed on Table A-12 (revised from Table A.I-4). In all cases, the baseline value for inorganics either increased (most cases) or remained unchanged.

A.7.1.1.3 Baseline Concentrations for Organic Chemicals in Concrete

The baseline values for organic chemicals in concrete are unchanged.

A.7.1.2 Changes to Characterization Results

Changes to the database occurred for one of three reasons: The final quality assurance check corrected a value or qualifier, additional data became available, or the statistical treatment of the data was changed in response to internal and Agency reviews. This section briefly describes these changes for radiological, inorganic and organic data.

A.7.1.2.1 Changes to Radiological Results

All radiological analytes were originally included as COCs because EPA classifies all radioactivity as a Class A carcinogen. The data changes do not affect this designation of radionuclides as COCs at the FEMP. The data changes do affect the summary statistics describing the population of samples collected. Tables A-13 and A-14 present new summary statistics for the COCs in all solid media and individual media, respectively.

A.7.1.2.2 Changes to Inorganic Chemical Results

Very few changes have occurred in the inorganic chemical data. These changes produced the new statistics listed in Tables A-13 and A-14, which replace Tables A.II-1 and A.III-1, respectively.

A.7.1.2.3 Changes to Organic Results

Changes to the database produced the new statistics listed in Tables A-13 and A-14.

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A.7.2 Impacts of Data Changes

A.7.2.1 Impacts of Changes to the Radiological Data Sets

The changes to the summary statistics are highlighted in Table A-15. All are insignificant except the changes to the uranium data. These changes imply that central estimates of uranium would increase slightly from the previous draft. This is more than offset by a concurrent decrease in the volume estimates of uranium held up in process piping. The change resulting from the update of the data is therefore judged to have no impact on the conservative nature of the RI/FS results and conclusions.

Changes to the baseline statistics resulted in lower baseline values. This affected the relative comparisons of the data to the baseline values presented in Appendix A. Tables A-16 and A-17 compare the new characterization data set to the new baseline values. The number of detections which exceeded baseline increased for most radiological COCs. An example of this is uranium, which increased from 365 to 396 detections over baseline. The increase in the number of samples containing COC concentrations exceeding baseline levels also produces an increase in the volume of materials containing noticeably elevated COC concentrations. This further strengthens the observation made in the September draft that uranium contamination within OU3 is widespread. This increase in volume over baseline has no effect on the actual mass of constituents going into the cell. Figures 3-4 through 3-7 and Figure 3-15 in the main body of the report have also been changed and reflect the new baseline values.

After evaluating the changes to the radiological portions of the database, its was concluded that the COC selection process is unaffected, the relative significance of the COCs are unchanged, and the waste deposition preferences are unchanged from the September draft of this report. The total mass of uranium in the solid media increases slightly, but this is offset by the decrease in hold up volume estimates. Thus the net impact of these changes on the results and conclusions presented in the September draft are judged to be insignificant.

A.7.2.2 Impacts of Changes to the Inorganic Chemical Data Sets

The major changes to the inorganic statistics between the July and December databases are listed in Table A-15. These changes primarily affected the measures of central tendency and dispersion of the data sets. In no case did the changes affect the maximum detected value for a contaminant.

The primary impact of the changes is that the number of samples exceeding concrete baseline values generally decreased, since all of the baseline values increased. This results in a slight increase in the

amount of material that is at or below baseline values for all contaminants. However, this increase is overshadowed by the decrease in volume of material below baseline associated with the decrease in the uranium baseline for concrete.

Therefore, the overall impact of changes to the inorganic data is considered minimal.

A.7.2.3 Impacts of Changes to the Organic Chemical Data Sets

The major changes to the organic statistics between the July and December databases are listed in Table A-15. These changes primarily affected the measures of central tendency and dispersion of the data sets.

Therefore, the overall impact of changes to the organic data is considered insignificant.

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TABLE A-5

CONSTITUENT OF CONCERN SCREENING

	PART B	CONCRETE	ACID BRICK	MASONRY	STEEL COATI	TRANSITE*	ASPHALT	WOOD	SOIL	LOOSE MEDIA	COC?
Radionuclides, pCi/g											
Americium-241	2.38E-01	1.30E+01	3.26E+01	1.20E+01	3.26E+01	N/A	ND	1.00E-01	ND	8.30E+01	Yes
Cesium-137+1D	2.08E-03	4.80E+00	2.09E+01	1.60E+01	4.10E+00	N/A	1.50E-01	ND	9.23E-01	1.30E+01	Yes
Lead-210+2D	1.20E-01	6.91E+01	1.75E+03	8.10E+02	1.04E+03	N/A	2.40E+00	8.80E+00	4.18E+00	1.00E+02	Yes
Neptunium-237+1D	9.44E-03	1.80E+01	1.72E+00	4.20E+00	4.90E+01	N/A	ND	9.00E-02	4.91E-01	6.80E+01	Yes
Polonium-210	5.30E-01	3.60E+01	2.97E+03	2.10E+02	7.97E+02	N/A	6.60E+00	6.80E+00	5.80E+00	8.68E+01	Yes
Plutonium-238	3.60E-01	2.46E+02	1.30E+03	6.00E+00	4.20E+02	N/A	1.50E-01	1.40E+00	1.55E-01	3.66E+02	Yes
Plutonium-239/240	3.44E-01	3.39E+01	7.45E+01	3.54E+00	9.20E+01	N/A	3.58E-02	3.00E-02	9.77E-02	6.90E+01	Yes
Plutonium-241	2.21E+01	1.29E+02	9.23E+02	2.20E+01	2.60E+02	N/A	N/A	ND	ND	2.89E+02	Yes
Radium-226+5D	6.94E-04	1.53E+03	5.30E+02	2.50E+03	6.71E+03	N/A	2.30E+00	1.90E+00	2.43E+00	2.82E+02	Yes
Radium-228	7.94E-01	1.50E+04	1.71E+03	6.20E+01	2.28E+03	N/A	1.60E+00	5.40E+00	1.74E+00	2.65E+03	Yes
Strontium-90	2.41E+00	5.97E+01	7.10E+00	1.30E+01	4.10E+01	N/A	2.80E+01	3.30E-01	5.40E-01	1.40E+02	Yes
Technetium-99	6.05E+01	8.10E+03	2.96E+02	6.30E+01	1.00E+03	N/A	7.70E+00	6.30E+00	3.96E+00	1.30E+04	Yes
Thorium-227	2.60E-02	6.70E+01	N/A	4.70E+01	8.00E+01	N/A	N/A	N/A	N/A	N/A	Yes
Thorium-228+7D	7.44E-04	8.95E+03	3.11E+01	2.20E+01	4.70E+02	N/A	1.80E+00	2.30E+00	2.27E+00	7.18E+02	Yes
Thorium-230	5.66E+00	9.80E+02	2.95E+02	7.40E+02	5.60E+03	N/A	1.90E+00	3.20E+00	9.82E+00	3.70E+03	Yes
Thorium-232	6.35E+00	1.27E+03	1.34E+01	2.00E+01	2.60E+02	N/A	1.20E+00	1.80E+00	2.03E+00	5.30E+02	Yes
Uranium-234	4.79E+00	4.90E+04	2.79E+03	2.80E+03	3.70E+04	N/A	2.53E+01	2.58E+02	3.83E+01	2.10E+05	Yes
Uranium-235/236	1.73E-02	6.80E+03	1.50E+02	1.70E+02	3.90E+03	N/A	3.43E+00	1.33E+01	1.73E+00	2.70E+04	Yes
Uranium-238+2D	1.10E-01	3.70E+04	3.80E+03	1.39E+03	3.30E+04	N/A	3.69E+01	2.54E+02	3.90E+01	1.80E+05	Yes
Metals, mg/kg											
Aluminum	NS	1.96E+04	4.40E+03	1.50E+04	6.94E+04	N/A	2.40E+03	1.15E+02	1.57E+04	1.50E+05	-
Antimony	1.10E+01	5.23E+01	9.00E+00	6.70E+00	3.93E+02	N/A	ND	2.04E+01	ND	2.14E+02	Yes
Arsenic	3.65E-02	3.68E+01	2.36E+01	3.38E+01	2.27E+02	ND	5.20E+00	2.69E+03	1.02E+01	2.46E+02	Yes
Barium	1.92E+03	5.89E+03	1.77E+03	3.82E+03	2.37E+04	ND	3.71E+01	1.30E+01	1.91E+02	4.08E+03	Yes
Beryllium	1.49E-02	4.80E+00	9.50E-01	1.40E+00	4.50E+00	N/A	ND	ND	2.40E+00	5.63E+01	Yes
Cadmium	1.37E+01	2.94E+01	3.40E+00	2.10E+01	5.58E+02	ND	ND	ND	3.00E-01	6.24E+01	Yes
Calcium	N S	2.73E+05	6.43E+03	2.18E+05	1.99E+05	N/A	2.21E+05	3.02E+03	1.42E+05	1.95E+05	-
Chromium	1.37E+02	6.40E+02	4.07E+02	3.06E+02	1.73E+04	1.19E+02	3.60E+00	2.74E+03	2.49E+01	3.21E+03	Yes
Cobalt	1.64E+03	2.20E+02	5.40E+00	1.38E+01	5.88E+02	N/A	1.90E+00	ND	1.06E+01	1.03E+02	-
Copper	1.02E+03	1.44E+03	1.78E+03	1.42E+02	2.31E+03	N/A	8.40E+00	1.69E+03	2.56E+01	2.63E+04	Yes
Iron	NS	1.05E+05	2.92E+04	1.47E+04	4.86E+05	N/A	6.15E+03	8.74E+02	3.84E+04	3.54E+05	-
Lead	NS [b]	2.73E+03	5.18E+02	1.63E+04	3.75E+05	ND	7.60E+00	3.20E+01	1.43E+02	1.03E+04	Yes
Magnesium	2.66E+05	7.50E+04	1.91E+03	5.98E+04	1.43E+04	N/A	5.73E+04	5.66E+02	3.39E+04	5.48E+04	-
Manganese	1.37E+02	1.47E+03	1.26E+02	4.09E+02	5.56E+03	N/A	4.46E+02	4.87E+01	7.95E+02	2.17E+03	Yes

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TABLE A-5

CONSTITUENT OF CONCERN SCREENING

	PART B	CONCRETE	ACID BRICK	MASONRY	STEEL COATI	TRANSITE*	ASPHALT	WOOD	SOIL	LOOSE MEDIA	COC?
Metals											
Mercury	8.21E+00	1.26E+01	7.00E+00	5.20E+00	3.26E+01	8.68E-02	ND	ND	ND	1.80E+01	Yes
Nickel	5.48E+02	4.62E+02	1.68E+02	4.84E+01	2.57E+03	N/A	6.70E+00	ND	2.62E+01	5.35E+04	Yes
Potassium	NS	1.92E+04	9.63E+03	6.63E+03	2.49E+04	N/A	2.11E+02	1.47E+03	2.14E+03	2.21E+05	-
Selenium	1.37E+02	1.17E+01	3.60E+00	2.30E+00	7.75E+01	ND	ND	ND	1.30E+00	1.57E+02	Yes [1]
Silver	1.37E+02	3.88E+01	1.01E+01	8.47E+01	5.92E+01	4.40E+00	ND	ND	ND	1.36E+03	Yes [1]
Sodium	NS	1.10E+04	3.46E+03	4.17E+03	1.29E+04	N/A	5.16E+02	3.83E+03	6.00E+02	8.22E+04	-
Thallium	1.92E+00	1.60E+01	ND	3.20E-01	3.10E+00	N/A	ND	ND	ND	8.70E-01	Yes
Uranium	2.50E-01	6.50E+04	9.40E+03	7.72E+03	4.50E+04	N/A	2.40E+02	2.60E+03	7.01E+01	5.20E+05	Yes
Vanadium	1.90E+02	4.94E+02	1.06E+01	5.03E+01	1.46E+02	N/A	2.52E+01	ND	3.54E+01	3.02E+02	Yes
Zinc	8.21E+03	1.36E+05	2.30E+02	2.05E+03	2.15E+05	N/A	2.14E+02	7.73E+01	2.87E+02	1.19E+04	Yes
Volatile Organics, ug/kg											
1,1-Dichloroethane	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
1,1-Dichloroethene	1.06E+02	ND	ND	ND	N/A	ND	ND	ND	ND	ND	-
1,1,1-Trichloroethane	NS	3.60E+04	1.00E+01	2.50E+01	N/A	N/A	ND	ND	ND	1.50E+02	-
1,1,2-Trichloroethane	1.12E+03	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
1,1,2,2-Tetrachloroethane	3.19E+02	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
1,2-Dichloroethane	7.02E+02	ND	ND	ND	N/A	ND	ND	ND	ND	ND	-
1,2-Dichloroethene (total)	2.46E+05	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
1,2-Dichloropropane	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
2-Butanone	1.64E+07	3.00E+03	8.00E+00	ND	N/A	ND	4.00E+00	ND	ND	5.80E+01	-
2-Hexanone	1.10E+06	4.90E+01	ND	ND	N/A	N/A	ND	ND	ND	ND	-
4-Methyl-2-pentanone	1.37E+06	5.30E+01	ND	ND	N/A	N/A	ND	ND	ND	1.00E+05	-
Acetone	2.74E+06	ND	ND	ND	N/A	N/A	N/A	ND	3.30E+01	2.20E+02	-
Benzene	2.20E+03	ND	ND	ND	N/A	ND	ND	ND	ND	2.80E+03	Yes [1]
Bromodichloromethane	1.03E+03	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
Bromoform	8.09E+03	ND	ND	ND	N/A	N/A	ND	ND	ND	2.20E+02	-
Bromomethane	3.83E+04	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
Carbon disulfide	2.74E+06	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
Carbon tetrachloride	4.91E+02	ND	ND	ND	N/A	ND	ND	ND	ND	ND	-
Chlorobenzene	5.48E+05	ND	ND	ND	N/A	ND	ND	ND	ND	6.30E+01	-
Chloroethane	5.48E+05	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
Chloroform	1.05E+04	ND	ND	ND	N/A	ND	ND	ND	ND	ND	-
Chloromethane	4.91E+03	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
cis-1,3-Dichloropropene	3.55E+02	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
Dibromochloromethane	7.60E+02	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-

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TABLE A-5

CONSTITUENT OF CONCERN SCREENING

	PART B	CONCRETE	ACID BRICK	MASONRY	STEEL COATI	TRANSITE*	ASPHALT	WOOD	SOIL	LOOSE MEDIA	COC?
Volatiles											
Ethylbenzene	2.74E+06	2.20E+05	5.00E+00	7.00E+00	N/A	N/A	ND	ND	ND	1.50E+03	-
Methylene chloride	8.52E+03	ND	9.00E+00	ND	N/A	N/A	ND	ND	ND	3.20E+03	-
Pyridine	2.74E+04	N/A	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	-
m, p-Xylene	5.50E+05	6.80E+04	1.40E+01	2.80E+01	N/A	N/A	N/A	N/A	N/A	1.90E+03	-
o-Xylene	NS	4.00E+03	4.00E+00	1.30E+01	N/A	N/A	N/A	N/A	N/A	1.20E+03	-
Trans-1,2-dichloroethene	5.50E+06	ND	ND	N/A	N/A	N/A	N/A	N/A	N/A	ND	-
Styrene	2.13E+03	ND	5.80E+01	ND	N/A	N/A	ND	ND	ND	4.50E+02	Yes [1]
Tetrachloroethene	1.23E+03	2.30E+01	5.00E+00	ND	N/A	1.18E+06	ND	ND	ND	2.90E+02	Yes
Toluene	5.48E+06	1.90E+01	2.00E+00	ND	N/A	N/A	ND	ND	ND	1.80E+03	-
Xylenes, Total	5.48E+07	1.30E+06	1.80E+01	4.20E+01	N/A	N/A	ND	ND	ND	2.40E+04	-
trans-1,3-Dichloropropene	3.55E+02	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
Trichloroethene	5.81E+03	ND	ND	ND	N/A	ND	ND	ND	ND	4.20E+01	-
Trichlorofluoromethane	8.21E+06	ND	6.00E+00	N/A	N/A	N/A	N/A	N/A	N/A	ND	-
Vinyl Chloride	3.36E+01	ND	ND	ND	N/A	ND	ND	ND	ND	ND	-
Semi-Volatile Organics, ug/kg											
1,2,4-Trichlorobenzene	2.74E+05	ND	ND	ND	N/A	N/A	ND	ND	ND	3.90E+04	-
1,2-Dichlorobenzene	2.46E+06	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
1,3-Dichlorobenzene	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
1,4-Dichlorobenzene	2.66E+03	ND	ND	ND	N/A	3.44E+05	ND	ND	ND	3.90E+04	Yes
2,2-Oxybis(1-chloropropane)	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
2,4,5-Trichlorophenol	2.74E+06	ND	ND	ND	N/A	ND	ND	ND	ND	ND	-
2,4,6-Trichlorophenol	5.81E+03	ND	ND	ND	N/A	ND	ND	ND	ND	ND	-
2,4-Dichlorophenol	8.21E+04	ND	ND	ND	N/A	N/A	ND	ND	ND	4.50E+02	-
2,4-Dimethylphenol	5.48E+05	ND	ND	ND	N/A	N/A	ND	ND	ND	1.40E+02	-
2,4-Dinitrophenol	5.48E+04	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
2,4-Dinitrotoluene	9.39E+01	ND	ND	ND	N/A	ND	ND	ND	ND	5.00E+04	Yes [1]
2,6-Dinitrotoluene	9.39E+01	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
2-Chloronaphthalene	2.19E+06	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
2-Chlorophenol	1.37E+05	ND	9.00E+00	ND	N/A	N/A	ND	ND	ND	5.70E+04	-
2-Methylnaphthalene	1.10E+06	ND	ND	ND	N/A	N/A	1.70E+02	ND	4.90E+01	6.30E+03	-
2-Nitroaniline	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
2-Nitrophenol	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
3,3-Dichlorobenzidine	1.42E+02	ND	ND	ND	N/A	N/A	N/A	ND	ND	ND	-
4,6-Dinitro-2-methylphenol	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
4-Bromophenyl phenyl ether	1.59E+06	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-

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TABLE A-5

CONSTITUENT OF CONCERN SCREENING

	PART B	CONCRETE	ACID BRICK	MASONRY	STEEL COATI	TRANSITE*	ASPHALT	WOOD	SOIL	LOOSE MEDIA	COC?
Semi-Volatiles											
4-Chloro-3-methylphenol	1.37E+06	ND	3.70E+01	ND	N/A	N/A	ND	ND	ND	6.90E+04	-
4-Chlorophenylphenyl ether	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
4-Nitroaniline	8.21E+04	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
4-Nitrophenol	1.70E+06	ND	ND	ND	N/A	N/A	ND	ND	ND	5.70E+04	-
Acenaphthene	1.64E+06	ND	2.00E+01	ND	N/A	N/A	ND	ND	7.70E+01	5.00E+04	-
Acenaphthylene	NS	ND	ND	ND	N/A	N/A	ND	ND	5.90E+01	2.60E+02	-
Anthracene	8.21E+06	ND	ND	ND	N/A	N/A	ND	ND	2.30E+02	3.70E+04	-
Benzo(a)anthracene	5.81E+01	5.20E+01	ND	ND	N/A	N/A	1.90E+02	1.10E+02	5.80E+02	6.10E+04	Yes
Benzo(a)pyrene	8.75E+00	ND	3.40E+02	ND	N/A	N/A	ND	8.50E+01	7.00E+02	4.40E+04	Yes
Benzo(b)fluoranthene	7.10E+01	ND	2.60E+02	ND	N/A	N/A	ND	1.00E+02	7.60E+02	6.60E+04	Yes
Benzo(g,h,i)perylene	NS	ND	ND	ND	N/A	N/A	ND	ND	8.10E+02	1.50E+04	-
Benzo(k)fluoranthene	1.68E+02	ND	ND	ND	N/A	N/A	ND	1.20E+02	6.40E+02	3.70E+04	Yes [1]
bis(2-Chloroethoxy)methane	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
bis(2-Chloroethyl)ether	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
bis(2-Chloroisopropyl) ether	9.13E+02	ND	N/A	ND	N/A	N/A	N/A	N/A	N/A	ND	-
bis(2-Ethylhexyl)phthalate	4.56E+03	1.40E+03	2.00E+03	ND	N/A	N/A	ND	ND	1.30E+03	5.60E+05	Yes [1]
Butyl benzyl phthalate	5.48E+06	5.00E+02	ND	ND	N/A	N/A	ND	ND	ND	8.70E+03	-
Carbazole	3.19E+03	ND	ND	ND	N/A	N/A	ND	2.10E+01	9.90E+01	2.40E+04	Yes [1]
Chrysene	2.00E+03	5.50E+02	4.50E+02	ND	N/A	N/A	4.10E+02	1.70E+02	6.70E+02	4.30E+04	Yes [1]
Di-n-butyl phthalate	2.74E+06	5.80E+01	ND	ND	N/A	N/A	ND	ND	2.60E+03	4.20E+04	-
Di-n-octyl phthalate	5.48E+05	3.90E+01	1.00E+02	ND	N/A	N/A	ND	N/A	ND	6.70E+02	-
Dibenzo(a,h)anthracene	8.80E+00	ND	ND	ND	N/A	N/A	ND	ND	1.90E+02	8.00E+03	Yes [1]
Dibenzofuran	1.10E+05	ND	ND	ND	N/A	N/A	ND	1.90E+01	ND	1.30E+04	-
Diethyl phthalate	2.19E+07	ND	ND	ND	N/A	N/A	ND	ND	ND	7.00E+02	-
Dimethyl phthalate	2.74E+08	ND	ND	ND	N/A	N/A	ND	ND	ND	3.00E+03	-
Fluoranthene	1.10E+06	7.10E+02	6.70E+01	ND	N/A	N/A	5.20E+02	2.60E+02	1.20E+03	1.80E+05	-
Fluorene	1.10E+06	ND	ND	ND	N/A	N/A	ND	ND	7.90E+01	1.90E+04	-
Hexachloro-1,3-butadiene	NS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-
Hexachlorobenzene	3.99E+01	ND	ND	ND	N/A	ND	ND	ND	ND	ND	-
Hexachlorobutadiene	8.19E+02	ND	ND	ND	N/A	2.98E+05	ND	ND	ND	ND	Yes
Hexachlorocyclopentadiene	1.92E+05	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
Hexachloroethane	4.56E+03	ND	ND	ND	N/A	ND	ND	ND	ND	ND	-
Indeno(1,2,3-cd)pyrene	3.19E+01	ND	ND	ND	N/A	N/A	ND	ND	6.30E+02	2.50E+04	Yes [1]
Isophorone	6.72E+04	ND	ND	ND	N/A	N/A	ND	ND	ND	4.50E+04	-
m-Methylphenol	1.28E+03	N/A	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	-

TABLE A-5

CONSTITUENT OF CONCERN SCREENING

	PART B	CONCRETE	ACID BRICK	MASONRY	STEEL COATI	TRANSITE*	ASPHALT	WOOD	SOIL	LOOSE MEDIA	COC?
Semi-Volatiles											
N-Nitroso-di-n-propylamine	9.11E+00	ND	ND	ND	N/A	N/A	ND	ND	ND	4.80E+04	Yes [1]
N-Nitrosodiphenylamine	1.30E+04	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
Naphthalene	1.10E+06	ND	ND	ND	N/A	N/A	ND	ND	ND	6.40E+03	-
Nitrobenzene	1.37E+04	ND	ND	ND	N/A	5.66E+05	ND	ND	ND	ND	Yes
o-Methylphenol	1.37E+06	ND	ND	ND	N/A	1.34E+05	ND	ND	ND	1.30E+03	-
p-Chloroaniline	NS	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
p-Methylphenol (cresol)	1.37E+06	6.50E+02	ND	ND	N/A	ND	ND	ND	ND	4.20E+02	-
Pentachlorophenol	5.32E+02	ND	ND	ND	N/A	ND	ND	ND	ND	1.40E+04	Yes [1]
Phenanthrene	NS	5.90E+02	2.20E+01	ND	N/A	N/A	4.70E+02	1.50E+02	8.20E+02	1.80E+05	-
Phenol	1.64E+07	ND	3.90E+01	ND	N/A	N/A	ND	ND	ND	6.70E+04	-
3-Nitroaniline	5.50E+05	ND	ND	ND	N/A	N/A	ND	ND	ND	ND	-
Pyrene	8.21E+05	7.20E+02	5.70E+01	ND	N/A	N/A	3.80E+02	2.60E+02	1.20E+03	1.00E+05	-
Pesticides/PCBs, ug/kg											
4,4'-DDD	2.66E+02	ND	N/A	N/A	N/A	N/A	ND	ND	1.90E+00	ND	-
4,4'-DDE	1.88E+02	9.40E+01	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
4,4'-DDT	1.88E+02	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
beta-BHC	3.55E+01	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
alpha-Chlordane	4.91E+01	7.10E+01	N/A	N/A	N/A	N/A	ND	ND	ND	ND	Yes
delta-BHC	NS	2.80E+00	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
Dieldrin	3.99E+00	6.90E+00	N/A	N/A	N/A	N/A	ND	ND	3.00E+00	ND	Yes
Endosulfan II	1.64E+05	2.20E+00	N/A	N/A	N/A	N/A	ND	ND	1.10E+01	ND	-
Endosulfan sulfate	1.64E+05	8.20E+00	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
Endosulfan-I	1.64E+05	2.70E+00	N/A	N/A	N/A	N/A	ND	1.50E+00	ND	ND	-
Endrin	8.21E+03	ND	N/A	N/A	N/A	N/A	ND	9.80E-01	2.20E+01	ND	-
Endrin aldehyde	8.21E+03	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
Endrin ketone	NS	7.10E+00	N/A	N/A	N/A	N/A	ND	ND	1.60E+00	ND	-
gamma-BHC (Lindane)	4.90E+01	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
gamma-Chlordane	4.91E+01	7.60E+01	N/A	N/A	N/A	N/A	ND	ND	1.40E+00	ND	Yes
Heptachlor	1.42E+01	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
Heptachlor epoxide	7.02E+00	1.10E+00	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
Methoxychlor	1.37E+05	ND	N/A	N/A	N/A	N/A	ND	ND	ND	1.40E+02	-
Toxaphene	5.81E+01	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
Aroclor-1016	8.30E+00	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
Aroclor-1221	8.30E+00	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
Aroclor-1232	8.30E+00	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-

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TABLE A-5

CONSTITUENT OF CONCERN SCREENING

	PART B	CONCRETE	ACID BRICK	MASONRY	STEEL COATI	TRANSITE*	ASPHALT	WOOD	SOIL	LOOSE MEDIA	COC?
Pesticides											
Aroclor-1242	8.30E+00	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-
Aroclor-1248	8.30E+00	1.70E+03	N/A	N/A	N/A	N/A	ND	ND	5.30E+01	ND	Yes
Aroclor-1254	8.30E+00	4.10E+03	N/A	N/A	N/A	N/A	ND	ND	5.10E+03	1.00E+02	Yes
Aroclor-1260	8.30E+00	3.40E+03	N/A	N/A	N/A	N/A	ND	ND	7.70E+01	5.30E+02	Yes
Aldrin	3.80E+00	ND	N/A	N/A	N/A	N/A	ND	ND	ND	ND	-

[a] No radiological constituents were removed from consideration.
[b] No acceptable screening value for lead.
[1] found as COC in extraneous media (soil, loose media) only.
N/A Analyte not analyzed for in media.
ND Not detected in samples analyzed.
NS No screening criteria for this analyte.

* TCLP results for transite were multiplied by 20 to estimate the concentration of the solid phase (see Appendix A.3 for an explanation of the 20-fold TCLP test).

TABLE A-6
CONSTITUENTS OF CONCERN[a]

Radionuclides

Americium-241
Cesium-137+1Daughter
Lead-210+2Daughters
Neptunium-237+1Daughter
Polonium-210
Plutonium-238
Plutonium-239/240
Plutonium-241
Radium-226+5Daughters
Radium-228
Strontium-90
Technetium-99
Thorium-227
Thorium-228+7Daughters
Thorium-230
Thorium-232
Uranium-234
Uranium-235/236
Uranium-238+2Daughters

Metals

Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Copper
Lead
Manganese
Mercury
Nickel

Metals (Cont'd)

[Selenium]
[Silver]
Thallium
Uranium
Vanadium
Zinc

Volatile Organics, ug/kg

[Benzene]
[Styrene]
Tetrachloroethene

Semi-Volatile Organics

1,4-Dichlorobenzene
[2,4-Dinitrotoluene]
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
[Benzo(k)fluoranthene]
[bis(2-Ethylhexyl)phthalate]
[Carbazole]
[Chrysene]
[Dibenzo(a,h)anthracene]
Hexachlorobutadiene
[Indeno(1,2,3-cd)pyrene]
[N-Nitroso-di-n-propylamine]Nitro
[Pentachlorophenol]

Pesticides/PCBs

alpha-Chlordane
Aroclor-1248
Aroclor-1254
Dieldrin
gamma-Chlordane

a Brackets represent COCs found only in extraneous media (soil and loose media).

TABLE A-9

CHANGES TO THE BASELINE DATASET [a] RADIONUCLIDES IN CONCRETE

Sample ID	Depth	Sample ID	Depth	Sample ID	Depth
September Samples		Samples Removed [b]		Additional Samples	
2E-005	1"-4"	2E-005	1"-4"	2C-005	1"-4"
3A-005R	1"-4"	3A-005R	1"-4"	11-006	1"-4"
3B-005	1"-4"	3G-005	1"-4"	12A-005	1"-4"
3D-004	1"-4"	12A-050R	1"-4"	12A-016R	1"-4"
3F-004	1"-4"	13B-005	1"-4"	18B-004	1"-4"
3G-005	1"-4"	74P-005	1"-4"	25G-005R	1"-4"
3J-004	1"-4"			46-005	1"-4"
3K-005	1"-4"				
10B-006	1"-4"				
11-014	1"-4"				
11-019	1"-4"				
12A-050R	1"-4"				
13B-005	1"-4"				
19D-005R	1"-4"				
19D-011R	1"-4"				
22E-004	1"-4"				
25E-005R	1"-4"				
25H-004	1"-4"				
26C-005	1"-4"				
74P-005	1"-4"				

Notes: [a] Changes in Table A.I-8 resulting from changes in data from the September Draft and the December Comment Response Document.

[b] Samples were removed from concrete background dataset due to elevated uranium results in the top ½-inch of concrete core.

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TABLE A-10

CHANGES IN OUTLIERS REMOVED FROM CONCRETE BASELINE DATA SET [a]

PARAMETER	SAMPLE ID	RESULT REMOVED
Technetium-99	3J-004 [b]	6.9 pCi/g
Technetium-99	18B-004 [c]	64.7 pCi/g
Radium-228	10B-006 [d]	0.9 pCi/g
Uranium, Total	10B-006 [d]	24 μg/g

Notes:
[a] Changes in Table A.I-10 resulting from changes in data from the September Draft and the December Comment Response Document.
[b] Outlier identified in September Draft.
[c] Outlier removed from additional dataset.
[d] Outlier removed from original dataset.

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TABLE A-11

STATISTICAL SUMMARY ON CONCRETE CORE DATA
FEMP CONCRETE SAMPLES

ANALYTE	POSITIVE SAMPLES/ TOTAL SAMPLES	MAXIMUM RESULT	ESTIMATED MEAN	DISTRIBUTION	ESTIMATED BASELINE LEVEL
Americium-241	2/21	0.23 pCi/g	0.1 pCi/g	Undefined	0.100 pCi/g
Cesium-137	1/21	0.064 pCi/g	0.04 pCi/g	Undefined	0.064 pCi/g
Lead-210	14/20	0.89 pCi/g	0.546 pCi/g	LogNormal	0.89 pCi/g
Neptunium-237	1/21	0.12 pCi/g	0.06 pCi/g	Undefined	0.12 pCi/g
Plutonium-238	1/21	0.2 pCi/g	0.05 pCi/g	Undefined	0.2 pCi/g
Plutonium-239/240	3/21	0.402 pCi/g	0.038 pCi/g	Undefined	0.100 pCi/g
Plutonium-241	1/6	3.3 pCi/g	1.7 pCi/g	Undefined	3.300 pCi/g
Polonium-210	18/21	1.7 pCi/g	0.596 pCi/g	~ Lognormal	1.423 pCi/g
Radium-226	19/19	1.8 pCi/g	0.590 pCi/g	LogNormal	1.127 pCi/g
Radium-228	10/19	0.369 pCi/g	0.3 pCi/g	Undefined	0.369 pCi/g
Strontium-90	1/21	3.0 pCi/g	0.3 pCi/g	Undefined	3.0 pCi/g
Technetium-99	3/19	0.33 pCi/g	0.499 pCi/g	Undefined	0.33 pCi/g
Thorium-227	3/3	2.9 pCi/g	1.5 pCi/g	Undefined	2.900 pCi/g
Thorium-228	19/20	1.04 pCi/g	0.341 pCi/g	LogNormal	0.726 pCi/g
Thorium-230	19/20	1.88 pCi/g	0.551 pCi/g	Normal	1.202 pCi/g
Thorium-232	19/20	0.84 pCi/g	0.248 pCi/g	Undefined	0.565 pCi/g
Uranium, Total	20/20	6.83 ug/g	0.248 ug/g	LogNormal	6.83 ug/g
Uranium-234	21/21	11.67 pCi/g	1.647 pCi/g	LogNormal	5.138 pCi/g
Uranium-235/236	13/21	1.2 pCi/g	0.198 pCi/g	LogNormal	0.714 pCi/g
Uranium-238	21/21	8.24 pCi/g	1.549 pCi/g	LogNormal	4.64 pCi/g

Shading reflects changes to Table A.I-12

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TABLE A-12

CHANGES TO STATISTICAL SUMMARY OF TRACE METALS IN CONCRETE CORE DATA

ANALYTE	POSITIVE SAMPLES/TOTAL SAMPLES	MAXIMUM RESULT (mg/kg)	ESTIMATED MEAN[a] (mg/kg)	DISTRIBUTION[b]	ESTIMATED BASELINE LEVEL (mg/kg)
Aluminum	27/27	6420	4716	Normal	6332
Antimony	2/20	11.4	9.5 UJ	Undefined	1.0
Arsenic	22/27	7.4	3.35	Normal	6.38
Barium	27/27	73.6	46.1	Normal	67.5
Beryllium	7/27	1.5	0.23	Undefined	1.40
Cadmium	12/27	2.7	1.2 U	Undefined	2.40
Calcium	27/27	252000	190170	~Normal	236031
Chromium	24/24	10.8	7.52	Normal	10.5
Cobalt	15/26	4.9	2.31	~Lognormal	4.9
Copper	24/27	28	9.22	Lognormal	18.5
Iron	27/27	25200	8888	~Lognormal	16485
Lead	18/25	5.8	2.93	Normal	5.28
Magnesium	27/27	62800	47841	Normal	61827
Manganese	27/27	619	313	Normal	463
Mercury	3/25	0.07	0.06 U	Undefined	0.03
Nickel	25/27	16.3	7.60	Lognormal	15.9
Potassium	23/27	1680	812	Lognormal	1388
Selenium	2/22	0.49	1.6 UJ	Undefined	0.47
Silver	16/27	9.3	2.67	Lognormal	9.30
Sodium	25/27	821	510	Lognormal	821
Thallium	1/26	0.32	0.44 UJ	Undefined	0.32
Vanadium	23/27	22.4	11.0	Lognormal	21.8
Zinc	24/26	70.9	21.8	Lognormal	47.5

Shading Reflects changes to Table A.I-4.

[a] Median value given for undefined distributions.
[b] Undefined distribution - dataset did not match either a normal or lognormal distribution.

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TABLE A-13
STATISTICS BY ANALYTE FOR ALL SOLID MEDIA

	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	nter-Quartil Range	Minimum Detect	Maximum Detect	Units
RADIONUCLIDES											
Americium-241	243	655	Lognormal	0.774	0.11	0.166	4.1	0.14	0	83	pCi/g
Cesium-137	185	668	Lognormal	0.619	0.11	0.178	1.9	0.32	0.02	20.9	pCi/g
Gross Alpha	.	1	Undeterminable	10	10	10	.	0	.	.	
Gross Beta	.	1	Undeterminable	10	10	10	.	0	.	.	
Lead-210	409	661	Lognormal	15.6	1.73	2.02	104	3.54	0.2	1750	pCi/g
Neptunium-237	250	661	Lognormal	0.751	0.13	0.178	3.75	0.31	0.01	68	pCi/g
Plutonium-238	309	663	Lognormal	6.07	0.12	0.157	58.2	0.27	0	1300	pCi/g
Plutonium-239/240	343	660	Lognormal	1.63	0.1	0.162	7.2	0.35	0	92	pCi/g
Plutonium-241	167	462	Lognormal	11.8	2	3.43	60.1	5.2	-303	923	pCi/g
Polonium-210	615	656	Lognormal	14.4	0.8	1.14	130	1.58	-1.2	2970	pCi/g
Radium-226	601	648	Lognormal	37.3	1	1.46	386	1.95	0.1	6710	pCi/g
Radium-228	487	661	Lognormal	59.4	0.8	1.38	621	2.9	0.1	15000	pCi/g
Strontium-90	171	656	Lognormal	1.24	0.37	0.439	6.4	0.71	0.04	140	pCi/g
Technetium-99	506	662	Lognormal	141	3.88	5.09	841	28.3	0.08	13000	pCi/g
Thorium-227	55	97	Lognormal	7.27	1.42	1.47	15.4	3.81	-2.16	80	pCi/g
Thorium-228	581	661	Lognormal	38.6	0.82	1.59	365	4.87	0.11	8950	pCi/g
Thorium-230	637	661	Lognormal	64.6	2.3	3.88	338	16.6	0.11	5600	pCi/g
Thorium-232	589	661	Lognormal	16.2	0.53	1.05	81.1	3.27	0.06	1270	pCi/g
Uranium, Total	665	668	Lognormal	4800	238	191	28900	1530	0.4	520000	ug/g
Uranium-234	639	652	Lognormal	1910	76	66.1	11700	685	0.02	210000	pCi/g
Uranium-235/236	597	652	Lognormal	223	6.1	6.09	1570	60.6	0.03	27000	pCi/g
Uranium-238	642	653	Lognormal	2130	90	73.2	12700	743	0.08	180000	pCi/g

TABLE A-13
STATISTICS BY ANALYTE FOR ALL SOLID MEDIA

	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	nter-Quartil Range	Minimum Detect	Maximum Detect	Units
INORGANICS											
Aluminum	710	716	Lognormal	6480	4900	4650	8940	2100	43.1	150000	mg/kg
Antimony	152	583	Lognormal	20.6	9.3	8.07	37.8	13	0.83	393	mg/kg
Arsenic	634	720	Lognormal	13.6	4.3	4.96	102	3.95	0.23	2690	mg/kg
Barium	719	727	Lognormal	464	65	108	1560	147	3.3	23700	mg/kg
Beryllium	198	692	Lognormal	1.03	0.41	0.33	2.7	0.815	0.03	56.3	mg/kg
Cadmium	306	726	Lognormal	7.24	1.2	1.74	30.7	4.39	0.11	558	mg/kg
Calcium	705	716	Undefined	134000	169000	77400	81200	149000	164	663000	mg/kg
Chromium	653	727	Lognormal	639	13.8	34.4	2050	81.4	1	17300	mg/kg
Cobalt	488	716	Lognormal	23	4.5	7.18	49.4	10.2	0.47	588	mg/kg
Copper	611	708	Lognormal	169	21.6	32.9	1060	87.2	2	26300	mg/kg
Iron	716	716	Lognormal	31000	8530	13400	57400	16400	76.4	486000	mg/kg
Lead	657	725	Lognormal	11500	26.6	75.7	38100	342	0.54	375000	mg/kg
Magnesium	708	716	Undefined	30600	36000	18600	18600	35600	92.5	75000	mg/kg
Manganese	716	716	Undefined	422	319	319	437	193	1.8	5560	mg/kg
Mercury	300	706	Lognormal	1.5	0.1	0.161	9.21	0.25	0.02	223	mg/kg
Nickel	560	716	Lognormal	125	14.5	18.6	2000	31.7	0.48	53500	mg/kg
Potassium	558	716	Lognormal	2190	1030	1200	8590	1210	96.9	221000	mg/kg
Selenium	96	594	Lognormal	2.68	1	1.14	9.02	1.6	0.29	157	mg/kg
Silver	257	716	Lognormal	6.71	1	1.41	55.2	3.85	0.17	1360	mg/kg
Sodium	606	716	Lognormal	1070	645	676	3280	591	50.1	82200	mg/kg
Thallium	37	662	Lognormal	0.781	0.4	0.444	1.42	0.62	0.04	16	mg/kg
Vanadium	517	707	Lognormal	17.3	10.8	10.5	28.1	12.7	0.23	494	mg/kg
Zinc	664	716	Lognormal	2190	68.9	134	11200	562	2.7	215000	mg/kg

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TABLE A-13
STATISTICS BY ANALYTE FOR ALL SOLID MEDIA

	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	nter-Quartil Range	Minimum Detect	Maximum Detect	Units
VOLATILE ORGANICS											
1,1,1-Trichloroethane	11	113	Lognormal	2170	14	63.7	7630	530	1	36000	ug/kg
1,1,2,2-Tetrachloroethane	.	111	Lognormal	1930	14	66.3	6990	540	.	.	
1,1,2-Trichloroethane	.	113	Lognormal	1900	14	64.2	6930	530	.	.	
1,1-Dichloroethane	.	116	Lognormal	1850	14	62.5	6850	505	.	.	
1,1-Dichloroethene	.	128	Lognormal	9550	17	82.1	88500	565	.	.	
1,2-Dichloroethane	.	128	Lognormal	9560	17	82.2	88500	610	.	.	
1,2-Dichloroethene (Total)	.	113	Lognormal	1900	14	65.6	6930	530	.	.	
1,2-Dichloropropane	.	113	Lognormal	1900	14	64.2	6930	530	.	.	
2-Butanone	15	126	Lognormal	17800	38	101	178000	1010	4	9600	ug/kg
2-Hexanone	1	105	Lognormal	1990	14	61.2	7180	480	49	49	ug/kg
4-Chloroaniline	.	1	Undeterminable	800	800	800	.	0	.	.	
4-Methyl-2-pentanone	8	110	Lognormal	2790	14.5	69.3	11600	570	5	100000	ug/kg
Acetone	10	71	Lognormal	1960	50	125	6360	1290	10	300	ug/kg
Benzene	3	125	Lognormal	9690	17	83.5	89500	630	18	2800	ug/kg
Bromodichloromethane	.	113	Lognormal	1900	14	64.2	6930	530	.	.	
Bromoform	2	113	Lognormal	1880	14	62	6940	410	140	220	ug/kg
Bromomethane	.	116	Lognormal	1850	14	62.5	6850	505	.	.	
Carbon Tetrachloride	.	125	Lognormal	9780	17	84.8	89500	750	.	.	
Carbon disulfide	1	116	Lognormal	1830	14	61.6	6850	485	500	500	ug/kg
Chlorobenzene	1	123	Lognormal	9970	17	89.3	90200	750	63	63	ug/kg
Chloroethane	.	114	Lognormal	1880	14	64.5	6900	530	.	.	
Chloroform	.	128	Lognormal	9550	17	82.1	88500	560	.	.	
Chloromethane	.	116	Lognormal	1850	14	62.5	6850	505	.	.	
Dibromochloromethane	.	113	Lognormal	1900	14	64.2	6930	530	.	.	
Ethylbenzene	23	111	Lognormal	3950	14	63.7	21900	490	1	220000	ug/kg
Methylene chloride	6	115	Lognormal	1720	15	59.2	6760	480	1	3200	ug/kg
Pyridine	.	11	Lognormal	1230	800	603	2260	600	.	.	
Styrene	9	111	Lognormal	1910	14	62.3	7000	280	25	3100	ug/kg
Tetrachloroethene	15	123	Lognormal	19500	17	82.5	139000	570	1	1180000	ug/kg
Toluene	23	111	Lognormal	2170	17	62.1	7380	570	1	27000	ug/kg
Trichloroethene	1	125	Lognormal	9780	17	84.7	89500	750	42	42	ug/kg
Trichlorofluoromethane	1	18	Lognormal	930	11	36.5	3520	110	0	14	ug/kg
Vinyl chloride	.	128	Lognormal	9600	17	84.5	88500	610	.	.	
Xylenes, Total	32	111	Lognormal	18400	17	81.6	127000	880	2	1300000	ug/kg
cis-1,3-Dichloropropene	.	113	Lognormal	1900	14	64.2	6930	530	.	.	
m,p-Xylene	4	4	Undeterminable	17500	964	474	33700	34900	14	68000	ug/kg
o-Xylene	4	4	Undeterminable	10300	607	224	19800	20600	4	40000	ug/kg
trans-1,2-Dichloroethene	.	2	Undeterminable	11	11	11	1.41	2	.	.	
trans-1,3-Dichloropropene	.	113	Lognormal	1900	14	64.2	6930	530	.	.	

TABLE A-13
STATISTICS BY ANALYTE FOR ALL SOLID MEDIA

	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	nter-Quartil Range	Minimum Detect	Maximum Detect	Units
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	1	100	Lognormal	8140	1150	2090	14600	10600	39000	39000	ug/kg
1,2-Dichlorobenzene	.	99	Lognormal	7940	1200	2100	14300	10600	.	.	
1,3-Dichlorobenzene	.	99	Lognormal	7940	1200	2100	14300	10600	.	.	
1,4-Dichlorobenzene	2	110	Lognormal	10600	924	1970	35000	9610	39000	344000	ug/kg
2,2-oxybis(1-Chloropropane)	.	71	Lognormal	7590	680	1710	15900	9630	.	.	
2,4,5-Trichlorophenol	.	100	Lognormal	14200	1650	3820	24900	11100	.	.	
2,4,6-Trichlorophenol	1	100	Lognormal	7320	800	1840	14200	9610	970	970	ug/kg
2,4-Dichlorophenol	4	93	Lognormal	7670	920	1830	14700	9630	48	450	ug/kg
2,4-Dimethylphenol	2	93	Lognormal	7800	1000	1890	14700	10600	32	140	ug/kg
2,4-Dinitrophenol	.	84	Lognormal	19000	2300	4710	36800	25000	.	.	
2,4-Dinitrotoluene	1	110	Lognormal	7250	800	1770	14100	9610	50000	50000	ug/kg
2,6-Dinitrotoluene	.	100	Lognormal	7870	1150	2080	14200	10600	.	.	
2-Chloronaphthalene	.	100	Lognormal	7870	1150	2080	14200	10600	.	.	
2-Chlorophenol	2	93	Lognormal	8280	1000	1900	15500	10600	9	57000	ug/kg
2-Methylnaphthalene	26	100	Lognormal	7250	690	1300	14100	9660	17	6300	ug/kg
2-Nitroaniline	.	100	Lognormal	15400	2850	4470	25000	15100	.	.	
2-Nitrophenol	.	93	Lognormal	7800	1000	1960	14700	10600	.	.	
3,3'-Dichlorobenzidine	.	88	Lognormal	8360	1300	2230	14900	10600	.	.	
3-Nitroaniline	.	95	Lognormal	16200	5000	4860	25400	18000	.	.	
4,6-Dinitro-2-methylphenol	.	93	Lognormal	19300	2800	4950	35800	25100	.	.	
4-Bromophenyl phenyl ether	.	100	Lognormal	7900	1300	2110	14200	10600	.	.	
4-Chloro-3-methylphenol	2	93	Lognormal	8410	1000	1940	16000	10600	37	69000	ug/kg
4-Chlorophenylphenyl ether	.	100	Lognormal	7870	1150	2080	14200	10600	.	.	
4-Nitroaniline	.	96	Lognormal	19800	3150	5270	35400	25100	.	.	
4-Nitrophenol	1	92	Lognormal	19700	2600	4970	36200	25100	57000	57000	ug/kg
Acenaphthene	30	100	Lognormal	6380	690	1280	13600	8910	20	50000	ug/kg
Acenaphthylene	9	100	Lognormal	7840	1150	1800	14300	10600	21	260	ug/kg
Anthracene	33	100	Lognormal	6590	620	1260	14200	8260	31	43000	ug/kg
Benzo(a)anthracene	60	99	Lognormal	7460	740	1260	15800	9020	18	73000	ug/kg
Benzo(a)pyrene	51	99	Lognormal	7800	860	1610	15700	9620	23	74000	ug/kg
Benzo(b)fluoranthene	62	99	Lognormal	6860	1200	1590	12800	8910	19	81000	ug/kg
Benzo(g,h,i)perylene	42	99	Lognormal	6220	1100	1610	13500	8800	31	56000	ug/kg
Benzo(k)fluoranthene	46	99	Lognormal	6910	900	1510	14600	9640	18	69000	ug/kg
Butyl benzyl phthalate	21	99	Lognormal	7110	700	1490	14300	9630	49	8700	ug/kg
Carbazole	33	98	Lognormal	6140	785	1380	13100	8840	21	24000	ug/kg
Chrysene	71	99	Lognormal	6220	690	1310	11600	8830	18	81000	ug/kg
Di-n-butyl phthalate	32	100	Lognormal	10800	1300	1820	39700	10100	58	42000	ug/kg
Di-n-octyl phthalate	26	98	Lognormal	6740	575	1400	13900	9630	39	37000	ug/kg
Dibenzo(a,h)anthracene	14	99	Lognormal	7480	1000	1790	13900	10600	55	15000	ug/kg
Dibenzofuran	26	100	Lognormal	6650	690	1330	13500	9660	19	13000	ug/kg

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TABLE A-13
STATISTICS BY ANALYTE FOR ALL SOLID MEDIA

	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	nter-Quartil Range	Minimum Detect	Maximum Detect	Units
SEMIVOLATILE ORGANICS (cont.)											
Diethyl phthalate	8	100	Lognormal	7600	700	1690	14300	10100	34	700	ug/kg
Dimethyl phthalate	3	100	Lognormal	7640	980	1940	14300	9620	170	3000	ug/kg
Fluoranthene	78	100	Lognormal	11200	1100	1580	29400	9640	36	190000	ug/kg
Fluorene	28	100	Lognormal	6150	690	1370	12800	9650	24	19000	ug/kg
Hexachlorobenzene	.	111	Lognormal	7170	800	1820	13700	9610	.	.	
Hexachlorobutadiene	1	111	Lognormal	9820	800	1890	30800	9620	298000	298000	ug/kg
Hexachlorocyclopentadiene	.	100	Lognormal	7870	1150	2080	14200	10600	.	.	
Hexachloroethane	.	110	Lognormal	7210	800	1820	13700	9610	.	.	
Indeno(1,2,3-cd)pyrene	51	99	Lognormal	6150	830	1320	13500	8930	20	49000	ug/kg
Isophorone	1	100	Lognormal	8310	1300	2170	14700	10600	45000	45000	ug/kg
N-Nitroso-di-n-propylamine	1	99	Lognormal	8310	1200	2130	14800	10600	48000	48000	ug/kg
N-Nitrosodiphenylamine	.	100	Lognormal	7900	1300	2110	14200	10600	.	.	
Naphthalene	29	100	Lognormal	7140	500	1270	14100	9670	30	6400	ug/kg
Nitrobenzene	2	111	Lognormal	12200	800	1840	54800	9630	140	566000	ug/kg
Pentachlorophenol	2	98	Lognormal	17400	2300	4410	34500	24100	730	14000	ug/kg
Phenanthrene	77	100	Lognormal	8880	705	1200	26800	6170	22	180000	ug/kg
Phenol	13	93	Lognormal	6910	800	1550	11900	9630	18	67000	ug/kg
Pyrene	76	99	Lognormal	10100	1400	1730	23900	8930	40	170000	ug/kg
bis(2-Chloroethoxy)methane	.	100	Lognormal	7870	1150	2070	14200	10600	.	.	
bis(2-Chloroethyl)ether	.	99	Lognormal	7940	1200	2100	14300	10600	.	.	
bis(2-Chloroisopropyl) ether	.	16	Normal	10100	10000	3420	9500	20000	.	.	
bis(2-Ethylhexyl)phthalate	34	99	Lognormal	18400	3300	3450	62300	16400	44	560000	ug/kg
m-Methylphenol	1	3	Undeterminable	629	800	569	296	512	288	288	ug/kg
o-Methylphenol	6	100	Lognormal	8040	800	1720	18700	9630	57	134000	ug/kg
p-Chloroaniline	1	96	Lognormal	7750	1050	1950	14500	9630	140	140	ug/kg
p-Methylphenol	21	101	Lognormal	6270	520	1240	13600	9640	13	20000	ug/kg
PESTICIDES											
4,4'-DDD	1	35	Lognormal	5.08	3.5	3.8	6.99	0.2	1.9	1.9	ug/kg
4,4'-DDE	3	35	Lognormal	8.11	3.5	4.37	16.6	0.4	0.69	94	ug/kg
4,4'-DDT	.	34	Undefined	4.39	3.5	3.72	4.93	0.3	.	.	
Aldrin	.	34	Undefined	2.22	1.8	1.88	2.46	0.2	.	.	
Aroclor-1016	.	37	Undefined	43.2	35	37	47.3	3	.	.	
Aroclor-1221	.	37	Undefined	86.4	70	73.2	96.5	6	.	.	
Aroclor-1232	.	37	Undefined	43.2	35	37	47.3	3	.	.	
Aroclor-1242	.	37	Undefined	43.2	35	37	47.3	3	.	.	
Aroclor-1248	2	37	Lognormal	88.7	35	41.6	276	3	53	1700	ug/kg
Aroclor-1254	14	37	Lognormal	631	38	111	1320	286	41	5100	ug/kg
Aroclor-1260	8	37	Lognormal	296	36	62.2	750	6	24	3400	ug/kg
Chlordane	0	2	Undeterminable	0	0	.	0	0	0	0	ug/kg

TABLE A-13
STATISTICS BY ANALYTE FOR ALL SOLID MEDIA

	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	nter-Quartil Range	Minimum Detect	Maximum Detect	Units
PESTICIDES (cont.)											
Dieldrin	5	34	Lognormal	5.23	3.5	3.88	7.1	0.3	1.6	6.9	ug/kg
Endosulfan II	3	35	Undefined	4.54	3.5	3.79	5	0.3	1.6	11	ug/kg
Endosulfan sulfate	3	35	Undefined	4.49	3.5	3.79	4.91	0.4	2.4	8.2	ug/kg
Endosulfan-I	2	35	Undefined	2.22	1.8	1.89	2.43	0.2	1.5	2.7	ug/kg
Endrin	2	34	Lognormal	4.84	3.5	3.76	5.82	0.3	0.98	22	ug/kg
Endrin aldehyde	.	35	Undefined	4.36	3.5	3.71	4.86	0.3	.	.	
Endrin ketone	2	35	Undefined	4.4	3.5	3.69	4.9	0.3	1.6	7.1	ug/kg
Heptachlor	.	34	Undefined	2.22	1.8	1.88	2.46	0.2	.	.	
Heptachlor epoxide	1	35	Undefined	2.21	1.8	1.9	2.42	0.2	1.1	1.1	ug/kg
Methoxychlor	1	35	Lognormal	27.1	18	20.4	33.2	2	140	140	ug/kg
Toxaphene	.	35	Undefined	220	180	187	243	20	.	.	
alpha-BHC	.	35	Undefined	2.2	1.8	1.87	2.43	0.2	.	.	
alpha-Chlordane	2	35	Lognormal	4.28	1.8	2.15	11.9	0.3	5.4	71	ug/kg
beta-BHC	.	35	Undefined	2.2	1.8	1.87	2.43	0.2	.	.	
delta-BHC	1	35	Undefined	2.23	1.8	1.9	2.43	0.2	2.8	2.8	ug/kg
gamma-BHC (Lindane)	.	34	Lognormal	2.83	1.8	2.07	3.69	0.2	.	.	
gamma-Chlordane	3	35	Lognormal	4.29	1.8	2.03	12.7	0.2	0.42	76	ug/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				ACID BRICK							
INORGANICS											
Aluminum	23	24	Undefined	1220	811	891	1120	803	264	4400	mg/kg
Antimony	3	18	Normal	3.78	1.7	2.53	3.38	4.9	1.3	9	mg/kg
Arsenic	17	24	Lognormal	2.71	1.5	1.55	4.76	1.03	0.81	23.6	mg/kg
Barium	24	24	Lognormal	367	192	150	481	390	7.3	1770	mg/kg
Beryllium	2	24	Lognormal	0.584	0.09	0.111	1.33	0.33	0.5	0.95	mg/kg
Cadmium	7	24	Lognormal	0.994	0.585	0.491	1.5	0.38	0.11	3.4	mg/kg
Calcium	21	24	Undefined	1750	1340	1240	1560	1780	360	6430	mg/kg
Chromium	20	24	Lognormal	56.6	6.45	10.3	116	41.3	1	407	mg/kg
Cobalt	13	24	Undefined	2.26	1.7	1.7	1.96	1.69	0.47	5.4	mg/kg
Copper	21	24	Lognormal	127	30.6	30.8	360	53.4	2.7	1780	mg/kg
Iron	24	24	Lognormal	4930	3470	3510	5740	2890	761	29200	mg/kg
Lead	22	24	Lognormal	90	34.3	38.3	130	72.2	5	518	mg/kg
Magnesium	22	24	Undefined	496	438	374	404	408	92.5	1910	mg/kg
Manganese	24	24	Normal	55.9	57.4	43.9	32.6	39.3	7	126	mg/kg
Mercury	15	24	Lognormal	0.875	0.09	0.202	1.75	0.74	0.05	7	mg/kg
Nickel	16	24	Lognormal	29	13.6	11.8	39.5	34.8	0.88	168	mg/kg
Potassium	16	24	Lognormal	1100	488	578	2010	325	174	9630	mg/kg
Selenium	4	23	Undefined	1.03	0.8	0.739	0.941	0.58	0.62	3.6	mg/kg
Silver	9	24	Lognormal	1.64	0.64	0.726	2.55	1.25	0.49	10.1	mg/kg
Sodium	19	24	Lognormal	577	298	329	785	399	88.6	3460	mg/kg
Thallium		24	Normal	0.632	0.655	0.49	0.41	0.59			mg/kg
Vanadium	12	24	Normal	3.58	2.75	2.62	2.8	3.8	1.1	10.6	mg/kg
Zinc	18	24	Lognormal	41.1	19.3	19.1	52.4	54.2	2.7	230	mg/kg

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SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				ACID BRICK							
RADIONUCLIDES											
Americium-241	13	21	Lognormal	2.28	0.23	0.344	7.08	0.37	0.13	32.6	pCi/g
Cesium-137	10	21	Lognormal	1.61	0.36	0.443	4.48	1.03	0.5	20.9	pCi/g
Lead-210	17	21	Lognormal	112	3.3	7.18	385	10.1	0.4	1750	pCi/g
Neptunium-237	10	21	Lognormal	0.315	0.19	0.213	0.366	0.3	0.09	1.72	pCi/g
Plutonium-238	12	21	Lognormal	72.1	0.12	0.415	283	0.43	0.02	1300	pCi/g
Plutonium-239/240	15	21	Lognormal	5.2	0.1	0.328	16.3	2.16	0.01	74.5	pCi/g
Plutonium-241	11	19	Lognormal	61.6	3.21	7.12	209	20.5	1.45	923	pCi/g
Polonium-210	19	21	Lognormal	180	2.35	3.75	656	11.2	0.06	2970	pCi/g
Radium-226	21	21	Lognormal	39.5	3.4	5.24	116	12.7	0.25	530	pCi/g
Radium-228	18	21	Lognormal	137	2.5	4.88	389	2.88	0.7	1710	pCi/g
Strontium-90	9	21	Lognormal	1.04	0.45	0.589	1.56	0.73	0.36	7.1	pCi/g
Technetium-99	20	21	Lognormal	50.5	17	14.2	79.2	50.5	0.35	296	pCi/g
Thorium-227	0	6	Undeterminable	3.22	2.62	0.958	3.48	4.62	0.04	9.28	pCi/g
Thorium-228	16	19	Normal	9.34	5.19	5.76	8.97	13.7	0.91	31.1	pCi/g
Thorium-230	19	19	Lognormal	45.9	9.22	13	79.2	60	1.6	295	pCi/g
Thorium-232	16	19	Normal	4.63	3.5	3.52	3.36	5.38	1.26	13.4	pCi/g
Uranium, Total	21	21	Lognormal	2080	1140	746	2660	2250	6.9	9400	ug/g
Uranium-234	21	21	Normal	626	335	239	696	719	0.44	2790	pCi/g
Uranium-235/236	20	21	Normal	50.7	25	18.4	57	62.9	0.58	200	pCi/g
Uranium-238	20	21	Lognormal	630	295	212	874	798	4.86	3800	pCi/g

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						ACID BRICK					
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
1,2-Dichlorobenzene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
1,3-Dichlorobenzene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
1,4-Dichlorobenzene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
2,2-oxybis(1-Chloropropane)	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
2,4,5-Trichlorophenol	.	3	Undeterminable	4430	3400	2800	4340	8500	.	.	ug/kg
2,4,6-Trichlorophenol	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
2,4-Dichlorophenol	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
2,4-Dimethylphenol	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
2,4-Dinitrophenol	.	2	Undeterminable	2550	2550	2400	1200	1700	.	.	ug/kg
2,4-Dinitrotoluene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
2,6-Dinitrotoluene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
2-Chloronaphthalene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
2-Chlorophenol	1	3	Undeterminable	3540	1400	488	4950	9190	9	9	ug/kg
2-Methylnaphthalene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
2-Nitroaniline	.	3	Undeterminable	4430	3400	2800	4340	8500	.	.	ug/kg
2-Nitrophenol	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
3,3'-Dichlorobenzidine	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
3-Nitroaniline	.	3	Undeterminable	4430	3400	2800	4340	8500	.	.	ug/kg
4,6-Dinitro-2-methylphenol	.	3	Undeterminable	9370	3400	5100	11800	21300	.	.	ug/kg
4-Bromophenyl phenyl ether	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
4-Chloro-3-methylphenol	1	3	Undeterminable	3550	1400	781	4940	9160	37	37	ug/kg
4-Chlorophenylphenyl ether	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
4-Nitroaniline	.	3	Undeterminable	9370	3400	5100	11800	21300	.	.	ug/kg
4-Nitrophenol	.	3	Undeterminable	9370	3400	5100	11800	21300	.	.	ug/kg
Acenaphthene	1	3	Undeterminable	3540	1400	636	4950	9180	20	20	ug/kg
Acenaphthylene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Anthracene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Benzo(a)anthracene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Benzo(a)pyrene	1	3	Undeterminable	3410	700	1300	5010	8860	340	340	ug/kg
Benzo(b)fluoranthene	2	3	Undeterminable	3160	260	357	5230	9180	19	260	ug/kg
Benzo(g,h,i)perylene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Benzo(k)fluoranthene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Butyl benzyl phthalate	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Carbazole	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Chrysene	2	3	Undeterminable	3220	450	421	5180	9180	18	450	ug/kg
Di-n-butyl phthalate	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Di-n-octyl phthalate	1	3	Undeterminable	733	700	461	651	1300	100	100	ug/kg
Dibenzo(a,h)anthracene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg

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SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						ACID BRICK					
SEMIVOLATILE ORGANICS (cont.)											
Dibenzofuran	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Diethyl phthalate	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Dimethyl phthalate	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Fluoranthene	2	3	Undeterminable	502	67	155	778	1360	40	67	ug/kg
Fluorene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Hexachlorobenzene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Hexachlorobutadiene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Hexachlorocyclopentadiene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Hexachloroethane	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Isophorone	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
N-Nitroso-di-n-propylamine	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
N-Nitrosodiphenylamine	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Naphthalene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Nitrobenzene	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
Pentachlorophenol	.	2	Undeterminable	13200	13200	8840	13900	19600	.	.	ug/kg
Phenanthrene	1	3	Undeterminable	3540	1400	657	4950	9180	22	22	ug/kg
Phenol	1	3	Undeterminable	3550	1400	795	4940	9160	39	39	ug/kg
Pyrene	1	3	Undeterminable	3550	1400	902	4940	9140	57	57	ug/kg
bis(2-Chloroethoxy)methane	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
bis(2-Chloroethyl)ether	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	1	3	Undeterminable	3970	2000	2340	4580	8500	2000	2000	ug/kg
o-Methylphenol	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
p-Chloroaniline	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg
p-Methylphenol	.	3	Undeterminable	3770	1400	2080	4720	8500	.	.	ug/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						ACID BRICK					
VOLATILE ORGANICS											
1,1,1-Trichloroethane	1	4	Undeterminable	113	11	26.7	205	205	10	10	ug/kg
1,1,2,2-Tetrachloroethane	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
1,1,2-Trichloroethane	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
1,1-Dichloroethane	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
1,1-Dichloroethene	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
1,2-Dichloroethane	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
1,2-Dichloroethene (Total)	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
1,2-Dichloropropane	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
2-Butanone	2	4	Undeterminable	111	9	21.2	206	208	6	8	ug/kg
2-Hexanone	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
4-Methyl-2-pentanone	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Acetone	.	2	Undeterminable	215	215	64.8	290	410	.	.	ug/kg
Benzene	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Bromodichloromethane	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Bromoform	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Bromomethane	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Carbon Tetrachloride	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Carbon disulfide	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Chlorobenzene	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Chloroethane	.	2	Undeterminable	215	215	64.8	290	410	.	.	ug/kg
Chloroform	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Chloromethane	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Dibromochloromethane	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Ethylbenzene	1	4	Undeterminable	112	11	22.5	206	208	5	5	ug/kg
Methylene chloride	1	4	Undeterminable	113	11	26	205	206	9	9	ug/kg
Styrene	1	4	Undeterminable	22.5	11	16.3	23.7	24	58	58	ug/kg
Tetrachloroethene	1	4	Undeterminable	112	11	22.5	206	208	5	5	ug/kg
Toluene	1	4	Undeterminable	111	10.5	17.4	206	210	2	2	ug/kg
Trichloroethene	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Trichlorofluoromethane	1	3	Undeterminable	146	11	30.3	238	414	6	6	ug/kg
Vinyl chloride	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
Xylenes, Total	1	4	Undeterminable	115	14.5	30.9	203	208	18	18	ug/kg
cis-1,3-Dichloropropene	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg
m,p-Xylene	1	1	Undeterminable	14	14	14	.	0	14	14	ug/kg
o-Xylene	1	1	Undeterminable	4	4	4	.	0	4	4	ug/kg
trans-1,3-Dichloropropene	.	4	Undeterminable	113	11	26.7	205	205	.	.	ug/kg

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SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						ASPHALT					
INORGANICS											
Aluminum	3	4	Undeterminable	1660	1490	1600	509	580	1250	2400	mg/kg
Antimony	.	4	Undeterminable	8.73	9.2	8.68	1.02	1.05	.	.	mg/kg
Arsenic	4	4	Undeterminable	2.84	2.6	2.4	1.77	2.43	0.95	5.2	mg/kg
Barium	4	4	Undeterminable	26.3	27.1	24.1	11.9	20.3	13.7	37.1	mg/kg
Beryllium	.	4	Undeterminable	0.288	0.275	0.274	0.103	0.175	.	.	mg/kg
Cadmium	.	4	Undeterminable	0.59	0.6	0.59	0.02	0.02	.	.	mg/kg
Calcium	4	4	Undeterminable	168000	165000	162000	50000	85000	121000	221000	mg/kg
Chromium	2	4	Undeterminable	4.28	3.7	4.14	1.36	1.55	3.4	3.6	mg/kg
Cobalt	1	4	Undeterminable	1.83	1.8	1.82	0.222	0.35	1.9	1.9	mg/kg
Copper	3	4	Undeterminable	5.88	6.2	5.36	2.62	4.25	2.7	8.4	mg/kg
Iron	4	4	Undeterminable	5350	5520	5290	884	1400	4220	6150	mg/kg
Lead	4	4	Undeterminable	4.1	3.55	3.53	2.57	3.7	1.7	7.6	mg/kg
Magnesium	4	4	Undeterminable	50600	50200	50400	5190	7250	44800	57300	mg/kg
Manganese	4	4	Undeterminable	324	331	306	122	203	188	446	mg/kg
Mercury	.	4	Undeterminable	0.095	0.1	0.0946	0.01	0.01	.	.	mg/kg
Nickel	1	4	Undeterminable	8.23	6.9	7.76	3.5	4.05	6.7	6.7	mg/kg
Potassium	1	4	Undeterminable	418	412	387	178	260	211	211	mg/kg
Selenium	.	4	Undeterminable	1.35	0.6	0.939	1.5	1.5	.	.	mg/kg
Silver	.	4	Undeterminable	0.773	0.8	0.771	0.0619	0.065	.	.	mg/kg
Sodium	4	4	Undeterminable	440	476	430	99.4	116	294	516	mg/kg
Thallium	.	4	Undeterminable	0.635	0.8	0.517	0.33	0.33	.	.	mg/kg
Vanadium	4	4	Undeterminable	13	10.3	11	8.71	12.4	6.1	25.2	mg/kg
Zinc	4	4	Undeterminable	72.7	28.2	42.9	94.3	102	20.6	214	mg/kg

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						ASPHALT					
PESTICIDES											
4,4'-DDD	.	2	Undeterminable	17.6	17.6	10.1	20.4	28.8	.	.	ug/kg
4,4'-DDE	.	2	Undeterminable	17.6	17.6	10.1	20.4	28.8	.	.	ug/kg
4,4'-DDT	.	2	Undeterminable	17.6	17.6	10.1	20.4	28.8	.	.	ug/kg
Aldrin	.	2	Undeterminable	8.8	8.8	5.06	10.2	14.4	.	.	ug/kg
Aroclor-1016	.	2	Undeterminable	176	176	101	204	288	.	.	ug/kg
Aroclor-1221	.	2	Undeterminable	358	358	206	414	585	.	.	ug/kg
Aroclor-1232	.	2	Undeterminable	176	176	101	204	288	.	.	ug/kg
Aroclor-1242	.	2	Undeterminable	176	176	101	204	288	.	.	ug/kg
Aroclor-1248	.	2	Undeterminable	176	176	101	204	288	.	.	ug/kg
Aroclor-1254	.	2	Undeterminable	176	176	101	204	288	.	.	ug/kg
Aroclor-1260	.	2	Undeterminable	176	176	101	204	288	.	.	ug/kg
Dieldrin	.	2	Undeterminable	17.6	17.6	10.1	20.4	28.8	.	.	ug/kg
Endosulfan II	.	2	Undeterminable	17.6	17.6	10.1	20.4	28.8	.	.	ug/kg
Endosulfan sulfate	.	2	Undeterminable	17.6	17.6	10.1	20.4	28.8	.	.	ug/kg
Endosulfan-I	.	2	Undeterminable	8.8	8.8	5.06	10.2	14.4	.	.	ug/kg
Endrin	.	2	Undeterminable	17.6	17.6	10.1	20.4	28.8	.	.	ug/kg
Endrin aldehyde	.	2	Undeterminable	17.6	17.6	10.1	20.4	28.8	.	.	ug/kg
Endrin ketone	.	2	Undeterminable	17.6	17.6	10.1	20.4	28.8	.	.	ug/kg
Heptachlor	.	2	Undeterminable	8.8	8.8	5.06	10.2	14.4	.	.	ug/kg
Heptachlor epoxide	.	2	Undeterminable	8.8	8.8	5.06	10.2	14.4	.	.	ug/kg
Methoxychlor	.	2	Undeterminable	88	88	50.6	102	144	.	.	ug/kg
Toxaphene	.	2	Undeterminable	880	880	506	1020	1440	.	.	ug/kg
alpha-BHC	.	2	Undeterminable	8.8	8.8	5.06	10.2	14.4	.	.	ug/kg
alpha-Chlordane	.	2	Undeterminable	8.8	8.8	5.06	10.2	14.4	.	.	ug/kg
beta-BHC	.	2	Undeterminable	8.8	8.8	5.06	10.2	14.4	.	.	ug/kg
delta-BHC	.	2	Undeterminable	8.8	8.8	5.06	10.2	14.4	.	.	ug/kg
gamma-BHC (Lindane)	.	2	Undeterminable	8.8	8.8	5.06	10.2	14.4	.	.	ug/kg
gamma-Chlordane	.	2	Undeterminable	8.8	8.8	5.06	10.2	14.4	.	.	ug/kg

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SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						ASPHALT					
RADIONUCLIDES											
Americium-241		4	Undeterminable	0.113	0.135	0.0871	0.064	0.085			pCi/g
Cesium-137	3	4	Undeterminable	0.06	0.035	0.0436	0.0606	0.07	0.02	0.15	pCi/g
Lead-210	3	4	Undeterminable	1.35	1.35	0.974	1.06	1.82	0.57	2.4	pCi/g
Neptunium-237		4	Undeterminable	0.108	0.11	0.107	0.015	0.025			pCi/g
Plutonium-238	1	4	Undeterminable	0.125	0.16	0.0811	0.0772	0.09	0.15	0.15	pCi/g
Plutonium-239/240	1	4	Undeterminable	0.0775	0.065	0.0696	0.0435	0.055	0.04	0.04	pCi/g
Plutonium-241		1	Undeterminable	1.87	1.87	1.87		0			pCi/g
Polonium-210	3	4	Undeterminable	2.6	1.65	1.71	2.74	3.5	0.51	6.6	pCi/g
Radium-226	4	4	Undeterminable	0.93	0.535	0.692	0.918	1	0.35	2.3	pCi/g
Radium-228	4	4	Undeterminable	0.603	0.33	0.402	0.67	0.735	0.15	1.6	pCi/g
Strontium-90	2	4	Undeterminable	13.3	12.6	2.15	15.2	26.3	25	28	pCi/g
Technetium-99	2	4	Undeterminable	3.31	2.64	1.29	3.68	6.08	5	7.7	pCi/g
Thorium-228	4	4	Undeterminable	0.708	0.42	0.494	0.737	0.845	0.19	1.8	pCi/g
Thorium-230	4	4	Undeterminable	0.77	0.5	0.541	0.768	0.86	0.18	1.9	pCi/g
Thorium-232	4	4	Undeterminable	0.44	0.215	0.29	0.509	0.56	0.13	1.2	pCi/g
Uranium, Total	4	4	Undeterminable	138	128	118	83.9	135	55	240	ug/g
Uranium-234	3	4	Undeterminable	7.91	3	2.88	11.7	13.5	2	25.3	pCi/g
Uranium-235/236	2	4	Undeterminable	0.983	0.195	0.346	1.63	1.68	0.21	3.43	pCi/g
Uranium-238	3	4	Undeterminable	11.2	3.7	3.36	17.3	20.1	1.9	36.9	pCi/g

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						ASPHALT					
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
1,2-Dichlorobenzene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
1,3-Dichlorobenzene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
1,4-Dichlorobenzene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
2,2-oxybis(1-Chloropropane)	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
2,4,5-Trichlorophenol	.	2	Undeterminable	5200	5200	5200	0	0	.	.	ug/kg
2,4,6-Trichlorophenol	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
2,4-Dichlorophenol	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
2,4-Dimethylphenol	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
2,4-Dinitrophenol	.	2	Undeterminable	5200	5200	5200	0	0	.	.	ug/kg
2,4-Dinitrotoluene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
2,6-Dinitrotoluene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
2-Chloronaphthalene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
2-Chlorophenol	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
2-Methylnaphthalene	2	2	Undeterminable	150	150	149	28.3	40	130	170	ug/kg
2-Nitroaniline	.	2	Undeterminable	5200	5200	5200	0	0	.	.	ug/kg
2-Nitrophenol	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
3-Nitroaniline	.	2	Undeterminable	5200	5200	5200	0	0	.	.	ug/kg
4,6-Dinitro-2-methylphenol	.	2	Undeterminable	5200	5200	5200	0	0	.	.	ug/kg
4-Bromophenyl phenyl ether	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
4-Chloro-3-methylphenol	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
4-Chlorophenylphenyl ether	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
4-Nitroaniline	.	2	Undeterminable	5200	5200	5200	0	0	.	.	ug/kg
4-Nitrophenol	.	2	Undeterminable	5200	5200	5200	0	0	.	.	ug/kg
Acenaphthene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Acenaphthylene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Anthracene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Benzo(a)anthracene	2	2	Undeterminable	165	165	163	35.4	50	140	190	ug/kg
Benzo(a)pyrene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Benzo(b)fluoranthene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Benzo(g,h,i)perylene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Benzo(k)fluoranthene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Butyl benzyl phthalate	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Carbazole	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Chrysene	2	2	Undeterminable	345	345	339	91.9	130	280	410	ug/kg
Di-n-butyl phthalate	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Di-n-octyl phthalate	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Dibenzo(a,h)anthracene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Dibenzofuran	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg

TA[illegible]A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						ASPHALT					
SEMIVOLATILE ORGANICS (cont.)											
Diethyl phthalate	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Dimethyl phthalate	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Fluoranthene	2	2	Undeterminable	425	425	414	134	190	330	520	ug/kg
Fluorene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Hexachlorobenzene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Hexachlorobutadiene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Hexachlorocyclopentadiene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Hexachloroethane	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Isophorone	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
N-Nitroso-di-n-propylamine	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
N-Nitrosodiphenylamine	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Naphthalene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Nitrobenzene	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Pentachlorophenol	.	2	Undeterminable	5200	5200	5200	0	0	.	.	ug/kg
Phenanthrene	2	2	Undeterminable	460	460	460	14.1	20	450	470	ug/kg
Phenol	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
Pyrene	2	2	Undeterminable	340	340	338	56.6	80	300	380	ug/kg
bis(2-Chloroethoxy)methane	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
bis(2-Chloroethyl)ether	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
o-Methylphenol	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
p-Chloroaniline	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg
p-Methylphenol	.	2	Undeterminable	2100	2100	2100	0	0	.	.	ug/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						ASPHALT					
VOLATILE ORGANICS											
1,1,1-Trichloroethane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
1,1,2,2-Tetrachloroethane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
1,1,2-Trichloroethane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
1,1-Dichloroethane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
1,1-Dichloroethene	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
1,2-Dichloroethane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
1,2-Dichloroethene (Total)	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
1,2-Dichloropropane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
2-Butanone	1	2	Undeterminable	7	7	6.32	4.24	6	4	4	ug/kg
2-Hexanone	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
4-Methyl-2-pentanone	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Benzene	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Bromodichloromethane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Bromoform	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Bromomethane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Carbon Tetrachloride	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Carbon disulfide	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Chlorobenzene	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Chloroethane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Chloroform	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Chloromethane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Dibromochloromethane	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Ethylbenzene	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Methylene chloride	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Styrene	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Tetrachloroethene	.	2	Undeterminable	11.5	11.5	11.4	2.12	3	.	.	ug/kg
Toluene	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Trichloroethene	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Vinyl chloride	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
Xylenes, Total	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
cis-1,3-Dichloropropene	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg
trans-1,3-Dichloropropene	.	2	Undeterminable	10	10	10	0	0	.	.	ug/kg

TA[illegible]A-14

SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics							
				Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CHIPS							
INORGANICS											
Aluminum	152	152	Undefined	5240	5060	5110	1260	1500	2570	11100	mg/kg
Antimony	26	128	Lognormal	15.3	9.3	7.27	19.4	7.8	0.83	44.1	mg/kg
Arsenic	143	150	Undefined	4.8	4.3	4.29	2.67	2.1	1.1	24	mg/kg
Barium	152	152	Lognormal	140	57.1	68.3	508	31.5	23.5	5890	mg/kg
Beryllium	66	147	Lognormal	0.711	0.41	0.292	0.941	0.72	0.2	2.6	mg/kg
Cadmium	38	152	Lognormal	1.96	0.8	0.997	3.04	1.83	0.69	29.4	mg/kg
Calcium	152	152	Normal	181000	183000	179000	25600	30500	60100	273000	mg/kg
Chromium	134	152	Lognormal	25.9	11.1	13.1	65.4	12.3	4.6	640	mg/kg
Cobalt	82	152	Undefined	4.6	3.7	3.89	3.94	2.3	1.7	41.3	mg/kg
Copper	126	150	Lognormal	50.1	17.1	21.6	135	29.7	5.2	1440	mg/kg
Iron	152	152	Undefined	11600	8090	9330	12200	3140	4340	105000	mg/kg
Lead	142	152	Lognormal	87.1	14	16.6	311	28.3	1.5	2730	mg/kg
Magnesium	152	152	Normal	40200	39700	39200	8820	9700	19100	75000	mg/kg
Manganese	152	152	Undefined	328	315	306	141	113	35.6	1470	mg/kg
Mercury	26	142	Lognormal	0.188	0.07	0.0783	0.598	0.05	0.03	4.8	mg/kg
Nickel	109	152	Lognormal	21.6	12.2	13.7	40	18	3.1	462	mg/kg
Potassium	116	152	Undefined	2400	1340	1640	2700	1640	498	19200	mg/kg
Selenium	13	123	Lognormal	1.35	0.62	0.857	1.6	1.48	1.2	10.2	mg/kg
Silver	28	149	Lognormal	2.65	0.81	0.952	4.2	3.69	0.17	26	mg/kg
Sodium	135	152	Undefined	1110	812	838	1220	635	253	11000	mg/kg
Thallium	11	145	Lognormal	0.651	0.31	0.364	1.57	0.59	0.04	16	mg/kg
Vanadium	118	152	Undefined	17.2	11.9	12.7	15.2	13.3	2.3	120	mg/kg
Zinc	143	152	Lognormal	1020	56.1	66.8	11000	72.1	13.5	136000	mg/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
CONCRETE CHIPS											
PESTICIDES											
4,4'-DDD	.	13	Undefined	3.26	3.4	3.19	0.569	0.1	.	.	ug/kg
4,4'-DDE	3	13	Lognormal	10.1	3.4	3.86	25.2	0.2	0.69	94	ug/kg
4,4'-DDT	.	13	Undefined	3.26	3.4	3.19	0.569	0.1	.	.	ug/kg
Aldrin	.	13	Undefined	1.65	1.7	1.61	0.299	0	.	.	ug/kg
Aroclor-1016	.	14	Undefined	32.7	34	32	5.48	1	.	.	ug/kg
Aroclor-1221	.	14	Undefined	63.4	68	61.2	14.1	2	.	.	ug/kg
Aroclor-1232	.	14	Undefined	32.7	34	32	5.48	1	.	.	ug/kg
Aroclor-1242	.	14	Undefined	32.7	34	32	5.48	1	.	.	ug/kg
Aroclor-1248	1	14	Lognormal	152	34	42.4	446	2	1700	1700	ug/kg
Aroclor-1254	2	14	Lognormal	261	34	47.9	846	1	41	3200	ug/kg
Aroclor-1260	2	14	Lognormal	146	34	43.4	419	1	50	1600	ug/kg
Chlordane	0	2	Undeterminable	0	0	.	0	0	0	0	ug/kg
Dieldrin	4	13	Normal	3.44	3.4	3.21	1.3	0.1	1.6	6.9	ug/kg
Endosulfan II	2	13	Undefined	3.19	3.4	3.12	0.595	0.1	1.6	2.2	ug/kg
Endosulfan sulfate	3	13	Undefined	3.61	3.4	3.37	1.52	0.1	2.4	8.2	ug/kg
Endosulfan-I	1	13	Undefined	1.73	1.7	1.67	0.417	0.1	2.7	2.7	ug/kg
Endrin	.	13	Undefined	3.26	3.4	3.19	0.569	0.1	.	.	ug/kg
Endrin aldehyde	.	13	Undefined	3.26	3.4	3.19	0.569	0.1	.	.	ug/kg
Endrin ketone	1	13	Undefined	3.55	3.4	3.38	1.21	0.1	7.1	7.1	ug/kg
Heptachlor	.	13	Undefined	1.65	1.7	1.61	0.299	0	.	.	ug/kg
Heptachlor epoxide	1	13	Undefined	1.68	1.7	1.67	0.186	0	1.1	1.1	ug/kg
Methoxychlor	.	13	Undefined	16.5	17	16.1	2.99	0	.	.	ug/kg
Toxaphene	.	13	Undefined	165	170	161	29.9	0	.	.	ug/kg
alpha-BHC	.	13	Undefined	1.65	1.7	1.61	0.299	0	.	.	ug/kg
alpha-Chlordane	2	13	Lognormal	7.27	1.7	2.35	19.2	0.1	5.4	71	ug/kg
beta-BHC	.	13	Undefined	1.65	1.7	1.61	0.299	0	.	.	ug/kg
delta-BHC	1	13	Undefined	1.74	1.7	1.68	0.437	0.1	2.8	2.8	ug/kg
gamma-BHC (Lindane)	.	13	Undefined	1.65	1.7	1.61	0.299	0	.	.	ug/kg
gamma-Chlordane	2	13	Lognormal	7.35	1.7	2.08	20.6	0.1	0.42	76	ug/kg

TA[illegible]-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CHIPS							
RADIONUCLIDES											
Americium-241	47	148	Lognormal	0.274	0.1	0.128	1.09	0.105	0.05	13	pCi/g
Cesium-137	37	151	Lognormal	0.277	0.1	0.12	0.666	0.16	0.02	4.8	pCi/g
Lead-210	91	150	Lognormal	5.73	1.99	2	21.8	3.2	0.2	69.1	pCi/g
Neptunium-237	48	151	Lognormal	0.4	0.12	0.143	1.63	0.19	0.01	18	pCi/g
Plutonium-238	60	151	Lognormal	0.398	0.1	0.103	1.09	0.17	0	8.7	pCi/g
Plutonium-239/240	60	151	Lognormal	0.333	0.09	0.0919	1.28	0.14	0.01	14	pCi/g
Plutonium-241	35	91	Lognormal	4.21	1.98	2.49	7.82	2.37	-0.78	47	pCi/g
Polonium-210	139	148	Lognormal	1.6	0.59	0.706	4.29	0.755	-1.2	36	pCi/g
Radium-226	138	148	Lognormal	14.1	0.9	1.11	127	0.935	0.25	1530	pCi/g
Radium-228	108	151	Lognormal	109	0.4	0.772	1220	1.2	0.12	15000	pCi/g
Strontium-90	35	149	Lognormal	1.09	0.3	0.413	4.93	0.7	0.11	59.7	pCi/g
Technetium-99	111	150	Lognormal	165	3.15	4.57	884	17.6	0.2	8100	pCi/g
Thorium-227	8	10	Normal	15.5	1.31	2	24.1	30.7	0.16	62	pCi/g
Thorium-228	118	150	Lognormal	78	0.52	1.2	739	2.6	0.13	8950	pCi/g
Thorium-230	142	150	Lognormal	32.2	1.4	2.61	115	5.89	0.11	980	pCi/g
Thorium-232	121	150	Lognormal	9.42	0.345	0.788	31.7	1.79	0.1	240	pCi/g
Uranium, Total	149	151	Lognormal	2180	430	220	6110	1620	1	65000	ug/g
Uranium-234	145	150	Lognormal	1260	134	77.5	4790	673	0.27	49000	pCi/g
Uranium-235/236	137	150	Lognormal	148	12	7.8	637	60.5	0.05	6800	pCi/g
Uranium-238	146	151	Lognormal	1260	180	92.7	4420	697	0.58	37000	pCi/g

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CHIPS							
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
1,2-Dichlorobenzene	.	5	Undeterminable	14100	9300	11800	11100	800	.	.	ug/kg
1,3-Dichlorobenzene	.	5	Undeterminable	14100	9300	11800	11100	800	.	.	ug/kg
1,4-Dichlorobenzene	.	5	Undeterminable	14100	9300	11800	11100	800	.	.	ug/kg
2,2-oxybis(1-Chloropropane)	.	5	Undeterminable	14100	9300	11800	11100	800	.	.	ug/kg
2,4,5-Trichlorophenol	.	2	Undeterminable	45600	45600	27500	51500	72800	.	.	ug/kg
2,4,6-Trichlorophenol	.	2	Undeterminable	21600	21600	17700	17500	24800	.	.	ug/kg
2,4-Dichlorophenol	.	2	Undeterminable	21600	21600	17700	17500	24800	.	.	ug/kg
2,4-Dimethylphenol	.	2	Undeterminable	21600	21600	17700	17500	24800	.	.	ug/kg
2,4-Dinitrotoluene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
2,6-Dinitrotoluene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
2-Chloronaphthalene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
2-Chlorophenol	.	2	Undeterminable	21600	21600	17700	17500	24800	.	.	ug/kg
2-Methylnaphthalene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
2-Nitroaniline	.	6	Undeterminable	22600	9250	10400	30300	18000	.	.	ug/kg
2-Nitrophenol	.	2	Undeterminable	21600	21600	17700	17500	24800	.	.	ug/kg
3,3'-Dichlorobenzidine	.	5	Undeterminable	12200	9200	6650	12700	1300	.	.	ug/kg
3-Nitroaniline	.	6	Undeterminable	22600	9250	10400	30300	18000	.	.	ug/kg
4,6-Dinitro-2-methylphenol	.	2	Undeterminable	52500	52500	43400	41700	59000	.	.	ug/kg
4-Bromophenyl phenyl ether	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
4-Chloro-3-methylphenol	.	2	Undeterminable	21600	21600	17700	17500	24800	.	.	ug/kg
4-Chlorophenylphenyl ether	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
4-Nitroaniline	.	6	Undeterminable	29100	23000	16400	27400	6000	.	.	ug/kg
4-Nitrophenol	.	2	Undeterminable	52500	52500	43400	41700	59000	.	.	ug/kg
Acenaphthene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Acenaphthylene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Anthracene	.	6	Undeterminable	10200	8600	4050	12400	8740	.	.	ug/kg
Benzo(a)anthracene	1	5	Undeterminable	12100	9200	4140	12800	1300	52	52	ug/kg
Benzo(a)pyrene	.	6	Undeterminable	10200	8600	4050	12400	8740	.	.	ug/kg
Benzo(b)fluoranthene	.	6	Undeterminable	10200	8600	4050	12400	8740	.	.	ug/kg
Benzo(g,h,i)perylene	.	6	Undeterminable	10200	8600	4050	12400	8740	.	.	ug/kg
Benzo(k)fluoranthene	.	6	Undeterminable	10200	8600	4050	12400	8740	.	.	ug/kg
Butyl benzyl phthalate	1	5	Undeterminable	10500	8000	3720	13800	8740	500	500	ug/kg
Carbazole	.	6	Undeterminable	10200	8600	4050	12400	8740	.	.	ug/kg
Chrysene	2	5	Undeterminable	10600	9200	2660	13800	8750	83	550	ug/kg
Di-n-butyl phthalate	1	6	Undeterminable	10100	8600	2780	12400	8960	58	58	ug/kg
Di-n-octyl phthalate	1	6	Undeterminable	8710	4280	1630	13100	8960	39	39	ug/kg
Dibenzo(a,h)anthracene	.	6	Undeterminable	10200	8600	4050	12400	8740	.	.	ug/kg
Dibenzofuran	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg

TA[illegible]A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
CONCRETE CHIPS											
SEMIVOLATILE ORGANICS (cont.)											
Diethyl phthalate	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Dimethyl phthalate	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Fluoranthene	3	6	Undeterminable	7460	525	1180	13500	9080	160	710	ug/kg
Fluorene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Hexachlorobenzene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Hexachlorobutadiene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Hexachlorocyclopentadiene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Hexachloroethane	.	5	Undeterminable	14100	9300	11800	11100	800	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	.	6	Undeterminable	10200	8600	4050	12400	8740	.	.	ug/kg
Isophorone	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
N-Nitroso-di-n-propylamine	.	5	Undeterminable	14100	9300	11800	11100	800	.	.	ug/kg
N-Nitrosodiphenylamine	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Naphthalene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Nitrobenzene	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
Pentachlorophenol	.	2	Undeterminable	52500	52500	43400	41700	59000	.	.	ug/kg
Phenanthrene	5	6	Undeterminable	370	380	332	166	240	130	590	ug/kg
Phenol	.	2	Undeterminable	21600	21600	17700	17500	24800	.	.	ug/kg
Pyrene	2	5	Undeterminable	10700	9200	3440	13800	8580	230	720	ug/kg
bis(2-Chloroethoxy)methane	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
bis(2-Chloroethyl)ether	.	5	Undeterminable	14100	9300	11800	11100	800	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	1	5	Undeterminable	10900	9200	4690	13600	7900	1400	1400	ug/kg
o-Methylphenol	.	2	Undeterminable	21600	21600	17700	17500	24800	.	.	ug/kg
p-Chloroaniline	.	6	Undeterminable	11800	9250	6550	11400	2000	.	.	ug/kg
p-Methylphenol	1	3	Undeterminable	14600	9200	5880	17300	33400	650	650	ug/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CHIPS							
VOLATILE ORGANICS											
1,1,1-Trichloroethane	2	6	Undeterminable	6440	675	250	14500	1290	8	36000	ug/kg
1,1,2,2-Tetrachloroethane	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
1,1,2-Trichloroethane	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
1,1-Dichloroethane	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
1,1-Dichloroethene	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
1,2-Dichloroethane	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
1,2-Dichloroethene (Total)	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
1,2-Dichloropropane	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
2-Butanone	2	5	Undeterminable	2120	2600	330	2130	2990	2600	3000	ug/kg
2-Hexanone	1	6	Undeterminable	1280	675	186	1930	1290	49	49	ug/kg
4-Methyl-2-pentanone	1	6	Undeterminable	1280	674	185	1930	1290	48	48	ug/kg
Acetone	.	5	Undeterminable	1520	1300	260	2050	1290	.	.	ug/kg
Benzene	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Bromodichloromethane	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Bromoform	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Bromomethane	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Carbon Tetrachloride	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Carbon disulfide	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Chlorobenzene	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Chloroethane	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Chloroform	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Chloromethane	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Dibromochloromethane	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Ethylbenzene	3	6	Undeterminable	3200	955	281	6300	1290	3	16000	ug/kg
Methylene chloride	.	5	Undeterminable	536	60	100	698	1290	.	.	ug/kg
Styrene	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Tetrachloroethene	1	6	Undeterminable	1280	675	153	1930	1290	3	3	ug/kg
Toluene	1	6	Undeterminable	1280	675	208	1930	1280	19	19	ug/kg
Trichloroethene	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Trichlorofluoromethane	.	1	Undeterminable	10	10	10	.	0	.	.	ug/kg
Vinyl chloride	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
Xylenes, Total	3	6	Undeterminable	19200	1300	604	44500	2590	10	110000	ug/kg
cis-1,3-Dichloropropene	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg
m,p-Xylene	1	1	Undeterminable	68000	68000	68000	.	0	68000	68000	ug/kg
o-Xylene	1	1	Undeterminable	40000	40000	40000	.	0	40000	40000	ug/kg
trans-1,3-Dichloropropene	.	6	Undeterminable	1280	675	187	1930	1290	.	.	ug/kg

TA[illegible]-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.0" - 0.5")							
INORGANICS											
Aluminum	93	93	Undefined	5450	5310	5250	1870	1290	3010	19600	mg/kg
Antimony	9	72	Lognormal	15.3	9.4	7.18	19.5	11.7	1.1	52.3	mg/kg
Arsenic	82	91	Undefined	5.55	4	4.5	4.75	3.2	0.94	34.1	mg/kg
Barium	93	93	Lognormal	305	63.9	92.5	836	32.3	32.3	4800	mg/kg
Beryllium	27	90	Lognormal	0.792	0.4	0.312	1.14	0.67	0.23	4.8	mg/kg
Cadmium	36	93	Undefined	1.82	1	1.15	1.77	2.08	0.46	8.1	mg/kg
Calcium	93	93	Undefined	182000	187000	179000	30600	23000	60600	267000	mg/kg
Chromium	79	93	Lognormal	27	11.4	14.6	49.3	16.3	4	424	mg/kg
Cobalt	60	93	Lognormal	8.66	3.6	4.46	24.9	3.8	1.3	220	mg/kg
Copper	78	92	Lognormal	48.3	21.2	25	79.9	39.6	5	526	mg/kg
Iron	93	93	Undefined	12000	8050	9380	12800	3000	2490	95600	mg/kg
Lead	86	93	Lognormal	67.1	20.9	24.2	151	54.4	3.4	1210	mg/kg
Magnesium	93	93	Normal	40000	40700	38000	10700	15200	5310	57500	mg/kg
Manganese	93	93	Undefined	331	314	307	129	117	70.1	863	mg/kg
Mercury	35	91	Lognormal	0.304	0.06	0.0897	1.34	0.05	0.03	12.6	mg/kg
Nickel	75	93	Lognormal	27	13.4	16.4	31.8	28.8	2.6	172	mg/kg
Potassium	76	93	Undefined	1830	1230	1350	2040	1030	436	15700	mg/kg
Selenium	13	72	Undefined	1.85	1.15	1.17	2.04	1.59	1.7	11.7	mg/kg
Silver	32	93	Lognormal	2.87	1.2	1.36	3.79	3.42	0.21	23.5	mg/kg
Sodium	77	93	Undefined	943	731	775	666	555	235	3680	mg/kg
Thallium		86	Lognormal	0.542	0.32	0.376	0.657	0.61			mg/kg
Vanadium	73	93	Undefined	14.4	10.8	10.3	11.5	10	2.4	51.8	mg/kg
Zinc	87	93	Lognormal	100	47.5	54.6	225	55	10	1880	mg/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.0" - 0.5")							
PESTICIDES											
4,4'-DDD	.	2	Undeterminable	3.4	3.4	3.4	0	0	.	.	ug/kg
4,4'-DDE	.	2	Undeterminable	3.4	3.4	3.4	0	0	.	.	ug/kg
4,4'-DDT	.	1	Undeterminable	3.4	3.4	3.4	.	0	.	.	ug/kg
Aldrin	.	1	Undeterminable	1.7	1.7	1.7	.	0	.	.	ug/kg
Aroclor-1016	.	2	Undeterminable	34	34	34	0	0	.	.	ug/kg
Aroclor-1221	.	2	Undeterminable	68.5	68.5	68.5	0.707	1	.	.	ug/kg
Aroclor-1232	.	2	Undeterminable	34	34	34	0	0	.	.	ug/kg
Aroclor-1242	.	2	Undeterminable	34	34	34	0	0	.	.	ug/kg
Aroclor-1248	.	2	Undeterminable	34	34	34	0	0	.	.	ug/kg
Aroclor-1254	2	2	Undeterminable	2500	2500	2070	1980	2800	1100	3900	ug/kg
Aroclor-1260	1	2	Undeterminable	1720	1720	340	2380	3370	3400	3400	ug/kg
Dieldrin	.	1	Undeterminable	3.4	3.4	3.4	.	0	.	.	ug/kg
Endosulfan II	.	2	Undeterminable	3.4	3.4	3.4	0	0	.	.	ug/kg
Endosulfan sulfate	.	2	Undeterminable	3.4	3.4	3.4	0	0	.	.	ug/kg
Endosulfan-I	.	2	Undeterminable	1.7	1.7	1.7	0	0	.	.	ug/kg
Endrin	.	1	Undeterminable	3.4	3.4	3.4	.	0	.	.	ug/kg
Endrin aldehyde	.	2	Undeterminable	3.4	3.4	3.4	0	0	.	.	ug/kg
Endrin ketone	.	2	Undeterminable	3.4	3.4	3.4	0	0	.	.	ug/kg
Heptachlor	.	1	Undeterminable	1.7	1.7	1.7	.	0	.	.	ug/kg
Heptachlor epoxide	.	2	Undeterminable	1.7	1.7	1.7	0	0	.	.	ug/kg
Methoxychlor	.	2	Undeterminable	17	17	17	0	0	.	.	ug/kg
Toxaphene	.	2	Undeterminable	170	170	170	0	0	.	.	ug/kg
alpha-BHC	.	2	Undeterminable	1.7	1.7	1.7	0	0	.	.	ug/kg
alpha-Chlordane	.	2	Undeterminable	1.7	1.7	1.7	0	0	.	.	ug/kg
beta-BHC	.	2	Undeterminable	1.7	1.7	1.7	0	0	.	.	ug/kg
delta-BHC	.	2	Undeterminable	1.7	1.7	1.7	0	0	.	.	ug/kg
gamma-BHC (Lindane)	.	1	Undeterminable	1.7	1.7	1.7	.	0	.	.	ug/kg
gamma-Chlordane	.	2	Undeterminable	1.7	1.7	1.7	0	0	.	.	ug/kg

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SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics							
				Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.0" - 0.5")							
RADIONUCLIDES											
Americium-241	40	92	Lognormal	0.484	0.11	0.169	1.15	0.135	0	6.99	pCi/g
Cesium-137	32	94	Lognormal	0.306	0.18	0.17	0.539	0.2	0.02	3.61	pCi/g
Lead-210	62	93	Lognormal	3.44	1.9	1.94	5.44	2.2	0.3	31.1	pCi/g
Neptunium-237	40	94	Lognormal	0.43	0.16	0.182	1.19	0.33	0.03	10.8	pCi/g
Plutonium-238	51	94	Lognormal	4.56	0.105	0.165	17.9	0.25	0.01	104	pCi/g
Plutonium-239/240	62	94	Lognormal	1.22	0.135	0.2	4.2	0.47	0.01	33.9	pCi/g
Plutonium-241	31	75	Lognormal	11.7	2.77	4.53	35.8	12.6	-194	129	pCi/g
Polonium-210	87	94	Lognormal	1.48	0.77	0.867	2.32	1.13	0.18	19	pCi/g
Radium-226	84	89	Lognormal	6.23	1.1	1.45	33.3	2.2	0.27	314	pCi/g
Radium-228	70	93	Lognormal	48.1	0.73	1.43	239	1.89	0.2	2040	pCi/g
Strontium-90	24	93	Lognormal	0.8	0.38	0.45	1.1	0.78	0.1	5.8	pCi/g
Technetium-99	78	92	Lognormal	48.2	6.65	5.94	119	36.9	0.11	838	pCi/g
Thorium-227	8	11	Lognormal	11.8	2.4	3.22	19.8	14.4	0.25	67	pCi/g
Thorium-228	82	93	Lognormal	48.7	0.8	1.97	155	5.09	0.15	990	pCi/g
Thorium-230	89	93	Lognormal	32.5	3.8	4.3	101	16.1	0.2	660	pCi/g
Thorium-232	83	93	Lognormal	30	0.51	1.11	129	2.3	0.1	976	pCi/g
Uranium, Total	93	94	Lognormal	1610	450	311	2550	2050	1.33	13900	ug/g
Uranium-234	93	94	Lognormal	1030	132	124	2650	811	0.4	18938.03	pCi/g
Uranium-235/236	91	94	Lognormal	96.8	13.3	11.4	281	81.7	0.07	2473	pCi/g
Uranium-238	94	94	Lognormal	876	223	133	1790	951	0.39	12149.13	pCi/g

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.0" - 0.5")							
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
1,2-Dichlorobenzene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
1,3-Dichlorobenzene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
1,4-Dichlorobenzene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
2,4,5-Trichlorophenol	.	1	Undeterminable	26000	26000	26000	.	0	.	.	ug/kg
2,4,6-Trichlorophenol	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
2,4-Dichlorophenol	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
2,4-Dimethylphenol	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
2,4-Dinitrophenol	.	1	Undeterminable	26000	26000	26000	.	0	.	.	ug/kg
2,4-Dinitrotoluene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
2,6-Dinitrotoluene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
2-Chloronaphthalene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
2-Chlorophenol	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
2-Methylnaphthalene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
2-Nitroaniline	.	1	Undeterminable	26000	26000	26000	.	0	.	.	ug/kg
2-Nitrophenol	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
3,3'-Dichlorobenzidine	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
3-Nitroaniline	.	1	Undeterminable	26000	26000	26000	.	0	.	.	ug/kg
4,6-Dinitro-2-methylphenol	.	1	Undeterminable	26000	26000	26000	.	0	.	.	ug/kg
4-Bromophenyl phenyl ether	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
4-Chloro-3-methylphenol	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
4-Chlorophenylphenyl ether	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
4-Nitroaniline	.	1	Undeterminable	26000	26000	26000	.	0	.	.	ug/kg
4-Nitrophenol	.	1	Undeterminable	26000	26000	26000	.	0	.	.	ug/kg
Acenaphthene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Acenaphthylene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Anthracene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Benzo(a)anthracene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Benzo(a)pyrene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Benzo(b)fluoranthene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Benzo(g,h,i)perylene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Benzo(k)fluoranthene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Butyl benzyl phthalate	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Carbazole	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Chrysene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Di-n-butyl phthalate	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Di-n-octyl phthalate	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Dibenzo(a,h)anthracene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Dibenzofuran	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg

TA[illegible]A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.0" - 0.5")							
SEMIVOLATILE ORGANICS (cont.)											
Diethyl phthalate	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Dimethyl phthalate	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Fluoranthene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Fluorene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Hexachlorobenzene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Hexachlorobutadiene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Hexachlorocyclopentadiene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Hexachloroethane	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Isophorone	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
N-Nitroso-di-n-propylamine	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
N-Nitrosodiphenylamine	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Naphthalene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Nitrobenzene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Pentachlorophenol	.	1	Undeterminable	26000	26000	26000	.	0	.	.	ug/kg
Phenanthrene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Phenol	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
Pyrene	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
bis(2-Chloroethoxy)methane	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
bis(2-Chloroethyl)ether	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
bis(2-Chloroisopropyl) ether	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
o-Methylphenol	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
p-Chloroaniline	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
p-Methylphenol	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.0" - 0.5")							
VOLATILE ORGANICS											
1,1,1-Trichloroethane	1	6	Undeterminable	8200	10.5	65.8	20000	140	150	150	ug/kg
1,1,2,2-Tetrachloroethane	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
1,1,2-Trichloroethane	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
1,1-Dichloroethane	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
1,1-Dichloroethene	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
1,2-Dichloroethane	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
1,2-Dichloroethene (Total)	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
1,2-Dichloropropane	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
2-Butanone	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
2-Hexanone	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
4-Methyl-2-pentanone	1	6	Undeterminable	8180	10.5	55.3	20000	43	53	53	ug/kg
Acetone	.	1	Undeterminable	44	44	44	.	0	.	.	ug/kg
Benzene	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Bromodichloromethane	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Bromoform	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Bromomethane	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Carbon Tetrachloride	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Carbon disulfide	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Chlorobenzene	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Chloroethane	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Chloroform	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Chloromethane	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Dibromochloromethane	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Ethylbenzene	2	6	Undeterminable	36700	10.5	91.3	89800	230	240	220000	ug/kg
Methylene chloride	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Styrene	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Tetrachloroethene	2	6	Undeterminable	8170	10	28.1	20000	0	1	10	ug/kg
Toluene	3	6	Undeterminable	8170	9.5	22.6	20000	7	1	9	ug/kg
Trichloroethene	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Vinyl chloride	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
Xylenes, Total	3	6	Undeterminable	217000	10	138	531000	1290	4	1300000	ug/kg
cis-1,3-Dichloropropene	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg
trans-1,3-Dichloropropene	.	6	Undeterminable	8180	10.5	54.9	20000	41	.	.	ug/kg

TA[illegible]A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
INORGANICS				CONCRETE CORE (0.5" - 1.0")							
Aluminum	86	86	Undefined	4950	4820	4810	1330	1610	2790	12800	mg/kg
Antimony	6	67	Lognormal	14	8.4	6.49	19.1	7.9	1.6	11.6	mg/kg
Arsenic	73	86	Undefined	4.32	3.7	3.77	2.33	2.4	0.91	14.5	mg/kg
Barium	86	86	Lognormal	74.7	50	57.5	97.8	21.6	24.4	783	mg/kg
Beryllium	21	84	Lognormal	0.803	0.235	0.286	1.23	0.765	0.03	4.4	mg/kg
Cadmium	25	86	Undefined	1.73	0.895	1.07	1.78	1.72	0.45	6.9	mg/kg
Calcium	86	86	Normal	187000	189000	185000	21000	30000	120000	233000	mg/kg
Chromium	74	86	Lognormal	16.5	8.8	10.6	32.7	5	5	280	mg/kg
Cobalt	51	86	Undefined	3.93	2.75	3.26	3.5	2.1	1.7	29.7	mg/kg
Copper	65	85	Undefined	13.3	9.7	10.9	10.3	7.5	4.3	64.8	mg/kg
Iron	86	86	Undefined	8460	6910	7700	5050	2700	4440	37400	mg/kg
Lead	72	85	Lognormal	20.6	5	7.2	46.6	7.5	1.8	275	mg/kg
Magnesium	86	86	Normal	44200	44900	42900	9560	12600	10400	64800	mg/kg
Manganese	86	86	Undefined	321	306	306	105	114	153	803	mg/kg
Mercury	13	83	Lognormal	0.0881	0.05	0.0625	0.173	0.05	0.04	1.6	mg/kg
Nickel	60	86	Undefined	13.2	7.85	9.55	13.8	10.2	3.2	100	mg/kg
Potassium	68	86	Undefined	1560	929	1140	1610	826	348	6870	mg/kg
Selenium	9	68	Undefined	1.59	1.1	1.06	1.53	1.55	1.6	9.2	mg/kg
Silver	30	86	Lognormal	2.98	1.25	1.57	3.7	4.19	0.22	22.7	mg/kg
Sodium	68	86	Undefined	695	580	615	407	368	250	2900	mg/kg
Thallium	1	80	Lognormal	0.555	0.32	0.385	0.672	0.61	0.29	0.29	mg/kg
Vanadium	68	86	Undefined	15.6	10.8	12.2	12.7	9.9	6.2	61.9	mg/kg
Zinc	74	86	Lognormal	50.8	24	31	86.5	31.3	10.5	650	mg/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.5" - 1.0")							
PESTICIDES											
4,4'-DDD	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
4,4'-DDE	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
4,4'-DDT	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Aldrin	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
Aroclor-1016	.	2	Undeterminable	34.5	34.5	34.5	0.707	1	.	.	ug/kg
Aroclor-1221	.	2	Undeterminable	69.5	69.5	69.5	2.12	3	.	.	ug/kg
Aroclor-1232	.	2	Undeterminable	34.5	34.5	34.5	0.707	1	.	.	ug/kg
Aroclor-1242	.	2	Undeterminable	34.5	34.5	34.5	0.707	1	.	.	ug/kg
Aroclor-1248	.	2	Undeterminable	34.5	34.5	34.5	0.707	1	.	.	ug/kg
Aroclor-1254	2	2	Undeterminable	2150	2150	883	2760	3910	190	4100	ug/kg
Aroclor-1260	1	2	Undeterminable	1370	1370	303	1890	2670	2700	2700	ug/kg
Dieldrin	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Endosulfan II	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Endosulfan sulfate	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Endosulfan-I	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
Endrin	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Endrin aldehyde	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Endrin ketone	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Heptachlor	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
Heptachlor epoxide	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
Methoxychlor	.	2	Undeterminable	17.5	17.5	17.5	0.707	1	.	.	ug/kg
Toxaphene	.	2	Undeterminable	175	175	175	7.07	10	.	.	ug/kg
alpha-BHC	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
alpha-Chlordane	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
beta-BHC	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
delta-BHC	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
gamma-BHC (Lindane)	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
gamma-Chlordane	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg

TA[illegible]-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.5" - 1.0")							
RADIONUCLIDES											
Americium-241	20	81	Lognormal	0.27	0.1	0.108	0.84	0.06	0.05	6.84	pCi/g
Cesium-137	15	85	Lognormal	0.203	0.1	0.103	0.528	0.16	0.1	4.68	pCi/g
Lead-210	47	84	Lognormal	1.25	0.7	0.852	1.69	0.815	0.2	13.7	pCi/g
Neptunium-237	13	85	Lognormal	0.219	0.09	0.112	0.483	0.09	0.03	3.83	pCi/g
Plutonium-238	28	85	Lognormal	3.69	0.1	0.107	26.7	0.18	0	246	pCi/g
Plutonium-239/240	34	84	Lognormal	0.372	0.065	0.0801	1.6	0.07	0.01	13.8	pCi/g
Plutonium-241	19	50	Lognormal	14.8	1.83	3.52	56.6	3.5	-1.3	392	pCi/g
Polonium-210	76	84	Undefined	0.881	0.55	0.62	0.991	0.605	0.18	4.8	pCi/g
Radium-226	81	82	Lognormal	1.27	0.735	0.793	1.93	0.78	0.2	11.9	pCi/g
Radium-228	53	85	Lognormal	26.6	0.34	0.739	140	0.54	0.1	1000	pCi/g
Strontium-90	13	82	Lognormal	0.591	0.345	0.364	0.72	0.4	0.05	4.7	pCi/g
Technetium-99	63	84	Lognormal	8.97	1.26	1.92	19.1	10.2	0.09	140	pCi/g
Thorium-227	8	11	Normal	2.23	1	0.817	2.55	3.5	0.02	8.1	pCi/g
Thorium-228	70	84	Lognormal	26.7	0.35	0.704	143	0.705	0.14	1140	pCi/g
Thorium-230	81	84	Lognormal	18.2	0.965	1.52	98.8	2.87	0.14	871	pCi/g
Thorium-232	76	84	Lognormal	22.7	0.24	0.464	142	0.31	0.1	1270	pCi/g
Uranium, Total	85	85	Lognormal	447	41	49.8	939	262	1.11	4900	ug/g
Uranium-234	83	84	Lognormal	174	13.8	15.9	422	63.3	0.42	2250	pCi/g
Uranium-235/236	72	84	Lognormal	13.2	1.11	1.39	30.4	5.42	0.03	158	pCi/g
Uranium-238	83	84	Lognormal	180	16.7	17	408	86.2	0.36	1800	pCi/g

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

000398

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.5" - 1.0")							
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
1,2-Dichlorobenzene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
1,3-Dichlorobenzene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
1,4-Dichlorobenzene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
2,4-Dinitrotoluene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
2,6-Dinitrotoluene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
2-Chloronaphthalene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
2-Methylnaphthalene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
2-Nitroaniline	.	1	Undeterminable	52000	52000	52000	.	0	.	.	ug/kg
3-Nitroaniline	.	1	Undeterminable	52000	52000	52000	.	0	.	.	ug/kg
4-Bromophenyl phenyl ether	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
4-Chlorophenylphenyl ether	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
4-Nitroaniline	.	1	Undeterminable	52000	52000	52000	.	0	.	.	ug/kg
Acenaphthene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Acenaphthylene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Anthracene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Benzo(a)anthracene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Benzo(a)pyrene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Benzo(b)fluoranthene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Benzo(g,h,i)perylene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Benzo(k)fluoranthene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Butyl benzyl phthalate	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Carbazole	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Chrysene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Di-n-butyl phthalate	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Di-n-octyl phthalate	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Dibenzo(a,h)anthracene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Dibenzofuran	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Diethyl phthalate	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Dimethyl phthalate	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Fluoranthene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Fluorene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Hexachlorobenzene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Hexachlorobutadiene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Hexachlorocyclopentadiene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Hexachloroethane	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Isophorone	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
N-Nitroso-di-n-propylamine	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg

TA[illegible]A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.5" - 1.0")							
SEMIVOLATILE ORGANICS (cont.)											
N-Nitrosodiphenylamine	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Naphthalene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Nitrobenzene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Phenanthrene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
Pyrene	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
bis(2-Chloroethoxy)methane	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
bis(2-Chloroethyl)ether	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
bis(2-Chloroisopropyl) ether	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg
p-Chloroaniline	.	1	Undeterminable	21000	21000	21000	.	0	.	.	ug/kg

000399

000400

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE (0.5" - 1.0")							
VOLATILE ORGANICS											
1,1,1-Trichloroethane	1	6	Undeterminable	2010	10	31.4	4900	0	8	8	ug/kg
1,1,2,2-Tetrachloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,1,2-Trichloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,1-Dichloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,1-Dichloroethene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,2-Dichloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,2-Dichloroethene (Total)	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,2-Dichloropropane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
2-Butanone	.	6	Undeterminable	2010	10	33.1	4890	1	.	.	ug/kg
2-Hexanone	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
4-Methyl-2-pentanone	1	6	Undeterminable	2010	10	38.9	4890	19	29	29	ug/kg
Acetone	.	1	Undeterminable	25	25	25	.	0	.	.	ug/kg
Benzene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Bromodichloromethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Bromoform	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Bromomethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Carbon Tetrachloride	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Carbon disulfide	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Chlorobenzene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Chloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Chloroform	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Chloromethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Dibromochloromethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Ethylbenzene	2	6	Undeterminable	7360	10	58.6	18000	82	92	44000	ug/kg
Methylene chloride	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Styrene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Tetrachloroethene	1	6	Undeterminable	2010	10	37.5	4890	13	23	23	ug/kg
Toluene	3	6	Undeterminable	2010	9	18.4	4900	8	2	8	ug/kg
Trichloroethene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Vinyl chloride	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Xylenes, Total	3	6	Undeterminable	43400	10	77.3	106000	400	2	260000	ug/kg
cis-1,3-Dichloropropene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
trans-1,3-Dichloropropene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg

TA[illegible]A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
CONCRETE CORE [1.0" - 4.0" (6.0")]											
INORGANICS											
Aluminum	77	77	Normal	4860	4890	4760	951	1220	1680	7290	mg/kg
Antimony	4	59	Lognormal	15.5	7.5	6.61	20.3	12.4	1	11.4	mg/kg
Arsenic	63	76	Undefined	4.52	3.5	3.43	5.12	1.65	0.75	36.8	mg/kg
Barium	77	77	Undefined	52.3	46.3	48.8	24.9	18.1	14.3	224	mg/kg
Beryllium	14	75	Lognormal	0.873	0.41	0.299	1.22	1.18	0.23	2.2	mg/kg
Cadmium	31	77	Undefined	1.99	1.1	1.26	2.09	2.07	0.54	7.8	mg/kg
Calcium	77	77	Undefined	186000	187000	171000	31000	21000	164	252000	mg/kg
Chromium	62	77	Undefined	11.9	8.7	9.57	13.7	3.8	4.4	105	mg/kg
Cobalt	46	77	Undefined	4.2	3	3.44	3.42	2.2	1.6	23.3	mg/kg
Copper	56	76	Undefined	11.7	9	9.8	8.76	5.5	4.7	61.6	mg/kg
Iron	77	77	Undefined	8430	7300	7860	3840	2460	3680	25200	mg/kg
Lead	60	77	Lognormal	8.59	3.7	4.91	12.4	4.2	0.54	74.8	mg/kg
Magnesium	77	77	Normal	46500	46600	45700	8320	11800	23500	64200	mg/kg
Manganese	77	77	Normal	311	299	300	82.6	89	96	619	mg/kg
Mercury	11	74	Lognormal	0.0764	0.05	0.0544	0.149	0.02	0.03	1.3	mg/kg
Nickel	56	77	Undefined	11.9	7.2	8.8	10.5	7.5	2.5	35.4	mg/kg
Potassium	59	77	Undefined	1570	929	1130	1630	502	438	5650	mg/kg
Selenium	7	58	Undefined	1.7	1.6	1.23	1.27	1.58	0.47	5.9	mg/kg
Silver	41	77	Lognormal	4.4	2.4	2.33	5.57	5.36	0.32	38.8	mg/kg
Sodium	59	77	Undefined	553	512	515	234	238	197	1880	mg/kg
Thallium	2	71	Lognormal	0.533	0.31	0.361	0.705	0.44	0.28	0.32	mg/kg
Vanadium	62	77	Lognormal	24.7	12.1	14.1	59.6	13.4	5.9	494	mg/kg
Zinc	64	77	Undefined	29.3	19.5	23.1	24.9	17	6	121	mg/kg

000402

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE [1.0" - 4.0" (6.0")]							
PESTICIDES											
4,4'-DDD	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
4,4'-DDE	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
4,4'-DDT	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Aldrin	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
Aroclor-1016	.	2	Undeterminable	34.5	34.5	34.5	0.707	1	.	.	ug/kg
Aroclor-1221	.	2	Undeterminable	69	69	69	1.41	2	.	.	ug/kg
Aroclor-1232	.	2	Undeterminable	34.5	34.5	34.5	0.707	1	.	.	ug/kg
Aroclor-1242	.	2	Undeterminable	34.5	34.5	34.5	0.707	1	.	.	ug/kg
Aroclor-1248	.	2	Undeterminable	34.5	34.5	34.5	0.707	1	.	.	ug/kg
Aroclor-1254	2	2	Undeterminable	1610	1610	1260	1410	1990	610	2600	ug/kg
Aroclor-1260	1	2	Undeterminable	667	667	210	895	1270	1300	1300	ug/kg
Dieldrin	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Endosulfan II	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Endosulfan sulfate	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Endosulfan-I	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
Endrin	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Endrin aldehyde	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Endrin ketone	.	2	Undeterminable	3.45	3.45	3.45	0.0707	0.1	.	.	ug/kg
Heptachlor	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
Heptachlor epoxide	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
Methoxychlor	.	2	Undeterminable	17.5	17.5	17.5	0.707	1	.	.	ug/kg
Toxaphene	.	2	Undeterminable	175	175	175	7.07	10	.	.	ug/kg
alpha-BHC	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
alpha-Chlordane	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
beta-BHC	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
delta-BHC	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
gamma-BHC (Lindane)	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg
gamma-Chlordane	.	2	Undeterminable	1.75	1.75	1.75	0.0707	0.1	.	.	ug/kg

TAB[illegible]A-14

SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
CONCRETE CORE [1.0" - 4.0" (6.0")]											
RADIONUCLIDES											
Americium-241	9	84	Undefined	0.103	0.1	0.0814	0.0887	0.05	0.05	0.6	pCi/g
Cesium-137	6	85	Lognormal	0.126	0.06	0.0772	0.191	0.07	0.06	0.33	pCi/g
Lead-210	56	84	Lognormal	1.15	0.54	0.662	2.98	0.395	0.2	26.9	pCi/g
Neptunium-237	9	85	Lognormal	0.141	0.1	0.0999	0.176	0.09	0.02	0.29	pCi/g
Plutonium-238	18	83	Lognormal	0.25	0.09	0.0727	1.07	0.17	0.01	9.76	pCi/g
Plutonium-239/240	17	81	Lognormal	0.199	0.05	0.0586	0.952	0.07	0.01	8.59	pCi/g
Plutonium-241	9	46	Lognormal	-12.0624	1.8	2.3	61.2	1.51	-303	41.4	pCi/g
Polonium-210	75	84	Lognormal	0.66	0.435	0.497	0.849	0.44	0.14	7.51	pCi/g
Radium-226	81	81	Lognormal	0.812	0.59	0.625	1.05	0.51	0.23	9.21	pCi/g
Radium-228	49	85	Lognormal	2.51	0.3	0.518	10.2	0.49	0.14	86.2	pCi/g
Strontium-90	10	82	Lognormal	0.614	0.33	0.377	0.794	0.43	0.16	5.2	pCi/g
Technetium-99	45	84	Lognormal	3.88	0.575	0.961	12	2.42	0.08	89	pCi/g
Thorium-227	8	11	Normal	1.8	0.16	0.622	2.66	2.79	-0.03	8.6	pCi/g
Thorium-228	78	84	Lognormal	2.17	0.29	0.458	6.62	0.34	0.12	43.9	pCi/g
Thorium-230	80	84	Lognormal	3.65	0.635	0.81	17.4	0.755	0.17	153	pCi/g
Thorium-232	76	84	Lognormal	1.4	0.22	0.318	5.36	0.155	0.09	43.2	pCi/g
Uranium, Total	85	85	Lognormal	117	8.7	13.4	626	47.5	1	5700	ug/g
Uranium-234	82	85	Lognormal	57.7	3.3	4.45	348	11.1	0.24	3200	pCi/g
Uranium-235/236	69	85	Lognormal	5.15	0.33	0.434	32.6	1.2	0.05	300	pCi/g
Uranium-238	83	85	Lognormal	58.4	3.7	4.51	350	15.1	0.29	3200	pCi/g

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				CONCRETE CORE [1.0" - 4.0" (6.0")]							
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
1,2-Dichlorobenzene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
1,3-Dichlorobenzene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
1,4-Dichlorobenzene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
2,2-oxybis(1-Chloropropane)	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
2,4-Dinitrotoluene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
2,6-Dinitrotoluene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
2-Chloronaphthalene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
2-Methylnaphthalene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
2-Nitroaniline	.	1	Undeterminable	29000	29000	29000	.	0	.	.	ug/kg
3,3'-Dichlorobenzidine	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
3-Nitroaniline	.	1	Undeterminable	29000	29000	29000	.	0	.	.	ug/kg
4-Bromophenyl phenyl ether	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
4-Chlorophenylphenyl ether	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
4-Nitroaniline	.	1	Undeterminable	29000	29000	29000	.	0	.	.	ug/kg
Acenaphthene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Acenaphthylene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Anthracene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Benzo(a)anthracene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Benzo(a)pyrene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Benzo(b)fluoranthene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Benzo(g,h,i)perylene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Benzo(k)fluoranthene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Butyl benzyl phthalate	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Carbazole	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Chrysene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Di-n-butyl phthalate	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Dibenzo(a,h)anthracene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Dibenzofuran	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Diethyl phthalate	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Dimethyl phthalate	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Fluoranthene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Fluorene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Hexachlorobenzene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Hexachlorobutadiene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Hexachlorocyclopentadiene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Hexachloroethane	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Isophorone	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg

TA[illegible]-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
CONCRETE CORE [1.0" - 4.0" (6.0")]											
SEMIVOLATILE ORGANICS (cont.)											
N-Nitroso-di-n-propylamine	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
N-Nitrosodiphenylamine	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Naphthalene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Nitrobenzene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Phenanthrene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
Pyrene	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
bis(2-Chloroethoxy)methane	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
bis(2-Chloroethyl)ether	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg
p-Chloroaniline	.	1	Undeterminable	12000	12000	12000	.	0	.	.	ug/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
CONCRETE CORE [1.0" - 4.0" (6.0")]											
VOLATILE ORGANICS											
1,1,1-Trichloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,1,2,2-Tetrachloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,1,2-Trichloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,1-Dichloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,1-Dichloroethene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,2-Dichloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,2-Dichloroethene (Total)	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
1,2-Dichloropropane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
2-Butanone	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
2-Hexanone	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
4-Methyl-2-pentanone	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Acetone	.	1	Undeterminable	18	18	18	.	0	.	.	ug/kg
Benzene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Bromodichloromethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Bromoform	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Bromomethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Carbon Tetrachloride	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Carbon disulfide	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Chlorobenzene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Chloroethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Chloroform	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Chloromethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Dibromochloromethane	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Ethylbenzene	3	6	Undeterminable	5840	10	21.7	14300	7	1	35000	ug/kg
Methylene chloride	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Styrene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Tetrachloroethene	3	6	Undeterminable	2010	9	20.6	4900	6	2	8	ug/kg
Toluene	1	6	Undeterminable	2010	10	24.9	4900	0	2	2	ug/kg
Trichloroethene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Vinyl chloride	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
Xylenes, Total	2	6	Undeterminable	33300	10	46.1	81600	14	2	200000	ug/kg
cis-1,3-Dichloropropene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg
trans-1,3-Dichloropropene	.	6	Undeterminable	2010	10	32.6	4890	0	.	.	ug/kg

TA[illegible]-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				HVAC FILTERS							
INORGANICS											
Aluminum	1	1	Undeterminable	261	261	261	.	0	261	261	mg/kg
Antimony	.	1	Undeterminable	9.3	9.3	9.3	.	0	.	.	mg/kg
Arsenic	1	1	Undeterminable	0.81	0.81	0.81	.	0	0.81	0.81	mg/kg
Barium	.	1	Undeterminable	10	10	10	.	0	.	.	mg/kg
Beryllium	.	1	Undeterminable	0.2	0.2	0.2	.	0	.	.	mg/kg
Cadmium	1	1	Undeterminable	1.2	1.2	1.2	.	0	1.2	1.2	mg/kg
Calcium	1	1	Undeterminable	3380	3380	3380	.	0	3380	3380	mg/kg
Chromium	1	1	Undeterminable	197	197	197	.	0	197	197	mg/kg
Cobalt	.	1	Undeterminable	1.4	1.4	1.4	.	0	.	.	mg/kg
Copper	.	1	Undeterminable	10.3	10.3	10.3	.	0	.	.	mg/kg
Iron	1	1	Undeterminable	1380	1380	1380	.	0	1380	1380	mg/kg
Lead	1	1	Undeterminable	4.3	4.3	4.3	.	0	4.3	4.3	mg/kg
Magnesium	1	1	Undeterminable	467	467	467	.	0	467	467	mg/kg
Manganese	1	1	Undeterminable	25.5	25.5	25.5	.	0	25.5	25.5	mg/kg
Mercury	.	1	Undeterminable	0.05	0.05	0.05	.	0	.	.	mg/kg
Nickel	1	1	Undeterminable	128	128	128	.	0	128	128	mg/kg
Potassium	1	1	Undeterminable	273	273	273	.	0	273	273	mg/kg
Selenium	1	1	Undeterminable	0.72	0.72	0.72	.	0	0.72	0.72	mg/kg
Silver	.	1	Undeterminable	1.4	1.4	1.4	.	0	.	.	mg/kg
Sodium	1	1	Undeterminable	4700	4700	4700	.	0	4700	4700	mg/kg
Thallium	.	1	Undeterminable	0.41	0.41	0.41	.	0	.	.	mg/kg
Vanadium	.	1	Undeterminable	0.61	0.61	0.61	.	0	.	.	mg/kg
Zinc	1	1	Undeterminable	125	125	125	.	0	125	125	mg/kg

000407

00408

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				HVAC FILTERS							
RADIONUCLIDES											
Americium-241	1	4	Undeterminable	3.83	0.1	0.35	7.45	7.45	15	15	pCi/g
Cesium-137	.	4	Undeterminable	2.36	0.1	0.246	4.56	4.58	.	.	pCi/g
Lead-210	2	4	Undeterminable	228	0.27	1.9	455	455	0.3	910	pCi/g
Neptunium-237	.	4	Undeterminable	5.03	0.035	0.164	9.98	9.99	.	.	pCi/g
Plutonium-238	.	4	Undeterminable	0.26	0.125	0.181	0.287	0.3	.	.	pCi/g
Plutonium-239/240	.	4	Undeterminable	0.625	0.1	0.217	1.05	1.05	.	.	pCi/g
Plutonium-241	.	1	Undeterminable	0.94	0.94	0.94	.	0	.	.	pCi/g
Polonium-210	1	2	Undeterminable	5.01	5.01	0.316	7.06	9.99	10	10	pCi/g
Radium-226	3	4	Undeterminable	5.14	0.2	0.589	9.91	9.93	0.15	0.2	pCi/g
Radium-228	3	4	Undeterminable	9.06	0.5	1.14	17.3	17.6	0.23	0.7	pCi/g
Strontium-90	.	4	Undeterminable	3.5	2.2	2.72	3.16	3.7	.	.	pCi/g
Technetium-99	1	4	Undeterminable	13.3	3.25	5.87	20.5	21.2	3.7	3.7	pCi/g
Thorium-227	0	1	Undeterminable	18	18	18	.	0	18	18	pCi/g
Thorium-228	1	4	Undeterminable	15.6	0.075	0.36	31	31	62	62	pCi/g
Thorium-230	3	4	Undeterminable	11.9	0.22	0.603	23.4	23.6	0.13	47	pCi/g
Thorium-232	3	4	Undeterminable	5.3	0.065	0.258	10.5	10.5	0.06	21	pCi/g
Uranium, Total	4	4	Undeterminable	14.7	2.2	2.65	26.2	28.4	0.4	54	ug/g
Uranium-234	2	3	Undeterminable	60.1	0.09	1.04	104	180	0.09	180	pCi/g
Uranium-235/236	1	3	Undeterminable	7.03	0.04	0.323	12.1	21	21	21	pCi/g
Uranium-238	3	3	Undeterminable	63.4	0.11	1.19	110	190	0.08	190	pCi/g

TA[illegible]-14

SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				LOOSE MEDIA							
INORGANICS											
Aluminum	70	71	Lognormal	9230	5690	5380	17800	6820	421	150000	mg/kg
Antimony	28	64	Lognormal	17.5	10.7	9.59	31.7	10.9	1.2	214	mg/kg
Arsenic	66	70	Lognormal	25.7	10.4	11.8	46.7	14.7	1.1	246	mg/kg
Barium	71	71	Lognormal	488	205	225	724	490	3.3	4080	mg/kg
Beryllium	15	70	Lognormal	2.85	0.81	0.665	7.53	2.11	0.34	56.3	mg/kg
Cadmium	45	71	Undefined	8.52	6.5	5.08	9.44	7.7	0.43	62.4	mg/kg
Calcium	68	71	Undefined	102000	71900	55500	112000	101000	1300	663000	mg/kg
Chromium	68	71	Lognormal	258	84.1	80.5	512	195	3.8	3210	mg/kg
Cobalt	56	71	Lognormal	22.7	16	14.2	29.2	16.8	0.74	213	mg/kg
Copper	69	71	Lognormal	886	244	225	3210	468	2	26300	mg/kg
Iron	71	71	Undefined	74900	40900	40800	81200	92300	191	354000	mg/kg
Lead	64	71	Lognormal	1010	348	267	2110	877	5	12500	mg/kg
Magnesium	70	71	Undefined	20000	19000	14200	14100	17300	609	67000	mg/kg
Manganese	71	71	Normal	694	641	529	427	513	1.8	2170	mg/kg
Mercury	45	70	Lognormal	5.26	0.525	0.568	26.8	2.08	0.06	223	mg/kg
Nickel	63	71	Lognormal	937	87.3	83.4	6340	160	6.3	53500	mg/kg
Potassium	59	71	Lognormal	5350	1260	1270	26200	2020	96.9	221000	mg/kg
Selenium	21	67	Lognormal	6.9	1.2	1.46	22.9	2.3	0.29	157	mg/kg
Silver	41	68	Lognormal	39.6	1.5	2.43	176	4.44	0.31	1360	mg/kg
Sodium	61	71	Lognormal	2620	755	781	9860	1200	50.1	82200	mg/kg
Thallium	4	67	Lognormal	1.28	0.63	0.642	2.31	1.04	0.26	0.91	mg/kg
Vanadium	48	68	Lognormal	32.5	19.7	14.5	47.4	24.9	1.7	302	mg/kg
Zinc	67	71	Lognormal	1420	944	648	2030	1050	28.5	11900	mg/kg

000409

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000410

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						LOOSE MEDIA					
PESTICIDES											
4,4'-DDD	.	2	Undeterminable	18.9	18.9	11.4	21.4	30.2	.	.	ug/kg
4,4'-DDE	.	2	Undeterminable	18.9	18.9	11.4	21.4	30.2	.	.	ug/kg
4,4'-DDT	.	2	Undeterminable	5.3	5.3	5.08	2.12	3	.	.	ug/kg
Aldrin	.	2	Undeterminable	2.7	2.7	2.61	0.99	1.4	.	.	ug/kg
Aroclor-1016	.	2	Undeterminable	53	53	50.8	21.2	30	.	.	ug/kg
Aroclor-1221	.	2	Undeterminable	109	109	104	43.8	62	.	.	ug/kg
Aroclor-1232	.	2	Undeterminable	53	53	50.8	21.2	30	.	.	ug/kg
Aroclor-1242	.	2	Undeterminable	53	53	50.8	21.2	30	.	.	ug/kg
Aroclor-1248	.	2	Undeterminable	53	53	50.8	21.2	30	.	.	ug/kg
Aroclor-1254	1	2	Undeterminable	84	84	82.5	22.6	32	100	100	ug/kg
Aroclor-1260	1	2	Undeterminable	284	284	142	348	492	530	530	ug/kg
Dieldrin	.	2	Undeterminable	18.9	18.9	11.4	21.4	30.2	.	.	ug/kg
Endosulfan II	.	2	Undeterminable	5.3	5.3	5.08	2.12	3	.	.	ug/kg
Endosulfan sulfate	.	2	Undeterminable	5.3	5.3	5.08	2.12	3	.	.	ug/kg
Endosulfan-I	.	2	Undeterminable	2.7	2.7	2.61	0.99	1.4	.	.	ug/kg
Endrin	.	2	Undeterminable	5.3	5.3	5.08	2.12	3	.	.	ug/kg
Endrin aldehyde	.	2	Undeterminable	5.3	5.3	5.08	2.12	3	.	.	ug/kg
Endrin ketone	.	2	Undeterminable	5.3	5.3	5.08	2.12	3	.	.	ug/kg
Heptachlor	.	2	Undeterminable	2.7	2.7	2.61	0.99	1.4	.	.	ug/kg
Heptachlor epoxide	.	2	Undeterminable	2.7	2.7	2.61	0.99	1.4	.	.	ug/kg
Methoxychlor	1	2	Undeterminable	80	80	52.9	84.9	120	140	140	ug/kg
Toxaphene	.	2	Undeterminable	270	270	261	99	140	.	.	ug/kg
alpha-BHC	.	2	Undeterminable	2.7	2.7	2.61	0.99	1.4	.	.	ug/kg
alpha-Chlordane	.	2	Undeterminable	2.7	2.7	2.61	0.99	1.4	.	.	ug/kg
beta-BHC	.	2	Undeterminable	2.7	2.7	2.61	0.99	1.4	.	.	ug/kg
delta-BHC	.	2	Undeterminable	2.7	2.7	2.61	0.99	1.4	.	.	ug/kg
gamma-BHC (Lindane)	.	2	Undeterminable	9.5	9.5	5.83	10.6	15	.	.	ug/kg
gamma-Chlordane	.	2	Undeterminable	2.7	2.7	2.61	0.99	1.4	.	.	ug/kg

TA[illegible]A-14

SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics							
				Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				LOOSE MEDIA							
RADIONUCLIDES											
Americium-241	49	67	Lognormal	2.43	0.38	0.431	10.3	0.73	0.08	83	pCi/g
Cesium-137	51	69	Lognormal	2.6	0.91	0.959	3.79	2.74	0.1	16	pCi/g
Lead-210	51	69	Lognormal	16.9	8.06	8.43	24.6	10.7	0.9	100	pCi/g
Neptunium-237	48	64	Lognormal	3.34	0.725	0.725	9.18	2.03	0.04	68	pCi/g
Plutonium-238	49	67	Lognormal	11.5	0.39	0.517	59.7	0.96	0.03	366	pCi/g
Plutonium-239/240	55	67	Lognormal	6.06	0.82	1.14	14.1	3.21	0.11	69	pCi/g
Plutonium-241	29	54	Lognormal	27.3	3.53	5.42	64.8	13	0	289	pCi/g
Polonium-210	66	66	Lognormal	19.9	8.1	8.14	31.1	17.6	0.43	165	pCi/g
Radium-226	60	64	Lognormal	18.3	5.55	5.77	43.1	9.11	0.16	282	pCi/g
Radium-228	60	64	Lognormal	73.8	4.7	6.52	349	11.1	0.25	2650	pCi/g
Strontium-90	37	69	Lognormal	3.42	0.46	0.614	16.8	1.28	0.04	140	pCi/g
Technetium-99	65	68	Lognormal	797	67.1	87.5	2160	545	0.52	13000	pCi/g
Thorium-227	0	5	Undeterminable	6.53	4.12	5.44	5.26	1.1	3.65	15.9	pCi/g
Thorium-228	65	68	Lognormal	63.2	6.52	10.1	160	32.9	0.34	718	pCi/g
Thorium-230	68	68	Lognormal	193	23.8	36.5	519	127	1.08	3700	pCi/g
Thorium-232	65	68	Lognormal	37.9	3.6	5.82	103	18.1	0.23	530	pCi/g
Uranium, Total	69	69	Lognormal	30600	2060	2500	84800	19700	6.6	520000	ug/g
Uranium-234	68	68	Lognormal	10400	662	714	34000	3760	1.76	210000	pCi/g
Uranium-235/236	68	68	Lognormal	1350	60.8	71.6	4600	412	0.23	27000	pCi/g
Uranium-238	68	68	Lognormal	12700	752	915	37100	6230	2.28	180000	pCi/g

000412

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						LOOSE MEDIA					
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	1	71	Lognormal	9280	1200	2300	16500	12500	39000	39000	ug/kg
1,2-Dichlorobenzene	.	71	Lognormal	8900	1200	2260	16100	11500	.	.	ug/kg
1,3-Dichlorobenzene	.	71	Lognormal	8900	1200	2260	16100	11500	.	.	ug/kg
1,4-Dichlorobenzene	1	71	Lognormal	9280	1200	2300	16500	12500	39000	39000	ug/kg
2,2-oxybis(1-Chloropropane)	.	46	Lognormal	9240	740	1920	18800	10600	.	.	ug/kg
2,4,5-Trichlorophenol	.	70	Lognormal	17600	3950	5140	27300	17800	.	.	ug/kg
2,4,6-Trichlorophenol	1	70	Lognormal	9030	1600	2390	16200	11500	970	970	ug/kg
2,4-Dichlorophenol	4	70	Lognormal	8840	1150	2120	16200	11600	48	450	ug/kg
2,4-Dimethylphenol	2	70	Lognormal	9010	1600	2210	16200	11500	32	140	ug/kg
2,4-Dinitrophenol	.	65	Lognormal	23400	5400	6330	40700	29800	.	.	ug/kg
2,4-Dinitrotoluene	1	70	Lognormal	9090	1150	2240	16700	11500	50000	50000	ug/kg
2,6-Dinitrotoluene	.	71	Lognormal	8900	1200	2290	16100	11500	.	.	ug/kg
2-Chloronaphthalene	.	71	Lognormal	8900	1200	2290	16100	11500	.	.	ug/kg
2-Chlorophenol	1	70	Lognormal	9660	1600	2380	17200	12500	57000	57000	ug/kg
2-Methylnaphthalene	23	71	Lognormal	8080	860	1310	15900	10700	17	6300	ug/kg
2-Nitroaniline	.	71	Lognormal	17300	2900	5010	27200	17900	.	.	ug/kg
2-Nitrophenol	.	70	Lognormal	9020	1600	2330	16200	11500	.	.	ug/kg
3,3'-Dichlorobenzidine	.	64	Lognormal	9630	2250	2610	16800	12500	.	.	ug/kg
3-Nitroaniline	.	67	Lognormal	18300	5400	5550	27700	21800	.	.	ug/kg
4,6-Dinitro-2-methylphenol	.	70	Lognormal	22300	5200	5920	39500	29800	.	.	ug/kg
4-Bromophenyl phenyl ether	.	71	Lognormal	8940	2000	2340	16100	11500	.	.	ug/kg
4-Chloro-3-methylphenol	1	70	Lognormal	9830	1600	2390	17700	12500	69000	69000	ug/kg
4-Chlorophenylphenyl ether	.	71	Lognormal	8900	1200	2290	16100	11500	.	.	ug/kg
4-Nitroaniline	.	68	Lognormal	22300	3950	5730	40100	29400	.	.	ug/kg
4-Nitrophenol	1	69	Lognormal	22900	5000	5970	40000	29800	57000	57000	ug/kg
Acenaphthene	27	71	Lognormal	6820	700	1270	15400	6970	31	50000	ug/kg
Acenaphthylene	7	71	Lognormal	8860	1200	1970	16100	11600	21	260	ug/kg
Anthracene	30	71	Lognormal	7240	680	1240	16100	5060	31	43000	ug/kg
Benzo(a)anthracene	48	71	Lognormal	8430	860	1480	18000	9670	18	73000	ug/kg
Benzo(a)pyrene	42	70	Lognormal	8980	1300	1870	17900	10600	27	74000	ug/kg
Benzo(b)fluoranthene	52	70	Lognormal	7660	1350	1900	14300	9520	23	81000	ug/kg
Benzo(g,h,i)perylene	37	70	Lognormal	6720	1200	1720	15300	8500	31	56000	ug/kg
Benzo(k)fluoranthene	40	70	Lognormal	7700	935	1580	16600	9650	18	69000	ug/kg
Butyl benzyl phthalate	20	71	Lognormal	7990	790	1520	16100	10600	49	8700	ug/kg
Carbazole	30	70	Lognormal	6540	900	1420	14700	4560	51	24000	ug/kg
Chrysene	56	71	Lognormal	6830	1000	1650	12800	6540	45	81000	ug/kg
Di-n-butyl phthalate	30	71	Lognormal	13100	1500	1980	46800	11600	87	42000	ug/kg
Di-n-octyl phthalate	24	71	Lognormal	7680	670	1580	15600	10600	50	37000	ug/kg
Dibenzo(a,h)anthracene	10	70	Lognormal	8510	1250	2090	15700	11500	56	15000	ug/kg

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
LOOSE MEDIA											
SEMIVOLATILE ORGANICS (cont.)											
Dibenzofuran	25	71	Lognormal	7190	680	1260	15300	9670	20	13000	ug/kg
Diethyl phthalate	8	71	Lognormal	8520	700	1710	16100	11600	34	700	ug/kg
Dimethyl phthalate	3	71	Lognormal	8570	1000	2070	16200	11500	170	3000	ug/kg
Fluoranthene	61	71	Lognormal	14200	1600	2250	34100	10500	43	190000	ug/kg
Fluorene	27	71	Lognormal	6490	680	1290	14500	9660	24	19000	ug/kg
Hexachlorobenzene	.	71	Lognormal	8940	2000	2340	16100	11500	.	.	ug/kg
Hexachlorobutadiene	.	71	Lognormal	8900	1200	2260	16100	11500	.	.	ug/kg
Hexachlorocyclopentadiene	.	71	Lognormal	8900	1200	2290	16100	11500	.	.	ug/kg
Hexachloroethane	.	71	Lognormal	8900	1200	2260	16100	11500	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	45	70	Lognormal	6620	925	1340	15200	9530	20	49000	ug/kg
Isophorone	1	71	Lognormal	9530	2000	2420	16600	12500	45000	45000	ug/kg
N-Nitroso-di-n-propylamine	1	71	Lognormal	9400	1200	2310	16800	12500	48000	48000	ug/kg
N-Nitrosodiphenylamine	.	71	Lognormal	8940	2000	2340	16100	11500	.	.	ug/kg
Naphthalene	29	71	Lognormal	7870	500	1140	16000	10800	30	6400	ug/kg
Nitrobenzene	1	71	Lognormal	8850	1100	2170	16100	11600	140	140	ug/kg
Pentachlorophenol	2	69	Lognormal	21200	5000	5630	39200	26800	730	14000	ug/kg
Phenanthrene	60	71	Lognormal	11400	1300	1700	31300	8110	45	180000	ug/kg
Phenol	12	70	Lognormal	7840	960	1770	12900	10600	18	67000	ug/kg
Pyrene	61	71	Lognormal	12300	2300	2220	27600	9480	54	170000	ug/kg
bis(2-Chloroethoxy)methane	.	71	Lognormal	8900	1200	2260	16100	11500	.	.	ug/kg
bis(2-Chloroethyl)ether	.	71	Lognormal	8900	1200	2260	16100	11500	.	.	ug/kg
bis(2-Chloroisopropyl) ether	.	13	Normal	9240	560	2520	10100	19500	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	25	71	Lognormal	23800	5300	5270	72900	19700	410	560000	ug/kg
o-Methylphenol	5	70	Lognormal	8170	1200	2030	15600	10600	57	20000	ug/kg
p-Chloroaniline	1	67	Lognormal	8790	1100	2090	16500	11600	140	140	ug/kg
p-Methylphenol	20	70	Lognormal	7610	510	1360	15600	10700	13	20000	ug/kg

000413

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						LOOSE MEDIA					
VOLATILE ORGANICS											
1,1,1-Trichloroethane	5	68	Lognormal	1940	42.5	96.4	6480	1240	1	150	ug/kg
1,1,2,2-Tetrachloroethane	.	66	Lognormal	2000	52	107	6570	1290	.	.	ug/kg
1,1,2-Trichloroethane	.	68	Lognormal	1940	42.5	100	6480	1240	.	.	ug/kg
1,1-Dichloroethane	.	71	Lognormal	1860	34	94.3	6350	1190	.	.	ug/kg
1,1-Dichloroethene	.	71	Lognormal	1860	34	94.3	6350	1190	.	.	ug/kg
1,2-Dichloroethane	.	71	Lognormal	1860	34	94.3	6350	1190	.	.	ug/kg
1,2-Dichloroethene (Total)	.	69	Lognormal	1920	42	101	6440	1190	.	.	ug/kg
1,2-Dichloropropane	.	68	Lognormal	1940	42.5	100	6480	1240	.	.	ug/kg
2-Butanone	9	70	Lognormal	1820	58.5	117	6260	1190	14	9600	ug/kg
2-Hexanone	.	60	Lognormal	2100	32.5	97.8	6880	1240	.	.	ug/kg
4-Chloroaniline	.	1	Undeterminable	800	800	800	.	0	.	.	ug/kg
4-Methyl-2-pentanone	5	65	Lognormal	3450	51	115	13800	1290	5	100000	ug/kg
Acetone	8	52	Lognormal	2490	89.5	174	7340	1380	17	300	ug/kg
Benzene	3	68	Lognormal	1760	42.5	97.9	6280	1240	18	2800	ug/kg
Bromodichloromethane	.	68	Lognormal	1940	42.5	100	6480	1240	.	.	ug/kg
Bromoform	2	68	Lognormal	1910	42.5	94.7	6490	659	140	220	ug/kg
Bromomethane	.	71	Lognormal	1860	34	94.3	6350	1190	.	.	ug/kg
Carbon Tetrachloride	.	68	Lognormal	1940	42.5	100	6480	1240	.	.	ug/kg
Carbon disulfide	1	71	Lognormal	1830	34	92	6360	749	500	500	ug/kg
Chlorobenzene	1	66	Lognormal	2000	53.5	108	6570	1290	63	63	ug/kg
Chloroethane	.	71	Lognormal	1860	34	94.3	6350	1190	.	.	ug/kg
Chloroform	.	71	Lognormal	1860	34	94.3	6350	1190	.	.	ug/kg
Chloromethane	.	71	Lognormal	1860	34	94.3	6350	1190	.	.	ug/kg
Dibromochloromethane	.	68	Lognormal	1940	42.5	100	6480	1240	.	.	ug/kg
Ethylbenzene	11	66	Lognormal	1790	52	94.5	6370	1290	1	1500	ug/kg
Methylene chloride	5	71	Lognormal	1700	42	91.8	6160	1190	1	3200	ug/kg
Styrene	8	66	Lognormal	1970	52	99.7	6580	607	25	3100	ug/kg
Tetrachloroethene	6	66	Lognormal	1960	53.5	96.5	6580	749	2	310	ug/kg
Toluene	14	66	Lognormal	2400	43.5	114	7250	1290	2	27000	ug/kg
Trichloroethene	1	68	Lognormal	1940	38	100	6480	1240	42	42	ug/kg
Trichlorofluoromethane	.	9	Lognormal	1800	14	74.6	4950	480	.	.	ug/kg
Vinyl chloride	.	71	Lognormal	1860	34	94.3	6350	1190	.	.	ug/kg
Xylenes, Total	18	66	Lognormal	2430	50.5	114	7200	1290	3	24000	ug/kg
cis-1,3-Dichloropropene	.	68	Lognormal	1940	42.5	100	6480	1240	.	.	ug/kg
m,p-Xylene	1	1	Undeterminable	1900	1900	1900	.	0	1900	1900	ug/kg
o-Xylene	1	1	Undeterminable	1200	1200	1200	.	0	1200	1200	ug/kg
trans-1,2-Dichloroethene	.	1	Undeterminable	10	10	10	.	0	.	.	ug/kg
trans-1,3-Dichloropropene	.	68	Lognormal	1940	42.5	100	6480	1240	.	.	ug/kg

TA[illegible]A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				MASONRY CHIPS							
INORGANICS											
Aluminum	60	60	Undefined	4260	4180	3700	2020	1240	226	15000	mg/kg
Antimony	4	49	Lognormal	9.33	7.2	5.64	11.7	6.1	1.8	6.7	mg/kg
Arsenic	55	60	Undefined	4	3.3	3.24	4.34	1.45	1.8	33.8	mg/kg
Barium	60	60	Lognormal	249	59.2	92.6	544	204	23.6	3820	mg/kg
Beryllium	17	60	Lognormal	0.696	0.21	0.228	1.22	0.605	0.14	1.4	mg/kg
Cadmium	12	60	Lognormal	1.96	0.61	0.836	3.93	0.725	0.2	21	mg/kg
Calcium	60	60	Undefined	150000	161000	111000	49800	18500	719	218000	mg/kg
Chromium	59	60	Lognormal	23.1	13.3	14.6	39.9	16.9	1.5	306	mg/kg
Cobalt	35	60	Undefined	4.66	3.9	4.04	2.64	3	2	13.8	mg/kg
Copper	49	57	Lognormal	19.4	9.7	12.4	27.4	8.1	5.7	142	mg/kg
Iron	60	60	Normal	6830	6800	6530	2020	2100	1710	14700	mg/kg
Lead	57	59	Lognormal	633	86	60.5	2680	141	2.8	16300	mg/kg
Magnesium	60	60	Undefined	36700	39500	26500	14000	10800	251	59800	mg/kg
Manganese	60	60	Normal	247	264	223	82.6	102	20.6	409	mg/kg
Mercury	42	60	Lognormal	0.525	0.22	0.223	0.958	0.39	0.04	5.2	mg/kg
Nickel	40	60	Undefined	12.4	8.05	9.38	10.9	8.85	2.9	48.4	mg/kg
Potassium	47	60	Undefined	1560	1040	1190	1400	750	151	6630	mg/kg
Selenium	3	53	Undefined	1.23	0.61	0.906	0.974	1.4	0.66	2.3	mg/kg
Silver	5	60	Lognormal	3.12	0.8	0.843	11	0.685	0.23	84.7	mg/kg
Sodium	51	60	Undefined	699	567	552	591	396	227	4170	mg/kg
Thallium	5	57	Lognormal	0.641	0.4	0.381	1.09	0.55	0.04	0.32	mg/kg
Vanadium	46	60	Undefined	11.5	9.25	9.8	8.62	4.45	5.8	50.3	mg/kg
Zinc	58	60	Lognormal	191	91.7	91.1	311	178	14	2050	mg/kg

000415

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000416

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				MASONRY CHIPS							
RADIONUCLIDES											
Americium-241	16	57	Lognormal	0.569	0.11	0.14	2.12	0.1	0.04	12	pCi/g
Cesium-137	10	58	Lognormal	0.66	0.1	0.104	2.83	0.15	0.09	16	pCi/g
Lead-210	38	55	Lognormal	30	1.1	1.47	143	1.41	0.3	810	pCi/g
Neptunium-237	18	58	Lognormal	0.257	0.12	0.126	0.576	0.12	0.01	4.2	pCi/g
Plutonium-238	23	58	Lognormal	0.364	0.1	0.112	0.894	0.18	0.01	6	pCi/g
Plutonium-239/240	18	58	Lognormal	0.228	0.055	0.0703	0.596	0.06	0.01	3.54	pCi/g
Plutonium-241	7	35	Lognormal	4.16	2	2.74	6.08	1.79	-0.75	27.9	pCi/g
Polonium-210	54	58	Lognormal	7.61	0.56	0.78	34.2	0.85	0.2	210	pCi/g
Radium-226	58	58	Lognormal	85.4	0.74	1.21	442	0.67	0.2	2500	pCi/g
Radium-228	45	57	Lognormal	4.26	0.5	0.781	12.7	0.8	0.2	62	pCi/g
Strontium-90	11	56	Lognormal	0.977	0.34	0.435	2.24	0.43	0.3	13	pCi/g
Technetium-99	38	58	Lognormal	3.7	0.595	0.918	9.89	1.4	0.19	63	pCi/g
Thorium-227	2	4	Undeterminable	20.4	17.3	2.57	23.8	40.2	0.05	47	pCi/g
Thorium-228	51	58	Lognormal	2.39	0.41	0.717	5.16	0.65	0.22	22	pCi/g
Thorium-230	56	58	Lognormal	29.1	0.985	1.7	128	3.05	0.12	740	pCi/g
Thorium-232	51	58	Lognormal	1.87	0.355	0.545	4.41	0.61	0.11	20	pCi/g
Uranium, Total	58	58	Lognormal	423	84.1	61.1	1140	318	1.12	7720	ug/g
Uranium-234	55	56	Lognormal	176	35.4	22.4	460	124	0.28	2800	pCi/g
Uranium-235/236	51	56	Lognormal	13.7	3.11	1.8	33.1	9.56	0.03	170	pCi/g
Uranium-238	55	56	Lognormal	135	38.7	22.4	265	121	0.36	1390	pCi/g

TA[illegible]-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				MASONRY CHIPS							
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
1,2-Dichlorobenzene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
1,3-Dichlorobenzene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
1,4-Dichlorobenzene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
2,2-oxybis(1-Chloropropane)	.	1	Undeterminable	11000	11000	11000	.	0	.	.	ug/kg
2,4,5-Trichlorophenol	.	2	Undeterminable	18000	18000	16600	9900	14000	.	.	ug/kg
2,4,6-Trichlorophenol	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
2,4-Dichlorophenol	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
2,4-Dimethylphenol	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
2,4-Dinitrophenol	.	1	Undeterminable	25000	25000	25000	.	0	.	.	ug/kg
2,4-Dinitrotoluene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
2,6-Dinitrotoluene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
2-Chloronaphthalene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
2-Chlorophenol	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
2-Methylnaphthalene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
2-Nitroaniline	.	2	Undeterminable	18000	18000	16600	9900	14000	.	.	ug/kg
2-Nitrophenol	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
3,3'-Dichlorobenzidine	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
3-Nitroaniline	.	2	Undeterminable	18000	18000	16600	9900	14000	.	.	ug/kg
4,6-Dinitro-2-methylphenol	.	2	Undeterminable	25500	25500	25500	707	1000	.	.	ug/kg
4-Bromophenyl phenyl ether	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
4-Chloro-3-methylphenol	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
4-Chlorophenylphenyl ether	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
4-Nitroaniline	.	2	Undeterminable	25500	25500	25500	707	1000	.	.	ug/kg
4-Nitrophenol	.	2	Undeterminable	25500	25500	25500	707	1000	.	.	ug/kg
Acenaphthene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Acenaphthylene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Anthracene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Benzo(a)anthracene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Benzo(a)pyrene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Benzo(b)fluoranthene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Benzo(g,h,i)perylene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Benzo(k)fluoranthene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Butyl benzyl phthalate	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Carbazole	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Chrysene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Di-n-butyl phthalate	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Di-n-octyl phthalate	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Dibenzo(a,h)anthracene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				MASONRY CHIPS							
SEMIVOLATILE ORGANICS (cont.)											
Dibenzofuran	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Diethyl phthalate	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Dimethyl phthalate	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Fluoranthene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Fluorene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Hexachlorobenzene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Hexachlorobutadiene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Hexachlorocyclopentadiene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Hexachloroethane	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Isophorone	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
N-Nitroso-di-n-propylamine	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
N-Nitrosodiphenylamine	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Naphthalene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Nitrobenzene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Pentachlorophenol	.	2	Undeterminable	25500	25500	25500	707	1000	.	.	ug/kg
Phenanthrene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Phenol	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
Pyrene	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
bis(2-Chloroethoxy)methane	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
bis(2-Chloroethyl)ether	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
bis(2-Chloroisopropyl) ether	.	1	Undeterminable	10000	10000	10000	.	0	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
o-Methylphenol	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
p-Chloroaniline	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg
p-Methylphenol	.	2	Undeterminable	10500	10500	10500	707	1000	.	.	ug/kg

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
MASONRY CHIPS											
VOLATILE ORGANICS											
1,1,1-Trichloroethane	1	2	Undeterminable	17.5	17.5	15.8	10.6	15	25	25	ug/kg
1,1,2,2-Tetrachloroethane	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
1,1,2-Trichloroethane	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
1,1-Dichloroethane	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
1,1-Dichloroethene	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
1,2-Dichloroethane	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
1,2-Dichloroethene (Total)	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
1,2-Dichloropropane	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
2-Butanone	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
2-Hexanone	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
4-Methyl-2-pentanone	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Acetone	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Benzene	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Bromodichloromethane	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Bromoform	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Bromomethane	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Carbon Tetrachloride	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Carbon disulfide	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Chlorobenzene	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Chloroethane	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Chloroform	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Chloromethane	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Dibromochloromethane	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Ethylbenzene	1	2	Undeterminable	8.5	8.5	8.37	2.12	3	7	7	ug/kg
Methylene chloride	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Styrene	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Tetrachloroethene	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Toluene	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Trichloroethene	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Vinyl chloride	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
Xylenes, Total	2	2	Undeterminable	22.5	22.5	11.2	27.6	39	3	42	ug/kg
cis-1,3-Dichloropropene	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg
m,p-Xylene	1	1	Undeterminable	28	28	28	.	0	28	28	ug/kg
o-Xylene	1	1	Undeterminable	13	13	13	.	0	13	13	ug/kg
trans-1,3-Dichloropropene	.	2	Undeterminable	30	30	22.4	28.3	40	.	.	ug/kg

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						OIL					
VOLATILE ORGANICS											
1,1,1-Trichloroethane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
1,1,2,2-Tetrachloroethane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
1,1,2-Trichloroethane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
1,1-Dichloroethane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
1,1-Dichloroethene	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
1,2-Dichloroethane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
1,2-Dichloroethene (Total)	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
1,2-Dichloropropane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
2-Butanone	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
2-Hexanone	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
4-Methyl-2-pentanone	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Acetone	.	1	Undeterminable	56000	56000	56000	.	0	.	.	ug/kg
Benzene	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Bromodichloromethane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Bromoform	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Bromomethane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Carbon Tetrachloride	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Carbon disulfide	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Chlorobenzene	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Chloroethane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Chloroform	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Chloromethane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Dibromochloromethane	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Ethylbenzene	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Methylene chloride	1	1	Undeterminable	93000	93000	93000	.	0	93000	93000	ug/kg
Styrene	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Tetrachloroethene	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Toluene	1	1	Undeterminable	19000	19000	19000	.	0	19000	19000	ug/kg
Trichloroethene	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Vinyl chloride	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
Xylenes, Total	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
cis-1,3-Dichloropropene	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg
trans-1,3-Dichloropropene	.	1	Undeterminable	50000	50000	50000	.	0	.	.	ug/kg

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics							
				Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				SOIL (1st DEPTH)							
INORGANICS											
Aluminum	9	9	Normal	10900	9530	10600	2910	4100	8240	15700	mg/kg
Antimony	.	9	Normal	8.78	9.9	8.63	1.66	2.8	.	.	mg/kg
Arsenic	9	9	Normal	7.7	6.9	7.56	1.61	3.2	6.3	10.2	mg/kg
Barium	9	9	Normal	97.3	76.3	91.9	39.6	27.6	69.3	191	mg/kg
Beryllium	6	9	Normal	0.859	0.76	0.747	0.599	0.25	0.39	2.4	mg/kg
Cadmium	.	9	Normal	0.611	0.65	0.592	0.138	0.03	.	.	mg/kg
Calcium	9	9	Normal	79200	75100	69200	39100	52200	19700	142000	mg/kg
Chromium	9	9	Normal	15.1	13.6	14.6	4.46	4.2	11.4	24.9	mg/kg
Cobalt	9	9	Normal	8.33	8.5	8.1	2.02	3.1	5.4	10.6	mg/kg
Copper	9	9	Normal	18.8	18.9	18.4	4.1	5.1	14.5	25.6	mg/kg
Iron	9	9	Normal	22300	20500	21300	7540	8400	14900	38400	mg/kg
Lead	9	9	Normal	35.9	17.8	24	42.5	27.9	11.2	143	mg/kg
Magnesium	9	9	Normal	21100	22000	19600	7760	10500	8220	33900	mg/kg
Manganese	9	9	Normal	574	579	565	108	65	389	795	mg/kg
Mercury	.	9	Normal	0.0911	0.1	0.088	0.0237	0.05	.	.	mg/kg
Nickel	9	9	Normal	20.4	20.1	19.9	4.34	6.7	14.2	26.2	mg/kg
Potassium	8	9	Normal	1290	1160	1220	434	300	845	2140	mg/kg
Selenium	1	9	Normal	0.6	0.65	0.563	0.21	0.25	0.99	0.99	mg/kg
Silver	.	9	Normal	0.829	0.87	0.822	0.109	0.02	.	.	mg/kg
Sodium	9	9	Normal	419	452	394	142	195	184	600	mg/kg
Thallium	.	9	Normal	0.651	0.86	0.551	0.304	0.51	.	.	mg/kg
Vanadium	9	9	Normal	22.1	20.2	21.5	6.15	7	16.3	35.4	mg/kg
Zinc	9	9	Undefined	82	60	66.4	77.7	18.4	39.8	287	mg/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				SOIL (1st DEPTH)							
PESTICIDES											
4,4'-DDD	.	8	Normal	3.61	3.6	3.6	0.327	0.2	.	.	ug/kg
4,4'-DDE	.	8	Normal	3.61	3.6	3.6	0.327	0.2	.	.	ug/kg
4,4'-DDT	.	8	Normal	3.61	3.6	3.6	0.327	0.2	.	.	ug/kg
Aldrin	.	8	Normal	1.83	1.85	1.82	0.191	0.15	.	.	ug/kg
Aroclor-1016	.	9	Normal	36.2	36	36.1	3.07	1	.	.	ug/kg
Aroclor-1221	.	9	Normal	73.1	73	72.8	6.37	4	.	.	ug/kg
Aroclor-1232	.	9	Normal	36.2	36	36.1	3.07	1	.	.	ug/kg
Aroclor-1242	.	9	Normal	36.2	36	36.1	3.07	1	.	.	ug/kg
Aroclor-1248	.	9	Normal	36.2	36	36.1	3.07	1	.	.	ug/kg
Aroclor-1254	3	9	Lognormal	665	39	88.5	1670	14	50	5100	ug/kg
Aroclor-1260	1	9	Normal	34.9	36	34.5	5.11	1	24	24	ug/kg
Dieldrin	.	8	Normal	3.61	3.6	3.6	0.327	0.2	.	.	ug/kg
Endosulfan II	.	8	Normal	3.61	3.6	3.6	0.327	0.2	.	.	ug/kg
Endosulfan sulfate	.	8	Normal	3.61	3.6	3.6	0.327	0.2	.	.	ug/kg
Endosulfan-I	.	8	Normal	1.83	1.85	1.82	0.191	0.15	.	.	ug/kg
Endrin	.	8	Normal	3.61	3.6	3.6	0.327	0.2	.	.	ug/kg
Endrin aldehyde	.	8	Normal	3.61	3.6	3.6	0.327	0.2	.	.	ug/kg
Endrin ketone	.	8	Normal	3.61	3.6	3.6	0.327	0.2	.	.	ug/kg
Heptachlor	.	8	Normal	1.83	1.85	1.82	0.191	0.15	.	.	ug/kg
Heptachlor epoxide	.	8	Normal	1.83	1.85	1.82	0.191	0.15	.	.	ug/kg
Methoxychlor	.	8	Normal	18.3	18.5	18.2	1.91	1.5	.	.	ug/kg
Toxaphene	.	8	Normal	183	185	182	19.1	15	.	.	ug/kg
alpha-BHC	.	8	Normal	1.83	1.85	1.82	0.191	0.15	.	.	ug/kg
alpha-Chlordane	.	8	Normal	1.83	1.85	1.82	0.191	0.15	.	.	ug/kg
beta-BHC	.	8	Normal	1.83	1.85	1.82	0.191	0.15	.	.	ug/kg
delta-BHC	.	8	Normal	1.83	1.85	1.82	0.191	0.15	.	.	ug/kg
gamma-BHC (Lindane)	.	8	Normal	1.83	1.85	1.82	0.191	0.15	.	.	ug/kg
gamma-Chlordane	.	8	Normal	1.83	1.85	1.82	0.191	0.15	.	.	ug/kg

TA[illegible]A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				SOIL (1st DEPTH)							
RADIONUCLIDES											
Americium-241	.	8	Normal	0.121	0.125	0.117	0.0352	0.07	.	.	pCi/g
Cesium-137	6	8	Normal	0.0475	0.035	0.0404	0.035	0.02	0.03	0.13	pCi/g
Lead-210	8	8	Normal	1.59	1.64	1.55	0.373	0.475	1.05	2.23	pCi/g
Neptunium-237	.	8	Normal	0.313	0.32	0.291	0.112	0.055	.	.	pCi/g
Plutonium-238	1	7	Normal	0.08	0.06	0.0727	0.0392	0.06	0.15	0.15	pCi/g
Plutonium-239/240	3	7	Normal	0.0471	0.05	0.0393	0.0298	0.04	0.05	0.1	pCi/g
Plutonium-241	.	8	Undefined	0.449	0.605	0.611	0.46	0.015	.	.	pCi/g
Polonium-210	7	7	Normal	1.31	1.43	1.18	0.624	1.28	0.6	2.07	pCi/g
Radium-226	8	8	Normal	1.2	1.15	1.19	0.136	0.18	1.05	1.42	pCi/g
Radium-228	8	8	Normal	1.25	1.14	1.22	0.307	0.525	0.92	1.74	pCi/g
Strontium-90	.	8	Normal	0.185	0.16	0.179	0.0578	0.035	.	.	pCi/g
Technetium-99	8	8	Normal	2.23	2.41	2.08	0.82	1.45	1.13	3.32	pCi/g
Thorium-227	0	8	Normal	1.46	1.42	1.07	0.967	1.8	0.16	2.7	pCi/g
Thorium-228	8	8	Normal	1.23	1.08	1.16	0.471	0.395	0.77	2.27	pCi/g
Thorium-230	8	8	Undefined	2.76	1.77	2.1	2.9	0.95	1.06	9.82	pCi/g
Thorium-232	7	8	Normal	0.925	0.82	0.831	0.503	0.505	0.48	2.03	pCi/g
Uranium, Total	8	8	Normal	29.7	22.5	25.7	19	19.5	14.14	70.09	ug/g
Uranium-234	8	8	Normal	12.5	8.25	9.67	11.2	8.87	4.62	38.3	pCi/g
Uranium-235/236	8	8	Normal	0.496	0.295	0.365	0.518	0.315	0.18	1.73	pCi/g
Uranium-238	8	8	Normal	12.5	8.23	9.77	11.3	7.66	4.48	39	pCi/g

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				SOIL (1st DEPTH)							
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
1,2-Dichlorobenzene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
1,3-Dichlorobenzene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
1,4-Dichlorobenzene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
2,2-oxybis(1-Chloropropane)	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
2,4,5-Trichlorophenol	.	9	Normal	913	920	913	27.4	20	.	.	ug/kg
2,4,6-Trichlorophenol	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
2,4-Dichlorophenol	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
2,4-Dimethylphenol	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
2,4-Dinitrophenol	.	9	Normal	913	920	913	27.4	20	.	.	ug/kg
2,4-Dinitrotoluene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
2,6-Dinitrotoluene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
2-Chloronaphthalene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
2-Chlorophenol	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
2-Methylnaphthalene	1	9	Undefined	335	370	296	108	20	49	49	ug/kg
2-Nitroaniline	.	9	Normal	913	920	913	27.4	20	.	.	ug/kg
2-Nitrophenol	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
3,3'-Dichlorobenzidine	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
3-Nitroaniline	.	9	Normal	913	920	913	27.4	20	.	.	ug/kg
4,6-Dinitro-2-methylphenol	.	9	Normal	913	920	913	27.4	20	.	.	ug/kg
4-Bromophenyl phenyl ether	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
4-Chloro-3-methylphenol	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
4-Chlorophenylphenyl ether	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
4-Nitroaniline	.	9	Normal	913	920	913	27.4	20	.	.	ug/kg
4-Nitrophenol	.	9	Normal	913	920	913	27.4	20	.	.	ug/kg
Acenaphthene	2	9	Normal	303	370	243	140	30	38	77	ug/kg
Acenaphthylene	2	9	Undefined	301	360	244	140	30	54	59	ug/kg
Anthracene	3	9	Normal	290	360	243	134	150	58	230	ug/kg
Benzo(a)anthracene	7	9	Normal	253	270	166	189	311	19	580	ug/kg
Benzo(a)pyrene	6	9	Normal	320	380	234	200	200	23	700	ug/kg
Benzo(b)fluoranthene	6	9	Normal	359	380	266	219	150	24	760	ug/kg
Benzo(g,h,i)perylene	5	9	Normal	345	380	277	217	200	57	810	ug/kg
Benzo(k)fluoranthene	5	9	Normal	352	380	298	163	90	50	640	ug/kg
Butyl benzyl phthalate	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Carbazole	2	9	Normal	307	370	259	132	30	53	99	ug/kg
Chrysene	7	9	Normal	293	390	193	215	317	26	670	ug/kg
Di-n-butyl phthalate	1	9	Undefined	610	370	448	747	30	2600	2600	ug/kg
Di-n-octyl phthalate	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Dibenzo(a,h)anthracene	4	9	Normal	256	360	202	149	280	55	190	ug/kg

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics							
				Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				SOIL (1st DEPTH)							
SEMIVOLATILE ORGANICS (cont.)											
Dibenzofuran	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Diethyl phthalate	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Dimethyl phthalate	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Fluoranthene	8	9	Normal	394	300	233	386	441	36	1200	ug/kg
Fluorene	1	9	Undefined	339	370	312	98.4	20	79	79	ug/kg
Hexachlorobenzene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Hexachlorobutadiene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Hexachlorocyclopentadiene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Hexachloroethane	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	5	9	Normal	320	370	270	170	210	77	630	ug/kg
Isophorone	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
N-Nitroso-di-n-propylamine	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
N-Nitrosodiphenylamine	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Naphthalene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Nitrobenzene	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Pentachlorophenol	.	9	Normal	913	920	913	27.4	20	.	.	ug/kg
Phenanthrene	7	9	Normal	295	290	179	263	336	29	820	ug/kg
Phenol	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
Pyrene	8	9	Normal	372	270	221	375	433	40	1200	ug/kg
bis(2-Chloroethoxy)methane	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
bis(2-Chloroethyl)ether	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	6	9	Normal	350	230	210	395	298	44	1300	ug/kg
o-Methylphenol	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
p-Chloroaniline	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg
p-Methylphenol	.	9	Normal	370	370	370	14.1	20	.	.	ug/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				SOIL (1st DEPTH)							
VOLATILE ORGANICS											
1,1,1-Trichloroethane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
1,1,2,2-Tetrachloroethane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
1,1,2-Trichloroethane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
1,1-Dichloroethane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
1,1-Dichloroethene	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
1,2-Dichloroethane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
1,2-Dichloroethene (Total)	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
1,2-Dichloropropane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
2-Butanone	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
2-Hexanone	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
4-Methyl-2-pentanone	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Acetone	2	5	Undeterminable	15.2	11	13.4	9.96	0	10	33	ug/kg
Benzene	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Bromodichloromethane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Bromoform	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Bromomethane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Carbon Tetrachloride	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Carbon disulfide	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Chlorobenzene	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Chloroethane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Chloroform	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Chloromethane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Dibromochloromethane	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Ethylbenzene	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Methylene chloride	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Styrene	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Tetrachloroethene	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Toluene	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Trichloroethene	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Vinyl chloride	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
Xylenes, Total	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
cis-1,3-Dichloropropene	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg
trans-1,3-Dichloropropene	.	9	Normal	11	11	11	0.5	0	.	.	ug/kg

TA[illegible]A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
SOIL (2nd DEPTH)											
INORGANICS											
Aluminum	2	2	Undeterminable	9510	9510	9420	1830	2590	8210	10800	mg/kg
Antimony	.	1	Undeterminable	6.9	6.9	6.9		0	.	.	mg/kg
Arsenic	2	2	Undeterminable	6.95	6.95	6.87	1.48	2.1	5.9	8	mg/kg
Barium	2	2	Undeterminable	87.7	87.7	87.6	5.09	7.2	84.1	91.3	mg/kg
Beryllium	1	2	Undeterminable	0.815	0.815	0.794	0.262	0.37	0.63	0.63	mg/kg
Cadmium	1	2	Undeterminable	0.4	0.4	0.387	0.141	0.2	0.3	0.3	mg/kg
Calcium	2	2	Undeterminable	93600	93600	91600	27400	38800	74200	113000	mg/kg
Chromium	2	2	Undeterminable	12	12	11.5	4.45	6.3	8.8	15.1	mg/kg
Cobalt	2	2	Undeterminable	7.95	7.95	7.76	2.47	3.5	6.2	9.7	mg/kg
Copper	2	2	Undeterminable	19.5	19.5	19.4	2.47	3.5	17.7	21.2	mg/kg
Iron	2	2	Undeterminable	17400	17400	17200	3820	5400	14700	20100	mg/kg
Lead	2	2	Undeterminable	36.7	36.7	29	31.7	44.9	14.2	59.1	mg/kg
Magnesium	2	2	Undeterminable	25900	25900	25500	6510	9200	21300	30500	mg/kg
Manganese	2	2	Undeterminable	686	686	683	91.9	130	621	751	mg/kg
Mercury	.	2	Undeterminable	0.06	0.06	0.06	0	0	.	.	mg/kg
Nickel	2	2	Undeterminable	15.8	15.8	15.2	6.01	8.5	11.5	20	mg/kg
Potassium	1	2	Undeterminable	854	854	821	334	472	1090	1090	mg/kg
Selenium	1	2	Undeterminable	0.77	0.77	0.559	0.75	1.06	1.3	1.3	mg/kg
Silver	.	2	Undeterminable	0.71	0.71	0.709	0.0424	0.06	.	.	mg/kg
Sodium	2	2	Undeterminable	149	149	142	61.5	87	105	192	mg/kg
Thallium	.	2	Undeterminable	0.44	0.44	0.402	0.255	0.36	.	.	mg/kg
Vanadium	2	2	Undeterminable	21.1	21.1	21.1	1.84	2.6	19.8	22.4	mg/kg
Zinc	2	2	Undeterminable	49.2	49.2	48.4	12.4	17.6	40.4	58	mg/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
SOIL (2nd DEPTH)											
PESTICIDES											
4,4'-DDD	1	3	Undeterminable	3.1	3.6	2.96	1.04	1.9	1.9	1.9	ug/kg
4,4'-DDE	.	3	Undeterminable	3.8	3.8	3.8	0.2	0.4	.	.	ug/kg
4,4'-DDT	.	3	Undeterminable	3.8	3.8	3.8	0.2	0.4	.	.	ug/kg
Aldrin	.	3	Undeterminable	1.93	2	1.93	0.115	0.2	.	.	ug/kg
Aroclor-1016	.	3	Undeterminable	38	38	38	2	4	.	.	ug/kg
Aroclor-1221	.	3	Undeterminable	77	77	76.9	4	8	.	.	ug/kg
Aroclor-1232	.	3	Undeterminable	38	38	38	2	4	.	.	ug/kg
Aroclor-1242	.	3	Undeterminable	38	38	38	2	4	.	.	ug/kg
Aroclor-1248	1	3	Undeterminable	43.7	40	43.2	8.14	15	53	53	ug/kg
Aroclor-1254	2	3	Undeterminable	213	220	147	171	342	220	380	ug/kg
Aroclor-1260	1	3	Undeterminable	51.7	40	48.9	22	39	77	77	ug/kg
Dieldrin	1	3	Undeterminable	3.47	3.6	3.45	0.416	0.8	3	3	ug/kg
Endosulfan II	1	3	Undeterminable	6.13	3.8	5.32	4.22	7.4	11	11	ug/kg
Endosulfan sulfate	.	3	Undeterminable	3.8	3.8	3.8	0.2	0.4	.	.	ug/kg
Endosulfan-I	.	3	Undeterminable	1.93	2	1.93	0.115	0.2	.	.	ug/kg
Endrin	1	3	Undeterminable	9.8	3.8	6.7	10.6	18.4	22	22	ug/kg
Endrin aldehyde	.	3	Undeterminable	3.8	3.8	3.8	0.2	0.4	.	.	ug/kg
Endrin ketone	1	3	Undeterminable	3	3.6	2.8	1.22	2.2	1.6	1.6	ug/kg
Heptachlor	.	3	Undeterminable	1.93	2	1.93	0.115	0.2	.	.	ug/kg
Heptachlor epoxide	.	3	Undeterminable	1.93	2	1.93	0.115	0.2	.	.	ug/kg
Methoxychlor	.	3	Undeterminable	19.3	20	19.3	1.15	2	.	.	ug/kg
Toxaphene	.	3	Undeterminable	193	200	193	11.5	20	.	.	ug/kg
alpha-BHC	.	3	Undeterminable	1.93	2	1.93	0.115	0.2	.	.	ug/kg
alpha-Chlordane	.	3	Undeterminable	1.87	2	1.86	0.231	0.4	.	.	ug/kg
beta-BHC	.	3	Undeterminable	1.93	2	1.93	0.115	0.2	.	.	ug/kg
delta-BHC	.	3	Undeterminable	1.93	2	1.93	0.115	0.2	.	.	ug/kg
gamma-BHC (Lindane)	.	3	Undeterminable	1.93	2	1.93	0.115	0.2	.	.	ug/kg
gamma-Chlordane	1	3	Undeterminable	1.67	1.6	1.65	0.306	0.6	1.4	1.4	ug/kg

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SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				SOIL (2nd DEPTH)							
RADIONUCLIDES											
Americium-241		4	Undeterminable	0.113	0.115	0.11	0.0275	0.045			pCi/g
Cesium-137	3	4	Undeterminable	0.303	0.125	0.154	0.414	0.455	0.11	0.92	pCi/g
Lead-210	4	4	Undeterminable	2.39	2.36	1.89	1.66	2.77	0.67	4.18	pCi/g
Neptunium-237	2	4	Undeterminable	0.283	0.26	0.241	0.174	0.285	0.16	0.49	pCi/g
Plutonium-238	1	4	Undeterminable	0.163	0.115	0.134	0.123	0.165	0.08	0.08	pCi/g
Plutonium-239/240	1	4	Undeterminable	0.213	0.095	0.115	0.275	0.335	0.04	0.04	pCi/g
Plutonium-241		3	Undeterminable	0.747	0.71	0.73	0.198	0.39			pCi/g
Polonium-210	4	4	Undeterminable	3.31	2.78	3.03	1.72	2.18	1.89	5.8	pCi/g
Radium-226	4	4	Undeterminable	1.5	1.25	1.41	0.638	0.83	1.07	2.43	pCi/g
Radium-228	4	4	Undeterminable	1.22	1.22	1.21	0.131	0.175	1.06	1.38	pCi/g
Strontium-90	2	4	Undeterminable	0.335	0.305	0.303	0.17	0.28	0.41	0.54	pCi/g
Technetium-99	4	4	Undeterminable	1.86	1.53	1.26	1.67	2.68	0.41	3.96	pCi/g
Thorium-227	0	2	Undeterminable	-0.39	-0.39	1.38	2.5	3.54	-2.16	1.38	pCi/g
Thorium-228	4	4	Undeterminable	1.31	1.36	1.28	0.308	0.415	0.9	1.64	pCi/g
Thorium-230	4	4	Undeterminable	3.7	3.39	3.21	2.19	3.5	1.6	6.44	pCi/g
Thorium-232	4	4	Undeterminable	0.838	0.75	0.763	0.419	0.645	0.46	1.39	pCi/g
Uranium, Total	4	4	Undeterminable	50.2	57.9	46.5	19	21.6	22	63.21	ug/g
Uranium-234	4	4	Undeterminable	16.9	18	15.9	6.08	8.04	8.53	23	pCi/g
Uranium-235/236	4	4	Undeterminable	0.72	0.815	0.678	0.248	0.33	0.36	0.89	pCi/g
Uranium-238	4	4	Undeterminable	19.1	20.3	18	6.54	8.3	10	25.6	pCi/g

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				SOIL (2nd DEPTH)							
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
1,2-Dichlorobenzene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
1,3-Dichlorobenzene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
1,4-Dichlorobenzene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
2,2-oxybis(1-Chloropropane)	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
2,4,5-Trichlorophenol	.	3	Undeterminable	913	900	913	41.6	80	.	.	ug/kg
2,4,6-Trichlorophenol	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
2,4-Dichlorophenol	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
2,4-Dimethylphenol	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
2,4-Dinitrophenol	.	3	Undeterminable	913	900	913	41.6	80	.	.	ug/kg
2,4-Dinitrotoluene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
2,6-Dinitrotoluene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
2-Chloronaphthalene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
2-Chlorophenol	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
2-Methylnaphthalene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
2-Nitroaniline	.	3	Undeterminable	913	900	913	41.6	80	.	.	ug/kg
2-Nitrophenol	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
3,3'-Dichlorobenzidine	.	2	Undeterminable	365	365	365	7.07	10	.	.	ug/kg
3-Nitroaniline	.	2	Undeterminable	920	920	919	56.6	80	.	.	ug/kg
4,6-Dinitro-2-methylphenol	.	3	Undeterminable	913	900	913	41.6	80	.	.	ug/kg
4-Bromophenyl phenyl ether	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
4-Chloro-3-methylphenol	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
4-Chlorophenylphenyl ether	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
4-Nitroaniline	.	2	Undeterminable	920	920	919	56.6	80	.	.	ug/kg
4-Nitrophenol	.	3	Undeterminable	913	900	913	41.6	80	.	.	ug/kg
Acenaphthene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Acenaphthylene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Anthracene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Benzo(a)anthracene	1	3	Undeterminable	280	370	218	182	330	70	70	ug/kg
Benzo(a)pyrene	1	3	Undeterminable	284	370	229	176	319	81	81	ug/kg
Benzo(b)fluoranthene	1	3	Undeterminable	293	370	253	159	290	110	110	ug/kg
Benzo(g,h,i)perylene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Benzo(k)fluoranthene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Butyl benzyl phthalate	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Carbazole	.	2	Undeterminable	380	380	379	28.3	40	.	.	ug/kg
Chrysene	1	3	Undeterminable	285	370	233	174	315	85	85	ug/kg
Di-n-butyl phthalate	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Di-n-octyl phthalate	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Dibenzo(a,h)anthracene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg

TA[illegible]-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
SOIL (2nd DEPTH)											
SEMIVOLATILE ORGANICS (cont.)											
Dibenzofuran	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Diethyl phthalate	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Dimethyl phthalate	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Fluoranthene	1	3	Undeterminable	313	370	293	125	230	170	170	ug/kg
Fluorene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Hexachlorobenzene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Hexachlorobutadiene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Hexachlorocyclopentadiene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Hexachloroethane	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	1	3	Undeterminable	276	370	204	190	343	57	57	ug/kg
Isophorone	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
N-Nitroso-di-n-propylamine	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
N-Nitrosodiphenylamine	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Naphthalene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Nitrobenzene	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Pentachlorophenol	.	3	Undeterminable	913	900	913	41.6	80	.	.	ug/kg
Phenanthrene	1	3	Undeterminable	279	370	216	184	332	68	68	ug/kg
Phenol	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
Pyrene	1	3	Undeterminable	307	370	281	137	250	150	150	ug/kg
bis(2-Chloroethoxy)methane	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
bis(2-Chloroethyl)ether	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	1	3	Undeterminable	275	360	210	184	336	64	64	ug/kg
o-Methylphenol	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
p-Chloroaniline	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg
p-Methylphenol	.	3	Undeterminable	377	370	376	20.8	40	.	.	ug/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				SOIL (2nd DEPTH)							
VOLATILE ORGANICS											
1,1,1-Trichloroethane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
1,1,2,2-Tetrachloroethane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
1,1,2-Trichloroethane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
1,1-Dichloroethane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
1,1-Dichloroethene	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
1,2-Dichloroethane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
1,2-Dichloroethene (Total)	.	2	Undeterminable	11.5	11.5	11.5	0.707	1	.	.	ug/kg
1,2-Dichloropropane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
2-Butanone	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
2-Hexanone	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
4-Methyl-2-pentanone	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Acetone	.	1	Undeterminable	12	12	12	.	0	.	.	ug/kg
Benzene	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Bromodichloromethane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Bromoform	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Bromomethane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Carbon Tetrachloride	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Carbon disulfide	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Chlorobenzene	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Chloroethane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Chloroform	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Chloromethane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Dibromochloromethane	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Ethylbenzene	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Methylene chloride	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Styrene	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Tetrachloroethene	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Toluene	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Trichloroethene	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Vinyl chloride	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
Xylenes, Total	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
cis-1,3-Dichloropropene	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg
trans-1,2-Dichloroethene	.	1	Undeterminable	12	12	12	.	0	.	.	ug/kg
trans-1,3-Dichloropropene	.	3	Undeterminable	11.7	12	11.7	0.577	1	.	.	ug/kg

TA[illegible]A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
STEEL COATINGS											
Aluminum	132	135	Lognormal	10900	4040	5380	14600	11200	777	69400	mg/kg
Antimony	71	109	Lognormal	48.6	20.4	15.9	70.1	59.6	1.1	393	mg/kg
Arsenic	116	134	Lognormal	21.1	7.4	8.6	35.4	21.6	0.23	227	mg/kg
Barium	134	135	Lognormal	1610	318	400	3210	1360	13.4	23700	mg/kg
Beryllium	29	124	Lognormal	1.13	0.81	0.446	1.35	1.2	0.28	4.5	mg/kg
Cadmium	110	134	Lognormal	27.7	7.35	8.54	67.3	19.2	0.13	558	mg/kg
Calcium	130	135	Lognormal	22800	14700	13900	27500	24200	528	199000	mg/kg
Chromium	134	135	Lognormal	3190	1600	1200	3810	4240	22.7	17300	mg/kg
Cobalt	133	135	Undefined	90.5	80.4	62.9	79.2	73.7	1.7	588	mg/kg
Copper	131	135	Lognormal	270	147	154	357	217	9	2310	mg/kg
Iron	135	135	Undefined	87500	57500	52100	88700	104000	980	486000	mg/kg
Lead	135	135	Undefined	60600	37800	17700	69500	87300	12.6	375000	mg/kg
Magnesium	130	135	Undefined	4610	3740	3600	3170	4950	647	14300	mg/kg
Manganese	135	135	Undefined	717	454	465	822	674	47.5	5560	mg/kg
Mercury	110	133	Lognormal	4.29	0.58	0.881	7.38	3.72	0.06	32.6	mg/kg
Nickel	127	135	Lognormal	100	42.9	47.7	260	67.3	1.9	2570	mg/kg
Potassium	105	135	Lognormal	1950	741	960	3410	1550	103	24900	mg/kg
Selenium	23	102	Lognormal	4.02	1.7	1.63	9.39	2.56	0.43	77.5	mg/kg
Silver	70	133	Lognormal	4.41	1.5	1.79	8.26	4.71	0.29	59.2	mg/kg
Sodium	118	135	Lognormal	1110	717	718	1490	840	137	12900	mg/kg
Thallium	14	114	Lognormal	1.28	0.76	0.679	1.83	1.23	0.09	3.1	mg/kg
Vanadium	75	129	Lognormal	13.7	7.6	7.2	18	13.7	0.23	146	mg/kg
Zinc	135	135	Lognormal	9520	3410	3140	21600	8980	12.5	215000	mg/kg

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				STEEL COATINGS							
RADIONUCLIDES											
Americium-241	47	83	Lognormal	1.57	0.19	0.376	4.57	0.66	0.11	32.6	pCi/g
Cesium-137	12	83	Undefined	0.627	0.54	0.477	0.584	0.34	0.34	4.1	pCi/g
Lead-210	28	83	Lognormal	34.2	3.4	4.52	151	5.9	0.83	1040	pCi/g
Neptunium-237	61	81	Lognormal	1.3	0.31	0.318	5.56	0.47	0.05	49	pCi/g
Plutonium-238	64	83	Lognormal	10.7	0.33	0.416	51	0.63	0	420	pCi/g
Plutonium-239/240	76	83	Lognormal	3.96	0.64	0.737	11.4	1.55	0	92	pCi/g
Plutonium-241	26	78	Lognormal	15.3	2.65	4.04	41.2	11.6	1.59	260	pCi/g
Polonium-210	83	83	Lognormal	40.3	1.9	2.96	144	3.99	0.23	797	pCi/g
Radium-226	57	83	Lognormal	173	2.1	3.32	989	7.82	0.11	6710	pCi/g
Radium-228	64	83	Lognormal	96.4	4.2	6.97	380	24.4	0.55	2280	pCi/g
Strontium-90	27	82	Lognormal	1.16	0.43	0.437	4.55	0.63	0.42	41	pCi/g
Technetium-99	70	83	Lognormal	89.8	28.2	23.7	160	78.9	0.57	1000	pCi/g
Thorium-227	21	28	Lognormal	7.61	0.745	1.34	17.9	2.9	0.3	80	pCi/g
Thorium-228	82	83	Lognormal	25.6	5.2	5.84	67.9	16.5	0.11	470	pCi/g
Thorium-230	82	83	Lognormal	208	26	25.8	771	64.8	0.34	5600	pCi/g
Thorium-232	82	83	Lognormal	19.9	4.3	4.53	46.1	14.8	0.07	260	pCi/g
Uranium, Total	83	83	Lognormal	5950	1400	1640	10000	5750	23.5	45000	ug/g
Uranium-234	73	73	Lognormal	2830	1360	864	5080	2780	0.02	37000	pCi/g
Uranium-235/236	73	73	Lognormal	251	115	76.9	519	216	0.83	3900	pCi/g
Uranium-238	73	73	Lognormal	2860	1400	999	4700	3260	15.3	33000	pCi/g

TA[illegible]A-14

SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics							
				Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				TRANSITE							
INORGANICS											
Arsenic	2	11	Normal	0.207	0.1	0.165	0.217	0.38	0.02	0.02	mg/L
Barium	5	11	Normal	0.467	0.42	0.45	0.135	0.31	0.31	0.64	mg/L
Cadmium	.	11	Undefined	0.0164	0.02	0.0174	0.00674	0.01	.	.	mg/L
Chromium	8	11	Lognormal	0.619	0.09	0.112	1.77	0.06	0.06	5.96	mg/L
Lead	1	11	Normal	0.293	0.39	0.246	0.165	0.25	0.19	0.19	mg/L
Mercury	3	11	Undeterminable	0	0	.	0	0	0	0	mg/L
Selenium	.	10	Normal	0.19	0.255	0.077	0.17	0.28	.	.	mg/L
Silver	1	8	Normal	0.0575	0.04	0.0386	0.0674	0.025	0.22	0.22	mg/L
SEMIVOLATILE ORGANICS											
1,4-Dichlorobenzene	1	11	Lognormal	1.6	0.04	0.0488	5.17	0.04	17.2	17.2	mg/L
2,4,5-Trichlorophenol	.	7	Undefined	0.0414	0.04	0.0413	0.00378	0	.	.	mg/L
2,4,6-Trichlorophenol	.	7	Normal	0.0343	0.04	0.0315	0.0113	0.01	.	.	mg/L
2,4-Dinitrotoluene	.	11	Normal	0.0273	0.03	0.0235	0.0135	0.03	.	.	mg/L
Hexachlorobenzene	.	11	Normal	0.0264	0.02	0.0227	0.0136	0.03	.	.	mg/L
Hexachlorobutadiene	1	11	Lognormal	1.38	0.04	0.0414	4.48	0.03	14.9	14.9	mg/L
Hexachloroethane	.	11	Normal	0.0291	0.04	0.0247	0.0151	0.03	.	.	mg/L
Nitrobenzene	1	11	Lognormal	2.6	0.03	0.0427	8.52	0.03	28.3	28.3	mg/L
Pentachlorophenol	.	7	Normal	0.0929	0.05	0.0722	0.0746	0.16	.	.	mg/L
m-Methylphenol	1	3	Undeterminable	0.03	0.04	0.0252	0.0173	0.03	0.01	0.01	mg/L
o-Methylphenol	1	7	Lognormal	0.984	0.04	0.0618	2.52	0.02	6.7	6.7	mg/L
p-Methylphenol	.	7	Undefined	0.0357	0.04	0.0328	0.0113	0	.	.	mg/L
VOLATILE ORGANICS											
1,1-Dichloroethene	.	12	Lognormal	4.2	0.03	0.0772	14.4	0.035	.	.	mg/L
1,2-Dichloroethane	.	12	Lognormal	4.2	0.03	0.0772	14.4	0.035	.	.	mg/L
2-Butanone	1	12	Lognormal	8.44	0.1	0.143	28.8	0.2	0.05	0.05	mg/L
Benzene	.	12	Lognormal	4.2	0.03	0.0772	14.4	0.035	.	.	mg/L
Carbon Tetrachloride	.	12	Lognormal	4.2	0.035	0.0793	14.4	0.035	.	.	mg/L
Chlorobenzene	.	12	Lognormal	4.22	0.03	0.0739	14.4	0.08	.	.	mg/L
Chloroform	.	12	Lognormal	4.2	0.03	0.0772	14.4	0.035	.	.	mg/L
Pyridine	.	11	Lognormal	0.0618	0.04	0.0304	0.113	0.03	.	.	mg/L
Tetrachloroethene	1	12	Lognormal	9.12	0.035	0.151	21.3	0.05	59	59	mg/L
Trichloroethene	.	12	Lognormal	4.2	0.035	0.0793	14.4	0.035	.	.	mg/L
Vinyl chloride	.	12	Lognormal	4.23	0.03	0.0829	14.4	0.105	.	.	mg/L

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				UNKNOWN LIQUIDS							
INORGANICS											
Aluminum	54	91	Lognormal	7040	252	509	21100	1320	27.4	148000	ug/L
Antimony	7	90	Lognormal	61.9	46	30.1	201	23.3	4.3	62.2	ug/L
Arsenic	29	91	Lognormal	4.52	2.3	2.67	6.69	2	0.89	43.7	ug/L
Barium	79	90	Lognormal	257	39.6	55.9	1130	63.8	3.2	10300	ug/L
Beryllium	15	87	Lognormal	3.5	1	1.39	7.36	3.39	1.2	49	ug/L
Cadmium	25	91	Lognormal	17.5	3	4.7	58.4	3	1.4	351	ug/L
Calcium	90	91	Lognormal	114000	50700	49900	277000	52600	8810	2090000	ug/L
Chromium	32	91	Lognormal	200	8	16	620	13.3	5.8	4190	ug/L
Cobalt	23	91	Lognormal	24.9	8	11.9	50.8	13.7	3.4	324	ug/L
Copper	58	91	Lognormal	798	30.6	48.6	2740	121	3.7	18200	ug/L
Iron	72	91	Lognormal	31700	909	1490	88800	6770	34.6	492000	ug/L
Lead	53	88	Lognormal	332	8.9	14.6	1540	71.2	1.2	13500	ug/L
Magnesium	87	91	Lognormal	37500	17400	14000	92500	31000	1130	852000	ug/L
Manganese	70	91	Lognormal	617	62	94.7	1660	518	6.2	14000	ug/L
Mercury	26	90	Lognormal	1.5	0.11	0.234	4.51	0.17	0.1	26.9	ug/L
Nickel	36	91	Lognormal	847	16.7	37.5	6060	70.9	8.2	57800	ug/L
Potassium	83	91	Lognormal	44700	4750	7210	138000	7320	750	716000	ug/L
Selenium	15	86	Lognormal	5.97	2	2.52	11.7	1.9	1	64.6	ug/L
Silver	23	84	Lognormal	19.7	4	5	58.2	2.85	1	357	ug/L
Sodium	85	91	Lognormal	150000	27000	26300	477000	45500	907	3490000	ug/L
Thallium	4	88	Undefined	2.29	1.5	1.78	2.37	2	0.76	2.1	ug/L
Vanadium	15	89	Lognormal	29.4	8	9.56	96.3	8	5.3	697	ug/L
Zinc	60	91	Lognormal	4230	127	155	28000	450	6.1	265000	ug/L

TA[illegible]A-14

SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				UNKNOWN LIQUIDS							
PESTICIDES											
4,4'-DDD	.	1	Undeterminable	0.11	0.11	0.11	.	0	.	.	ug/L
4,4'-DDE	.	1	Undeterminable	0.11	0.11	0.11	.	0	.	.	ug/L
4,4'-DDT	.	1	Undeterminable	0.11	0.11	0.11	.	0	.	.	ug/L
Aldrin	.	1	Undeterminable	0.06	0.06	0.06	.	0	.	.	ug/L
Aroclor-1016	.	1	Undeterminable	1.1	1.1	1.1	.	0	.	.	ug/L
Aroclor-1221	.	1	Undeterminable	2.2	2.2	2.2	.	0	.	.	ug/L
Aroclor-1232	.	1	Undeterminable	1.1	1.1	1.1	.	0	.	.	ug/L
Aroclor-1242	.	1	Undeterminable	1.1	1.1	1.1	.	0	.	.	ug/L
Aroclor-1248	.	1	Undeterminable	1.1	1.1	1.1	.	0	.	.	ug/L
Aroclor-1254	.	1	Undeterminable	1.1	1.1	1.1	.	0	.	.	ug/L
Aroclor-1260	.	1	Undeterminable	1.1	1.1	1.1	.	0	.	.	ug/L
Chlordane	0	1	Undeterminable	0	0	.	.	0	0	0	ug/L
Dieldrin	.	1	Undeterminable	0.11	0.11	0.11	.	0	.	.	ug/L
Endosulfan II	.	1	Undeterminable	0.11	0.11	0.11	.	0	.	.	ug/L
Endosulfan sulfate	.	1	Undeterminable	0.11	0.11	0.11	.	0	.	.	ug/L
Endosulfan-I	.	1	Undeterminable	0.06	0.06	0.06	.	0	.	.	ug/L
Endrin	0	2	Undeterminable	0.055	0.055	0.11	0.0778	0.11	0	0	ug/L
Endrin aldehyde	.	1	Undeterminable	0.11	0.11	0.11	.	0	.	.	ug/L
Endrin ketone	.	1	Undeterminable	0.11	0.11	0.11	.	0	.	.	ug/L
Heptachlor	0	2	Undeterminable	0.03	0.03	0.06	0.0424	0.06	0	0	ug/L
Heptachlor epoxide	0	2	Undeterminable	0.03	0.03	0.06	0.0424	0.06	0	0	ug/L
Methoxychlor	0	2	Undeterminable	0.28	0.28	0.56	0.396	0.56	0	0	ug/L
Toxaphene	0	2	Undeterminable	2.8	2.8	5.6	3.96	5.6	0	0	ug/L
alpha-BHC	.	1	Undeterminable	0.06	0.06	0.06	.	0	.	.	ug/L
alpha-Chlordane	.	1	Undeterminable	0.06	0.06	0.06	.	0	.	.	ug/L
beta-BHC	.	1	Undeterminable	0.06	0.06	0.06	.	0	.	.	ug/L
delta-BHC	.	1	Undeterminable	0.06	0.06	0.06	.	0	.	.	ug/L
gamma-BHC (Lindane)	0	2	Undeterminable	0.03	0.03	0.06	0.0424	0.06	0	0	ug/L
gamma-Chlordane	.	1	Undeterminable	0.06	0.06	0.06	.	0	.	.	ug/L

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
UNKNOWN LIQUIDS											
RADIONUCLIDES											
Americium-241	24	82	Lognormal	3.53	0.2	0.324	20.8	0.59	0.11	185	pCi/L
Cesium-137	10	89	Lognormal	7.97	6.7	5.05	12.7	5.9	1.6	110	pCi/L
Lead-210	43	87	Lognormal	114	16	22.5	219	116	1.6	873	pCi/L
Neptunium-237	20	87	Lognormal	3.41	0.24	0.368	22.5	0.62	0.14	210	pCi/L
Plutonium-238	25	86	Lognormal	17.1	0.24	0.217	148	0.32	0.02	1370	pCi/L
Plutonium-239/240	35	86	Lognormal	7.47	0.19	0.24	47.8	0.29	0.04	430	pCi/L
Plutonium-241	10	44	Lognormal	221	2.01	5.64	1240	3.16	0	8230	pCi/L
Polonium-210	43	84	Lognormal	4.03	0.635	0.903	11.4	2.41	0.07	82	pCi/L
Radium-226	61	89	Lognormal	12.2	0.64	1.1	62.2	1.58	0.13	561	pCi/L
Radium-228	36	88	Lognormal	89.9	2.1	3.84	464	2.75	0.9	3850	pCi/L
Strontium-90	34	89	Lognormal	3.74	1.5	1.71	7.69	2.59	0.29	62.7	pCi/L
Technetium-99	76	89	Lognormal	1710	199	180	6520	494	7.86	47000	pCi/L
Thorium-228	51	82	Lognormal	68.4	0.495	1.35	347	2.51	0.14	2710	pCi/L
Thorium-230	52	82	Lognormal	412	0.705	2.06	3390	13.9	0.1	30700	pCi/L
Thorium-232	49	82	Lognormal	35.6	0.24	0.597	204	1.13	0.05	1780	pCi/L
Uranium, Total	88	90	Lognormal	22000	1700	1130	73900	5400	0.98	431000	ug/L
Uranium-234	78	82	Lognormal	16800	395	314	53500	1310	0.76	340000	pCi/L
Uranium-235/236	74	82	Lognormal	1480	44	34.8	5800	215	0.04	49000	pCi/L
Uranium-238	79	82	Lognormal	14000	531	340	41700	1240	0.6	230000	pCi/L

TA[illegible]A-14

SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				UNKNOWN LIQUIDS							
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	1	92	Lognormal	16.9	10	12	30.6	0	22	22	ug/L
1,2-Dichlorobenzene	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
1,3-Dichlorobenzene	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
1,4-Dichlorobenzene	1	92	Lognormal	16.7	10	11.7	30.6	0	5	5	ug/L
2,2-oxybis(1-Chloropropane)	.	75	Lognormal	17.2	10	12.1	32.4	1	.	.	ug/L
2,4,5-Trichlorophenol	.	91	Lognormal	45.1	25	30.9	80.7	1	.	.	ug/L
2,4,6-Trichlorophenol	.	91	Lognormal	17.9	10	12.3	32	1	.	.	ug/L
2,4-Dichlorophenol	1	91	Lognormal	16.8	10	11.8	30.8	0	3	3	ug/L
2,4-Dimethylphenol	5	92	Lognormal	17.4	10	11.6	31.2	0.5	1	71	ug/L
2,4-Dinitrophenol	2	82	Lognormal	46.9	25	30.9	84.9	1	7	18	ug/L
2,4-Dinitrotoluene	.	92	Lognormal	16.8	10	11.9	30.6	0	.	.	ug/L
2,6-Dinitrotoluene	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
2-Chloronaphthalene	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
2-Chlorophenol	.	91	Lognormal	17.9	10	12.2	32	0	.	.	ug/L
2-Methylnaphthalene	3	93	Lognormal	16.4	10	11	30.5	0	0.1	4	ug/L
2-Nitroaniline	.	93	Lognormal	42.3	25	30.1	76.9	1	.	.	ug/L
2-Nitrophenol	2	91	Lognormal	17.7	10	11.7	32	0	1	2	ug/L
3,3'-Dichlorobenzidine	.	73	Lognormal	18.6	10	12.5	34.2	1	.	.	ug/L
3-Nitroaniline	.	90	Lognormal	42.9	25	30.2	78.1	1	.	.	ug/L
4,6-Dinitro-2-methylphenol	.	91	Lognormal	45.1	25	30.9	80.7	1	.	.	ug/L
4-Bromophenyl phenyl ether	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
4-Chloro-3-methylphenol	1	90	Lognormal	17.9	10	11.8	32.2	0	0.4	0.4	ug/L
4-Chlorophenylphenyl ether	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
4-Nitroaniline	.	91	Lognormal	42.7	25	30.2	77.7	1	.	.	ug/L
4-Nitrophenol	3	88	Lognormal	44.8	25	28.9	82.3	1	1	7	ug/L
Acenaphthene	1	92	Lognormal	16.7	10	11.4	30.6	0	0.2	0.2	ug/L
Acenaphthylene	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
Anthracene	4	93	Lognormal	16.4	10	10.3	30.6	0	0.02	4	ug/L
Benzo(a)anthracene	4	93	Lognormal	16.3	10	10.8	30.6	0	0.7	4	ug/L
Benzo(a)pyrene	2	92	Lognormal	16.2	10	11.1	30.6	0	0.2	5	ug/L
Benzo(b)fluoranthene	3	92	Lognormal	16.2	10	11	30.6	0	0.6	7	ug/L
Benzo(g,h,i)perylene	.	92	Lognormal	16.5	10	11.8	30.5	0	.	.	ug/L
Benzo(k)fluoranthene	2	92	Lognormal	16.3	10	11	30.6	0	0.2	1	ug/L
Butyl benzyl phthalate	6	93	Lognormal	17.4	10	11	32.7	0	0.2	130	ug/L
Carbazole	1	91	Lognormal	16.8	10	11.6	30.8	1	0.7	0.7	ug/L
Chrysene	5	93	Lognormal	16.2	10	10.4	30.6	0	0.5	6	ug/L
Di-n-butyl phthalate	5	92	Lognormal	19.6	10	11.7	41.9	0	1	290	ug/L
Di-n-octyl phthalate	9	93	Lognormal	15.6	10	9.94	30.2	0	0.3	87	ug/L
Dibenzo(a,h)anthracene	.	92	Lognormal	16.5	10	11.8	30.5	0	.	.	ug/L

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000440

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				UNKNOWN LIQUIDS							
SEMIVOLATILE ORGANICS (cont.)											
Dibenzofuran	1	93	Lognormal	16.7	10	11.4	30.5	0	0.2	0.2	ug/L
Diethyl phthalate	7	93	Lognormal	16.2	10	10.8	25.8	0	0.1	190	ug/L
Dimethyl phthalate	3	93	Lognormal	16.6	10	11.3	30.5	0	0.2	14	ug/L
Fluoranthene	14	92	Lognormal	14.2	10	8.44	29.6	0	0.2	11	ug/L
Fluorene	1	93	Lognormal	16.7	10	11.5	30.5	0	0.3	0.3	ug/L
Hexachlorobenzene	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
Hexachlorobutadiene	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
Hexachlorocyclopentadiene	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
Hexachloroethane	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
Indeno(1,2,3-cd)pyrene	.	92	Lognormal	16.5	10	11.8	30.5	0	.	.	ug/L
Isophorone	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
N-Nitroso-di-n-propylamine	.	92	Lognormal	16.8	10	11.9	30.6	0	.	.	ug/L
N-Nitrosodiphenylamine	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
Naphthalene	7	93	Lognormal	18	10	10.5	36	0	0.09	200	ug/L
Nitrobenzene	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
Pentachlorophenol	.	90	Lognormal	45.3	25	31	81.1	1	.	.	ug/L
Phenanthrene	11	93	Lognormal	15.4	10	9.17	30.7	0	0.06	8	ug/L
Phenol	10	90	Lognormal	22.9	10	11	62.4	0	0.3	520	ug/L
Pyrene	12	92	Lognormal	15.4	10	8.64	30.9	0	0.2	9	ug/L
bis(2-Chloroethoxy)methane	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
bis(2-Chloroethyl)ether	.	93	Lognormal	16.8	10	11.9	30.4	0	.	.	ug/L
bis(2-Chloroisopropyl) ether	.	16	Undeterminable	10	10	10	0	0	.	.	ug/L
bis(2-Ethylhexyl)phthalate	21	93	Lognormal	22.7	10	11.1	49.8	0	0.8	280	ug/L
o-Methylphenol	4	92	Lognormal	16.6	10	11.2	30.7	0	0.5	10	ug/L
p-Chloroaniline	.	86	Lognormal	17.2	10	12	31.6	0	.	.	ug/L
p-Methylphenol	7	91	Lognormal	15.7	10	10.5	30.6	0	0.5	20	ug/L

TA[illegible]A-14

SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
				UNKNOWN LIQUIDS							
VOLATILE ORGANICS											
1,1,1-Trichloroethane	9	92	Lognormal	117	10	15.1	546	0	0.4	290	ug/L
1,1,2,2-Tetrachloroethane	1	93	Lognormal	115	10	16.1	542	0	2	2	ug/L
1,1,2-Trichloroethane	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
1,1-Dichloroethane	10	93	Lognormal	115	10	14.7	543	0	1	200	ug/L
1,1-Dichloroethene	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
1,2-Dichloroethane	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
1,2-Dichloroethene (Total)	1	86	Lognormal	65.8	10	16.1	186	0	40	40	ug/L
1,2-Dichloropropane	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
2-Butanone	11	89	Lognormal	216	20	34	840	46	18	6100	ug/L
2-Hexanone	1	87	Lognormal	122	10	16.9	560	0	8	8	ug/L
4-Methyl-2-pentanone	4	92	Lognormal	117	10	16.7	545	0	6	95	ug/L
Acetone	15	67	Lognormal	7870	14	35.2	62300	40	7	510000	ug/L
Benzene	1	93	Lognormal	115	10	16.4	542	0	11	11	ug/L
Bromodichloromethane	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
Bromoform	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
Bromomethane	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
Carbon Tetrachloride	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
Carbon disulfide	1	93	Lognormal	115	10	16.1	542	0	2	2	ug/L
Chlorobenzene	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
Chloroethane	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
Chloroform	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
Chloromethane	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
Dibromochloromethane	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
Ethylbenzene	5	93	Lognormal	115	10	15.4	542	0	1	13	ug/L
Methylene chloride	2	93	Lognormal	170	10	17.5	749	0	1	5100	ug/L
Pyridine	.	2	Undeterminable	15	15	14.1	7.07	10	.	.	ug/L
Styrene	3	93	Lognormal	115	10	15.9	542	0	1	17	ug/L
Tetrachloroethene	12	93	Lognormal	193	10	16.1	880	0	1	6800	ug/L
Toluene	14	93	Lognormal	119	10	14.9	543	0	1	370	ug/L
Trichloroethene	3	93	Lognormal	115	10	16.3	542	0	3	78	ug/L
Trichlorofluoromethane	.	14	Lognormal	381	10	22.5	1330	10	.	.	ug/L
Vinyl chloride	1	93	Lognormal	115	10	16.4	542	0	9	9	ug/L
Xylenes, Total	8	93	Lognormal	116	10	16.1	542	0	1	93	ug/L
cis-1,3-Dichloropropene	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L
m,p-Xylene	.	3	Undeterminable	15	10	13.6	8.66	15	.	.	ug/L
o-Xylene	.	3	Undeterminable	15	10	13.6	8.66	15	.	.	ug/L
trans-1,2-Dichloroethene	.	7	Lognormal	723	10	24.3	1890	0	.	.	ug/L
trans-1,3-Dichloropropene	.	93	Lognormal	115	10	16.4	542	0	.	.	ug/L

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TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						WOOD					
INORGANICS											
Aluminum	2	2	Undeterminable	79.1	79.1	70.4	50.8	71.9	43.1	115	mg/kg
Antimony	1	2	Undeterminable	15.4	15.4	14.6	7.07	10	20.4	20.4	mg/kg
Arsenic	1	2	Undeterminable	1350	1350	42.5	1900	2690	2690	2690	mg/kg
Barium	2	2	Undeterminable	11.2	11.2	11	2.62	3.7	9.3	13	mg/kg
Beryllium	.	2	Undeterminable	0.125	0.125	0.0678	0.148	0.21	.	.	mg/kg
Cadmium	.	2	Undeterminable	0.395	0.395	0.274	0.403	0.57	.	.	mg/kg
Calcium	2	2	Undeterminable	2090	2090	1860	1320	1870	1150	3020	mg/kg
Chromium	1	2	Undeterminable	1370	1370	77.6	1940	2740	2740	2740	mg/kg
Cobalt	.	2	Undeterminable	1.04	1.04	0.697	1.08	1.53	.	.	mg/kg
Copper	2	2	Undeterminable	850	850	123	1190	1680	9	1690	mg/kg
Iron	2	2	Undeterminable	475	475	258	564	798	76.4	874	mg/kg
Lead	2	2	Undeterminable	17.5	17.5	9.8	20.5	29	3	32	mg/kg
Magnesium	2	2	Undeterminable	394	394	354	243	344	222	566	mg/kg
Manganese	2	2	Undeterminable	44.8	44.8	44.6	5.59	7.9	40.8	48.7	mg/kg
Mercury	.	2	Undeterminable	0.07	0.07	0.0575	0.0566	0.08	.	.	mg/kg
Nickel	1	2	Undeterminable	1.64	1.64	1.16	1.64	2.32	0.48	0.48	mg/kg
Potassium	1	2	Undeterminable	904	904	705	800	1130	1470	1470	mg/kg
Selenium	.	2	Undeterminable	0.44	0.44	0.375	0.325	0.46	.	.	mg/kg
Silver	.	2	Undeterminable	0.56	0.56	0.445	0.481	0.68	.	.	mg/kg
Sodium	2	2	Undeterminable	2820	2820	2630	1430	2020	1810	3830	mg/kg
Thallium	.	2	Undeterminable	0.6	0.6	0.52	0.424	0.6	.	.	mg/kg
Vanadium	.	2	Undeterminable	0.585	0.585	0.493	0.445	0.63	.	.	mg/kg
Zinc	2	2	Undeterminable	54.5	54.5	49.5	32.2	45.6	31.7	77.3	mg/kg

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						WOOD					
PESTICIDES											
4,4'-DDD	.	1	Undeterminable	3.6	3.6	3.6	.	0	.	.	ug/kg
4,4'-DDE	.	1	Undeterminable	18	18	18	.	0	.	.	ug/kg
4,4'-DDT	.	1	Undeterminable	3.6	3.6	3.6	.	0	.	.	ug/kg
Aldrin	.	1	Undeterminable	1.8	1.8	1.8	.	0	.	.	ug/kg
Aroclor-1016	.	1	Undeterminable	36	36	36	.	0	.	.	ug/kg
Aroclor-1221	.	1	Undeterminable	72	72	72	.	0	.	.	ug/kg
Aroclor-1232	.	1	Undeterminable	36	36	36	.	0	.	.	ug/kg
Aroclor-1242	.	1	Undeterminable	36	36	36	.	0	.	.	ug/kg
Aroclor-1248	.	1	Undeterminable	36	36	36	.	0	.	.	ug/kg
Aroclor-1254	.	1	Undeterminable	36	36	36	.	0	.	.	ug/kg
Aroclor-1260	.	1	Undeterminable	36	36	36	.	0	.	.	ug/kg
Dieldrin	.	1	Undeterminable	3.6	3.6	3.6	.	0	.	.	ug/kg
Endosulfan II	.	1	Undeterminable	3.6	3.6	3.6	.	0	.	.	ug/kg
Endosulfan sulfate	.	1	Undeterminable	3.6	3.6	3.6	.	0	.	.	ug/kg
Endosulfan-I	1	1	Undeterminable	1.5	1.5	1.5	.	0	1.5	1.5	ug/kg
Endrin	1	1	Undeterminable	0.98	0.98	0.98	.	0	0.98	0.98	ug/kg
Endrin aldehyde	.	1	Undeterminable	3.6	3.6	3.6	.	0	.	.	ug/kg
Endrin ketone	.	1	Undeterminable	3.6	3.6	3.6	.	0	.	.	ug/kg
Heptachlor	.	1	Undeterminable	1.8	1.8	1.8	.	0	.	.	ug/kg
Heptachlor epoxide	.	1	Undeterminable	1.8	1.8	1.8	.	0	.	.	ug/kg
Methoxychlor	.	1	Undeterminable	90	90	90	.	0	.	.	ug/kg
Toxaphene	.	1	Undeterminable	180	180	180	.	0	.	.	ug/kg
alpha-BHC	.	1	Undeterminable	1.8	1.8	1.8	.	0	.	.	ug/kg
alpha-Chlordane	.	1	Undeterminable	1.8	1.8	1.8	.	0	.	.	ug/kg
beta-BHC	.	1	Undeterminable	1.8	1.8	1.8	.	0	.	.	ug/kg
delta-BHC	.	1	Undeterminable	1.8	1.8	1.8	.	0	.	.	ug/kg
gamma-BHC (Lindane)	.	1	Undeterminable	9	9	9	.	0	.	.	ug/kg
gamma-Chlordane	.	1	Undeterminable	1.8	1.8	1.8	.	0	.	.	ug/kg

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000444

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics							
				Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						WOOD					
RADIONUCLIDES											
Americium-241	1	2	Undeterminable	0.07	0.07	0.0633	0.0424	0.06	0.1	0.1	pCi/g
Cesium-137		2	Undeterminable	0.22	0.22	0.219	0.0283	0.04			pCi/g
Lead-210	2	2	Undeterminable	5	5	3.25	5.37	7.6	1.2	8.8	pCi/g
Neptunium-237	1	2	Undeterminable	0.065	0.065	0.06	0.0354	0.05	0.09	0.09	pCi/g
Plutonium-238	1	2	Undeterminable	0.8	0.8	0.529	0.849	1.2	1.4	1.4	pCi/g
Plutonium-239/240	1	2	Undeterminable	0.065	0.065	0.0548	0.0495	0.07	0.03	0.03	pCi/g
Plutonium-241		1	Undeterminable	0.69	0.69	0.69		0			pCi/g
Polonium-210	1	1	Undeterminable	6.8	6.8	6.8		0	6.8	6.8	pCi/g
Radium-226	2	2	Undeterminable	1	1	0.436	1.27	1.8	0.1	1.9	pCi/g
Radium-228	1	2	Undeterminable	2.85	2.85	1.27	3.61	5.1	5.4	5.4	pCi/g
Strontium-90	1	2	Undeterminable	0.715	0.715	0.602	0.544	0.77	0.33	0.33	pCi/g
Technetium-99	1	2	Undeterminable	3.35	3.35	1.59	4.17	5.9	6.3	6.3	pCi/g
Thorium-228	2	2	Undeterminable	1.25	1.25	0.678	1.48	2.1	0.2	2.3	pCi/g
Thorium-230	1	2	Undeterminable	1.65	1.65	0.566	2.19	3.1	3.2	3.2	pCi/g
Thorium-232	1	2	Undeterminable	0.92	0.92	0.268	1.24	1.76	1.8	1.8	pCi/g
Uranium, Total	2	2	Undeterminable	1300	1300	45.6	1840	2600	0.8	2600	ug/g
Uranium-234	2	2	Undeterminable	129	129	7.18	182	258	0.2	258	pCi/g
Uranium-235/236	1	2	Undeterminable	6.7	6.7	1.15	9.33	13.2	13.3	13.3	pCi/g
Uranium-238	2	2	Undeterminable	127	127	8.73	179	254	0.3	254	pCi/g

TA[illegible]A-14

SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE

(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						WOOD					
SEMIVOLATILE ORGANICS											
1,2,4-Trichlorobenzene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
1,2-Dichlorobenzene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
1,3-Dichlorobenzene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
1,4-Dichlorobenzene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
2,2-oxybis(1-Chloropropane)	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
2,4,5-Trichlorophenol	.	1	Undeterminable	820	820	820	.	0	.	.	ug/kg
2,4,6-Trichlorophenol	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
2,4-Dichlorophenol	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
2,4-Dimethylphenol	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
2,4-Dinitrophenol	.	1	Undeterminable	820	820	820	.	0	.	.	ug/kg
2,4-Dinitrotoluene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
2,6-Dinitrotoluene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
2-Chloronaphthalene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
2-Chlorophenol	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
2-Methylnaphthalene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
2-Nitroaniline	.	1	Undeterminable	820	820	820	.	0	.	.	ug/kg
2-Nitrophenol	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
3,3'-Dichlorobenzidine	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
3-Nitroaniline	.	1	Undeterminable	820	820	820	.	0	.	.	ug/kg
4,6-Dinitro-2-methylphenol	.	1	Undeterminable	820	820	820	.	0	.	.	ug/kg
4-Bromophenyl phenyl ether	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
4-Chloro-3-methylphenol	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
4-Chlorophenylphenyl ether	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
4-Nitroaniline	.	1	Undeterminable	820	820	820	.	0	.	.	ug/kg
4-Nitrophenol	.	1	Undeterminable	820	820	820	.	0	.	.	ug/kg
Acenaphthene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Acenaphthylene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Anthracene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Benzo(a)anthracene	1	1	Undeterminable	110	110	110	.	0	110	110	ug/kg
Benzo(a)pyrene	1	1	Undeterminable	85	85	85	.	0	85	85	ug/kg
Benzo(b)fluoranthene	1	1	Undeterminable	100	100	100	.	0	100	100	ug/kg
Benzo(g,h,i)perylene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Benzo(k)fluoranthene	1	1	Undeterminable	120	120	120	.	0	120	120	ug/kg
Butyl benzyl phthalate	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Carbazole	1	1	Undeterminable	21	21	21	.	0	21	21	ug/kg
Chrysene	1	1	Undeterminable	170	170	170	.	0	170	170	ug/kg
Di-n-butyl phthalate	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Dibenzo(a,h)anthracene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Dibenzofuran	1	1	Undeterminable	19	19	19	.	0	19	19	ug/kg

000446

TABLE A-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics: Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						WOOD					
SEMIVOLATILE ORGANICS (cont.)											
Diethyl phthalate	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Dimethyl phthalate	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Fluoranthene	1	1	Undeterminable	260	260	260	.	0	260	260	ug/kg
Fluorene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Hexachlorobenzene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Hexachlorobutadiene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Hexachlorocyclopentadiene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Hexachloroethane	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Indeno(1,2,3-cd)pyrene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Isophorone	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
N-Nitroso-di-n-propylamine	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
N-Nitrosodiphenylamine	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Naphthalene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Nitrobenzene	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Pentachlorophenol	.	1	Undeterminable	820	820	820	.	0	.	.	ug/kg
Phenanthrene	1	1	Undeterminable	150	150	150	.	0	150	150	ug/kg
Phenol	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
Pyrene	1	1	Undeterminable	260	260	260	.	0	260	260	ug/kg
bis(2-Chloroethoxy)methane	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
bis(2-Chloroethyl)ether	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
bis(2-Ethylhexyl)phthalate	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
o-Methylphenol	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
p-Chloroaniline	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg
p-Methylphenol	.	1	Undeterminable	340	340	340	.	0	.	.	ug/kg

TA[illegible]-14
SUMMARY STATISTICS FOR ALL ANALYTES GROUPED BY MEDIA TYPE
(replaces Table A.III-1)

Parameter	# of Detects	# of Samples	Distribution	Summary Statistics Mean	Median	Geometric Mean	Standard Deviation	Inter-Quartile Range	Minimum Detect	Maximum Detect	Units
						WOOD					
VOLATILE ORGANICS											
1,1,1-Trichloroethane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
1,1,2,2-Tetrachloroethane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
1,1,2-Trichloroethane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
1,1-Dichloroethane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
1,1-Dichloroethene	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
1,2-Dichloroethane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
1,2-Dichloroethene (Total)	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
1,2-Dichloropropane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
2-Butanone	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
2-Hexanone	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
4-Methyl-2-pentanone	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Acetone	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Benzene	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Bromodichloromethane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Bromoform	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Bromomethane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Carbon Tetrachloride	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Carbon disulfide	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Chlorobenzene	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Chloroethane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Chloroform	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Chloromethane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Dibromochloromethane	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Ethylbenzene	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Methylene chloride	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Styrene	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Tetrachloroethene	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Toluene	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Trichloroethene	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Vinyl chloride	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
Xylenes, Total	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
cis-1,3-Dichloropropene	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg
trans-1,3-Dichloropropene	.	1	Undeterminable	900	900	900	.	0	.	.	ug/kg

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TABLE A-15

LIST OF MAJOR DATA CHANGES AND ASSOCIATED IMPACTS

Parameter	Description of Change	Impact
Radionuclides		
Americium-241	Additional data added; number of detections increased; arithmetic mean dropped from 0.89 to 0.77 pCi/g; no other statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Cesium-137	Duplicates and matrix spikes removed; number of samples and detections decreased; arithmetic mean dropped from 1.4 to 0.62 pCi/g; no other statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Lead-210	Duplicates and matrix spikes removed; number of samples and detections decreased; minimum detected value increased from 0.09 to 0.2; no other statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Neptunium-237	Additional data added; number of detections increased; geometric mean increased from 0.16 to 0.18 pCi/g; no other statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Plutonium-238	Duplicates and matrix spikes removed; number of detections increased; median increased from 0.10 to 0.12 pCi/g; no other statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Plutonium-239/240	Duplicates and matrix spikes removed; number of detections increased; no statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Plutonium-241	Additional data added; number of detections increased; the median increased from 1.8 to 2.0 pCi/g; the geometric mean decreased from 3.9 to 3.4 pCi/g; no other statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Polonium-210	Duplicates and matrix spikes removed; number of detections increased; no statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Radium-226	Duplicates and matrix spikes removed; number of samples and detections both decreased; minimum detection increased from 0.03 to 0.1 pCi/g no statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Radium-228	Duplicates and matrix spikes removed; number of samples and detections both decreased; no statistic describing the range or the central tendency changed by more than 10%.	Insignificant

TABLE A (Continued)

LIST OF MAJOR DATA CHANGES AND ASSOCIATED IMPACTS

Parameter	Description of Change	Impact
Strontium-90	Duplicates and matrix spikes removed; number of samples and detections both decreased; arithmetic mean decreased from 1.6 to 1.2 pCi/g; no other statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Technetium-99	Duplicates and matrix spikes removed; number of samples decreased; no statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Thorium-227	No net change in sample size; no statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Thorium-228	Duplicates and matrix spikes removed; number of detections increased; number of detections decreased; no statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Thorium-230	Duplicates and matrix spikes removed; number of detections increased; number of detections decreased; no statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Thorium-232	Duplicates and matrix spikes removed; number of detections increased; number of detections decreased; no statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Uranium	Duplicates and matrix spikes removed; number of samples and detections both decreased; the minimum detection increased from 0.03 to 0.4 ug/g; the median increased from 190 to 238 ug/g; the geometric mean increased from 152 to 191 ug/g.	Both risk and volume estimates increase slightly. No change in conclusions or recommendations result.
Uranium-234	Duplicates and matrix spikes removed; number of detections increased; number of detections decreased; the minimum detection increased from 0.018 to 0.02 pCi/g; no other statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Uranium-235/236	Duplicates and matrix spikes removed; number of detections increased; number of detections decreased; no statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Uranium-238	Duplicates and matrix spikes removed; number of detections increased; number of detections decreased; the minimum detection decreased from 0.14 to 0.08 pCi/g; no other statistic describing the range or the central tendency changed by more than 10%.	Insignificant
Inorganics		
Barium	Standard deviation changed from 1960 to 1560	Insignificant
Mercury	Minimum detected concentration changed from 0.024 to 0.02 mg/kg.	Insignificant

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TABLE A-15 (Continued)

LIST OF MAJOR DATA CHANGES AND ASSOCIATED IMPACTS

Parameter	Description of Change	Impact
Semivolatile Organics		
3,3'-Dichlorobenzidine	Median changed from 1700 to 1300.	Insignificant
4-Bromophenyl phenyl ether	Median changed from 1700 to 1300.	Insignificant
4-Nitroaniline	Median changed from 4200 to 3150.	Insignificant
Isophorone	Median changed from 1700 to 1300.	Insignificant
n-Nitrosodiphenylamine	Median changed from 1700 to 1300.	Insignificant
Volatile Organics		
1,1-Dichloroethene	Standard deviation changed from 6480 to 88500 and mean changed from 1740 to 9550 μg/kg.	Insignificant
1,2-Dichloroethane	Standard deviation changed from 6480 to 88500 and mean changed from 1740 to 9560 μg/kg.	Insignificant
2-Butanone	Standard deviation changed from 6480 to 178000 and mean changed from 1900 to 17800 μg/kg.	Insignificant
Benzene	Standard deviation changed from 6440 to 89500 and mean changed from 1690 to 9690 μg/kg.	Insignificant
Carbon tetrachloride	Standard deviation changed from 6550 to 89500 and mean changed from 1790 to 9780 μg/kg.	Insignificant
Chlorobenzene	Standard deviation changed from 6600 to 90200 and mean changed from 1840 to 9970 μg/kg.	Insignificant
Chloroform	Standard deviation changed from 6480 to 88500 and mean changed from 1740 to 9550 μg/kg.	Insignificant
Trichloroethene	Standard deviation changed from 6550 to 89500 and mean changed from 1790 to 9780 μg/kg.	Insignificant
Pesticides/PCBs		
	No changes	

TA[illegible]A-16
NUMBER OF DETECTS EXCEEDING REFERENCE CRITERIA FOR SOLID MEDIA
(replaces Table A.II-2)

	# of Detects	# of Samples	Detects Above Per Criteria: Part B Soil Screening Levels	20 Times TCLP Limits [1]	Source Material [2]	Envirocare WAC	Concrete Baseline	Paint Baseline
RADIONUCLIDES								
Americium-241	243	655	142	0	0	0	120	45
Cesium-137	185	668	187	0	0	0	99	11
Gross Alpha	.	1	.	.	.	.	.	.
Gross Beta	.	1	.	.	.	.	.	.
Lead-210	409	661	411	0	0	0	173	28
Neptunium-237	250	661	252	0	0	0	85	41
Plutonium-238	309	663	149	0	0	0	95	42
Plutonium-239/240	343	660	174	0	0	0	124	61
Plutonium-241	167	462	46	0	0	0	80	11
Polonium-210	615	656	409	0	0	0	85	17
Radium-226	601	648	603	0	0	4	158	26
Radium-228	487	661	284	0	0	5	222	49
Strontium-90	171	656	34	0	0	0	15	6
Technetium-99	506	662	112	0	0	0	343	68
Thorium-227	55	97	82	0	0	0	20	18
Thorium-228	581	661	583	0	0	5	154	47
Thorium-230	637	661	243	0	0	0	238	48
Thorium-232	589	661	99	0	0	2	136	43
Uranium, Total	665	668	667	0	273	0	396	74
Uranium-234	639	652	505	0	266	5	350	65
Uranium-235/236	597	652	599	0	297	23	315	64
Uranium-238	642	653	642	0	283	10	325	66

1 TCLP Limits do not apply to Radionuclides.
2. Source Material Criteria do not apply to anything besides Uranium.

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TABLE A-16
NUMBER OF DETECTS EXCEEDING REFERENCE CRITERIA FOR SOLID MEDIA
(replaces Table A.II-2)

			Detects Above Per Criteria					
	# of Detects	# of Samples	Part B Soil Screening Levels	20 Times TCLP Limits [1]	Source Material [2]	Envirocare WAC	Concrete Baseline	Paint Baseline
INORGANICS								
Aluminum	710	716	0	0	0	0	45	32
Antimony	152	583	75	0	0	0	49	17
Arsenic	634	720	634	11	0	0	67	32
Barium	719	727	36	34	0	0	158	22
Beryllium	198	692	198	0	0	0	20	13
Cadmium	306	726	62	44	0	0	41	13
Calcium	705	716	0	0	0	0	3	13
Chromium	653	727	157	176	0	0	217	33
Cobalt	488	716	0	0	0	0	42	4
Copper	611	708	19	0	0	0	142	31
Iron	716	716	0	0	0	0	43	33
Lead	657	725	0	248	0	0	320	4
Magnesium	708	716	0	0	0	0	7	39
Manganese	716	716	661	0	0	0	38	28
Mercury	300	706	31	50	0	0	139	12
Nickel	560	716	8	0	0	0	89	19
Potassium	558	716	0	0	0	0	111	38
Selenium	96	594	1	7	0	0	48	14
Silver	257	716	5	5	0	0	20	13
Sodium	606	716	0	0	0	0	144	51
Thallium	37	662	2	0	0	0	6	0
Vanadium	517	707	3	0	0	0	72	18
Zinc	664	716	44	0	0	0	200	3

1 TCLP Limits do not apply to Radionuclides.
2. Source Material Criteria do not apply to anything besides Uranium.

TA[illegible]A-16

NUMBER OF DETECTS EXCEEDING REFERENCE CRITERIA FOR SOLID MEDIA

(replaces Table A.II-2)

	# of Detects	# of Samples	Detects Above Per Criteria: Part B Soil Screening Levels	20 Times TCLP Limits [1]	Source Material [2]	Envirocare WAC	Concrete Baseline	Paint Baseline
VOLATILE ORGANICS								
1,1,1-Trichloroethane	11	113	0	0	0	0	0	0
1,1,2,2-Tetrachloroethane	.	111	.	.	.	.	.	.
1,1,2-Trichloroethane	.	113	.	.	.	.	.	.
1,1-Dichloroethane	.	116	.	.	.	.	.	.
1,1-Dichloroethene	.	128	.	.	.	.	.	.
1,2-Dichloroethane	.	128	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	113	.	.	.	.	.	.
1,2-Dichloropropane	.	113	.	.	.	.	.	.
2-Butanone	15	126	0	0	0	0	0	0
2-Hexanone	1	105	0	0	0	0	0	0
4-Chloroaniline	.	1	.	.	.	.	.	.
4-Methyl-2-pentanone	8	110	0	0	0	0	0	0
Acetone	10	71	0	0	0	0	0	0
Benzene	3	125	1	0	0	0	0	0
Bromodichloromethane	.	113	.	.	.	.	.	.
Bromoform	2	113	0	0	0	0	0	0
Bromomethane	.	116	.	.	.	.	.	.
Carbon Tetrachloride	.	125	.	.	.	.	.	.
Carbon disulfide	1	116	0	0	0	0	0	0
Chlorobenzene	1	123	0	0	0	0	0	0
Chloroethane	.	114	.	.	.	.	.	.
Chloroform	.	128	.	.	.	.	.	.
Chloromethane	.	116	.	.	.	.	.	.
Dibromochloromethane	.	113	.	.	.	.	.	.
Ethylbenzene	23	111	0	0	0	0	0	0
Methylene chloride	6	115	0	0	0	0	0	0
Pyridine	.	11	.	.	.	.	.	.
Styrene	9	111	1	0	0	0	0	0
Tetrachloroethene	15	123	1	1	0	0	0	0
Toluene	23	111	0	0	0	0	0	0
Trichloroethene	1	125	0	0	0	0	0	0
Trichlorofluoromethane	1	18	0	0	0	0	0	0
Vinyl chloride	.	128	.	.	.	.	.	.
Xylenes, Total	32	111	0	0	0	0	0	0
cis-1,3-Dichloropropene	.	113	.	.	.	.	.	.
m,p-Xylene	4	4	0	0	0	0	0	0
o-Xylene	4	4	0	0	0	0	0	0
trans-1,2-Dichloroethene	.	2	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	113	.	.	.	.	.	.

1 TCLP Limits do not apply to Radionuclides.
2. Source Material Criteria do not apply to anything besides Uranium.

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TABLE A-16
NUMBER OF DETECTS EXCEEDING REFERENCE CRITERIA FOR SOLID MEDIA
(replaces Table A.II-2)

	# of Detects	# of Samples	Detects Above Per Criteria: Part B Soil Screening Levels	20 Times TCLP Limits [1]	Source Material [2]	Envirocare WAC	Concrete Baseline	Paint Baseline
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	1	100	0	0	0	0	0	0
1,2-Dichlorobenzene	.	99	.	.	.	.	.	.
1,3-Dichlorobenzene	.	99	.	.	.	.	.	.
1,4-Dichlorobenzene	2	110	2	1	0	0	0	0
2,2-oxybis(1-Chloropropane)	.	71	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	100	.	.	.	.	.	.
2,4,6-Trichlorophenol	1	100	0	0	0	0	0	0
2,4-Dichlorophenol	4	93	0	0	0	0	0	0
2,4-Dimethylphenol	2	93	0	0	0	0	0	0
2,4-Dinitrophenol	.	84	.	.	.	.	.	.
2,4-Dinitrotoluene	1	110	1	1	0	0	0	0
2,6-Dinitrotoluene	.	100	.	.	.	.	.	.
2-Chloronaphthalene	.	100	.	.	.	.	.	.
2-Chlorophenol	2	93	0	0	0	0	0	0
2-Methylnaphthalene	26	100	0	0	0	0	0	0
2-Nitroaniline	.	100	.	.	.	.	.	.
2-Nitrophenol	.	93	.	.	.	.	.	.
3,3'-Dichlorobenzidine	.	88	.	.	.	.	.	.
3-Nitroaniline	.	95	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	93	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	100	.	.	.	.	.	.
4-Chloro-3-methylphenol	2	93	0	0	0	0	0	0
4-Chlorophenylphenyl ether	.	100	.	.	.	.	.	.
4-Nitroaniline	.	96	.	.	.	.	.	.
4-Nitrophenol	1	92	0	0	0	0	0	0
Acenaphthene	30	100	0	0	0	0	0	0
Acenaphthylene	9	100	0	0	0	0	0	0
Anthracene	33	100	0	0	0	0	0	0
Benzo(a)anthracene	60	99	56	0	0	0	0	0
Benzo(a)pyrene	51	99	51	0	0	0	0	0
Benzo(b)fluoranthene	62	99	59	0	0	0	0	0
Benzo(g,h,i)perylene	42	99	0	0	0	0	0	0
Benzo(k)fluoranthene	46	99	40	0	0	0	0	0
Butyl benzyl phthalate	21	99	0	0	0	0	0	0
Carbazole	33	98	7	0	0	0	0	0
Chrysene	71	99	22	0	0	0	0	0
Di-n-butyl phthalate	32	100	0	0	0	0	0	0
Di-n-octyl phthalate	26	98	0	0	0	0	0	0

1 TCLP Limits do not apply to Radionuclides.
2. Source Material Criteria do not apply to anything besides Uranium.

TA[illegible]A-16

NUMBER OF DETECTS EXCEEDING REFERENCE CRITERIA FOR SOLID MEDIA

(replaces Table A.II-2)

	# of Detects	# of Samples	Detects Above Per Criteria: Part B Soil Screening Levels	20 Times TCLP Limits [1]	Source Material [2]	Envirocare WAC	Concrete Baseline	Paint Baseline
SEMIVOLATILE ORGANICS (cont>)								
Dibenzo(a,h)anthracene	14	99	14	0	0	0	0	0
Dibenzofuran	26	100	0	0	0	0	0	0
Diethyl phthalate	8	100	0	0	0	0	0	0
Dimethyl phthalate	3	100	0	0	0	0	0	0
Fluoranthene	78	100	0	0	0	0	0	0
Fluorene	28	100	0	0	0	0	0	0
Hexachlorobenzene	.	111	.	.	.	.	.	.
Hexachlorobutadiene	1	111	1	1	0	0	0	0
Hexachlorocyclopentadiene	.	100	.	.	.	.	.	.
Hexachloroethane	.	110	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	51	99	50	0	0	0	0	0
Isophorone	1	100	0	0	0	0	0	0
N-Nitroso-di-n-propylamine	1	99	1	0	0	0	0	0
N-Nitrosodiphenylamine	.	100	.	.	.	.	.	.
Naphthalene	29	100	0	0	0	0	0	0
Nitrobenzene	2	111	1	1	0	0	0	0
Pentachlorophenol	2	98	2	0	0	0	0	0
Phenanthrene	77	100	0	0	0	0	0	0
Phenol	13	93	0	0	0	0	0	0
Pyrene	76	99	0	0	0	0	0	0
bis(2-Chloroethoxy)methane	.	100	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	99	.	.	.	.	.	.
bis(2-Chloroisopropyl) ether	.	16	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	34	99	16	0	0	0	0	0
m-Methylphenol	1	3	0	0	0	0	0	0
o-Methylphenol	6	100	0	0	0	0	0	0
p-Chloroaniline	1	96	0	0	0	0	0	0
p-Methylphenol	21	101	0	0	0	0	0	0
PESTICIDES								
4,4'-DDD	1	35	0	0	0	0	0	0
4,4'-DDE	3	35	0	0	0	0	0	0
4,4'-DDT	.	34	.	.	.	.	.	.
Aldrin	.	34	.	.	.	.	.	.
Aroclor-1016	.	37	.	.	.	.	.	.
Aroclor-1221	.	37	.	.	.	.	.	.
Aroclor-1232	.	37	.	.	.	.	.	.
Aroclor-1242	.	37	.	.	.	.	.	.
Aroclor-1248	2	37	2	0	0	0	0	0

1 TCLP Limits do not apply to Radionuclides.
2. Source Material Criteria do not apply to anything besides Uranium.

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TABLE A-16
NUMBER OF DETECTS EXCEEDING REFERENCE CRITERIA FOR SOLID MEDIA
(replaces Table A.II-2)

	# of Detects	# of Samples	Detects Above Per Criteria: Part B Soil Screening Levels	20 Times TCLP Limits [1]	Source Material [2]	Envirocare WAC	Concrete Baseline	Paint Baseline
PESTICIDES (cont.)								
Aroclor-1254	14	37	14	0	0	0	0	0
Aroclor-1260	8	37	8	0	0	0	0	0
Chlordane	0	2	0	0	0	0	0	0
Dieldrin	5	34	2	0	0	0	0	0
Endosulfan II	3	35	0	0	0	0	0	0
Endosulfan sulfate	3	35	0	0	0	0	0	0
Endosulfan-I	2	35	0	0	0	0	0	0
Endrin	2	34	0	0	0	0	0	0
Endrin aldehyde	.	35	.	.	.	.	.	.
Endrin ketone	2	35	0	0	0	0	0	0
Heptachlor	.	34	.	.	.	.	.	.
Heptachlor epoxide	1	35	0	0	0	0	0	0
Methoxychlor	1	35	0	0	0	0	0	0
Toxaphene	.	35	.	.	.	.	.	.
alpha-BHC	.	35	.	.	.	.	.	.
alpha-Chlordane	2	35	1	0	0	0	0	0
beta-BHC	.	35	.	.	.	.	.	.
delta-BHC	1	35	0	0	0	0	0	0
gamma-BHC (Lindane)	.	34	.	.	.	.	.	.
gamma-Chlordane	3	35	1	0	0	0	0	0

1 TCLP Limits do not apply to Radionuclides.
2. Source Material Criteria do not apply to anything besides Uranium.

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			ACID BRICK					
INORGANICS								
Aluminum	23	24	0	0	0	0	0	0
Antimony	3	18	0	0	0	0	3	0
Arsenic	17	24	17	0	0	0	2	0
Barium	24	24	0	0	0	0	16	0
Beryllium	2	24	2	0	0	0	0	0
Cadmium	7	24	0	0	0	0	1	0
Calcium	21	24	0	0	0	0	0	0
Chromium	20	24	3	4	0	0	9	0
Cobalt	13	24	0	0	0	0	1	0
Copper	21	24	1	0	0	0	15	0
Iron	24	24	0	0	0	0	1	0
Lead	22	24	0	5	0	0	21	0
Magnesium	22	24	0	0	0	0	0	0
Manganese	24	24	0	0	0	0	0	0
Mercury	15	24	0	2	0	0	15	0
Nickel	16	24	0	0	0	0	11	0
Potassium	16	24	0	0	0	0	3	0
Selenium	4	23	0	0	0	0	4	0
Silver	9	24	0	0	0	0	1	0
Sodium	19	24	0	0	0	0	5	0
Thallium	.	24	.	.	.	.	.	.
Vanadium	12	24	0	0	0	0	0	0
Zinc	18	24	0	0	0	0	6	0

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
				ACID BRICK				
RADIONUCLIDES								
Americium-241	13	21	8	NA [a]	0	0	13	0
Cesium-137	10	21	10	NA [a]	0	0	10	0
Lead-210	17	21	17	NA [a]	0	0	16	0
Neptunium-237	10	21	10	NA [a]	0	0	8	0
Plutonium-238	12	21	7	NA [a]	0	0	7	0
Plutonium-239/240	15	21	8	NA [a]	0	0	10	0
Plutonium-241	11	19	5	NA [a]	0	0	9	0
Polonium-210	19	21	17	NA [a]	0	0	13	0
Radium-226	21	21	21	NA [a]	0	0	16	0
Radium-228	18	21	17	NA [a]	0	0	18	0
Strontium-90	9	21	1	NA [a]	0	0	1	0
Technetium-99	20	21	4	NA [a]	0	0	20	0
Thorium-227	0	6	6	NA [a]	0	0	3	0
Thorium-228	16	19	16	NA [a]	0	0	16	0
Thorium-230	19	19	11	NA [a]	0	0	19	0
Thorium-232	16	19	5	NA [a]	0	0	16	0
Uranium, Total	21	21	21	NA [a]	14	0	21	0
Uranium-234	21	21	20	NA [a]	16	0	20	0
Uranium-235/236	20	21	20	NA [a]	15	0	19	0
Uranium-238	20	21	20	NA [a]	15	0	19	0

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			ACID BRICK					
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	.	3	.	.	.	.	.	.
1,2-Dichlorobenzene	.	3	.	.	.	.	.	.
1,3-Dichlorobenzene	.	3	.	.	.	.	.	.
1,4-Dichlorobenzene	.	3	.	.	.	.	.	.
2,2-oxybis(1-Chloropropane)	.	3	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	3	.	.	.	.	.	.
2,4,6-Trichlorophenol	.	3	.	.	.	.	.	.
2,4-Dichlorophenol	.	3	.	.	.	.	.	.
2,4-Dimethylphenol	.	3	.	.	.	.	.	.
2,4-Dinitrophenol	.	2	.	.	.	.	.	.
2,4-Dinitrotoluene	.	3	.	.	.	.	.	.
2,6-Dinitrotoluene	.	3	.	.	.	.	.	.
2-Chloronaphthalene	.	3	.	.	.	.	.	.
2-Chlorophenol	1	3	0	0	0	0	0	0
2-Methylnaphthalene	.	3	.	.	.	.	.	.
2-Nitroaniline	.	3	.	.	.	.	.	.
2-Nitrophenol	.	3	.	.	.	.	.	.
3,3'-Dichlorobenzidine	.	3	.	.	.	.	.	.
3-Nitroaniline	.	3	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	3	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	3	.	.	.	.	.	.
4-Chloro-3-methylphenol	1	3	0	0	0	0	0	0
4-Chlorophenylphenyl ether	.	3	.	.	.	.	.	.
4-Nitroaniline	.	3	.	.	.	.	.	.
4-Nitrophenol	.	3	.	.	.	.	.	.
Acenaphthene	1	3	0	0	0	0	0	0
Acenaphthylene	.	3	.	.	.	.	.	.
Anthracene	.	3	.	.	.	.	.	.
Benzo(a)anthracene	.	3	.	.	.	.	.	.
Benzo(a)pyrene	1	3	1	0	0	0	0	0
Benzo(b)fluoranthene	2	3	1	0	0	0	0	0
Benzo(g,h,i)perylene	.	3	.	.	.	.	.	.
Benzo(k)fluoranthene	.	3	.	.	.	.	.	.
Butyl benzyl phthalate	.	3	.	.	.	.	.	.
Carbazole	.	3	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			ACID BRICK					
SEMIVOLATILE ORGANICS (cont.)								
Chrysene	2	3	0	0	0	0	0	0
Di-n-butyl phthalate	.	3	.	.	.	.	.	.
Di-n-octyl phthalate	1	3	0	0	0	0	0	0
Dibenzo(a,h)anthracene	.	3	.	.	.	.	.	.
Dibenzofuran	.	3	.	.	.	.	.	.
Diethyl phthalate	.	3	.	.	.	.	.	.
Dimethyl phthalate	.	3	.	.	.	.	.	.
Fluoranthene	2	3	0	0	0	0	0	0
Fluorene	.	3	.	.	.	.	.	.
Hexachlorobenzene	.	3	.	.	.	.	.	.
Hexachlorobutadiene	.	3	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	3	.	.	.	.	.	.
Hexachloroethane	.	3	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	.	3	.	.	.	.	.	.
Isophorone	.	3	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	3	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	3	.	.	.	.	.	.
Naphthalene	.	3	.	.	.	.	.	.
Nitrobenzene	.	3	.	.	.	.	.	.
Pentachlorophenol	.	2	.	.	.	.	.	.
Phenanthrene	1	3	0	0	0	0	0	0
Phenol	1	3	0	0	0	0	0	0
Pyrene	1	3	0	0	0	0	0	0
bis(2-Chloroethoxy)methane	.	3	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	3	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	1	3	0	0	0	0	0	0
o-Methylphenol	.	3	.	.	.	.	.	.
p-Chloroaniline	.	3	.	.	.	.	.	.
p-Methylphenol	.	3	.	.	.	.	.	.
VOLATILE ORGANICS								
1,1,1-Trichloroethane	1	4	0	0	0	0	0	0
1,1,2,2-Tetrachloroethane	.	4	.	.	.	.	.	.
1,1,2-Trichloroethane	.	4	.	.	.	.	.	.
1,1-Dichloroethane	.	4	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			ACID BRICK					
VOLATILE ORGANICS (cont.)								
1,1-Dichloroethene	.	4	.	.	.	.	.	.
1,2-Dichloroethane	.	4	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	4	.	.	.	.	.	.
1,2-Dichloropropane	.	4	.	.	.	.	.	.
2-Butanone	2	4	0	0	0	0	0	0
2-Hexanone	.	4	.	.	.	.	.	.
4-Methyl-2-pentanone	.	4	.	.	.	.	.	.
Acetone	.	2	.	.	.	.	.	.
Benzene	.	4	.	.	.	.	.	.
Bromodichloromethane	.	4	.	.	.	.	.	.
Bromoform	.	4	.	.	.	.	.	.
Bromomethane	.	4	.	.	.	.	.	.
Carbon Tetrachloride	.	4	.	.	.	.	.	.
Carbon disulfide	.	4	.	.	.	.	.	.
Chlorobenzene	.	4	.	.	.	.	.	.
Chloroethane	.	2	.	.	.	.	.	.
Chloroform	.	4	.	.	.	.	.	.
Chloromethane	.	4	.	.	.	.	.	.
Dibromochloromethane	.	4	.	.	.	.	.	.
Ethylbenzene	1	4	0	0	0	0	0	0
Methylene chloride	1	4	0	0	0	0	0	0
Styrene	1	4	0	0	0	0	0	0
Tetrachloroethene	1	4	0	0	0	0	0	0
Toluene	1	4	0	0	0	0	0	0
Trichloroethene	.	4	.	.	.	.	.	.
Trichlorofluoromethane	1	3	0	0	0	0	0	0
Vinyl chloride	.	4	.	.	.	.	.	.
Xylenes, Total	1	4	0	0	0	0	0	0
cis-1,3-Dichloropropene	.	4	.	.	.	.	.	.
m,p-Xylene	1	1	0	0	0	0	0	0
o-Xylene	1	1	0	0	0	0	0	0
trans-1,3-Dichloropropene	.	4	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			ASPHALT					
INORGANICS								
Aluminum	3	4	0	0	0	0	0	0
Antimony	.	4	.	.	.	.	.	.
Arsenic	4	4	4	0	0	0	0	0
Barium	4	4	0	0	0	0	0	0
Beryllium	.	4	.	.	.	.	.	.
Cadmium	.	4	.	.	.	.	.	.
Calcium	4	4	0	0	0	0	0	0
Chromium	2	4	0	0	0	0	0	0
Cobalt	1	4	0	0	0	0	0	0
Copper	3	4	0	0	0	0	0	0
Iron	4	4	0	0	0	0	0	0
Lead	4	4	0	0	0	0	1	0
Magnesium	4	4	0	0	0	0	0	0
Manganese	4	4	4	0	0	0	0	0
Mercury	.	4	.	.	.	.	.	.
Nickel	1	4	0	0	0	0	0	0
Potassium	1	4	0	0	0	0	0	0
Selenium	.	4	.	.	.	.	.	.
Silver	.	4	.	.	.	.	.	.
Sodium	4	4	0	0	0	0	0	0
Thallium	.	4	.	.	.	.	.	.
Vanadium	4	4	0	0	0	0	1	0
Zinc	4	4	0	0	0	0	1	0

a There are no TCLP limits for radionuclides.

000462

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
					ASPHALT			
PESTICIDES								
4,4'-DDD	.	2	.	.	.	.	.	.
4,4'-DDE	.	2	.	.	.	.	.	.
4,4'-DDT	.	2	.	.	.	.	.	.
Aldrin	.	2	.	.	.	.	.	.
Aroclor-1016	.	2	.	.	.	.	.	.
Aroclor-1221	.	2	.	.	.	.	.	.
Aroclor-1232	.	2	.	.	.	.	.	.
Aroclor-1242	.	2	.	.	.	.	.	.
Aroclor-1248	.	2	.	.	.	.	.	.
Aroclor-1254	.	2	.	.	.	.	.	.
Aroclor-1260	.	2	.	.	.	.	.	.
Dieldrin	.	2	.	.	.	.	.	.
Endosulfan II	.	2	.	.	.	.	.	.
Endosulfan sulfate	.	2	.	.	.	.	.	.
Endosulfan-I	.	2	.	.	.	.	.	.
Endrin	.	2	.	.	.	.	.	.
Endrin aldehyde	.	2	.	.	.	.	.	.
Endrin ketone	.	2	.	.	.	.	.	.
Heptachlor	.	2	.	.	.	.	.	.
Heptachlor epoxide	.	2	.	.	.	.	.	.
Methoxychlor	.	2	.	.	.	.	.	.
Toxaphene	.	2	.	.	.	.	.	.
alpha-BHC	.	2	.	.	.	.	.	.
alpha-Chlordane	.	2	.	.	.	.	.	.
beta-BHC	.	2	.	.	.	.	.	.
delta-BHC	.	2	.	.	.	.	.	.
gamma-BHC (Lindane)	.	2	.	.	.	.	.	.
gamma-Chlordane	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
				ASPHALT				
RADIONUCLIDES								
Americium-241	.	4	.	NA [a]	.	.	.	.
Cesium-137	3	4	3	NA [a]	0	0	1	0
Lead-210	3	4	3	NA [a]	0	0	2	0
Neptunium-237	.	4	.	NA [a]	.	.	.	.
Plutonium-238	1	4	0	NA [a]	0	0	0	0
Plutonium-239/240	1	4	0	NA [a]	0	0	0	0
Plutonium-241	.	1	.	NA [a]	.	.	.	.
Polonium-210	3	4	2	NA [a]	0	0	2	0
Radium-226	4	4	4	NA [a]	0	0	1	0
Radium-228	4	4	1	NA [a]	0	0	1	0
Strontium-90	2	4	2	NA [a]	0	0	2	0
Technetium-99	2	4	0	NA [a]	0	0	2	0
Thorium-228	4	4	4	NA [a]	0	0	1	0
Thorium-230	4	4	0	NA [a]	0	0	1	0
Thorium-232	4	4	0	NA [a]	0	0	1	0
Uranium, Total	4	4	4	NA [a]	0	0	4	0
Uranium-234	3	4	1	NA [a]	0	0	1	0
Uranium-235/236	2	4	2	NA [a]	0	0	1	0
Uranium-238	3	4	3	NA [a]	0	0	1	0

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
					ASPHALT			
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	.	2	.	.	.	.	.	.
1,2-Dichlorobenzene	.	2	.	.	.	.	.	.
1,3-Dichlorobenzene	.	2	.	.	.	.	.	.
1,4-Dichlorobenzene	.	2	.	.	.	.	.	.
2,2-oxybis(1-Chloropropane)	.	2	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	2	.	.	.	.	.	.
2,4,6-Trichlorophenol	.	2	.	.	.	.	.	.
2,4-Dichlorophenol	.	2	.	.	.	.	.	.
2,4-Dimethylphenol	.	2	.	.	.	.	.	.
2,4-Dinitrophenol	.	2	.	.	.	.	.	.
2,4-Dinitrotoluene	.	2	.	.	.	.	.	.
2,6-Dinitrotoluene	.	2	.	.	.	.	.	.
2-Chloronaphthalene	.	2	.	.	.	.	.	.
2-Chlorophenol	.	2	.	.	.	.	.	.
2-Methylnaphthalene	2	2	0	0	0	0	0	0
2-Nitroaniline	.	2	.	.	.	.	.	.
2-Nitrophenol	.	2	.	.	.	.	.	.
3-Nitroaniline	.	2	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	2	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	2	.	.	.	.	.	.
4-Chloro-3-methylphenol	.	2	.	.	.	.	.	.
4-Chlorophenylphenyl ether	.	2	.	.	.	.	.	.
4-Nitroaniline	.	2	.	.	.	.	.	.
4-Nitrophenol	.	2	.	.	.	.	.	.
Acenaphthene	.	2	.	.	.	.	.	.
Acenaphthylene	.	2	.	.	.	.	.	.
Anthracene	.	2	.	.	.	.	.	.
Benzo(a)anthracene	2	2	2	0	0	0	0	0
Benzo(a)pyrene	.	2	.	.	.	.	.	.
Benzo(b)fluoranthene	.	2	.	.	.	.	.	.
Benzo(g,h,i)perylene	.	2	.	.	.	.	.	.
Benzo(k)fluoranthene	.	2	.	.	.	.	.	.
Butyl benzyl phthalate	.	2	.	.	.	.	.	.
Carbazole	.	2	.	.	.	.	.	.
Chrysene	2	2	0	0	0	0	0	0

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
					ASPHALT			
SEMIVOLATILE ORGANICS (cont.)								
Di-n-butyl phthalate	.	2	.	.	.	.	.	.
Di-n-octyl phthalate	.	2	.	.	.	.	.	.
Dibenzo(a,h)anthracene	.	2	.	.	.	.	.	.
Dibenzofuran	.	2	.	.	.	.	.	.
Diethyl phthalate	.	2	.	.	.	.	.	.
Dimethyl phthalate	.	2	.	.	.	.	.	.
Fluoranthene	2	2	0	0	0	0	0	0
Fluorene	.	2	.	.	.	.	.	.
Hexachlorobenzene	.	2	.	.	.	.	.	.
Hexachlorobutadiene	.	2	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	2	.	.	.	.	.	.
Hexachloroethane	.	2	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	.	2	.	.	.	.	.	.
Isophorone	.	2	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	2	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	2	.	.	.	.	.	.
Naphthalene	.	2	.	.	.	.	.	.
Nitrobenzene	.	2	.	.	.	.	.	.
Pentachlorophenol	.	2	.	.	.	.	.	.
Phenanthrene	2	2	0	0	0	0	0	0
Phenol	.	2	.	.	.	.	.	.
Pyrene	2	2	0	0	0	0	0	0
bis(2-Chloroethoxy)methane	.	2	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	2	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	.	2	.	.	.	.	.	.
o-Methylphenol	.	2	.	.	.	.	.	.
p-Chloroaniline	.	2	.	.	.	.	.	.
p-Methylphenol	.	2	.	.	.	.	.	.
VOLATILE ORGANICS								
1,1,1-Trichloroethane	.	2	.	.	.	.	.	.
1,1,2,2-Tetrachloroethane	.	2	.	.	.	.	.	.
1,1,2-Trichloroethane	.	2	.	.	.	.	.	.
1,1-Dichloroethane	.	2	.	.	.	.	.	.
1,1-Dichloroethene	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
					ASPHALT			
VOLATILE ORGANICS								
1,2-Dichloroethane	.	2	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	2	.	.	.	.	.	.
1,2-Dichloropropane	.	2	.	.	.	.	.	.
2-Butanone	1	2	0	0	0	0	0	0
2-Hexanone	.	2	.	.	.	.	.	.
4-Methyl-2-pentanone	.	2	.	.	.	.	.	.
Benzene	.	2	.	.	.	.	.	.
Bromodichloromethane	.	2	.	.	.	.	.	.
Bromoform	.	2	.	.	.	.	.	.
Bromomethane	.	2	.	.	.	.	.	.
Carbon Tetrachloride	.	2	.	.	.	.	.	.
Carbon disulfide	.	2	.	.	.	.	.	.
Chlorobenzene	.	2	.	.	.	.	.	.
Chloroethane	.	2	.	.	.	.	.	.
Chloroform	.	2	.	.	.	.	.	.
Chloromethane	.	2	.	.	.	.	.	.
Dibromochloromethane	.	2	.	.	.	.	.	.
Ethylbenzene	.	2	.	.	.	.	.	.
Methylene chloride	.	2	.	.	.	.	.	.
Styrene	.	2	.	.	.	.	.	.
Tetrachloroethene	.	2	.	.	.	.	.	.
Toluene	.	2	.	.	.	.	.	.
Trichloroethene	.	2	.	.	.	.	.	.
Vinyl chloride	.	2	.	.	.	.	.	.
Xylenes, Total	.	2	.	.	.	.	.	.
cis-1,3-Dichloropropene	.	2	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000467

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CHIPS					
INORGANICS								
Aluminum	152	152	0	0	0	0	16	0
Antimony	26	128	9	0	0	0	24	0
Arsenic	143	150	143	0	0	0	21	0
Barium	152	152	1	1	0	0	47	0
Beryllium	66	147	66	0	0	0	7	0
Cadmium	38	152	1	1	0	0	11	0
Calcium	152	152	0	0	0	0	1	0
Chromium	134	152	5	5	0	0	79	0
Cobalt	82	152	0	0	0	0	11	0
Copper	126	150	1	0	0	0	55	0
Iron	152	152	0	0	0	0	21	0
Lead	142	152	0	13	0	0	111	0
Magnesium	152	152	0	0	0	0	2	0
Manganese	152	152	150	0	0	0	12	0
Mercury	26	142	0	1	0	0	25	0
Nickel	109	152	0	0	0	0	36	0
Potassium	116	152	0	0	0	0	50	0
Selenium	13	123	0	0	0	0	13	0
Silver	28	149	0	0	0	0	6	0
Sodium	135	152	0	0	0	0	71	0
Thallium	11	145	1	0	0	0	6	0
Vanadium	118	152	0	0	0	0	31	0
Zinc	143	152	1	0	0	0	81	0

a There are no TCLP limits for radionuclides.

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CHIPS					
PESTICIDES								
4,4'-DDD	.	13	.	.	.	.	.	.
4,4'-DDE	3	13	0	0	0	0	0	0
4,4'-DDT	.	13	.	.	.	.	.	.
Aldrin	.	13	.	.	.	.	.	.
Aroclor-1016	.	14	.	.	.	.	.	.
Aroclor-1221	.	14	.	.	.	.	.	.
Aroclor-1232	.	14	.	.	.	.	.	.
Aroclor-1242	.	14	.	.	.	.	.	.
Aroclor-1248	1	14	1	0	0	0	0	0
Aroclor-1254	2	14	2	0	0	0	0	0
Aroclor-1260	2	14	2	0	0	0	0	0
Chlordane	0	2	0	0	0	0	0	0
Dieldrin	4	13	2	0	0	0	0	0
Endosulfan II	2	13	0	0	0	0	0	0
Endosulfan sulfate	3	13	0	0	0	0	0	0
Endosulfan-I	1	13	0	0	0	0	0	0
Endrin	.	13	.	.	.	.	.	.
Endrin aldehyde	.	13	.	.	.	.	.	.
Endrin ketone	1	13	0	0	0	0	0	0
Heptachlor	.	13	.	.	.	.	.	.
Heptachlor epoxide	1	13	0	0	0	0	0	0
Methoxychlor	.	13	.	.	.	.	.	.
Toxaphene	.	13	.	.	.	.	.	.
alpha-BHC	.	13	.	.	.	.	.	.
alpha-Chlordane	2	13	1	0	0	0	0	0
beta-BHC	.	13	.	.	.	.	.	.
delta-BHC	1	13	0	0	0	0	0	0
gamma-BHC (Lindane)	.	13	.	.	.	.	.	.
gamma-Chlordane	2	13	1	0	0	0	0	0

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CHIPS					
RADIONUCLIDES								
Americium-241	47	148	24	NA [a]	0	0	40	0
Cesium-137	37	151	39	NA [a]	0	0	28	0
Lead-210	91	150	93	NA [a]	0	0	59	0
Neptunium-237	48	151	50	NA [a]	0	0	28	0
Plutonium-238	60	151	22	NA [a]	0	0	27	0
Plutonium-239/240	60	151	16	NA [a]	0	0	37	0
Plutonium-241	35	91	3	NA [a]	0	0	21	0
Polonium-210	139	148	76	NA [a]	0	0	23	0
Radium-226	138	148	140	NA [a]	0	0	49	0
Radium-228	108	151	43	NA [a]	0	1	65	0
Strontium-90	35	149	6	NA [a]	0	0	3	0
Technetium-99	111	150	21	NA [a]	0	0	112	0
Thorium-227	8	10	8	NA [a]	0	0	4	0
Thorium-228	118	150	120	NA [a]	0	2	47	0
Thorium-230	142	150	37	NA [a]	0	0	73	0
Thorium-232	121	150	9	NA [a]	0	0	38	0
Uranium, Total	149	151	151	NA [a]	72	0	128	0
Uranium-234	145	150	116	NA [a]	69	1	116	0
Uranium-235/236	137	150	139	NA [a]	78	5	107	0
Uranium-238	146	151	148	NA [a]	75	2	111	0

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CHIPS					
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	.	6	.	.	.	.	.	.
1,2-Dichlorobenzene	.	5	.	.	.	.	.	.
1,3-Dichlorobenzene	.	5	.	.	.	.	.	.
1,4-Dichlorobenzene	.	5	.	.	.	.	.	.
2,2-oxybis(1-Chloropropane)	.	5	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	2	.	.	.	.	.	.
2,4,6-Trichlorophenol	.	2	.	.	.	.	.	.
2,4-Dichlorophenol	.	2	.	.	.	.	.	.
2,4-Dimethylphenol	.	2	.	.	.	.	.	.
2,4-Dinitrotoluene	.	6	.	.	.	.	.	.
2,6-Dinitrotoluene	.	6	.	.	.	.	.	.
2-Chloronaphthalene	.	6	.	.	.	.	.	.
2-Chlorophenol	.	2	.	.	.	.	.	.
2-Methylnaphthalene	.	6	.	.	.	.	.	.
2-Nitroaniline	.	6	.	.	.	.	.	.
2-Nitrophenol	.	2	.	.	.	.	.	.
3,3'-Dichlorobenzidine	.	5	.	.	.	.	.	.
3-Nitroaniline	.	6	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	2	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	6	.	.	.	.	.	.
4-Chloro-3-methylphenol	.	2	.	.	.	.	.	.
4-Chlorophenylphenyl ether	.	6	.	.	.	.	.	.
4-Nitroaniline	.	6	.	.	.	.	.	.
4-Nitrophenol	.	2	.	.	.	.	.	.
Acenaphthene	.	6	.	.	.	.	.	.
Acenaphthylene	.	6	.	.	.	.	.	.
Anthracene	.	6	.	.	.	.	.	.
Benzo(a)anthracene	1	5	0	0	0	0	0	0
Benzo(a)pyrene	.	6	.	.	.	.	.	.
Benzo(b)fluoranthene	.	6	.	.	.	.	.	.
Benzo(g,h,i)perylene	.	6	.	.	.	.	.	.
Benzo(k)fluoranthene	.	6	.	.	.	.	.	.
Butyl benzyl phthalate	1	5	0	0	0	0	0	0
Carbazole	.	6	.	.	.	.	.	.
Chrysene	2	5	0	0	0	0	0	0

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CHIPS					
SEMIVOLATILE ORGANICS (cont.)								
Di-n-butyl phthalate	1	6	0	0	0	0	0	0
Di-n-octyl phthalate	1	6	0	0	0	0	0	0
Dibenzo(a,h)anthracene	.	6	.	.	.	.	.	.
Dibenzofuran	.	6	.	.	.	.	.	.
Diethyl phthalate	.	6	.	.	.	.	.	.
Dimethyl phthalate	.	6	.	.	.	.	.	.
Fluoranthene	3	6	0	0	0	0	0	0
Fluorene	.	6	.	.	.	.	.	.
Hexachlorobenzene	.	6	.	.	.	.	.	.
Hexachlorobutadiene	.	6	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	6	.	.	.	.	.	.
Hexachloroethane	.	5	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	.	6	.	.	.	.	.	.
Isophorone	.	6	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	5	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	6	.	.	.	.	.	.
Naphthalene	.	6	.	.	.	.	.	.
Nitrobenzene	.	6	.	.	.	.	.	.
Pentachlorophenol	.	2	.	.	.	.	.	.
Phenanthrene	5	6	0	0	0	0	0	0
Phenol	.	2	.	.	.	.	.	.
Pyrene	2	5	0	0	0	0	0	0
bis(2-Chloroethoxy)methane	.	6	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	5	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	1	5	0	0	0	0	0	0
o-Methylphenol	.	2	.	.	.	.	.	.
p-Chloroaniline	.	6	.	.	.	.	.	.
p-Methylphenol	1	3	0	0	0	0	0	0
VOLATILE ORGANICS								
1,1,1-Trichloroethane	2	6	0	0	0	0	0	0
1,1,2,2-Tetrachloroethane	.	6	.	.	.	.	.	.
1,1,2-Trichloroethane	.	6	.	.	.	.	.	.
1,1-Dichloroethane	.	6	.	.	.	.	.	.
1,1-Dichloroethene	.	6	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CHIPS					
VOLATILE ORGANICS (cont.)								
1,2-Dichloroethane	.	6	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	6	.	.	.	.	.	.
1,2-Dichloropropane	.	6	.	.	.	.	.	.
2-Butanone	2	5	0	0	0	0	0	0
2-Hexanone	1	6	0	0	0	0	0	0
4-Methyl-2-pentanone	1	6	0	0	0	0	0	0
Acetone	.	5	.	.	.	.	.	.
Benzene	.	6	.	.	.	.	.	.
Bromodichloromethane	.	6	.	.	.	.	.	.
Bromoform	.	6	.	.	.	.	.	.
Bromomethane	.	6	.	.	.	.	.	.
Carbon Tetrachloride	.	6	.	.	.	.	.	.
Carbon disulfide	.	6	.	.	.	.	.	.
Chlorobenzene	.	6	.	.	.	.	.	.
Chloroethane	.	6	.	.	.	.	.	.
Chloroform	.	6	.	.	.	.	.	.
Chloromethane	.	6	.	.	.	.	.	.
Dibromochloromethane	.	6	.	.	.	.	.	.
Ethylbenzene	3	6	0	0	0	0	0	0
Methylene chloride	.	5	.	.	.	.	.	.
Styrene	.	6	.	.	.	.	.	.
Tetrachloroethene	1	6	0	0	0	0	0	0
Toluene	1	6	0	0	0	0	0	0
Trichloroethene	.	6	.	.	.	.	.	.
Trichlorofluoromethane	.	1	.	.	.	.	.	.
Vinyl chloride	.	6	.	.	.	.	.	.
Xylenes, Total	3	6	0	0	0	0	0	0
cis-1,3-Dichloropropene	.	6	.	.	.	.	.	.
m,p-Xylene	1	1	0	0	0	0	0	0
o-Xylene	1	1	0	0	0	0	0	0
trans-1,3-Dichloropropene	.	6	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000473

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000474

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.0" - 0.5 ")					
INORGANICS								
Aluminum	93	93	0	0	0	0	11	0
Antimony	9	72	4	0	0	0	9	0
Arsenic	82	91	82	0	0	0	19	0
Barium	93	93	5	4	0	0	39	0
Beryllium	27	90	27	0	0	0	3	0
Cadmium	36	93	0	0	0	0	11	0
Calcium	93	93	0	0	0	0	1	0
Chromium	79	93	1	5	0	0	50	0
Cobalt	60	93	0	0	0	0	13	0
Copper	78	92	0	0	0	0	44	0
Iron	93	93	0	0	0	0	13	0
Lead	86	93	0	16	0	0	77	0
Magnesium	93	93	0	0	0	0	0	0
Manganese	93	93	89	0	0	0	12	0
Mercury	35	91	1	1	0	0	33	0
Nickel	75	93	0	0	0	0	26	0
Potassium	76	93	0	0	0	0	24	0
Selenium	13	72	0	0	0	0	13	0
Silver	32	93	0	0	0	0	3	0
Sodium	77	93	0	0	0	0	33	0
Thallium	.	86	.	.	.	.	.	.
Vanadium	73	93	0	0	0	0	15	0
Zinc	87	93	0	0	0	0	43	0

a There are no TCLP limits for radionuclides.

TABLE A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.0" - 0.5")					
PESTICIDES								
4,4'-DDD	.	2	.	.	.	.	.	.
4,4'-DDE	.	2	.	.	.	.	.	.
4,4'-DDT	.	1	.	.	.	.	.	.
Aldrin	.	1	.	.	.	.	.	.
Aroclor-1016	.	2	.	.	.	.	.	.
Aroclor-1221	.	2	.	.	.	.	.	.
Aroclor-1232	.	2	.	.	.	.	.	.
Aroclor-1242	.	2	.	.	.	.	.	.
Aroclor-1248	.	2	.	.	.	.	.	.
Aroclor-1254	2	2	2	0	0	0	0	0
Aroclor-1260	1	2	1	0	0	0	0	0
Dieldrin	.	1	.	.	.	.	.	.
Endosulfan II	.	2	.	.	.	.	.	.
Endosulfan sulfate	.	2	.	.	.	.	.	.
Endosulfan-I	.	2	.	.	.	.	.	.
Endrin	.	1	.	.	.	.	.	.
Endrin aldehyde	.	2	.	.	.	.	.	.
Endrin ketone	.	2	.	.	.	.	.	.
Heptachlor	.	1	.	.	.	.	.	.
Heptachlor epoxide	.	2	.	.	.	.	.	.
Methoxychlor	.	2	.	.	.	.	.	.
Toxaphene	.	2	.	.	.	.	.	.
alpha-BHC	.	2	.	.	.	.	.	.
alpha-Chlordane	.	2	.	.	.	.	.	.
beta-BHC	.	2	.	.	.	.	.	.
delta-BHC	.	2	.	.	.	.	.	.
gamma-BHC (Lindane)	.	1	.	.	.	.	.	.
gamma-Chlordane	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000475

2392

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.0" - 0.5")					
RADIONUCLIDES								
Americium-241	40	92	20	NA [a]	0	0	33	0
Cesium-137	32	94	32	NA [a]	0	0	30	0
Lead-210	62	93	62	NA [a]	0	0	47	0
Neptunium-237	40	94	40	NA [a]	0	0	29	0
Plutonium-238	51	94	21	NA [a]	0	0	27	0
Plutonium-239/240	62	94	29	NA [a]	0	0	47	0
Plutonium-241	31	75	13	NA [a]	0	0	25	0
Polonium-210	87	94	61	NA [a]	0	0	24	0
Radium-226	84	89	84	NA [a]	0	0	41	0
Radium-228	70	93	40	NA [a]	0	1	54	0
Strontium-90	24	93	6	NA [a]	0	0	5	0
Technetium-99	78	92	17	NA [a]	0	0	76	0
Thorium-227	8	11	10	NA [a]	0	0	5	0
Thorium-228	82	93	82	NA [a]	0	1	40	0
Thorium-230	89	93	38	NA [a]	0	0	63	0
Thorium-232	83	93	16	NA [a]	0	1	35	0
Uranium, Total	93	94	93	NA [a]	45	0	87	0
Uranium-234	93	94	80	NA [a]	44	0	80	0
Uranium-235/236	91	94	91	NA [a]	51	1	77	0
Uranium-238	94	94	94	NA [a]	48	0	77	0

a There are no TCLP limits for radionuclides.

TABLE A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.0" - 0.5")					
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	.	1	.	.	.	.	.	.
1,2-Dichlorobenzene	.	1	.	.	.	.	.	.
1,3-Dichlorobenzene	.	1	.	.	.	.	.	.
1,4-Dichlorobenzene	.	1	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	1	.	.	.	.	.	.
2,4,6-Trichlorophenol	.	1	.	.	.	.	.	.
2,4-Dichlorophenol	.	1	.	.	.	.	.	.
2,4-Dimethylphenol	.	1	.	.	.	.	.	.
2,4-Dinitrophenol	.	1	.	.	.	.	.	.
2,4-Dinitrotoluene	.	1	.	.	.	.	.	.
2,6-Dinitrotoluene	.	1	.	.	.	.	.	.
2-Chloronaphthalene	.	1	.	.	.	.	.	.
2-Chlorophenol	.	1	.	.	.	.	.	.
2-Methylnaphthalene	.	1	.	.	.	.	.	.
2-Nitroaniline	.	1	.	.	.	.	.	.
2-Nitrophenol	.	1	.	.	.	.	.	.
3,3'-Dichlorobenzidine	.	1	.	.	.	.	.	.
3-Nitroaniline	.	1	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	1	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	1	.	.	.	.	.	.
4-Chloro-3-methylphenol	.	1	.	.	.	.	.	.
4-Chlorophenylphenyl ether	.	1	.	.	.	.	.	.
4-Nitroaniline	.	1	.	.	.	.	.	.
4-Nitrophenol	.	1	.	.	.	.	.	.
Acenaphthene	.	1	.	.	.	.	.	.
Acenaphthylene	.	1	.	.	.	.	.	.
Anthracene	.	1	.	.	.	.	.	.
Benzo(a)anthracene	.	1	.	.	.	.	.	.
Benzo(a)pyrene	.	1	.	.	.	.	.	.
Benzo(b)fluoranthene	.	1	.	.	.	.	.	.
Benzo(g,h,i)perylene	.	1	.	.	.	.	.	.
Benzo(k)fluoranthene	.	1	.	.	.	.	.	.
Butyl benzyl phthalate	.	1	.	.	.	.	.	.
Carbazole	.	1	.	.	.	.	.	.
Chrysene	.	1	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000477

2692

000478

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.0" - 0.5")					
SEMIVOLATILE ORGANICS (cont.)								
Di-n-butyl phthalate	.	1	.	.	.	.	.	.
Di-n-octyl phthalate	.	1	.	.	.	.	.	.
Dibenzo(a,h)anthracene	.	1	.	.	.	.	.	.
Dibenzofuran	.	1	.	.	.	.	.	.
Diethyl phthalate	.	1	.	.	.	.	.	.
Dimethyl phthalate	.	1	.	.	.	.	.	.
Fluoranthene	.	1	.	.	.	.	.	.
Fluorene	.	1	.	.	.	.	.	.
Hexachlorobenzene	.	1	.	.	.	.	.	.
Hexachlorobutadiene	.	1	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	1	.	.	.	.	.	.
Hexachloroethane	.	1	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	.	1	.	.	.	.	.	.
Isophorone	.	1	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	1	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	1	.	.	.	.	.	.
Naphthalene	.	1	.	.	.	.	.	.
Nitrobenzene	.	1	.	.	.	.	.	.
Pentachlorophenol	.	1	.	.	.	.	.	.
Phenanthrene	.	1	.	.	.	.	.	.
Phenol	.	1	.	.	.	.	.	.
Pyrene	.	1	.	.	.	.	.	.
bis(2-Chloroethoxy)methane	.	1	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	1	.	.	.	.	.	.
bis(2-Chloroisopropyl) ether	.	1	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	.	1	.	.	.	.	.	.
o-Methylphenol	.	1	.	.	.	.	.	.
p-Chloroaniline	.	1	.	.	.	.	.	.
p-Methylphenol	.	1	.	.	.	.	.	.
VOLATILE ORGANICS								
1,1,1-Trichloroethane	1	6	0	0	0	0	0	0
1,1,2,2-Tetrachloroethane	.	6	.	.	.	.	.	.
1,1,2-Trichloroethane	.	6	.	.	.	.	.	.
1,1-Dichloroethane	.	6	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.0" - 0.5")					
VOLATILE ORGANICS (cont.)								
1,1-Dichloroethene	.	6	.	.	.	.	.	.
1,2-Dichloroethane	.	6	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	6	.	.	.	.	.	.
1,2-Dichloropropane	.	6	.	.	.	.	.	.
2-Butanone	.	6	.	.	.	.	.	.
2-Hexanone	.	6	.	.	.	.	.	.
4-Methyl-2-pentanone	1	6	0	0	0	0	0	0
Acetone	.	1	.	.	.	.	.	.
Benzene	.	6	.	.	.	.	.	.
Bromodichloromethane	.	6	.	.	.	.	.	.
Bromoform	.	6	.	.	.	.	.	.
Bromomethane	.	6	.	.	.	.	.	.
Carbon Tetrachloride	.	6	.	.	.	.	.	.
Carbon disulfide	.	6	.	.	.	.	.	.
Chlorobenzene	.	6	.	.	.	.	.	.
Chloroethane	.	6	.	.	.	.	.	.
Chloroform	.	6	.	.	.	.	.	.
Chloromethane	.	6	.	.	.	.	.	.
Dibromochloromethane	.	6	.	.	.	.	.	.
Ethylbenzene	2	6	0	0	0	0	0	0
Methylene chloride	.	6	.	.	.	.	.	.
Styrene	.	6	.	.	.	.	.	.
Tetrachloroethene	2	6	0	0	0	0	0	0
Toluene	3	6	0	0	0	0	0	0
Trichloroethene	.	6	.	.	.	.	.	.
Vinyl chloride	.	6	.	.	.	.	.	.
Xylenes, Total	3	6	0	0	0	0	0	0
cis-1,3-Dichloropropene	.	6	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	6	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000479

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000480

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.5" - 1.0")					
INORGANICS								
Aluminum	86	86	0	0	0	0	9	0
Antimony	6	67	1	0	0	0	6	0
Arsenic	73	86	73	0	0	0	14	0
Barium	86	86	0	0	0	0	17	0
Beryllium	21	84	21	0	0	0	4	0
Cadmium	25	86	0	0	0	0	7	0
Calcium	86	86	0	0	0	0	0	0
Chromium	74	86	1	2	0	0	25	0
Cobalt	51	86	0	0	0	0	2	0
Copper	65	85	0	0	0	0	11	0
Iron	86	86	0	0	0	0	4	0
Lead	72	85	0	5	0	0	39	0
Magnesium	86	86	0	0	0	0	2	0
Manganese	86	86	86	0	0	0	9	0
Mercury	13	83	0	0	0	0	13	0
Nickel	60	86	0	0	0	0	8	0
Potassium	68	86	0	0	0	0	14	0
Selenium	9	68	0	0	0	0	9	0
Silver	30	86	0	0	0	0	2	0
Sodium	68	86	0	0	0	0	20	0
Thallium	1	80	0	0	0	0	0	0
Vanadium	68	86	0	0	0	0	10	0
Zinc	74	86	0	0	0	0	19	0

a There are no TCLP limits for radionuclides.

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.5" - 1.0")					
PESTICIDES								
4,4'-DDD	.	2	.	.	.	.	.	.
4,4'-DDE	.	2	.	.	.	.	.	.
4,4'-DDT	.	2	.	.	.	.	.	.
Aldrin	.	2	.	.	.	.	.	.
Aroclor-1016	.	2	.	.	.	.	.	.
Aroclor-1221	.	2	.	.	.	.	.	.
Aroclor-1232	.	2	.	.	.	.	.	.
Aroclor-1242	.	2	.	.	.	.	.	.
Aroclor-1248	.	2	.	.	.	.	.	.
Aroclor-1254	2	2	2	0	0	0	0	0
Aroclor-1260	1	2	1	0	0	0	0	0
Dieldrin	.	2	.	.	.	.	.	.
Endosulfan II	.	2	.	.	.	.	.	.
Endosulfan sulfate	.	2	.	.	.	.	.	.
Endosulfan-I	.	2	.	.	.	.	.	.
Endrin	.	2	.	.	.	.	.	.
Endrin aldehyde	.	2	.	.	.	.	.	.
Endrin ketone	.	2	.	.	.	.	.	.
Heptachlor	.	2	.	.	.	.	.	.
Heptachlor epoxide	.	2	.	.	.	.	.	.
Methoxychlor	.	2	.	.	.	.	.	.
Toxaphene	.	2	.	.	.	.	.	.
alpha-BHC	.	2	.	.	.	.	.	.
alpha-Chlordane	.	2	.	.	.	.	.	.
beta-BHC	.	2	.	.	.	.	.	.
delta-BHC	.	2	.	.	.	.	.	.
gamma-BHC (Lindane)	.	2	.	.	.	.	.	.
gamma-Chlordane	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000481

A 7397

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.5" - 1.0")					
RADIONUCLIDES								
Americium-241	20	81	8	NA [a]	0	0	14	0
Cesium-137	15	85	15	NA [a]	0	0	15	0
Lead-210	47	84	47	NA [a]	0	0	18	0
Neptunium-237	13	85	13	NA [a]	0	0	6	0
Plutonium-238	28	85	11	NA [a]	0	0	14	0
Plutonium-239/240	34	84	9	NA [a]	0	0	15	0
Plutonium-241	19	50	4	NA [a]	0	0	13	0
Polonium-210	76	84	41	NA [a]	0	0	9	0
Radium-226	81	82	81	NA [a]	0	0	23	0
Radium-228	53	85	19	NA [a]	0	0	30	0
Strontium-90	13	82	1	NA [a]	0	0	1	0
Technetium-99	63	84	2	NA [a]	0	0	57	0
Thorium-227	8	11	9	NA [a]	0	0	4	0
Thorium-228	70	84	70	NA [a]	0	1	19	0
Thorium-230	81	84	16	NA [a]	0	0	37	0
Thorium-232	76	84	6	NA [a]	0	1	16	0
Uranium, Total	85	85	85	NA [a]	15	0	66	0
Uranium-234	83	84	55	NA [a]	12	0	53	0
Uranium-235/236	72	84	72	NA [a]	17	0	46	0
Uranium-238	83	84	83	NA [a]	15	0	49	0

a There are no TCLP limits for radionuclides.

000482

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
	CONCRETE CORE (0.5" - 1.0")							
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	.	1	.	.	.	.	.	.
1,2-Dichlorobenzene	.	1	.	.	.	.	.	.
1,3-Dichlorobenzene	.	1	.	.	.	.	.	.
1,4-Dichlorobenzene	.	1	.	.	.	.	.	.
2,4-Dinitrotoluene	.	1	.	.	.	.	.	.
2,6-Dinitrotoluene	.	1	.	.	.	.	.	.
2-Chloronaphthalene	.	1	.	.	.	.	.	.
2-Methylnaphthalene	.	1	.	.	.	.	.	.
2-Nitroaniline	.	1	.	.	.	.	.	.
3-Nitroaniline	.	1	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	1	.	.	.	.	.	.
4-Chlorophenylphenyl ether	.	1	.	.	.	.	.	.
4-Nitroaniline	.	1	.	.	.	.	.	.
Acenaphthene	.	1	.	.	.	.	.	.
Acenaphthylene	.	1	.	.	.	.	.	.
Anthracene	.	1	.	.	.	.	.	.
Benzo(a)anthracene	.	1	.	.	.	.	.	.
Benzo(a)pyrene	.	1	.	.	.	.	.	.
Benzo(b)fluoranthene	.	1	.	.	.	.	.	.
Benzo(g,h,i)perylene	.	1	.	.	.	.	.	.
Benzo(k)fluoranthene	.	1	.	.	.	.	.	.
Butyl benzyl phthalate	.	1	.	.	.	.	.	.
Carbazole	.	1	.	.	.	.	.	.
Chrysene	.	1	.	.	.	.	.	.
Di-n-butyl phthalate	.	1	.	.	.	.	.	.
Di-n-octyl phthalate	.	1	.	.	.	.	.	.
Dibenzo(a,h)anthracene	.	1	.	.	.	.	.	.
Dibenzofuran	.	1	.	.	.	.	.	.
Diethyl phthalate	.	1	.	.	.	.	.	.
Dimethyl phthalate	.	1	.	.	.	.	.	.
Fluoranthene	.	1	.	.	.	.	.	.
Fluorene	.	1	.	.	.	.	.	.
Hexachlorobenzene	.	1	.	.	.	.	.	.
Hexachlorobutadiene	.	1	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	1	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000483

2692

000484

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.5" - 1.0")					
SEMIVOLATILE ORGANICS (cont.)								
Hexachloroethane	.	1	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	.	1	.	.	.	.	.	.
Isophorone	.	1	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	1	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	1	.	.	.	.	.	.
Naphthalene	.	1	.	.	.	.	.	.
Nitrobenzene	.	1	.	.	.	.	.	.
Phenanthrene	.	1	.	.	.	.	.	.
Pyrene	.	1	.	.	.	.	.	.
bis(2-Chloroethoxy)methane	.	1	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	1	.	.	.	.	.	.
bis(2-Chloroisopropyl) ether	.	1	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	.	1	.	.	.	.	.	.
p-Chloroaniline	.	1	.	.	.	.	.	.
VOLATILE ORGANICS								
1,1,1-Trichloroethane	1	6	0	0	0	0	0	0
1,1,2,2-Tetrachloroethane	.	6	.	.	.	.	.	.
1,1,2-Trichloroethane	.	6	.	.	.	.	.	.
1,1-Dichloroethane	.	6	.	.	.	.	.	.
1,1-Dichloroethene	.	6	.	.	.	.	.	.
1,2-Dichloroethane	.	6	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	6	.	.	.	.	.	.
1,2-Dichloropropane	.	6	.	.	.	.	.	.
2-Butanone	.	6	.	.	.	.	.	.
2-Hexanone	.	6	.	.	.	.	.	.
4-Methyl-2-pentanone	1	6	0	0	0	0	0	0
Acetone	.	1	.	.	.	.	.	.
Benzene	.	6	.	.	.	.	.	.
Bromodichloromethane	.	6	.	.	.	.	.	.
Bromoform	.	6	.	.	.	.	.	.
Bromomethane	.	6	.	.	.	.	.	.
Carbon Tetrachloride	.	6	.	.	.	.	.	.
Carbon disulfide	.	6	.	.	.	.	.	.
Chlorobenzene	.	6	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TABLE A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE (0.5" - 1.0")					
VOLATILE ORGANICS (cont.)								
Chloroethane	.	6	.	.	.	.	.	.
Chloroform	.	6	.	.	.	.	.	.
Chloromethane	.	6	.	.	.	.	.	.
Dibromochloromethane	.	6	.	.	.	.	.	.
Ethylbenzene	2	6	0	0	0	0	0	0
Methylene chloride	.	6	.	.	.	.	.	.
Styrene	.	6	.	.	.	.	.	.
Tetrachloroethene	1	6	0	0	0	0	0	0
Toluene	3	6	0	0	0	0	0	0
Trichloroethene	.	6	.	.	.	.	.	.
Vinyl chloride	.	6	.	.	.	.	.	.
Xylenes, Total	3	6	0	0	0	0	0	0
cis-1,3-Dichloropropene	.	6	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	6	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000485

2692

000486

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
CONCRETE CORE [1.0" - 4.0" (6.0")]								
INORGANICS								
Aluminum	77	77	0	0	0	0	5	0
Antimony	4	59	1	0	0	0	3	0
Arsenic	63	76	63	0	0	0	8	0
Barium	77	77	0	0	0	0	12	0
Beryllium	14	75	14	0	0	0	6	0
Cadmium	31	77	0	0	0	0	8	0
Calcium	77	77	0	0	0	0	1	0
Chromium	62	77	0	1	0	0	17	0
Cobalt	46	77	0	0	0	0	4	0
Copper	56	76	0	0	0	0	7	0
Iron	77	77	0	0	0	0	4	0
Lead	60	77	0	0	0	0	22	0
Magnesium	77	77	0	0	0	0	3	0
Manganese	77	77	76	0	0	0	5	0
Mercury	11	74	0	0	0	0	9	0
Nickel	56	77	0	0	0	0	3	0
Potassium	59	77	0	0	0	0	7	0
Selenium	7	58	0	0	0	0	6	0
Silver	41	77	0	0	0	0	6	0
Sodium	59	77	0	0	0	0	3	0
Thallium	2	71	0	0	0	0	0	0
Vanadium	62	77	2	0	0	0	11	0
Zinc	64	77	0	0	0	0	8	0

a There are no TCLP limits for radionuclides.

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE [1.0" - 4.0" (6.0")]					
PESTICIDES								
4,4'-DDD	.	2	.	.	.	.	.	.
4,4'-DDE	.	2	.	.	.	.	.	.
4,4'-DDT	.	2	.	.	.	.	.	.
Aldrin	.	2	.	.	.	.	.	.
Aroclor-1016	.	2	.	.	.	.	.	.
Aroclor-1221	.	2	.	.	.	.	.	.
Aroclor-1232	.	2	.	.	.	.	.	.
Aroclor-1242	.	2	.	.	.	.	.	.
Aroclor-1248	.	2	.	.	.	.	.	.
Aroclor-1254	2	2	2	0	0	0	0	0
Aroclor-1260	1	2	1	0	0	0	0	0
Dieldrin	.	2	.	.	.	.	.	.
Endosulfan II	.	2	.	.	.	.	.	.
Endosulfan sulfate	.	2	.	.	.	.	.	.
Endosulfan-I	.	2	.	.	.	.	.	.
Endrin	.	2	.	.	.	.	.	.
Endrin aldehyde	.	2	.	.	.	.	.	.
Endrin ketone	.	2	.	.	.	.	.	.
Heptachlor	.	2	.	.	.	.	.	.
Heptachlor epoxide	.	2	.	.	.	.	.	.
Methoxychlor	.	2	.	.	.	.	.	.
Toxaphene	.	2	.	.	.	.	.	.
alpha-BHC	.	2	.	.	.	.	.	.
alpha-Chlordane	.	2	.	.	.	.	.	.
beta-BHC	.	2	.	.	.	.	.	.
delta-BHC	.	2	.	.	.	.	.	.
gamma-BHC (Lindane)	.	2	.	.	.	.	.	.
gamma-Chlordane	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000487

2397

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE [1.0" - 4.0" (6.0")]					
RADIONUCLIDES								
Americium-241	9	84	1	NA [a]	0	0	6	0
Cesium-137	6	85	6	NA [a]	0	0	5	0
Lead-210	56	84	56	NA [a]	0	0	10	0
Neptunium-237	9	85	9	NA [a]	0	0	2	0
Plutonium-238	18	83	4	NA [a]	0	0	5	0
Plutonium-239/240	17	81	3	NA [a]	0	0	7	0
Plutonium-241	9	46	1	NA [a]	0	0	5	0
Polonium-210	75	84	32	NA [a]	0	0	4	0
Radium-226	81	81	81	NA [a]	0	0	13	0
Radium-228	49	85	16	NA [a]	0	0	24	0
Strontium-90	10	82	3	NA [a]	0	0	1	0
Technetium-99	45	84	2	NA [a]	0	0	41	0
Thorium-227	8	11	9	NA [a]	0	0	2	0
Thorium-228	78	84	78	NA [a]	0	0	14	0
Thorium-230	80	84	5	NA [a]	0	0	21	0
Thorium-232	76	84	3	NA [a]	0	0	12	0
Uranium, Total	85	85	85	NA [a]	3	0	44	0
Uranium-234	82	85	40	NA [a]	4	0	39	0
Uranium-235/236	69	85	69	NA [a]	3	0	31	0
Uranium-238	83	85	83	NA [a]	3	0	31	0

a There are no TCLP limits for radionuclides.

000488

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE [1.0" - 4.0" (6.0")]					
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	.	1	.	.	.	.	.	.
1,2-Dichlorobenzene	.	1	.	.	.	.	.	.
1,3-Dichlorobenzene	.	1	.	.	.	.	.	.
1,4-Dichlorobenzene	.	1	.	.	.	.	.	.
2,2-oxybis(1-Chloropropane)	.	1	.	.	.	.	.	.
2,4-Dinitrotoluene	.	1	.	.	.	.	.	.
2,6-Dinitrotoluene	.	1	.	.	.	.	.	.
2-Chloronaphthalene	.	1	.	.	.	.	.	.
2-Methylnaphthalene	.	1	.	.	.	.	.	.
2-Nitroaniline	.	1	.	.	.	.	.	.
3,3'-Dichlorobenzidine	.	1	.	.	.	.	.	.
3-Nitroaniline	.	1	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	1	.	.	.	.	.	.
4-Chlorophenylphenyl ether	.	1	.	.	.	.	.	.
4-Nitroaniline	.	1	.	.	.	.	.	.
Acenaphthene	.	1	.	.	.	.	.	.
Acenaphthylene	.	1	.	.	.	.	.	.
Anthracene	.	1	.	.	.	.	.	.
Benzo(a)anthracene	.	1	.	.	.	.	.	.
Benzo(a)pyrene	.	1	.	.	.	.	.	.
Benzo(b)fluoranthene	.	1	.	.	.	.	.	.
Benzo(g,h,i)perylene	.	1	.	.	.	.	.	.
Benzo(k)fluoranthene	.	1	.	.	.	.	.	.
Butyl benzyl phthalate	.	1	.	.	.	.	.	.
Carbazole	.	1	.	.	.	.	.	.
Chrysene	.	1	.	.	.	.	.	.
Di-n-butyl phthalate	.	1	.	.	.	.	.	.
Dibenzo(a,h)anthracene	.	1	.	.	.	.	.	.
Dibenzofuran	.	1	.	.	.	.	.	.
Diethyl phthalate	.	1	.	.	.	.	.	.
Dimethyl phthalate	.	1	.	.	.	.	.	.
Fluoranthene	.	1	.	.	.	.	.	.
Fluorene	.	1	.	.	.	.	.	.
Hexachlorobenzene	.	1	.	.	.	.	.	.
Hexachlorobutadiene	.	1	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000489

7397

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE [1.0" - 4.0" (6.0")]					
SEMIVOLATILE ORGANICS (cont.)								
Hexachlorocyclopentadiene	.	1	.	.	.	.	.	.
Hexachloroethane	.	1	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	.	1	.	.	.	.	.	.
Isophorone	.	1	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	1	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	1	.	.	.	.	.	.
Naphthalene	.	1	.	.	.	.	.	.
Nitrobenzene	.	1	.	.	.	.	.	.
Phenanthrene	.	1	.	.	.	.	.	.
Pyrene	.	1	.	.	.	.	.	.
bis(2-Chloroethoxy)methane	.	1	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	1	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	.	1	.	.	.	.	.	.
p-Chloroaniline	.	1	.	.	.	.	.	.
VOLATILE ORGANICS								
1,1,1-Trichloroethane	.	6	.	.	.	.	.	.
1,1,2,2-Tetrachloroethane	.	6	.	.	.	.	.	.
1,1,2-Trichloroethane	.	6	.	.	.	.	.	.
1,1-Dichloroethane	.	6	.	.	.	.	.	.
1,1-Dichloroethene	.	6	.	.	.	.	.	.
1,2-Dichloroethane	.	6	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	6	.	.	.	.	.	.
1,2-Dichloropropane	.	6	.	.	.	.	.	.
2-Butanone	.	6	.	.	.	.	.	.
2-Hexanone	.	6	.	.	.	.	.	.
4-Methyl-2-pentanone	.	6	.	.	.	.	.	.
Acetone	.	1	.	.	.	.	.	.
Benzene	.	6	.	.	.	.	.	.
Bromodichloromethane	.	6	.	.	.	.	.	.
Bromoform	.	6	.	.	.	.	.	.
Bromomethane	.	6	.	.	.	.	.	.
Carbon Tetrachloride	.	6	.	.	.	.	.	.
Carbon disulfide	.	6	.	.	.	.	.	.
Chlorobenzene	.	6	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible] A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			CONCRETE CORE [1.0" - 4.0" (6.0")]					
VOLATILE ORGANICS (cont.)								
Chloroethane	.	6	.	.	.	.	.	.
Chloroform	.	6	.	.	.	.	.	.
Chloromethane	.	6	.	.	.	.	.	.
Dibromochloromethane	.	6	.	.	.	.	.	.
Ethylbenzene	3	6	0	0	0	0	0	0
Methylene chloride	.	6	.	.	.	.	.	.
Styrene	.	6	.	.	.	.	.	.
Tetrachloroethene	3	6	0	0	0	0	0	0
Toluene	1	6	0	0	0	0	0	0
Trichloroethene	.	6	.	.	.	.	.	.
Vinyl chloride	.	6	.	.	.	.	.	.
Xylenes, Total	2	6	0	0	0	0	0	0
cis-1,3-Dichloropropene	.	6	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	6	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000491

7397

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			HVAC FILTERS					
INORGANICS								
Aluminum	1	1	0	0	0	0	0	0
Antimony	.	1	.	.	.	.	.	.
Arsenic	1	1	1	0	0	0	0	0
Barium	.	1	.	.	.	.	.	.
Beryllium	.	1	.	.	.	.	.	.
Cadmium	1	1	0	0	0	0	0	0
Calcium	1	1	0	0	0	0	0	0
Chromium	1	1	1	1	0	0	0	0
Cobalt	.	1	.	.	.	.	.	.
Copper	.	1	.	.	.	.	.	.
Iron	1	1	0	0	0	0	0	0
Lead	1	1	0	0	0	0	0	0
Magnesium	1	1	0	0	0	0	0	0
Manganese	1	1	0	0	0	0	0	0
Mercury	.	1	.	.	.	.	.	.
Nickel	1	1	0	0	0	0	0	0
Potassium	1	1	0	0	0	0	0	0
Selenium	1	1	0	0	0	0	0	0
Silver	.	1	.	.	.	.	.	.
Sodium	1	1	0	0	0	0	0	0
Thallium	.	1	.	.	.	.	.	.
Vanadium	.	1	.	.	.	.	.	.
Zinc	1	1	0	0	0	0	0	0

a There are no TCLP limits for radionuclides.

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			HVAC FILTERS					
RADIONUCLIDES								
Americium-241	1	4	1	NA [a]	0	0	0	0
Cesium-137	.	4	.	NA [a]	.	.	.	.
Lead-210	2	4	2	NA [a]	0	0	0	0
Neptunium-237	.	4	.	NA [a]	.	.	.	.
Plutonium-238	.	4	.	NA [a]	.	.	.	.
Plutonium-239/240	.	4	.	NA [a]	.	.	.	.
Plutonium-241	.	1	.	NA [a]	.	.	.	.
Polonium-210	1	2	1	NA [a]	0	0	0	0
Radium-226	3	4	3	NA [a]	0	0	0	0
Radium-228	3	4	0	NA [a]	0	0	0	0
Strontium-90	.	4	.	NA [a]	.	.	.	.
Technetium-99	1	4	0	NA [a]	0	0	0	0
Thorium-227	0	1	1	NA [a]	0	0	0	0
Thorium-228	1	4	1	NA [a]	0	0	0	0
Thorium-230	3	4	1	NA [a]	0	0	0	0
Thorium-232	3	4	1	NA [a]	0	0	0	0
Uranium, Total	4	4	4	NA [a]	0	0	0	0
Uranium-234	2	3	1	NA [a]	1	0	0	0
Uranium-235/236	1	3	1	NA [a]	1	0	0	0
Uranium-238	3	3	1	NA [a]	1	0	0	0

a There are no TCLP limits for radionuclides.

000493

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000494

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			LOOSE MEDIA					
INORGANICS								
Aluminum	70	71	0	0	0	0	0	0
Antimony	28	64	12	0	0	0	0	0
Arsenic	66	70	66	5	0	0	0	0
Barium	71	71	3	3	0	0	0	0
Beryllium	15	70	15	0	0	0	0	0
Cadmium	45	71	12	5	0	0	0	0
Calcium	68	71	0	0	0	0	0	0
Chromium	68	71	24	31	0	0	0	0
Cobalt	56	71	0	0	0	0	0	0
Copper	69	71	9	0	0	0	0	0
Iron	71	71	0	0	0	0	0	0
Lead	64	71	0	53	0	0	0	0
Magnesium	70	71	0	0	0	0	0	0
Manganese	71	71	66	0	0	0	0	0
Mercury	45	70	6	11	0	0	0	0
Nickel	63	71	5	0	0	0	0	0
Potassium	59	71	0	0	0	0	0	0
Selenium	21	67	1	4	0	0	0	0
Silver	41	68	5	5	0	0	0	0
Sodium	61	71	0	0	0	0	0	0
Thallium	4	67	0	0	0	0	0	0
Vanadium	48	68	1	0	0	0	0	0
Zinc	67	71	2	0	0	0	0	0

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			LOOSE MEDIA					
PESTICIDES								
4,4'-DDD	.	2	.	.	.	.	.	.
4,4'-DDE	.	2	.	.	.	.	.	.
4,4'-DDT	.	2	.	.	.	.	.	.
Aldrin	.	2	.	.	.	.	.	.
Aroclor-1016	.	2	.	.	.	.	.	.
Aroclor-1221	.	2	.	.	.	.	.	.
Aroclor-1232	.	2	.	.	.	.	.	.
Aroclor-1242	.	2	.	.	.	.	.	.
Aroclor-1248	.	2	.	.	.	.	.	.
Aroclor-1254	1	2	1	0	0	0	0	0
Aroclor-1260	1	2	1	0	0	0	0	0
Dieldrin	.	2	.	.	.	.	.	.
Endosulfan II	.	2	.	.	.	.	.	.
Endosulfan sulfate	.	2	.	.	.	.	.	.
Endosulfan-I	.	2	.	.	.	.	.	.
Endrin	.	2	.	.	.	.	.	.
Endrin aldehyde	.	2	.	.	.	.	.	.
Endrin ketone	.	2	.	.	.	.	.	.
Heptachlor	.	2	.	.	.	.	.	.
Heptachlor epoxide	.	2	.	.	.	.	.	.
Methoxychlor	1	2	0	0	0	0	0	0
Toxaphene	.	2	.	.	.	.	.	.
alpha-BHC	.	2	.	.	.	.	.	.
alpha-Chlordane	.	2	.	.	.	.	.	.
beta-BHC	.	2	.	.	.	.	.	.
delta-BHC	.	2	.	.	.	.	.	.
gamma-BHC (Lindane)	.	2	.	.	.	.	.	.
gamma-Chlordane	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			LOOSE MEDIA					
RADIONUCLIDES								
Americium-241	49	67	39	NA [a]	0	0	0	0
Cesium-137	51	69	51	NA [a]	0	0	0	0
Lead-210	51	69	51	NA [a]	0	0	0	0
Neptunium-237	48	64	48	NA [a]	0	0	0	0
Plutonium-238	49	67	34	NA [a]	0	0	0	0
Plutonium-239/240	55	67	51	NA [a]	0	0	0	0
Plutonium-241	29	54	12	NA [a]	0	0	0	0
Polonium-210	66	66	63	NA [a]	0	0	0	0
Radium-226	60	64	60	NA [a]	0	0	0	0
Radium-228	60	64	57	NA [a]	0	1	0	0
Strontium-90	37	69	8	NA [a]	0	0	0	0
Technetium-99	65	68	38	NA [a]	0	0	0	0
Thorium-227	0	5	5	NA [a]	0	0	0	0
Thorium-228	65	68	65	NA [a]	0	1	0	0
Thorium-230	68	68	60	NA [a]	0	0	0	0
Thorium-232	65	68	21	NA [a]	0	0	0	0
Uranium, Total	69	69	69	NA [a]	50	0	0	0
Uranium-234	68	68	67	NA [a]	47	4	0	0
Uranium-235/236	68	68	68	NA [a]	52	12	0	0
Uranium-238	68	68	68	NA [a]	51	7	0	0

a There are no TCLP limits for radionuclides.

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			LOOSE MEDIA					
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	1	71	0	0	0	0	0	0
1,2-Dichlorobenzene	.	71	.	.	.	.	.	.
1,3-Dichlorobenzene	.	71	.	.	.	.	.	.
1,4-Dichlorobenzene	1	71	1	0	0	0	0	0
2,2-oxybis(1-Chloropropane)	.	46	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	70	.	.	.	.	.	.
2,4,6-Trichlorophenol	1	70	0	0	0	0	0	0
2,4-Dichlorophenol	4	70	0	0	0	0	0	0
2,4-Dimethylphenol	2	70	0	0	0	0	0	0
2,4-Dinitrophenol	.	65	.	.	.	.	.	.
2,4-Dinitrotoluene	1	70	1	1	0	0	0	0
2,6-Dinitrotoluene	.	71	.	.	.	.	.	.
2-Chloronaphthalene	.	71	.	.	.	.	.	.
2-Chlorophenol	1	70	0	0	0	0	0	0
2-Methylnaphthalene	23	71	0	0	0	0	0	0
2-Nitroaniline	.	71	.	.	.	.	.	.
2-Nitrophenol	.	70	.	.	.	.	.	.
3,3'-Dichlorobenzidine	.	64	.	.	.	.	.	.
3-Nitroaniline	.	67	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	70	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	71	.	.	.	.	.	.
4-Chloro-3-methylphenol	1	70	0	0	0	0	0	0
4-Chlorophenylphenyl ether	.	71	.	.	.	.	.	.
4-Nitroaniline	.	68	.	.	.	.	.	.
4-Nitrophenol	1	69	0	0	0	0	0	0
Acenaphthene	27	71	0	0	0	0	0	0
Acenaphthylene	7	71	0	0	0	0	0	0
Anthracene	30	71	0	0	0	0	0	0
Benzo(a)anthracene	48	71	47	0	0	0	0	0
Benzo(a)pyrene	42	70	42	0	0	0	0	0
Benzo(b)fluoranthene	52	70	51	0	0	0	0	0
Benzo(g,h,i)perylene	37	70	0	0	0	0	0	0
Benzo(k)fluoranthene	40	70	36	0	0	0	0	0
Butyl benzyl phthalate	20	71	0	0	0	0	0	0
Carbazole	30	70	7	0	0	0	0	0

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			LOOSE MEDIA					
SEMIVOLATILE ORGANICS (cont.)								
Chrysene	56	71	22	0	0	0	0	0
Di-n-butyl phthalate	30	71	0	0	0	0	0	0
Di-n-octyl phthalate	24	71	0	0	0	0	0	0
Dibenzo(a,h)anthracene	10	70	10	0	0	0	0	0
Dibenzofuran	25	71	0	0	0	0	0	0
Diethyl phthalate	8	71	0	0	0	0	0	0
Dimethyl phthalate	3	71	0	0	0	0	0	0
Fluoranthene	61	71	0	0	0	0	0	0
Fluorene	27	71	0	0	0	0	0	0
Hexachlorobenzene	.	71	.	.	.	.	.	.
Hexachlorobutadiene	.	71	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	71	.	.	.	.	.	.
Hexachloroethane	.	71	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	45	70	44	0	0	0	0	0
Isophorone	1	71	0	0	0	0	0	0
N-Nitroso-di-n-propylamine	1	71	1	0	0	0	0	0
N-Nitrosodiphenylamine	.	71	.	.	.	.	.	.
Naphthalene	29	71	0	0	0	0	0	0
Nitrobenzene	1	71	0	0	0	0	0	0
Pentachlorophenol	2	69	2	0	0	0	0	0
Phenanthrene	60	71	0	0	0	0	0	0
Phenol	12	70	0	0	0	0	0	0
Pyrene	61	71	0	0	0	0	0	0
bis(2-Chloroethoxy)methane	.	71	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	71	.	.	.	.	.	.
bis(2-Chloroisopropyl) ether	.	13	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	25	71	16	0	0	0	0	0
o-Methylphenol	5	70	0	0	0	0	0	0
p-Chloroaniline	1	67	0	0	0	0	0	0
p-Methylphenol	20	70	0	0	0	0	0	0
VOLATILE ORGANICS								
1,1,1-Trichloroethane	5	68	0	0	0	0	0	0
1,1,2,2-Tetrachloroethane	.	66	.	.	.	.	.	.
1,1,2-Trichloroethane	.	68	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			LOOSE MEDIA					
VOLATILE ORGANICS (cont.)								
1,1-Dichloroethane	.	71	.	.	.	.	.	.
1,1-Dichloroethene	.	71	.	.	.	.	.	.
1,2-Dichloroethane	.	71	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	69	.	.	.	.	.	.
1,2-Dichloropropane	.	68	.	.	.	.	.	.
2-Butanone	9	70	0	0	0	0	0	0
2-Hexanone	.	60	.	.	.	.	.	.
4-Chloroaniline	.	1	.	.	.	.	.	.
4-Methyl-2-pentanone	5	65	0	0	0	0	0	0
Acetone	8	52	0	0	0	0	0	0
Benzene	3	68	1	0	0	0	0	0
Bromodichloromethane	.	68	.	.	.	.	.	.
Bromoform	2	68	0	0	0	0	0	0
Bromomethane	.	71	.	.	.	.	.	.
Carbon Tetrachloride	.	68	.	.	.	.	.	.
Carbon disulfide	1	71	0	0	0	0	0	0
Chlorobenzene	1	66	0	0	0	0	0	0
Chloroethane	.	71	.	.	.	.	.	.
Chloroform	.	71	.	.	.	.	.	.
Chloromethane	.	71	.	.	.	.	.	.
Dibromochloromethane	.	68	.	.	.	.	.	.
Ethylbenzene	11	66	0	0	0	0	0	0
Methylene chloride	5	71	0	0	0	0	0	0
Styrene	8	66	1	0	0	0	0	0
Tetrachloroethene	6	66	0	0	0	0	0	0
Toluene	14	66	0	0	0	0	0	0
Trichloroethene	1	68	0	0	0	0	0	0
Trichlorofluoromethane	.	9	.	.	.	.	.	.
Vinyl chloride	.	71	.	.	.	.	.	.
Xylenes, Total	18	66	0	0	0	0	0	0
cis-1,3-Dichloropropene	.	68	.	.	.	.	.	.
m,p-Xylene	1	1	0	0	0	0	0	0
o-Xylene	1	1	0	0	0	0	0	0
trans-1,2-Dichloroethene	.	1	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	68	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			MASONRY CHIPS					
INORGANICS								
Aluminum	60	60	0	0	0	0	4	0
Antimony	4	49	0	0	0	0	4	0
Arsenic	55	60	55	0	0	0	3	0
Barium	60	60	1	1	0	0	27	0
Beryllium	17	60	17	0	0	0	0	0
Cadmium	12	60	2	1	0	0	3	0
Calcium	60	60	0	0	0	0	0	0
Chromium	59	60	1	1	0	0	36	0
Cobalt	35	60	0	0	0	0	11	0
Copper	49	57	0	0	0	0	10	0
Iron	60	60	0	0	0	0	0	0
Lead	57	59	0	23	0	0	48	0
Magnesium	60	60	0	0	0	0	0	0
Manganese	60	60	55	0	0	0	0	0
Mercury	42	60	0	2	0	0	42	0
Nickel	40	60	0	0	0	0	5	0
Potassium	47	60	0	0	0	0	13	0
Selenium	3	53	0	0	0	0	3	0
Silver	5	60	0	0	0	0	1	0
Sodium	51	60	0	0	0	0	12	0
Thallium	5	57	0	0	0	0	0	0
Vanadium	46	60	0	0	0	0	4	0
Zinc	58	60	0	0	0	0	42	0

a There are no TCLP limits for radionuclides.

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			MASONRY CHIPS					
RADIONUCLIDES								
Americium-241	16	57	7	NA [a]	0	0	14	0
Cesium-137	10	58	10	NA [a]	0	0	10	0
Lead-210	38	55	38	NA [a]	0	0	21	0
Neptunium-237	18	58	18	NA [a]	0	0	12	0
Plutonium-238	23	58	10	NA [a]	0	0	15	0
Plutonium-239/240	18	58	5	NA [a]	0	0	8	0
Plutonium-241	7	35	1	NA [a]	0	0	7	0
Polonium-210	54	58	29	NA [a]	0	0	10	0
Radium-226	58	58	58	NA [a]	0	2	15	0
Radium-228	45	57	16	NA [a]	0	0	30	0
Strontium-90	11	56	4	NA [a]	0	0	2	0
Technetium-99	38	58	1	NA [a]	0	0	35	0
Thorium-227	2	4	4	NA [a]	0	0	2	0
Thorium-228	51	58	51	NA [a]	0	0	17	0
Thorium-230	56	58	9	NA [a]	0	0	24	0
Thorium-232	51	58	4	NA [a]	0	0	18	0
Uranium, Total	58	58	58	NA [a]	11	0	46	0
Uranium-234	55	56	41	NA [a]	10	0	41	0
Uranium-235/236	51	56	51	NA [a]	15	0	34	0
Uranium-238	55	56	55	NA [a]	11	0	37	0

a There are no TCLP limits for radionuclides.

000501

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			MASONRY CHIPS					
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	.	2	.	.	.	.	.	.
1,2-Dichlorobenzene	.	2	.	.	.	.	.	.
1,3-Dichlorobenzene	.	2	.	.	.	.	.	.
1,4-Dichlorobenzene	.	2	.	.	.	.	.	.
2,2-oxybis(1-Chloropropane)	.	1	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	2	.	.	.	.	.	.
2,4,6-Trichlorophenol	.	2	.	.	.	.	.	.
2,4-Dichlorophenol	.	2	.	.	.	.	.	.
2,4-Dimethylphenol	.	2	.	.	.	.	.	.
2,4-Dinitrophenol	.	1	.	.	.	.	.	.
2,4-Dinitrotoluene	.	2	.	.	.	.	.	.
2,6-Dinitrotoluene	.	2	.	.	.	.	.	.
2-Chloronaphthalene	.	2	.	.	.	.	.	.
2-Chlorophenol	.	2	.	.	.	.	.	.
2-Methylnaphthalene	.	2	.	.	.	.	.	.
2-Nitroaniline	.	2	.	.	.	.	.	.
2-Nitrophenol	.	2	.	.	.	.	.	.
3,3'-Dichlorobenzidine	.	2	.	.	.	.	.	.
3-Nitroaniline	.	2	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	2	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	2	.	.	.	.	.	.
4-Chloro-3-methylphenol	.	2	.	.	.	.	.	.
4-Chlorophenylphenyl ether	.	2	.	.	.	.	.	.
4-Nitroaniline	.	2	.	.	.	.	.	.
4-Nitrophenol	.	2	.	.	.	.	.	.
Acenaphthene	.	2	.	.	.	.	.	.
Acenaphthylene	.	2	.	.	.	.	.	.
Anthracene	.	2	.	.	.	.	.	.
Benzo(a)anthracene	.	2	.	.	.	.	.	.
Benzo(a)pyrene	.	2	.	.	.	.	.	.
Benzo(b)fluoranthene	.	2	.	.	.	.	.	.
Benzo(g,h,i)perylene	.	2	.	.	.	.	.	.
Benzo(k)fluoranthene	.	2	.	.	.	.	.	.
Butyl benzyl phthalate	.	2	.	.	.	.	.	.
Carbazole	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			MASONRY CHIPS					
SEMIVOLATILE ORGANICS (cont.)								
Chrysene	.	2	.	.	.	.	.	.
Di-n-butyl phthalate	.	2	.	.	.	.	.	.
Di-n-octyl phthalate	.	2	.	.	.	.	.	.
Dibenzo(a,h)anthracene	.	2	.	.	.	.	.	.
Dibenzofuran	.	2	.	.	.	.	.	.
Diethyl phthalate	.	2	.	.	.	.	.	.
Dimethyl phthalate	.	2	.	.	.	.	.	.
Fluoranthene	.	2	.	.	.	.	.	.
Fluorene	.	2	.	.	.	.	.	.
Hexachlorobenzene	.	2	.	.	.	.	.	.
Hexachlorobutadiene	.	2	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	2	.	.	.	.	.	.
Hexachloroethane	.	2	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	.	2	.	.	.	.	.	.
Isophorone	.	2	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	2	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	2	.	.	.	.	.	.
Naphthalene	.	2	.	.	.	.	.	.
Nitrobenzene	.	2	.	.	.	.	.	.
Pentachlorophenol	.	2	.	.	.	.	.	.
Phenanthrene	.	2	.	.	.	.	.	.
Phenol	.	2	.	.	.	.	.	.
Pyrene	.	2	.	.	.	.	.	.
bis(2-Chloroethoxy)methane	.	2	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	2	.	.	.	.	.	.
bis(2-Chloroisopropyl) ether	.	1	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	.	2	.	.	.	.	.	.
o-Methylphenol	.	2	.	.	.	.	.	.
p-Chloroaniline	.	2	.	.	.	.	.	.
p-Methylphenol	.	2	.	.	.	.	.	.
VOLATILE ORGANICS								
1,1,1-Trichloroethane	1	2	0	0	0	0	0	0
1,1,2,2-Tetrachloroethane	.	2	.	.	.	.	.	.
1,1,2-Trichloroethane	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000503

7397

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			MASONRY CHIPS					
VOLATILE ORGANICS (cont.)								
1,1-Dichloroethane	.	2	.	.	.	.	.	.
1,1-Dichloroethene	.	2	.	.	.	.	.	.
1,2-Dichloroethane	.	2	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	2	.	.	.	.	.	.
1,2-Dichloropropane	.	2	.	.	.	.	.	.
2-Butanone	.	2	.	.	.	.	.	.
2-Hexanone	.	2	.	.	.	.	.	.
4-Methyl-2-pentanone	.	2	.	.	.	.	.	.
Acetone	.	2	.	.	.	.	.	.
Benzene	.	2	.	.	.	.	.	.
Bromodichloromethane	.	2	.	.	.	.	.	.
Bromoform	.	2	.	.	.	.	.	.
Bromomethane	.	2	.	.	.	.	.	.
Carbon Tetrachloride	.	2	.	.	.	.	.	.
Carbon disulfide	.	2	.	.	.	.	.	.
Chlorobenzene	.	2	.	.	.	.	.	.
Chloroethane	.	2	.	.	.	.	.	.
Chloroform	.	2	.	.	.	.	.	.
Chloromethane	.	2	.	.	.	.	.	.
Dibromochloromethane	.	2	.	.	.	.	.	.
Ethylbenzene	1	2	0	0	0	0	0	0
Methylene chloride	.	2	.	.	.	.	.	.
Styrene	.	2	.	.	.	.	.	.
Tetrachloroethene	.	2	.	.	.	.	.	.
Toluene	.	2	.	.	.	.	.	.
Trichloroethene	.	2	.	.	.	.	.	.
Vinyl chloride	.	2	.	.	.	.	.	.
Xylenes, Total	2	2	0	0	0	0	0	0
cis-1,3-Dichloropropene	.	2	.	.	.	.	.	.
m,p-Xylene	1	1	0	0	0	0	0	0
o-Xylene	1	1	0	0	0	0	0	0
trans-1,3-Dichloropropene	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000504

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
					OIL			
VOLATILE ORGANICS								
1,1,1-Trichloroethane	.	1	.	.	.	.	.	.
1,1,2,2-Tetrachloroethane	.	1	.	.	.	.	.	.
1,1,2-Trichloroethane	.	1	.	.	.	.	.	.
1,1-Dichloroethane	.	1	.	.	.	.	.	.
1,1-Dichloroethene	.	1	.	.	.	.	.	.
1,2-Dichloroethane	.	1	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	1	.	.	.	.	.	.
1,2-Dichloropropane	.	1	.	.	.	.	.	.
2-Butanone	.	1	.	.	.	.	.	.
2-Hexanone	.	1	.	.	.	.	.	.
4-Methyl-2-pentanone	.	1	.	.	.	.	.	.
Acetone	.	1	.	.	.	.	.	.
Benzene	.	1	.	.	.	.	.	.
Bromodichloromethane	.	1	.	.	.	.	.	.
Bromoform	.	1	.	.	.	.	.	.
Bromomethane	.	1	.	.	.	.	.	.
Carbon Tetrachloride	.	1	.	.	.	.	.	.
Carbon disulfide	.	1	.	.	.	.	.	.
Chlorobenzene	.	1	.	.	.	.	.	.
Chloroethane	.	1	.	.	.	.	.	.
Chloroform	.	1	.	.	.	.	.	.
Chloromethane	.	1	.	.	.	.	.	.
Dibromochloromethane	.	1	.	.	.	.	.	.
Ethylbenzene	.	1	.	.	.	.	.	.
Methylene chloride	1	1	1	0	0	0	0	0
Styrene	.	1	.	.	.	.	.	.
Tetrachloroethene	.	1	.	.	.	.	.	.
Toluene	1	1	0	0	0	0	0	0
Trichloroethene	.	1	.	.	.	.	.	.
Vinyl chloride	.	1	.	.	.	.	.	.
Xylenes, Total	.	1	.	.	.	.	.	.
cis-1,3-Dichloropropene	.	1	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	1	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000505

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (1st DEPTH)					
INORGANICS								
Aluminum	9	9	0	0	0	0	0	0
Antimony	.	9	.	.	.	.	.	.
Arsenic	9	9	9	0	0	0	0	0
Barium	9	9	0	0	0	0	0	0
Beryllium	6	9	6	0	0	0	0	0
Cadmium	.	9	.	.	.	.	.	.
Calcium	9	9	0	0	0	0	0	0
Chromium	9	9	0	0	0	0	0	0
Cobalt	9	9	0	0	0	0	0	0
Copper	9	9	0	0	0	0	0	0
Iron	9	9	0	0	0	0	0	0
Lead	9	9	0	1	0	0	0	0
Magnesium	9	9	0	0	0	0	0	0
Manganese	9	9	9	0	0	0	0	0
Mercury	.	9	.	.	.	.	.	.
Nickel	9	9	0	0	0	0	0	0
Potassium	8	9	0	0	0	0	0	0
Selenium	1	9	0	0	0	0	0	0
Silver	.	9	.	.	.	.	.	.
Sodium	9	9	0	0	0	0	0	0
Thallium	.	9	.	.	.	.	.	.
Vanadium	9	9	0	0	0	0	0	0
Zinc	9	9	0	0	0	0	0	0

a There are no TCLP limits for radionuclides.

000506

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (1st DEPTH)					
PESTICIDES								
4,4'-DDD	.	8	.	.	.	.	.	.
4,4'-DDE	.	8	.	.	.	.	.	.
4,4'-DDT	.	8	.	.	.	.	.	.
Aldrin	.	8	.	.	.	.	.	.
Aroclor-1016	.	9	.	.	.	.	.	.
Aroclor-1221	.	9	.	.	.	.	.	.
Aroclor-1232	.	9	.	.	.	.	.	.
Aroclor-1242	.	9	.	.	.	.	.	.
Aroclor-1248	.	9	.	.	.	.	.	.
Aroclor-1254	3	9	3	0	0	0	0	0
Aroclor-1260	1	9	1	0	0	0	0	0
Dieldrin	.	8	.	.	.	.	.	.
Endosulfan II	.	8	.	.	.	.	.	.
Endosulfan sulfate	.	8	.	.	.	.	.	.
Endosulfan-I	.	8	.	.	.	.	.	.
Endrin	.	8	.	.	.	.	.	.
Endrin aldehyde	.	8	.	.	.	.	.	.
Endrin ketone	.	8	.	.	.	.	.	.
Heptachlor	.	8	.	.	.	.	.	.
Heptachlor epoxide	.	8	.	.	.	.	.	.
Methoxychlor	.	8	.	.	.	.	.	.
Toxaphene	.	8	.	.	.	.	.	.
alpha-BHC	.	8	.	.	.	.	.	.
alpha-Chlordane	.	8	.	.	.	.	.	.
beta-BHC	.	8	.	.	.	.	.	.
delta-BHC	.	8	.	.	.	.	.	.
gamma-BHC (Lindane)	.	8	.	.	.	.	.	.
gamma-Chlordane	.	8	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000507

7392

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (1st DEPTH)					
RADIONUCLIDES								
Americium-241	.	8	.	NA [a]	.	.	.	.
Cesium-137	6	8	6	NA [a]	0	0	0	0
Lead-210	8	8	8	NA [a]	0	0	0	0
Neptunium-237	.	8	.	NA [a]	.	.	.	.
Plutonium-238	1	7	0	NA [a]	0	0	0	0
Plutonium-239/240	3	7	0	NA [a]	0	0	0	0
Plutonium-241	.	8	.	NA [a]	.	.	.	.
Polonium-210	7	7	7	NA [a]	0	0	0	0
Radium-226	8	8	8	NA [a]	0	0	0	0
Radium-228	8	8	8	NA [a]	0	0	0	0
Strontium-90	.	8	.	NA [a]	.	.	.	.
Technetium-99	8	8	0	NA [a]	0	0	0	0
Thorium-227	0	8	8	NA [a]	0	0	0	0
Thorium-228	8	8	8	NA [a]	0	0	0	0
Thorium-230	8	8	1	NA [a]	0	0	0	0
Thorium-232	7	8	0	NA [a]	0	0	0	0
Uranium, Total	8	8	8	NA [a]	0	0	0	0
Uranium-234	8	8	7	NA [a]	0	0	0	0
Uranium-235/236	8	8	8	NA [a]	0	0	0	0
Uranium-238	8	8	8	NA [a]	0	0	0	0

a There are no TCLP limits for radionuclides.

000508

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (1st DEPTH)					
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	.	9	.	.	.	.	.	.
1,2-Dichlorobenzene	.	9	.	.	.	.	.	.
1,3-Dichlorobenzene	.	9	.	.	.	.	.	.
1,4-Dichlorobenzene	.	9	.	.	.	.	.	.
2,2-oxybis(1-Chloropropane)	.	9	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	9	.	.	.	.	.	.
2,4,6-Trichlorophenol	.	9	.	.	.	.	.	.
2,4-Dichlorophenol	.	9	.	.	.	.	.	.
2,4-Dimethylphenol	.	9	.	.	.	.	.	.
2,4-Dinitrophenol	.	9	.	.	.	.	.	.
2,4-Dinitrotoluene	.	9	.	.	.	.	.	.
2,6-Dinitrotoluene	.	9	.	.	.	.	.	.
2-Chloronaphthalene	.	9	.	.	.	.	.	.
2-Chlorophenol	.	9	.	.	.	.	.	.
2-Methylnaphthalene	1	9	0	0	0	0	0	0
2-Nitroaniline	.	9	.	.	.	.	.	.
2-Nitrophenol	.	9	.	.	.	.	.	.
3,3'-Dichlorobenzidine	.	9	.	.	.	.	.	.
3-Nitroaniline	.	9	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	9	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	9	.	.	.	.	.	.
4-Chloro-3-methylphenol	.	9	.	.	.	.	.	.
4-Chlorophenylphenyl ether	.	9	.	.	.	.	.	.
4-Nitroaniline	.	9	.	.	.	.	.	.
4-Nitrophenol	.	9	.	.	.	.	.	.
Acenaphthene	2	9	0	0	0	0	0	0
Acenaphthylene	2	9	0	0	0	0	0	0
Anthracene	3	9	0	0	0	0	0	0
Benzo(a)anthracene	7	9	5	0	0	0	0	0
Benzo(a)pyrene	6	9	6	0	0	0	0	0
Benzo(b)fluoranthene	6	9	5	0	0	0	0	0
Benzo(g,h,i)perylene	5	9	0	0	0	0	0	0
Benzo(k)fluoranthene	5	9	4	0	0	0	0	0
Butyl benzyl phthalate	.	9	.	.	.	.	.	.
Carbazole	2	9	0	0	0	0	0	0

a There are no TCLP limits for radionuclides.

000509

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (1st DEPTH)					
SEMIVOLATILE ORGANICS (cont.)								
Chrysene	7	9	0	0	0	0	0	0
Di-n-butyl phthalate	1	9	0	0	0	0	0	0
Di-n-octyl phthalate	.	9	.	.	.	.	.	.
Dibenzo(a,h)anthracene	4	9	4	0	0	0	0	0
Dibenzofuran	.	9	.	.	.	.	.	.
Diethyl phthalate	.	9	.	.	.	.	.	.
Dimethyl phthalate	.	9	.	.	.	.	.	.
Fluoranthene	8	9	0	0	0	0	0	0
Fluorene	1	9	0	0	0	0	0	0
Hexachlorobenzene	.	9	.	.	.	.	.	.
Hexachlorobutadiene	.	9	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	9	.	.	.	.	.	.
Hexachloroethane	.	9	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	5	9	5	0	0	0	0	0
Isophorone	.	9	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	9	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	9	.	.	.	.	.	.
Naphthalene	.	9	.	.	.	.	.	.
Nitrobenzene	.	9	.	.	.	.	.	.
Pentachlorophenol	.	9	.	.	.	.	.	.
Phenanthrene	7	9	0	0	0	0	0	0
Phenol	.	9	.	.	.	.	.	.
Pyrene	8	9	0	0	0	0	0	0
bis(2-Chloroethoxy)methane	.	9	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	9	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	6	9	0	0	0	0	0	0
o-Methylphenol	.	9	.	.	.	.	.	.
p-Chloroaniline	.	9	.	.	.	.	.	.
p-Methylphenol	.	9	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000510

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (1st DEPTH)					
VOLATILE ORGANICS								
1,1,1-Trichloroethane	.	9	.	.	.	.	.	.
1,1,2,2-Tetrachloroethane	.	9	.	.	.	.	.	.
1,1,2-Trichloroethane	.	9	.	.	.	.	.	.
1,1-Dichloroethane	.	9	.	.	.	.	.	.
1,1-Dichloroethene	.	9	.	.	.	.	.	.
1,2-Dichloroethane	.	9	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	9	.	.	.	.	.	.
1,2-Dichloropropane	.	9	.	.	.	.	.	.
2-Butanone	.	9	.	.	.	.	.	.
2-Hexanone	.	9	.	.	.	.	.	.
4-Methyl-2-pentanone	.	9	.	.	.	.	.	.
Acetone	2	5	0	0	0	0	0	0
Benzene	.	9	.	.	.	.	.	.
Bromodichloromethane	.	9	.	.	.	.	.	.
Bromoform	.	9	.	.	.	.	.	.
Bromomethane	.	9	.	.	.	.	.	.
Carbon Tetrachloride	.	9	.	.	.	.	.	.
Carbon disulfide	.	9	.	.	.	.	.	.
Chlorobenzene	.	9	.	.	.	.	.	.
Chloroethane	.	9	.	.	.	.	.	.
Chloroform	.	9	.	.	.	.	.	.
Chloromethane	.	9	.	.	.	.	.	.
Dibromochloromethane	.	9	.	.	.	.	.	.
Ethylbenzene	.	9	.	.	.	.	.	.
Methylene chloride	.	9	.	.	.	.	.	.
Styrene	.	9	.	.	.	.	.	.
Tetrachloroethene	.	9	.	.	.	.	.	.
Toluene	.	9	.	.	.	.	.	.
Trichloroethene	.	9	.	.	.	.	.	.
Vinyl chloride	.	9	.	.	.	.	.	.
Xylenes, Total	.	9	.	.	.	.	.	.
cis-1,3-Dichloropropene	.	9	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	9	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

Draft

000511

7397

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (2nd DEPTH)					
INORGANICS								
Aluminum	2	2	0	0	0	0	0	0
Antimony	.	1	.	.	.	.	.	.
Arsenic	2	2	2	0	0	0	0	0
Barium	2	2	0	0	0	0	0	0
Beryllium	1	2	1	0	0	0	0	0
Cadmium	1	2	0	0	0	0	0	0
Calcium	2	2	0	0	0	0	0	0
Chromium	2	2	0	0	0	0	0	0
Cobalt	2	2	0	0	0	0	0	0
Copper	2	2	0	0	0	0	0	0
Iron	2	2	0	0	0	0	0	0
Lead	2	2	0	0	0	0	0	0
Magnesium	2	2	0	0	0	0	0	0
Manganese	2	2	2	0	0	0	0	0
Mercury	.	2	.	.	.	.	.	.
Nickel	2	2	0	0	0	0	0	0
Potassium	1	2	0	0	0	0	0	0
Selenium	1	2	0	0	0	0	0	0
Silver	.	2	.	.	.	.	.	.
Sodium	2	2	0	0	0	0	0	0
Thallium	.	2	.	.	.	.	.	.
Vanadium	2	2	0	0	0	0	0	0
Zinc	2	2	0	0	0	0	0	0

a There are no TCLP limits for radionuclides.

000512

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (2nd DEPTH)					
PESTICIDES								
4,4'-DDD	1	3	0	0	0	0	0	0
4,4'-DDE	.	3	.	.	.	.	.	.
4,4'-DDT	.	3	.	.	.	.	.	.
Aldrin	.	3	.	.	.	.	.	.
Aroclor-1016	.	3	.	.	.	.	.	.
Aroclor-1221	.	3	.	.	.	.	.	.
Aroclor-1232	.	3	.	.	.	.	.	.
Aroclor-1242	.	3	.	.	.	.	.	.
Aroclor-1248	1	3	1	0	0	0	0	0
Aroclor-1254	2	3	2	0	0	0	0	0
Aroclor-1260	1	3	1	0	0	0	0	0
Dieldrin	1	3	0	0	0	0	0	0
Endosulfan II	1	3	0	0	0	0	0	0
Endosulfan sulfate	.	3	.	.	.	.	.	.
Endosulfan-I	.	3	.	.	.	.	.	.
Endrin	1	3	0	0	0	0	0	0
Endrin aldehyde	.	3	.	.	.	.	.	.
Endrin ketone	1	3	0	0	0	0	0	0
Heptachlor	.	3	.	.	.	.	.	.
Heptachlor epoxide	.	3	.	.	.	.	.	.
Methoxychlor	.	3	.	.	.	.	.	.
Toxaphene	.	3	.	.	.	.	.	.
alpha-BHC	.	3	.	.	.	.	.	.
alpha-Chlordane	.	3	.	.	.	.	.	.
beta-BHC	.	3	.	.	.	.	.	.
delta-BHC	.	3	.	.	.	.	.	.
gamma-BHC (Lindane)	.	3	.	.	.	.	.	.
gamma-Chlordane	1	3	0	0	0	0	0	0

a There are no TCLP limits for radionuclides.

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000514

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (2nd DEPTH)					
RADIONUCLIDES								
Americium-241	.	4	.	NA [a]	.	.	.	.
Cesium-137	3	4	3	NA [a]	0	0	0	0
Lead-210	4	4	4	NA [a]	0	0	0	0
Neptunium-237	2	4	2	NA [a]	0	0	0	0
Plutonium-238	1	4	0	NA [a]	0	0	0	0
Plutonium-239/240	1	4	0	NA [a]	0	0	0	0
Plutonium-241	.	3	.	NA [a]	.	.	.	.
Polonium-210	4	4	4	NA [a]	0	0	0	0
Radium-226	4	4	4	NA [a]	0	0	0	0
Radium-228	4	4	4	NA [a]	0	0	0	0
Strontium-90	2	4	0	NA [a]	0	0	0	0
Technetium-99	4	4	0	NA [a]	0	0	0	0
Thorium-227	0	2	1	NA [a]	0	0	0	0
Thorium-228	4	4	4	NA [a]	0	0	0	0
Thorium-230	4	4	1	NA [a]	0	0	0	0
Thorium-232	4	4	0	NA [a]	0	0	0	0
*Uranium, Total	4	4	4	NA [a]	0	0	0	0
Uranium-234	4	4	4	NA [a]	0	0	0	0
Uranium-235/236	4	4	4	NA [a]	0	0	0	0
Uranium-238	4	4	4	NA [a]	0	0	0	0

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (2nd DEPTH)					
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	.	3	.	.	.	.	.	.
1,2-Dichlorobenzene	.	3	.	.	.	.	.	.
1,3-Dichlorobenzene	.	3	.	.	.	.	.	.
1,4-Dichlorobenzene	.	3	.	.	.	.	.	.
2,2-oxybis(1-Chloropropane)	.	3	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	3	.	.	.	.	.	.
2,4,6-Trichlorophenol	.	3	.	.	.	.	.	.
2,4-Dichlorophenol	.	3	.	.	.	.	.	.
2,4-Dimethylphenol	.	3	.	.	.	.	.	.
2,4-Dinitrophenol	.	3	.	.	.	.	.	.
2,4-Dinitrotoluene	.	3	.	.	.	.	.	.
2,6-Dinitrotoluene	.	3	.	.	.	.	.	.
2-Chloronaphthalene	.	3	.	.	.	.	.	.
2-Chlorophenol	.	3	.	.	.	.	.	.
2-Methylnaphthalene	.	3	.	.	.	.	.	.
2-Nitroaniline	.	3	.	.	.	.	.	.
2-Nitrophenol	.	3	.	.	.	.	.	.
3,3'-Dichlorobenzidine	.	2	.	.	.	.	.	.
3-Nitroaniline	.	2	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	3	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	3	.	.	.	.	.	.
4-Chloro-3-methylphenol	.	3	.	.	.	.	.	.
4-Chlorophenylphenyl ether	.	3	.	.	.	.	.	.
4-Nitroaniline	.	2	.	.	.	.	.	.
4-Nitrophenol	.	3	.	.	.	.	.	.
Acenaphthene	.	3	.	.	.	.	.	.
Acenaphthylene	.	3	.	.	.	.	.	.
Anthracene	.	3	.	.	.	.	.	.
Benzo(a)anthracene	1	3	1	0	0	0	0	0
Benzo(a)pyrene	1	3	1	0	0	0	0	0
Benzo(b)fluoranthene	1	3	1	0	0	0	0	0
Benzo(g,h,i)perylene	.	3	.	.	.	.	.	.
Benzo(k)fluoranthene	.	3	.	.	.	.	.	.
Butyl benzyl phthalate	.	3	.	.	.	.	.	.
Carbazole	.	2	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
	SOIL (2nd DEPTH)							
SEMIVOLATILE ORGANICS (cont.)								
Chrysene	1	3	0	0	0	0	0	0
Di-n-butyl phthalate	.	3	.	.	.	.	.	.
Di-n-octyl phthalate	.	3	.	.	.	.	.	.
Dibenzo(a,h)anthracene	.	3	.	.	.	.	.	.
Dibenzofuran	.	3	.	.	.	.	.	.
Diethyl phthalate	.	3	.	.	.	.	.	.
Dimethyl phthalate	.	3	.	.	.	.	.	.
Fluoranthene	1	3	0	0	0	0	0	0
Fluorene	.	3	.	.	.	.	.	.
Hexachlorobenzene	.	3	.	.	.	.	.	.
Hexachlorobutadiene	.	3	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	3	.	.	.	.	.	.
Hexachloroethane	.	3	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	1	3	1	0	0	0	0	0
Isophorone	.	3	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	3	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	3	.	.	.	.	.	.
Naphthalene	.	3	.	.	.	.	.	.
Nitrobenzene	.	3	.	.	.	.	.	.
Pentachlorophenol	.	3	.	.	.	.	.	.
Phenanthrene	1	3	0	0	0	0	0	0
Phenol	.	3	.	.	.	.	.	.
Pyrene	1	3	0	0	0	0	0	0
bis(2-Chloroethoxy)methane	.	3	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	3	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	1	3	0	0	0	0	0	0
o-Methylphenol	.	3	.	.	.	.	.	.
p-Chloroaniline	.	3	.	.	.	.	.	.
p-Methylphenol	.	3	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			SOIL (2nd DEPTH)					
VOLATILE ORGANICS								
1,1,1-Trichloroethane	.	3	.	.	.	.	.	.
1,1,2,2-Tetrachloroethane	.	3	.	.	.	.	.	.
1,1,2-Trichloroethane	.	3	.	.	.	.	.	.
1,1-Dichloroethane	.	3	.	.	.	.	.	.
1,1-Dichloroethene	.	3	.	.	.	.	.	.
1,2-Dichloroethane	.	3	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	2	.	.	.	.	.	.
1,2-Dichloropropane	.	3	.	.	.	.	.	.
2-Butanone	.	3	.	.	.	.	.	.
2-Hexanone	.	3	.	.	.	.	.	.
4-Methyl-2-pentanone	.	3	.	.	.	.	.	.
Acetone	.	1	.	.	.	.	.	.
Benzene	.	3	.	.	.	.	.	.
Bromodichloromethane	.	3	.	.	.	.	.	.
Bromoform	.	3	.	.	.	.	.	.
Bromomethane	.	3	.	.	.	.	.	.
Carbon Tetrachloride	.	3	.	.	.	.	.	.
Carbon disulfide	.	3	.	.	.	.	.	.
Chlorobenzene	.	3	.	.	.	.	.	.
Chloroethane	.	3	.	.	.	.	.	.
Chloroform	.	3	.	.	.	.	.	.
Chloromethane	.	3	.	.	.	.	.	.
Dibromochloromethane	.	3	.	.	.	.	.	.
Ethylbenzene	.	3	.	.	.	.	.	.
Methylene chloride	.	3	.	.	.	.	.	.
Styrene	.	3	.	.	.	.	.	.
Tetrachloroethene	.	3	.	.	.	.	.	.
Toluene	.	3	.	.	.	.	.	.
Trichloroethene	.	3	.	.	.	.	.	.
Vinyl chloride	.	3	.	.	.	.	.	.
Xylenes, Total	.	3	.	.	.	.	.	.
cis-1,3-Dichloropropene	.	3	.	.	.	.	.	.
trans-1,2-Dichloroethene	.	1	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	3	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			STEEL COATINGS					
INORGANICS								
Aluminum	132	135	0	0	0	0	0	32
Antimony	71	109	47	0	0	0	0	17
Arsenic	116	134	116	5	0	0	0	32
Barium	134	135	26	25	0	0	0	22
Beryllium	29	124	29	0	0	0	0	13
Cadmium	110	134	47	37	0	0	0	13
Calcium	130	135	0	0	0	0	0	13
Chromium	134	135	119	124	0	0	0	33
Cobalt	133	135	0	0	0	0	0	4
Copper	131	135	7	0	0	0	0	31
Iron	135	135	0	0	0	0	0	33
Lead	135	135	0	132	0	0	0	4
Magnesium	130	135	0	0	0	0	0	39
Manganese	135	135	124	0	0	0	0	28
Mercury	110	133	24	33	0	0	0	12
Nickel	127	135	3	0	0	0	0	19
Potassium	105	135	0	0	0	0	0	38
Selenium	23	102	0	3	0	0	0	14
Silver	70	133	0	0	0	0	0	13
Sodium	118	135	0	0	0	0	0	51
Thallium	14	114	1	0	0	0	0	0
Vanadium	75	129	0	0	0	0	0	18
Zinc	135	135	41	0	0	0	0	3

a There are no TCLP limits for radionuclides.

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			STEEL COATINGS					
RADIONUCLIDES								
Americium-241	47	83	34	NA [a]	0	0	0	45
Cesium-137	12	83	12	NA [a]	0	0	0	11
Lead-210	28	83	28	NA [a]	0	0	0	28
Neptunium-237	61	81	61	NA [a]	0	0	0	41
Plutonium-238	64	83	39	NA [a]	0	0	0	42
Plutonium-239/240	76	83	53	NA [a]	0	0	0	61
Plutonium-241	26	78	7	NA [a]	0	0	0	11
Polonium-210	83	83	75	NA [a]	0	0	0	17
Radium-226	57	83	57	NA [a]	0	2	0	26
Radium-228	64	83	62	NA [a]	0	2	0	49
Strontium-90	27	82	3	NA [a]	0	0	0	6
Technetium-99	70	83	27	NA [a]	0	0	0	68
Thorium-227	21	28	21	NA [a]	0	0	0	18
Thorium-228	82	83	82	NA [a]	0	0	0	47
Thorium-230	82	83	64	NA [a]	0	0	0	48
Thorium-232	82	83	34	NA [a]	0	0	0	43
Uranium, Total	83	83	83	NA [a]	62	0	0	74
Uranium-234	73	73	72	NA [a]	62	0	0	65
Uranium-235/236	73	73	73	NA [a]	64	5	0	64
Uranium-238	73	73	73	NA [a]	63	1	0	66

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
					TRANSITE			
INORGANICS								
Arsenic	2	11	0	0	0	0	0	0
Barium	5	11	0	0	0	0	0	0
Cadmium	.	11	.	.	.	.	.	.
Chromium	8	11	0	0	0	0	0	0
Lead	1	11	0	0	0	0	0	0
Mercury	3	11	0	0	0	0	0	0
Selenium	.	10	.	.	.	.	.	.
Silver	1	8	0	0	0	0	0	0
SEMIVOLATILE ORGANICS								
1,4-Dichlorobenzene	1	11	0	0	0	0	0	0
2,4,5-Trichlorophenol	.	7	.	.	.	.	.	.
2,4,6-Trichlorophenol	.	7	.	.	.	.	.	.
2,4-Dinitrotoluene	.	11	.	.	.	.	.	.
Hexachlorobenzene	.	11	.	.	.	.	.	.
Hexachlorobutadiene	1	11	0	0	0	0	0	0
Hexachloroethane	.	11	.	.	.	.	.	.
Nitrobenzene	1	11	0	0	0	0	0	0
Pentachlorophenol	.	7	.	.	.	.	.	.
m-Methylphenol	1	3	0	0	0	0	0	0
o-Methylphenol	1	7	0	0	0	0	0	0
p-Methylphenol	.	7	.	.	.	.	.	.
VOLATILE ORGANICS								
1,1-Dichloroethene	.	12	.	.	.	.	.	.
1,2-Dichloroethane	.	12	.	.	.	.	.	.
2-Butanone	1	12	0	0	0	0	0	0
Benzene	.	12	.	.	.	.	.	.
Carbon Tetrachloride	.	12	.	.	.	.	.	.
Chlorobenzene	.	12	.	.	.	.	.	.
Chloroform	.	12	.	.	.	.	.	.
Pyridine	.	11	.	.	.	.	.	.
Tetrachloroethene	1	12	0	0	0	0	0	0
Trichloroethene	.	12	.	.	.	.	.	.
Vinyl chloride	.	12	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000520

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			UNKNOWN LIQUIDS					
INORGANICS								
Aluminum	54	91	0	0	0	0	0	0
Antimony	7	90	4	0	0	0	0	0
Arsenic	29	91	29	0	0	0	0	0
Barium	79	90	3	3	0	0	0	0
Beryllium	15	87	15	0	0	0	0	0
Cadmium	25	91	12	11	0	0	0	0
Calcium	90	91	0	0	0	0	0	0
Chromium	32	91	16	16	0	0	0	0
Cobalt	23	91	0	0	0	0	0	0
Copper	58	91	10	0	0	0	0	0
Iron	72	91	0	0	0	0	0	0
Lead	53	88	0	20	0	0	0	0
Magnesium	87	91	1	0	0	0	0	0
Manganese	70	91	36	0	0	0	0	0
Mercury	26	90	5	5	0	0	0	0
Nickel	36	91	12	0	0	0	0	0
Potassium	83	91	0	0	0	0	0	0
Selenium	15	86	0	3	0	0	0	0
Silver	23	84	4	5	0	0	0	0
Sodium	85	91	0	0	0	0	0	0
Thallium	4	88	1	0	0	0	0	0
Vanadium	15	89	3	0	0	0	0	0
Zinc	60	91	4	0	0	0	0	0

a There are no TCLP limits for radionuclides.

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			UNKNOWN LIQUIDS					
PESTICIDES								
4,4'-DDD	.	1	.	.	.	.	.	.
4,4'-DDE	.	1	.	.	.	.	.	.
4,4'-DDT	.	1	.	.	.	.	.	.
Aldrin	.	1	.	.	.	.	.	.
Aroclor-1016	.	1	.	.	.	.	.	.
Aroclor-1221	.	1	.	.	.	.	.	.
Aroclor-1232	.	1	.	.	.	.	.	.
Aroclor-1242	.	1	.	.	.	.	.	.
Aroclor-1248	.	1	.	.	.	.	.	.
Aroclor-1254	.	1	.	.	.	.	.	.
Aroclor-1260	.	1	.	.	.	.	.	.
Chlordane	0	1	0	0	0	0	0	0
Dieldrin	.	1	.	.	.	.	.	.
Endosulfan II	.	1	.	.	.	.	.	.
Endosulfan sulfate	.	1	.	.	.	.	.	.
Endosulfan-I	.	1	.	.	.	.	.	.
Endrin	0	2	0	0	0	0	0	0
Endrin aldehyde	.	1	.	.	.	.	.	.
Endrin ketone	.	1	.	.	.	.	.	.
Heptachlor	0	2	0	0	0	0	0	0
Heptachlor epoxide	0	2	0	0	0	0	0	0
Methoxychlor	0	2	0	0	0	0	0	0
Toxaphene	0	2	0	0	0	0	0	0
alpha-BHC	.	1	.	.	.	.	.	.
alpha-Chlordane	.	1	.	.	.	.	.	.
beta-BHC	.	1	.	.	.	.	.	.
delta-BHC	.	1	.	.	.	.	.	.
gamma-BHC (Lindane)	0	2	0	0	0	0	0	0
gamma-Chlordane	.	1	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			UNKNOWN LIQUIDS					
RADIONUCLIDES								
Americium-241	24	82	17	NA [a]	0	0	0	0
Cesium-137	10	89	10	NA [a]	0	0	0	0
Lead-210	43	87	43	NA [a]	0	0	0	0
Neptunium-237	20	87	24	NA [a]	0	0	0	0
Plutonium-238	25	86	12	NA [a]	0	0	0	0
Plutonium-239/240	35	86	19	NA [a]	0	0	0	0
Plutonium-241	10	44	3	NA [a]	0	0	0	0
Polonium-210	43	84	32	NA [a]	0	0	0	0
Radium-226	61	89	61	NA [a]	0	0	0	0
Radium-228	36	88	36	NA [a]	0	2	0	0
Strontium-90	34	89	17	NA [a]	0	0	0	0
Technetium-99	76	89	59	NA [a]	0	0	0	0
Thorium-228	51	82	51	NA [a]	0	2	0	0
Thorium-230	52	82	20	NA [a]	0	1	0	0
Thorium-232	49	82	10	NA [a]	0	1	0	0
Uranium, Total	88	90	88	NA [a]	64	0	0	0
Uranium-234	78	82	72	NA [a]	52	10	0	0
Uranium-235/236	74	82	74	NA [a]	57	13	0	0
Uranium-238	79	82	79	NA [a]	52	10	0	0

a There are no TCLP limits for radionuclides.

000523

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000524

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			UNKNOWN LIQUIDS					
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	1	92	0	0	0	0	0	0
1,2-Dichlorobenzene	.	93	.	.	.	.	.	.
1,3-Dichlorobenzene	.	93	.	.	.	.	.	.
1,4-Dichlorobenzene	1	92	0	0	0	0	0	0
2,2-oxybis(1-Chloropropane)	.	75	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	91	.	.	.	.	.	.
2,4,6-Trichlorophenol	.	91	.	.	.	.	.	.
2,4-Dichlorophenol	1	91	0	0	0	0	0	0
2,4-Dimethylphenol	5	92	0	0	0	0	0	0
2,4-Dinitrophenol	2	82	0	0	0	0	0	0
2,4-Dinitrotoluene	.	92	.	.	.	.	.	.
2,6-Dinitrotoluene	.	93	.	.	.	.	.	.
2-Chloronaphthalene	.	93	.	.	.	.	.	.
2-Chlorophenol	.	91	.	.	.	.	.	.
2-Methylnaphthalene	3	93	0	0	0	0	0	0
2-Nitroaniline	.	93	.	.	.	.	.	.
2-Nitrophenol	2	91	0	0	0	0	0	0
3,3'-Dichlorobenzidine	.	73	.	.	.	.	.	.
3-Nitroaniline	.	90	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	91	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	93	.	.	.	.	.	.
4-Chloro-3-methylphenol	1	90	0	0	0	0	0	0
4-Chlorophenylphenyl ether	.	93	.	.	.	.	.	.
4-Nitroaniline	.	91	.	.	.	.	.	.
4-Nitrophenol	3	88	0	0	0	0	0	0
Acenaphthene	1	92	0	0	0	0	0	0
Acenaphthylene	.	93	.	.	.	.	.	.
Anthracene	4	93	0	0	0	0	0	0
Benzo(a)anthracene	4	93	0	0	0	0	0	0
Benzo(a)pyrene	2	92	0	0	0	0	0	0
Benzo(b)fluoranthene	3	92	0	0	0	0	0	0
Benzo(g,h,i)perylene	.	92	.	.	.	.	.	.
Benzo(k)fluoranthene	2	92	0	0	0	0	0	0
Butyl benzyl phthalate	6	93	0	0	0	0	0	0
Carbazole	1	91	0	0	0	0	0	0

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			UNKNOWN LIQUIDS					
SEMIVOLATILE ORGANICS (cont.)								
Chrysene	5	93	0	0	0	0	0	0
Di-n-butyl phthalate	5	92	0	0	0	0	0	0
Di-n-octyl phthalate	9	93	0	0	0	0	0	0
Dibenzo(a,h)anthracene	.	92	.	.	.	.	.	.
Dibenzofuran	1	93	0	0	0	0	0	0
Diethyl phthalate	7	93	0	0	0	0	0	0
Dimethyl phthalate	3	93	0	0	0	0	0	0
Fluoranthene	14	92	0	0	0	0	0	0
Fluorene	1	93	0	0	0	0	0	0
Hexachlorobenzene	.	93	.	.	.	.	.	.
Hexachlorobutadiene	.	93	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	93	.	.	.	.	.	.
Hexachloroethane	.	93	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	.	92	.	.	.	.	.	.
Isophorone	.	93	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	92	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	93	.	.	.	.	.	.
Naphthalene	7	93	0	0	0	0	0	0
Nitrobenzene	.	93	.	.	.	.	.	.
Pentachlorophenol	.	90	.	.	.	.	.	.
Phenanthrene	11	93	0	0	0	0	0	0
Phenol	10	90	0	0	0	0	0	0
Pyrene	12	92	0	0	0	0	0	0
bis(2-Chloroethoxy)methane	.	93	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	93	.	.	.	.	.	.
bis(2-Chloroisopropyl) ether	.	16	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	21	93	0	0	0	0	0	0
o-Methylphenol	4	92	0	0	0	0	0	0
p-Chloroaniline	.	86	.	.	.	.	.	.
p-Methylphenol	7	91	0	0	0	0	0	0
VOLATILE ORGANICS								
1,1,1-Trichloroethane	9	92	0	0	0	0	0	0
1,1,2,2-Tetrachloroethane	1	93	0	0	0	0	0	0
1,1,2-Trichloroethane	.	93	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000525

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

000526

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
			UNKNOWN LIQUIDS					
VOLATILE ORGANICS (cont.)								
1,1-Dichloroethane	10	93	0	0	0	0	0	0
1,1-Dichloroethene	.	93	.	.	.	.	.	.
1,2-Dichloroethane	.	93	.	.	.	.	.	.
1,2-Dichloroethene (Total)	1	86	0	0	0	0	0	0
1,2-Dichloropropane	.	93	.	.	.	.	.	.
2-Butanone	11	89	0	0	0	0	0	0
2-Hexanone	1	87	0	0	0	0	0	0
4-Methyl-2-pentanone	4	92	0	0	0	0	0	0
Acetone	15	67	0	0	0	0	0	0
Benzene	1	93	0	0	0	0	0	0
Bromodichloromethane	.	93	.	.	.	.	.	.
Bromoform	.	93	.	.	.	.	.	.
Bromomethane	.	93	.	.	.	.	.	.
Carbon Tetrachloride	.	93	.	.	.	.	.	.
Carbon disulfide	1	93	0	0	0	0	0	0
Chlorobenzene	.	93	.	.	.	.	.	.
Chloroethane	.	93	.	.	.	.	.	.
Chloroform	.	93	.	.	.	.	.	.
Chloromethane	.	93	.	.	.	.	.	.
Dibromochloromethane	.	93	.	.	.	.	.	.
Ethylbenzene	5	93	0	0	0	0	0	0
Methylene chloride	2	93	0	0	0	0	0	0
Pyridine	.	2	.	.	.	.	.	.
Styrene	3	93	0	0	0	0	0	0
Tetrachloroethene	12	93	1	0	0	0	0	0
Toluene	14	93	0	0	0	0	0	0
Trichloroethene	3	93	0	0	0	0	0	0
Trichlorofluoromethane	.	14	.	.	.	.	.	.
Vinyl chloride	1	93	0	0	0	0	0	0
Xylenes, Total	8	93	0	0	0	0	0	0
cis-1,3-Dichloropropene	.	93	.	.	.	.	.	.
m,p-Xylene	.	3	.	.	.	.	.	.
o-Xylene	.	3	.	.	.	.	.	.
trans-1,2-Dichloroethene	.	7	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	93	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
					WOOD			
INORGANICS								
Aluminum	2	2	0	0	0	0	0	0
Antimony	1	2	1	0	0	0	0	0
Arsenic	1	2	1	1	0	0	0	0
Barium	2	2	0	0	0	0	0	0
Beryllium	.	2	.	.	.	.	.	.
Cadmium	.	2	.	.	.	.	.	.
Calcium	2	2	0	0	0	0	0	0
Chromium	1	2	1	1	0	0	0	0
Cobalt	.	2	.	.	.	.	.	.
Copper	2	2	1	0	0	0	0	0
Iron	2	2	0	0	0	0	0	0
Lead	2	2	0	0	0	0	0	0
Magnesium	2	2	0	0	0	0	0	0
Manganese	2	2	0	0	0	0	0	0
Mercury	.	2	.	.	.	.	.	.
Nickel	1	2	0	0	0	0	0	0
Potassium	1	2	0	0	0	0	0	0
Selenium	.	2	.	.	.	.	.	.
Silver	.	2	.	.	.	.	.	.
Sodium	2	2	0	0	0	0	0	0
Thallium	.	2	.	.	.	.	.	.
Vanadium	.	2	.	.	.	.	.	.
Zinc	2	2	0	0	0	0	0	0

a There are no TCLP limits for radionuclides.

000527

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TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

000528

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
					WOOD			
PESTICIDES								
4,4'-DDD	.	1	.	.	.	.	.	.
4,4'-DDE	.	1	.	.	.	.	.	.
4,4'-DDT	.	1	.	.	.	.	.	.
Aldrin	.	1	.	.	.	.	.	.
Aroclor-1016	.	1	.	.	.	.	.	.
Aroclor-1221	.	1	.	.	.	.	.	.
Aroclor-1232	.	1	.	.	.	.	.	.
Aroclor-1242	.	1	.	.	.	.	.	.
Aroclor-1248	.	1	.	.	.	.	.	.
Aroclor-1254	.	1	.	.	.	.	.	.
Aroclor-1260	.	1	.	.	.	.	.	.
Dieldrin	.	1	.	.	.	.	.	.
Endosulfan II	.	1	.	.	.	.	.	.
Endosulfan sulfate	.	1	.	.	.	.	.	.
Endosulfan-I	1	1	0	0	0	0	0	0
Endrin	1	1	0	0	0	0	0	0
Endrin aldehyde	.	1	.	.	.	.	.	.
Endrin ketone	.	1	.	.	.	.	.	.
Heptachlor	.	1	.	.	.	.	.	.
Heptachlor epoxide	.	1	.	.	.	.	.	.
Methoxychlor	.	1	.	.	.	.	.	.
Toxaphene	.	1	.	.	.	.	.	.
alpha-BHC	.	1	.	.	.	.	.	.
alpha-Chlordane	.	1	.	.	.	.	.	.
beta-BHC	.	1	.	.	.	.	.	.
delta-BHC	.	1	.	.	.	.	.	.
gamma-BHC (Lindane)	.	1	.	.	.	.	.	.
gamma-Chlordane	.	1	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
				WOOD				
RADIONUCLIDES								
Americium-241	1	2	0	NA [a]	0	0	0	0
Cesium-137	.	2	.	NA [a]	.	.	.	.
Lead-210	2	2	2	NA [a]	0	0	0	0
Neptunium-237	1	2	1	NA [a]	0	0	0	0
Plutonium-238	1	2	1	NA [a]	0	0	0	0
Plutonium-239/240	1	2	0	NA [a]	0	0	0	0
Plutonium-241	.	1	.	NA [a]	.	.	.	.
Polonium-210	1	1	1	NA [a]	0	0	0	0
Radium-226	2	2	2	NA [a]	0	0	0	0
Radium-228	1	2	1	NA [a]	0	0	0	0
Strontium-90	1	2	0	NA [a]	0	0	0	0
Technetium-99	1	2	0	NA [a]	0	0	0	0
Thorium-228	2	2	2	NA [a]	0	0	0	0
Thorium-230	1	2	0	NA [a]	0	0	0	0
Thorium-232	1	2	0	NA [a]	0	0	0	0
Uranium, Total	2	2	2	NA [a]	1	0	0	0
Uranium-234	2	2	1	NA [a]	1	0	0	0
Uranium-235/236	1	2	1	NA [a]	1	0	0	0
Uranium-238	2	2	2	NA [a]	1	0	0	0

a There are no TCLP limits for radionuclides.

000529

2692

000530

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
					WOOD			
SEMIVOLATILE ORGANICS								
1,2,4-Trichlorobenzene	.	1	.	.	.	.	.	.
1,2-Dichlorobenzene	.	1	.	.	.	.	.	.
1,3-Dichlorobenzene	.	1	.	.	.	.	.	.
1,4-Dichlorobenzene	.	1	.	.	.	.	.	.
2,2-oxybis(1-Chloropropane)	.	1	.	.	.	.	.	.
2,4,5-Trichlorophenol	.	1	.	.	.	.	.	.
2,4,6-Trichlorophenol	.	1	.	.	.	.	.	.
2,4-Dichlorophenol	.	1	.	.	.	.	.	.
2,4-Dimethylphenol	.	1	.	.	.	.	.	.
2,4-Dinitrophenol	.	1	.	.	.	.	.	.
2,4-Dinitrotoluene	.	1	.	.	.	.	.	.
2,6-Dinitrotoluene	.	1	.	.	.	.	.	.
2-Chloronaphthalene	.	1	.	.	.	.	.	.
2-Chlorophenol	.	1	.	.	.	.	.	.
2-Methylnaphthalene	.	1	.	.	.	.	.	.
2-Nitroaniline	.	1	.	.	.	.	.	.
2-Nitrophenol	.	1	.	.	.	.	.	.
3,3'-Dichlorobenzidine	.	1	.	.	.	.	.	.
3-Nitroaniline	.	1	.	.	.	.	.	.
4,6-Dinitro-2-methylphenol	.	1	.	.	.	.	.	.
4-Bromophenyl phenyl ether	.	1	.	.	.	.	.	.
4-Chloro-3-methylphenol	.	1	.	.	.	.	.	.
4-Chlorophenylphenyl ether	.	1	.	.	.	.	.	.
4-Nitroaniline	.	1	.	.	.	.	.	.
4-Nitrophenol	.	1	.	.	.	.	.	.
Acenaphthene	.	1	.	.	.	.	.	.
Acenaphthylene	.	1	.	.	.	.	.	.
Anthracene	.	1	.	.	.	.	.	.
Benzo(a)anthracene	1	1	1	0	0	0	0	0
Benzo(a)pyrene	1	1	1	0	0	0	0	0
Benzo(b)fluoranthene	1	1	1	0	0	0	0	0
Benzo(g,h,i)perylene	.	1	.	.	.	.	.	.
Benzo(k)fluoranthene	1	1	0	0	0	0	0	0
Butyl benzyl phthalate	.	1	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

TA[illegible]A-17

DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE

(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
Carbazole	1	1	0	0	0	0	0	0
					WOOD			
SEMIVOLATILE ORGANICS (cont.)								
Chrysene	1	1	0	0	0	0	0	0
Di-n-butyl phthalate	.	1	.	.	.	.	.	.
Dibenzo(a,h)anthracene	.	1	.	.	.	.	.	.
Dibenzofuran	1	1	0	0	0	0	0	0
Diethyl phthalate	.	1	.	.	.	.	.	.
Dimethyl phthalate	.	1	.	.	.	.	.	.
Fluoranthene	1	1	0	0	0	0	0	0
Fluorene	.	1	.	.	.	.	.	.
Hexachlorobenzene	.	1	.	.	.	.	.	.
Hexachlorobutadiene	.	1	.	.	.	.	.	.
Hexachlorocyclopentadiene	.	1	.	.	.	.	.	.
Hexachloroethane	.	1	.	.	.	.	.	.
Indeno(1,2,3-cd)pyrene	.	1	.	.	.	.	.	.
Isophorone	.	1	.	.	.	.	.	.
N-Nitroso-di-n-propylamine	.	1	.	.	.	.	.	.
N-Nitrosodiphenylamine	.	1	.	.	.	.	.	.
Naphthalene	.	1	.	.	.	.	.	.
Nitrobenzene	.	1	.	.	.	.	.	.
Pentachlorophenol	.	1	.	.	.	.	.	.
Phenanthrene	1	1	0	0	0	0	0	0
Phenol	.	1	.	.	.	.	.	.
Pyrene	1	1	0	0	0	0	0	0
bis(2-Chloroethoxy)methane	.	1	.	.	.	.	.	.
bis(2-Chloroethyl)ether	.	1	.	.	.	.	.	.
bis(2-Ethylhexyl)phthalate	.	1	.	.	.	.	.	.
o-Methylphenol	.	1	.	.	.	.	.	.
p-Chloroaniline	.	1	.	.	.	.	.	.
p-Methylphenol	.	1	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

000531

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000532

TABLE A-17
DETECTS EXCEEDING REFERENCE CRITERIA FOR EACH MEDIA TYPE
(replaces Table A.III-2)

Parameter	# of Detects	# of Samples	Detects Above Given Criteria: Part B Soil	20 Times TCLP	Source Material	Envirocare WAC	Concrete Baseline	Paint Baseline
					WOOD			
VOLATILE ORGANICS								
1,1,1-Trichloroethane	.	1	.	.	.	.	.	.
1,1,2,2-Tetrachloroethane	.	1	.	.	.	.	.	.
1,1,2-Trichloroethane	.	1	.	.	.	.	.	.
1,1-Dichloroethane	.	1	.	.	.	.	.	.
1,1-Dichloroethene	.	1	.	.	.	.	.	.
1,2-Dichloroethane	.	1	.	.	.	.	.	.
1,2-Dichloroethene (Total)	.	1	.	.	.	.	.	.
1,2-Dichloropropane	.	1	.	.	.	.	.	.
2-Butanone	.	1	.	.	.	.	.	.
2-Hexanone	.	1	.	.	.	.	.	.
4-Methyl-2-pentanone	.	1	.	.	.	.	.	.
Acetone	.	1	.	.	.	.	.	.
Benzene	.	1	.	.	.	.	.	.
Bromodichloromethane	.	1	.	.	.	.	.	.
Bromoform	.	1	.	.	.	.	.	.
Bromomethane	.	1	.	.	.	.	.	.
Carbon Tetrachloride	.	1	.	.	.	.	.	.
Carbon disulfide	.	1	.	.	.	.	.	.
Chlorobenzene	.	1	.	.	.	.	.	.
Chloroethane	.	1	.	.	.	.	.	.
Chloroform	.	1	.	.	.	.	.	.
Chloromethane	.	1	.	.	.	.	.	.
Dibromochloromethane	.	1	.	.	.	.	.	.
Ethylbenzene	.	1	.	.	.	.	.	.
Methylene chloride	.	1	.	.	.	.	.	.
Styrene	.	1	.	.	.	.	.	.
Tetrachloroethene	.	1	.	.	.	.	.	.
Toluene	.	1	.	.	.	.	.	.
Trichloroethene	.	1	.	.	.	.	.	.
Vinyl chloride	.	1	.	.	.	.	.	.
Xylenes, Total	.	1	.	.	.	.	.	.
cis-1,3-Dichloropropene	.	1	.	.	.	.	.	.
trans-1,3-Dichloropropene	.	1	.	.	.	.	.	.

a There are no TCLP limits for radionuclides.

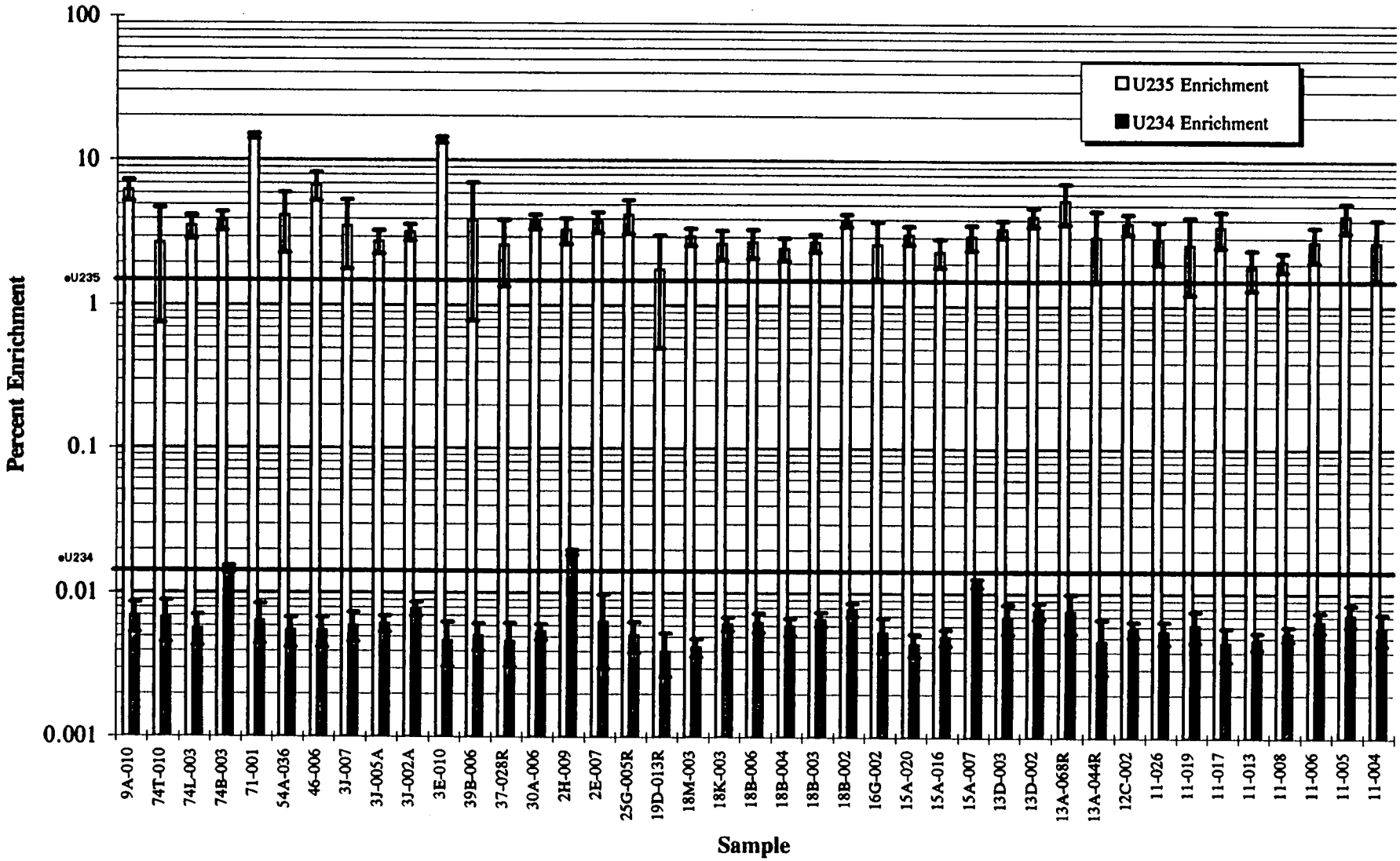

FIGURE A-13
COMPARISON OF URANIUM-234 AND URANIUM-235 ENRICHMENT RESULTS

Lognormal Distribution:

If the background data distribution is assumed to be lognormal, the equation used to calculate the 95 percent UCLs is:

$$95\%\ UCLs = e^{\bar{y} + t_{(n-1,\ 0.025)} \times \frac{s_y}{\sqrt{n}}}$$

where:

n = *number of samples*
$\bar{y}$ = *sample mean of the* log-*transformed data*
$t_{(n-1,\ 0.025)}$ = *percentage point from the t distribution with n-1 degrees of freedom*
s_y = *sample standard deviation of the* log-*transformed data*

$$s_y = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (y_i - \bar{y})^2} \quad \textit{where}$$

y_i = *individual* log-*transformed values*

Undetermined Distribution:

If the distribution of the background data could not be adequately determined, the 95 percent upper and lower confidence limits on the mean can not be determined because of the relatively small sample sizes obtained. In this case, a non-parametric method was used to estimate the 95th percent~~ile~~ UCL ~~concentration~~ of the ~~data set~~ median value of the dataset. The 95th percent~~ile concentration~~ UCL of the median value would then be used as the estimated baseline concentration. The initial step in this procedure is to order the data such that:

$$x_1 \le x_2 \le \ldots \le x_i$$

where:

$x_{j,\ (j=1\ to\ i)}$ = *sample concentrations*
i = *the number of samples*

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The 95th percent~~ile concentration~~ UCL of the median then is determined to be

x_k where

$$k \geq \frac{i+1}{2} + \frac{Z_{0.975}\sqrt{i}}{2}$$

where:

$Z_{0.975}$ = *cumulative normal distribution for the 95th percentile*
$Z_{0.975}$ = 1.96
i = *number of samples*

A.I.2.4 Analytical Results

Tables A.I-4 (concrete) and A.I-5 (steel coatings) present summaries of the data set for each trace metal. For each analyte, the number of samples in the data set is listed, preceded by the number of results above detectable levels. The maximum result, estimated mathematical mean, distribution and estimated baseline level also are presented for each analyte.

A.I.3 ESTIMATED BASELINE CONCENTRATIONS OF RADIONUCLIDES

Similar to the estimated baseline concentration for trace metals, estimated baseline concentrations have also been calculated for radioactive parameters. This section addresses the approach to and methodology for determining baseline concentrations of radionuclides within concrete and the paint coatings of structural steel used in construction of OU3 buildings and structures. This data is used to assess the nature of contamination within OU3.

A.I.3.1 Identification of Approach

This section discusses the methods by which baseline levels for radionuclides were calculated for concrete and steel coatings.

Baseline of Radioactive Parameters in Concrete and Paint Coatings

The estimate of baseline levels for radioactive parameters in concrete will be calculated in two ways. The first approach will utilize data from a study conducted by the University of Cincinnati, entitled Final Report - Measure of Naturally Occurring Radionuclides in Concrete Fill Material (July 1, 1987).

A.I.3.2 Methodology

Radioactive Parameters Methodology - Concrete

In the University of Cincinnati study, six different suppliers each produced one cubic yard of concrete using 1320 pounds of sand, 1860 pounds of gravel, 564 pounds of cement and 35 gallons of water. The six samples were tested for radium-226, uranium-238, and thorium-232 using a high-resolution, high-efficiency, intrinsic germanium detector. Table A.I-7 shows the concrete supplier and theradionuclide content in picocuries and picocuries per gram.

The second approach used for radioactive parameters in concrete will estimate baseline concentrations using the same sample locations used for the trace metals baselines calculations. The sample ID numbers for the concrete core samples outside of process areas are listed in Table A.I-8.

The sampling effort for determination of baseline levels in steel coatings involved collection of steel coating samples from several OU3 structural steel locations from the non-process area of the FEMP. Two samples were removed from the data set due to elevated contamination from radionuclides in the samples. The sample ID numbers for the steel coatings for non-process areas, along with the samples removed from the dataset, are listed in Table A.I-9.

A.I.3.3 Statistical Analysis Approach for Radionuclides

The background data set was evaluated to determine the probability distribution type (normal, lognormal, or undefined) that best describes the data set. The approach is the same as described in Section A.I.2.3 (Kolomogorv-Smirnov and probability plot). ~~The Shapiro-Wilkes test was used to determine the distribution type. The untransformed and transformed data were not plotted on normal probability paper because the data sets were relatively small and a determination of whether the plotted data adequately fit a straight line was felt to be too subjective.~~

~~Two special kinds of departures from the normal distribution are skewness, in which the data are unsymmetrically distributed around a mean, and kurtosis (curvature) in which the data are abnormally compressed or more spread out than for a true normal distribution. The Shapiro-Wilkes test measures the kurtosis and skewness of the data set. The test calculates a W statistic and a p-value associated with the W statistic that identifies the false positive probability of concluding that the data were not obtained from a normally distributed population.~~

~~Since the Shapiro-Wilkes test is very powerful (and particularly so as the sample size increases) a 1-percent level of significance was selected. The statistical methods employed to determine the estimated baseline~~

~~concentration and 95 percent upper and lower confidence limits on the mean are robust to minor deviations from normality and lognormality. The Shapiro Wilkes test was performed on the untransformed data to test the normality assumption and on the log transformed data to test the assumption of lognormality. If this test failed to provide evidence of normality or lognormality, the probability distribution of the population from which the samples were drawn was listed as undefined.~~

Treatment of Non-Detected Results for Background Radioisotope Concentrations

Non-detected results (if present in the data set) must be considered, with positively detected background results, to determine the descriptive statistics for background data sets. Although US EPA's Risk Assessment Guidance for Superfund Part A, Human Health Evaluation Manual allows for best professional judgement in determining the most appropriate assignment of values for non-detected results (EPA 1989a), EPA Region V has requested that a value of one-half the minimum detectable concentration (MDC) be assigned for each non-detected result. Statistical treatment of background data for risk assessments will therefore conform to the methodology requested by EPA Region V.

Test for Outliers in Background Radioisotope Concentration Data

An outlier is defined as an abnormally high or low data value. Since an outlier can represent a true extreme value or can indicate data errors, each value was evaluated to determine if it is an outlier or a true datum. The outlier test is described in Section A.I.2.3 (Rosner). ~~Because of the relatively small data sets any highest value that was at least two times larger than the second highest value or any lowest value that was an order of magnitude less than the second lowest value was viewed with suspicion.~~

~~The Dixon test for outliers is used to statistically identify a single anomaly in a given data set. A multiple outlier test was not used because of the relatively small data sets (n ≤ 6). Since the Dixon test, as with most quantitative tests for outliers, assumes a normal distribution, data sets that were not normally distributed were transformed to approximate a normal distribution, if possible, before the test was performed. The data points were ranked from smallest to largest. After this was done, a point at either end that stood out as a suspected outlier was examined and the probability that point could had been selected by chance due to the variability of the data was calculated. A two sided 1 percent level of significance was chosen for the Dixon test. This means that there is at least 99 percent confidence that rejecting an outlier is merited, and that there is also at most a 1 percent risk that the wrong decision (of rejecting the outlier) was made.~~

TABLE A.I-4

STATISTICAL SUMMARY OF TRACE METALS IN CONCRETE CORE DATA

ANALYTE	POSITIVE SAMPLES/TOTAL SAMPLES	MAXIMUM RESULT (mg/kg)	ESTIMATED MEAN[a] (mg/kg)	DISTRIBUTION[b]	ESTIMATED BASELINE LEVEL (mg/kg)
Aluminum	27/27	6420	4716	Normal	5039
Antimony	2/20	11.4	9.5 UJ	Undefined	1.0
Arsenic	22/27	7.4	3.35	Normal	3.96
Barium	27/27	73.6	46.1	Normal	50.4
Beryllium	7/27	1.5	0.23	Undefined	1.40
Cadmium	12/27	2.7	1.2 U	Undefined	2.40
Calcium	27/27	252000	190170	~Normal	199321
Chromium	24/24	10.8	7.52	Normal	8.15
Cobalt	15/26	4.9	2.31	~Lognormal	2.89
Copper	24/27	28	9.22	Lognormal	11.1
Iron	27/27	25200	8888	~Lognormal	10438
Lead	18/25	5.8	2.93	Normal	3.42
Magnesium	27/27	62800	47841	Normal	50632
Manganese	27/27	619	313	Normal	343
Mercury	3/25	0.07	0.06 U	Undefined	0.03
Nickel	25/27	16.3	7.60	Lognormal	9.37
Potassium	23/27	1680	812	Lognormal	927
Selenium	2/22	0.49	1.6 UJ	Undefined	0.47
Silver	16/27	9.3	2.67	Lognormal	5.42
Sodium	25/27	821	510	Lognormal	607
Thallium	1/26	0.32	0.44 UJ	Undefined	0.32
Vanadium	23/27	22.4	11.0	Lognormal	13.2
Zinc	24/26	70.9	21.8	Lognormal	27.5

a Median value given for undefined distributions
b Undefined distribution - dataset did not match either a normal or lognormal distribution

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TABLE A.I-5

STATISTICAL SUMMARY OF TRACE METALS IN STEEL COATINGS DATA

ANALYTE	POSITIVE SAMPLES/TOTAL SAMPLES	MAXIMUM RESULT (mg/kg)	ESTIMATED MEAN[a] (mg/kg)	DISTRIBUTION[b]	ESTIMATED BASELINE LEVEL (mg/kg)
Aluminum	49/51	42300	9115.4	LogNormal	14371.39
Antimony	21/42	224	46.9	~LogNormal	108.76
Arsenic	43/50	199	15.0	LogNormal	25.95
Barium	51/51	23700	1442.8	~LogNormal	3278.72
Beryllium	6/48	4.2	0.73 U	Undefined	1.10
Cadmium	36/50	232	27.5	LogNormal	66.52
Calcium	51/51	199000	29790.9	LogNormal	43357.59
Chromium	50/51	14800	2252.4	LogNormal	4539.90
Cobalt	49/51	588	158.1	~LogNormal	253.04
Copper	50/51	2020	212.7	LogNormal	318.65
Iron	51/51	306000	89083.9	LogNormal	129610.09
Lead	51/51	367000	26000-	Undefined	239000
Magnesium	50/51	14300	4930.8	LogNormal	6396.18
Manganese	51/51	5560	711.3	LogNormal	958.51
Mercury	39/51	26.2	5.6	~LogNormal	18.04
Nickel	49/51	2570	86.5	LogNormal	134.74
Potassium	34/51	6060	904.4	LogNormal	1193.38
Selenium	7/40	42.2	2.2 U	Undefined	0.83
Silver	17/51	9.4	5.4 U	Undefined	6.40
Sodium	44/51	4370	646.6	LogNormal	844.02
Thallium	0/43		0.82 U	Undefined	
Vanadium	27/49	72.4	12.3	LogNormal	21.97
Zinc	51/51	215000	21087.0	LogNormal	55005.39

a Median value given for undefined distributions
b Undefined distribution - dataset did not match either a normal or lognormal distribution

TABLE A.I-10

OUTLIERS REMOVED FROM RADIOLOGICAL BASELINE DATA SETS

MEDIA	PARAMETER	SAMPLE ID	RESULT REMOVED
CONCRETE	Technetium-99	3J-004	6.9 -
STEEL COATING	Cesium-137	3F-007	0.14 UJ
STEEL COATING	Lead-210	3F-007	9.1 -

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TABLE A.I-14

REPRESENTATIVE COMPOSITION OF VARIOUS STEEL PRODUCTS

Representative Composition (percent)[a]						
	Carbon Steel		Stainless Steel[c]		Special Alloys	
Constituent	Structural[b]	Piping[b]	Type 304	Type 316	Inconel[c]	Monel[c]
Carbon	1.7	1.7	0.08	0.08		
Chromium			18-20	16-18		50
Copper	0.6	0.6			12	
Iron	95.45	95.45	64.845	61.845	71	29
Manganese	1.65	1.65	2	2		
Molybdenum				2-3	17	
Nickel			8-12	10-14		21
Phosphorus			0.045	0.045		
Sulfur			0.03	0.03		
Silicon	0.6	0.6	1	1		

[a] In all cases except iron, compositions are maximum. For iron, the composition is minimum.
[b] From Structural Steel Design (3rd Edition).
[c] From CRC Handbook of Chemistry & Physics (65th Edition)

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A.II SUMMARY OF CONTAMINATION BY ANALYTE

This attachment to Appendix A presents the results of the Operable Unit 3 (OU3) Remedial Investigation/Feasibility Study (RI/FS) sampling program in detail on an analyte basis. This organization is useful in identifying the abundance and level of contamination in OU3 by analyte, such as the occurrence of enriched uranium or which materials were detected at levels greater than toxicity characteristic leaching procedure (TCLP) limits.

As previously noted, changes in the database of analytical results occurred after this Attachment was drafted in September 1995. Because these changes do not alter the conclusions from the analysis of the data, this Attachment has not been updated to reflect the minor changes. A description of the major changes is included as Appendix A.7 and Appendix L identifies all of the changes.

A.II.1 STATISTICAL SUMMARY OF CONTAMINATION BY ANALYTE

Tables A.II-1 and A.II-2 summarize the frequency of detection and relative levels of contamination in OU3 by analyte and identify the constituents of concern (COCs) (see Appendix A.2). These tables are organized in the same general layout as the sections below: radionuclides, inorganics, volatiles, semivolatiles, and pesticides/PCBs.

A.II.1.1 Statistical Summary

Summary statistics for each analyte are presented in Tables ~~A.III-1~~ A.II-1 and ~~A.III-2~~ A.II-2 in Attachment A. This section describes the meaning and use of the statistical data included in this table.

A.II.1.2 Type of Distribution

The data for each analyte was evaluated to determine the type of distribution (i.e. normal, lognormal, undefined or undeterminable). The Shapiro-Wilkes test was used in conjunction with other statistics to determine the distribution type.

Two special kinds of departures from the normal distribution are skewness, in which the data are asymmetrically distributed around a mean, and kurtosis (curvature), in which the data are abnormally compressed or more spread out than for a true normal distribution. The Shapiro-Wilkes test measures the kurtosis and skewness of the data set. The test calculates a W statistic and a p value associated with the W statistic that identifies the false positive probability of concluding that the data were not obtained from a normally distributed population.

The term "total uranium" is used to distinguish this type of analysis from isotopic uranium analyses. It is possible to calculate the amount of uranium present from isotopic analytical data, but analytical techniques based on chemical properties are typically more cost effective. The elemental uranium techniques used for FEMP samples include fluorometry and kinetic phosphorescence analysis (KPA). These techniques are similar in that both rely upon the use of an external source of high-energy light to excite uranium atoms and thus cause them to emit light of a characteristic wavelength. The results of total uranium analyses should agree with elemental uranium values calculated from isotopic alpha spectrometry data. Unfortunately, this is not always the case. Both total and isotopic uranium techniques are subject to interferences and errors that cannot be accurately characterized for every sample. When discrepancies are noted, it is often not possible to determine which results are more accurate. In such cases, the data may be rejected as unusable or identified as being usable with qualification.

A.II.2.1.3 Environmental Radioactivity

Many radioactive materials are present in the environment. Some of these have been produced by radiation that is constantly bombarding the earth, some have been released from facilities using radioactive materials, and some have come from past atmospheric nuclear weapons tests around the world. The overwhelming majority are from radionuclides that occur naturally.

Uranium-238, thorium-232, and uranium-235 are the initial members of three natural decay chains, shown schematically in Exhibits ~~Figures~~ A.II-1 (uranium series), A.II-2 (thorium series), and A.II-3 (actinium series), respectively. Each of these chains begins with a radionuclide ~~with a very~~ long half-life (i.e., the time for half of the atoms present to decay) and ends with a stable isotope of lead. The intermediary radionuclides have half-lives of varying lengths, some in hundreds of thousands of years and some in microseconds.

A.II.2.1.4 Potential FEMP Contaminants

Uranium was processed at the FEMP. In nature, uranium consists of three principal isotopes: uranium-234 (0.0057 percent), uranium-235 (0.72 percent), and uranium-238 (99.27 percent) (EGG 1988). The principal material processed at the FEMP was uranium in which the percentages of uranium-235 varied from below the natural abundance (depleted) to 2.5 percent of the total uranium (2.5 percent enrichment). Most processed uranium was depleted (less than 0.2 percent U-235), and most was received as ores, ore concentrates, and metal.

Some of the uranium processed at the FEMP was material that had been recycled from other DOE facilities. This recycled uranium contained trace amounts of fission products (such as cesium-137 and technetium-99) and activation products (such as americium-241, neptunium-237, plutonium-239, and uranium-236). During the processing of recycled material, small quantities of fission products and activation products were released to the environment and may have contributed to contamination in the vicinity of the FEMP. Because they are expected to be seen only in very low concentrations and many are difficult to measure at low levels, it is not practical to analyze samples for all possible fission and activation products. At the FEMP, certain radionuclides that would serve as indicators of fission or activation products are chosen for analysis. These include cesium-137, strontium-90, technetium-99, plutonium-238, plutonium-239/240, and neptunium-237.

Uranium was also extracted from ore concentrates at the FEMP. Ore concentrates were produced at off-site facilities. During this process, much of the extraneous bulk was stripped away from the uranium component, leaving uranium and some associated constituents. This ore concentrate was then shipped to the FEMP. In addition to uranium, these materials contained the long-lived decay products of uranium-238 and uranium-235, including protactinium-231, actinium-227, uranium-234, thorium-230, radium-226, and lead-210, as well as members of the thorium decay series.

Thorium was also processed at the FEMP on several occasions, and the FEMP was used for a period of time for storage of DOE's thorium inventory from other sites (much of which remains at the FEMP). Natural thorium contains thorium-232, thorium-230, and thorium-228. Thorium-232 and thorium-228 belong to the thorium decay series, whereas thorium-230 is produced by the uranium decay series. Other than thorium-232, none of the nuclides in the thorium series have a half-life longer than approximately six years. This means that if any thorium-232 had been released during operation of the FEMP, the activity concentrations of its decay products would approach ~~its decay products would also be present in activity concentrations approaching~~ that of thorium-232 after about 20 years. Thorium-232, radium-228, and thorium-228 are the only members of the decay series that have half-lives long enough to be found in the environment without their parent radionuclides also being present.

To characterize radiological contamination in OU3, 795 samples were collected and analyzed for elemental uranium and 19 radionuclides. Almost 89 percent of these samples were from solid media (acid brick, concrete chips, concrete cores, loose media, masonry chips. sediment, sludge, soil, and

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arsenic concentrations were detected in loose media and steel coating samples collected from the Green Salt Plant (4A). As a reference point, all of the detected arsenic results were above the Part B reference criteria (0.037 mg/kg). Arsenic has a TCLP limit of 5 milligrams per liter (mg/L) in the leachate. Concentrations of 11 samples exceeded 20 times the TCLP limit (100 mg/kg)~~, and are therefore potentially hazardous.~~ As discussed Attachment A.II-7, no OU3 material is considered potentially hazardous due to arsenic.

Table A.II-2 presents the number of detections found above established criteria. The presence of arsenic in OU3 at levels of concern is further confirmed by its detection in 29 of 91 unknown liquid samples, with concentrations ranging from 0.89 to 43.7 μg/L (average of 4.52 μg/L).

The 11 samples in which arsenic concentrations exceeded 20 times the TCLP limit (100 mg/kg) include five steel coatings samples (with concentrations ranging from 109 to 227 mg/kg), four loose media samples (with concentrations ranging from 110 to 246 mg/kg), one sediment sample (with a concentration of 140 mg/kg), and the wood sample. No concrete, masonry, or acid brick samples exceeded 20 times the TCLP limit for arsenic.

The steel coatings samples which exceeded 20 times the TCLP limit were collected from the Preparation Plant (1A), the Green Salt Plant (4A), the Recovery Plant (8A), the Incinerator Building (39A), and the Pilot Plant Warehouse (68). The sediment samples were collected from the Ore Refinery Plant (2A), the Metal Dissolver Building (2D), and the Green Salt Plant (4A) (two samples); the loose media sample was collected from the Coal Pile Runoff Basin (18C); and the wood was collected from the Electrical Panels and Transformers (16C).

Eight of these 11 samples exceeding 20 times the TCLP limit were collected from components located in the process buildings component category. One each was collected from the warehouse/storage buildings, the ponds and basins, and the aboveground piping.

Figure A.II-46 depicts the arsenic contamination by media. As indicated, arsenic was detected in all sampled media, at the highest levels in loose media and steel coatings. Arsenic was detected at consistently high levels in steel coatings.

A.II.3.4 Barium

Barium is a trace element in the earth's crust. It is a trace constituent in concrete (up to a baseline level of 50.4 mg/kg at the FEMP) and is a trace constituent of coal and the resulting flyash when the coal is burned. Barium carbonate was used in thorium extractions in the Pilot Plant. Barium compounds also were involved in operations at the Preparation Plant (1A), the Graphite Furnace and Oil Burner (10D), the Coal Pile (P-005), and the Laboratory (15A).

As depicted on Figure A.II-47 and shown on Table A.II-1, barium was detected in 98 percent (720 of 733) of the samples of solid media, with concentrations ranging from 3.3 to 23,700 mg/kg (geometric mean of 109 mg/kg). The 12 highest concentrations of barium were detected in steel coatings samples, with the maximum concentration detected in a sample collected from the High Nitrate Storage Tank (18M). As reference points, 5 percent of the detected results for barium were above the Part B reference criteria (1900 mg/kg), approximately 32 percent were at or below the OU3 baseline level for concrete (50 mg/kg), and 96 percent were at or below the OU3 baseline level for steel coatings (3300 mg/kg). Barium has a TCLP limit of 100 mg/L in the leachate. Concentrations of 33 samples exceeded 20 times the TCLP limit (2000 mg/kg). ~~and are therefore potentially hazardous.~~ As discussed in Attachment A.II-7, no OU3 material is considered potentially hazardous due to barium.

Table A.II-2 presents the number of detections found above established criteria. The presence of barium in OU3 at levels of concern is further confirmed by its detection in 79 of 90 unknown liquid samples, with concentrations ranging from 3.2 to 10,300 μg/L (average of 257 μg/L).

The 33 samples in which the barium concentration exceeded 20 times the TCLP limit (2000 mg/kg) include 24 steel coatings samples (with concentrations ranging from 2670 to 23,700 mg/kg), five concrete samples (with concentrations ranging from 3000 to 5890 mg/kg), two loose media samples (with concentrations of 2850 and 4080 mg/kg), one masonry sample (with a concentration of 3820 mg/kg), and one sediment sample (with a concentration of 2690 mg/kg). No acid brick samples exceeded 20 times the TCLP limit for barium.

The components with the most samples exceeding 20 times the TCLP limit in the steel coatings were the Metals Production Plant (5A) with four; the Incinerator Building (39A) and the Heavy Equipment Building (46) with three each; and the Drum Reconditioning Building (66) and the Metals Fabrication collected from the Special Products Plant (9A) and the Sump Pump House (13C). The single

Figure A.II-50 depicts the beryllium contamination by media. As indicated, beryllium was detected in all sampled media except asphalt, with the highest concentrations in loose media.

Beryllium is a COC because 100 percent of the detected results exceed the Part B reference criteria, indicating a potential concern with direct contact. However, it was only detected in 29 percent of the solid samples collected from OU3, there are no hazardous criteria governing its disposal in a landfill (40 CFR 261.24), and there is no WAC for its on-property or off-site disposal. Therefore, it is considered *not as significant* compared to other inorganic COCs and is not further discussed in Section 3.0.

A.II.3.6 Cadmium

Cadmium is a trace element in the earth's crust, most often associated with zinc ores. Its sulfide salt is used as a yellow pigment in paints. It is also a trace constituent in concrete (up to a baseline level of 2.40 mg/kg at the FEMP) and is a trace constituent of coal and the resulting flyash when the coal is burned. Cadmium was also a minor impurity in uranium ores and ore concentrates used at the FEMP, with concentrations ranging from 0.006 to 0.007 percent (DOE 1994a). However, the impurities were concentrated up to five times through the removal of the uranium in the refining process.

As depicted on Figure A.II-51 and Table A.II-1, cadmium was detected in 42 percent (305 of 732) of the solid media samples, with concentrations ranging from 0.11 to 558 mg/kg. The median of all cadmium results is 1.2 mg/kg. The 13 highest concentrations of cadmium were detected in steel coatings samples, with the highest three concentrations collected from the Incinerator Building (39A). As reference points, approximately 80 percent of these cadmium results were at or below the Part B reference criteria (14.0 mg/kg), approximately 75 percent were at or below the OU3 baseline level for concrete (2.40 mg/kg), and approximately 98 percent were at or below the OU3 baseline level for steel coatings (66.5 mg/kg). Cadmium has a TCLP limit of 1.00 mg/L in the leachate.
Concentrations of 44 samples exceeded 20 times the TCLP limit (20 mg/kg) and are therefore potentially hazardous. As discussed in Attachment A.II-7, no OU3 material is considered potentially hazardous due to cadmium.

Table A.II-2 presents the number of detections found above established criteria. The presence of cadmium in OU3 is further confirmed by its detection in 25 of 91 unknown liquid samples, with concentrations ranging from 1.4 to 351 μg/L (average of 17.5 μg/L).
concentration. As reference points, approximately 76 percent of all chromium results were at or below the Part B reference criteria (137 mg/kg), approximately 30 percent of all results were at or below the OU3

baseline level for concrete (8.15 mg/kg), and approximately 95 percent of all results were at or below the OU3 baseline level for steel coatings (4540 mg/kg). Chromium has a TCLP limit of 5.0 mg/L in the leachate. Concentrations of chromium in 175 samples exceeded 20 times the TCLP limit (100 mg/kg) and are therefore potentially hazardous. Table A.II-2 presents the number of detections found above established criteria.

The 175 samples in which the chromium concentration exceeded 20 times the TCLP limit consisted of 123 steel coatings samples (with concentrations ranging from 115 to 17,300 mg/kg), 21 loose media samples (with concentrations ranging from 111 to 3210 mg/kg), 10 sediment samples (with concentrations ranging from 114 to 857 mg/kg), eight concrete core samples (with concentrations ranging from 102 to 424 mg/kg), five concrete chip samples (with concentrations ranging from 169 to 640 mg/kg), three masonry samples (with concentrations from 306 to 407 mg/kg), two acid brick samples (with concentrations of 127 and 189 mg/kg), and one air filter (with a concentration of 197 mg/kg), one transite (with a concentration of 358 mg/kg, extrapolated from the TCLP leachate result), and one wood (with a concentration of 2,740 mg/kg). As discussed in Attachment A.II-7, the two acid brick samples which were taken from the Special Products Plant (9A), are considered potentially hazardous due to chromium. As previously discussed, the loose media and sediment are not part of the decision-making process of this RI/FS. The six components with the most samples exceeding 20 times the TCLP limit in the steel coatings samples were the Recovery Plant (8A) with 15; the Metals Production Plant (5A) with nine; and the Preparation Plant (1A), the Metals Fabrication Plant (6A), the Special Products Plant (9A), and the Six to Four Reduction Plant #1 (54A) with seven each.

The Six to Four Reduction Facility #1 (54A) has a chromium concentration exceeding 20 times the TCLP limit in a depth of 4.0 inches in the concrete core sample collected. Three components, the Old Cooling Water Tower (3K), the Nuclear Fuel Services Storage and Pump House (2E), and the Metals Fabrication Plant (6A), have chromium concentrations exceeding 20 times the TCLP limit in depths to 1.0 inch in the concrete core samples collected. The NFS Storage and Pump House (2E),

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A.II.3.12 Lead

Lead is rare in nature but is a trace constituent in concrete (up to a baseline level of 3.42 mg/kg at the FEMP). Lead (lead dioxide) is used in storage batteries, and lead compounds have been used extensively in paints. At the FEMP, lead, as lead oxide, was an impurity in uranium ores and ore concentrates, with concentrations ranging from 0.09 to 4.78 percent (DOE 1994a). However, the impurities were concentrated up to five times through the removal of the uranium in the refining process.

As depicted on Figure A.II-63 and on Table A.II.1, lead was detected in 90 percent (658 of 731) of solid media samples collected from OU3, with concentrations ranging from 0.54 to 375,000 mg/kg. The geometric mean for all lead results is 77.3 mg/kg The maximum concentration of lead was found in a steel coatings sample collected from the Metals Production Plant (5A). Ten other steel coatings samples collected from this component also exceeded 20 times the TCLP limit (100 mg/kg). Another component, the Recovery Plant (8A), had 16 steel coatings samples which exceeded 20 times the TCLP limit. As reference points, approximately 17 percent of all lead results were at or below the OU3 baseline level for concrete (3.42 mg/kg), and 99 percent of all results were at or below the OU3 baseline level for steel coatings (239,000 mg/kg). Table A.II-2 presents the number of detections found above established criteria.

Lead has a TCLP limit of 5.0 mg/L in the leachate. Concentrations of lead in 247 samples exceeded 20 times the TCLP limit. ~~and are therefore potentially hazardous.~~ The presence of lead in OU3 is further confirmed by its presence in 53 of 88 unknown liquid samples, with concentrations ranging from 1.2 to 13,500 μg/L (average of 330 μg/L).

These 247 samples consisted of 131 steel coatings samples (with concentrations ranging from 106 to 375,000 mg/kg), 34 loose media samples (with concentrations ranging from 117 to 10,300 mg/kg), 23 masonry samples (with concentrations ranging from 101 to 16,300 mg/kg), 21 concrete core samples (with concentrations ranging from 101 to 1210 mg/kg), 20 sediment samples (with concentrations ranging from 107 to 12,500 mg/kg), 13 concrete chip samples (with concentrations ranging from 130 to 2730 mg/kg), and five acid brick samples (with concentrations ranging from 153 to 518 mg/kg). As discussed in Attachment A.II-7, only two of these samples, where were taken from the Ore Refinery Plant (2A) and the Metal Dissolver Building (2D) are considered potentially hazardous due to lead. As previously discussed, the loose media, sediment, and soil are not part of the Plant (1A),

A.II.3.15 Mercury

Mercury is a trace element in the earth's crust, and mercuric sulfide is used as a pigment in paints. Mercury is a trace constituent in concrete (up to a baseline level of 0.03 mg/kg at the FEMP) and a trace constituent of coal and the resulting flyash when the coal is burned. Mercury was used in the dissolution of alloys in Plant 2/3, as well as in the Laboratory (15A).

As depicted on Figure A.II-69 and on Table A.II-1, mercury was detected in 42 percent (299 of 712) of solid media samples collected from OU3, with concentrations ranging from 0.024 to 223 mg/kg. The median of all mercury results is 0.1 mg/kg. The maximum concentration of mercury (223 mg/kg) was found in a sediment sample collected from the Laboratory (15A). Five other sediment samples collected from two components, one sample from the Low Nitrate Tank (18K) and four samples from the BDN Surge Lagoon (18A), also exceeded 20 times the TCLP limit (4 mg/kg).
Mercury has a TCLP limit of 0.2 mg/L in the leachate. Concentrations of mercury in 50 samples exceeded 20 times the TCLP limit~~. and are therefore potentially hazardous.~~ As discussed in Attachment A.II-7, no OU3 material is considered potentially hazardous due to mercury. As reference points, approximately 99 percent of all mercury results were at or below the Part B reference criteria, approximately 8 percent of all results were at or below the OU3 baseline level for concrete, and 98 percent of all results were at or below the OU3 baseline for steel coatings. Table A.II-2 presents the number of detections found above established criteria. The presence of mercury in OU3 at levels of concern is further confirmed by its detection in 26 of 90 unknown liquid samples, with concentrations ranging from 0.1 to 26.9 μg/L (average of 1.5 μg/L).

The 50 samples in which mercury exceeded 20 times the TCLP limit consisted of 32 steel coatings samples (with concentrations ranging from 4.5 to 32.6 mg/kg), five loose media samples (with concentrations ranging from 6.2 to 18.0 mg/kg), six sediment samples (with concentrations ranging from 4.2 to 223 mg/kg), two masonry samples (with concentrations ranging from 4.6 to 5.2 mg/kg), two acid brick samples (with concentrations ranging from 5.2 to 7.0 mg/kg), one concrete core sample (with a concentration of 12.6 mg/kg), and two concrete chip samples (with concentrations of 4 and 4.8 mg/kg). As previously discussed, the loose media and sediment are not part of the decision-making process of this RI/FS.

Since potassium is not a COC and it has no WAC for its on-property or off-site disposal, it is not further discussed is Appendix A or Section 3.0.

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A.II.3.18 Selenium

Selenium is a trace element in the earth's crust and is found in a few minerals. It is a trace constituent in concrete (up to a baseline level of 0.47 mg/kg at the FEMP) and is a trace constituent of coal and the resulting flyash when the coal is burned.

As depicted on Figure A.II-75 and on Table A.II-1, selenium was detected in 16 percent (96 of 601) of solid media samples collected from OU3, with concentrations ranging from 0.29 to 157 mg/kg. The geometric mean of all selenium results is 1.13 mg/kg. The maximum concentration of selenium (157 mg/kg) was found in a loose media sample collected from the Metals Fabrication Plant (6A). Three other loose media samples collected from two components, one sample from the Ore Refinery Plant (2A) and two samples from the Green Salt Plant (4A), also exceeded 20 times the TCLP limit (20 mg/kg). As reference points, approximately 99 percent of all detected selenium results were at or below the Part B reference criteria (140 mg/kg), approximately 84 percent of all results were at or below the OU3 baseline level for concrete (0.47 mg/kg), and approximately 87 percent of all selenium results were at or below the OU3 baseline for steel coatings (0.83 mg/kg). Table A.II-2 presents the number of detections found above established criteria.

Selenium has a TCLP limit of 1.0 mg/L in the leachate. Concentrations of selenium in seven samples exceeded 20 times the TCLP limit (20 mg/kg)~~. and are therefore potentially hazardous.~~ As discussed in Attachment A.II-7.2, no OU3 material is considered potentially hazardous due to selenium. The presence of selenium in OU3 is further confirmed by its detection in 15 of 86 unknown liquid samples, ranging from 1 to 64.6 μg/L (average of 6.0 μg/L).

The seven samples in which selenium exceeded 20 times the TCLP limit consisted of four loose media samples discussed above (with concentrations ranging from 49.8 to 157 mg/kg) and three steel coatings samples (with concentrations ranging from 36.4 to 77.5 mg/kg). No concrete, masonry, or acid brick samples exceeded 20 times the TCLP limit for selenium. As previously discussed, the loose media and sediment are not part of the decision-making process of this RI/FS. The three steel coatings samples exceeding 20 times the TCLP limit were collected from the Green Salt Plant (4A), the Combined Raffinate Tanks (3J), and the Incinerator Building (39A).

Six of the seven samples exceeding 20 times the TCLP limit were collected from the process buildings component category, and the remaining sample was collected from the aboveground container category.

Figure A.II-76 depicts the summary of contamination by media sampled for the analyte selenium. As indicated, selenium was detected in all sampled media, except asphalt, with the highest concentrations detected in loose media.

Selenium is a COC; however, since it has no WAC for on-property or off-site disposal, it is considered *not as significant* compared to other inorganic contaminants and is not further discussed in Appendix A or Section 3.0.

A.II.3.19 Silver

Silver is a trace element in the earth's crust. It is a trace constituent in concrete (up to a baseline level of 5.42 mg/kg at the FEMP) and is a trace constituent of coal and the resulting flyash when the coal is burned. Silver compounds were used as an algicide in the Plant 4 heat exchangers, but silver is not reported to have been used in other production-related activities at the FEMP.

As depicted on Figure A.II-77 and on Table A.II-1, silver was detected in 36 percent (257 of 722) of solid media samples collected from OU3, with concentrations ranging from 0.17 to 1360 mg/kg. The geometric mean for all silver results is 1.41 mg/kg. The maximum concentration of silver was found in a loose media sample collected from the Special Products Plant (9A) as was a second sample. Two other loose media samples collected from two components, one sample from the Recovery Plant (8A) and one sample from the Metal Dissolver Building (2D), also exceeded 20 times the TCLP limit (100 mg/kg). As reference points, approximately 99 percent of all silver results were at or below the Part B reference criteria (140 mg/kg), approximately 91 percent of all results were at or below the OU3 baseline level for concrete (5.42 mg/kg), and approximately 92 percent were at or below the OU3 baseline for steel coatings (6.40 mg/kg). Table A.II-2 presents the number of detections found above established criteria. The presence of silver in OU3 is further confirmed by its detection in 23 of 84 unknown liquid samples, with concentrations ranging from 1 to 357 μg/L (average of 19.7 μg/L).

Silver has a TCLP limit of 5.0 mg/L in the leachate. Concentrations of silver in five samples exceeded 20 times the TCLP limit (100 mg/kg). ~~and are therefore potentially hazardous.~~

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These five samples in which silver exceeded 20 times the TCLP limit consisted of four loose media samples discussed above (with concentrations ranging from 143 to 1360 mg/kg) and one sediment sample (with a concentration of 435 mg/kg) collected from the Laboratory (15A). No concrete, masonry, or acid brick samples exceeded 20 times the TCLP limit for silver. As discussed in Attachment A.II-7, no OU3 material is considered potentially hazardous due to silver. As previously discussed, the loose media and sediment are not part of the decision-making process of this RI/FS.

All of the five samples exceeding 20 times the TCLP limit were collected from the process buildings.

Figure A.II-78 depicts the summary of contamination by media sampled for the analyte silver. As indicated, silver was detected in all sampled media, except asphalt and soil, and at the highest levels in loose media.

Silver is a COC; however, since it has no WAC for on-property or off-site disposal, it is considered *not as significant* compared to other inorganic contaminants. The samples which exceeded the TCLP limit were not for a major media.

A.II.3.20 Sodium

Sodium is the sixth most abundant element in the earth's crust and is a trace constituent in concrete (up to a baseline level of 610 mg/kg at the FEMP). Sodium chloride (NaCl) was used in the heat treating processes at the FEMP, and sodium hydroxide (NaOH) was used extensively in the processing areas and the General Sump to precipitate metals in wastewater prior to discharge. Sodium was also an impurity in uranium ores and ore concentrates used at the FEMP, with concentrations ranging from 0.001 to 9.90 percent (DOE 1994a). However, the impurities were concentrated up to five times through the removal of the uranium in the refining process.

As depicted on Figure A.II-79 and Tables A.II-1 and A.II-2, sodium was detected in 84 percent (607 of 722) of solid media samples collected from OU3, with concentrations ranging from 50.1 to 82,200 mg/kg. The geometric mean of all sodium results is 676 mg/kg. The maximum concentration of sodium was found in the same loose media sample collected from the Special Products Plant (9A) in which the highest silver concentration was detected. As reference points, approximately 53 percent of all sodium results were at or below the OU3 baseline level for concrete (610 mg/kg), and 68 percent of the results were at or below the OU3 baseline for steel coatings (840 mg/kg). The presence of sodium in OU3 is further confirmed by its detection in 85 of 91

CFR 261 App. II). This procedure is designed to conservatively estimate the amount of a contaminant that will leach from a sample in a landfill. ~~In simple terms,~~ Simply, the procedure specifies that 100 grams (g) of a solid sample be ground, placed in 2 liters (L) of acidified water, shaken together for a period of time, the liquid separated from the solids, and the concentration of contaminants in the liquid measured. If the concentration of specified contaminants in the liquid exceeds regulatory levels (40 CFR 261.24), the solid material is classified as hazardous. Samples of liquids that exceed the regulatory limits are also considered hazardous.

A significant factor in the procedure is that contaminants in the solid sample that leach are diluted by a factor of 20 (i.e., 20000 milliliters [ml] per 100 g or 20 ml/g or 20 L/kilogram [kg]). Stated another way:

> *if a 100 mg solid sample contains 2.0 mg of a given contaminant (i.e., a concentration of 2.0 mg/100 mg or 20 mg/kg) and it all leaches in the TCLP test, its concentration in the leachate will be 1 mg/L.*

This factor is useful in making determinations as to whether or not a material can be hazardous based on the concentration of regulated chemicals in the solid sample. If the concentration of a specified chemical is less than 20 times the respective TCLP limit, it cannot be hazardous. If the concentration is greater than 20 times the TCLP limit, it may be hazardous, but a TCLP analysis must be performed to be sure.

In the 46 samples that were analyzed using the TCLP test, 17 regulated chemicals were detected. Chromium, lead, and cadmium were detected the most often: chromium in seven samples (three acid brick and four concrete), lead in seven samples (three in acid brick, three in concrete, and one in masonry), and cadmium in six samples (three acid brick and three concrete). Of the samples that had detected levels of regulated chemicals, the concentrations in ~~three~~ six samples exceeded specified TCLP limits for ~~five~~ six chemicals, as shown below. ~~, and are considered hazardous.~~

Sample Number	Sampled Media	Contaminant	TCLP Result (mg/L)	TCLP Limit (mg/L)
54A-040	Masonry	Lead	11	5.0
9A-028	Transite	1,4-Dichlorobenzene	17.2	7.5
		Hexachlorobutadiene	14.9	0.5
		Nitrobenzene	28.3	2.0
2A-014	Transite	Tetrachloroethene	59	0.7
3E-015	Transite	Chromium	5.963	5.0

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6A-019	Liquid	Tetrachloroethene	6.8	0.7
9A-020	Liquid	Lead	13.5	5.0

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Another use for the TCLP results is to determine the amount of individual chemicals that leach during the test to evaluate: 1) whether the 20 times TCLP level is too conservative, and 2) how much may leach after disposal. To determine this, the concentration of the contaminant in the solid sample must be known. Of the 46 samples for which TCLP analyses were performed, the concentration of at least one fraction of contaminants (i.e., radiological, inorganics, semivolatiles and/or volatiles) was determined in the solid phase of 33 of the same or nearby samples (6 acid brick, 2 masonry, 9 concrete chip, and 16 concrete cores). Tables A.II-3, A.II-4, A.II-5, and A.II-6 compare the total and TCLP results for these samples for radionuclides, inorganics, semivolatiles, and volatiles, respectively. Note that only analyses in which the leachate concentration was below the theoretical maximum concentration, based on all of the metal in the solid sample leaching, are considered reasonable. Note also that, for comparison purposes, non-detected results are designated with a *less than* (<) sign.

A.II.7.1 Radionuclides

Note that there are no TCLP limits for radionuclides. However, a few acid brick and concrete samples were analyzed using the TCLP test to obtain a conservative estimate of the percentage of contaminants that leach.

Acid Brick

Two acid brick samples were analyzed for radionuclides using the TCLP test. All of the radionuclides, except cesium-137, were detected in both the solid phase and the leachate. Cesium-137, however, was not detected in the leachate of either sample. From 0.3 percent (technetium-99) to 78 percent (neptunium-237) of the radionuclides leached in the TCLP test.

Concrete

Four concrete samples (two chip samples and two core samples) were analyzed for radionuclides using the TCLP test. Sample results indicate that most of the radionuclides were detected in both the solid phase and the leachate. The major exceptions were cesium-137, and strontium-90. Cesium-137 was not detected in the solid phase or leachate of any of the samples, and strontium-90 was not detected in the solid phase of three samples. Because of the low apparent percentage of most radionuclides that leached from the samples taken from the Metals Production Plant (5A), the two samples are not considered representative. Even excluding these samples, a quantity of less than 0.1 percent (thorium-230) to 56 percent (technetium-99) of the radionuclides leached in the TCLP test.

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Masonry

Neither of the masonry samples were analyzed for radionuclides.

A.II.7.2 Inorganics

Acid Brick

Three acid brick samples were analyzed for inorganics using the TCLP test. Only two TCLP metals, chromium (at 127 mg/kg) and lead (at 169 mg/kg), were detected at greater than 20 times the TCLP limit in the solid. Chromium was detected in the TCLP leachate of the corresponding sample at 0.116 mg/L, well below the TCLP limit of 5.0 mg/L. ~~Analytical~~ These results indicate that only two percent of available chromium leached from the solid sample. Lead was detected in the TCLP leachate of the solid sample exceeding 20 times TCLP at 0.0727 mg/L, well below the TCLP limit of 5.0 mg/L. These ~~R~~results indicate that only one percent of the available lead leached from the solid sample. Based on these results (assuming a maximum of two percent of any TCLP metal with a high initial concentration in the solid phase would leach during the TCLP test), no acid brick samples would be considered characteristically hazardous due to TCLP metals.

In all of the samples, from 0.9 percent (arsenic) to 66 percent (cobalt) of the TAL inorganics and a maximum of 35 percent (lead) of any TCLP metal, leached out in the TCLP test. Based on these data (assuming a maximum of 35 percent of any TCLP metal would leach during a TCLP test), only four samples would be expected to leach metals in excess of TCLP limits, ~~considered characteristically hazardous due to TCLP metals,~~ two for chromium and two for lead. ~~Conservatively, however, a concentration of 20 times the TCLP limit in the solid sample will be used to estimate the amount of acid brick that is potentially hazardous.~~

As discussed in Attachment A.III.2.1, acid brick was used in wet process areas. Therefore, it is expected that contamination associated with acid brick would be uniformly distributed. This expectation is supported by field survey data. Based on this, acid brick in the process areas/components where these four samples were collected (9A - 2 samples, 2A and 2D) will be assumed potentially hazardous due to TCLP metals. This assumption is considered conservative since it does not account for the facts that: 1) much of the contamination associated with acid brick is expected to be on the surface (acid brick is nonporous) and should be removed during decontamination, and 2) the samples were collected at the locations of highest contamination and, by definition, not conservative.

Concrete

From 0.1 percent (iron) to 57.9 percent (sodium) of the TAL inorganics, ~~and a maximum of ten percent (silver) of TCLP metals,~~ leached in the TCLP test. ~~From 0.1 percent (lead) to 16.5 percent (barium) of TCLP metals leached in the TCLP test.~~ Based on these data (conservatively assuming a maximum of 25 percent of any TCLP metal would leach during a TCLP test), twelve ~~ten~~ samples would be ~~considered hazardous for lead and two for chromium.~~ expected to leach metals in excess of TCLP limits, ten for lead and two for chromium.

As noted in Section 2.3, the concrete chip samples are not truly representative. In most cases, the samples were taken from the top 1/2-inch of an assumed 8-inch thickness. The concrete below the concrete chip is assumed to be at the OU3 baseline concentration for all inorganics. ~~This~~ Accounting for more representative sampling would indicate that even the sample with the highest lead concentration would not be hazardous, excluding the fact that the sample was collected at the location of highest contamination. Therefore, no concrete is considered potentially hazardous due to TCLP metals.

~~Although all of these data indicate that 20 times the TCLP limit is overly conservative, they are not consistent enough to make a definitive assessment. Therefore, a concentration of 20 times the TCLP limit in the solid sample will be used to estimate the amount of concrete that is potentially hazardous.~~

Masonry

In the two masonry samples analyzed for both total and TCLP inorganics, ~~only~~ one TCLP metal, lead (at 13,000 mg/kg), was detected at greater than 20 times the TCLP limit in the solid sample corresponding to the sample analyzed using the TCLP. Lead was detected in the leachate of the corresponding sample at 11 mg/L, above the TCLP limit of 5.0 mg/L. But only 1.7 percent of the available lead leached from the solid sample. Based on this result (assuming a maximum of two percent of any TCLP metal would leach during the TCLP test), two masonry samples (both from the same process area) would be ~~considered characteristically hazardous due to lead.~~ expected to leach metals in excess of TCLP limits.

The sample in which the leachate concentration exceeded the TCLP limit for lead is the only one for which the estimate of the amount of any inorganic that leached is considered reliable. Based on these results, no conclusions can be made regarding the leachability of inorganics from masonry.

- As noted in Section 2.3, the masonry samples are not truly representative. In most cases, the samples were taken from the top 1/2-inch of an assumed 8-inch thickness. The masonry below the concrete chip is

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assumed to be at the OU3 baseline concentration for all inorganics. This would indicate that both masonry samples with the maximum lead concentrations would still be expected to leach in excess of TCLP limits. ~~hazardous if a representative sample were collected. Therefore, a concentration of 20 times the TCLP limit in the solid sample will be used to estimate the amount of concrete that is potentially hazardous.~~

As described in Attachment III.2.5, masonry is a porous media used to construct non-structural walls throughout the FEMP. Therefore, it is expected that contamination would be limited and localized (i.e., contamination would primarily be the result of spills and splashing, which would be absorbed in the immediate vicinity of contact). Samples truly representative of the full depth, width and height of the masonry in areas would, then, not be expected to be hazardous. For this reason, no masonry is considered potentially hazardous due to TCLP metals.

Transite

Eleven transite samples were analyzed for inorganics using the TCLP test; analyses of the solid samples were not performed. As described in more detail in Attachment A.III.2.7, the concentration of chromium in the leachate from one sample exceeded the TCLP limit, (5.96 mg/L detected versus a TCLP limit if 5.0 mg/L).

Transite is a porous media used to construct non-structural walls. Therefore, it is expected that chemical contamination would be limited and localized (i.e., contamination would primarily be the result of spills and splashing, which would be absorbed in the immediate vicinity of contact.) Samples truly representative of the full depth, width and height of the transite in this area would, then, not be expected to be hazardous. for this reason, no transite is considered potentially hazardous due to TCLP metals.

Since solid samples of transite were not analyzed, a method is needed to estimate the associated source term. Since transite is similar to concrete, concrete leachability results have been used to estimate contaminant concentrations, in transite, based on TCLP results. As described in Attachment a.II.7.2, a maximum of 16.5 percent of ant TCLP metal (barium) leached in the TCLP test. Therefore, a conservative estimate of 33 percent has been used to estimate the concentration of contaminants in transite, based on TCLP result for metals. This relates to a factor of 60 to convert form TCLP results to estimated concentrations in the solid (i.e., the normal factor of 20 for the TCLP test-see Attachment A.II.7, times a factor of three to account for reduced leachability).

For five of the concrete samples that were analyzed for inorganics using the TCLP test, a corresponding solid sample was also analyzed. Only one TCLP metal, lead (at 105 mg/kg), was detected at greater than 20 times the TCLP limit in the solid sample corresponding to the sample analyzed using the TCLP test. Lead was detected in the leachate of the corresponding sample at 0.0075 mg/L, well below the TCLP limit of 5.0 mg/L and indicating that only 0.14 percent of the available lead leached from the solid sample. Based on this result (assuming a maximum of 0.2 percent of any TCLP metal would leach during the TCLP test), no concrete samples would be ~~considered characteristically hazardous due to TCLP metals.~~ expected to leach TCLP metals in excess of TCLP limits.

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A.II.7.3 Semivolatiles

Acid Brick

Two acid brick samples were analyzed for both total and TCLP semivolatile organics. Only nine semivolatiles (2-chloronapthalene, 4-bromophenyl phenyl ether, 4-nitrophenol, benzo(a)pyrene, chrysene, fluoranthene, phenanthrene, phenol, and pyrene) ~~semivolatiles~~ were detected in the solid phase of one sample and only two (di-n-octyl phthalate and fluoranthene) in the second. No semivolatiles were detected in the leachate from either sample. There are no TCLP limits for any of the detected semivolatiles. Since there were so few detections of semivolatiles in acid brick, no conclusions can be made regarding the leachability of semivolatiles. In addition, although the detection limits for most of the non-detected results are somewhat higher than the detected results,
they are ~~still~~ well ~~above~~ below TCLP limits, for the leachate and well ~~above~~ below 20 times the TCLP limit for the solids. Since no concentration of semivolatiles in acid brick samples exceeded 20 times the TCLP limit, ~~N~~no acid brick is expected to be characteristically hazardous due to semivolatiles. ~~Conservatively, 20 times the TCLP limit is used to estimate the amount that is potentially hazardous.~~

Concrete

Four concrete samples for which TCLP analyses were performed were also analyzed for semivolatile contamination. Only eight semivolatiles (benzo(a)anthracene, butyl benzyl phthalate, chrysene, di-n-butyl phthalate, di-n-octyl phthalate, fluoranthene, phenanthrene - in all four, and pyrene) were detected in the solid sample, and only one (phenanthrene) was detected in the leachate. Phenanthrene was detected in all four solid samples, but only in one leachate sample, and fluoranthene was detected in two solid samples. All other detected semivolatiles were only detected in one solid. There are no TCLP limits for any of the detected semivolatiles.

Because of the large number of non-detected results, only one of the estimates of the amount of any semivolatile that leached is considered reliable, thus no conclusions can be made regarding the leachability of semivolatiles from concrete. ~~Therefore, 20 times the TCLP limit is used to estimate the amount that is potentially hazardous.~~ However, since no concentration of semivolatiles in concrete exceeded 20 times the TCLP limit, no concrete is considered potentially hazardous due to semivolatiles.

Masonry

Neither of the masonry samples was analyzed for semivolatiles using the TCLP test. However, since no concentration of semivolatiles in masonry exceeded 20 times the TCLP limit, no masonry is considered potentially hazardous due to semivolatiles.

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Transite

Eleven transite samples were analyzed for semivolatiles using the TCLP test; analyses of the solid samples were not performed. As described in Attachment A.III.2.7, the concentrations of 1,4-dichlorobenzene, hexachlorobutadiene, and nitrobenzene, in one sample exceeded the respective TCLP limits.

As described in Attachment A.II.2.7, chemical contamination in transite is expected to be limited and localized. Samples truly representative of the full depth, width, and height of the transite in this area would, then, not be expected to be hazardous. for the reason, no transite is considered potentially hazardous due to semivolatiles.

Since solid samples of transite were not analyzed, a method is needed to estimate the associated source term. Leachability results for semivolatiles from concrete indicate values greater than 1.1 percent and less than 90.9 percent, with the only reliable result indicating 9.5 percent. Based on the inconclusive results, it has been assumed that 100 percent of semivolatiles leach from transite. This relates to a facet of 20 to convert TCLP results to estimated concentrations in the solid. This assumption is considered reasonable for use in estimating the source term given the limited extent of semivolatile contamination in transite.

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A.II.7.4 Volatiles

Acid Brick

The solid phase of two of the acid brick samples for which the TCLP test was performed were was analyzed for volatile organics. Only seven volatiles (1,1,1,-trichloroethane, ethylbenzene, methylene chloride, tetrachloroethene, xylenes (m/p, o, and total), one of which is regulated by RCRA (tetrachloroethene), were detected in the solid sample and only one, benzene (which is regulated by RCRA) was detected in the leachate. The solid sample did not exceed 20 times the TCLP limit~~,~~ and the leachate sample did not exceed the TCLP limit. None of the estimates of the amount of any volatile that leached are considered reliable; thus no conclusions can be made regarding the leachability of volatiles from acid brick. Therefore, ~~20 times the TCLP limit is used to estimate the amount that is potentially hazardous.~~ However, since no concentration of volatiles in acid brick exceeded 20 times the TCLP limit, no acid brick is considered potentially hazardous due to volatiles.

Concrete

The solid phase of 18 concrete samples for which TCLP analyses were performed was also analyzed for volatile organic contamination. Only 10 volatiles were detected in the solid sample, and only 11 volatiles were detected in the leachate. The following volatiles were detected in the solid samples: 1,1,1-trichloroethane - in four samples; 2-butanone, 2-hexanone, and 4-methyl-2-pentanone - in three samples; benzene, and ethylbenzene - in ten samples, methylene chloride, and tetrachloroethene - in five samples; toluene - in seven samples; and xylenes [m/p, o, and total] - in eight samples. Volatiles detected in the leachate were 1,1,1-trichloroethane - in seven samples [including the four where it was detected in the solid phase]; 2-butanone, 4-methyl-2-pentanone - in three samples [including two in which it was detected in the solid phase]; benzene - in two samples; carbon disulfide - in nine samples; chlorobenzene, chloroform, and ethylbenzene - in eight samples [including seven in which it was detected in the solid phase]; tetrachloroethene, and toluene - in five samples 9 [including two in which it was detected in the solid phase]; and total xylenes - in eight samples [including seven in which it was detected in the solid phase]. Because of the detection of ethylbenzene, toluene, and xylenes in many of the same samples, it is likely that this contamination is a result of spills of gasoline or other petroleum product.

TCLP limits exist for only four of the detected volatiles, 2-butanone, benzene, chloroform, and tetrachloroethene. The concentration of 2-butanone in the one solid in which it was detected was well

concentration of chloroform in the leachate of one sample was well below the TCLP limit (0.001 mg/L detected, versus the TCLP limit of 6.0 mg/L). All detected concentrations of tetrachloroethene in the solid samples were well below 20 times the TCLP limit (maximum of 23 μg/kg detected, versus a 20 times the TCLP limit value of 14,000 μg/kg).

Primarily because of the large number of non-detected results, only nine of the estimates of the amount of any volatile that leached are considered reliable; ~~thus no conclusions can be made regarding the leachability of volatiles from concrete. Therefore, **20 times the TCLP limit is used to estimate the amount that is potentially hazardous.**~~ However, since no concentration of volatiles in concrete exceeded 20 times the TCLP limit, no concrete is considered potentially hazardous due to semivolatiles.

Masonry

Neither of the masonry samples was analyzed for volatiles using the TCLP test. However, since no concentration of volatiles in masonry exceeded 20 times the TCLP limit, no masonry is considered potentially hazardous due to volatiles.

Transite

Twelve transite samples were anlayzed for volatiles using the TCLP test; analyses of the solid samples were not performed. As described in more detail in Attachment A.III.2.7, the concentration of tetrachloroethene in one sample exceeded the TCLP limit.

As described in Attachment A.II-2.7, chemical contaminants in transite is expected to be limited and localized. Samples truly representative of the full depth, width and height of the transite in this areas would, then, not be expected to be hazardous. For this reason, no transite is considered potentially hazardous due to volatiles.

Since solid samples were not analyzed, a method is needed to estimate the associated source term. Leachability results for volatiles from concrete indicate values greater than 0.4 percent to greater than 100 percent, with reliable results ranging from 4.0 percent to 12.0 percent. Based on these inconclusive results, it has been assumed that 100 percent of volatiles leach from transite. This relates to a factor of 20 to convert TCLP results to estimated concentrations in the solid. This assumption is considered reasonable for use in estimating the source term, given the limited extent of volatile contamination in transite.

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RADIONUCLIDE	ELEMENT NAME	HALF-LIFE	PRINCIPAL RADIATION EMITTED
U-238	URANIUM	4.47×10^9 YEARS	α
↓			
Th-234	THORIUM	24.1 DAYS	β γ
↓			
Pa-234m	PROTACTINIUM	1.17 MINUTES	β γ
99.87% | 0.13%			
Pa-234	PROTACTINIUM	6.7 HOURS	β γ
↓			
U-234	URANIUM	2.45×10^5 YEARS	α γ
↓			
Th-230	THORIUM	7.7×10^4 YEARS	α γ
↓			
Ra-226	RADIUM	1600 YEARS	α γ
↓			
Rn-222	RADON	3.82 DAYS	α γ
↓			
Po-218	POLONIUM	3.05 MINUTES	α β
↓			
Pb-214	LEAD	26.8 MINUTES	β γ
↓			
Bi-214	BISMUTH	19.9 MINUTES	α β γ
↓			
Po-214	POLONIUM	63.7 MICROSECOND	α γ
↓			
Pb-210	LEAD	22.3 YEARS	α β γ
↓			
Bi-210	BISMUTH	5.01 DAYS	α β
↓			
Po-210	POLONIUM	138 DAYS	α γ
↓			
Pb-206	LEAD	STABLE	———

NOTE:
SOME MINOR DECAY BRANCHES HAVE BEEN ELIMINATED FOR SIMPLICITY.

LEGEND:
α = ALPHA
β = BETA
γ = GAMMA

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EXHIBIT A.II-1 NATURALLY OCCURING RADIOACTIVE DECAY CHAIN URANIUM SERIES

RADIONUCLIDE	ELEMENT NAME	HALF-LIFE	PRINCIPAL RADIATION EMITTED
U-238	URANIUM	4.47×10^9 YEARS	α
↓			
Th-234	THORIUM	24.1 DAYS	β γ
↓			
Pa-234m	PROTACTINIUM	1.17 MINUTES	β γ
99.87% | 0.13%			
Pa-234	PROTACTINIUM	6.7 HOURS	β γ
↓			
U-234	URANIUM	2.45×10^5 YEARS	α γ
↓			
Th-230	THORIUM	7.7×10^4 YEARS	α γ
↓			
Ra-226	RADIUM	1600 YEARS	α γ
↓			
Rn-222	RADON	3.82 DAYS	α γ
↓			
Po-218	POLONIUM	3.05 MINUTES	α β
↓			
Pb-214	LEAD	26.8 MINUTES	β γ
↓			
Bi-214	BISMUTH	19.9 MINUTES	α β γ
↓			
Po-214	POLONIUM	63.7 MICROSECOND	α γ
↓			
Pb-210	LEAD	22.3 YEARS	α β γ
↓			
Bi-210	BISMUTH	5.01 DAYS	α β
↓			
Po-210	POLONIUM	138 DAYS	α γ
↓			
Pb-206	LEAD	STABLE	———

NOTE:
SOME MINOR DECAY BRANCHES HAVE BEEN ELIMINATED FOR SIMPLICITY.

LEGEND:
α = ALPHA
β = BETA
γ = GAMMA

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EXHIBIT A.II-2 NATURALLY OCCURRING RADIOACTIVE DECAY CHAIN THORIUM SERIE

RADIONUCLIDE	ELEMENT NAME	HALF-LIFE	PRINCIPAL RADIATION EMITTED
U-235	URANIUM	7.04×10^8 YEARS	α γ
↓ Th-231	THORIUM	25.5 HOURS	β γ
↓ Pa-231	PROTACTINIUM	3.28×10^4 YEARS	α γ
↓ Ac-227	ACTINIUM	21.8 YEARS	α β γ
1.2% / 98.8% → Th-227	THORIUM	18.9 DAYS	α γ
→ Fr-223	FRANCIUM	21.8 MINUTES	α γ
↓ Ra-223	RADIUM	11.4 DAYS	α
↓ Rn-219	RADON	3.96 SECONDS	α γ
↓ Po-215	POLONIUM	7.8×10^{-4} SECONDS	α
↓ Pb-211	LEAD	36.1 MINUTES	β γ
↓ Bi-211	BISMUTH	2.13 MINUTES	α β γ
99.73% / 0.27% → Po-211	POLONIUM	0.52 SECONDS	α γ
→ Tl-207	THALLIUM	4.77 MINUTES	β γ
↓ Pb-207	LEAD	STABLE	——

NOTE:
SOME MINOR DECAY BRANCHES HAVE BEEN ELIMINATED FOR SIMPLICITY

LEGEND:
α = ALPHA
β = BETA
γ = GAMMA

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EXHIBIT A.II-3 NATURALLY OCCURRING RADIOACTIVE DECAY CHAIN ACTINIUM SERIES

A.III SUMMARY OF CONTAMINATION BY MEDIA

A.III.1 INTRODUCTION

This attachment presents the results of the Operable Unit 3 (OU3) remedial investigation/feasibility study (RI/FS) field sampling program. The data in this attachment is organized according to sampled medium type. This organization provides the mechanism for identifying the media within OU3 which are of primary concern in terms of the level and extent of contamination.

Table A.III-1 summarizes the results of analyses of samples collected during the field program by sampled media types. The table is separated into two parts: major media, which were collected to characterize OU3, and supplemental media, which were collected to support the characterization of OU3 and provide data for a baseline risk assessment. Since no baseline risk assessment is being performed (see Section 1.0), the supplemental samples are only used to support the characterization provided by the major media.

As previously noted, changes in the database of analytical results occurred after this attachment was drafted in September 1995. Because these changes do not alter the conclusions from the analysis of the data, this attachment has not been updated to reflect the minor changes. A description of the major changes is included as Appendix A.7 and Appendix L identifies all of the changes.

A.III.2 MAJOR MEDIA

Major media includes acid brick, asphalt, concrete (chips and cores), masonry, steel coatings, and transite. The following sections describe the contamination associated with each of these.

A.III.2.1 Acid Brick

Acid brick was used in several wet process areas as a protective layer for the underlying concrete. It is a heat-treated material that is non-porous and resistant to chemical attack. Since acid brick is nonporous, significant penetration of contaminants is not expected. Samples were collected by chipping away the surface using a jackhammer, hammer drill, or chisel. The sampling was intended to be representative of the maximum expected radiological and chemical contamination (note that these locations may be different) based on nonintrusive sampling results and process knowledge.

A total of 33 acid brick samples were taken for analysis of radiological and chemical contamination. Note that one of the samples was analyzed only for volatile organics and not inorganics.

The geometric mean of sample analytical results is used for comparing lognormal and the arithmetic mean is used for comparing normally distributed radionuclide sample results to baseline and Part B reference criteria radionuclide concentrations. The mean of sample results exceeds the baseline concentration by the greatest ratios for: technetium-99, uranium, uranium-234, uranium-235/236, and uranium-238. The mean exceeds the Part B reference criteria concentration by the greatest ratios for: radium-226, thorium-228, uranium and two of its isotopes, uranium-235/236 and uranium-238.

The minimum sample result detected exceeds the corresponding concrete baseline or Part B reference criteria concentration for the following radionuclides:

Comparison with Baseline	Comparison with Part B reference
Americium-241	Cesium-137
Cesium-137	Lead-210
Radium-228	Neptunium-237
Thorium-228	Radium-226
Thorium-230	Thorium-228
Thorium-232	Uranium
	Uranium-235/236
	Uranium-238

This indicates that these analyte's baseline or Part B reference criteria concentrations exceed the analyte's detection limits. Note that the list of radionuclides with all results greater than the Part B reference criteria concentration is longer than the list of radionuclides with all results greater than the baseline concentration. This is partially attributable to Part B reference criteria concentrations that are substantially lower than baseline concentrations for several radionuclides.

None of the maximum sample results detected are less than the corresponding baseline or Part B reference criteria concentration. This indicates that acid brick in OU3 contains elevated levels of every radionuclide sampled.

TCLP Results:

~~Two~~ four acid brick samples were analyzed for radionuclides using the TCLP test. Two of these have corresponding results from nearby solid samples (see Attachment A.II.7 for ~~complete~~ results). All of the radionuclides, except cesium-137 which was not detected in the leachate of either sample, were detected in both the solid phase and the leachate. From 0.3 percent (technetium-99) to 78 percent (neptunium-237) of the radionuclides leached out in the TCLP test.

TCLP Results:

Three acid brick samples were analyzed for inorganics using the ~~toxicity characteristic leachate procedure (TCLP)~~ test. Tables A.II-3 through A.II-6 compare the results of the TCLP analyses with those for total inorganics in the solid sample. Note that only analyses where the leachate concentration was below the theoretical maximum concentration, based on all of the metal in the solid sample leaching, are considered reasonable.

Only two TCLP metals, chromium (at 127 mg/kg) and lead (at 169 mg/kg), were detected at greater than 20 times the TCLP limit in the solid sample. Chromium was detected in the TCLP leachate of the respective sample at 0.116 mg/L, well below the TCLP limit of 5.0 mg/L and indicating that only two percent of available chromium leached from the solid sample. Lead was detected in the TCLP leachate of the respective sample at 0.0727 mg/L, well below the TCLP limit of 5.0 mg/L. This indicated that only one percent of the available lead leached from the solid sample.

From 0.9 percent (arsenic) to 66 percent (cobalt) of the TAL inorganics, and a maximum of 35 percent (lead) of any TCLP metal, leached out in the TCLP test. ~~A concentration of 20 times the TCLP limit in the solid sample will be used to conservatively estimate the amount of acid brick that is potentially hazardous.~~ As discussed in Attachment A.II.7.2, acid brick in three components (9A, 2A, and 2D) are considered potentially hazardous due to TCLP metals.

A.III.2.1.3 Semivolatile Organic Contamination

Three acid brick samples from two components were analyzed for semivolatile organic constituents. Only 12 of the 64 semivolatiles for which analyses were performed were detected. Benzo(b)fluoranthene, chrysene, and fluoranthene were each detected in two samples. All other detected semivolatiles were found in only one sample.

The maximum and average concentration of only two semivolatiles, benzo(a)pyrene and benzo(b)fluoranthene, exceeded the Part B reference criteria. The maximum concentrations exceeded these levels by factors of 39 and 1.2, respectively.

No semivolatiles for which a TCLP limit exists were detected.

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TCLP Results:

two in the second. No semivolatiles were detected in the leachate from either sample. There are no TCLP limits for any of the detected semivolatiles. Since most of the detection limits for semivolatiles were well ~~above~~ below ~~the~~ 20 times TCLP ~~value~~, limit no acid brick is considered potentially ~~expected to be characteristically~~ hazardous due to semivolatiles. ~~Conservatively, 20 times the TCLP limit is used to estimate the amount that is potentially hazardous.~~

A.III.2.1.4 Volatile Organic Contamination

Four acid brick samples from two components was analyzed for volatile organic constituents. Only 11 of the 36 volatiles for which analyses were performed were detected. 2-Butanone was detected in two samples. All other detected volatiles were found in only one sample.

The maximum and average concentration of all detected volatiles were below the respective Part B reference criteria.

The only detected semivolatiles for which TCLP limits exist were 2-butanone and trichloroethene, which were detected at concentrations of 8 and 5 μg/kg, respectively, well below the 4,000,000 and 14,000 μg/kg (i.e., 20 times the TCLP limits) required to even be potentially hazardous.

TCLP Results:

Two ~~of the~~ acid brick samples were analyzed for volatile organics in both the TCLP leachate and the solid sample. ~~using the TCLP test~~ (see Attachment A.II.7 for complete details). Only seven volatiles, one of which is regulated by RCRA, (tetrachloroethene) were detected in the solid sample and only one, which is regulated by RCRA, (benzene) was detected in the leachate. The detected concentration in the solid sample did not exceed 20 times the TCLP limited and the detected value in the leachate sample did not exceed the TCLP limit. Since most of the detection limits for volatiles were well below ~~above~~ 20 times the TCLP value, no acid brick is considered potentially ~~expected to be characteristically~~ hazardous due to volatiles. ~~Conservatively, 20 times the TCLP limit is used to estimate the amount that is potentially hazardous.~~

A.III.2.1.5 Pesticide/PCB Contamination

None of the acid brick samples were analyzed for pesticides or PCBs.

~~Two~~ Three acid brick samples were analyzed for TCLP semivolatile organics. Two of these have corresponding results for the solid sample, (see Attachment A.II.7 for complete details). Only nine semivolatiles were detected in the solid phase of one sample and only

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chisel. The sampling was intended to be representative of the maximum expected radiological and chemical contamination (note that these locations may be different) based on nonintrusive sampling results and process knowledge.

A total of four asphalt samples were taken for analysis of radiological and chemical contamination. The following describes the results of those analyses. None of the samples were analyzed using the TCLP test. In summary, asphalt contains elevated levels of elemental uranium but no samples are potentially hazardous.

A.III.2.2.1 Radiological Contamination

The results of radiological sample analyses for asphalt are statistically summarized in Table A.III-1. This indicates four analytical results are available from asphalt for americium-241, cesium-137, lead-210, neptunium-237, plutonium-238, plutonium-239/240, polonium-210, radium-226, radium-228, strontium-90, technetium-99, thorium-228, thorium-230, thorium-232, uranium, uranium-234, uranium-235/236, and uranium-238. With the exceptions of americium-241 and neptunium-237, all radionuclides and uranium were detected in at least one sample.

Radionuclide sample analytical results can be compared with the corresponding concrete baseline concentrations and Part B reference criteria concentrations. Comparison with these two parameters reveals that the mean sample result exceeds the corresponding concrete baseline or Part B reference criteria for the following radionuclides (sample-to-baseline/screen ratios are included in parentheses for each radionuclide):

Comparison with Baseline	Comparison with Part B reference
Americium-241 (1.1)	Cesium-137 (28.8)
Lead-210 (1.5)	Lead-210 (11.3)
Plutonium-238 (1.4)	Neptunium-237 (11.6)
Polonium-210 (1.8)	Polonium-210 (4.9)
Radium-228 (2.0)	Radium-226 (1346)
Technetium-99 (8.3)	Strontium-90 (5.6)
Thorium-228 (1.2)	Thorium-228 (956.8)
Uranium (11.0)	Uranium (550.3)
Uranium-235/236 (1.2)	Uranium-234 (1.6)
Uranium-238 (1.7)	

The arithmetic mean is used for comparing results that can not be assigned a statistical distribution to concrete baseline and Part B reference criteria radionuclide concentrations. The mean of sample results exceeds the baseline concentration by the greatest ratios for: technetium-99 and uranium. The

performed, except seven (antimony, beryllium, cadmium, mercury, selenium, silver, and thallium), were detected. Ten inorganics (arsenic, barium, calcium, iron, lead, magnesium, manganese, sodium, vanadium, and zinc) were detected in all four samples.

Since there are no baseline concentrations available for asphalt, baseline concentrations for concrete are used as a reference for evaluating the level of contamination. All asphalt samples exceeded the OU3 baseline concentration of inorganics in concrete for at least one analyte. The maximum concentrations of only seven inorganics (arsenic, calcium, lead, magnesium, manganese, vanadium, and zinc), and the average concentration of only two (lead and zinc) exceeded the concrete baseline values. The average concentration of lead and zinc exceeded the baseline levels in concrete by factors of 1.2 and 2.6, respectively.

As described in Appendix A.3, a second reference for evaluating the level of contamination in asphalt is the Part B reference criteria. The maximum and average concentrations, of only two detected inorganics (arsenic and manganese) exceeded these criteria. The average concentration of arsenic and manganese exceeded these criteria, by a factor of 77 and 2.3, respectively.

None of the asphalt samples exceeded 20 times the TCLP limit for any inorganic contaminant.

A.III.2.2.3 Semivolatile Organic Contamination

Two asphalt chip samples, both from roads, were analyzed for semivolatile organic constituents. Only six (2-methylnaphthalene, benzo(a)anthracene, chrysene, fluoranthene, phenanthrene, and pyrene) of the 63 semivolatiles for which analyses were performed were detected, and all six were detected in both samples.

Benzo(a)anthracene was the only detected semivolatile that exceeded a Part B reference criteria and both samples detected benzo(a)anthracene which exceeded the level, the maximum by a factor of 2.8.

There are no TCLP limits for any of the detected semivolatiles.

A.III.2.2.4 Volatile Organic Contamination

~~The same t~~Two asphalt chip samples that were analyzed for semivolatile contaminants were also analyzed for volatiles. Only one of the 32 volatiles for which analyses were performed was detected, 2-butanone at 4.0 μg/kg.

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Comparison with Baseline	Comparison with Part B reference criteria
None	Cesium-137
	Lead-210
	Neptunium-237
	Radium-226
	Thorium-227
	Thorium-228
	Uranium
	Uranium-235/236
	Uranium-238

This indicates that all sample analytical results for these radionuclides are greater than corresponding baseline or Part B reference criteria concentrations. Note that the list of radionuclides with all results greater than the Part B reference criteria concentration is longer than the list of radionuclides with all results greater than the baseline concentration. This is partially attributable to Part B reference criteria concentrations that are substantially lower than baseline concentrations for several radionuclides.

None of the maximum sample results detected are less than the corresponding baselines or Part B reference criteria concentrations. This indicates that elevated levels of every radionuclide and uranium were detected in surface concrete from at least one location.

TCLP Results:

~~Two~~ Eight concrete chip samples were analyzed for radionuclides using the TCLP test. Two of these have corresponding results for the same or a nearby solid sample. (see Attachment A.II.7 for complete details). Most of the radionuclides were detected in both the solid phase and the leachate. The major exceptions were cesium-137, which was not detected in the solid phase or leachate of either of the samples, and strontium-90, which was not detected in the solid phase of either sample. From less than 0.1 percent (thorium-227) to 25 percent (technetium-99) of the radionuclides leached out in the TCLP test.

A.III.2.3.2 Inorganic Contamination

A total of 154 concrete chip samples were taken from 90 components for analysis of TAL inorganics. As shown on Tables A.III-1 and A.III-2, all of the inorganic chemicals for which analyses were

All concrete chip samples exceeded the OU3 baseline concentration of inorganics in concrete for at least one analyte. The baseline concentrations of nine inorganics (aluminum, arsenic, barium, chromium, copper, lead, potassium, sodium, and zinc) were exceeded in over half of the samples. Also, the average concentration of all inorganics, except six (calcium, cadmium, beryllium, magnesium, manganese, and silver), exceeds the respective OU3 baseline concentration in concrete. The most significant of these are zinc, lead, and antimony with average concentrations in concrete chips that exceeded the concrete baseline concentrations by factors of 36, 25, and 15, respectively.

For ten inorganics (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, manganese, thallium and zinc), the maximum concentration exceeded the respective Part B reference criteria. The average concentration of only four inorganics (antimony, arsenic, beryllium, and manganese) exceeds the respective Part B reference criteria. The most significant of these are arsenic and beryllium, which exceeded these levels by factors of 131 and 48, respectively.

Table A.III-3 summarizes the inorganic contamination in concrete chips that exceeds 20 times the TCLP limit. Five of the eight RCRA metals (barium, cadmium, chromium, lead, and mercury) were detected at greater than 20 times the TCLP limit. Most significant of these is lead, which was detected at greater than 20 times the TCLP limit in 13 samples, with concentrations ranging up to 2730 mg/kg. This is followed by chromium (detected at greater than 20 times the TCLP limit in five samples, with concentrations ranging up to 640 mg/kg) and barium, cadmium, and mercury (each detected at greater than 20 times the TCLP limit in one sample, with concentrations of 5890, 29.4 and 4.8, respectively).

The most extensive inorganic contamination in concrete chips is associated with the Ball Mall Area of the Recovery Plant (8A), where results exceeded 20 times the TCLP limit for barium, chromium, and lead.

TCLP Results:

Eight ~~Seven~~ concrete chip samples were analyzed for inorganics using the TCLP test. In five of these, the same sample or one collected from a nearby location were analyzed for TAL inorganics in the solid sample. Tables A.II-3 through A.II-6 compare the results of the TCLP analyses with those for TAL (total) inorganics in the solid sample. Note that only analyses where the leachate concentration was below the theoretical maximum concentration, based on all of the metal in the solid sample leaching, are considered.

Only one TCLP metal, lead in the Sump Processing System Area of the Pilot Plant Wet Side (13A), was detected at greater than 20 times the TCLP limit in the solid sample (105 mg/kg). Lead was detected in the corresponding TCLP leachate at 0.0075 mg/L, well below the TCLP limit of 5.0 mg/L and indicating that only 0.14 percent of the available lead leached from the solid sample.

From 0.1 percent (iron) to 57.9 percent (sodium) of the TAL inorganics, and a maximum of ~~10~~ 16.5 percent ~~(silver)~~ (barium) of TCLP metals, leached out in the TCLP test. ~~Conservatively, a concentration of 20 times the TCLP limit in the solid sample has been used to estimate the amount of concrete that is potentially hazardous due to inorganics.~~ As discussed in Attachment A.II.7, no concrete is considered potentially hazardous due to TCLP metals.

A.III.2.3.3 Semivolatile Organic Contamination

Eight samples from four components were analyzed for semivolatile organic constituents. Only ten of the 64 semivolatile compounds for which analyses were performed were detected. Phenanthrene was detected in five samples. This is followed by fluoranthene (detected in three samples); chrysene and pyrene (each detected in two samples); and benzo(a)anthracene, bis(2-ethylhexyl)phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, and p-methylphenol (Cresol) (each detected in one sample).

The maximum and average concentration of only two detected semivolatiles (benzo(a)anthracene and bis(2-ethylhexyl)phthalate), exceeded Part B reference criteria. Most significant of these was benzo(a)anthracene, whose average concentration exceeded the screening level by a factor of 200.

The only detected semivolatile for which a TCLP limit exists was p-methylphenol (cresol), which was detected at a maximum of 650 μg/kg, well below the 4,000,000 μg/kg (i.e., 20 times the TCLP limit) required to even be potentially hazardous.

TCLP Result:

Seven concrete chip samples were analyzed for semivolatile contamination~~,~~ using the TCLP test (see Attachment A.II.7 for ~~complete~~ details). In four of these, the same sample, or one collected from a nearby location, was analyzed for ~~TCL S~~semivolatile ~~O~~organics in the solid sample. Only eight semivolatiles were detected in the solid sample, and only one was detected in the leachate. There are no TCLP limits for any of the detected semivolatiles.

Since most of the detection limits for semivolatiles were well above 20 times the TCLP value, ~~no concrete chips are expected to be characteristically hazardous due to semivolatiles. Conservatively, 20 times the TCLP limit is used to estimate the amount that is potentially hazardous.~~ As discussed in Attachment A.II.7, no concrete is considered potentially hazardous due to semivolatiles.

A.III.2.3.4 Volatile Organic Contamination

~~The same e~~Eight concrete chip samples ~~that~~ were analyzed for ~~semi~~volatile organics using the TCLP test. (See Attachment A.III-7 for results). ~~were also analyzed for volatile organics.~~ Only ten of the 36 volatiles for which analyses were performed were detected. Ethylbenzene and total xylenes were each detected in three samples. These are followed by 1,1,1-trichloroethane and 2-butanone (each detected in two samples); and 2-hexanone, 4-methyl-2-pentanone, m,p-xylene, o-xylene, tetrachloroethene, and toluene (each detected in one sample).

None of the detected concentrations exceeded the Part B reference criteria.

The only detected volatiles for which TCLP limits exist were 2-butanone and tetrachloroethene, which were detected a maximum concentrations of 3000 and 3 μg/kg, respectively, well below the respective concentration of 4,000,000 and 14,000 μg/kg (i.e., 20 times the respective TCLP limit) required to even be potentially hazardous.

TCLP Results:

Eight concrete chip samples were analyzed for volatile organic contaminati~~ng~~on using the TCLP test (see Attachment A.II.7 for complete details). In five of these, the same sample, or one collected from a nearby location, were analyzed for ~~TCL V~~volatiles ~~O~~organics in the solid sample. Only seven volatiles were detected in the solid sample, and only five were detected in the leachate.

TCLP limits exist for only four of the detected volatiles: 2-butanone, benzene, chloroform, and tetrachloroethene. All detected concentrations were well below any level of concern.

~~Since most of the detection limits for volatiles were below 20 times the TCLP value, no concrete chips are expected to be characteristically hazardous due to volatiles. Conservatively, 20 times the TCLP limit is used to estimate the amount of concrete that is potentially hazardous due to volatiles.~~

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As discussed in Attachment A.II.7, no concrete is considered to be potentially hazardous due to volatiles.

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contain elevated levels of isotopic and elemental uranium, technetium-99, radium-228, thorium-230, and lead-210, and samples from 19 components contain potentially hazardous levels of barium, chromium, lead, and mercury.

A.III.2.4.1 Radiological Contamination

Table A.III-1 presents summary statistics for radionuclide concentrations in concrete cores. Synopses of results from the concrete core sampling efforts are offered below:

- All radionuclides were detected in at least one sample from each depth.
- No nuclide was detected in 100% of the samples collected.
- Americium-241, cesium-137, neptunium-237, plutonium-238, plutonium-241, and strontium-90 were detected in fewer than 50% of the samples collected from all core sampling intervals.
- Plutonium-239/240 was detected in fewer than 50% of the samples collected from the 0.5 to 1.0 inch and greater than 1 inch core sampling intervals.
- Lead-210, radium-226, uranium, uranium-235/236, and uranium-238 exceed their Part B reference criteria concentrations in all three concrete core sampling intervals over 50% of the time.
- Polonium-210, thorium-227, thorium-228, and uranium-234 exceed their Part B reference criteria concentrations in the top 0.5 inch of concrete core over 50% of the time.
- Polonium-210, thorium-228, and uranium-234 exceed their Part B reference criteria concentrations in the second 0.5 inch of concrete core over 50% of the time.
- No nuclide exceeds their respective concrete baseline concentrations in all three concrete core sampling intervals over 50% of the time.
- Lead-210, radium-228, technetium-99, thorium-230, uranium, uranium-234, uranium-235/236, and uranium-238 exceed their respective concrete baseline concentrations in the top 0.5 inch of concrete core over 50% of the time.
- Technetium-99, uranium, uranium-234, uranium-235/236, and uranium-238 exceed their respective concrete baseline concentrations in the second 0.5 inch of concrete core in over 50% of the samples.

TCLP Results:

Two concrete core samples were analyzed for radionuclides using the TCLP test (see Attachment A.II.7 for complete details). Most of the radionuclides were detected in both the solid phase and the leachate. The major exceptions were cesium-137 and strontium-90, which were not detected in the

The maximum concentration of nine inorganics (antimony, arsenic, barium, beryllium, chromium, manganese, mercury, thallium, and vanadium) exceeded the Part B reference criteria at one or more depths. Most significant of these were arsenic and beryllium, which exceeded these criteria by factors of 920 and 320, respectively, at all three depths.

TCLP Results:

Table A.III-3 summarizes the inorganic contamination in concrete cores that exceeds 20 times TCLP. Only four (barium, chromium, lead, and mercury) were detected at greater than 20 times the TCLP limit. Lead was detected at greater than 20 times the TCLP limit in 16 samples from the top ½-inch, with concentrations ranging up to 1210 mg/kg; and five times in the second ½-inch, with concentrations ranging up to 275 mg/kg. In two of the samples where lead was detected at greater than 20 times the TCLP limit in the top ½-inch, the lead contamination was greater than 20 times the TCLP limit in the second ½-inch. However, in the other three samples where chromium was detected at greater than 20 times the TCLP limit in the second ½-inch, it was not detected at elevated levels in the top ½-inch.

Chromium was detected at greater than 20 times the TCLP limit in five samples from the top ½-inch, with concentrations up to 424 mg/kg; in two samples from the second ½-inch, with concentrations up to 280 mg/kg; and in one sample from below 1-inch, at a concentration of 105 mg/kg. In two of the samples where chromium was detected at greater than 20 times the TCLP limit in the top ½-inch, it was also detected at greater than 20 times the TCLP limit in the second ½-inch. However, in the sample where chromium was detected at greater than 20 times the TCLP limit at a depth greater than 1-inch, the sample taken from the top ½-inch in the same area does not indicate an elevated chromium level.

Barium was detected at greater than 20 times the TCLP limit in four samples from the top ½-inch, with concentrations up to 4800 mg/kg. The barium concentration in lower depths at the same locations were all well within 20 times the TCLP limit.

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Mercury was detected at greater than 20 times the TCLP limit in the top ½-inch of one sample, with a concentration of 12.6 mg/kg. The mercury concentration in lower depths at the same location was well within 20 times the TCLP limit.

The most extensive inorganic contamination in concrete core samples is associated with the Ore Refinery Plant (2A), the Ozone Building (3B), and the Old Cooling Water Tower (3K), where results exceeded 20 times the TCLP limit for both lead and chromium. As discussed in Attachment A.III.7, concrete in these components are considered potentially hazardous due to TCLP metals.

A.III.2.4.2.1 Vertical Profile of Aluminum in Concrete

Figure A.III-21 presents aluminum concentrations measured in 86 concrete cores plotted against depth. The concentration of aluminum in the top ½-inch varies from 3010 kg to 19,600 mg/kg, and most samples (53) from the top ½-inch exceed the concrete baseline (5000 mg/kg), although only three samples exceed 10,000 mg/kg. The highest two concentrations were detected in samples collected from the Ore Refinery Plant (2A). In most cases, the aluminum concentration does not decrease with depth, which is due at least in part to masking effect of the high baseline concentration. In those cases where the concentration does decrease with depth, except when the concentration in the top ½-inch is high, the decrease is not significant. This is due, at least in part, to the fact that most of the aluminum present at the site was highly soluble (i.e., aluminum sulfate and aluminum cladding and ore impurities that had been dissolved in acid solutions.

A.III.2.4.2.2 Vertical Profile of Antimony in Concrete

Figure A.III-22 presents antimony concentrations measured in 85 concrete cores plotted against depth. The concentration of antimony in the top ½-inch varies from 0.81 mg/kg to 70.4 mg/kg, although most results (76) from the top ½-inch exceed the concrete baseline (1 mg/kg). The highest concentration was detected in a sample collected from the Special Products Plant (9A), although three of the eight highest results were collected from the Ore Refinery Plant (2A). In about half of the samples, the antimony concentration does not decrease with depth, and in those where it does, the decrease is not significant (typically less than 20 percent).

A.III.2.4.2.3 Vertical Profile of Arsenic in Concrete

Figure A.III-23 presents arsenic concentrations measured in 85 concrete cores plotted against depth. The concentration of arsenic in the top ½-inch varies from 0.4 mg/kg to 34.1 mg/kg, and about half

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Building (6F). In approximately 80 percent of the samples, the vanadium concentration does not decrease with depth. In those where it does, the amount of the decrease varies from less than 10 percent to a maximum of 70 percent.

A.III.2.4.2.23 Vertical Profile of Zinc in Concrete

Figure A.III-43 presents zinc concentrations measured in 85 concrete cores plotted against depth. The concentration of zinc in the top ½-inch varies from 10 mg/kg to 1880 mg/kg, and most of the samples (69) from the top ½-inch exceed the baseline concentration (27.5 mg/kg). The highest concentration was found in a sample collected from the Electrostatic Precipitator (9F) and the concentration is significantly higher than in the other samples. In over half of the samples, the zinc concentration does decrease with depth. The amount of the decrease varies from less than 10 percent to a maximum of approximately 95 percent.

A.III.2.4.3 Semivolatile Organic Contamination:

Three samples, all from the same location but at three different depths, were analyzed for analysis of semivolatile organics. None of the 65 semivolatiles for which analyses were performed were detected at any of the depths.

A.III.2.4.4 Volatile Organic Contamination

Eighteen samples, from six locations (three components) and three depths, were analyzed for volatile organics. Only six (1,1,1-trichloroethane, 4-methyl-2-pentanone, ethylbenzene, toluene, tetrachloroethene and total xylenes) of 33 volatiles were detected. All of these were detected in the top two depths and all but 1,1,1-trichloroethane and 4-methyl-2-pentanone were detected below the 1-inch depth.

None of the detected concentrations of volatiles exceeded the respective Part B reference criteria. The only detected volatile compound for which a TCLP limit exists is tetrachloroethene, which was detected at a maximum concentration of 8 μg/kg, well below the 700 μg/kg (i.e., 20 times the TCLP limit) required to even be potentially hazardous.

~~Concrete TCLP Results:~~

~~Thirteen concrete core samples were analyzed for volatile organics using the TCLP test (see Attachment A.II for complete results). Only six volatiles were detected in the solid sample, and only nine were detected in the leachate.~~

~~Masonry~~

~~Neither of the masonry samples was analyzed for volatiles using the TCLP test.~~

A.III.2.4.5 Pesticide/PCB Contamination

Six samples, from two components and three depths, were collected for analysis of pesticides and PCBs. None of the 21 pesticides, and only two of the seven PCBs, for which analyses were performed were detected. Aroclor-1254 was detected at all three depths in three locations and Aroclor-1260 was detected at all three depths in one location. None of the results exceeded the 50 ppm TSCA limit (see Appendix A.4).

A.III.2.4.6 TCLP Results - Organics:

~~Eleven~~ Thirteen concrete core samples, (~~three~~ five from the top 1/2-inch, four from the second 1/2-inch, and four below 1 inch) were analyzed for the leachability of organics using the TCLP test. In eight of these, the same sample or one collected from a nearby location, were analyzed for organics in the solid sample. These results, compared to the organic concentration in the core itself, are summarized on Table A.II-3 through A.II-6. Nearly all of the results for both the total and TCLP analyses were below detection limits (designated as less than [<]). None of the analyses where both the total and TCLP results were above detection limits are considered reliable since the apparent percent leached is greater than 100 percent. Many of the other analyses are also unreliable since the apparent percent leached is also greater than 100 percent (designated as a dash ([-]). The remaining results, although not definitive, indicate, based on the detection limits, a very low percentage of contaminant in the core sample leaches during the TCLP test. ~~Since none of these results definitively indicate a leachable percentage, a conservative estimate of 100 percent (i.e., 20 times the TCLP limit) will be used to assess the potential for being a hazardous waste.~~

(Moved from top of page) Only six volatile organics were detected in the solid samples and only ten were detected in the leachate. TCLP limits exist for only three of the detected volatiles, 2-butanone, chloroform, and tetrachloroethene. All of the detected results are well below any level of concern.

Since most of the detection limits for volatiles were well below 20 times the TCLP value, no concrete cores are expected to be characteristically hazardous due to volatiles. Conservatively, 20 times the TCLP limit is used to estimate the amount of concrete that is potentially hazardous due to volatiles.

A.III.2.5 Masonry Chips

concentration. This is partially attributable to Part B reference criteria concentrations that are substantially lower than baseline concentrations for several radionuclides.

All maximum sample results exceed the corresponding baseline or Part B reference criteria concentration. This indicates elevated levels of every radionuclide and uranium were detected in surface masonry samples from at least one location.

TCLP Results:

None of the masonry samples were analyzed for radionuclides using the TCLP test.

A.III.2.5.2 Inorganic Contamination

A total of 60 masonry samples from 28 components were collected for analysis of TAL inorganic contaminants. As shown on Tables A.III-1 and A.III-2, all of the 23 inorganics for which analyses were performed were detected and all but four (antimony, silver, selenium, and thallium) were detected in at least 12 samples. Six inorganics (aluminum, barium, calcium, iron, magnesium, and manganese) were detected in all 60 samples.

Since there are no baseline concentrations available for masonry, OU3 baseline concentrations for concrete were used as a reference for evaluating the level of contamination. All 60 masonry samples exceeded the OU3 baseline concentration of inorganics in concrete for at least one analyte. The maximum concentration of all inorganics exceeded the respective baseline concentration. Most significant are lead, mercury, barium and zinc, which exceeded the respective baseline concentrations by factors of 4800, 170, 75 and 75, respectively. The average concentration 14 inorganics (antimony, arsenic, barium, chromium, cobalt, copper, lead, mercury, nickel, potassium, selenium, sodium, thallium, and zinc) exceed the OU3 baseline concentration in concrete. The average concentration of lead, mercury, and antimony are the most significant, exceeding the baseline levels by factors of 185, 18, and 9, respectively.

As described in Appendix A.3, a second reference for evaluating the level of contamination in masonry is the Part B reference criteria. The maximum concentration of eight inorganics (antimony, arsenic, barium, beryllium, cadmium, chromium, manganese, and thallium) exceed these screening levels. Most significant of these are arsenic and thallium, which exceed the respective screening level by factors of 913 and 4.4, respectively. The average concentration of only three (arsenic, beryllium, and manganese) exceeded these levels, by factors of 108, 46, and 1.8, respectively.

was detected at greater than 20 times the TCLP limit (i.e., greater than 4 mg/kg) in two of 60 samples, with concentrations up to 5.2 mg/kg; and barium, cadmium, and chromium which were detected at greater than 20 times the TCLP limit (i.e., greater than 2000 mg/kg, 20 mg/kg, and 100 mg/kg, respectively) each in one of 60 samples, with concentrations of 3820 mg/kg, 21 mg/kg, and 306 mg/kg, respectively.

The most extensive inorganic contamination is associated with the Hydrometallurgical System WINLO, and Water Treatment Area of the Recovery Plant (8A), where results exceeded 20 times the TCLP limit for chromium and lead; the Engine House/Garage (31A), where results exceeded 20 times the TCLP limit for barium and lead; and the Digester and Control Building (25E), where results exceeded 20 times the TCLP limit for lead and mercury.

TCLP Results:

Two samples, both from the Six to Four Reduction Facility #1 (54A) were also analyzed for TCLP inorganics. Table A.II-3 through A.II-6 compare the results of the TCLP analyses with those for total inorganics in the solid sample. Only one TCLP metal, lead in the Autoclave Area, was detected at greater than 20 times the TCLP limit. Lead, ~~which was the only metal with a TCLP regulatory limit detected in the TCLP analysis,~~ was detected in the leachate at 11 mg/L, well above the TCLP limit of 5.0 mg/L. ~~Based on these results, these two masonry samples are considered characteristically hazardous due to TCLP inorganic compounds (metals).~~ However, as discussed in Attachment A.II.7.2, no masonry is considered potentially hazardous due to TCLP metals.

A.III.2.5.3 Semivolatile Organic Contamination

Two masonry samples taken from two components were analyzed for semivolatile organic constituents. None of the 64 semivolatiles for which analyses were performed were detected.

A.III.2.5.4 Volatile Organic Contamination

Two masonry samples were taken from two components were analyzed for volatile organic constituents. Only five of the 35 volatiles for which analyses were performed were detected. 1,1,1-Trichloroethane, ethylbenzene, m,p-xylene, and o-xylene were detected in one sample. Xylenes, (total) was detected in both samples.

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The maximum lead value determined in the OU3 RI/FS characterization study for lead-based paint was 375,000 mg/kg. To determine if this result would result in a potentially hazardous waste, the anticipated TCLP leachate result was calculated. The following variables were used in the calculation:

- the minimum metal thickness (18 gauge or 0.0478 inches) determined in the light-gauge metal study,
- the maximum paint thickness (23 mil) determined in the light-gauge metal study;
- the maximum percent of lead leached (1.1 percent) determined in the light-gauge metal study, and
- the maximum lead result (375,000 mg/kg) determined in the OU3 RI/FS characterization study.

The resulting TCLP leachate concentration was calculated to be 4.3 mg/L, below the 5 mg/L TCLP limit for lead. Therefore, no painted material in OU3 is considered potentially ~~characteristically~~ hazardous as a result of being painted with lead-based paint. However, any paint that is removed from any surface will be considered characteristically hazardous waste unless actual TCLP results show otherwise. This conclusion is extended to the other toxicity characteristic (TC) metals. This is possible because the maximum concentration for lead was so much higher than the maximum concentration of the other eight TC metals (375,000 mg/kg in lead versus 17,500 mg/kg in chromium, or 558 mg/kg for cadmium).

A.III.2.6.3 Organic Contamination

None of the steel coatings samples were analyzed for organic contamination.

A.III.2.7 Transite

Transite, a mixture of cement and asbestos, is a common construction material used for walls and roofs for many components in OU3. All transite is assumed to be radiologically contaminated. Samples of transite were collected by chipping away the surface using a jackhammer, hammer drill, or chisel. The sampling was intended to be representative of the maximum expected radiological and chemical contamination (note that these locations may be different) based on nonintrusive sampling results and process knowledge.

A total of ten transite samples collected from nine components were analyzed for chemical contamination. The following describes the results of the analyses of transite. In summary, samples from three components contain hazardous levels of either chromium, 1,4-dichlorobenzene; hexachlorobutadiene; nitrobenzene; or tetrachloroethene.

A.III.2.7.1 Radiological Contamination

Samples of transite collected were assumed to be radiologically contaminated and were not subjected to radiological analyses at the analytical laboratory.

A.III.2.7.2 Inorganic Contamination

Eleven samples of transite were collected from nine components and analyzed for the leachability of metals using the TCLP test. Tables A.III-1 and A.III-2 summarize the inorganic chemical contamination associated with transite. Of the eight ~~TC~~ TCLP metals, all except cadmium and selenium were detected in at least one transite sample, while only one metal (chromium) exceeded the TCLP limit. As indicated on Table A.III-4, chromium was detected in eight of the 11 samples, one of which exceeded the TCLP limit (5.0 mg/L). This sample was collected from the Hot Raffinate Building (3E). The chromium concentration in the leachate was 5.96 mg/L; the TCLP limit for chromium is 5.0 mg/L, ~~indicating that the transite in this component is characteristically hazardous.~~ As discussed in Attachment A.II.7.2, no transite is considered potentially hazardous due to TCLP metals.

A.III.2.7.3 Semivolatile Organic Contamination

~~Twelve~~ Eight samples were analyzed for the leachability of semivolatiles using the TCLP test. Only five semivolatile constituents were detected, and three of these were in excess of the TCLP limits: 1,4-dichlorobenzene (17.2 mg/L detected compared to a TCLP limit of 7.5 mg/L), hexachlorobutadiene (14.9 mg/L detected compared to a TCLP limit of 0.5 mg/L), and nitrobenzene (28.3 mg/L detected compared to a TCLP limit of 2.0 mg/L). All three results were found in the same sample of transite in the Special Products Plant (9A). As discussed in Attachment A.II.7.2, no transite is considered potentially hazardous due to semivolatiles.

A.III.2.7.4 Volatile Organic Contamination

Twelve samples were analyzed for leachability of volatiles using the TCLP test. Only two volatile constituents were detected, tetrachloroethene and 2-butanone. Tetrachloroethene was the only detected result that exceeds the TCLP limit at 59 mg/L (compared to a TCLP limit of 0.7 mg/L). This sample

as collected from the Ore Refinery Plant (2A). As discussed in Attachment A.II.7.2, no transite is considered potentially hazardous due to volatiles.

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criterion for lead-210 is assumed to be the same as for radium-226 and the water quality criterion for uranium is derived from the isotopic criteria. The mean of sample results is higher by the greatest ratios for: uranium, uranium-234, uranium-235/236, and uranium-238.

None of the minimum sample results detected are greater than upgradient groundwater quality. None of the maximum sample results detected is less than upgradient groundwater quality.

A.III.3.6.2 Inorganic Contamination

A total of 91 liquid samples was taken from 52 components for analysis of TAL inorganic constituents. As shown on Tables A.III-1 and A.III-2, all of the 23 inorganics for which analyses were performed were detected and 11 of these were detected in at least half of the samples. These inorganics include aluminum, barium, calcium, copper, iron, lead, magnesium, manganese, potassium, sodium, and zinc. The maximum inorganic contamination was sodium at 3,490,000 μg/L.

Table A.III-4 summarizes the inorganic contamination in liquid samples that exceed the TCLP limits. One sample, from the Zirnlo Decladding Area of the Special Products Plant (9A) exceeds the TCLP limit for lead (13,500 μg/L detected compared to a TCLP limit of 5000 μg/L).

The most extensive inorganic contamination in an unknown liquid sample is associated with the Southern Extraction Area of the Pilot Plant Wet Side (13A), ~~were~~ where 20 analytes were detected.

A.III.3.6.3 Semivolatile Organic Contamination

From 52 components, 93 liquid samples were collected for analysis of semivolatile organic constituents. Only 32 of 65 semivolatiles for which analyses were performed were detected. Bis(2-ethylhexyl)phthalate was detected most often which 21 detects out of 93 samples. Followed by fluoranthene (detected in 14 of 92 samples); phenanthrene (detected in 11 of 93 samples); pyrene (detected in 12 of 92 samples); phenol (detected in 10 of 90 samples); and 2,4-dimethylphenol, butyl benzyl phthalate, chrysene, di-n-butyl phthalate, di-n-octyl phthalate, diethyl phthalate, naphthalene, and p-methylphenol(cresol) (each detected between 5 and 10 samples). The remaining 19 semivolatiles were detected in less than 5 samples of the 93 samples analyzed. The maximum semivolatile contaminant was phenol at 520 μg/L.

No semivolatile organics exceed the TCLP limits.

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A.IV SUMMARY OF CONTAMINATION BY COMPONENT

Components were classified into eleven categories by level of surface radiological contamination based on the criteria and guidelines described in Tables 2.3 and 2.4 of the CRU3 WPA. The components within each category and the associated contaminants by media type are described in the following sections. Radiological contamination is described first followed by chemical contamination.

As previously noted, changes in the database of analytical results occurred after this Attachment was drafted in September 1995. Because these changes do not alter the conclusions from the analysis of the data, this Attachment has not been updated to reflect the minor changes. A description of the major changes is included as Appendix A.7 and Appendix L identifies all the changes.

~~Much~~ Some of the data results used in this attachment were rejected for radiological analysis. Therefore, if ~~an analyte~~ a radionuclide is not mentioned in the description of ~~the~~ a component, it is assumed that those results are rejected. If an analyte is not mentioned in the component description it is either a non-detected or a rejected result.

A.IV.1 Administrative and Support Buildings

Administrative and support buildings were determined by the criteria referenced above to contain no significant levels of radiological contamination. Based on this information, sampling activities were confirmatory in nature and limited in scope.

A.IV.1.1 NAR Control House (3C)

The Nitric Acid Recovery Building (NAR) is a single story building located just north of 101st Street and west of the Maintenance Building (3A). The building is rectangular. The NAR Control House is constructed with a structural steel frame and transite panels on a poured concrete base. Electrical control panels for the nitric acid recovery system (3D), a conference room, offices, and a restroom are present in this building. No process activities occurred within this building, however, this building serves as the radiological control point for entry into the NAR Towers and Drum Storage Building (72) areas. Routine surveys for removable alpha contamination and total beta-gamma contamination are conducted in this building to identify any "hot spots" which may be present. There are no anticipated contaminants for this component.

From this component, one concrete chip sample and two steel coatings samples were collected.

4). Calculation of IF (age-adjusted soil ingestion factor):

4a.) Radionuclides:

$IF_r = (IR_c \times ED_c) + (IR_a \times ED_a)$

4b.) Chemicals:

$IF_c = [(IR_c \times EDc)/BW_c] + [(IR_a \times ED_a)/BW_a]$

Where:

C_s = Risk-based concentration of constituent in soils (pCi/g, ug/Kg, mg/Kg)

TR - Target risk level (unitless) = 1.0e-07

THQ = Target hazard quotient (unitless) = 1.0e-01

SF_o = Oral cancer slope factor (Risk/pCi; kg-day/mg)

SF_e = Cancer slope factor, external radiation (Risk-g/pCi-yr)

RfD_o = Oral reference dose (mg/kg/day)

BW_c = Body weight, child (kg) = 15

BW_a = Body weight, adult (kg) = 70

AT_c = Averaging time (carcinogen) = 70 years x 365 days/year = 25550

AT_a = Averaging time (noncarcinogen) = ED (30 years) x 365 days/year = 10950

IR_c = Daily soil ~~water~~ ingestion rate, childe (mg/day) = 200

Ir_a = Daily soil ~~water~~ ingestion rate, adult (mg/day) = 100

ED_c = Exposure duration, child (years) = 6

ED_a = Exposure duration, adult (years) = 24

ED = Exposure duration, (years) = 30

IF_r = Age-adjusted ingestion factor, radionuclides (mg-yr/day) = 0

IF_c = Age-adjusted ingestion factor, chemicals (mg-yr/kg-day)=0

EF = Exposure frequency (days/year) = 350

CF_r = Conversion factor, radionuclides (g/mg) = 1.0e-03

CF_o = Conversion factor, Organics (0.001 mg ~~ug~~-chem/µg~~mg~~-chem x 0.000001 kg-soil/mg-soil) = 1.0e-09

CF_i = Conversion factor, Inorganics (kg/mg) = 1.0e-06

S_e = Gamma shielding factor (unitless) = 0.2

T_e = Gamma exposure time factor (unitless) = 1

The carcinogenic potential of uranium is caused solely by radiation release from three different uranium isotopes. It's screening criteria was calculated from the weight fractions of the different isotopes in natural uranium and the Part B reference criteria calculated from the individual isotopes.

where:

$$Cs_{Unat} = 1.478 \sum_{i=N}^{i=1} F_i \; Cs_i$$

Cs_{Unat} = Screening Concentration of natural uranium (ug/g)

Cs_{Ui} = Screening Concentration of uranium isotope i (pCi/g).

F_i = mass fraction of isotope i in natural uranium.

and

1.478 is the conversion factor from pCi to ug for natural Uranium.

For this summation, it was assumed natural uranium is made up of 99 percent U-238, 0.71 percent U-235 and .0054 percent U-234.

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Table A.V-2
Missing CRU3 RI/FS Soil Screening Levels compared to EPA Residential PRGs

Compound	Appendix A.V-3 Risk Based Concentration (ug/kg)	CSForal (kg-day/mg)	RfDoral (mg/kg-day)	PRG ICLR (1E-07)(ug/kg)	PRG Hazard Index (0.1)(ug/kg)
Aldrin	3.8E+00	1.70E+01	3.00E-05	3.76E+00	8.21E+02
3-Nitroaniline	5.5E+05	0.00E+00	2.00E-02	NC	5.48E+05
trans-1,2-dichloroethene	5.5E+06	0.00E+00	2.00E-01	NC	5.48E+06
m,p-xylene	5.5E+05	0.00E+00	2.00E-02	NC	5.48E+05
o-xylene	NA	0.00E+00	0.00E+00	NC	NH
Benzene	2.2E+03	2.90E-02	0.00E+00	2.20E+03	NH
Toluene	5.5E+06	0.00E+00	2.00E-01	NC	5.48E+06

Notes and Abbreviations:
1. NA: Toxicity Information Not Available.
2. NC: Compound considered Non-Carcinogenic or a Systemic Hazard
3. NH: Compound considered Non-Systemic Hazard or a Carcinogenic.
4. Benzene and toluene evaluated to confirm replication of methodology.
5. EPA values presented for comparison of published Residential Soil PRGs.
6. Summation of xylene isomers could be compared to total xylene screening level.

APPENDIX B

Finally, by comparing regulatory criteria to analytical results, materials and their associated weights or volumes are categorized as low level, hazardous, mixed, polychlorinated biphenyl (PCB), or below baseline materials. This information sets the stage for development and evaluation of remedial alternatives.

B.2 MATERIAL WEIGHTS AND VOLUMES

This section discusses the ten material categories, 67 construction material descriptions, and the seven types of inventory materials. Summaries of weights and volumes of each material are also provided. Section B.2.1 discusses the categorization of OU3 materials into manageable units. Section B.2.2 discusses the data sources for the weights and volumes of OU3 materials. Section B.2.3 discusses material-specific assumptions for the 67 construction materials and identifies coatings or layers that may be associated with a given material. Section B.2.4 provides general equations used to calculate the contaminated weights associated with each material. Section B.2.5 identifies the added weights and volumes of holdup and contaminant layers. Finally, Section B.2.6 summarizes the material weights and volumes.

B.2.1 Material Categories

OU3 RI/FS material categories were developed as a management strategy to handle the diverse materials generated in OU3 as a result of ongoing and proposed decontamination and dismantlement activities. The categorization of OU3 construction materials into ten material categories and 67 construction material types was based on potential treatment and disposition options, possible dismantling techniques, and existing material management strategies, as well as the regulatory drivers for segregation and disposition of materials. The estimated weights and volumes of materials, and process knowledge, were also considered in the definition and categorization of materials. The material categories provide a cross-walk to link weight and volume estimates in the SWIFTS database, RI/FS characterization data, and potential process options. The material categories and material descriptions developed for OU3 materials are defined below and summarized in Table B-1.

A-Accessible Metals: Structural steel and steel decking have large accessible surface areas and thicknesses which are greater than 1/4 inch. ~~The surface of accessible metals can be easily decontaminated using physical surface decontamination techniques and subsequently surveyed prior to disposition.~~ The surface of accessible metals are accessible for application of physical surface decontamination techniques, as well as, subsequent radiological surveys prior to disposition.

of the mean of 5.3 mil (WEMCO 1991) indicating this conservatism of a 10 mil assumption. A density of 3.0 (g/cc) (187 lbs/ft^3) for the lead-based paint at the FEMP was used in calculating total contaminant mass for painted surfaces. This density was determined through calculations using the known analytical percent of metals in paint scraping samples and the density of acrylic plastic and epoxy resin. The calculations were verified through personal communication with a paint research chemist.

All process piping, conduit, electrical cables, process equipment, and transformers are not painted and are assumed to have a radiologically contaminated dust layer on the metal surface. A thickness of five mil is used as an estimate of the thickness of all external dust. A conservative density of 1.5 g/cc (93.5 lbs./ft^3) was used in calculating total contaminant mass for dust surfaces (approximately the density of soil). Ductwork, process piping, and process equipment were assumed to be internally contaminated. For example, ductwork is assumed to have a 10 mil dust layer on the interior surface. Dust contaminants are represented by paint sample results in adjacent sampled materials.

Process piping and process equipment are assumed to have both a layer of corrosion/rust/undefined debris (CRUD) and holdup material. CRUD is formed within process piping and process equipment over time from the general process of corrosion. Process piping is assumed to contain one percent of the interior volume as CRUD and ten percent of the interior volume as holdup, whereas process equipment is assumed to contain one tenth percent of the interior volume as CRUD and one percent of the interior volume as holdup. The density of CRUD is estimated as 3.0 g/cc (187 lbs./ft^3). Holdup is defined as the material, primarily assumed to consist of uranyl nitrate hexahydrate (UNH), within process piping or process equipment, which has crystallized into a solid/semisolid mass. During the years of production,the interior of process piping and equipment is known to have accumulated material, of which a significant percentage is uranium and water. UNH was chosen to be representative of all holdup material within process piping and process equipment because it contains 43 percent uranium, closer to an average concentration of uranium within piping and equipment than the use of UF4 (approximately 75 percent uranium) or uranium residues (approximately 5 percent uranium). For the purposes of calculating a holdup contaminant mass, enrichment status is not considered. ~~UNH is composed of 43 percent uranium; enrichment is not considered.~~ The density of holdup is 2.8 g/cc (175 lbs./ft^3). The uranium content of UNH is subsequently used to develop a uranium source term for applicable materials, as well as to calculate total weights.

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The use of a 10 percent holdup for process piping, and a 1 percent holdup for process equipment is supported through examination of data generated by Removal Action No. 12 activities within Plant 4. The following material quantities were collected from Plant 4 during implementation of D&D activities, and no separation of piping, equipment and ductwork materials was made; to be conservative, it is assumed that all material was removed from piping. Material remaining in piping after completion of Safe Shutdown activities is estimated to be less than 5 percent of total removed material.

Process piping throughout the production area at the FEMP is generally categorized into 3 diameters: 2 inches and less; between 2.5 and 4 inches; and greater than 4 inches. There was 92,748 linear feet of 2 inches and less diameter piping, 15,564 linear feet of 2.5 to 4 inch diameter piping; and 10,260 linear feet of piping greater than 4 inches in diameter within Plant 4. The total volume of process piping in Plant 4 is calculated to be 4856 cubic feet. During the D & D process, 850 cubic feet of piping was removed and containerized without further D & D activity, leaving approximately 4781 cubic feet of piping.

Approximately 48.6 cubic feet of holdup material was removed from Plant 4 piping, ductwork, and process equipment. Five percent of holdup materials are estimated to remain in piping, ductwork, and equipment after D & D activity. Approximately a one percent holdup was present in Plant 4 piping, supporting the conservative nature of applying a 10 percent holdup for process piping and a one percent holdup for process equipment.

Material	Weight in Pounds	Weight in Kilograms	Density of Material	Volume in Cubic Meters	Volume in Cubic feet
UF_4	15826	7185	6.7 g/cc	1.072	37.9
UO_2	3084	1400	10.97 g/cc	0.128	4.5
U_3O_8	1403	637	8.38 g/cc	0.076	2.7
UO_3	1590	722	7.3 g/cc	0.099	3.5
All material	21903	9944		1.375	48.6

Conversions - 0.454 kg/pound, 0.3048 m/ft

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greater than 4 inches is assumed to be uncontaminated; baseline values were applied. Concrete that is classified as below-grade by material description was assumed to be uncontaminated and was not sampled. Baseline values were also applied to this classification.

B.2.3.7 Conduit and Wire

As discussed in Section B.2.2.1, it is assumed that all conduit is unpainted, with a 5 mil layer of radiologically contaminated dust on the exterior surface. Conduit is electrical cable or wiring wrapped in an insulated or rubberized covering, mainly running beneath and between buildings.

B.2.3.8 Ductwork

All ductwork is assumed to have a 10 mil layer of paint on the exterior surface. In addition, it is assumed that the interior surface of all ductwork contains a 10 mil dust layer of radiologically contaminated material. Ductwork includes contaminated systems associated with dust collectors, as well as potentially contaminated systems of heating, ventilating, and air conditioning (HVAC) equipment. Dust and other particulate material are pulled into and, along with the circulating air, through the ductwork. As discussed in Section B.3.2, ~~d~~During the dismantlement of Plant 4, approximately 1 percent holdup was found to be present in process piping, equipment and ductwork. ~~interior of ductwork was found to contain a moderate quantity of dust. Since more dust was present in the interior of the ductwork than present on the outside surface; a 10 mil dust layer was applied in the calculations.~~

B.2.3.9 Equipment

Equipment is assumed to have a 10 mil layer of paint on the exterior surface. Process equipment is generally comprised of stainless steel or other specialty metals, is not painted, and is assumed to have a 5 mil layer of radiologically contaminated dust on its exterior surface.

In addition, one percent holdup and one-tenth percent CRUD layers are assumed to be present in process equipment. A one percent holdup for process equipment is based on process knowledge that there was a build up of holdup in fittings, valves, and other parts of process equipment but that the interior cavity space was generally less than that of piping.

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B.3.2 Process Areas/Components Not Sampled

As discussed in Section 2.2, components that were determined to be "clean" by evaluation of radiological surveys and process knowledge were not sampled. Several of these non-sampled components were screened as "confirmatory" components, but no intrusive samples were collected. Consistent with the OU3 RI/FS Work Plan Addendum (DOE 1993), components not sampled and considered uncontaminated should exhibit baseline levels of contaminants; thus, baseline values were applied to all materials within those components. The application of maximum values to these non-sampled components, or to below-grade materials, would have resulted in unrealistically elevated source term estimates.

A detailed discussion of baseline values and the methodology used in their determination is provided in Appendix A. Table B-9 provides baseline values by media and analyte that were used in determining the source term.

There are 7582 components that were not sampled as part of the RI/FS characterization study since these facilities were never associated with the processing activities. Also, there are 14 components which are new structures (constructed after development of the WPA) and, as such, are not considered contaminated. These components are listed in Table B-8. In such cases, baseline values for concrete and steel coatings were applied to the concrete, masonry, and metals, located in the components not sampled. Seven components were not sampled due to (safety) ALARA reasons. The high background radiation readings precluded any sampling activities. Results from components of similar function were applied to the seven non-sampled components as described below: component 71 results were applied to all materials in components 4B, 5F, and 30B. Component 6C results were applied to all materials in component 6E; and finally results in component 64 were applied to all materials in components 60, 61, and 65.

Seven components were not sampled because background radiological readings were determined to be too high to allow sampling. These four components are:

- Plant 4 Warehouse (4B)
- Plant 5 Covered Storage Pad (5F)
- Plant 6 Electrostaic Precipitator (North) (6E)
- Quonset Hut #2 (61)
- Plant 5 Warehouse (65)
- Drum Storage Warehouse (30B)
- Quonset Hut #1 (60)

As described in Attachment A.IV to Appendix A, The General In-Process Warehouse (71) was used to characterize components 4B, 5F and 30B because of similarities in function. Likewise, the Plant 6 Electrostatic Precipitator (South) (6C) was used to characterize Component 6E, and the Thorium Warehouse (64) was used to characterize Components 60, 61 and 65.

B.3.3 Non-Detected Results

In certain situations, the maximum value for a material is an analytical result below the laboratory detection level (nondetected). This is a usable value with three options for its use. The actual analytical result may be used; the actual result may be replaced by the laboratory detection limit or the minimum detectable concentration (MDC); or half of the actual result may be used. The actual analytical result is used in cases where the analytical result is a nondetected value (U or UJ validation qualifier; data validation is discussed in Section 2).

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B.3.4 Chromium

The OU3 analytical data generated for chromium is for total chromium. However, hexavalent chromium is the form of chromium generally considered of most concern, and the form used in the OU5 COC list and in most disposal facility acceptance criteria. According to supplement 94-014 for the FEMP Risk Assessment Work Plan Addendum (DOE 1992), calculations should use ten percent of total chromium analytical results as hexavalent. However, those calculations were based on environmental media. Since OU3 consists primarily of construction materials, it has been conservatively assumed that all total chromium measured in the OU3 RI/FS characterization study is hexavalent.

B.3.5 Pesticides

Due to a limited number of samples for pesticides, to conservatively bound potential impacts from pesticide use throughout the facilities, it is assumed that the top half inch of all above-grade and at-grade concrete slabs is contaminated with pesticides. The maximum pesticide value reported for concrete from all samples was applied to this volume. Based on pesticide use within the facilities, only surface contamination is expected, and therefore, no pesticide contamination is assumed for the remaining volume of concrete.

B.3.6 Transite

Approximately 20 samples of transite were analyzed by the toxicity characteristic leaching procedure (TCLP) for metals and for organic constituents (volatile and semivolatile). The TCLP produces results for the leachate from the sample in mg/L. Total transite results were estimated by extrapolating from these sample results by multiplying the liquid phase result by 260 L/kg. Transite samples were not analyzed for radiological constituents; thus masonry chip data are applied for radiological constituents.

B.3.7 Concrete

In some instances, both concrete core and concrete chip samples were collected from the same process area/component. In such cases, the maximum value of the two was used. In areas where only concrete chip samples were taken (generally "dry" process areas), contamination is expected to be present only on the surface of the concrete. Conservatively, concrete chip results are assumed to

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B.5.1.5 Radionuclides

Total uranium with 10,800,000 kg has the greatest amount of contaminant mass associated with it. Sixty-nine percent of this mass (7,503,000 kg) is associated with containerized waste inventory materials and will be dispositioned separately. Of the remaining 31 percent, 30 percent is associated with UNH holdup within process piping and equipment. Uranium-238 (90,700 kg), uranium-235/236 (958 kg), and uranium 233/234 (nearly 15 kg) have associated source terms which are also significant.

Thorium-232 (4,320 kg) is the only non-uranium analyte that has a source term greater than 1 kg, with technetium-99 at 0.127 kg and neptunium-237 at 0.069 kg. The presence of a high contaminant mass for uranium, uranium isotopes, and thorium, is expected since the FEMP processed more than 180,000 metric tons of uranium products during the years of production. The contaminant mass associated with technetium-99 is significant as discussed in Appendix A. Technetium-99 is water soluble and is easily transported through water. This characteristic makes technetium-99 a major concern for both risk and determination of possible disposition options. For these reasons, total uranium and technetium-99 are discussed in greater detail than other COCs in the following sections.

B.5.1.5.1 Technetium-99 Source Term

First, the materials in which technetium-99 source terms are found are discussed, followed by a discussion of the components where the contaminant mass for technetium-99 was highest. Primarily the contaminant mass for technetium-99 is associated with concrete (0.0998 kg), in particular concrete slabs (0.0934 kg); masonry (2.8x10-4 0.30003 kg); acid brick (0.008 kg); asphalt (0.005 kg); paint ((0.005 kg); CRUD (0.003 kg); and dust (0.0020.01 kg) contribute collectively, about one percent to the total technetium-00 source term. Finally, wood (1.051.04 x 10^{-5} kg) and the soil piles (2.50 x 10^{-6} kg) contribute less than one percent of the contaminant mass associated with technetium-99. The source term for technetium-99 by material description is presented in Table B-11.

Most of the technetium-99 contaminant mass is located in the following components: 9A (0.058 kg), 74T (0.015 kg) and 8A (0.007 kg). A complete accounting of the technetium-99 source term by component is presented in Table B-12. As discussed in Appendix A, the Special Products Plant (9A), Plant One Pad (74T), and the Recovery Plant (8A) are all either process-related buildings or storage areas where process-related materials were stored. The source term by material category and

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	Technetium-99	Elemental Uranium	Chromium	Tetrachloroethene	Neptunium-237
Volume of Affected Material (cu. ft)	112000	0	46200	425000	524000
Percent of Total OU3 Volume	1.5	0	0.6	5.7	7.0
Weight of Material Affected (tons)	6800	0	3140	18900	26800
Percent of Total OU3 Weight	1.8	0	0.8	5.0	7.0
Source Term with Normal Non-Detect (kg)	0.013	3,340,000	2,470,000	351	0.070
Change in Source Term	9.24×10^{-7}	0.00	5.23	-0.265	-0.001
Source Term with 100 percent Non-Detect	0.127	3,340,000	2,470,000	377	0.070
Percent Decrease/(-Increase)	0	0	0	-7.55	-1.47

B.6.1.7 Assumption of 10 mil Paint Thickness

As described in Section B.2, a 10 mil thickness has been conservatively assumed for all painted surfaces. However, as also stated, studies have indicated that the normal thickness is 5 mil. To assess the impact of the 10 mil assumption, a 5 mil paint thickness was applied to all painted surfaces.

As indicated below, the amount of painted material represents less than one percent of the total OU3 material volume and only approximately one percent of the weight. Use of a 5 mil thickness on painted surfaces, instead of 10 mil, would decrease the source term from 2.8 percent for neptunium-237 and nearly two percent for technetium-99, to a negligible amount for elemental uranium. Overall, the impact of applying 10 mil paint, rather than 5 mil is slight; therefore, the use of the 10 mil paint thickness appears to be somewhat conservative, and changing to a less conservative estimate would be insignificant.

	Technetium-99	Elemental Uranium	Chromium	Tetrachloroethene	Neptunium-237
Volume of Affected Material (cu. ft)	4440	4440	4440	4440	4440
Percent of Total OU3 Volume	0.06	0.06	0.06	0.06	0.06
Weight of Material Affected (tons)	412	412	412	412	412
Percent of Total OU3 Weight	0.1	0.1	0.1	0.1	0.1
Source Term with 10 Mil Paint (kg)	0.127	3,340,000	2,470,000	351	0.070
Change in Source Term	0.002	2,410	1,760	0.00	0.002
Source Term with 5 Mil Paint (kg)	0.125	3,340,000	2,470,000	351	0.067
Percent Decrease/(-Increase)	1.95	0.07	0.07	0	2.84

B.6.1.8 Assumption of One Percent CRUD Layer on the Interior of Piping and Process Equipment

As described in Section B.2, the interior surface of all process piping and equipment are conservatively assumed to be contaminated with a one percent, by volume ~~weight~~, layer of CRUD. This layer has been assigned a radiological contamination level that is concurrent with radiologically contaminated surface paint. This paint coats the interior surfaces of the component in which the piping and equipment are located. To assess this assumption, the impacts of the one percent layer of

contamination in paint in the same process area/component. To assess the impact of this assumption, a 1 mil dust layer was applied to the material to which the 5 mil layer was applied.

As indicated below, the amount of material affected by this assumption is approximately 0.07 percent of the total OU3 material volume and nearly one percent of the weight. Use of a 1 mil thickness of dust on unpainted surfaces would decrease the technetium-99, elemental uranium, and neptunium-237 source terms by 0.9 percent, 0.03 percent, and 1.4 percent respectively. Therefore, the use of the 5 mil dust layer is considered conservative.

	Technetium-99	Elemental Uranium	Chromium	Tetrachloroethene	Neptunium-237
Volume of Affected Material (cu. ft)	1474.8	1474.8	1474.8	1474.8	1474.8
Percent of Total OU3 Volume	0.07	0.07	0.07	0.07	0.07
Weight of Material Affected (tons)	69	69	69	69	69
Percent of Total OU3 Weight	0.02	0.02	0.02	0.02	0.02
Change in Source Term	0.002	1,110	551	0.00	0.0001
Source Term 1 Mil Dust (kg)	0.126	3,340,000	2,470,000	351	0.068
Percent Decrease	0.92	0.03	0.02	0	1.39

B.6.1.12 Assumption of OU5 Subsurface Soil Results to Below-Grade Concrete.
In this sensitivity analysis, below grade concrete is assumed to be contaminated with levels equal to those present in subsurface soils below or near production area components. This sensitivity analysis was performed to assess the impact of currently applying baseline values to below grade concrete.

Maximum subsurface soil results (depth of 5-10 feet) from around or beneath Plants 6, 2/3, 9 and the Plant 1 Pad were applied to components within these plants. The concrete foundations and footers are assumed to extend into the perched groundwater zone and to be contaminated throughout the concrete material, thus all of the below-grade concrete in components within Plants 6, 2/3, 9, and the Plant 1 Pad was assumed to be contaminated.

Maximum subsurface soil results (3-5 feet) were applied to all other components, based on the assumption that the foundations for these components extended approximately 5 feet down. The top inch of concrete was assumed contaminated and the maximum values were applied. The remaining 7 inches was assumed to be relatively uncontaminated, thus baseline values were applied.

As indicated below, the result of this sensitivity analysis is an increase in the elemental uranium and technetium-99 source term by less than 0.1 percent. Therefore, the application of baseline values to below-grade concrete is reasonable in relation to surrounding soil values.

	Technetium-99	Uranium, Total	Chromium	Tetrachloroethene
Volume of Affected Material (cu. ft)	1537709	1537709	1537709	1537709
Percent of Total OU3 Volume	0.166	0.166	0.166	0.166
Weight of Material Affected (tons)	115320	115320	115320	115320
Percent of Total OU3 Weight	0.26	0.26	0.26	0.26
Source Term with Soil (Max Results)	0.006	83960.6	1231.3	8.691
Percent Increase	0.04	0.01	0.00	0.025

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B.6.1.13 Assumption of 10% UNH Holdup on Interior of Clay Piping and One Percent CRUD Layer to Interior of Clay Piping

Assumption of 10% UNH holdup and one percent CRUD layer on interior of clay piping. In this sensitivity analysis, the interior surface of clay piping located beneath process area is conservatively assumed to be contaminated with a 10 percent holdup layer consisting of 43 percent elemental uranium. A one percent CRUD layer is also assumed to be present on the interior of all clay piping.

As indicated below, the result of this sensitivity analysis adds less than one hundredth of a percent to the overall source term for elemental uranium, technetium-99, chromium, mercury, and tetrachloroethene. Lead increased by less than one percent.

The impact is insignificant to the overall source term. Therefore, the application of baseline values is sufficiently conservative for use in determination of a source term for clay piping.

	Technetium-99	Uranium, Total	Chromium	Tetrachloroethene
Volume of Affected Material (cu. ft)	94.52876	94.52876	94.52876	94.52876
Percent of Total OU3 Volume	1.02083E-05	1.02083E-05	1.02083E-05	1.02083E-05
Weight of Material Affected (tons)	8.746433	8.746433	8.746433	8.746433
Percent of Total OU3 Weight	1.96549E-05	1.96549E-05	1.96549E-05	1.96549E-05
10 percent UNH and 1 percent CRUD	6.46464E-06	532.4322697	8.0116494	0
Percent Increase of Source Term	5.08661E-05	6.63567E-05	3.25337E-06	0

Table B-2
Summary of Estimated OU3 Material Quantities

FS Category[1]	Material Description	Unbulked Volume (cu. ft)	Weight (tons)
A	STRUCTURAL AND MISC. STEEL	61,400	15,000
Totals for FS Category	**A**	**61,400**	**15,000**
B	CONDUIT/WIRE (2" AND LESS)	6,300	1,060
B	CONDUIT/WIRE (2-1/2" TO 4")	5,440	591
B	CONDUIT/WIRE/CABLE TRAY (OVER 4")	1,980	164
B	DOORS	10,200	204
B	ELECTRICAL EQUIPMENT	97,100	1,020
B	ELECTRICAL FIXTURES	26,100	163
B	ELECTRICAL TRANSFORMERS	14,900	334
B	ELECTRICAL WIRING	206	59.
B	EQUIPMENT AND MISCELLANEOUS	135,000	3,380
B	HVAC EQUIPMENT	66,100	347
B	MATERIAL HANDLING EQUIPMENT	103,000	645
B	MISCELLANEOUS ELECTRICAL ITEMS	16,600	415
B	PIPING (2" AND LESS)	12,800	1,440
B	PIPING (2-1/2" TO 4")	21,400	1,530
B	PIPING (OVER 4")	67,000	2,960
B	PROCESS EQUIPMENT	1,160,000	11,100
Totals for FS Category	**B**	**1,740,000**	**25,400**
C	ELECTRICAL EQUIPMENT	8,160	94.7
C	EQUIPMENT AND MISCELLANEOUS	15,000	375
C	HVAC EQUIPMENT	5,380	28.6
C	MATERIAL HANDLING EQUIPMENT	11,200	69.2
C	PIPING (2" AND LESS)	1,000	113
C	PIPING (2-1/2" TO 4")	2,750	197
C	PIPING (OVER 4")	14,000	620
C	PROCESS EQUIPMENT	91,900	1,090
Totals for FS Category	**C**	**149,000**	**2,590**
D	DUCTWORK	3,220	890
D	EXTERIOR METAL WALL PANELS	591	146
D	INTERIOR METAL WALL PANELS	91.1	22.5
D	LEAD FLASHING	49.4	17.5
D	LOUVERS	1,480	29.5
D	METAL PANEL ROOF	623	154
Totals for FS Category	**D**	**6,060**	**1,260**
E	ASPHALT	552,000	22,400
E	CLAY PIPING	7,910	554
E	CONCRETE	468,000	35,100
E	CONCRETE BEAMS	57,600	4,320
E	CONCRETE COLUMNS	22,400	1,680
E	CONCRETE FOUNDATION	921,000	69,100
E	CONCRETE SLABS	2,260,000	169,000
E	CONCRETE WALLS	139,000	10,400
E	MASONRY	12,200	336
E	MASONRY WALLS	260,000	7,150
Totals for FS Category	**E**	**4,700,000**	**320,000**
F	ACID BRICK	20,700	1,450

Table B-2 (Continued)

FS Category[1]	Material Description	Unbulked Volume (cu. ft)	Weight (tons)
Totals for FS Category	F	20,700	1,450
G	CEILING DEMOLITION	12,300	147
G	EXTERIOR TRANSITE PANELS	17,500	982
G	FEEDER CABLE	1,120	321
G	FIRE BRICK	5,590	391
G	FLOOR TILE	3,720	179
G	INTERIOR TRANSITE PANELS	12,300	680
G	TRANSITE ROOF	18,900	1,060
Totals for FS Category	G	71,300	3,760
H	DUCTWORK INSULATION	5,390	12.1
H	PERSONAL PROTECTIVE EQUIPMENT	6,860	10.4
H	PIPING INSULATION	20,200	45.4
Totals for FS Category	H	32,400	68
I	BASIN LINERS	2,140	69.1
I	BUILDING INSULATION	155,000	349
I	DRYWALL	20,400	538
I	FABRIC	35.7	1.15
I	FABRIC ROOF	382	12.3
I	FABRIC WALLS	176	5.68
I	MISCELLANEOUS DEBRIS	31,200	467
I	NON PROCESS TRAILERS	305,000	896
I	PERSONAL PROTECTIVE EQUIPMENT	36,000	54.5
I	PROCESS TRAILERS	71,100	209
I	PVC CONDUIT	408	13.3
I	PVC PIPING	283	1.22
I	ROOFING (BUILT UP)	29,000	1,040
I	WINDOWS	21,000	419
I	WOOD	30,900	463
Totals for FS Category	I	703,000	4,540
Totals:		**7,480,000**	**374,000**

1. Source: SWIFTS or Req. Doc.
2. FS Category
   - A = Inaccessible Metals
   - B = Accessible Metals
   - C = Process Related Metals
   - D = Painted Light Guage Metals
   - E = Concrete
   - F = Acid Brick
   - G = ACS-FMS-Release
   - H = ACS-
   - I = Misc. Materials
   - J = Other Materials

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TABLE B-3
SUMMARY OF WASTE INVENTORY MATERIALS

	NON-RCRA			RCRA			UNCHARACTERIZED		
	NUMBER OF CONTAINERS	VOLUME (cu.ft)	WEIGHT (tons)	NUMBER OF CONTAINERS	VOLUME (cu.ft)	WEIGHT (tons)	NUMBER OF CONTAINERS	VOLUME (cu.ft)	WEIGHT (tons)
THORIUM	4,529	63,000	1,673	16	457	6	1,891	14,050	396
PRODUCT	24,282	85,370	5,181	547	4,333	100	13,213	16,830	3,103
OTHER	15,326	267,600	3,496	4,511	49,650	2,721	13,659	223,500	3,116

TABLE B-4
SOIL PILE QUANTITY ESTIMATES

SOIL PILE	LOCATION	VOLUME (CU FT)	WEIGHT (TONS)
1	East of Building 2A	393	19
2	Southeast of Building 8A	2,945	141
3	West of Decon Pad 74P	10,000	480
4	South of Building 80	6,412	308
5	South of Building 5A	1,244	60
6	Between Railroad Tracks 6 & 9	160,363	7,697
7	3rd Street Dirt Pile	803,589	38,572
TOTAL		984,946	47,277

Table B-6
Summary of Added Holdup and Contaminant Layer Quantities

FS Category	Material Description	Coating/Layer Type[1]	Unbulked Volume (cu. ft)	Weight (tons)
A	STRUCTURAL AND MISC. STEEL	PAINT	2,000	187
Totals for FS Category	**A**		**2,000**	**187**
B	CONDUIT/WIRE (2" AND LESS)	DUST	210	9.82
B	CONDUIT/WIRE (2-1/2" TO 4")	DUST	40.3	1.89
B	CONDUIT/WIRE/CABLE TRAY (OVER 4	DUST	10.6	.493
B	DOORS	PAINT	102	9.56
B	ELECTRICAL EQUIPMENT	PAINT	162	15.1
B	ELECTRICAL FIXTURES	PAINT	109	10.2
B	ELECTRICAL TRANSFORMERS	PAINT	3.97	.372
B	EQUIPMENT AND MISCELLANEOUS	PAINT	147	13.8
B	HVAC EQUIPMENT	PAINT	81.	7.58
B	MATERIAL HANDLING EQUIPMENT	PAINT	76.6	7.16
B	MISCELLANEOUS ELECTRICAL ITEMS	PAINT	47.	4.4
B	PIPING (2" AND LESS)	CRUD	37.7	3.53
B	PIPING (2" AND LESS)	DUST	8.08	.378
B	PIPING (2" AND LESS)	PAINT	95.4	8.92
B	PIPING (2-1/2" TO 4")	CRUD	61.2	5.72
B	PIPING (2-1/2" TO 4")	DUST	11.9	.557
B	PIPING (2-1/2" TO 4")	PAINT	64.8	6.06
B	PIPING (OVER 4")	CRUD	72.4	6.77
B	PIPING (OVER 4")	DUST	3.26	.153
B	PIPING (OVER 4")	PAINT	66.3	6.2
B	PROCESS EQUIPMENT	CRUD	414	38.7
B	PROCESS EQUIPMENT	DUST	50.2	2.35
B	PROCESS EQUIPMENT	PAINT	360	33.6
Totals for FS Category	**B**		**2,230**	**193**
C	ELECTRICAL EQUIPMENT	PAINT	13.6	1.27
C	EQUIPMENT AND MISCELLANEOUS	PAINT	16.4	1.53
C	HVAC EQUIPMENT	PAINT	6.59	.616
C	MATERIAL HANDLING EQUIPMENT	PAINT	8.32	.778
C	PIPING (2" AND LESS)	CRUD	8.39	.784
C	PIPING (2" AND LESS)	DUST	8.08	.378
C	PIPING (2" AND LESS)	PAINT	.51	.048
C	PIPING (2" AND LESS)	HOLD-UP	83.9	7.34
C	PIPING (2-1/2" TO 4")	CRUD	13.6	1.27
C	PIPING (2-1/2" TO 4")	DUST	11.9	.557
C	PIPING (2-1/2" TO 4")	PAINT	2.69	.251
C	PIPING (2-1/2" TO 4")	HOLD-UP	136	11.9
C	PIPING (OVER 4")	CRUD	16.1	1.51
C	PIPING (OVER 4")	DUST	3.26	.153
C	PIPING (OVER 4")	HOLD-UP	161	14.1
C	PROCESS EQUIPMENT	CRUD	91.9	8.59
C	PROCESS EQUIPMENT	DUST	50.2	2.35
C	PROCESS EQUIPMENT	HOLD-UP	919	80.4
Totals for FS Category	**C**		**1,550**	**134**
D	DUCTWORK	DUST	53.9	2.52

Table B-6 (Continued)

FS Category	Material Description	Coating/Layer Type[1]	Unbulked Volume (cu. ft)	Weight (tons)
D	DUCTWORK	PAINT	539	50.4
D	EXTERIOR METAL WALL PANELS	PAINT	221	20.7
D	INTERIOR METAL WALL PANELS	PAINT	34.1	3.19
D	LOUVERS	PAINT	14.8	1.38
D	METAL PANEL ROOF	PAINT	233	21.8
Totals for FS Category	**D**		**1,100**	**100.**
I	NON PROCESS TRAILERS	PAINT	18.9	1.77
I	PROCESS TRAILERS	PAINT	7.15	.669
I	WINDOWS	PAINT	11.6	1.09
Totals for FS Category	**I**		**37.7**	**3.52**
J	DUCTWORK	DUST	485	22.7
J	PIPING (2" AND LESS)	CRUD	37.7	3.53
J	PIPING (2" AND LESS)	DUST	64.6	3.02
J	PIPING (2" AND LESS)	HOLD-UP	755	66.
J	PIPING (2-1/2" TO 4")	CRUD	61.2	5.72
J	PIPING (2-1/2" TO 4")	DUST	95.3	4.46
J	PIPING (2-1/2" TO 4")	HOLD-UP	1,220	107
J	PIPING (OVER 4")	CRUD	72.4	6.77
J	PIPING (OVER 4")	DUST	26.1	1.22
J	PIPING (OVER 4")	HOLD-UP	1,450	127
J	PROCESS EQUIPMENT	CRUD	414	38.7
J	PROCESS EQUIPMENT	DUST	401	18.8
J	PROCESS EQUIPMENT	HOLD-UP	8,270	724
Totals for FS Category	**J**		**13,400**	**1,130**
	Totals		**20,300**	**1,750**

1. Coating/layer types are assumptions based on calculated materials. Assumptions information is provided in Section B.2.3

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Table B-7
Summary of All OU3 Material Quantities*

FS Category	Material Description	Unbulked Volume (cu. ft)	Weight (tons)
A	STRUCTURAL AND MISC. STEEL	63,400	15,200
Totals for FS Category	**A**	**63,400**	**15,200**
B	CONDUIT/WIRE (2" AND LESS)	6,510	1,070
B	CONDUIT/WIRE (2-1/2" TO 4")	5,480	593
B	CONDUIT/WIRE/CABLE TRAY (OVER 4")	1,990	165
B	DOORS	10,300	214
B	ELECTRICAL EQUIPMENT	97,200	1,040
B	ELECTRICAL FIXTURES	26,200	173
B	ELECTRICAL TRANSFORMERS	14,900	334
B	ELECTRICAL WIRING	206	59.
B	EQUIPMENT AND MISCELLANEOUS	135,000	3,390
B	HVAC EQUIPMENT	66,200	355
B	MATERIAL HANDLING EQUIPMENT	103,000	653
B	MISCELLANEOUS ELECTRICAL ITEMS	16,600	419
B	PIPING (2" AND LESS)	12,900	1,450
B	PIPING (2-1/2" TO 4")	21,500	1,540
B	PIPING (OVER 4")	67,100	2,970
B	PROCESS EQUIPMENT	1,160,000	11,200
Totals for FS Category	**B**	**1,740,000**	**25,600**
C	ELECTRICAL EQUIPMENT	8,170	95.9
C	EQUIPMENT AND MISCELLANEOUS	15,000	377
C	HVAC EQUIPMENT	5,380	29.2
C	MATERIAL HANDLING EQUIPMENT	11,200	70.
C	PIPING (2" AND LESS)	1,100	122
C	PIPING (2-1/2" TO 4")	2,920	211
C	PIPING (OVER 4")	14,200	636
C	PROCESS EQUIPMENT	93,000	1,180
Totals for FS Category	**C**	**151,000**	**2,720**
D	DUCTWORK	3,820	943
D	EXTERIOR METAL WALL PANELS	812	167
D	INTERIOR METAL WALL PANELS	125	25.7
D	LEAD FLASHING	49.4	17.5
D	LOUVERS	1,490	30.9
D	METAL PANEL ROOF	857	176
Totals for FS Category	**D**	**7,150**	**1,360**
E	ASPHALT	552,000	22,400
E	CLAY PIPING	7,910	554
E	CONCRETE	468,000	35,100
E	CONCRETE BEAMS	57,600	4,320
E	CONCRETE COLUMNS	22,400	1,680
E	CONCRETE FOUNDATION	921,000	69,100
E	CONCRETE SLABS	2,260,000	169,000
E	CONCRETE WALLS	139,000	10,400
E	MASONRY	12,200	336
E	MASONRY WALLS	260,000	7,150
Totals for FS Category	**E**	**4,700,000**	**320,000**
F	ACID BRICK	20,700	1,450
Totals for FS Category	**F**	**20,700**	**1,450**
G	CEILING DEMOLITION	12,300	147

Table B-7 (Continued)*

FS Category	Material Description	Unbulked Volume (cu. ft)	Weight (tons)
G	EXTERIOR TRANSITE PANELS	17,500	982
G	FEEDER CABLE	1,120	321
G	FIRE BRICK	5,590	391
G	FLOOR TILE	3,720	179
G	INTERIOR TRANSITE PANELS	12,300	680
G	TRANSITE ROOF	18,900	1,060
Totals for FS Category	**G**	**71,300**	**3,760**
H	COPPER PILE	47,800	1,370
H	DUCTWORK INSULATION	5,390	12.1
H	PERSONAL PROTECTIVE EQUIPMENT	6,860	10.4
H	PIPING INSULATION	20,200	45.4
Totals for FS Category	**H**	**80,200**	**1,440**
I	BASIN LINERS	2,140	69.1
I	BUILDING INSULATION	155,000	349
I	DRYWALL	20,400	538
I	FABRIC	35.7	1.15
I	FABRIC ROOF	382	12.3
I	FABRIC WALLS	176	5.68
I	MISCELLANEOUS DEBRIS	31,200	467
I	NON PROCESS TRAILERS	305,000	898
I	PERSONAL PROTECTIVE EQUIPMENT	36,000	54.5
I	PROCESS TRAILERS	71,100	210
I	PVC CONDUIT	408	13.3
I	PVC PIPING	283	1.22
I	ROOFING (BUILT UP)	29,000	1,040
I	WINDOWS	21,000	420
I	WOOD	30,900	463
Totals for FS Category	**I**	**703,000**	**4,550**
J	DUCTWORK	485	22.7
J	OTHER WASTE	541,000	9,330
J	PIPING (2" AND LESS)	857	72.6
J	PIPING (2-1/2" TO 4")	1,380	117
J	PIPING (OVER 4")	1,550	135
J	PROCESS EQUIPMENT	9,090	781
J	PRODUCT WASTE	107,000	8,380
J	SOIL PILE	985,000	47,300
J	THORIUM WASTE	77,500	2,080
Totals for FS Category	**J**	**1,720,000**	**68,200**
	Totals	**9,260,000**	**445,000**

***Volumes and Weights inclusive of Table B-2, B-4, B-5 and B-7**

Table B.10
Source Term by Constituent of Concern *

Sort Class	Parameter	Source Term (kg)
INORGANICS		
	Antimony	741
	Arsenic	2070
	Barium	24400
	Beryllium	397
	Cadmium	761
	Chromium	2470000
	Copper	182000
	Lead	102000
	Manganese	862000
	Mercury	27.8
	Nickel	1730000
	Selenium	23.2
	Silver	2920
	Thallium	93.2
	Vanadium	6620
	Zinc	36500
PESTICIDES & PCBs		
	alpha-Chlordane	0.04
	Aroclor-1248	0.0443
	Aroclor-1254	8.46
	Aroclor-1260	5.3
	Dieldrin	0.00825
	gamma-Chlordane	0.0426
RADIOISOTOPES		
	Americium-241	0.0000227
	Cesium-137	0.000000746
	Lead-210	0.0000314
	Neptunium-237	0.0734
	Plutonium-238	0.0000362
	Plutonium-239/240	0.000967
	Plutonium-241	0.0000146
	Polonium-210	0.000000441
	Radium-226	0.00599
	Radium-228	0.0000102
	Strontium-90	0.00000798
	Technetium-99	0.127
	Thorium, Total	882000
	Thorium-228	0.00000143
	Thorium-230	0.148
	Thorium-232	3720
	Uranium, Total	8020000
	Uranium-233/234	1.37
	Uranium-234	5.27
	Uranium-235/236	41200
	Uranium-238	7560000

Table B.10 (Continued) *

Sort Class	Parameter	Source Term (kg)
SEMIVOLATILE		
	1,4-Dichlorobenzene	94.2
	2,4-Dinitrotoluene	0
	Benzo(a)anthracene	2.2
	Benzo(a)pyrene	0.246
	Benzo(b)fluoranthene	0.195
	Benzo(k)fluoranthene	0.00842
	bis(2-Ethylhexyl)phthalate	6.31
	Carbazole	0.00147
	Chrysene	6.9
	Dibenzo(a,h)anthracene	0
	Hexachlorobutadiene	81.6
	Indeno(1,2,3-cd)pyrene	0
	N-Nitroso-di-n-propylamine	0
	Nitrobenzene	155
	Pentachlorophenol	0
VOLATILE		
	Benzene	0
	Styrene	0.0354
	Tetrachloroethene	351

*** Note: Includes source term contribution from inventory and soil piles.**

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Table B-12
Source Term for Technetium-99 by Component

Component	Source Term (kg)	Weight (tons)	Unbulked Volume (cu. ft)
01A	1.800E-03	3,100	86,600
01B	1.740E-05	1,030	13,700
01C	1.020E-05	581	7,750
02A	4.300E-03	7,880	243,000
02B	9.560E-06	264	11,000
02C	4.500E-06	201	5,030
02D	3.590E-04	424	15,600
02E	1.680E-06	133	8,620
02F	5.500E-06	324	10,000
02G	2.590E-06	152	9,410
02H	3.370E-06	162	2,170
03A	3.320E-05	1,720	33,400
03B	3.350E-06	125	1,870
03C	6.710E-06	291	12,600
03D	7.140E-06	702	46,700
03E	2.940E-04	1,840	47,700
03F	1.550E-06	125	2,560
03G	2.450E-06	98.3	2,580
03H	1.660E-05	206	14,700
03J	1.570E-03	662	23,900
03K	9.740E-07	55.8	1,010
03L	3.690E-06	201	9,080
04A	2.180E-03	8,960	176,000
04B	2.040E-05	1,230	16,600
04C	1.110E-05	375	6,780
05A	3.180E-03	10,300	302,000
05B	6.680E-06	303	6,530
05C	1.270E-06	91.2	2,010
05D	1.570E-05	1,600	39,000
05E	5.390E-06	307	4,280
05F	1.130E-05	688	9,220
05G	2.210E-06	111	1,510
06A	9.600E-03	28,200	548,000
06B	4.660E-06	89.2	1,200
06C	2.360E-05	42.4	724
06D	1.260E-06	76.2	1,150
06E	8.270E-07	61.5	1,470
06F	1.040E-04	192	4,260
06G	1.760E-05	1,280	26,200
07A	2.070E-03	29,000	387,000
08A	6.940E-03	5,510	142,000
08B	5.150E-06	257	4,990
08C	8.370E-04	3,030	76,600
08D	1.000E-05	652	8,020
08E	2.800E-07	22.9	315
08F	4.560E-09	.791	45.2
09A	5.800E-02	6,360	147,000
09B	5.280E-05	173	3,470
09C	7.850E-07	50.4	690
09D	3.000E-06	111	2,220
09E	9.010E-08	3.08	59.3

Table B-12 (Continued)

Component	Source Term (kg)	Weight (tons)	Unbulked Volume (cu. ft)
09F	3.170E-05	43.3	650
10A	1.580E-04	7,070	144,000
10B	5.200E-06	219	3,430
10C	7.290E-06	417	5,700
10D	5.730E-05	146	1,940
10E	3.020E-06	180	2,790
11	2.300E-04	11,500	246,000
12A	1.180E-04	4,410	98,700
12B	1.190E-05	681	10,100
12C	2.990E-06	180	2,530
12D	7.530E-06	459	7,670
13A	1.570E-03	2,740	57,300
13B	7.320E-06	379	6,870
13C	3.600E-05	149	2,580
13D	1.930E-05	286	13,300
14A	1.150E-04	4,330	82,900
14B	2.120E-07	8.88	358
15A	1.970E-03	13,300	255,000
15B	1.300E-06	81.4	2,070
16A	9.780E-06	619	12,000
16B	2.570E-06	109	3,850
16C	5.950E-08	7.33	297
16D	1.660E-06	84.3	2,210
16E	7.580E-07	264	10,600
16F	1.100E-07	9.59	288
16G	1.100E-07	9.79	291
16H	2.970E-07	21.5	1,060
16J	2.970E-07	21.5	1,060
18A	1.250E-06	71.3	1,590
18B	1.390E-03	599	8,970
18C	4.120E-06	212	2,830
18D	6.830E-06	633	16,500
18E	4.680E-09	35.2	1,200
18G	9.320E-06	25.1	555
18H	2.770E-04	269	40,700
18J	2.220E-06	133	1,770
18K	1.090E-08	19.4	661
18L	1.090E-08	19.4	666
18M	1.540E-05	878	11,800
18P	1.050E-06	93.4	18,200
18Q	2.620E-06	211	8,420
19A	5.910E-05	3,530	66,600
19B	1.010E-05	618	13,800
19C	6.310E-06	363	6,470
19D	2.770E-06	181	14,400
19E	3.480E-07	32.	1,050
20A	2.340E-06	181	3,430
20B	2.930E-05	1,960	29,800
20C	1.540E-05	1,030	193,000
20D	1.170E-05	796	9,910
20E	2.880E-07	18.9	615

Table B-12 (Continued)

Component	Source Term (kg)	Weight (tons)	Unbulked Volume (cu. ft)
20F	2.890E-07	19.1	628
20G	3.610E-07	21.9	1,060
20H	1.750E-05	1,000	14,500
22A	9.180E-07	53.2	1,130
22B	4.700E-07	30.7	909
22C	8.940E-10	5.45	24.9
22D	2.540E-06	146	2,060
22E	5.540E-05	3,210	42,200
23	7.690E-08	4.93	81.
24A	5.720E-06	317	4,510
24B	4.610E-06	247	4,880
25A	2.750E-06	157	2,460
25B	6.820E-07	40.9	738
25C	4.450E-06	255	3,840
25D	2.010E-06	117	1,730
25E	1.640E-05	693	11,900
25F	1.540E-05	473	6,280
25G	9.070E-06	517	6,920
25H	3.970E-06	217	2,920
25J	3.250E-07	18.9	326
26A	2.170E-05	446	8,590
26B	1.280E-05	1,310	11,900
26C	5.610E-07	28.4	734
28A	2.030E-05	1,080	19,800
28B	1.320E-05	821	16,100
28C	6.700E-08	5.6	254
28D	6.330E-08	4.25	271
28E	2.030E-07	12.4	211
28F	7.310E-07	12.3	175
28G	2.020E-07	12.1	212
30A	3.610E-05	1,690	25,400
30B	4.870E-07	32.9	599
31A	5.710E-05	676	13,500
31B	4.810E-06	274	3,650
32A	1.650E-05	967	17,500
32B	1.760E-04	163	2,400
35A	0.000E+00	1.03	9.16
37	1.930E-04	1,110	30,500
38A	3.440E-06	221	3,910
38B	4.050E-07	63.7	2,500
39A	2.060E-05	289	4,750
39B	2.050E-05	513	6,860
39C	2.560E-07	20.	737
39D	1.340E-06	70.	1,680
45A	6.120E-05	1,510	23,600
45B	3.140E-07	1.48	194
46	3.040E-05	1,350	18,900
51	6.900E-05	7,970	203,000
53A	1.420E-04	7,430	128,000
53B	1.640E-05	1,060	15,500
54A	2.070E-04	1,680	55,200

Table B-12 (Continued)

Component	Source Term (kg)	Weight (tons)	Unbulked Volume (cu. ft)
54B	3.300E-06	202	3,530
54C	3.340E-06	114	2,980
55A	1.010E-04	412	12,700
55B	4.550E-05	238	3,670
56A	1.170E-05	647	9,230
56B	4.000E-08	3.92	357
56C	5.120E-08	5.38	373
60	2.070E-05	1,200	16,000
61	2.770E-06	167	2,290
62	5.080E-06	296	3,990
63	3.830E-05	2,280	40,400
64	6.830E-05	1,210	18,300
65	1.100E-05	729	10,000
66	1.320E-04	366	10,700
67	4.850E-05	233	3,330
68	1.330E-05	431	6,110
69	1.840E-04	744	14,000
71	4.440E-03	1,790	32,600
72	2.000E-06	121	1,880
73A	1.710E-06	97.	1,290
74A	8.840E-06	290	3,860
74B	2.040E-05	412	5,500
74C	2.280E-05	543	7,240
74D	1.870E-05	369	4,920
74E	3.360E-05	640	8,530
74F	2.360E-06	65.4	872
74G	7.080E-05	176	2,350
74H	3.720E-06	113	1,500
74J	2.190E-06	114	1,530
74K	2.530E-04	383	5,100
74L	3.170E-04	1,050	14,000
74M	8.050E-05	908	12,100
74N	4.310E-06	245	3,270
74P	4.640E-05	2,470	32,900
74Q	1.660E-05	94.4	1,290
74R	5.330E-05	154	2,050
74S	2.120E-06	120	1,610
74T	1.500E-02	33,600	448,000
74U	4.140E-06	235	3,140
74V	1.780E-06	101	1,350
74W	4.710E-06	206	2,750
77	1.910E-05	1,170	15,500
78	1.350E-05	897	24,000
79	1.730E-05	1,070	14,200
80	1.450E-05	903	12,300
81	1.200E-05	786	9,970
82	1.570E-05	955	14,800
89	5.150E-04	28,300	498,000
G-002	5.430E-03	45,700	743,000
G-004	1.390E-06	1,050	27,000
G-006	1.610E-06	210	71,100

Table B-12 (Continued)

Component	Source Term (kg)	Weight (tons)	Unbulked Volume (cu. ft)
G-007	4.240E-06	898	305,000
G-008	1.600E-06	589	2,700
G-011	0.000E+00	19,800	725,000
G-013	2.500E-06	47,300	985,000
GRID 1	1.440E-06	136	3,300
GRID 10	5.350E-06	458	8,030
GRID 11	1.430E-05	977	14,900
GRID 12	9.530E-06	619	8,890
GRID 13	2.720E-05	1,650	22,400
GRID 14	7.010E-06	645	10,100
GRID 15	3.090E-07	57.6	641
GRID 16	4.490E-06	295	5,620
GRID 17	3.080E-06	1,010	7,260
GRID 18	8.280E-05	4,850	66,800
GRID 19	2.240E-05	1,570	23,500
GRID 2	3.080E-06	233	3,660
GRID 20	1.460E-05	989	14,200
GRID 21	7.560E-07	128	2,340
GRID 22	9.030E-07	80.8	2,150
GRID 23	1.220E-07	318	1,810
GRID 24	4.890E-07	71.2	1,650
GRID 25	1.540E-05	1,010	14,900
GRID 26	4.540E-06	343	5,890
GRID 27	3.510E-06	278	4,100
GRID 28	7.240E-08	11.1	81.8
GRID 29	3.250E-08	25.8	395
GRID 3	8.660E-06	604	9,030
GRID 30	2.220E-08	139	2,960
GRID 31	1.390E-06	305	8,490
GRID 32	9.170E-07	139	2,350
GRID 33	7.920E-08	15.6	222
GRID 4	8.440E-06	553	7,650
GRID 5	3.500E-05	2,040	27,300
GRID 6	2.990E-05	1,860	25,800
GRID 7	5.920E-06	422	6,120
GRID 8	1.750E-06	129	1,680
GRID 9	3.510E-06	320	6,250
P-004	0.000E+00	1,370	47,800
TS-001	8.260E-08	57.6	835
TS-002	1.150E-07	75.1	764
TS-003	2.700E-08	15.7	201
TS-004	2.340E-07	125	1,560
TS-005	2.360E-07	125	1,590
TS-006	2.930E-08	15.2	261
Totals:	**1.270E-01**	**445,000**	**9,260,000**

Table B-15
Source Term for Total Uranium by Component

Component	Source Term (kg)	Weight (tons)	Unbulked Volume (cu. ft)
01A	1.998E+04	3,100	86,600
01B	6.350E+00	1,030	13,700
01C	3.602E+00	581	7,750
02A	5.751E+04	7,880	243,000
02B	2.331E+03	264	11,000
02C	4.116E+02	201	5,030
02D	3.565E+03	424	15,600
02E	7.177E+00	133	8,620
02F	7.659E+00	324	10,000
02G	7.683E+00	152	9,410
02H	3.966E+00	162	2,170
03A	3.277E+03	1,720	33,400
03B	4.554E+01	125	1,870
03C	2.769E+00	291	12,600
03D	1.100E+01	702	46,700
03E	9.459E+03	1,840	47,700
03F	6.988E-01	125	2,560
03G	5.965E+01	98.3	2,580
03H	1.189E+01	206	14,700
03J	2.343E+02	662	23,900
03K	4.343E-01	55.8	1,010
03L	1.869E+03	201	9,080
04A	3.418E+04	8,960	176,000
04B	7.518E+00	1,230	16,600
04C	8.689E+02	375	6,780
05A	5.894E+04	10,300	302,000
05B	8.303E+02	303	6,530
05C	4.519E+02	91.2	2,010
05D	6.560E+03	1,600	39,000
05E	2.635E+00	307	4,280
05F	4.200E+00	688	9,220
05G	7.081E+00	111	1,510
06A	7.444E+04	28,200	548,000
06B	8.846E+00	89.2	1,200
06C	9.182E+01	42.4	724
06D	4.968E-01	76.2	1,150
06E	2.094E+02	61.5	1,470
06F	3.611E+03	192	4,260
06G	5.422E+03	1,280	26,200
07A	6.835E+02	29,000	387,000
08A	3.851E+04	5,510	142,000
08B	9.127E+01	257	4,990
08C	1.113E+04	3,030	76,600
08D	8.904E+01	652	8,020
08E	1.257E-01	22.9	315
08F	9.077E-03	.791	45.2
09A	3.391E+04	6,360	147,000
09B	7.371E+02	173	3,470
09C	2.908E+01	50.4	690
09D	1.629E+01	111	2,220
09E	4.497E-01	3.08	59.3

Table B-15 (Continued)

Component	Source Term (kg)	Weight (tons)	Unbulked Volume (cu. ft)
09F	9.569E+01	43.3	650
10A	2.087E+04	7,070	144,000
10B	6.729E+01	219	3,430
10C	2.414E+01	417	5,700
10D	8.481E+01	146	1,940
10E	1.902E+01	180	2,790
11	5.479E+01	11,500	246,000
12A	3.364E+03	4,410	98,700
12B	4.050E+00	681	10,100
12C	6.964E+00	180	2,530
12D	2.837E+00	459	7,670
13A	1.396E+04	2,740	57,300
13B	1.048E+02	379	6,870
13C	2.750E+02	149	2,580
13D	1.135E+01	286	13,300
14A	4.743E+01	4,330	82,900
14B	3.316E+00	8.88	358
15A	2.527E+04	13,300	255,000
15B	3.460E-01	81.4	2,070
16A	3.766E+00	619	12,000
16B	3.498E+00	109	3,850
16C	2.088E-02	7.33	297
16D	1.828E+00	84.3	2,210
16E	2.848E-01	264	10,600
16F	4.728E-02	9.59	288
16G	1.072E-01	9.79	291
16H	1.222E-01	21.5	1,060
16J	1.222E-01	21.5	1,060
18A	2.344E-01	71.3	1,590
18B	1.090E+02	599	8,970
18C	1.309E+00	212	2,830
18D	2.826E+03	633	16,500
18E	9.680E-03	35.2	1,200
18G	3.540E+01	25.1	555
18H	1.327E+04	269	40,700
18J	8.295E-01	133	1,770
18K	2.238E-02	19.4	661
18L	2.238E-02	19.4	666
18M	5.318E+00	878	11,800
18P	5.549E+03	93.4	18,200
18Q	2.283E+03	211	8,420
19A	2.128E+01	3,530	66,600
19B	3.655E+00	618	13,800
19C	2.008E+00	363	6,470
19D	1.856E+00	181	14,400
19E	4.284E+01	32.	1,050
20A	1.976E+03	181	3,430
20B	7.075E+03	1,960	29,800
20C	8.230E+00	1,030	193,000
20D	4.388E+00	796	9,910
20E	5.566E+01	18.9	615

Table B-15 (Continued)

Component	Source Term (kg)	Weight (tons)	Unbulked Volume (cu. ft)
20F	5.566E+01	19.1	628
20G	1.241E+02	21.9	1,060
20H	6.189E+00	1,000	14,500
22A	4.865E+01	53.2	1,130
22B	1.433E+02	30.7	909
22C	6.885E-01	5.45	24.9
22D	1.756E+00	146	2,060
22E	1.954E+01	3,210	42,200
23	9.056E-01	4.93	81.
24A	3.015E+00	317	4,510
24B	5.007E+01	247	4,880
25A	1.243E+01	157	2,460
25B	2.926E+01	40.9	738
25C	1.565E+01	255	3,840
25D	8.450E+01	117	1,730
25E	3.287E+02	693	11,900
25F	2.725E+00	473	6,280
25G	3.197E+00	517	6,920
25H	1.299E+00	217	2,920
25J	1.159E-01	18.9	326
26A	6.592E+02	446	8,590
26B	5.400E+00	1,310	11,900
26C	5.609E+01	28.4	734
28A	5.735E+00	1,080	19,800
28B	4.019E+00	821	16,100
28C	1.496E-02	5.6	254
28D	1.361E-02	4.25	271
28E	7.914E-02	12.4	211
28F	7.453E-01	12.3	175
28G	7.784E-02	12.1	212
30A	3.104E+01	1,690	25,400
30B	2.047E-01	32.9	599
31A	4.381E+02	676	13,500
31B	1.697E+00	274	3,650
32A	4.880E+00	967	17,500
32B	5.680E+01	163	2,400
35A	0.000E+00	1.03	9.16
37	4.981E+03	1,110	30,500
38A	1.228E+03	221	3,910
38B	6.960E+00	63.7	2,500
39A	5.850E+02	289	4,750
39B	2.701E+01	513	6,860
39C	8.079E+00	20.	737
39D	4.179E+00	70.	1,680
45A	8.235E+01	1,510	23,600
45B	2.193E+00	1.48	194
46	6.495E+02	1,350	18,900
51	1.046E+03	7,970	203,000
53A	4.385E+01	7,430	128,000
53B	5.858E+00	1,060	15,500
54A	1.072E+04	1,680	55,200

Table B-15 (Continued)

Component	Source Term (kg)	Weight (tons)	Unbulked Volume (cu. ft)
54B	1.213E+00	202	3,530
54C	8.025E+02	114	2,980
55A	1.747E+03	412	12,700
55B	2.375E+02	238	3,670
56A	4.267E+00	647	9,230
56B	2.785E-02	3.92	357
56C	4.095E-02	5.38	373
60	7.423E+00	1,200	16,000
61	1.063E+00	167	2,290
62	2.486E+00	296	3,990
63	1.063E+02	2,280	40,400
64	1.875E+01	1,210	18,300
65	4.291E+00	729	10,000
66	2.673E+03	366	10,700
67	1.708E+00	233	3,330
68	4.290E+00	431	6,110
69	9.966E+02	744	14,000
71	1.433E+03	1,790	32,600
72	1.331E+00	121	1,880
73A	6.017E-01	97.	1,290
74A	2.133E+01	290	3,860
74B	1.464E+01	412	5,500
74C	1.040E+02	543	7,240
74D	1.109E+02	369	4,920
74E	7.136E+00	640	8,530
74F	1.609E+00	65.4	872
74G	7.445E+01	176	2,350
74H	6.636E+00	113	1,500
74J	6.203E+00	114	1,530
74K	1.194E+02	383	5,100
74L	6.133E+02	1,050	14,000
74M	3.171E+01	908	12,100
74N	1.581E+00	245	3,270
74P	1.030E+02	2,470	32,900
74Q	1.135E+01	94.4	1,290
74R	1.295E+01	154	2,050
74S	6.946E-01	120	1,610
74T	7.401E+03	33,600	448,000
74U	1.575E+00	235	3,140
74V	5.860E-01	101	1,350
74W	1.473E+01	206	2,750
77	6.537E+00	1,170	15,500
78	1.515E+03	897	24,000
79	6.438E+00	1,070	14,200
80	5.101E+00	903	12,300
81	4.002E+00	786	9,970
82	3.128E+02	955	14,800
89	1.137E+02	28,300	498,000
G-002	2.778E+03	45,700	743,000
G-004	1.959E+00	1,050	27,000
G-006	2.490E-01	210	71,100

Table B-15 (Continued)

Component	Source Term (kg)	Weight (tons)	Unbulked Volume (cu. ft)
G-007	6.574E-01	898	305,000
G-008	1.869E+01	589	2,700
G-011	7.507E+06	19,800	725,000
G-013	0.000E+00	47,300	985,000
GRID 1	2.337E-01	136	3,300
GRID 10	1.580E+00	458	8,030
GRID 11	4.679E+00	977	14,900
GRID 12	3.209E+00	619	8,890
GRID 13	9.448E+00	1,650	22,400
GRID 14	2.199E+00	645	10,100
GRID 15	5.410E-03	57.6	641
GRID 16	1.250E+00	295	5,620
GRID 17	8.917E-01	1,010	7,260
GRID 18	2.894E+01	4,850	66,800
GRID 19	7.629E+00	1,570	23,500
GRID 2	8.807E-01	233	3,660
GRID 20	4.982E+00	989	14,200
GRID 21	1.735E-01	128	2,340
GRID 22	1.759E-01	80.8	2,150
GRID 23	6.211E-03	318	1,810
GRID 24	6.352E-02	71.2	1,650
GRID 25	5.288E+00	1,010	14,900
GRID 26	1.338E+00	343	5,890
GRID 27	1.164E+00	278	4,100
GRID 28	1.268E-03	11.1	81.8
GRID 29	5.689E-04	25.8	395
GRID 3	2.802E+00	604	9,030
GRID 30	3.892E-04	139	2,960
GRID 31	7.733E-02	305	8,490
GRID 32	3.044E-01	139	2,350
GRID 33	1.387E-03	15.6	222
GRID 4	2.908E+00	553	7,650
GRID 5	1.234E+01	2,040	27,300
GRID 6	1.035E+01	1,860	25,800
GRID 7	1.990E+00	422	6,120
GRID 8	4.682E-01	129	1,680
GRID 9	8.193E-01	320	6,250
P-004	0.000E+00	1,370	47,800
TS-001	2.034E-01	57.6	835
TS-002	2.773E-01	75.1	764
TS-003	6.483E-02	15.7	201
TS-004	2.800E-01	125	1,560
TS-005	2.849E-01	125	1,590
TS-006	3.707E-02	15.2	261
Totals:	**8.020E+06**	**445,000**	**9,260,000**

Table B-22
Segregation Category by Material Description

Segregation Category	FS Category	Material Description	Unbulked Volume (cu. ft)	Weight (tons)
BELOW BASELINE				
	E	ASPHALT	261,000	10,600
	E	CLAY PIPING	7,910	554
	E	CONCRETE	462,000	34,700
	E	CONCRETE BEAMS	51,400	3,850
	E	CONCRETE COLUMNS	18,400	1,380
	E	CONCRETE FOUNDATION	921,000	69,100
	E	CONCRETE SLABS	2,050,000	154,000
	E	CONCRETE WALLS	131,000	9,800
	E	MASONRY	11,400	315
	E	MASONRY WALLS	245,000	6,740
	I	BUILDING INSULATION	16,400	36.8
	I	DRYWALL	2,220	58.7
	I	FABRIC	11.1	.356
	I	FABRIC ROOF	238	7.67
	I	FABRIC WALLS	101	3.27
	I	MISCELLANEOUS DEBRIS	31,200	467
	I	NON PROCESS TRAILERS	305,000	896
	I	PROCESS TRAILERS	71,100	209
	I	PVC CONDUIT	408	13.3
	I	PVC PIPING	283	1.22
	I	ROOFING (BUILT UP)	29,000	1,040
	I	WINDOWS	21,000	419
	I	WOOD	25,400	381
Segregation Category Totals:			4,660,000	295,000
LOW LEVEL				
	A	STRUCTURAL AND MISC. STEEL	63,400	15,200
	B	CONDUIT/WIRE (2" AND LESS)	6,510	1,070
	B	CONDUIT/WIRE (2-1/2" TO 4")	5,480	593
	B	CONDUIT/WIRE/CABLE TRAY (OV	1,990	164
	B	DOORS	10,300	214
	B	ELECTRICAL EQUIPMENT	97,300	1,040
	B	ELECTRICAL FIXTURES	26,200	173
	B	ELECTRICAL WIRING	206	59.
	B	EQUIPMENT AND MISCELLANEO	135,000	3,390
	B	HVAC EQUIPMENT	66,200	355
	B	MATERIAL HANDLING EQUIPMEN	103,000	652
	B	MISCELLANEOUS ELECTRICAL IT	16,600	419
	B	PIPING (2" AND LESS)	12,900	1,450
	B	PIPING (2-1/2" TO 4")	21,500	1,540
	B	PIPING (OVER 4")	67,100	2,970
	B	PROCESS EQUIPMENT	1,160,000	11,200
	C	ELECTRICAL EQUIPMENT	8,170	96.
	C	EQUIPMENT AND MISCELLANEO	15,000	377
	C	HVAC EQUIPMENT	5,390	29.2
	C	MATERIAL HANDLING EQUIPMEN	11,200	70.
	C	PIPING (2" AND LESS)	1,100	122
	C	PIPING (2-1/2" TO 4")	2,910	211
	C	PIPING (OVER 4")	14,200	636

Table B-22 (Continued)

Segregation Category	FS Category	Material Description	Unbulked Volume (cu. ft)	Weight (tons)
	C	PROCESS EQUIPMENT	93,000	1,180
	D	DUCTWORK	3,810	943
	D	EXTERIOR METAL WALL PANELS	812	167
	D	INTERIOR METAL WALL PANELS	125	25.7
	D	LOUVERS	1,490	30.9
	D	METAL PANEL ROOF	856	176
	E	ASPHALT	291,000	11,800
	E	CONCRETE	5,730	429
	E	CONCRETE BEAMS	6,220	467
	E	CONCRETE COLUMNS	4,000	300
	E	CONCRETE SLABS	210,000	15,800
	E	CONCRETE WALLS	8,060	605
	E	MASONRY	763	21.
	E	MASONRY WALLS	14,800	407
	F	ACID BRICK	15,400	1,080
	G	CEILING DEMOLITION	12,300	147
	G	EXTERIOR TRANSITE PANELS	17,500	982
	G	FEEDER CABLE	1,120	321
	G	FIRE BRICK	5,590	391
	G	FLOOR TILE	3,720	179
	G	INTERIOR TRANSITE PANELS	12,300	680
	G	TRANSITE ROOF	18,900	1,060
	H	COPPER PILE	47,800	1,370
	H	DUCTWORK INSULATION	5,390	12.1
	H	PERSONAL PROTECTIVE EQUIPM	6,860	10.4
	H	PIPING INSULATION	20,200	45.4
	I	BASIN LINERS	2,140	69.1
	I	BUILDING INSULATION	139,000	313
	I	DRYWALL	18,200	480
	I	FABRIC	24.7	.796
	I	FABRIC ROOF	145	4.67
	I	FABRIC WALLS	74.9	2.42
	I	NON PROCESS TRAILERS	18.9	1.77
	I	PERSONAL PROTECTIVE EQUIPM	36,000	54.5
	I	PROCESS TRAILERS	7.15	.669
	I	WINDOWS	11.6	1.09
	I	WOOD	5,490	82.3
	J	DUCTWORK	12.9	.604
	J	OTHER WASTE	492,000	6,620
	J	PIPING (2" AND LESS)	763	66.5
	J	PIPING (2-1/2" TO 4")	1,230	108
	J	PIPING (OVER 4")	1,470	129
	J	PROCESS EQUIPMENT	8,320	727
	J	PRODUCT WASTE	102,000	8,280
	J	SOIL PILE	985,000	47,300
	J	THORIUM WASTE	77,100	2,070
Segregation Category Totals:			**4,530,000**	**147,000**
MIXED				
	D	LEAD FLASHING	49.4	17.5

Table B-22 (Continued)

Segregation Category	FS Category	Material Description	Unbulked Volume (cu. ft)	Weight (tons)
	F	ACID BRICK	5,280	370
	J	DUCTWORK	462	21.6
	J	OTHER WASTE	49,700	2,720
	J	PIPING (2" AND LESS)	94.5	6.05
	J	PIPING (2-1/2" TO 4")	142	9.25
	J	PIPING (OVER 4")	77.2	6.26
	J	PROCESS EQUIPMENT	767	54.1
	J	PRODUCT WASTE	4,330	100.
	J	THORIUM WASTE	457	6.24
Segregation Category Totals:			**61,400** [a]	**3,310** [b]
PCB WASTE				
	B	ELECTRICAL TRANSFORMERS	14,900	334
Segregation Category Totals:			**14,900**	**334**
		Totals:	**9,270,000**	**445,000**

[a] **Includes 10 cubic feet of inventory considered hazardous.**

[b] **Includes 0.47 tons of inventory conisdered hazardous.**

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APPENDIX C

C.0 POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND OTHER CRITERIA TO BE CONSIDERED

C.1 ARARs DEVELOPMENT

This appendix includes the potential statutory and regulatory requirements impacting remedial alternatives for Operable Unit 3 (OU3). Remedial action decisions must include consideration of any ARARs. Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), jointly referred to as CERCLA, and Section 300.430(f)(ii)(B) ~~300.68(i)(1)~~ of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) require CERCLA response actions to attain or exceed environmental and public health ARARs unless specific waivers are obtained from regulators. CERCLA lists specific federal environmental laws that must be considered as part of an ARARs analysis. This list includes:

- Toxic Substances Control Act (TSCA)
- Safe Drinking Water Act (SDWA)
- Clean Air Act (CAA)
- Clean Water Act (CWA)
- Solid Waste Disposal Act/Resource Conservation and Recovery Act, as amended (jointly referred to as RCRA)

A requirement under these and other environmental laws may be either "applicable" or "relevant and appropriate," but not both. These terms are defined below.

- Applicable requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

- Relevant and appropriate requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Determination of whether a requirement is applicable or relevant and appropriate will differ for each site. In addition to ARARs, the NCP directs that other criteria, advisories, and guidance issued by federal or state government agencies that may be useful in developing CERCLA remedies may be

used as "To Be Considered" (TBC) criteria and do not have the status of potential ARARs. However, these TBC criteria are evaluated along with the ARARs to determine the necessary level of cleanup or technology required to protect human health and the environment.

Some TBC criteria include United States Department of Energy (DOE) Orders, which pertain only to DOE facilities under the Atomic Energy Act (AEA). The substantive requirements of DOE Orders are TBCs, which, when specifically incorporated in a CERCLA Record of Decision (ROD), are enforceable cleanup standards under CERCLA. The United States Environmental Protection Agency's (US EPA's) Compliance with Other Laws Manual (1988) states, "DOE Orders are not promulgated requirements and are not potential ARARs." The manual further states that, "to the extent that DOE Orders are more stringent or cover areas not addressed by existing ARARs, they should be considered, when necessary, to develop a protective remedy."

The NCP has identified three categories of ARARs:

- Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies used to determine acceptable concentrations of chemicals that may be found in or discharged to the environment (e.g., maximum contaminant levels [MCLs] that establish safe levels in drinking water).

- Location-specific ARARs restrict actions or contaminant concentrations in certain environmentally sensitive areas. Examples of areas regulated under various federal laws include floodplains, wetlands, and locations where endangered species or historically significant cultural resources are present.

- Action-specific ARARs are usually technology-, performance-, or activity-based requirements or limitations on actions or conditions involving special substances.

The regulatory requirements discussed in this section have been identified for the OU3 final remedial action. Many key decisions affecting the final disposition of materials generated during the OU3 interim remedial action were made under RODs from other OUs:

- OU2 identified the ARARs/TBCs and waste acceptance criteria for low-level radioactive waste disposal in an on-property disposal cell, including a US EPA waiver of solid waste disposal facility siting criteria established by the OEPA [OAC 3745-27-07(H)(2)(c)and(d)]; ~~from the siting criteria established by the Ohio Environmental Protection Agency (OEPA);~~

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In addition, the OU5 Feasibility Study (FS) Report identified the ARARs/TBCs and waste acceptance criteria for low-level and mixed waste disposal in an on-property disposal facility, and discussed the Corrective Action Management Unit (CAMU) concept; the OU5 decision expands the scope of the disposal cell.

Three alternatives will be evaluated for the OU3 final remedial action: Alternative 1 is the no further action option (based on implementation of the interim remedial action at OU3); Alternative 2 involves selected material treatment, on-property disposal of most construction rubble and off-site disposal of the remaining materials; and Alternative 3 involves selected material treatment and off-site disposal. For the no further action alternative, it is assumed that there is no active management and no new construction associated with the continued storage of the material beyond the completion of the interim remedial action. It is also assumed that there will not be any new construction if Alternative 3 is selected.

C.2 ARARs WAIVER OF ~~TO~~ OEPA SOLID WASTE DISPOSAL FACILITY SITING CRITERIA ~~REQUIREMENTS~~

EPA has determined that the buried valley aquifer system of the Great Miami/Little Miami Rivers of southwestern Ohio (Great Miami Aquifer) is a sole or principal source of drinking water. Contamination of this aquifer could create a significant hazard to public health. OEPA has established solid waste siting criteria that prohibit locating a solid waste landfill over a 100 gpm [OAC 3745-27-07(H)(2)(d)] or a sole-source aquifer [OAC 3745-27-07(H)(2)(c)]. ORC 3734.02(G) allows exemptions to requirements identified in the regulations for obtaining a permit or license. These exemptions must be based on a determination that a disposal facility in this location would be unlikely to adversely affect public health or safety or the environment. To ensure protection of public health and the environment, DOE will provide additional engineering controls beyond these required by the OEPA solid waste engineering regulations to protect the aquifer. Additional controls include ARARs for Uranium Mill Tailings Radiation Control Act (UMTRCA) and RCRA. The resulting combination of hydrogeologic conditions and engineering controls will provide protection of human health and the environment.

Because the on-property disposal facility would contain solid waste in addition to low-level radioactive waste/residual radioactive material, the facility must comply with the OEPA siting criteria in the Ohio Solid Waste Disposal Regulations. OAC 3745-27-07 lists the following areas where a solid waste disposal facility may not be located:

TABLE C-1
CHEMICAL - SPECIFIC REQUIREMENTS

SOURCE		OU1	OU2	OU4	OU5	OU3 IROD	OU3 FS OPTIONS ALT 1	ALT 2	ALT 3
DRINKING WATER									
40 CFR 141.15 to 141.16	EPA National Primary Drinking Water Regulations	R	R	R	R	T		R	
56 FR 33050	Proposed Maximum Contaminant Limit (MCL) for Radiological Contaminants July 18, 1991		T		T			T	
DOE Order 5400.5	Radiation Protection of the Public and Environment	T	T	T	T	T		T	T
DOE Order 5480.11	Radiation in All Media	T			T	T	T	T	T
40 CFR 192.12	Standards for Uranium Mill Tailings	R	R		R			~~T~~	~~T~~
OAC 3745-1	Ohio Water Quality Standard Chemical Discharge to Surface Water	A			A	A		A	A
40 CFR 141.12 and .50	EPA National Primary Drinking Water Standard MCLGs	R			R	R		R	R
40 CFR 141.61	EPA National Primary Drinking Water Standard	R	R	R	R	R		R	R
OAC 3745-81-12	Ohio Drinking Water Regulations for Maximum Contaminant Limits (MCLs)	R		R	R	R		R	R
55 FR 30370	Proposed MCLs for Organic Contaminants - July 25, 1990				T			T	

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TABLE C-1 (Continued)

CHEMICAL - SPECIFIC REQUIREMENTS

SOURCE		OU1	OU2	OU4	OU5	OU3 IROD	OU3 FS OPTIONS ALT 1	ALT 2	ALT 3
AIR (Continued)									
40 CFR 50.6	EPA Regulations on National Primary and Secondary Ambient Air Quality Standards	A	R		A			~~T~~	~~T~~
OAC 3745-17-07	Ohio Ambient Air Quality Standards	A			A			~~T~~	~~T~~
OEPA Proposed Policy January 1994	Ohio De Minimis Emission Levels		T		T			T	T
40 CFR 50.12	Ambient Air Quality - Lead in Air	A			A			~~T~~	~~T~~
OAC 3745-17-08	Restriction of Emission of Fugitive Dust	A			A	R		R	R
OAC 3545-21-07(G)(2)	Organic Air Emissions				A			A	A
40 CFR 50	List Primary National Ambient Air Quality Standard Levels		R		R			~~T~~	~~T~~
40 CFR 192.41	Implements Standards for Uranium Mill Tailings	R	R						
40 CFR ~~61.150 - 61.155~~ ~~61.151(a)~~	National Emission Standard for Asbestos		R					R	R
OAC 3745-20-07(A), (C)	Ohio Asbestos Handling Regulations		A					A	A
SOILS AND CONTAMINATED MEDIA									
40 CFR 192.02 Subpart A	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings	R	R	R	R			R	
40 CFR 192.12(a) Subpart B	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings	R	R	R	R			R	
40 CFR 192.20 Subpart C	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings	R	R	R	R			R	
40 CFR 192.21(f) to 192.22(b) Subpart C	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings	R	R	R	R			R	

TABLE C-2

LOCATION - SPECIFIC REQUIREMENTS

SOURCE		OU1	OU2	OU4	OU5	OU3 IROD	OU3 OPTIONS ALT 1	ALT 2	ALT 3
THREATENED AND ENDANGERED SPECIES									
40 CFR 6.302(h)	Procedures for Implementing NEPA	A	A	A	A			~~T~~	
16 USC §1531 et seq.	Endangered Species Act	A		R	A			A	
50 CFR 17.21, 17.31, 17.61, 17.71 and 17.94	Endangered and Threatened Wildlife and Plants	A	A	A	A			A	
50 CFR 402.01	Interagency Cooperation - Endangered Species Act		A	R	A			A	
50 CFR 402.12(a)(b)	Interagency Cooperation - Endangered Species Act		A		A			A	
ORC 1513.25	Ohio Endangered Species Act	A	A	R	A		A	A	R
OAC 1501:18-1 ORC 1518.02	Ohio Endangered Species Act	A	A	R	A		A	A	R
40 CFR 257.3-2	Classification of Solid Waste Disposal Facilities and Practices	A	A	A	A			A	
16 USC §661 et seq.	Fish and Wildlife Coordination Act	A		A	A			A	
HISTORIC AND CULTURAL RESOURCE PROTECTION									
16 USC §431-33	Antiquities Act of 1906	A	A	A	A			A	
16 USC §461-467	Historic Sites Preservation Act	A		A	A			A	
16 USC §408(a)	Archeological Recovery Act			A	A			A	
40 CFR 6.301(a), (b), (c)	Procedures for Implementing NEPA	A	A	A	A			A	

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TABLE C-2 (Continued)

LOCATION - SPECIFIC REQUIREMENTS

SOURCE		OU1	OU2	OU4	OU5	OU3 IROD	OU3 OPTIONS ALT 1	ALT 2	ALT 3
HISTORIC AND CULTURAL RESOURCE PROTECTION (Continued)									
43 CFR 7.4(a)	Protection of Archeological Resources		A	A	A			A	
16 USC §106 and 110	National Historic Preservation Act			A	A			A	
36 CFR §60, §60.4, §63, and §800	Protection of Historic and Cultural Properties		A	A	A			A	
16 USC §469, 16 USC §470 and §470aa et seq	Archaeological and Historic Preservation Act and the National Historic Preservation Act	A	A	A	A			A	
42 USC §1996	American Indian Religious Freedom Act	A	A	A	A			A	
Executive Order 11593	Protection and Enhancement of Cultural Environment	A		A	A			A	
25 USC §3001	Native American Graves Protection and Repatriation Act	A	A	A	A			A	
36 CFR §65.2(c)(2)	National Historic Landmarks Program			A	A			A	
FLOOD PLAINS AND WETLANDS									
10 CFR 1022.11(a)(b)(c)	DOE Compliance with Flood Plains/Wetlands Environmental Review Requirement	A	A	A	A	A		T	
10 CFR 1022.12(a), (c) 10 CFR 1022.15(a), (b)	DOE Compliance with Flood Plains/Wetlands Environmental Review Requirement	A	A	A	A	A		T	

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TABLE C-3
ACTION - SPECIFIC REQUIREMENTS

SOURCE		OU1	OU2	OU4	OU5	OU3 IROD	OU3 OPTIONS ALT 1	ALT 2	ALT 3
GENERAL									
40 USC §6903(27)	Definition of Solid Waste		A				A	A	A
OAC 3745-27-01(B)(40)	Ohio Solid Waste Disposal Regulations		A				A	A	A
40 CFR 261.3(a)	Definition of Hazardous Waste		A				A	A	A
40 CFR 260.10	Definition of Remediation Waste		A				A	A	A
42 USC §2014(2)(ee)	Atomic Energy Act - Definition of Low - Level Radioactive Material		A				A	A	A
42 USC §10101 (12), (16), (23)	Nuclear Waste Policy Act		A				A	A	A
40 USC §4901 et seq.	Noise Control Act		A		A		R	R	R
42 USC §7641	Noise Pollution and Abatement Act				A	A	R	R	R
40 CFR 261.6	Requirements for Recyclable Materials (See Table C-5 for additional discussion)						R	A	A
OAC 3745-51-06	Requirements for Recyclable Materials (See Table C-5 for additional discussion)						R	A	A
40 CFR Part 300	The off-site rule under CERCLA finalized 58 FR 49200 (September 22, 1993) (See Table C-5 for additional discussion)							A	A
	Hamilton County Earthwork Regulations Erosion Control Specifications				T			T	
ORC 3734.02.7 (a,b)	Prohibits Commingling of Low Level Waste with Solid Waste				A			A	A

TABLE C-3 (Continued)

ACTION - SPECIFIC REQUIREMENTS

SOURCE		OU1	OU2	OU4	OU5	OU3 IROD	OU3 OPTIONS ALT 1	ALT 2	ALT 3
HAZARDOUS WASTE MANAGEMENT (GENERAL FACILITY STANDARDS) (Continued)									
40 CFR 265.175(a)-(c)	RCRA Containment Storage Area Requirements				R	A		R	R
OAC 3745-55-75	RCRA Containment Storage Area Requirements				R	A		R	R
40 CFR 264.1100 through 1102	RCRA Permitted Containment Building Requirements				R	A		R	R
40 CFR 262.20 through .33, 40 CFR 263.20	RCRA - Preparing and Transporting Hazardous Waste Off-Site				A	A		A	A
OAC 3745-53-20 through .31 and OAC 3745-52-30 and 33	RCRA - Preparing and Transporting Hazardous Waste Off-Site			A	A	A		A	A
40 CFR 268.40 through .44	RCRA Land Disposal Restrictions (See Table C-5 for additional discussion)				A			A	A
OAC 3745-59	RCRA Land Disposal Restrictions (See Table C-5 for additional discussion)				A			A	A
40 CFR 268.2	RCRA Definition of Hazardous Waste Debris (See Table C-5 for additional discussion)				A			A	A
40 CFR 268.45	RCRA Hazardous Waste Debris Land Disposal Requirements - (See Table C-5 for additional discussion)				A			A	A
40 CFR 261.3	RCRA Hazardous Waste Determination (See Table C-5 for additional discussion)				A			A	A
ORC 3734.02 (i)	Air Emissions from Hazardous Waste Facilities				A			R	R

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TABLE C-3 (Continued)

ACTION - SPECIFIC REQUIREMENTS

SOURCE		OU1	OU2	OU4	OU5	OU3 IROD	OU3 OPTIONS ALT 1	ALT 2	ALT 3
RADIOACTIVE (Continued)									
10 CFR 835	Occupational Radiation Protection							A	A
DOE Order 5400.5	Radiation Protection of the Public and the Environment		T			T		T	
10 CFR 20	Standards for Protection Against Radiation							R	R
DOE Order 6430.1A, 1324-5.3, -6	Low-Level Radioactive Solid Waste Confinement (General Design Criteria)		T					T	
UNDERGROUND STORAGE TANKS (UST)									
40 CFR 280.61 - .66	UST Confined Release Response				A				
OAC 1301:7-7-36	UST Confined Release Response				A				
WATER									
40 CFR 122.26	Discharge of Stormwater Run-off	A	A	A			A	A	A
OAC 3745-38	Discharge of Stormwater Run-off	A		A			A	A	A
40 CFR 122.41	National Pollutant Discharge Elimination System (NPDES) Wastewater Discharges				A		A	A	A
ORC 6111.07 a,c OAC 3745-33-05	NPDES Wastewater Discharges				A		A	A	A
40 CFR 125.100	Discharge of Treatment System Effluent	A		R			A	A	A
40 CFR 125.104	Clean Water Act Best Management Practices	R			A		R	R	R
ORC 6111.04	Ohio Water Pollution Control Regulations		A		A		R	R	R
OAC 3745-1-05	Antidegradation Policy				A		A	A	A

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TABLE C-3 (Continued)

ACTION - SPECIFIC REQUIREMENTS

SOURCE		OU1	OU2	OU4	OU5	OU3 IROD	OU3 OPTIONS ALT 1	ALT 2	ALT 3
SOLID WASTE DISPOSAL - FACILITY OPERATIONS									
OAC 3745-27-19	Requirements for Operation of Solid Waste Disposal Facilities		A		A			A	
OAC 3745-27-11(H); (O)	Final Closure of Sanitary Landfill Facilities		A		A			A	
OAC 3745-27-14	Post-Closure Care of Sanitary Landfill Facilities		A		A			A	
40 CFR 258.61	Post-Closure Care of Sanitary Landfill Facilities		A					A	
OAC 3745-27-01(B)(15) OAC 3745-27-30(A), (E), (H) ORC 3734.021(A)(1)(c), (d)	Ohio Infectious Waste Regulations		A						
ORC 3734.03 OAC 3745-27-05~~(A)~~	Ohio Solid Waste Disposal Regulations		A		A			A	
OEPA Policy PP 01 03 200	Ohio Petroleum Contaminated Soil Policy		T						
40 CFR 258.61	EPA Criteria for Municipal Solid Waste Landfills		R						
OAC 3745-27-10	Groundwater Monitoring		A	R	A			A	
40 CFR 257.3-3 and .3-4	Classification of Solid Waste Disposal Facilities and Practices - (See Table C-5 for additional discussion	A	A					A	
40 CFR 257.3-7	US EPA Solid Waste Disposal Regulations (Open burning Prohibited)		A					A	
OAC 3745-09-10	Abandonment of Test Holes and Wells	A		A	A/R		A	A	A
POLYCHLORINATED BIPHENYLS (PCBs)									
40 CFR 761.3	Excluded PCB Materials		R				R	R	R
40 CFR 761.60(a)(3), (4)	PCB Disposal Requirements - (See Table C-5 for additional discussion)				R/A	T	R	R	R

TABLE C-5 (Continued)
EXPANDED DISCUSSION

CITATION	REQUIREMENT	ARAR /TBC	REMARKS
40 CFR 761.75 Action-Specific	Chemical Waste Landfills This section specifies the technical requirements for a chemical waste landfill used for the disposal of PCB items.	A	This requirement is applicable only if non-liquid PCBs at concentrations of 50 parts per million (ppm) or greater in the form of contaminated soil, rags, or other debris is disposed of on-site.
40 CFR 761.120, .125, and .130 Action-Specific	PCB Cleanup Policy This policy established criteria that the EPA will use to determine the adequacy of the cleanup of spills resulting from the release of materials containing PCBs at concentrations of 50 ppm or greater. The policy applies to spills which occur after May 4, 1987.	T	This requirement is not applicable to the remediation material, due to the spills being "old." The requirement will be considered ~~is applicable~~ for spills which occur during remediation and ~~is relevant and appropriate~~ when remediating areas where PCB contamination exists in the soil.

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APPENDIX D

TABLE D-1

INITIAL SCREENING OF TECHNOLOGY TYPES AND PROCESS OPTIONS THAT ARE POTENTIALLY APPLICABLE TO THE OU3 MATERIAL CATEGORIES

General Response Action	Technology Type	Process Options	Description	Screening Comments
No Further Action	None	Not Applicable	Under this CERCLA required GRA, the site would remain in an "as is" condition once the interim remedial action is completed. Materials generated by the interim remedial action would be in interim storage in controlled stockpiles. After the interim remedial action and other operable unit remedial actions were completed, DOE would maintain site ownership but no physical presence on-property.	Potentially applicable
Institutional Controls	Monitoring	Short-Term Air Monitoring	Additional monitoring for airborne contaminants during the final remediation activities.	Potentially applicable
Disposition	On-Property Disposal	Landfilling	Disposal of materials in an on-property landfill	Potentially applicable
	Off-site Disposal	Nevada Test Site	Land disposal of low-level radiologically contaminated materials at a permitted facility.	Potentially applicable
		Representative Commercial Disposal Facility	Land disposal of mixed or low-level radiologically contaminated material in a permitted facility.	Potentially applicable
	Unrestricted - Release	Sanitary Landfill (Subtitle D)	Land disposal of materials in a municipal (Subtitle D) sanitary landfill.	Potentially applicable
		Reuse/Recycle	The release of materials to a vendor or government agency of re-use or recycle.	Potentially applicable
	Restricted Recycle	Restricted - Reuse/Recycle	The application of a proven form of treatment or processing to a recoverable material that will leave some radiological contamination, thus requiring continued DOE control.	Potentially applicable
	Material Transportation	Truck ~~Rail~~ Transport	The use of trucks for transporting materials to a disposal area, either on-property or off-site.	Potentially applicable
		Rail ~~Truck~~ Transport	The use of rail transportation to ship materials to an off-site disposal facility.	Potentially applicable

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APPENDIX E

Section E.5 provides the base unit costs for disposition of materials by unbulked volumes for an on-property disposal facility and at the representative commercial disposal facility.

Tables E-1, E-2, and E-3 provide the cost amounts for these comparisons as follows.

	~~Category E Cost~~	~~Category I Cost~~	~~Total Cost~~
~~1. Unrestricted Release (Table 3-1)~~	~~$1,386,500~~	~~$ 647,200~~	~~$ 2,033,700~~
~~2. Alternative 2~~	~~$3,342,000~~	~~$2,525,400~~	~~$ 5,867,400~~
~~3. Alternative 3~~	~~$8,396,300~~	~~$7,122,100~~	~~$15,518,400~~

	Category I Cost	Total Cost
1. Unrestricted Release (Table 3-1)	$ 776,900	$ 776,900
2. Alternative 2	$2,753,200	$ 2,753,200
3. Alternative 3	$7,454,900	$ 7,454,900

Based on these results, for both Alternatives 2 and 3, unrestricted release is more cost effective. The estimated cost for the unrestricted release of these materials includes an initial radiological survey of the material prior to D&D followed by additional surveys as the material is containerized for release off-site.

Major assumptions used for this cost comparison are:

- A pre-D&D radiological survey would be performed of all surfaces at 1 hr/100 ft^2 to verify materials eligible for DOE 5400.5.
- There is a post-D&D survey of material as it is placed within the container, to verify meeting requirements of DOE 5400.5.
- No costs for core/chip sampling for laboratory analyses are included.
- All materials within Category~~ies E and~~ I can be released (i.e., no isolated hot spots).
- These materials are on the administrative side of the FEMP and process knowledge is also used to support release.
- Disposal costs assume no treatment and are based on unbulked volumes.
- The cost of containerization for these materials falls within the interim remedial action. Containerization costs are similar for off-site release, off-site disposal, and on-property disposal hauling.

E.4 SCOPE AND ASSUMPTIONS OF COST ESTIMATE

This section provides a brief overview of the activities that would be involved in implementing each remedial action alternative evaluated in Section 6. It also presents assumptions that were made in preparing this cost estimate.

E.4.1 Alternative 1: No Action

The No Further Action Alternative is retained throughout the RI/FS process, as required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 CFR 300.430(e)(6)]. The No Further Action Alternative provides a comparative performance baseline against which other alternatives can be evaluated. Under the No Further Action Alternative, the DOE would retain ownership of the site. However, an active DOE presence at the site would cease upon the completion of the interim remedial action for OU3 and remedial activities of the other OUs. The assumptions used for costing Alternative 1 follow.

E.4.1.1 Material Management/Generation

For Alternative 1, it is assumed that all activities and costs associated with D&D, containerization of materials, placement of materials in storage, operations and maintenance during the interim action duration are within the scope of the interim remedial action. Therefore, there are no costs associated with implementing Alternative 1.

E.4.2 Alternative 2: On-Property Disposal

This alternative assumes that the materials generated by the interim remedial action will be stored on-property until the on-property disposal facility is available. As stated in Section 5, current estimates indicate that this storage period would last from 1995 through 1997. Material segregation to determine disposition would occur during D&D as part of the interim remedial action. Material that meets unrestricted release criteria has been costed as being sent to a local landfill in accordance with DOE Order 5400.5. Material Categories C and F and the concrete to be removed to meet the allowable mass limit for technetium-99 would be dispositioned off-site as low level waste (LLW). Category C materials would be transported by truck to the Nevada Test Site (NTS), and the remaining material would be transported by truck to the representative commercial disposal facility because of the potential for mixed waste. All the remaining OU3 material would be placed within the on-property disposal facility. ~~Materials within Category E that are designated as below background, and are not located in the Production Area, would be released to a local landfill.~~

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Option	Total Cost	Unit Cost
~~1. On Property Disposal (Alternative 2)~~	~~$1,004,500~~	~~$15.84/ft³~~
~~2. Off Site Disposal (Alternative 3)~~	~~$5,206,500~~	~~$82.12/ft³~~
~~3. Recycle - Decontamination (Unrestricted Use)~~	~~$33,085,700~~	~~$521.86/ft³~~
~~4. Recycle - Metal Melt (Restricted Use)~~	~~$37,652,000~~	~~$593.88/ft³~~
1. On-Property Disposal (Alternative 2)	$1,001,400	$15.79/ft³
2. Off-Site Disposal (Alternative 3)	$4,742,200	$74.80/ft³
3. Recycle - Decontamination (Unrestricted Use)	$33,136,700	$522.66/ft³
4. Recycle - Metal Melt (Restricted Use)	$38,184,200	$602.27/ft³

At this time, recycling options exist for structural steel as well as for other metal materials; however, because of the radiological component associated with the material, the cost to perform the recycling far outweighs available disposal options. Because of the large volume of materials to be disposed of by the Fernald Environmental Management Project (FEMP) at both on-property and off-site locations, low unit rates for disposal are available.

But cost represents only one factor in the evaluation of recycling as a viable alternative to disposal. Other factors limiting recycling include limited survey capabilities for inaccessible surfaces, few vendors performing recycling, liability for release of materials, and limited uses for contaminated materials. At this time, few companies perform recycling of radiologially contaminated materials and as a result, minimal competition exists to reduce the costs to be incurred. Additional factors that are limiting the number of companies willing to perform recycling is the requirement for the company to accept potential liability for the release of the materials. Finally, for the materials that cannot be effectively released for unrestricted use, no market currently exists for the processing of or reuse of contaminated materials.

While currently available cost data suggest recycling is significantly more expensive than disposal, it should be noted that as new technologies or markets become available this could change. DOE also recognizes that, while cost is a driving factor in making project-specific recycling decisions, other factors such as stakeholder imput are relevant and should be considered as well. DOE will continue over the life of the D&D of the Former Production Area to agressively evaluate existing and emerging recycling technologies and markets to identify opportunities for cost-competitive application at the FEMP.

Because of large-scale environmental projects throughout the Department of Energy (DOE), funding constraints are imposing limitations on disposition options that can be pursued. Based on current ~~the~~

costs and other limiting factors as detailed above, recycling of metal materials will not be carried forward into the alternatives in Section 5. ~~comparisons, it is not currently cost effective for the FEMP to recycle structural steels.~~ Recycling of higher value materials (copper, stainless steel, high nickel alloys) is currently being evaluated at the FEMP and throughout DOE to determine actual costs. For costing and evaluation purposes only, the OU3 Remedial Investigation/Feasibility Study (RI/FS) Report will not consider recycling options. However, throughout the performance of the D&D action, DOE commits to evaluate recycling as a viable option. The OU3 RI/FS strives to maintain recycling as an option to be considered for each material at the time of it's intended generation and will continue to evaluate recycling on a case by case basis within each D&D complex implementation plan. ~~However, if, during the performance of the remedial actions, recycling costs become more competitive with disposal costs, recycling will be reevaluated for structural steel as well as other metal materials such as copper, inconel, monel, stainless steel, etc., for beneficial impacts and could be incorporated in the disposition of materials at any time in the future of the project.~~

E.3.2 Unrestricted Release

The cost comparison performed to evaluate the cost effectiveness of unrestricted release looks at ~~two categories; Category E (Concrete) and~~ only Category I (Miscellaneous Materials) (see Section 3 for a detailed breakdown of ~~these categories~~this category). Only quantities identified in the below-background segregation category are used for this comparison. This comparison looks at unrestricted release versus placement in the on-property disposal facility for Alternative 2 and versus off-site disposition for Alternative 3.

Unrestricted release consists of several steps. The first is the sampling/surveying required in order to determine whether these materials meet the unrestricted release criteria set forth in DOE Order 5400.5, and the second is transportation to, and burial rates for, a Subtitle D solid waste landfill.

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For shipment of materials that meet unrestricted free release criteria going to landfill, the same principles apply as Alternative 2.

E.4.4 Assumptions

The following assumptions have been made to facilitate costing of the alternatives for OU3.

1. Alternative 2 container maintenance would occur after every other trip to the on-property disposal facility. Alternative 3 containers are estimated to be maintained after every trip due to damage associated with off-site transportation.

2. B-12 and B-25 containers would be shipped off-site in lots of six.

3. All treatment of materials to meet LDRs is assumed to occur at off-site locations.

4. Materials regulated under Toxic Substance Contract Act (TSCA) (transformers) will be flushed during Safe Shutdown activities, therefore, no costs associated with flushing are assumed under Alternatives 2 and 3.

5. For Alternative 2 Category D, lead flashing will be segregated and disposed of at the completion of each complex (there are 21 above-grade complexes).

6. This estimate is based on a ten-hour work day, four-day week with no provision for premium time.

7. Wage rates used for this estimate are current wage rates for Fernald Atomic Trades and Labor Council.

8. Truck travel to the on-property disposal facility is limited to one mile each way at a speed of 5 miles per hour.

9. This estimate includes the purchase of all containers. No allowance has been included to receive, inspect, store or deliver containers to the D&D contractor, since these activities fall into the scope of the former IROD.

10. Hauling activity from the queuing area to the disposal facility is estimated as two workers loading ROBs, ROBs and hauling them one mile for 30 minutes, and then disposing of the contents and returning them to the queuing area for another 30 minutes.

11. Costs to weigh and certify each shipment are based on data provided by on-property waste programs.

12. For Alternative 3, once the ITC is cleared for shipment, a six-worker crew will load the container onto an articulated rail car. A unit rate for this operation is 7.50 hours per ITC.

13. The container maintenance area is assumed to be an existing building. The maintenance area would be refurbished and maintained for the duration of the project. The work area would be approximately 600 ft^2 and would be equipped to handle the container repairs.

14. The labor required to maintain a container (of any kind) is assumed to be two craft workers, a lead worker and an equipment operator. A productivity rate of 14.40 hours per container would allow for delivery to area, inspection for damage, the actual repairs and returning containers to the queuing area.

15. Project stating is based on nine years lasting from late 1996 when ROD is signed until 2005. Staffing includes: Project Manager, 1 at 40 percent; Project Engineer, 1 at 50 percent; Junior Engineers 2 at 50 percent; Safety Engineer 2 at 50 percent; Procurement 1 at 10 percent; Accounting/Finance 1 at 10 percent; Secretarial 2 at 50 percent; General Clerk 1 at 100 percent; Technicians 3 at 50 percent. All positions are extended for nine years.

16. This estimate includes sales tax on appropriate commodities.

17. PPE requirements for this estimate are considered to be low. An allowance for safety and PPE cost are set at $50.00 per man day. It is assumed that respirators would not be required for the shipment purpose and respirator costs are not included in the estimate.

~~18. A packaging safety factor of 0.4 percent is used through the quantity estimates to consider packaging inside the containers. This packaging is used to protect inside surface of the container and thereby reduces the volume of the container by 0.4 percent.~~

19~~8~~. A real discount rate of 4.8 percent is used for Present Worth (PW) analysis calculations based on circular by The Office of Management and Budget (1992).

20~~19~~. The schedule is based on the ten year plan. Details of the material balance model are described in Section 5.

21~~10~~. Contingency factor used for Alternative 2 is ~~15.48~~ 15.8 percent and for Alternative 3 is ~~20.6~~22.2 percent.
(The details are provided in Attachment E.II).

22~~1~~. Risk Budget factor used for Alternative 2 is ~~23.2~~23.3 percent and for Alternative 3 is ~~24.0~~23.6 percent.
(The details are provided in the Attachment E.II).

23~~2~~. Two-trailers will be used during the last three years of the project for administrative staff as the D&D of last complex is being carried out and below-grade removal occurs. These two trailers will be leased and returned at the end of the project.

24~~3~~. The O&M for the on-property disposal facility is based on OU2 estimates and is a one time cost of $1.12 per ft^3. The rate for on-property burial is $3.05 per ft^3.

25~~4~~. The unit rate of one way shipment to NTS is $3200 per LMB. Disposal cost at NTS for containerized material is based on external dimensions of the container and is ~~$12.60~~17.00 per ft^3.

26~~5~~. The unit rate of one way shipment to the commercial disposal facility is $3000 per truck. Treatment cost at Envirocare for solidification and encapsulation of hazardous material is $101 per ft^3.

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276. The disposal cost at the commercial disposal facility for Alternative 2 is $32 per ft^3 (based on small volume shipment).

287. The disposal cost at the commercial disposal facility for Alternative 3 is $7 per ft^3 (Envirocare 1995). This is based on joint shipment and disposal with OU1 wastes, reflecting the economics of a larger volume contract.

298. Railroad shipping rate from the FEMP to the commercial disposal facility and back is $800 per car. Each car carries 6 ITCs. Based on purchase price of $78,000 per rail car, the unit amortized rate including maintenance for each rail car is $211. Purchase of the rail cars is assumed because of the potential to contaminate the vehicle beyond the reasonable expectation if released and because the cars would be heavily utilized.

3029. Reuses of the containers: For ROBs in Alternative 2, Categories A, B, D, and E will have 25 reuses and Categories G, H, and I will have 50 reuses. For ITCs in Alternative 3, all categories will have 50 reuses.

310. There is no provision for disposal of the ROBs or ITCs in Alternatives 2 and 3. It is assumed that they would be disposed of in the same location where the prime material is being disposed, at the respective end of useful service life.

321. Disposal cost at the commercial landfill for the unrestricted free released materials is $310 per ROB container. These ROB containers will be rented from the landfill contractors. The distance to a sanitary landfill is assumed to be eight miles for purposes of this cost estimate.

E.5 DETAILED COST ESTIMATES

The following sections provide the detailed cost estimates for Alternatives 1, 2 and 3.

E.5.1 Alternative 1

No additional costs would be incurred, since no actions are included in the alternative definition.

E.5.2 Alternative 2

This section provides the detailed breakdown of the costs associated with the implementation of Alternative 2. Each material category has a specific or several specific treatment and disposition paths which are identified based on the contaminant type and concentration. Section 3 provides a breakdown of each material category by "segregation category." In addition, the material flow diagrams presented in Section E.6 provide the detailed pathways for each material category by segregation category. There are activities shown on the diagrams which occur within the scope of the interim remedial action and will not be costed as part of the final remedial action. The blocks along a given pathway identify "cost blocks" associated with that pathway. Within each "cost block" there

In addition to the detailed cost estimate worksheets, back-up work sheets for risk budget, contingency and manhour calculations are included in Attachment E.II.

Total cost for Alternative 2 is $93 million. This cost includes risk and it is in 1995 constant dollars.

E.5.3 Alternative 3

The detailed cost estimates worksheets for Alternative 3 are presented in the same manner as in Alternative 2. Tables E-22 through E-42 describe the details of cost estimates as follows:

- Table E-25 (same as E-4)
- Table E-26 (same as E-5)
- Table E-27 through E-35 (same as E-6 through E-14)
- Table E-36 (same as E-15)
- Table E-37 (same as E-16)
- Table E-38 (same as E-17)
- Table E-39 (same as E-18)
- Table E-40 (same as E-19)
- Table E-41 (same as E-20)
- Table E-42 (same as E-21)
- Table E-43 (same as E-22)
- Table E-44 (same as E-23)
- Table E-45 (same as E-24)
- Table E-46 provides in details the cost associated with rail shipments.

Total cost for Alternative 3 is $~~194~~185 million. This cost includes risk and it is in 1995 constant dollars.

E.5.4 Sample Calculations for Containers

Calculations for generating quantities of containers for cost estimating are based on two factors: volume restriction or weight restriction. These calculations are applicable to both Alternatives 2 and 3. Examples of each type are described below.

Example 1: Volume Restriction Calculations:

Category A - Accessible Metals for Alternative 2 are considered for the volume restriction example. Calculations are performed as follows:

Total unbulked volume:	63,400 ft^3
Bulking factor for accessible metals:	16.7
Total bulked volume:	63,400 x 16.7 = 1,058,750 ft^3
Interior volume per ROB:	810 ft^3
No. of ROBs:	1,058,570 / 810 = 1,307

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~~Packaging safety factor: 1.004 (0.4%)~~
~~No. of ROBs: 1,307 x 1.004 = 1,312~~

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Example 2: Weight Restriction Calculations:

~~Category E - Concrete for Alternative 2 is considered for the weight restriction example.~~

~~Calculations are performed as follows:~~

~~Total unbulked volume:~~	~~4,250,000 ft^3~~
~~Density of concrete:~~	~~134.5 lbs per ft^3~~
~~Total weight:~~	~~4,250,000 ft^3 x 134.5 (lbs per ft^3) = 571,625,000 lbs~~
~~Weight of material allowed per ROB:~~	~~33,000 lbs~~
~~No. of ROBs:~~	~~571,625,000 / 33,000 = 17,322~~
~~Packaging safety factor:~~	~~1.004 (0.4%)~~
~~No. of ROBs:~~	~~17,322 x 1.004 = 17,392~~

Within Category E - Concrete, Concrete Slabs is considered for the weight restriction example.

Calculations are performed as follows:

Total unbulked volume:	2,260,000 ft^3
Density of concrete:	150 lbs per ft^3
Total weight:	2,260,000 ft^3 x 150 (lbs per ft^3) = 339,000,000 lbs
Weight of material allowed per ROB:	33,000 lbs
No. of ROBs:	339,000,000 / 33,000 = 10,273

E.6 MATERIAL FLOW DIAGRAMS

Diagrams for each material category are provided for Alternatives 2 and 3 which detail material configuration; specific treatment (if required); and final disposition. Diagrams for Alternative 2 are presented in Figures E-1 through E-9, and for Alternative 3, in Figures E-10 through E-18. The material flow diagrams presented in this section provide details on treatment and disposition options for these alternatives for all nine material categories. These flow diagrams detail activities which occur during the interim remedial action but which may be affected by requirements for the final remedial action. The flow diagrams show the potential field segregation pathways for each material category and its material configuration at the completion of the interim remedial action. The final remedial action begins with the materials in interim storage, addresses treatment (in some cases), and then finally addresses disposition, either in the on-property disposal facility or off-site. For pathways that have hatching, no material quantity is estimated and therefore the pathway is not considered.

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WBS NO.–1[illegible].1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.–TJV
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TABLE B[illegible]

UNRESTRICTED–RELEASE COMPARISON

CONTRAC[illegible]24321
EST #: C3–95–1–5–R2
BY: JAW
DATE: 12/09/95

COST CAT.	DESCRIPTION UNRESRTICTED RELEASE	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF–SITE DISPOSITION DISPOSAL – LANDFILL MISCELLANIOUS													
I	COMMODITY: BELOW BACKGROUND													
	COMMERCIAL LANDFILL VENDER WOULD PROVIDE A 30 CY ROB TO BE FILLED BY THE D &D CONTRACTOR ASSUME 5 DAY TURNAROUND FOR FILLING NO LABOR BY FERMCO.													
	INITIAL INSPECTION	541,000	CF	0.013	7,033	25.55				$179,700				$179,700
	INSPECTION FOR FREE RELEASE	850	LOAD	15.00	12,750	25.55				$325,800				$325,800
	DAYS ON–PROPERTY TO BE FILLED	4,250	DAY					$3.50				$14,900		$14,900
	TRANSPORTATION AND BURIAL	850	ROB					$301.75				$256,500		$256,500
	UNBULKED MATERIAL VOLUME THIS CATEGORY	541,000	CF											
										$505,500	$0	$271,400	$0	$776,900

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-2

UNRESTRICTED-RELEASE COMPARISON

CONTRACT #: 04424321
EST #: C3-95-1-5-R2
BY: JAW
DATE: 12/09/95
TIME: 03:24 PM

COST CAT.	DESCRIPTION ALTERNATIVE 2	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	ON-PROPERTY DISPOSAL (MISCELLANIOUS)													
I	COMMODITY: BELOW BASELINE													
	CONTAINER COST:													
	ROLL-OF-BOX (ROB) REUSE 50 LOADS PER ROB	24	EA						$7,000				$168,000	$168,000
	ON-PROPERTY HAULING	1,190	LOAD	3.02	3,595	21.06				$75,700				$75,700
	ROB MAINTENANCE COST	595	ROB	14.40	8,571	22.64			$100	$194,000	$59,500			$253,500
	ON-PROPERTY BURIAL UNBULKED CAPITAL	541,000	CF					$4.17				$2,256,000		$2,256,000
										$269,700	$59,500	$2,256,000	$168,000	$2,753,200

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WBS NO.– [redacted].1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABLE [redacted]

UNRESTRICTED–RELEASE COMPARISON

CONTRAC[redacted]424321
EST #: C3–95–1–5–R2
BY: JAW
DATE: 12/09/95
TIME: 03:24 PM

COST CAT.	DESCRIPTION ALTERNATIVE 3	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF–SITE DISPOSAL (MISCELLANIOUS)													
I	COMMODITY: BELOW BASELINE													
	CONTAINER COST:													
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X)	27	EA						$6,920				$186,800	$186,800
	ON–PROPERTY HAULING	1,363	LOAD	2.40	3,270	21.06				$68,900				$68,900
	WEIGH, CERTIFICATION	1,363	LOAD	15.00	20,439	24.94				$509,800				$509,800
	ON–PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	1,363	I.T.C.	7.50	10,220	21.35				$218,200				$218,200
	INTERMODAL TRANSPORT CONTAINER MAINT.	1,363	I.T.C.	14.40	19,622	22.64			$100	$444,200	$136,300			$580,500
	RAIL ROAD TRANSPORTATION	1,363	I.T.C.					$1,333				$1,816,800		$1,816,800
	ARTICULATED CONTAINER CAR COST	1,363	I.T.C.					$211				$286,900		$286,900
	OFF–SITE BURIAL UNBULKED	541,000	CF					$7.00				$3,787,000		$3,787,000
										$1,241,100	$136,300	$5,890,700	$186,800	$7,454,900

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-4

CONTRACT #: 04424321
EST #: C3-95-1-5-R2
BY: JAW
DATE: 12/09/95

COST CAT.	DESCRIPTION ALTERNATIVE NUMBER 2	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	TOTAL
	DISPOSAL					
	ON-PROPERTY			$20,831,500		
	OFF-SITE			$12,766,800		
	LANDFILL			$271,400		
	SUB TOTAL			$33,869,700		$33,869,700
	TREATMENT					
	ENCAPSULATION			$539,600		
	SHREDDING			$107,200		
	SUB TOTAL			$646,800		$646,800
	CONTAINERS					
	ROLL-OFF-BOX				$8,043,000	
	B-12				$63,400	
	B-25				$269,200	
	LARGE METAL BOX				$2,997,200	
	SUB TOTAL				$11,372,800	$11,372,800
	TRANSPORTATION					
	ON-PROPERTY HANDLING	$1,688,700				
	ON-PROPERTY INSPECTION	$505,500				
	ON-PROPERTY HAULING	$1,890,100				
	WEIGHING & CERTIFICATION	$261,700				
	OFF- SITE TRANSPORTATION			$1,871,100		
	MAINTENANCE FOR CONTAINERS	$4,773,200	$1,464,100			
	SUB TOTAL	$9,119,200	$1,464,100	$1,871,100		$12,454,400
	INDIRECT COST (STAFF, CAPITAL EQUIPMENT ETC.)	$3,219,000	$5,843,900	$545,000		$9,607,900
	OPERATION AND MAINTENANCE		$7,644,100			$7,644,100
	RISK BUDGET (23.5%)		$17,613,800			$17,613,800
	TOTAL	$12,338,200	$32,565,900	$36,932,600	$11,372,800	[illegible],209,500

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WBS NO.– [redacted]1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABLE [redacted]

ALTERNATIVE 2
ESTIMATE SUMMARY

CONTRA[redacted]04424321
EST #: C[redacted]–1–5–R1
BY: JAW
DATE: 12/08/95
TIME: 03:25 PM

COST CAT.		QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	A – ACCESSIBLE METALS				33,690					$730,200	$65,400	$193,400	$371,000	$1,360,000
	B – INACCESSIBLE METALS				133,109					$2,903,800	$368,500	$5,321,900	$2,072,000	$10,666,200
	C – PROCESS–RELATED METALS				8,839					$215,700	$0	$13,370,600	$2,997,200	$16,583,500
	D – PAINTED LIGHT GAUGE METALS				972					$21,400	$4,200	$27,000	$29,000	$81,600
	E – CONCRETE				198,823					$4,408,900	$970,200	$14,437,600	$5,501,400	$25,318,100
	F – BRICK				3,369					$77,000	$0	$1,806,400	$269,200	$2,152,600
	G – NON–REGULATED ACM				2,887					$63,800	$12,500	$217,500	$35,000	$328,800
	H – REGULATED ACM				4,513					$100,900	$25,400	$244,600	$42,000	$412,900
	I – MISCELLANEOUS MATERIALS				23,948					$597,500	$17,900	$768,600	$56,000	$1,440,000
	OPERATION AND MAINTENANCE										$7,644,100	$0	$0	$7,644,100
	INDIRECT COST (STAFF, CAPITAL EQUIPMENT ETC.)				123,552					$3,219,000	$5,843,900	$545,000	$0	$9,607,900
	RISK BUDGET (23.3 %)										$17,613,800			$17,613,800
					533,702					$12,338,200	$32,565,900	$36,932,600	$11,372,800	$93,209,500

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-6

ALTERNATIVE 2
ESTIMATE DETAILS

CONTRACT #: 04424321
EST #: C3-95-1-5-R2
BY: JAW
DATE: 12/08/95
TIME: 02:27 PM

COST CAT.	DESCRIPTION A - ACCESSIBLE METALS	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	ON-PROPERTY DISPOSAL													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	ROLL-OFF-BOX (ROB) REUSE 25 LOADS PER ROB	53	EA.						$7,000				$371,000	$371,000
	ON-PROPERTY MATERIAL (STAGED IN PILE) BULKED	243,000	CF											
	ON-PROPERTY LOADING & HANDLING	300	LOAD	67.75	20,325	21.35				$433,900				$433,900
	ON-PROPERTY HAULING, DISPOSAL & RETURN.	1,307	ROB	3.02	3,947	21.06				$83,100				$83,100
	ROB MAINTENANCE COST	654	ROB	14.40	9,418	22.64			$100	$213,200	$65,400			$278,600
	ON-PROPERTY BURIAL UNBULKED	63,400	CF					$3.05				$193,400		$193,400
					33,690					$730,200	$65,400	$193,400	$371,000	$1,360,000

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WBS NO.– [illegible].3.1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABL[illegible]

ALTERNATIVE 2
ESTIMATE DETAILS

CONTR[illegible] #: 04424321
EST #: C3–95–1–5–R2
BY: JAW
DATE: 12/08/95
TIME: 02:27 PM

COST CAT.	DESCRIPTION B – INACCESSIBLE METALS	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	ON–PROPERTY DISPOSAL													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	ROLL–OFF–BOX (ROB) REUSE 25 LOADS PER ROB	293	EA.						$7,000				$2,051,000	$2,051,000
	ON–PROPERTY MATERIAL (STAGED IN PILE)	691,000	CF											
	ON–PROPERTY LOADING & HANDLING	853	LOAD	67.75	57,791	21.35				$1,233,800				$1,233,800
	ON–PROPERTY HAULING, DISPOSAL & RETURN.	7,305	ROB	3.02	22,061	21.06				$464,600				$464,600
	ROB MAINTENANCE COST	3,653	ROB	14.40	52,603	22.64			$100	$1,190,900	$365,300			$1,556,200
	ON–PROPERTY BURIAL UNBULKED	1,730,000	CF					$3.05				$5,276,500		$5,276,500
													SUB TOTAL	$10,582,100
	ON–PROPERTY DISPOSAL													
	COMMODITY: PCB													
	CONTAINER COST:													
	ROLL–OFF–BOX (ROB) REUSE 25 LOADS PER ROB	3	EA.						$7,000				$21,000	$21,000
	ON–PROPERTY HAULING, DISPOSAL & RETURN.	64	ROB	3.02	193	21.06				$4,100				$4,100
	ROB MAINTENANCE COST	32	ROB	14.40	461	22.64			$100	$10,400	$3,200			$13,600
	ON–PROPERTY BURIAL UNBULKED	14,900	CF					$3.05				$45,400		$45,400
													SUB TOTAL	$84,100
					133,109					$2,903,800	$368,500	$5,321,900	$2,072,000	$10,666,200

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-8

ALTERNATIVE 2
ESTIMATE DETAILS

CONTRACT #: 04424321
EST #: C3-95-1-5-R2
BY: JAW
DATE: 12/08/95
TIME: 02:27 PM

COST CAT.	DESCRIPTION C - PROCESS-RELATED METALS	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF-SITE DISPOSAL - NTS													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	LARGE METAL BOX	508	EA.						$5,900				$2,997,200	$2,997,200
	ON-PROPERTY HAULING	508	LMB	2.40	1,219	21.06				$25,700				$25,700
	WEIGH,CERTIFICATION AND STAGE / LOAD OUT	508	LMB	15.00	7,620	24.94				$190,000				$190,000
	TRANSPORTATION TRUCK TO NTS	508	LMB					$3,200				$1,625,600		$1,625,600
	OFF-SITE BURIAL CONTAINERS	508	LMB					$23,120				$11,745,000		$11,745,000
	UNBULKED MATERIAL VOLUME THIS CATEGORY	151,000	CF											
					8,839					$215,700		$13,370,600	$2,997,200	$16,583,500

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WBS NO.– [illegible]3.1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABLE [illegible]

ALTERNATIVE 2
ESTIMATE DETAILS

CONTRAC[illegible] 04424321
EST #: C3–95–1–5–R2
BY: JAW
DATE: 12/08/95
TIME: 02:27 PM

COST CAT.	DESCRIPTION D – PAINTED LIGHT GAUGE METALS	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	ON–PROPERTY DISPOSAL													
	COMMODITY: POTENTIALLY MIXED WASTE													
	CONTAINER COST:													
	B–12	1	EA.						$960				$1,000	$1,000
	ON–PROPERTY HAULING TO ENCAPSULATION S/C	21	B–12	2.40	50	21.06				$1,100				$1,100
	PROCESSING BY ENCAPSULATION S/C	50	CF					$101.24				$5,100		$5,100
	RELOAD & HAUL TO DISPOSAL CELL & RETURN.	21	B–12	3.02	63	21.06				$1,300				$1,300
	ON–PROPERTY BURIAL UNBULKED	50	CF					$3.05				$200		$200
	NOTE: B–12 EMPTIED AFTER EACH COMPLEX (21)												SUB TOTAL	$8,700
	ON–PROPERTY DISPOSAL													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	ROLL–OFF–BOX (ROB) REUSE 25 LOADS PER ROB	4	EA.						$7,000				$28,000	$28,000
	ON–PROPERTY HAULING, DISPOSAL & RETURN.	84	ROB	3.02	254	21.06				$5,300				$5,300
	ROB MAINTAIN COST	42	ROB	14.40	605	22.64			$100	$13,700	$4,200			$17,900
	ON–PROPERTY BURIAL UNBULKED	7,100	CF					$3.05				$21,700		$21,700
													SUB TOTAL	$72,900
					972					$21,400	$4,200	$27,000	$29,000	$81,600

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DRAFT

WBS NO.–
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABLE E-10

ALTERNATIVE 2
ESTIMATE DETAILS

CONTRACT #: 04424321
EST #: C3–95–1–5–R2
BY: JAW
DATE: 12/08/95
TIME: 02:27 PM

COST CAT.	DESCRIPTION E – CONCRETE	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MATL	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF–SITE DISPOSAL – ENVIROCARE													
	COMMODITY: LOW LEVEL WASTE SCABBLED CONCRETE – EXCEEDS WAC													
	CONTAINER COST:													
	B–12	65	EA						$960				$62,400	$62,400
	ON–PROPERTY HAULING (B–12)	65	B–12	1.65	107	21.06				$2,300				$2,300
	WEIGH,CERTIFICATION AND STAGE / LOAD OUT	65	B–12	6.26	407	23.32				$9,500				$9,500
	TRANSPORTATION (6 CONTAINERS PER TRUCK)	65	B–12					$500.00				$32,500		$32,500
	OFF–SITE BURIAL – UNBULKED	2,190	CF					$32.00				$70,100		$70,100
													SUB TOTAL	$176,800
	NOTE: 1. ENVIROCARE DISPOSAL RATE IS BASED ON LIMITED VOLUME OF MATERIAL.													
	ON–PROPERTY DISPOSAL													
	COMMODITY: BASELINE / LOW LEVEL WASTE													
	CONTAINER COST:													
	ROLL–OFF–BOX (ROB) REUSE 25 LOADS PER ROB	777	EA						$7,000				$5,439,000	$5,439,000
	ON–PROPERTY HAULING, DISPOSAL & RETURN.	19,404	ROB	3.02	58,600	21.06				$1,234,100				$1,234,100
	ROB MAINTAIN COST	9,702	ROB	14.40	139,709	22.64			$100	$3,163,000	$970,200			$4,133,200
	ON–PROPERTY BURIAL UNBULKED	4,700,000	CF					$3.05				$14,335,000		$14,335,000
													SUB TOTAL	$25,141,300
					198,823					$4,408,900	$970,200	$14,437,600	$5,501,400	$25,318,100

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WBS NO.– [illegible]3.1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABLE [illegible]
ALTERNATIVE 2
ESTIMATE DETAILS

CONTR[illegible]#: 04424321
EST #: C3–95–1–5–R2
BY: JAW
DATE: 12/08/95
TIME: 02:27 PM

COST CAT.	DESCRIPTION F – BRICK	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF–SITE DISPOSAL – ENVIROCARE													
	COMMODITY: POTENTIALLY MIXED WASTE													
	CONTAINER COST:													
	B–25	109	EA						$632				$68,900	$68,900
	ON–PROPERTY HAULING	109	WMB	1.65	180	21.06				$3,800				$3,800
	WEIGH, CERTIFICATION AND STAGE / LOAD OUT	109	WMB	6.26	682	23.32				$15,900				$15,900
	TRANSPORTATION TRUCK TO ENVIROCARE	109	WMB					$500				$54,500		$54,500
	ENCAPSULATION	5,280	CF					$101.24				$534,500		$534,500
	OFF–SITE BURIAL UNBULKED	5,280	CF					$32				$169,000		$169,000
	OFF–SITE SHREDDING OF WMB	2,318	CF					$11.84				$27,400		$27,400
	OFF–SITE BURIAL SHREDDED WMB	2,318	CF					$32				$74,200		$74,200
													SUB TOTAL	$948,200
	OFF–SITE DISPOSAL – ENVIROCARE													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	B–25	317	EA						$632				$200,300	$200,300
	ON–PROPERTY HAULING	317	WMB	1.65	523	21.06				$11,000				$11,000
	WEIGH, CERTIFICATION AND STAGE / LOAD OUT	317	WMB	6.26	1,984	23.32				$46,300				$46,300
	TRANSPORTATION TRUCK TO ENVIROCARE	317	WMB					$500				$158,500		$158,500
	OFF–SITE BURIAL UNBULKED	15,400	CF					$32				$492,800		$492,800
	OFF–SITE SHREDDING OF WMB	6,740	CF					$11.84				$79,800		$79,800
	OFF–SITE BURIAL SHREDDED WMB	6,740	CF					$32				$215,700		$215,700
													SUB TOTAL	$1,204,400
	WMB = 106.3 CF EXT. VOL. SHREDDED = 21.3 C													
					3,369					$77,000		$1,806,400	$269,200	$2,152,600

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-12

ALTERNATIVE 2
ESTIMATE DETAILS

CONTRACT #: 04424321
EST #: C3-95-1-5-R2
BY: JAW
DATE: 12/08/95
TIME: 02:27 PM

COST CAT.	DESCRIPTION G - NON-REGULATED ACM	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	ON-PROPERTY DISPOSAL													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	ROLL-OFF-BOX (ROB) REUSE 50 LOADS PER ROB	5	EA.						$7,000				$35,000	$35,000
	ON-PROPERTY MATERIAL (STAGED IN PILE)	17,000	CF											
	ON-PROPERTY LOADING & HANDLING	26	ROB	12.90	335	21.35				$7,200				$7,200
	ON-PROPERTY HAULING, DISPOSAL & RETURN.	249	ROB	3.02	752	21.06				$15,800				$15,800
	ROB MAINTENANCE COST	125	ROB	14.40	1,800	22.64			$100	$40,800	$12,500			$53,300
	ON-PROPERTY BURIAL UNBULKED	71,300	CF					$3.05				$217,500		$217,500
					2,887					$63,800	$12,500	$217,500	$35,000	$328,800

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WBS NO.– [illegible]3.1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABLE E-[illegible]

ALTERNATIVE 2
ESTIMATE DETAILS

CONTRAC[illegible]04424321
EST #: C3–95–1–5–R2
BY: JAW
DATE: 12/08/95
TIME: 02:27 PM

COST CAT.	DESCRIPTION H – REGULATED ACM	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	ON–PROPERTY DISPOSAL													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	ROLL–OFF–BOX (ROB) REUSE 50 LOADS PER ROB	6	EA.						$7,000				$42,000	$42,000
	ON–PROPERTY MATERIAL (STAGED IN LMB CONT.)	3	LMB	14.00	42	21.55				$900				$900
	ON–PROPERTY LOADING & HANDLING	4	ROB	12.75	46	21.35				$1,000				$1,000
	ON–PROPERTY HAULING, DISPOSAL & RETURN.	254	ROB	3.02	767	21.06				$16,200				$16,200
	ROB MAINTENANCE COST	254	ROB	14.40	3,658	22.64			$100	$82,800	$25,400			$108,200
	ON–PROPERTY BURIAL UNBULKED	80,200	CF					$3.05				$244,600		$244,600
					4,513					$100,900	$25,400	$244,600	$42,000	$412,900

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-14

ALTERNATIVE 2
ESTIMATE DETAILS

CONTRACT #: 04424321
EST #: C3-95-1-5-R2
BY: JAW
DATE: 12/08/95
TIME: 02:27 PM

COST CAT.	DESCRIPTION I - MISCELLANEOUS MATERIALS	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	ON-PROPERTY DISPOSAL													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	ROLL-OFF-BOX (ROB) REUSE 50 LOADS PER ROB	8	EA.						$7,000				$56,000	$56,000
	ON-PROPERTY MATERIAL (STAGED IN LMB CONT.)	17	LMB											
	ON-PROPERTY UNLOADING & HANDLING	17	LMB	14.00	238	21.55				$5,100				$5,100
	ON-PROPERTY LOADING & HANDLING	21	ROB	12.75	268	21.35				$5,700				$5,700
	ON-PROPERTY HAULING, DISPOSAL & RETURN.	358	ROB	3.02	1,081	21.06				$22,800				$22,800
	ROB MAINTENANCE COST	179	ROB	14.40	2,578	22.64			$100	$58,400	$17,900			$76,300
	ON-PROPERTY BURIAL UNBULKED	163,000	CF					$3.05				$497,200		$497,200
													SUB TOTAL	$663,100
	OFF-SITE DISPOSAL - LANDFILL													
	COMMODITY: BELOW BASELINE													
	COMMERCIAL LANDFILL VENDOR WOULD PROVIDE A 30 CY ROB TO BE FILLED BY THE D&D CONTRACTOR ASSUME A 5 DAY TURNAROUND FOR FILLING NO DIRECT FERMCO LABOR													
	INITIAL INSPECTION	541,000	CF	0.013	7,033	25.55				$179,700				$179,700
	INSPECTION FOR FREE RELEASE	850	ROB	15.00	12,750	25.55				$325,800				$325,800
	DAYS ON-PROPERTY TO BE FILLED	4,250	DAY					$3.50				$14,900		$14,900
	TRANSPORTATION AND BURIAL	850	ROB					$301.75				$256,500		$256,500
	UNBULKED MATERIAL VOLUME THIS CATEGORY	541,000	CF										SUB TOTAL	$776,900
					23,948					$597,500	$17,900	$768,600	$56,000	$1,440,000

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TABLE E-15

SUMMARY SHEET

FERMCO ESTIMATING SERVICES

FILE #:	C3-95-1-5-R2	DATE:	09-Dec-95
CLIENT:	DOE	ESTIMATOR:	J. WINGATE
PROJECT:	CRU3 FEASIBILITY STUDY (ALT. 2)	LOCATION:	FERNALD
WBS#:	1.1.1.1.3.1.3	TASK#:	3ACA4

CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
	EXCAVATION AND CIVIL						
	CONCRETE						
	STRUCTURAL STEEL						
	BUILDINGS						
	MACHINERY AND EQUIPMENT						
	PIPING						
	ELECTRICAL						
	INSTRUMENTS						
	PAINTING AND SCAFFOLD						
	INSULATION						
DIRECT FIELD COSTS							
SUPERVISION - CONTRACTOR							
SM TOOLS/CONSM'BLS							
EQUIPMENT RENTAL							
TEMP. FACILITIES							
TEMP UTL'S HOOK-UP							
JOB CLEAN-UP							
SAFETY							
TH PHYSICS S/C							
LA	$1,500 PER PERSON						
OVERHEAD & PROFIT							
PAYRL BRD.&BENFT.							
INDIRECT FIELD COSTS							
DIRECT & INDIRECT FIELD COSTS							
	QTY / $/UNIT						
WASTE CONTAINERS							
CERTIFICATION							
TRANSPORTATION							
BURIAL							
RECYCLING							
STORAGE							
WASTE MANAGEMENT COSTS							
FERMCO SUPPORT LABOR		410,150		$9,119,200	$36,387,600	$12,836,900	$58,343,700
FERMCO MGMT. & SUPPORT		123,552		$3,219,000	$545,000	$4,238,900	$8,002,900
O & M COST						$7,644,100	
FERMCO FIELD SUPPORT COSTS				**$12,338,200**	**$36,932,600**	**$24,719,900**	**$73,990,700**
ENGINEERING/DESIGN/INSPECTION	A/E			FERMCO			
ENGINEERING COSTS							
SALES TAX - SUBCONTRACT		SALES TAX - FERMCO				$1,605,000	$1,605,000
SUB-TOTAL(BASE ESTIMATE)							**$75,595,700**
G&A-FERMCO (SEE EXCLUSION COMMENTS)							
ESCALATION (SEE EXCLUSION COMMENTS)							
RISK BUDGET	23.3%						$17,613,800
TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							**$93,209,500**
CONTINGENCY	15.8%						$11,944,100

FY 95 DOLLARS

TABLE E-16

ESTIMATE: C3-95-1-5-R2

DATE : 08-Dec-95

CLIENT: US DOE

FERMCO

LEVEL OF EFFORT SUMMARY SHEET

ESTIMATOR: J.W.

LOCATION: FERNALD, OH

PROJECT TITLE: CRU3 FEASIBILITY STUDY (ALT. 2)

WBS NUMBER: 1.1.1.1.3.1.3

ITEM DESCRIPTION	M/H	LABOR $	S/C $	MAT'L $	TOTAL $
FERMCO LABOR AND MATERIALS					
FERMCO LABOR INCL. BENEFITS & BURDENS	123,552	$3,219,000			$3,219,000
FERMCO MATERIAL - OBJCL 200 & OBJCL 300				$4,218,000	$4,218,000
SALES TAX - OBJCL 394				$1,605,000	$1,605,000
SUB-TOTAL 1 FERMCO LABOR & MATERIAL TOTAL	123,552	$3,219,000		$5,823,000	$9,042,000
SUBCONTRACTS					
CONTRACT HIRE ($/HR) & MISC SUBCONTRACTORS			$545,000		$545,000
ENGINEERING (A/E)					
SUB-TOTAL 2 ENGINEERING & SUBCONTRS TOTAL			$545,000		$545,000
TEAMING PARTNERS					
SITE STAFF					
HOME OFFICE SUPPORT					
SUB-TOTAL 3 TEAMING PARTNERS TOTAL					
OTHER DIRECT COSTS					
TRAVEL - OBJCL 600				$20,900	$20,900
RELOCATION - OBJCL 700					
OTHER					
SUB-TOTAL 4 OTHER DIRECT COSTS TOTAL				$20,900	$20,900
TOTAL		$3,219,000	$545,000	$5,843,900	
SUMMARY SHEET TOTAL	*****JAN 95 RATES*****				$9,607,900

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ESTIMATE: C3-95-1-5-R2 DATE: 08-Dec-95

TABLE E-17

CLIENT: US DOE

FERMCO LABOR & MATERIALS

ESTIMATOR: J.W. / T.P.

PROJECT TITLE: CRU3 FEASIBILITY STUDY (ALT. 2

LOCATION: FERNALD, OH

WBS NUMBER: 1.1.1.1.3.1.3

GROUP	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $	MAT'L $	TOTAL $
1A	TOP LEVEL & ENGINEERING MANAGERS	7,488	$53.04	$397,200			$397,200
1B	MANUFACTURING MANAGERS		$33.77				
1C	NON-ENGINEERING MANAGERS	1,872	$36.60	$68,500			$68,500
2A	JUNIOR ENGINEER	18,720	$30.55	$571,900			$571,900
2A	SENIOR ENGINEER	9,360	$42.13	$394,300			$394,300
2B	JUNIOR TECHNICAL SUPPORT PROFESSIONALS		$27.58				
2B	SENIOR TECHNICAL SUPPORT PROFESSIONALS		$35.55				
2C	JUNIOR NON - TECH SUPPORT PROFESSIONALS	1,872	$22.56	$42,200			$42,200
2C	SENIOR NON - TECH SUPPORT PROFESSIONALS	18,720	$31.98	$598,700			$598,700
3A	TECHNICIANS	28,080	$20.26	$568,900			$568,900
5A	SECRETARIAL	18,720	$15.48	$289,800			$289,800
5B	GENERAL CLERKS	18,720	$15.36	$287,500			$287,500
6A	CRAFTS		$22.79				
7B	EQUIPMENT OPERATORS		$21.06				
8A&B	GENERAL LABORERS		$17.87				
9A	SECURITY POLICE OFFICERS		$20.21				
9B	GENERAL WORKERS (UTILITY)		$17.76				
SUB-TOTAL 1 FERMCO LABOR INCL BENEFITS & BURDENS		123,552		$3,219,000			$3,219,000

MATERIALS

OBJCL	Description	Totals
261	Bldg & Road Mat. ROB repair	$167,500
262	Hardware & Small Tools	
263	Chemicals & Compounds	
264	Metals & M Alloys	
265	Electrical Materials	
266	Electronic Materials	
267	Mechanical Materials	
268	Custodial Materials	
269	Office Materials	
270	Fuels & Lubricants	
271	Clothes	
273	Laboratory Supplies	
275	Misc. Materials & Supplies	
330	LEASED TRAILER	$29,500
332		
335		
	Total ObjCl 200	$197,000

OBJCL	Description	Totals
310	Main. Matls & Supp.	
315	Repair Matls. / Exps.	
325	Tools, Metal Fabr.	
330	Safety Cloth / Equip. PPE	$2,051,000
332	Training	$441,600
335	BOND @ 1%	$369,300
341	Coal	
342	Diesel Fuel	
343	Gasoline	
345	Propane	
346	Kerosene	
350	Frgt. Nuc. Mat. Sho.	

OBJCL	Description	Totals
355	Pkg. Supp. & Exps.	
360	Equip. Purch. W Op.	
361	Capital Equipment	$1,111,100
363	Construction Materials	
365	Instrumentation	
366	Sampling Mat. & Equip	
367	Laundry & Clean. Supp	
368	Training Materials	
369	Medical Supplies	
370	Office Supplies	$1,100
375	Other Comp. Hardware	$2,400
376	PC Hardware	$7,000
377	PC Software	$5,000
378	Computer Supplies	$1,100
380	PRT Photo & Graphic Supp	$2,700
385	Communication Exp.	$19,400
388	Freight	$5,400
389	Misc. Tools & Ele. Sup.	
390	Office Furniture	$2,300
392	Offsite Office Rent	
393	Permit Fees	
394	Sales Tax	$376,100
395	Periodicals	
396	Memberships	
397	Cafeteria Utensils	
398	Labotatory Supplies	
399	Misc Supp. & Expense	$1,600
O&M	PROJECT MATERIAL SALES TAX @ 6%	$546,500
CAPITAL	PROJECT MATERIAL SALES TAX @ 6%	$682,400
	Total ObjCl 300 (Less Sales Tax)	$4,021,000

Material Total $4,218,000

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*****JAN 95 RATES*****

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ESTIMATE: C3-95-1-5-R2

DATE: 08-Dec-95

TABLE E-18

CLENT: US DOE

TEAMING PARTNERS / SUBCONTRACTS

ESTIMATOR: J.W. / T.P.

PROJECT TITLE: CRU3 FEASIBILITY STUDY (ALT. 2)
WBS NUMBER: 1.1.1.1.3.1.3

LOCATION: FERNALD, OH

ITEM DESCRIPTION	WORK HOURS								TOTALS
	FDIS	FDIH	HALLS	HALLH	JACOBSS	JACOBSH	NFSS	NFSH	
General									
Project Management									
Engineering									
Project Controls									
Procurement									
Construction									
General Services									
Finance									
Field Support									
TOTAL HOURS									
$ Per Hour *	$57.00	$78.00	$57.00	$78.00	$57.00	$78.00	$57.00	$78.00	
TOTAL $									

CONTRACT HIRE ($HR) & SUBCONTRACTORS (excluding A/E)

OBJ(	Description	Totals
405	Rentals & Leases	
410	Subc – Maintenance	
420	Subc – Not Maint/Rout	
421	Subc – Prof. Services	$250,000
423	Ind. Prof. Subcontr	$250,000
425	Subc. – Routine Analysis	
429	R.M. Parsons	
440	Scientific Ecology	
443	Theta Technologies	
448	Exec.Resource Assoc.	
	Ebasco	
	ASI	

OBJCL	Description	Totals
	IT – Analytical	
	IT – Engineering	
	Penn Drill	
	BURIAL	
460	Temporaries	$20,000
470	Service Agreements	$25,000
471	Site-Wide Serv. Agreements	
480	Outside Laundry, ETC.	

S/C Total $545,000

*****JAN 95 RATES*****

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ESTIMATE: C3-95-1-5-R2

DATE: 08-Dec-95

TABLE E-19

OTHER DIRECT COSTS

CLIENT: US DOE

ESTIMATOR:

PROJECT TITLE: CRU3 FEASIBILITY STUDY (ALT. 2)

LOCATION: FERNALD, OH

WBS NUMBER: 1.1.1.1.3.1.3

Travel – OBJCL 600

Group	No. of Trips			Cost Per Trip			Total Cost
	1 Day	3 Day	5 Day	1 Day	3 Day	5 Day	
General		9			$695		$6,300
Project Management			9			$925	$8,300
Engineering							
Project Controls							
Procurement							
Construction							
General Services							
Finance		9			$695		$6,300
Field Support							
Totals		18	9				$20,900

Relocation – OBJCL 700

Group	Total Relocations		Cost Per Relocation		Total Cost
General					
Project Management					
Engineering					
Project Controls					
Procurement					
Construction					
General Services					
Finance					
Field Support					
Totals					

Other

Item		Total Cost
Employment Interview		
Tuition Refund		
Misc		
Totals		

*****JAN 95 RATES*****

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TABLE E-20

ALTERNATIVE 2 ANNUAL EXPENDITURES

ESTIMATES FOR PRESENT WORTH ANALYSIS

FISCAL YEAR	OFF-SITE DISPOSAL COSTS	ON-PROPERTY DISPOSAL COSTS	OVERHEAD COSTS	DISPOSAL CELL O&M	RISK BUDGET	TOTAL ANNUAL COST	TOTAL CUMULATIVE COST
1995	$455,500	$0	$0	$0	106131	$561,631	$561,631
1996	$1,418,500	$0	$0	$0	330510	$1,749,010	$2,310,641
1997	$3,258,000	$0	$0	$0	759113	$4,017,113	$6,327,754
1998	$2,997,800	$7,044,300	$1,200,988	$201,161	2666507	$14,110,755	$20,438,509
1999	$2,559,400	$5,438,800	$1,200,988	$201,161	2190278	$11,590,626	$32,029,135
2000	$3,149,600	$6,753,100	$1,200,988	$201,161	2634026	$13,938,874	$45,968,009
2001	$2,326,400	$2,153,500	$1,200,988	$201,161	1370516	$7,252,564	$53,220,573
2002	$1,005,800	$5,959,600	$1,200,988	$201,161	1949636	$10,317,184	$63,537,757
2003	$1,199,900	$7,023,200	$1,200,988	$201,161	2242680	$11,867,928	$75,405,685
2004	$245,800	$3,523,900	$1,200,988	$201,161	1205039	$6,376,887	$81,782,572
2005	$119,400	$1,711,300	$1,200,988	$201,161	753257	$3,986,005	$85,768,577
2006				$201,161	46870	$248,031	$86,016,608
2007				$201,161	46870	$248,031	$86,264,639
2008				$201,161	46870	$248,031	$86,512,670
2009				$201,161	46870	$248,031	$86,760,701
2010				$201,161	46870	$248,031	$87,008,732
2011				$201,161	46870	$248,031	$87,256,763
2012				$201,161	46870	$248,031	$87,504,794
2013				$201,161	46870	$248,031	$87,752,825
2014				$201,161	46870	$248,031	$88,000,856
2015				$201,161	46870	$248,031	$88,248,887
2016				$201,161	46870	$248,031	$88,496,918
2017				$201,161	46870	$248,031	$88,744,949
2018				$201,161	46870	$248,031	$88,992,980
2019				$201,161	46870	$248,031	$89,241,011
2020				$201,161	46870	$248,031	$89,489,042
2021				$201,161	46870	$248,031	$89,737,073
2022				$201,161	46870	$248,031	$89,985,104
2023				$201,161	46870	$248,031	$90,233,135
2024				$201,161	46870	$248,031	$90,481,166
2025				$201,161	46870	$248,031	$90,729,197
2026				$201,161	46870	$248,031	$90,977,228
2027				$201,161	46870	$248,031	$91,225,259
2028				$201,161	46870	$248,031	$91,473,290
2029				$201,161	46870	$248,031	$91,721,321
2030				$201,161	46870	$248,031	$91,969,352
2031				$201,161	46870	$248,031	$92,217,383
2032				$201,161	46870	$248,031	$92,465,414
2033				$201,161	46870	$248,031	$92,713,445
2034				$201,161	46870	$248,031	$92,961,476
2035				$201,161	46870	$248,031	$93,209,507
	$18,736,100	$39,607,700	$9,607,900	$7,644,100	$17,613,793	$93,209,500	

ALTERNATIVE 2

TABLE E - 21

PRESENT WORTH ANALYSIS

LCC TITLE: OU3 FEASIBILITY STUDY
CHARGE NO.: 3ACA4
BASE DATE: FY 1995
CLIENT: EPA
STUDY PERIOD: 12 YEARS
LOCATION: FERNALD, OH
REAL DISCOUNT RATE: 4.8%
ANALYST: J. JACOBOSKI

ALTERNATIVE 2	CASH FLOW YEAR
$561,631	1995
$1,749,010	1996
$4,017,113	1997
$14,110,755	1998
$11,590,626	1999
$13,938,874	2000
$7,252,564	2001
$10,317,184	2002
$11,867,928	2003
$6,376,887	2004
$3,986,005	2005
$5,167,313	2006
$93,209,500	TOTAL
$69,604,400	< = = = = = = (@NPV)

Note: Fiscal year 2006 for Alternative 2 is considered a capitalized cost.

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TABLE E-22

WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV

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ALTERNATIVE 2
ESTIMATE SUMMARY

ESTIMATOR: JAW
DATE: 12/09/95

COST	DESCRIPTION	ON-PROP. ROB QUAN	ON-PROP. B-12 QUAN	OFF-SITE NTS LMB QUAN	OFF-SITE LANDFL ROB QUAN	OFF-SITE ENVIRO WMB QUAN	OFF-SITE ENVIRO B-12 QUAN	
	NUMBER OF CONTAINERS USED FOR DISPOSITION OF EACH MATERIAL CATEGORY AT THE DESIGANTED LOCATION							
	A - ACCESSIBLE METALS	1,307						
	B - INACCESSIBLE METALS	7,369						
	C - PROCESS-RELATED METALS			508				
	D - PAINTED LIGHT GAUGE METALS	84	21					
	E - CONCRETE	19,404					65	
	F - BRICK					426		
	G - NON-REGULATED ACM	249						
	H - REGULATED ACM	254						
	I - MISCELLANEOUS MATERIALS	358			850			
		29,025	21	508	850	426	65	

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TABLE E-23

ALERNATIVE 2 **OVERHEAD ESTIMATE SHEET.**

9 YEAR PLAN — BASED ON 2080 HR'S / YEAR

	GROUP	REQ NO.	% REQ.	NO. YR'S.	TOTAL HR'S
PROJECT MANAGER	1A	1	40%	9	7,488
PROJECT ENGINEERS SR.	2A	1	50%	9	9,360
JUNIOR ENGINEERS	2A	2	50%	9	18,720
SAFETY ENGINEER	2C	2	50%	9	18,720
PROCUREMENT	1C	1	10%	9	1,872
ACCOUNTING, FINANCE	2C	1	10%	9	1,872
SECRETARIAL	5A	2	50%	9	18,720
GENERAL CLERKS	5B	1	100%	9	18,720
TECHNICIANS (H. & S.)	3A	1	50%	9	9,360
TECHNICIANS (RADTECH)	3A	2	50%	9	18,720
	EMPLOYEE:	14		TOTAL HOURS	123,552

MATERIALS

OBJCL	DESCRIPTION	CALCULATIONS	
370	OFFICE SUPPLIES	9 YEARS * 12 MONTHS * ALLOWANCE @ $10 / MONTH	$1,100
375	OTHER COMP. HARDWARE	2 PRINTERS @ $1200 EACH	$2,400
376	PC HARDWARE	2 COMPUTERS @ $3,500 EACH	$7,000
377	PC SOFTWARE	2 COPIES @ $2,500 EACH FOR LICENCE AGREEMENTS	$5,000
378	COMPUTER SUPPIES	9 YEARS * 12 MONTHS * ALLOWANCE @ $10 / MONTH	$1,100
380	PHOTO & GRAPHIC SUPPORT	9 YEARS * 12 MONTHS * ALLOWANCE @ $25 / MONTH	$2,700
385	COMMUNICATIONS EXP.	9 YEARS * 12 MONTHS * 3 PHONES *ALLOW @ $60 / MONTH	$19,400
388	FREIGHT / POSTAGE	9 YEARS * 12 MONTHS * POSTAGE ETC ALLOW @ $50 / MONTH	$5,400
390	OFFICE FURNITURE	3 WORKERS @ $750 EACH	$2,300
399	MISC. SUPP. & EXPENSE	9 YEARS * 12 MONTHS * ALLOWANCE @ $15 / MONTH	$1,600
		LESS SALES TAX	$48,000
394	SALES TAX @ 6%		$2,900
		TOTAL	$50,900

OBJCL	DESCRIPTION	CALCULATIONS		
330	SAFETY & PPE COST (DIRECT MAN HOURS ONLY)	410,150	HRS./ 10 HRS. PER DAY @ $50.00 / WORKER	$2,051,000
N/A	SUB CONTRACT BOND AT 1%	$36,932,600	TOTAL OF SUB CONTRACTS	$369,300
368	TRAINING	533,702	HRS./ 1813 HRS./ YEAR @ $1500.00 / WORKER	$441,600

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TABLE E-24

ON-PROPERTY REQUIREMENTS

OFFICE SPACE FOR THE LAST THREE YEARS OF PROJECT:

OBJCL # 276 TRAILER LEASING

FROM MEANS CONSTRUCTION DATA BOOK 1994 PRICING COMMERCIAL STYLE OFFICE TRAILER

50' * 12' TRAILER	2	REQ.	$410	RENT PER MONTH * 36 MONTHS	$29,500
50' * 12' TRAILER	2	REQ.	$13,790	PURCHASE	$27,600
SET UP COST	2	REQ.	$5,000	ALLOW FOR EACH TRAILER	$10,000
MAINTENANCE	2	REQ.	$5,000	ALLOW $2,500 PER YEAR EACH TRAILER	$10,000
				USING THE LEASED PRICING	$49,500

SITE DEVELOPMENT

OBJCL # 261

USING AN EXISTING BUIDING FOR THE CONTAINER REPAIR SHOP (ROB, ITC)

APPORXAMENTLY 100'-0 * 60'-0

INSPECT, CLEAN AND MAKE READY FOR REPAIR SHOP	2,000 HRS	$25.00		$50,000
MATERIALS TO OUT FIT SHOP AREA				
BINS, STORAGE RACKS, BENCHES			ALLOW	$12,000
ELECTRICAL REQUIREMENTS, LIGHTS, OUTLETS ETC.			ALLOW	$8,500
UTILITIES WATER, TELEPHONE, HONEWELL CONTROLS			ALLOW	$15,000
HVAC			ALLOW	$12,000
MAINTENANCE 10 YEARS AT $5,000 PER YEAR				$50,000
SPARE PARTS, REPAIR MATERIAL, STEEL PLATE ETC. IS PRICED WITH IN THE ESTIMATE.				
		TOTAL		$147,500

CAPITAL EQUIPMENT

CONSTRUCTION EQUIPMENT:
OBJCL #361

	NO. REQUIRED	UNIT PRICE	TOTAL COST
TAYLOR TYPE FORK LIFT	1	$110,000	$110,000
MILLER PORTABLE WELDING MACHINES	3	$8,000	$24,000
TRUCK WITH ROB/I.T.C. LOADING/DUMPING CAPABILITIES	3	$80,000	$240,000
TRUCK 2 TON CAPACITY	2	$25,000	$50,000
HYDRAULIC CRANE	2	$120,000	$240,000
50-0 * 12'-0 OFFICE TRAILERS	3	$13,790	$41,400
PORTABLE HYDRAULIC EQUIPMENT	2	$8,500	$17,000
PORTABLE HEATERS	6	$1,500	$9,000
LIGHT PLANTS (FLOOD LIGHTS)	5	$12,000	$60,000
PORTABLE GANTRY CRANE 10 TON CAPACITY	1	$4,500	$4,500
PORTABLE GENERATOR	3	$25,000	$75,000
PORTABLE AIR COMPRESSOR	1	$18,000	$18,000
		SUB TOTAL	$888,900
REPLACEMENT ALLOWANCE AT: 25%			$222,200
		TOTAL	$1,111,100

WBS NO.- 1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-25

CONTRACT #: 0442432
EST #: C3-95-1-7-R2
BY: JAW
DATE: 12/09/95
TIME: 12:10 PM

COST CAT.	DESCRIPTION ALTERNATIVE NUMBER 3	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	DISPOSAL					
	OFF-SITE			$59,699,800		
	LANDFILL			$271,400		
	SUB TOTAL			$59,971,200		$59,971,200
	TREATMENT					
	ENCAPSULATION			$539,600		
	SHREDDING			$500		
	SUB TOTAL			$540,100		$540,100
	CONTAINERS					
	INTERMODAL TRANSPORTATION CONTAINER				$3,640,100	
	B-12				$1,000	
	LARGE METAL BOX				$2,997,200	
	SUB TOTAL				$6,638,300	$6,638,300
	TRANSPORTATION					
	ON-PROPERTY HAULING	$1,340,800				
	ON-PROPERTY HANDLING	$500				
	ON-PROPERTY INSPECTION	$505,500				
	WEIGHING & CERTIFICATION	$9,922,700				
	ON-PROPERETY LOADING OF I.T.C.	$4,166,000				
	TRANSPORTATION			$1,625,600		
	RAIL ROAD TRANSPORTATION			$34,688,000		
	ARTICULATED CONTAINER CAR			$5,477,100		
	MAINTENANCE FOR CONTAINERS	$8,481,800	$2,601,600			
	SUB TOTAL	$24,417,300	$2,601,600	$41,790,700		$68,809,600
	INDIRECT COST (STAFF, CAPITAL EQUIPMENT, ETC.)	$3,219,000	$10,019,700	$545,000	$0	$13,783,700
	RISK BUDGET (24.1%)		$35,339,300			$35,339,300
	TOTAL	$27,636,300	$47,960,600	$102,847,000	$6,638,300	$185,082,200

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WBS NO.–1.1.1.1.3.1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABLE E-26
ALTERNATIVE 3
ESTIMATE SUMMARY

CONTRACT #: 04424321
EST #: C3–95–1–7–R2
BY: JAW
DATE: 12/08/95
TIME: 02:52 PM

COST CAT.		QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	A – ACCESSIBLE METALS				54,313					$1,258,800	$138,200	$2,577,500	$193,800	$4,168,300
	B – INACCESSIBLE METALS				303,593					$7,035,800	$772,500	$24,140,600	$1,072,600	$33,021,500
	C – PROCESS–RELATED METALS				8,839					$215,700	$0	$13,370,600	$2,997,200	$16,583,500
	D – PAINTED LIGHT GAUGE METALS				2,790					$64,600	$7,000	$164,000	$15,000	$250,600
	E – CONCRETE				625,263					$14,490,600	$1,591,000	$57,462,800	$2,207,500	$75,751,900
	F – BRICK				2,790					$64,700	$7,100	$789,000	$20,700	$881,500
	G – NON–REGULATED ACM				8,253					$191,300	$21,000	$823,300	$34,600	$1,070,200
	H – REGULATED ACM				10,573					$245,000	$26,900	$976,700	$41,500	$1,290,100
	I – MISCELLANEOUS MATERIALS				34,679					$850,800	$37,900	$1,997,500	$55,400	$2,941,600
	INDIRECT COST (STAFF, CAPITAL EQUIPMENT, ETC.)				123,552					$3,219,000	$10,019,700	$545,000	$0	$13,783,700
	RISK BUDGET (23.6 %)										$35,339,300			$35,339,300
					1,174,645					$27,636,300	$47,960,600	$102,847,000	$6,638,300	$185,082,200

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WBS NO.– [illegible]3.1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABLE [illegible]27
ALTERNATIVE 3
ESTIMATE DETAILS

CONTRA[illegible] 04424321
EST #: C3-95-1-7-R2
BY: JAW
DATE: 12/08/95
TIME: 02:46 PM

COST CAT.	DESCRIPTION A – ACCESSIBLE METALS	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF-SITE DISPOSAL-ENVIROCARE													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X)	28	EA.						$6,920				$193,800	$193,800
	ON-PROPERTY HAULING	1,382	LOAD	2.40	3,317	21.06				$69,900				$69,900
	WEIGH, CERTIFICATION	1,382	LOAD	15.00	20,730	24.94				$517,000				$517,000
	ON-PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	1,382	LOAD	7.50	10,365	21.35				$221,300				$221,300
	INTERMODAL TRANSPORT CONTAINER MAINT.	1,382	LOAD	14.40	19,901	22.64			$100	$450,600	$138,200			$588,800
	RAIL ROAD TRANSPORTATION	1,382	I.T.C.					$1,333				$1,842,700		$1,842,700
	ARTICULATED CONTAINER CAR COST	1,382	I.T.C.					$211				$291,000		$291,000
	OFF-SITE BURIAL UNBULKED	63,400	CF					$7.00				$443,800		$443,800
					54,313					$1,258,800	$138,200	$2,577,500	$193,800	$4,168,300

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-28

ALTERNATIVE 3
ESTIMATE DETAILS

CONTRACT #: 04424321
EST #: C3-95-1-7-R2
BY: JAW
DATE: 12/08/95
TIME: 02:46 PM

COST CAT.	DESCRIPTION B - INACCESSIBLE METALS	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF-SITE DISPOSAL-ENVIROCARE													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X)	153	EA.						$6,920				$1,058,800	$1,058,800
	ON-PROPERTY HAULING	7,659	LOAD	2.40	18,382	21.06				$387,100				$387,100
	WEIGH, CERTIFICATION	7,659	LOAD	15.00	114,885	24.94				$2,865,200				$2,865,200
	ON-PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	7,659	I.T.C.	7.50	57,443	21.35				$1,226,400				$1,226,400
	INTERMODAL TRANSPORT CONTAINER MAINT.	7,659	I.T.C.	14.40	110,290	22.64			$100	$2,497,000	$765,900			$3,262,900
	RAIL ROAD TRANSPORTATION	7,659	I.T.C.					$1,333				$10,212,000		$10,212,000
	ARTICULATED CONTAINER CAR COST	7,659	I.T.C.					$211				$1,612,400		$1,612,400
	OFF-SITE BURIAL UNBULKED	1,730,000	CF					$7.00				$12,110,000		$12,110,000
													SUB TOTAL	$32,734,800
	OFF-SITE DISPOSAL-ENVIROCARE													
	COMMODITY: PCB													
	CONTAINER COST:													
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X)	2	EA.						$6,920				$13,800	$13,800
	ON-PROPERTY HAULING	66	LOAD	2.40	158	21.06				$3,300				$3,300
	WEIGH, CERTIFICATION	66	LOAD	15.00	990	24.94				$24,700				$24,700
	ON-PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	66	I.T.C.	7.50	495	21.35				$10,600				$10,600
	INTERMODAL TRANSPORT CONTAINER MAINT.	66	I.T.C.	14.40	950	22.64			$100	$21,500	$6,600			$28,100
	RAIL ROAD TRANSPORTATION	66	I.T.C.					$1,333				$88,000		$88,000
	ARTICULATED CONTAINER CAR COST	66	I.T.C.					$211				$13,900		$13,900
	OFF-SITE BURIAL UNBULKED	14,900	CF					$7.00				$104,300		$104,300
													SUB TOTAL	$286,700
					303,593					$7,035,800	$772,500	$24,140,600	$1,072,600	$33,021,500

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WBS NO.– [illegible].3.1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABLE E-29

ALTERNATIVE 3
ESTIMATE DETAILS

CONTRAC[illegible] 04424321
EST #: C3–95–1–7–R2
BY: JAW
DATE: 12/08/95
TIME: 02:46 PM

COST CAT.	DESCRIPTION C – PROCESS–RELATED METALS	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF–SITE DISPOSAL–NTS													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	LARGE WHITE METAL BOX	508	EA.						$5,900				$2,997,200	$2,997,200
	ON–PROPERTY HAULING	508	LOAD	2.40	1,219	21.06				$25,700				$25,700
	WEIGH, CERTIFICATION AND STAGE FOR LOAD OUT	508	LOAD	15.00	7,620	24.94				$190,000				$190,000
	TRANSPORTATION TO NTS	508	LOAD					$3,200				$1,625,600		$1,625,600
	OFF–SITE BURIAL CONTAINERS	508	LMB					$23,120				$11,745,000		$11,745,000
	OFF–SITE BURIAL UNBULKED	151,000	CF											
					8,839					$215,700		$13,370,600	$2,997,200	$16,583,500

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-30

ALTERNATIVE 3
ESTIMATE DETAILS

CONTRACT #: 04424321
EST #: C3-95-1-7-R2
BY: JAW
DATE: 12/08/95
TIME: 02:46 PM

COST CAT.	DESCRIPTION D - PAINTED LIGHT GAUGE METALS	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF-SITE DISPOSAL-ENVIROCARE													
	COMMODITY: POTENTIALLY MIXED WASTE													
	CONTAINER COST:													
	B-12 CONTAINERS	1	EA.						$960				$1,000	$1,000
	ON-PROPERTY HAULING OF (B-12)	4	B-12	1.65	7	21.06				$100				$100
	WEIGH, CERTIFICATION	4	B-12	6.26	25	23.32				$600				$600
	ON-PROPERTY LOADING/HANDLING OF (B-12)	4	EA.	5.83	23	21.35				$500				$500
	ON-PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	1	I.T.C.	7.50	8	21.35				$200				$200
	INTERMODAL TRANSPORT CONTAINER MAINT.	1	I.T.C.	14.40	14	22.64			$100	$300	$100			$400
	RAIL ROAD TRANSPORTATION	1	I.T.C.					$1,333				$1,300		$1,300
	ARTICULATED CONTAINER CAR COST	1	I.T.C.					$210.53				$200		$200
	ENCAPSULATION	50	CF					$101.24				$5,100		$5,100
	OFF-SITE BURIAL UNBULKED	50	CF					$7.00				$400		$400
	OFF-SITE SHREDDING OF B-12	43	CF					$11.84				$500		$500
	OFF-SITE BURIAL SHREDDED B-12	43	CF					$7.00				$300		$300
	B-12 = 52.75 CF EXT. VOL. SHREDDED = 10.55 CF												SUB TOTAL	$10,600
	OFF-SITE DISPOSAL-ENVIROCARE													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X	2	EA.						$7,000				$14,000	$14,000
	ON-PROPERTY HAULING	69	LOAD	2.40	166	21.06				$3,500				$3,500
	WEIGH, CERTIFICATION	69	LOAD	15.00	1,035	24.94				$25,800				$25,800
	ON-PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	69	I.T.C.	7.50	518	21.35				$11,100				$11,100
	INTERMODAL TRANSPORT CONTAINER MAINT.	69	I.T.C.	14.40	994	22.64			$100	$22,500	$6,900			$29,400
	RAIL ROAD TRANSPORTATION	69	I.T.C.					$1,333				$92,000		$92,000
	ARTICULATED CONTAINER CAR COST	69	I.T.C.					$210.53				$14,500		$14,500
	OFF-SITE BURIAL UNBULKED	7,100	CF					$7.00				$49,700		$49,700
													SUB TOTAL	$240,000
	NOTES: 1. B-12's ARE HELD IN INTERIM STORAGE. 2. VOLUME NOT INCREASED FOR ENCAPSULATION OF LEAD FLASHING. 3. COST FOR I.T.C. TO HAUL B-12 TO ENVIROCARE IS INCLUDED IN LOW LEVEL WASTE CALCULATION													
					2,790					$64,600	$7,000	$164,000	$15,000	$250,600

DRAFT

WBS NO.-
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE 1
ALTERNATIVE 3
ESTIMATE DETAILS

CONTR: 04424321
EST #: CS-95-1-7-R2
BY: JAW
DATE: 12/09/95
TIME: 02:34 PM

COST CAT.	DESCRIPTION E - CONCRETE	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	COST/UNIT RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF-SITE DISPOSAL-ENVIROCARE													
	COMMODITY: BELOW BASELINE / LOW LEVEL WASTE													
	CONTAINER COST:													
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X)	319	EA						$6,920				$2,207,500	$2,207,500
	ON-PROPERTY HAULING	15,910	I.T.C.	2.40	38,184	21.06				$804,200				$804,200
	WEIGH, CERTIFICATION	15,910	I.T.C.	15.00	238,650	24.94				$5,951,900				$5,951,900
	ON-PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	15,910	I.T.C.	7.50	119,325	21.35				$2,547,600				$2,547,600
	INTERMODAL TRANSPORT CONTAINER MAINT.	15,910	I.T.C.	14.40	229,104	22.64			$100	$5,186,900	$1,591,000			$6,777,900
	RAIL ROAD TRANSPORTATION	15,910	I.T.C.					$1,333				$21,213,300		$21,213,300
	ARTICULATED CONTAINER CAR COST	15,910	I.T.C.					$211				$3,349,500		$3,349,500
	OFF-SITE BURIAL UNBULKED	4,700,000	CF					$7.00				$32,900,000		$32,900,000
					625,263					$14,490,600	$1,591,000	$57,462,800	$2,207,500	$75,751,900

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2692

DRAFT

WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-32

ALTERNATIVE 3
ESTIMATE DETAILS

CONTRACT #: 04424321
EST #: C3-95-1-7-R2
BY: JAW
DATE: 12/08/95
TIME: 02:46 PM

COST CAT.	DESCRIPTION F - BRICK	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	COST/UNIT RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF-SITE DISPOSAL-ENVIROCARE													
	COMMODITY: POTENTIALLY MIXED WASTE													
	CONTAINER COST:													
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X	1	EA						$6,920				$6,900	$6,900
	ON-PROPERTY HAULING	18	LOAD	2.40	43	21.06				$900				$900
	WEIGH, CERTIFICATION	18	LOAD	15.00	270	24.94				$6,700				$6,700
	ON-PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	18	I.T.C.	7.50	135	21.35				$2,900				$2,900
	INTERMODAL TRANSPORT CONTAINER MAINT.	18	I.T.C.	14.40	259	22.64			$100	$5,900	$1,800			$7,700
	RAIL ROAD TRANSPORTATION	18	I.T.C.					$1,333				$24,000		$24,000
	ARTICULATED CONTAINER CAR COST	18	I.T.C.					$211				$3,800		$3,800
	ENCAPSULATION OF MIXED WASTE	5,280	CF					$101.24				$534,500		$534,500
	OFF-SITE BURIAL UNBULKED	5,280	CF					$7.00				$37,000		$37,000
													SUB TOTAL	$624,400
	OFF-SITE DISPOSAL-ENVIROCARE													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X	2	EA						$6,920				$13,800	$13,800
	ON-PROPERTY HAULING	53	LOAD	2.40	127	21.06				$2,700				$2,700
	WEIGH, CERTIFICATION	53	LOAD	15.00	795	24.94				$19,800				$19,800
	ON-PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	53	I.T.C.	7.50	398	21.35				$8,500				$8,500
	INTERMODAL TRANSPORT CONTAINER MAINT.	53	I.T.C.	14.40	763	22.64			$100	$17,300	$5,300			$22,600
	RAIL ROAD TRANSPORTATION	53	I.T.C.					$1,333				$70,700		$70,700
	ARTICULATED CONTAINER CAR COST	53	I.T.C.					$211				$11,200		$11,200
	OFF-SITE BURIAL UNBULKED	15,400	CF					$7.00				$107,800		$107,800
													SUB TOTAL	$257,100
					2,790					$64,700	$7,100	$789,000	$20,700	$881,500

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DRAFT

WBS NO.– [illegible]3.1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABL[illegible]-33
ALTERNATIVE 3
ESTIMATE DETAILS

CONTR[illegible]#: 04424321
EST #: C5-95-1-7-R2
BY: JAW
DATE: 12/08/95
TIME: 02:46 PM

COST CAT.	DESCRIPTION G – NON-REGULATED ACM	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF-SITE DISPOSAL-ENVIROCARE													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X)	5	EA.						$6,920				$34,600	$34,600
	ON-PROPERTY HAULING	210	I.T.C.	2.40	504	21.06				$10,600				$10,600
	WEIGH, CERTIFICATION	210	LOAD	15.00	3,150	24.94				$78,600				$78,600
	ON-PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	210	I.T.C.	7.50	1,575	21.35				$33,600				$33,600
	INTERMODAL TRANSPORT CONTAINER MAINT.	210	I.T.C.	14.40	3,024	22.64			$100	$68,500	$21,000			$89,500
	RAIL ROAD TRANSPORTATION	210	I.T.C.					$1,333				$280,000		$280,000
	ARTICULATED CONTAINER CAR COST	210	I.T.C.					$211				$44,200		$44,200
	OFF-SITE BURIAL UNBULKED	71,300	CF					$7.00				$499,100		$499,100
					8,253					$191,300	$21,000	$823,300	$34,600	$1,070,200

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2397

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E-34

ALTERNATIVE 3
ESTIMATE DETAILS

CONTRACT #: 04424321
EST #: C3-95-1-7-R2
BY: JAW
DATE: 12/08/95
TIME: 02:46 PM

COST CAT.	DESCRIPTION H - REGULATED ACM	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	OFF-SITE DISPOSAL-ENVIROCARE													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:													
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X)	6	EA.						$6,920				$41,500	$41,500
	ON-PROPERTY HAULING	269	I.T.C.	2.40	646	21.06				$13,600				$13,600
	WEIGH, CERTIFICATION	269	I.T.C.	15.00	4,035	24.94				$100,600				$100,600
	ON-PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	269	I.T.C.	7.50	2,018	21.35				$43,100				$43,100
	INTERMODAL TRANSPORT CONTAINER MAINT.	269	I.T.C.	14.40	3,874	22.64			$100	$87,700	$26,900			$114,600
	RAIL ROAD TRANSPORTATION	269	I.T.C.					$1,333				$358,700		$358,700
	ARTICULATED CONTAINER CAR COST	269	I.T.C.					$211				$56,600		$56,600
	OFF-SITE BURIAL UNBULKED	80,200	CF					$7.00				$561,400		$561,400
					10,573					$245,000	$26,900	$976,700	$41,500	$1,290,100

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WBS NO.– [redacted]1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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TABLE [redacted]
ALTERNATIVE 3
ESTIMATE DETAILS

CONTRA[redacted]4424321
EST #: C3–[redacted]–1–7–R2
BY: JAW
DATE: 12/08/95
TIME: 02:46 PM

COST CAT.	DESCRIPTION	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	O & M LABOR	O & M MATERIAL	CAPITAL SUB CONTRACT	CAPITAL MATERIAL	LINE TOTAL
	I – MISCELLANEOUS MATERIALS													
	OFF–SITE DISPOSAL–ENVIROCARE													
	COMMODITY: LOW LEVEL WASTE													
	CONTAINER COST:												$55,400	$55,400
	INTERMODAL TRANSPORT CONTAINER (REUSE 50 X)	8	EA						$6,920					$19,200
	ON–PROPERTY HAULING	379	I.T.C.	2.40	910	21.06				$19,200				$141,800
	WEIGH, CERTIFICATION	379	I.T.C.	15.00	5,685	24.94				$141,800				$60,700
	ON–PROPERTY LOADING OF I.T.C. ONTO R.R. CAR	379	I.T.C.	7.50	2,843	21.35				$60,700				$161,500
	INTERMODAL TRANSPORT CONTAINER MAINT.	379	I.T.C.	14.40	5,458	22.64			$100	$123,600	$37,900			$505,300
	RAIL ROAD TRANSPORTATION	379	I.T.C.					$1,333				$505,300		$79,800
	ARTICULATED CONTAINER CAR COST	379	I.T.C.					$211				$79,800		$1,141,000
	OFF–SITE BURIAL UNBULKED	163,000	CF					$7.00				$1,141,000		
													SUB TOTAL	$2,164,700
	OFF–SITE DISPOSAL – LANDFILL													
	COMMODITY: BELOW BASELINE													
	COMMERCIAL LANDFILL VENDOR WOULD PROVIDE A 30 CY ROB TO BE FILLED BY THE D&D CONTRACTOR ASSUME A 5 DAY TURNAROUND FOR FILLING NO DIRECT FERMCO LABOR													
	INITIAL INSPECTION	541,000	CF	0.013	7,033	25.55				$179,700				$179,700
	INSPECTION FOR FREE RELEASE	850	ROB	15.00	12,750	25.55				$325,800				$325,800
	DAYS ON–PROPERTY TO BE FILLED	4,250	DAY					$3.50				$14,900		$14,900
	TRANSPORTATION AND BURIAL	850	ROB					$301.75				$256,500		$256,500
	UNBULKED MATERIAL VOLUME THIS CATEGORY	541,000	CF										SUB TOTAL	$776,900
					34,679					$850,800	$37,900	$1,997,500	$55,400	$2,941,600

DRAFT

TABLE E-36

SUMMARY SHEET

EST FILE #: C3-95-1-7-R2
CLIENT: DOE
PROJECT: CRU3 FEASIBILITY STUDY (ALT. 3)
WBS#: 1.1.1.1.3.1.3

FERMCO ESTIMATING SERVICES

DATE: 09-Dec-95
ESTIMATOR: J. WINGATE
LOCATION: FERNALD
TASK#: 3ACA4

CODE	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $ / OTHERS	MAT'L $	TOTAL $
	EXCAVATION AND CIVIL						
	CONCRETE						
	STRUCTURAL STEEL						
	BUILDINGS						
	MACHINERY AND EQUIPMENT						
	PIPING						
	ELECTRICAL						
	INSTRUMENTS						
	PAINTING AND SCAFFOLD						
	INSULATION						
DIRECT FIELD COSTS							
SUPERVISION - CONTRACTOR							
SM TOOLS/CONSM'BLS							
EQUIPMENT RENTAL							
TEMP. FACILITIES							
TEMP UTL'S HOOK-UP							
JOB CLEAN-UP							
SAFETY							
HEALTH PHYSICS S/C							
CERCLA $1,500 PER PERSON							
BOND							
OVERHEAD & PROFIT							
PAYRL BRD.&BENFT.							
INDIRECT FIELD COSTS							
DIRECT & INDIRECT FIELD COSTS							
	QTY	$/UNIT					
WASTE CONTAINERS							
CERTIFICATION							
TRANSPORTATION							
BURIAL							
RECYCLING							
STORAGE							
WASTE MANAGEMENT COSTS							
FERMCO SUPPORT LABOR			1,064,520	$24,417,300	$102,302,000	$9,239,900	$135,959,200
FERMCO MGMT. & SUPPORT			123,552	$3,219,000	$545,000	$8,633,200	$12,397,200
O & M COST							
FERMCO FIELD SUPPORT COSTS				$27,636,300	$102,847,000	$17,873,100	$148,356,400
ENGINEERING/DESIGN/INSPECTION	A/E			FERMCO			
ENGINEERING COSTS							
SALES TAX - SUBCONTRACT			SALES TAX - FERMCO			$1,386,500	$1,386,500
SUB-TOTAL(BASE ESTIMATE)							$149,742,900
G&A-FERMCO (SEE EXCLUSION COMMENTS)							
ESCALATION (SEE EXCLUSION COMMENTS)							
RISK BUDGET	23.6%						$35,339,300
TARGET ESTIMATE (BASE ESTIMATE PLUS RISK BUDGET)							$185,082,200
CONTINGENCY	22.2%						$33,242,900

FY 95 DOLLARS

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TABLE E-37

7397

ESTIMATE: C3-95-1-7-R2

DATE : 08-Dec-95

CLIENT: US DOE

FERMCO

LEVEL OF EFFORT SUMMARY SHEET

ESTIMATOR: JIM WINGATE

LOCATION: FERNALD, OH

PROJECT TITLE: CRU3 FEASIBILITY STUDY (ALT. 3)

WBS NUMBER: 1.1.1.1.3.1.3

ITEM DESCRIPTION	M/H	LABOR $	S/C $	MAT'L $	TOTAL $
FERMCO LABOR AND MATERIALS					
FERMCO LABOR INCL. BENEFITS & BURDENS	123,552	$3,219,000			$3,219,000
FERMCO MATERIAL - OBJCL 200 & OBJCL 300				$8,612,300	$8,612,300
SALES TAX - OBJCL 394				$1,386,500	$1,386,500
SUB-TOTAL 1 FERMCO LABOR & MATERIAL TOTAL	123,552	$3,219,000		$9,998,800	$13,217,800
SUBCONTRACTS					
CONTRACT HIRE ($/HR) & MISC SUBCONTRACTORS			$545,000		$545,000
ENGINEERING (A/E)					
SUB-TOTAL 2 ENGINEERING & SUBCONTRS TOTAL			$545,000		$545,000
TEAMING PARTNERS					
SITE STAFF					
HOME OFFICE SUPPORT					
SUB-TOTAL 3 TEAMING PARTNERS TOTAL					
OTHER DIRECT COSTS					
TRAVEL - OBJCL 600				$20,900	$20,900
RELOCATION - OBJCL 700					
OTHER					
SUB-TOTAL 4 OTHER DIRECT COSTS TOTAL				$20,900	$20,900
TOTAL		$3,219,000	$545,000	$10,019,700	
SUMMARY SHEET TOTAL	*****JAN 95 RATES*****				$13,783,700

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TABLE E-38

ESTIMATE: C3-95-1-7-R2 DATE: 08-Dec-95

CLIENT: US DOE **FERMCO LABOR & MATERIALS** ESTIMATOR: J.W.

PROJECT TITLE: CRU3 FEASIBILITY STUDY (ALT. 3 LOCATION: FERNALD, OH

WBS NUMBER: 1.1.1.1.3.1.3

GROUP	ITEM DESCRIPTION	M/H	RATE	LABOR $	S/C $	MAT'L $	TOTAL $
1A	TOP LEVEL & ENGINEERING MANAGERS	7,488	$53.04	$397,200			$397,200
1B	MANUFACTURING MANAGERS		$33.77				
1C	NON-ENGINEERING MANAGERS	1,872	$36.60	$68,500			$68,500
2A	JUNIOR ENGINEER	18,720	$30.55	$571,900			$571,900
2A	SENIOR ENGINEER	9,360	$42.13	$394,300			$394,300
2B	JUNIOR TECHNICAL SUPPORT PROFESSIONALS		$27.58				
2B	SENIOR TECHNICAL SUPPORT PROFESSIONALS		$35.55				
2C	JUNIOR NON - TECH SUPPORT PROFESSIONALS	1,872	$22.56	$42,200			$42,200
2C	SENIOR NON - TECH SUPPORT PROFESSIONALS	18,720	$31.98	$598,700			$598,700
3A	TECHNICIANS	28,080	$20.26	$568,900			$568,900
5A	SECRETARIAL	18,720	$15.48	$289,800			$289,800
5B	GENERAL CLERKS	18,720	$15.36	$287,500			$287,500
6A	CRAFTS		$22.79				
7B	EQUIPMENT OPERATORS		$21.06				
8A&B	GENERAL LABORERS		$17.87				
9A	SECURITY POLICE OFFICERS		$20.21				
9B	GENERAL WORKERS (UTILITY)		$17.76				
SUB-TOTAL 1 FERMCO LABOR INCL BENEFITS & BURDENS		123,552		$3,219,000			$3,219,000

MATERIALS

OBJCL	Description	Totals
261	Bldg & Road Mat. ROB repair	$167,500
262	Hardware & Small Tools	
263	Chemicals & Compounds	
264	Metals & M Alloys	
265	Electrical Materials	
266	Electronic Materials	
267	Mechanical Materials	
268	Custodial Materials	
269	Office Materials	
270	Fuels & Lubricants	
271	Clothes	
273	Laboratory Supplies	
275	Misc. Materials & Supplies	
330	LEASED TRAILER	$29,500
332		
335		
	Total ObjCl 200	$197,000

OBJCL	Description	Totals
310	Main. Matls & Supp.	
315	Repair Matls. / Exps.	
325	Tools, Metal Fabr.	
330	Safety Cloth / Equip. PPE	$5,255,800
332	Training	$971,900
335	BOND @ 1%	$1,028,500
341	Coal	
342	Diesel Fuel	
343	Gasoline	
345	Propane	
346	Kerosene	
350	Frgt. Nuc. Mat. Sho.	

OBJCL	Description	Totals
355	Pkg. Supp. & Exps.	
360	Equip. Purch. W Op.	
361	Capital Equipment	$1,111,100
363	Construction Materials	
365	Instrumentation	
366	Sampling Mat. & Equip	
367	Laundry & Clean. Supp	
368	Training Materials	
369	Medical Supplies	
370	Office Supplies	$1,100
375	Other Comp. Hardware	$2,400
376	PC Hardware	$7,000
377	PC Software	$5,000
378	Computer Supplies	$1,100
380	PRT Photo & Graphic Supp	$2,700
385	Communication Exp.	$19,400
388	Freight	$5,400
389	Misc. Tools & Ele. Sup.	
390	Office Furniture	$2,300
392	Offsite Office Rent	
393	Permit Fees	
394	Sales Tax	$832,100
395	Periodicals	
396	Memberships	
397	Cafeteria Utensils	
398	Labotatory Supplies	
399	Misc Supp. & Expense	$1,600
O&M	PROJECT MATERIAL SALES TAX @ 6%	$156,100
CAPITAL	PROJECT MATERIAL SALES TAX @ 6%	$398,300
	Total ObjCl 300 (Less Sales Tax)	$8,415,300

Material Total $8,612,300

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TABLE E-39

ESTIMATE: C3-95-1-7-R2 DATE: 08-Dec-95

CLENT: US DOE

TEAMING PARTNERS / SUBCONTRACTS

ESTIMATOR: J.W.

PROJECT TITLE: CRU3 FEASIBILITY STUDY (ALT. 3) LOCATION: FERNALD, OH

WBS NUMBER: 1.1.1.1.3.1.3

ITEM DESCRIPTION	WORK HOURS								TOTALS
	FDIS	FDIH	HALLS	HALLH	JACOBSS	JACOBSH	NFSS	NFSH	
General									
Project Management									
Engineering									
Project Controls									
Procurement									
Construction									
General Services									
Finance									
Field Support									
TOTAL HOURS									
$ Per Hour *	$57.00	$78.00	$57.00	$78.00	$57.00	$78.00	$57.00	$78.00	
TOTAL $									

CONTRACT HIRE ($HR) & SUBCONTRACTORS (excluding A/E)

OBJC	Description	Totals
405	Rentals & Leases	
410	Subc – Maintenance	
420	Subc – Not Maint/Rout	
421	Subc – Prof. Services	$250,000
423	Ind. Prof. Subcontr	$250,000
425	Subc. – Routine Analysis	
429	R.M. Parsons	
440	Scientific Ecology	
443	Theta Technologies	
448	Exec.Resource Assoc.	
	Ebasco	
	ASI	

OBJCL	Description	Totals
	IT – Analytical	
	IT – Engineering	
	Penn Drill	
	BURIAL	
460	Temporaries	$20,000
470	Service Agreements	$25,000
471	Site-Wide Serv. Agreements	
480	Outside Laundry, ETC.	

S/C Total $545,000

*****JAN 95 RATES*****

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ESTIMATE: C3-95-1-7-R2

DATE: 08-Dec-95

TABLE E-40

OTHER DIRECT COSTS

CLIENT: US DOE

ESTIMATOR: J.W.

PROJECT TITLE: CRU3 FEASIBILITY STUDY (ALT. 3)

LOCATION: FERNALD, OH

WBS NUMBER: 1.1.1.1.3.1.3

Travel – OBJCL 600

Group	No. of Trips			Cost Per Trip			Total Cost
	1 Day	3 Day	5 Day	1 Day	3 Day	5 Day	
General		9			$695		$6,300
Project Management			9			$925	$8,300
Engineering							
Project Controls							
Procurement							
Construction							
General Services							
Finance		9			$695		$6,300
Field Support							
Totals		18	9				$20,900

Relocation – OBJCL 700

Group	Total Relocations		Cost Per Relocation		Total Cost
General					
Project Management					
Engineering					
Project Controls					
Procurement					
Construction					
General Services					
Finance					
Field Support					
Totals					

Other

Item		Total Cost
Employment Interview		
Tuition Refund		
Misc		
Totals		

*****JAN 95 RATES*****

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TABLE E-41

ALTERNATIVE 3 ANNUAL EXPENDITURES

ESTIMATES FOR PRESENT WORTH ANALYSIS

FISCAL YEAR	OFF-SITE DISPOSAL COSTS	ON-PROPERTY DISPOSAL COSTS	OVERHEAD COSTS	DISPOSAL CELL O&M	RISK BUDGET	TOTAL ANNUAL COST	TOTAL CUMULATIVE COST
1995	$2,678,432	$0	$0	$0	$632,110	$3,310,542	$3,310,542
1996	$5,582,571	$0	$0	$0	$1,317,486	$6,900,057	$10,210,599
1997	$11,126,689	$0	$0	$0	$2,625,897	$13,752,586	$23,963,185
1998	$9,691,681	$0	$1,722,963	$0	$2,693,854	$14,108,498	$38,071,683
1999	$18,693,863	$0	$1,722,963	$0	$4,818,368	$25,235,194	$63,306,877
2000	$23,329,297	$0	$1,722,963	$0	$5,912,329	$30,964,589	$94,271,466
2001	$8,800,887	$0	$1,722,963	$0	$2,483,627	$13,007,477	$107,278,943
2002	$18,383,171	$0	$1,722,963	$0	$4,745,044	$24,851,178	$132,130,121
2003	$21,775,122	$0	$1,722,963	$0	$5,545,544	$29,043,629	$161,173,750
2004	$10,700,936	$0	$1,722,963	$0	$2,932,038	$15,355,937	$176,529,687
2005	$5,196,549	$0	$1,722,963	$0	$1,633,004	$8,552,516	$185,082,203
2006							
2007							
2008							
2009							
2010							
2011							
2012							
2013							
2014							
2015							
2016							
2017							
2018							
2019							
2020							
2021							
2022							
2023							
2024							
2025							
2026							
2027							
2028							
2029							
2030							
2031							
2032							
2033							
2034							
2035							
	$135,959,198	$0	$13,783,700	$0	$35,339,301	$185,082,200	

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ALTERNATIVE 3

TABLE E - 42

PRESENT WORTH ANALYSIS

LCC TITLE: OU3 FEASIBILITY STUDY	CHARGE NO.: 3ACA4
BASE DATE: FY 1995	CLIENT: EPA
STUDY PERIOD: 12 YEARS	LOCATION: FERNALD, OH
REAL DISCOUNT RATE: 4.8%	ANALYST: J. JACOBOSKI

ALTERNATIVE 3	CASH FLOW YEAR
$3,310,542	1995
$6,900,057	1996
$13,752,586	1997
$14,108,498	1998
$25,235,194	1999
$30,964,589	2000
$13,007,477	2001
$24,851,178	2002
$29,043,629	2003
$15,355,937	2004
$8,552,516	2005
$0	2006
$185,082,200	TOTAL
$143,185,600	< = = = = = = (@NPV)

Note: Fiscal year 2006 for alternative 2 is considered a capitalized cost.

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TABLE-43

WBS NO.– 1.1.1.1.3.1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
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ALTERNATIVE 3
ESTIMATE SUMMARY

JAW
12/09/95

COST CAT.	DESCRIPTION CONTAINER QUANTITIES	OFF-PROP. ENVIRO. QUAN I.T.C.	OFF-PROP. NTS QUAN LMB	OFF-PROP. ENVIRO. QUAN B-12	S/C LANDFL QUAN LOADS	
	NUMBER OF CONTAINERS USED FOR DISPOSITION OF EACH MATERIAL CATEGORY AT THE DESOGNATED LOCATION					
	A – ACCESSIBLE METALS	1,382				
	B – INACCESSIBLE METALS	7,725				
	C – PROCESS-RELATED METALS		508			
	D – PAINTED LIGHT GAUGE METALS	70		4		
	E – CONCRETE	15,910				
	F – BRICK	71				
	G – NON-REGULATED ACM	210				
	H – REGULATED ACM	269				
	I – MISCELLANEOUS MATERIALS	379			850	
		26,016	508	4	850	

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TABLE E-44

ALERNATIVE 3 **OVERHEAD ESTIMATE SHEET.**

9 YEAR PLAN — BASED ON 2080 HR'S / YEAR

	GROUP	REQ NO. REQ.	%	NO. YR'S.	TOTAL HR'S
PROJECT MANAGER	1A	1	40%	9	7,488
PROJECT ENGINEERS SR.	2A	1	50%	9	9,360
JUNIOR ENGINEERS	2A	2	50%	9	18,720
SAFETY ENGINEER	2C	2	50%	9	18,720
PROCUREMENT	1C	1	10%	9	1,872
ACCOUNTING, FINANCE	2C	1	10%	9	1,872
SECRETARIAL	5A	2	50%	9	18,720
GENERAL CLERKS	5B	1	100%	9	18,720
TECHNICIANS (H. & S.)	3A	1	50%	9	9,360
TECHNICIANS (RADTECH)	3A	2	50%	9	18,720
	EMPLOYEE:	14		TOTAL HOURS	123,552

MATERIALS

OBJCL	DESCRIPTION	CALCULATIONS	
370	OFFICE SUPPLIES	9 YEARS • 12 MONTHS • ALLOWANCE @ $10 / MONTH	$1,100
375	OTHER COMP. HARDWARE	2 PRINTERS @ $1200 EACH	$2,400
376	PC HARDWARE	2 COMPUTERS @ $3,500 EACH	$7,000
377	PC SOFTWARE	2 COPIES @ $2,500 EACH FOR LICENCE AGREEMENTS	$5,000
378	COMPUTER SUPPIES	9 YEARS • 12 MONTHS * ALLOWANCE @ $10 / MONTH	$1,100
380	PHOTO & GRAPHIC SUPPORT	9 YEARS * 12 MONTHS • ALLOWANCE @ $25 / MONTH	$2,700
385	COMMUNICATIONS EXP.	9 YEARS • 12 MONTHS * 3 PHONES *ALLOW @ $60 / MONTH	$19,400
388	FREIGHT / POSTAGE	9 YEARS • 12 MONTHS • POSTAGE ETC ALLOW @ $50 / MONTH	$5,400
390	OFFICE FURNITURE	3 WORKERS @ $750 EACH	$2,300
399	MISC. SUPP. & EXPENSE	9 YEARS • 12 MONTHS • ALLOWANCE @ $15 / MONTH	$1,600
		LESS SALES TAX	$48,000
394	SALES TAX @ 6%		$2,900
		TOTAL	$50,900

OBJCL	DESCRIPTION	CALCULATIONS		
330	SAFETY & PPE COST (DIRECT MAN HOURS ONLY)	1,051,093	HRS./ 10 HRS. PER DAY @ $50.00 / WORKER	$5,255,800
N/A	SUB CONTRACT BOND AT 1%	$102,847,000	TOTAL OF SUB CONTRACTS	$1,028,500
368	TRAINING	1,174,645	HRS./ 1813 HRS./ YEAR @ $1500.00 / WORKER	$971,900

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TABLE E-45

ON-PROPERTY REQUIREMENTS

OFFICE SPACE FOR THE LAST THREE YEARS OF PROJECT:

OBJCL # 276 TRAILER LEASING

FROM MEANS CONSTRUCTION DATA BOOK. 1994 PRICING COMMERCIAL STYLE OFFICE TRAILER

50' * 12' TRAILER	2	REQ.	$410	RENT PER MONTH * 36 MONTHS	$29,500
50' * 12' TRAILER	2	REQ.	$13,790	PURCHASE	$27,600
SET UP COST	2	REQ.	$5,000	ALLOW FOR EACH TRAILER	$10,000
MAINTENANCE	2	REQ.	$5,000	ALLOW $2,500 PER YEAR EACH TRAILER	$10,000
				USING THE LEASED PRICING	$49,500

SITE DEVELOPMENT

OBJCL # 261

USING AN EXISTING BUIDING FOR THE CONTAINER REPAIR SHOP (ROB, ITC)

APPORXAMENTLY 100'-0 * 60'-0

INSPECT, CLEAN AND MAKE READY FOR REPAIR SHOP	2,000 HRS	$25.00		$50,000
MATERIALS TO OUT FIT SHOP AREA				
BINS, STORAGE RACKS, BENCHES			ALLOW	$12,000
ELECTRICAL REQUIREMENTS, LIGHTS, OUTLETS ETC.			ALLOW	$8,500
UTILITIES WATER, TELEPHONE, HONEWELL CONTROLS			ALLOW	$15,000
HVAC			ALLOW	$12,000
MAINTENANCE 10 YEARS AT $5,000 PER YEAR				$50,000
SPARE PARTS, REPAIR MATERIAL, STEEL PLATE ETC. IS PRICED WITH IN THE ESTIMATE.				
		TOTAL		$147,500

CAPITAL EQUIPMENT

CONSTRUCTION EQUIPMENT:
OBJCL #361

	NO. REQUIRED	UNIT PRICE	TOTAL COST
TAYLOR TYPE FORK LIFT	1	$110,000	$110,000
MILLER PORTABLE WELDING MACHINES	3	$8,000	$24,000
TRUCK WITH ROB/I.T.C. LOADING/DUMPING CAPABILITIES	3	$80,000	$240,000
TRUCK 2 TON CAPACITY	2	$25,000	$50,000
HYDRAULIC CRANE	2	$120,000	$240,000
50-0 * 12'-0 OFFICE TRAILERS	3	$13,790	$41,400
PORTABLE HYDRAULIC EQUIPMENT	2	$8,500	$17,000
PORTABLE HEATERS	6	$1,500	$9,000
LIGHT PLANTS (FLOOD LIGHTS)	5	$12,000	$60,000
PORTABLE GANTRY CRANE 10 TON CAPACITY	1	$4,500	$4,500
PORTABLE GENERATOR	3	$25,000	$75,000
PORTABLE AIR COMPRESSOR	1	$18,000	$18,000
		SUB TOTAL	$888,900
REPLACEMENT ALLOWANCE AT: 25%			$222,200
		TOTAL	$1,111,100

RAIL ROAD COST SPREAD SHEET

INTERMODAL TRANSPORT CONTAINER

INTERMODAL TRANSPORT CONTAINER COST (3 PURCHASED)			$8,000
DISCOUNTED AT 80% FOR VOLUME ORDER		80%	$6,400
LOCKING PINS FOR TOP TWO I.T.C. (4 REQUIRED)			
AT $65 PER LOCK PIN • FOUR CORNERS • TWO I.T.C.			$520
ARTICULATED CONTAINER CAR CAPABLE OF CARRING SIX I.T.C.			6
INTERMODAL TRANSPORT CONTAINER COST FOR ONE ARTICULATED RAIL CAR			$41,520
COST FOR ONE INTERMODAL TRANSPORT CONTAINER.	CAPITAL		$6,920
I.T.C. CAPACITY AT 28.4 CY			
CUBIC FEET PER 28.4 CY I.T.C. @ 766 CF			
WEIGHT LIMIT PER I.T.C. (LBS) 40,550 #			

OUT RIGHT PURCHASE ONE ARTICULATED CONTAINER RAIL CAR.

COST FOR ONE ARTICULATED CONTAINER RAIL CAR.	$78,000
COST PER CAR @ $78,000/ 152 TRIPS/ 6 I.T.C.'s	$85.53
MAINT PER TRIP @ 750 PER CAR / 6 I.T.C.'s	$125.00
	$210.53

RAIL ROAD TRANSPORTATION

TRAIN COST PER ROUND TRIP PULL	$8,000 PER RAIL CAR/ 6 I.T.C.'s	$1,333

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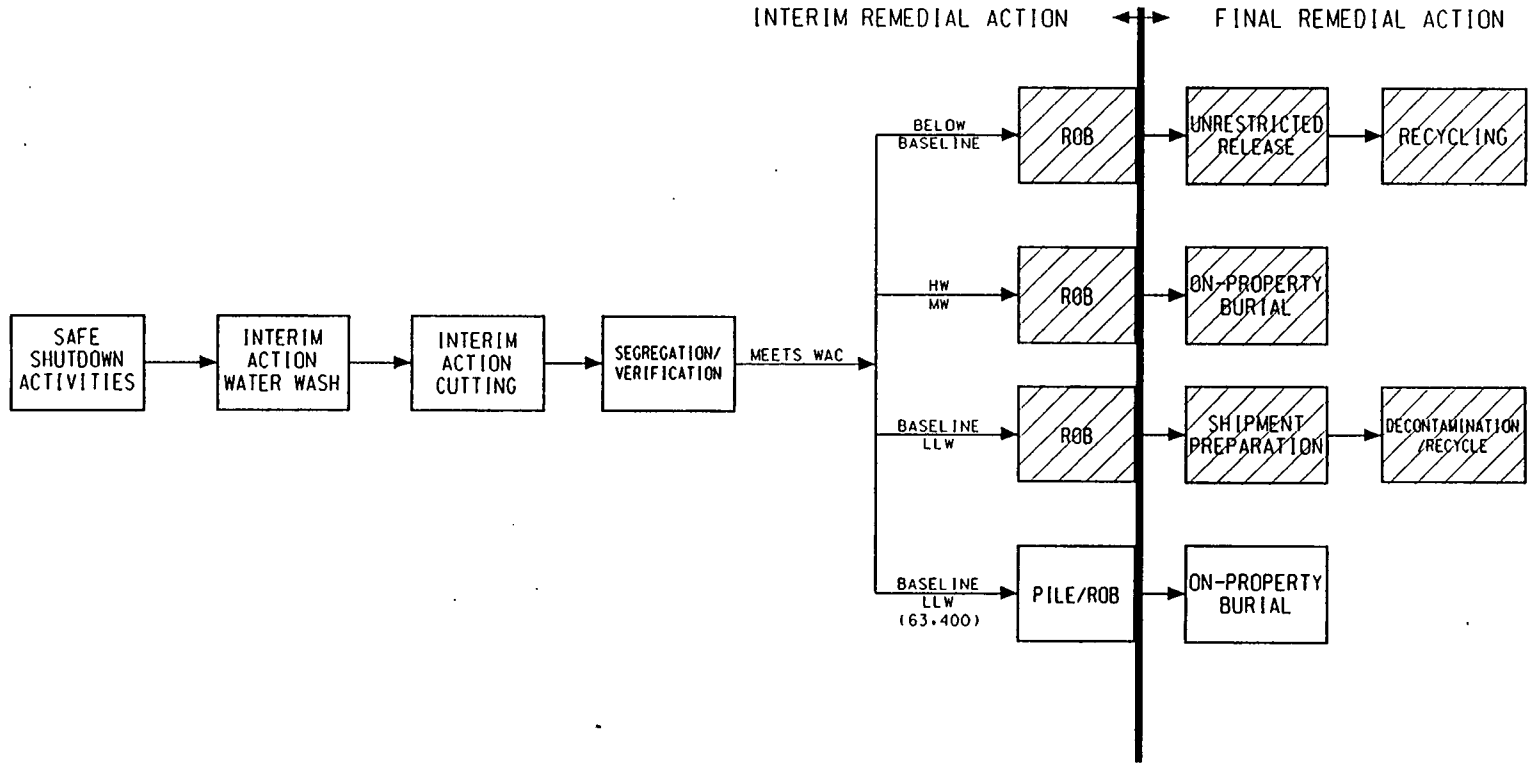
FIGURE E-1

ALTERNATIVE 2
A-ACCESSIBLE METALS



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
B-12	= White Metal Box (9,000 lb. Capacity)
LMB	= Large Metal Box (35,000 lb. Capacity)

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/usr/erma/3oca4/dgn/ACCMETAL.DGN 11/29/95
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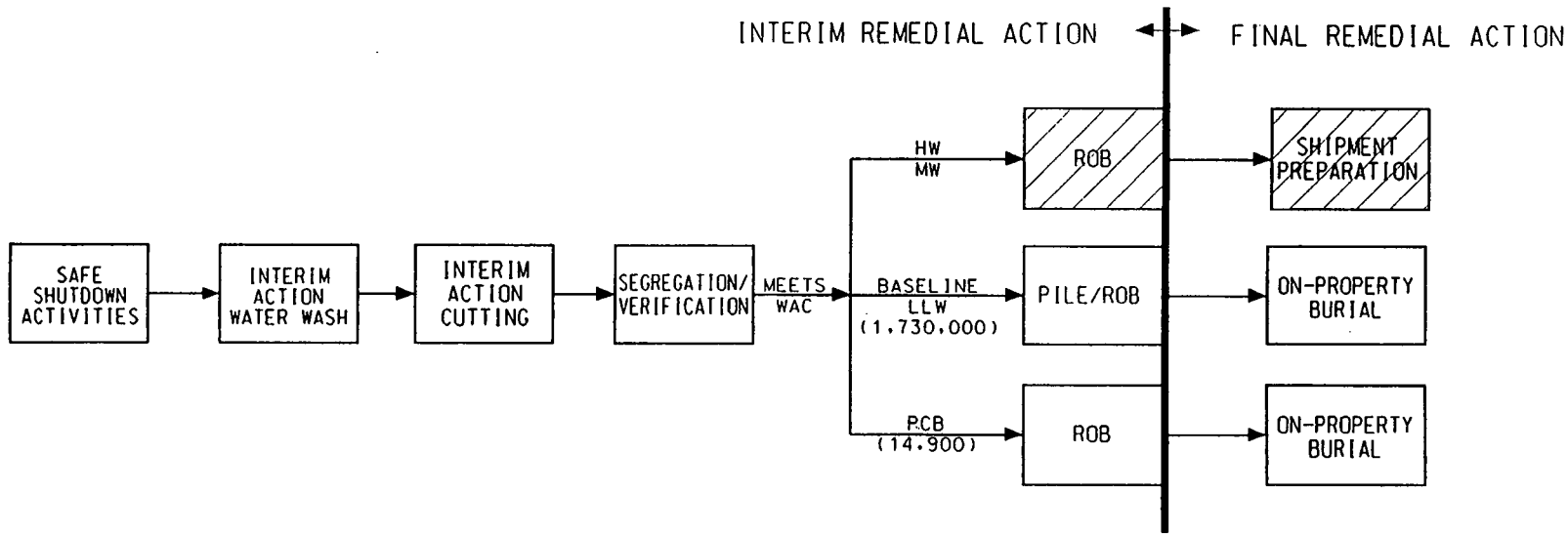
FIGURE E-2

ALTERNATIVE 2
B-INACCESSIBLE METALS



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
B-12	= White Metal Box (9,000 lb. Capacity)
LMB	= Large Metal Box (35,000 lb. Capacity)

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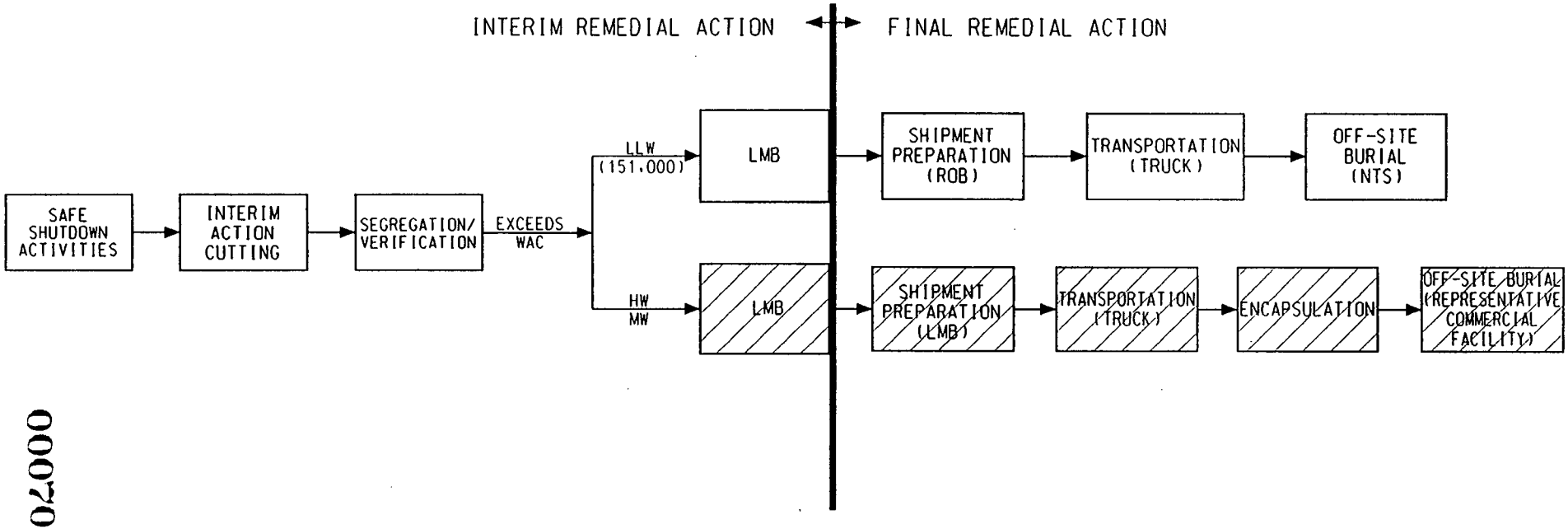
/usr/ermo5/3aca4/dgn/INACMETAL.DGN 11/29/95

FOGURE E-3

ALTERNATIVE 2
C-PROCESS RELATED METALS



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MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Baseline Segregation Category N/A

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
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LMB	= Large Metal Box (35,000 lb. Capacity)

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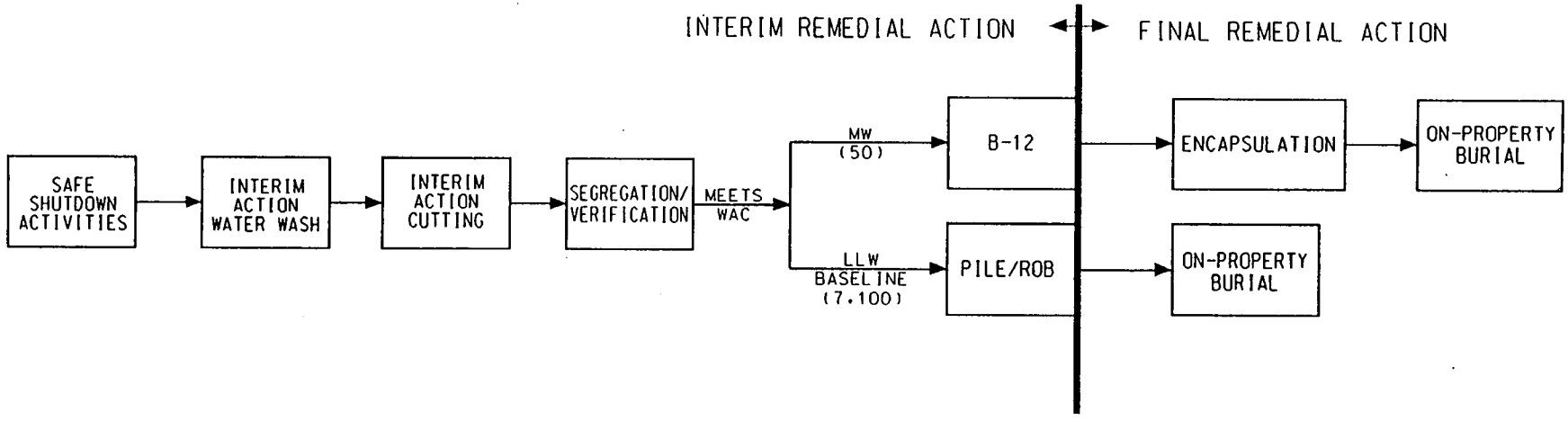
FIGURE E-4

ALTERNATIVE 2
D-PAINTED LIGHT GAUGE METALS



MATERIAL SEGREGATION CATEGORIES

BASELINE = ≤ Baseline Concentrations
LLW = Low Level Waste
HW = Hazardous Waste
MW = Mixed Waste
TSCA = PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC = Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB = Roll-Off Box
ITC = Intermodal Transport Container
B-25 = White Metal Box (6,800 lb. Capacity)
B-12 = White Metal Box (9,000 lb. Capacity)
LMB = Large Metal Box (35,000 lb. Capacity)

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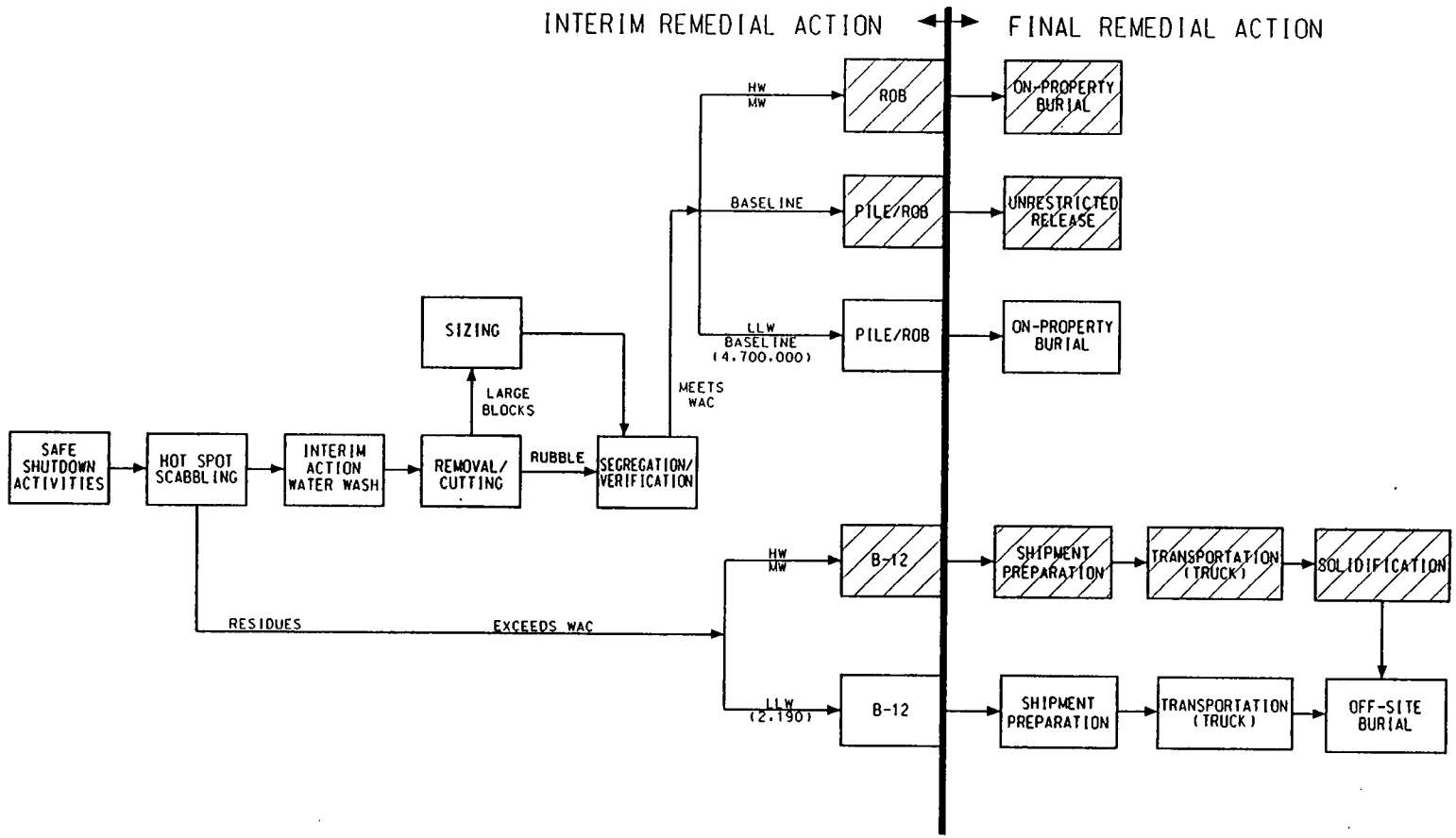
/usr/ermo5/3aca4/dgn/PLGMETAL.DGN 11/29/95

FIGURE E-5

ALTERNATIVE 2
E-CONCRETE



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Catergories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

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ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
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LMB	= Large Metal Box (35,000 lb. Capacity)

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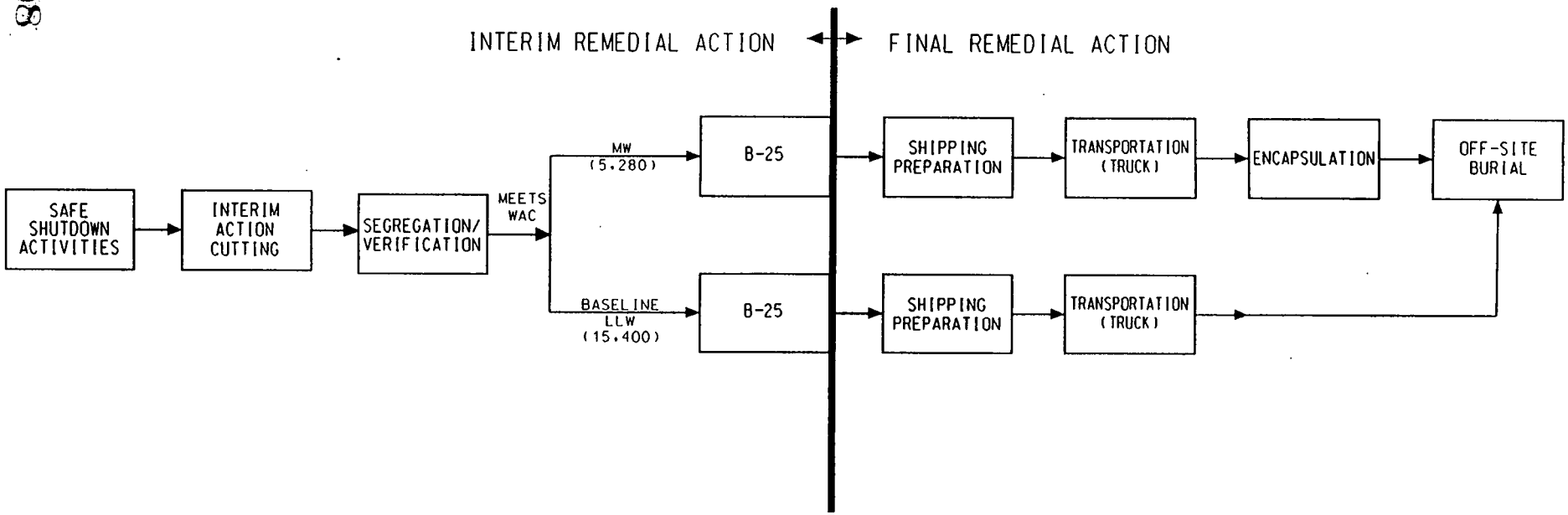
FIGURE E-6

ALTERNATIVE 2
F-BRICK



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

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ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
B-12	= White Metal Box (9,000 lb. Capacity)
LMB	= Large Metal Box (35,000 lb. Capacity)

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/usr/ermas/3aca4/dgn/BRICK.DGN 11/29/95

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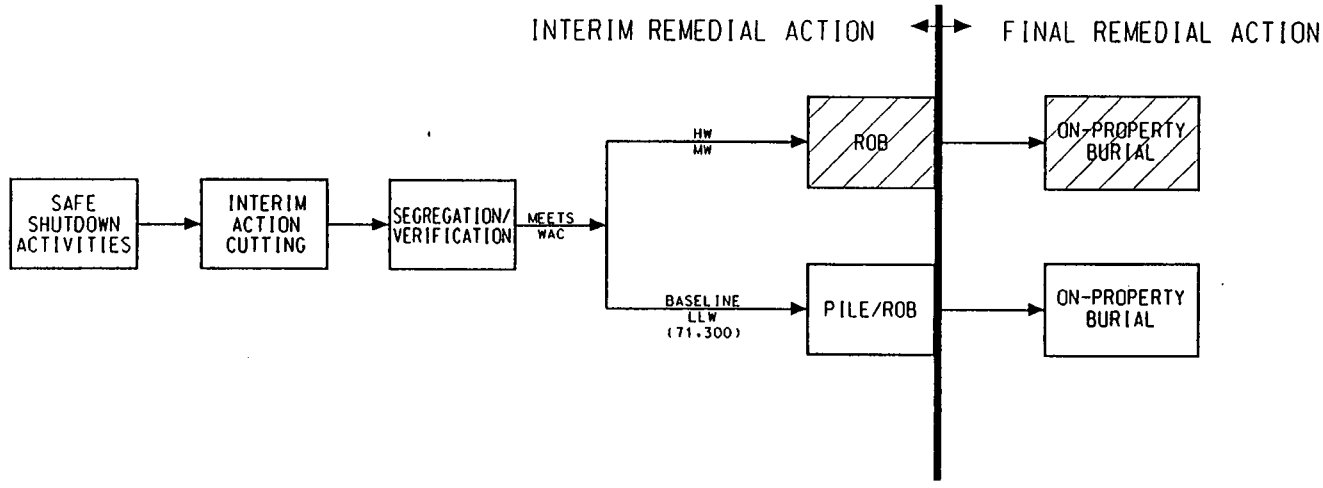
FIGURE E-7

ALTERNATIVE 2
G-NON-REGULATED ACM



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
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LMB	= Large Metal Box (35,000 lb. Capacity)

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/usr/ermas/3aca4/dgn/NONREGACM.DGN 11/29/95

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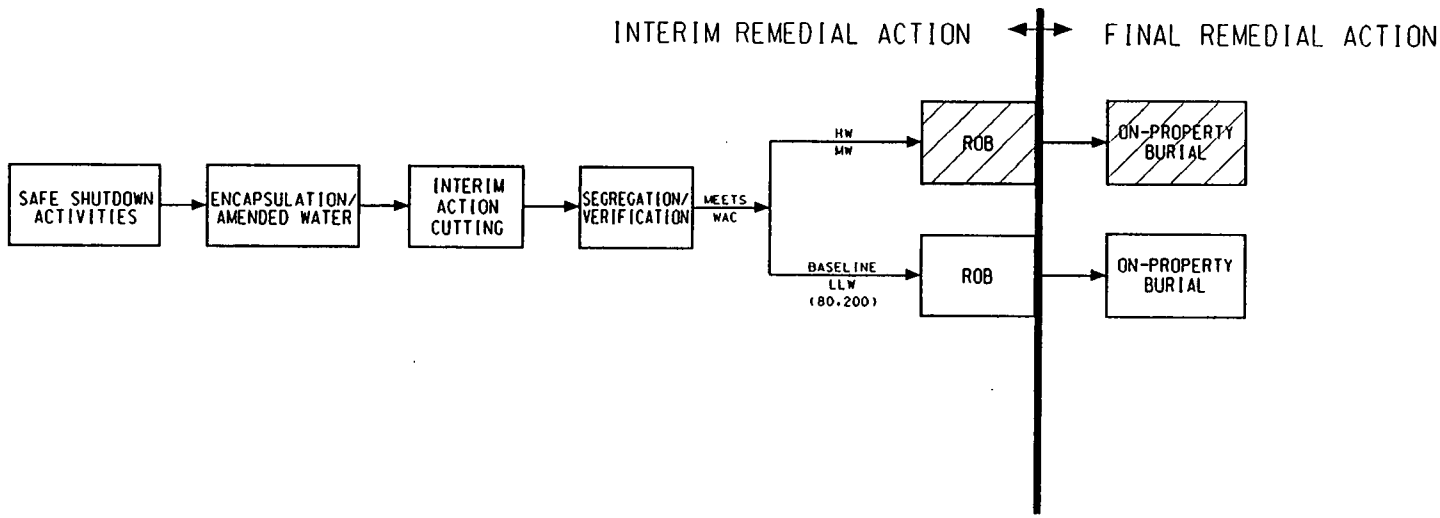
FIGURE E-8

ALTERNATIVE 2
H-REGULATED ACM



MATERIAL SEGREGATION CATEGORIES

BASELINE = ≤ Baseline Concentrations
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MW = Mixed Waste
TSCA = PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

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LMB = Large Metal Box (35,000 lb. Capacity)

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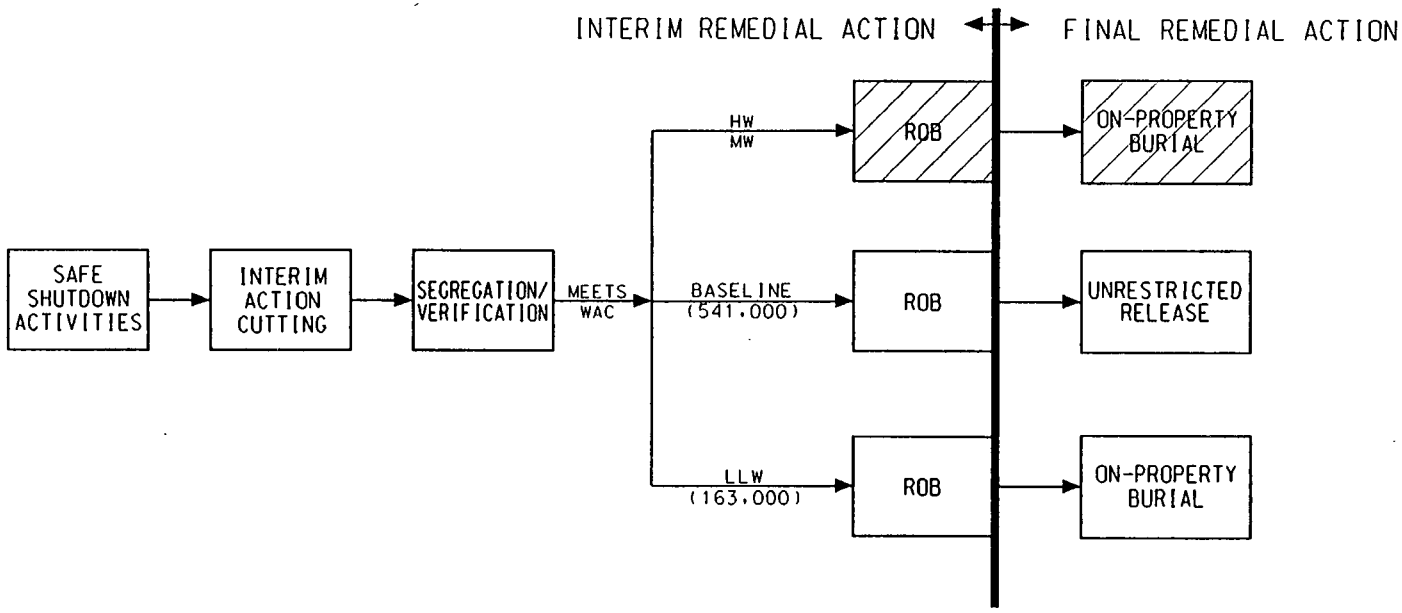
/usr/ermd5/3aca4/dgn/REGUACM.DGN 11/29/95

FIGURE E-9

ALTERNATIVE 2
I-MISCELLANEOUS



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
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B-25	= White Metal Box (6,800 lb. Capacity)
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LMB	= Large Metal Box (35,000 lb. Capacity)

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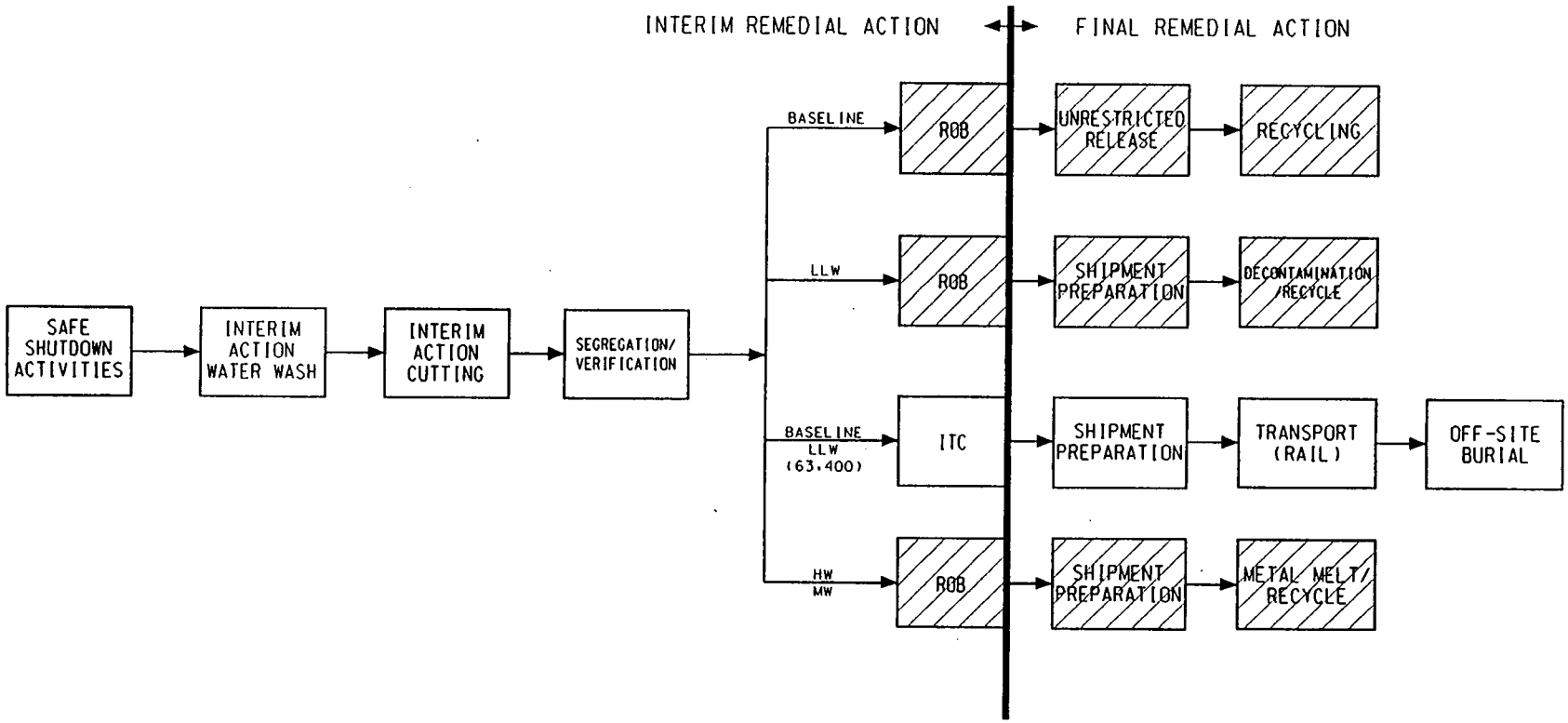
FIGURE E-10

ALTERNATIVE 3
A-ACCESSIBLE METALS



MATERIAL SEGREGATION CATEGORIES

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HW = Hazardous Waste
MW = Mixed Waste
TSCA = PCB Waste

NOTES

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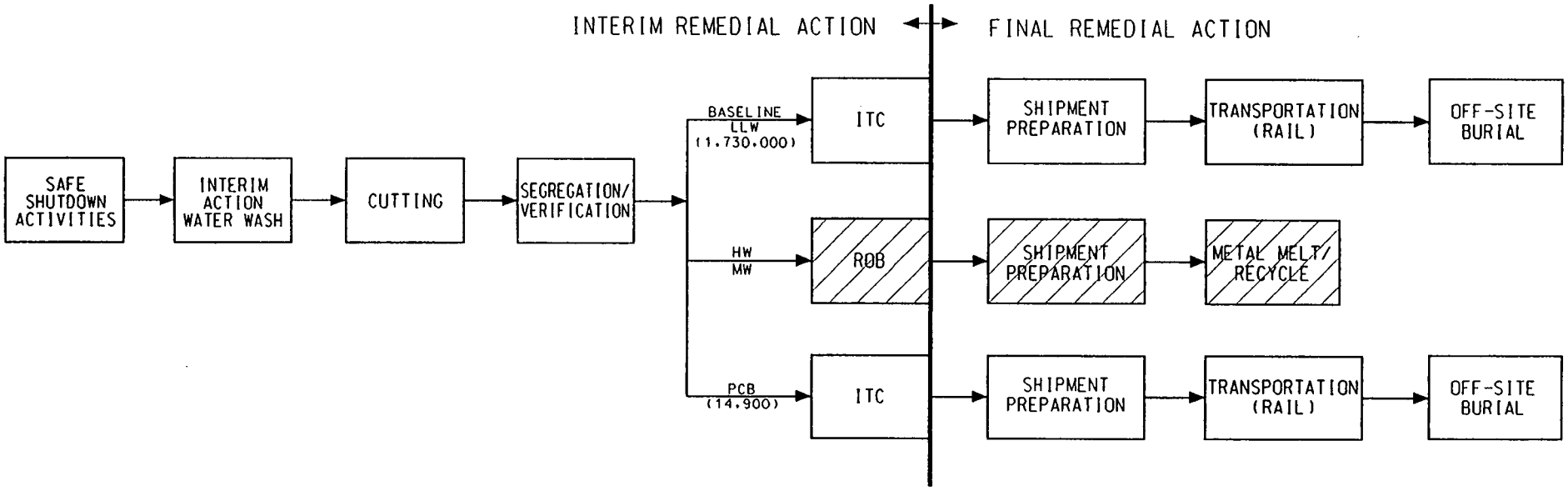
/usr/ermd5/3aca4/dgn/ACCMETAL.DGN 11/29/95

FIGURE E-11

ALTERNATIVE 3
B-INACCESSIBLE METALS



MATERIAL SEGREGATION CATEGORIES

BASELINE = ≤ Baseline Concentrations
LLW = Low Level Waste
HW = Hazardous Waste
MW = Mixed Waste
TSCA = PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC = Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB = Roll-Off Box
ITC = Intermodal Transport Container
B-25 = White Metal Box (6,800 lb. Capacity)
B-12 = White Metal Box (9,000 lb. Capacity)
LMB = Large Metal Box (35,000 lb. Capacity)

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/usr/ermd5/3aco4/dgn/INACMETAL.DGN 11/29/95

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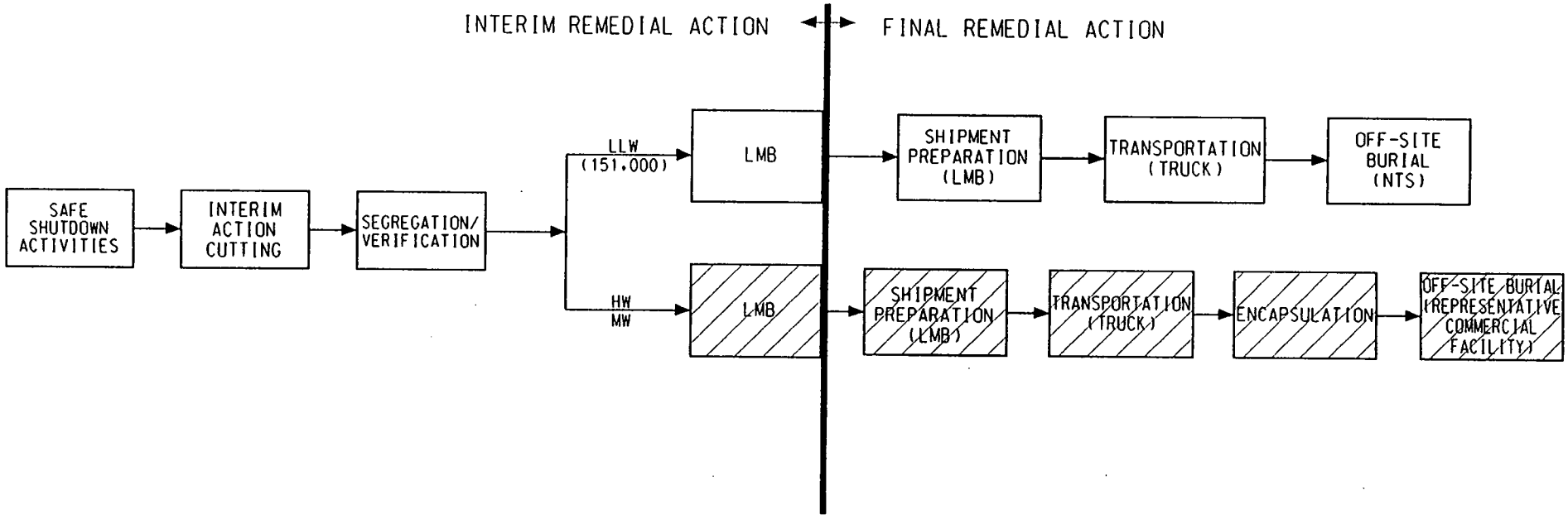
FIGURE E-12

ALTERNATIVE 3
C-PROCESS RELATED METALS



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Background Segregation Category N/A

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
B-12	= White Metal Box (9,000 lb. Capacity)
LMB	= Large Metal Box (35,000 lb. Capacity)

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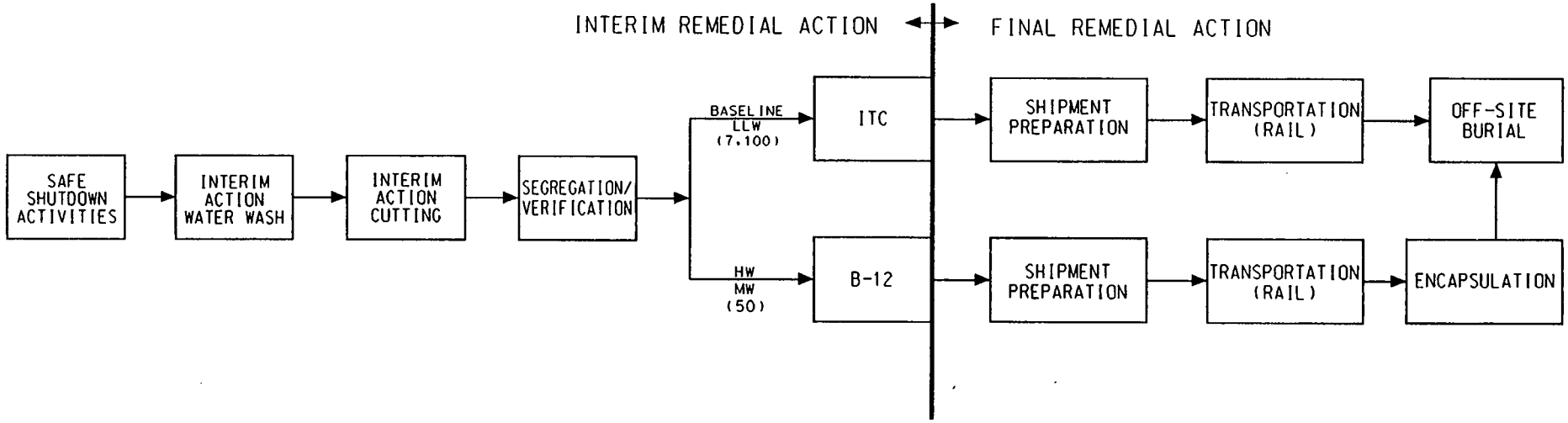
/usr/ermd5/3aco4/dgn/PROREMET.DGN 11/29/95

FIGURE E-13

ALTERNATIVE 3
D-PAINTED LIGHT GAUGE METALS



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
B-12	= White Metal Box (9,000 lb. Capacity)
LMB	= Large Metal Box (35,000 lb. Capacity)

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/usr/ermo5/3aca4/dgn/PLGMETAL.DGN 11/29/95

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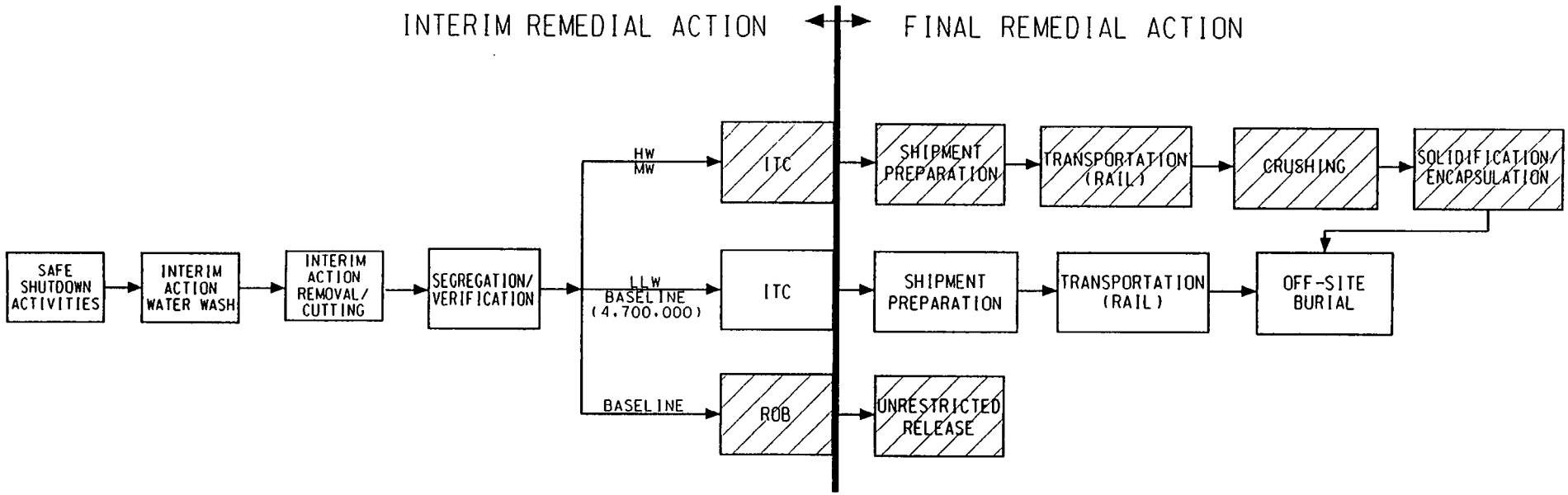
FIGURE E-14

ALTERNATIVE 3
E-CONCRETE



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Catergories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
B-12	= White Metal Box (9,000 lb. Capacity)
LMB	= Large Metal Box (35,000 lb. Capacity)

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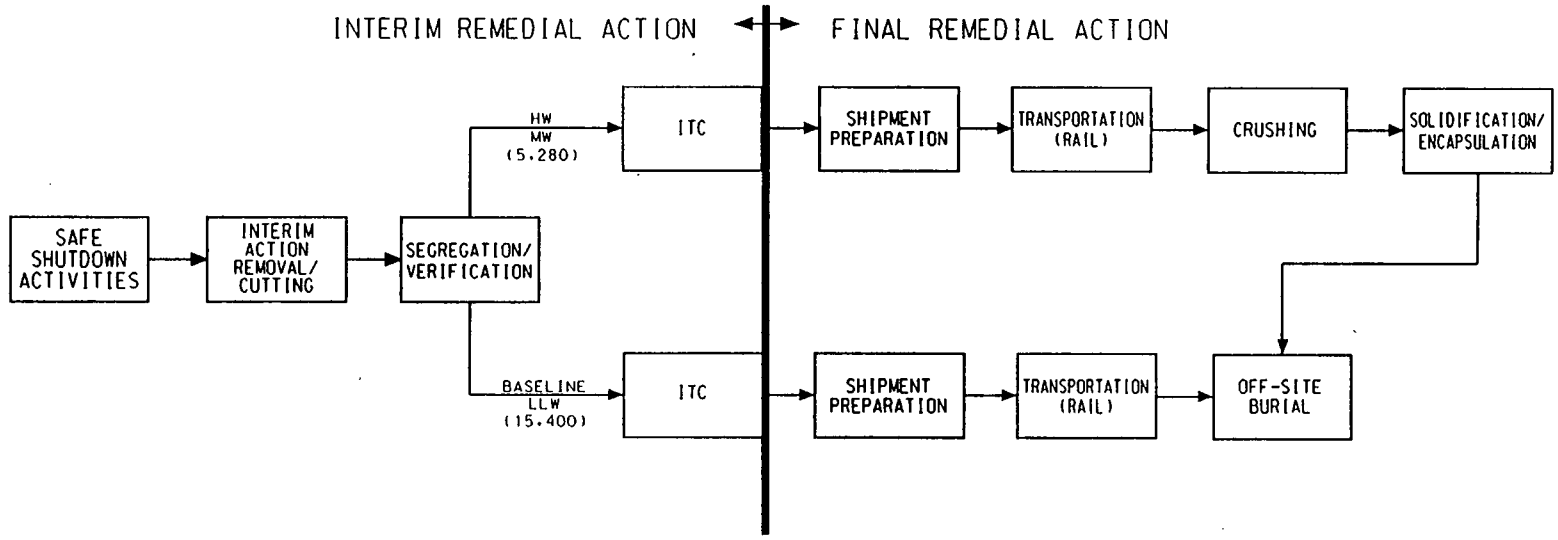
/usr/ermo5/3aca4/dgn/CONCRETE.DGN 11/29/95

FIGURE E-15

ALTERNATIVE 3
F-BRICK



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
B-12	= White Metal Box (9,000 lb. Capacity)
LMB	= Large Metal Box (35,000 lb. Capacity)

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/usr/ermd5/3acad/dgn/BRICK.DGN 11/29/95

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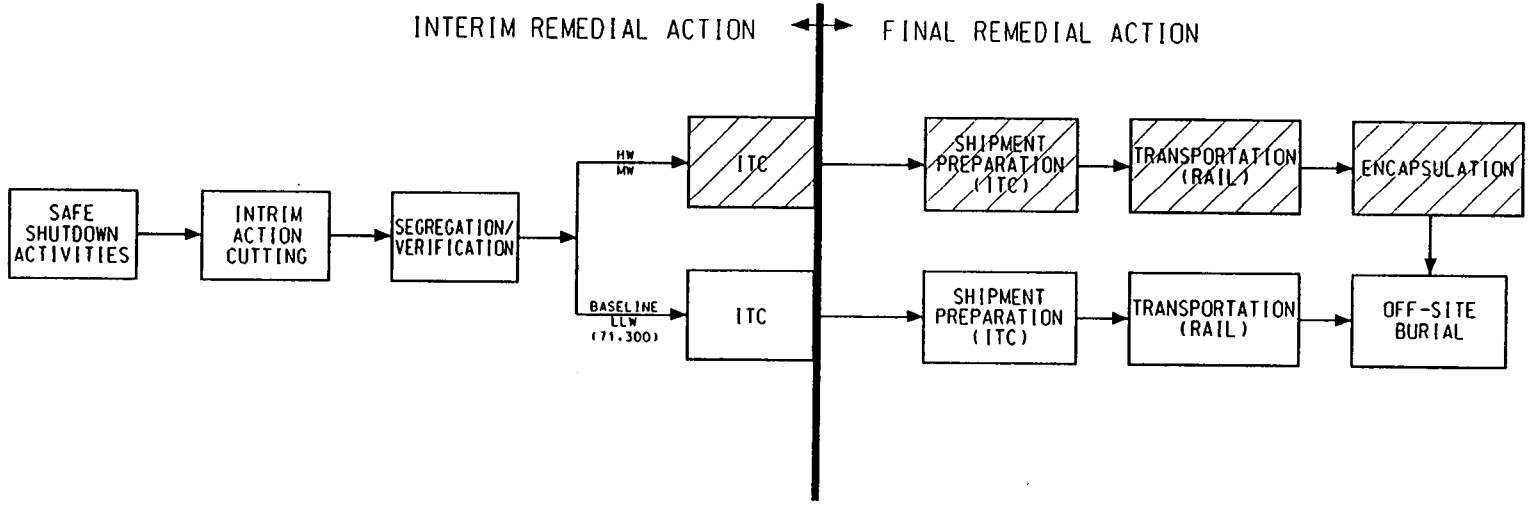
FIGURE E-16

ALTERNATIVE 3
G-NON-REGULATED ACM



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

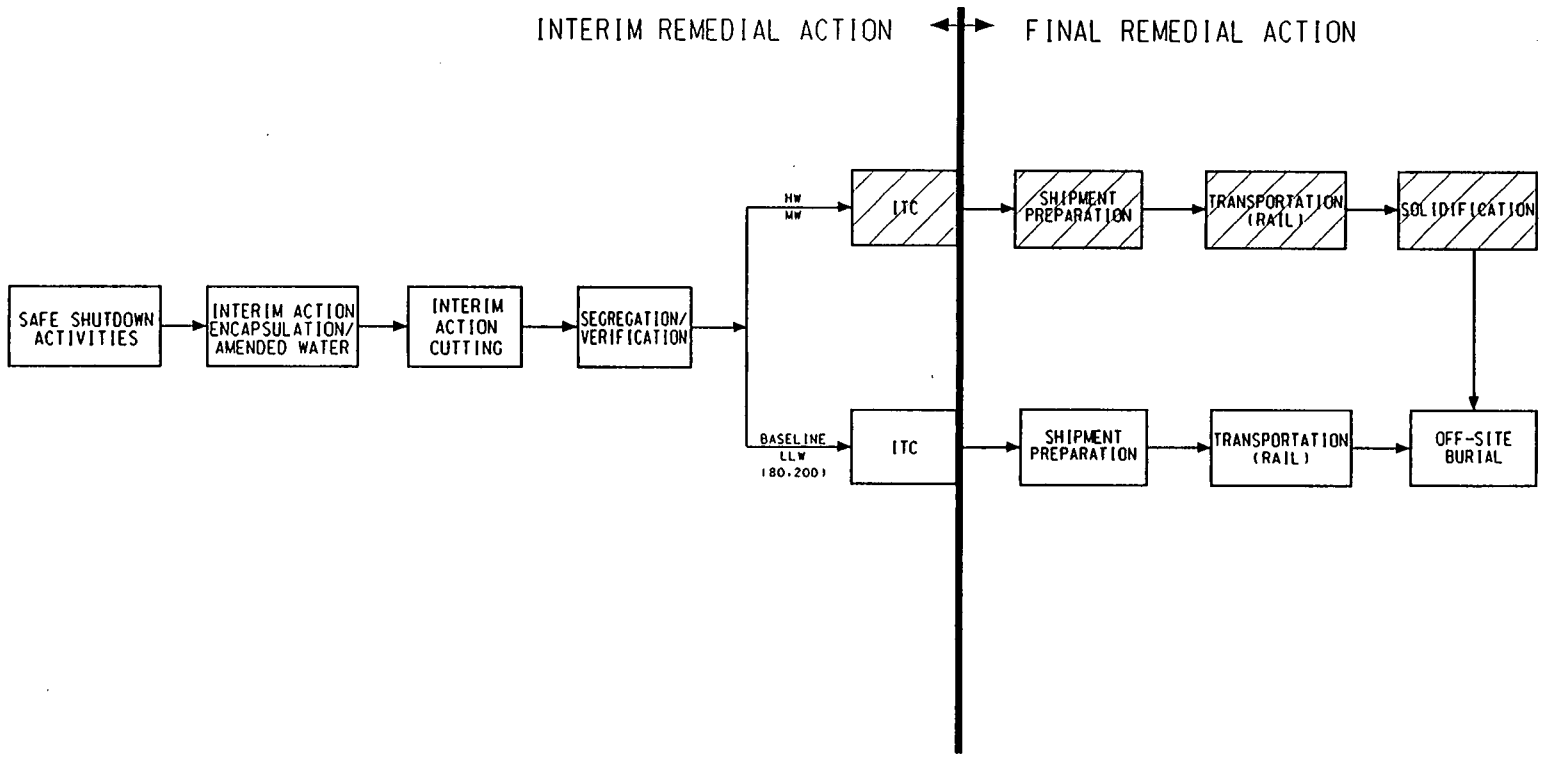
WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
B-12	= White Metal Box (9,000 lb. Capacity)
LMB	= Large Metal Box (35,000 lb. Capacity)

/usr/ermo5/3oco4/dgn/NONREGACM.DGN 11/29/95

DRAFT

FIGURE E-17

ALTERNATIVE 3
H-REGULATED ACM



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
B-12	= White Metal Box (9,000 lb. Capacity)
LMB	= Large Metal Box (35,000 lb. Capacity)

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/usr/ermo5/3oco4/dgn/REGUACM.DGN 11/29/95

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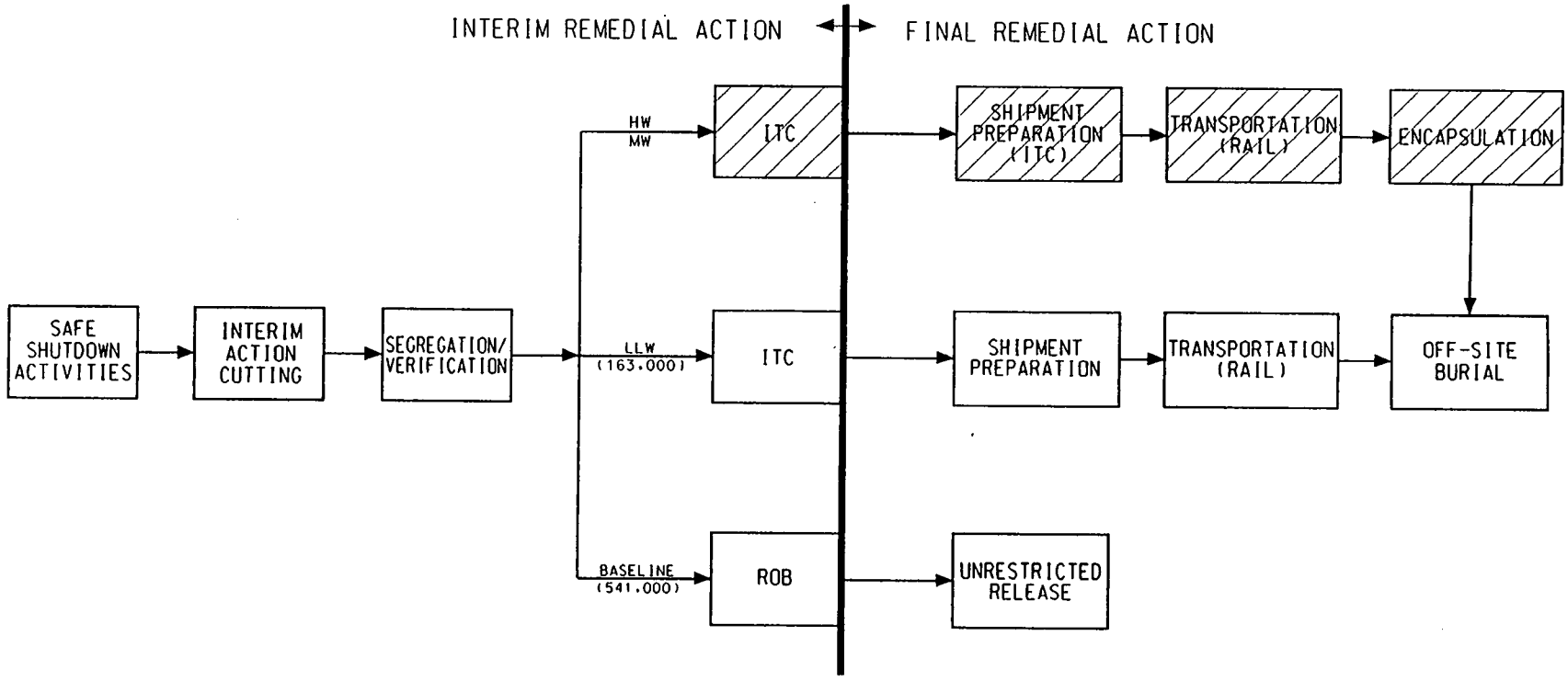
FIGURE E-18

ALTERNATIVE 3
I-MISCELLANEOUS



MATERIAL SEGREGATION CATEGORIES

BASELINE	= ≤ Baseline Concentrations
LLW	= Low Level Waste
HW	= Hazardous Waste
MW	= Mixed Waste
TSCA	= PCB Waste

NOTES

Blocks Remain Unshaded for Segregation Categories with Non-Zero Quantities

Quantities are in (CF)

ACRONYMS

WAC	= Risk-Based Waste Acceptance Criteria for On-Property Disposal
ROB	= Roll-Off Box
ITC	= Intermodal Transport Container
B-25	= White Metal Box (6,800 lb. Capacity)
B-12	= White Metal Box (9,000 lb. Capacity)
LMB	= Large Metal Box (35,000 lb. Capacity)

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/usr/ermo5/3aca4/dgn/MICELL.DGN 11/29/95

E.I.2.4 Recycle - Metal Melt for Restricted Use

The metal-melt decontamination method used for structural steel includes melting the steel components and molding them into end products, such as containers that can be used under radiological control. The surface contamination is stabilized as a result of the melting process. The recycling costs are based on actual data and proposals submitted by the vendors for recycling structural steel from the D&D of Plant 7.

The following assumptions are made for the structural steel metal-melt process.

- The structural steel would be shipped in ROBs to a commercial metal-melt facility;
- ROBs used for the transportation of the structural steel to a commercial metal-melt facility would have 25 reuses (cost of ROBs are prorated per use);
- The secondary wastes, such as slag and molten waste generated as a result of the metal-melting processes, would be dispositioned at Envirocare; and
- A portion of the material would be rejected for the metal-melt process due to the presence of other metal and contaminants, and it would therefore be dispositioned in the on-property disposal facility.

Additional assumptions are detailed on the estimate summary sheet (Table E.I-4).

E.I.3 COST COMPARISONS

Based on the volume and weight estimates in Appendix B, the total unbulked volume and weight of OU3 structural steel is 63,400 ft^3 and 15,200 tons, respectively. The following listing presents total costs as well as a unit cost per ft^3 for the four options evaluated for structural steel.

Option	Total Cost	Unit Cost
1. On-Property Disposal (Alternative 2)	~~$1,004,500~~	~~$15.84~~/$ft^3$
	1,001,400	15.79
2. Off-Site Disposition (Alternative 3)	~~$5,206,500~~	~~$82.12~~/$ft^3$
	4,742,200	74.80
3. Recycle - Decontamination (Unrestricted Use)	~~$33,085,700~~	~~$521.86~~/$ft^3$
	33,136,700	522.66
4. Recycle - Metal Melt (Restricted Use)	~~$37,652,000~~	~~$593.88~~/$ft^3$
	38,184,200	602.27

E.I.4 CONCLUSIONS

disposed of by the Fernald Environmental Management Project (FEMP) at both on-property and off-site locations, low unit rates for disposal are available.

But cost represents only one factor in the evaluation of recycling as a viable alternative to disposal. Other factors limiting recycling include limited survey capabilities for inaccessible surfaces, few vendors performing recycling, liability for release of materials, and limited uses for contaminated materials. At this time, few companies perform recycling of radiologially contaminated materials and as a result, minimal competition exists to reduce the costs to be incurred. Additional factors that are limiting the number of companies willing to perform recycling is the requirement for the company to accept potential liability for the release of the materials. Finally, for the materials that cannot be effectively released for unrestricted use, no market currently exists for the processing of or reuse of contaminated materials.

The following text has been added to page 4-8, line 9; page E-5, line 26; page E.I-5, line 13 while currently available cost data suggest recycling is significantly more expensive than disposal it should be noted that as new technologies or markets become available this could change. DOE also recognizes that, while cost is a driving factor in making project-specific recycling decisions, other factors such as stakeholder input are relevant and should be considered as well. DOE will continue over the life of the D&D of the Former Production Area to agressively evaluate existing and emerging recycling technologies and markets to identify opportunities for cost-competitive application at the FEMP.

Because of large-scale environmental projects throughout the Department of Energy (DOE), funding constraints are imposing limitations on disposition options that can be pursued. Based on current ~~the~~ costs and other limiting factors as detailed above, recycling of metal materials will not be carried forward into the alternative in Section 5. ~~comparisons, at this time it is not currently cost effective for the FEMP to recycle metal materials.~~ Therefore, for cost and evaluation purposes only, the OU3 Remedial Investigation/Feasibility Study (RI/FS) Report assumes that the recycling option is not pursued. However, throughout the performance of the D&D action, DOE commits to evaluate recycling as a viable option. The OU3 RI/FS strives to maintain recycling as an option to be considered for each material at the time of it's intended generation and will continue to evaluate recycling on a case by case basis within each D&D complex implementation plan. ~~However, if, during the performance of the remedial actions, recycling costs become more competitive with~~

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~~disposal costs, recycling would be reevaluated for structural steel as well as other metal materials such as copper, inconel, monel, stainless steel, etc., for beneficial impacts. If cost effective, recycling could be readily pursued as part of the dispositon remedy.~~

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
F:\LOTUS34\JIM\DEC95-FS\RECYCLE3.WK3

TABLE E.I-1
COST STUDY
ESTIMATE SUMMARY

CONTRACT #: 0442432

BY: KDM / JAW
DATE: 12/09/95
TIME: 03:52 PM

	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	LINE TOTAL
ON-PROPERTY DISPOSITION (ALTERNATIVE 2)												
COMMODITY: LOW LEVEL STRUCTURAL STEEL												
ROLL-OFF BOXES (ROB) REUSE 25 LOADS PER ROB	53	EACH						$7,000			$372,900	$372,900
ON-PROPERTY HAULING ROB (from CDF to queue area)	53	LOAD	2.40	128	21.06				$2,700			$2,700
ROB MAINTENANCE (every other load)	653	LOAD	14.40	9,410	22.64			$100	$213,000		$65,300	$278,300
ON-PROPERTY HAULING, DISPOSAL & RETURN.	1,307	LOAD	3.02	3,947	21.06				$83,100			$83,100
ON-PROPERTY BURIAL IN CELL (UNBULKED)	63,400	CF					$4.17			$264,400		$264,400
SUBTOTAL				13,484					$298,800	$264,400	$438,200	$1,001,400

NOTES

1. Costs based on Alternative 2 with On-property disposal of structural steel.
2. Roll-off box prices were provided by Waste Management.
3. Number of ROB loads needed were based on the following :

BULKED CF	1,058,592
DIVIDED BY INTERIOR CF VOLUME LIMIT OF ROB	810
EQUALS TOTAL NUMBER OF ROB LOADS	1307
DIVIDED BY ASSUMPTION 25 REUSES PER ROB	25
EQUALS NUMBER OF ROBS NEEDED	53

NOTES CONTINUED

4. ROB maintenance manhour units were provided in OU3 FS. Material costs to cover replacement of the tarp and general repairs such as rivets, tears or welds.
5. On-property burial rate provided by OU2 and is consisting of longterm ground-water monitoring and disposal facility monitoring and maintenance.
6. This estimate does not include risk or contingency.

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WBS NO.-1.[illegible].3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
F:\LOTUS34\JIM\DEC95-FS\RECYCLE3.WK3

TABLE E.I-2
COST STUDY
ESTIMATE SUMMARY

CONTRACT #: 0442432
BY: KDM / JAW
DATE: 12/09/95
TIME: 03:49 PM

	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	LINE TOTAL
OFF-SITE DISPOSITION - ENVIROCARE (ALTERNATIVE 3)												
COMMODITY: LOW LEVEL STRUCTURAL STEEL												
INTERMODAL TRANSPORT CONTAINER (REUSE 50 X)	28	EA.						$6,920			$191,300	$191,300
ON-PROPERTY HAULING ITC (from CDF to queue area)	1,382	LOAD	2.40	3,317	21.06				$69,900			$69,900
ON-PROPERTY HAULING ITC (from queue area to shipping area)	1,382	LOAD	2.40	3,317	21.06				$69,900			$69,900
WEIGH AND CERTIFICATION OF ITC	1,382	LOAD	15.00	20,730	24.94				$517,000			$517,000
ON-PROPERTY LOADING OF ITC ONTO RR CAR	1,382	LOAD	7.50	10,365	21.35				$221,300			$221,300
ITC MAINTENANCE/SURVEY	1,382	LOAD	14.40	19,900	22.64			$100	$450,500		$138,200	$588,700
RAIL ROAD TRANSPORTATION	1,382	I.T.C.					$1,333			$1,842,200		$1,842,200
ARTICULATED CONTAINER CAR COST	1,382	I.T.C.					$211			$290,900		$290,900
SAMPLING, STORAGE, MONITORING, WASTE PROFILING	63,400	CF							$507,200			$507,200
OFF-SITE BURIAL - ENVIROCARE (UNBULKED)	63,400	CF					$7.00			$443,800		$443,800
SUBTOTAL				57,628					$1,835,800	$2,576,900	$329,500	$4,742,200

NOTES

1. ITCs are $6920 each. This price was provided in the OU3 FS.
2. Number of ITC loads needed were based on the following calculations
   BULKED CF 1,058,592
   DIVIDED BY INTERIOR CF VOLUME LIMIT OF ITC 766
   EQUALS TOTAL NUMBER OF ITC LOADS 1382
3. Assumption made that ITC would be reused 50 times, based on data provided by the vendor and on-site judgement.
   TOTAL NUMBER OF ITC LOADS 1382
   DIVIDED BY REUSE NUMBER 50
   EQUALS TOTAL NUMBER OF ITC NEEDED 28
4. ITC maintenance hours were provided in OU3 FS, the hours include survey/paperwork time to get the ITC back on site. Material costs to cover replacement of the tarp and general repairs such as rivets, tears and/or welds.

NOTES CONTINUED

5. Railroad transportation cost were provided in OU3 FS.
6. Articulated container car costs were provided in OU3 FS.
7. Envirocare burial rate provided in OU3 FS.
8. Bulked volumes were used to calculate number of ROB/loads, and ITCs.
9. This estimate does not include risk or contingency.

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WBS NO.-1.1.1.1.3.1.3
CLIENT- U.S. DEPT. OF ENERGY
PROJECT- OU3 FEASIBILITY STUDY
LOCATION- FERNALD, OHIO
PROJ.CTL.- TJV
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TABLE E.I-3
COST STUDY
ESTIMATE SUMMARY

CONTRACT #: 0442432

BY: KDM / JAW
DATE: 12/09/95
TIME: 03:50 PM

	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	LINE TOTAL
OFF-SITE DISPOSITION - DECON-RECYCLE												
COMMODITY: LOW LEVEL STRUCTURAL STEEL												
ROLL-OFF BOXES (ROB) REUSE 25 LOADS PER ROB	53	EACH						$7,000			$372,900	$372,900
ON-PROPERTY HAULING ROB (from CDF to queue area)	53	LOAD	2.40	128	21.06				$2,700			$2,700
ON-PROPERTY HAULING (from queue area to ship area)	1,307	LOAD	2.40	3,137	21.06				$66,100			$66,100
WEIGH, CERTIFICATION & STAGE FOR VENDOR	1,307	LOAD	15.00	19,604	24.94				$488,900			$488,900
ROB MAINTENANCE/SURVEY	1,307	LOAD	14.40	18,819	22.64			$100	$426,100		$130,700	$556,800
SHOT AND PAINT CHIPS - BURIAL AT ENVIROCARE	761	CF					7.00			$5,300		$5,300
ON-PROPERTY HAULING, DISPOSAL	102	LOAD	3.02	309	21.06				$6,500			$6,500
REJECTED STEEL - BURIAL IN CELL	4,963	CF					4.17			$20,700		$20,700
COMPACTIBLE WASTE - BURIAL IN CELL	190	CF					4.17			$800		$800
DECON - RECYCLE VENDOR COST PER LBS.	30,400,000	LBS					$1.04			$31,616,000		$31,616,000
SUBTOTAL				41,996					$990,300	$31,642,800	$503,600	$33,136,700

NOTES

1. Roll-off box prices were provided by Waste Management.
2. Number of ROB and ROB loads needed were based on the following :

BULKED CF	1,058,592
DIVIDED BY INTERIOR CF VOLUME LIMIT OF ROB	810
EQUALS TOTAL NUMBER OF ROB LOADS	1307
DIVIDED BY ASSUMPTION 25 REUSES PER ROB	25
EQUALS NUMBER OF ROBS NEEDED	53

3. Weigh, certification, and load rates provided by Waste Management.
4. ROB maintenance hours were provided in OU3 FS, the hours include survey/paperwork time to get the ROB back on site. Material costs to cover replacement of the tarp and general repairs such as rivets, tears and/or welds.
5. Envirocare burial rate provided in OU3 FS.
6. Rejected steel volume based on actuals and vendor's quotes on Plant 7. The same percentage is then used for this project. A factor of 490 lbs per cf was used for the conversion.

TOTAL OF STRUCTURAL STEEL (LBS)	30,400,000
TIMES PERCENTAGE FROM PLANT 7	0.08
EQUALS STEEL TO BE REJECTED (lbs)	2,432,000
DIVIDED BY FACTOR (lbs per cf)	490
EQUALS STEEL TO BE REJECTED (cf)	4963

NOTES CONTINUED

7. Secondary waste (shot and paint chips) volume based on actuals and vendors quotes from Plant 7. The same percentage is then used for this project. The number is then doubled due to treatment. (solidification)

UNBULKED VOLUME OF STRUCTURAL STEEL (cf)	63,400
TIMES PERCENTAGE FROM PLANT 7	0.006
EQUALS PAINT CHIPS (cf)	380

8. Assumption made that compactible waste volume was 3% of the total unbulked volume based on actuals and vendors quote from Plant 7. The same percentage then used for this project.
9. Recycle rates were provided by vendor proposals for recycling Plant 7 metals. This rate includes:
   Shipment of structural steel to vendor, sort and resize, use of hand tools to remove paint before size reduction, grit blast, spin blast, chem dcon, free release survey, shipment of empty ROB back to FERMCO, treatment of secondary waste, report/schedules to FERMCO, shipment of secondary waste to Envirocare for burial, and shipment of compactable waste to Fernald for burial in the cell.
10. On-property burial rate provided by OU2 and is consisting of longterm ground-water monitoring and disposal facility monitoring and maintenance.
11. This estimate does not include risk or contingency.

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WBS NO.–1[illegible].1.3
CLIENT– U.S. DEPT. OF ENERGY
PROJECT– OU3 FEASIBILITY STUDY
LOCATION– FERNALD, OHIO
PROJ.CTL.– TJV
F:\LOTUS34\JIM\DEC95–FS\RECYCLE3.WK3

TABLE E.I–4
COST STUDY
ESTIMATE SUMMARY

CONTRACT #: 0442432

BY: KDM / JAW
DATE: 12/11/95
TIME: 09:57 AM

	QUAN	UNIT	MANHOURS UNIT	MANHOURS TOTAL	MANHOURS RATE	COST/UNIT LABOR	COST/UNIT SUB	COST/UNIT MAT'L	LABOR	SUB CONTRACT	MATERIAL	LINE TOTAL
OFF–SITE DISPOSITION – METAL MELT–RECYCLE												
COMMODITY: LOW LEVEL STRUCTURAL STEEL												
ROLL–OFF BOXES (ROB) REUSE 25 LOADS PER ROB	53	EACH						$7,000			$372,900	$372,900
ON–PROPERTY HAULING ROB (from CDF to queue area)	1,307	LOAD	2.40	3,137	21.06				$66,100			$66,100
ON–PROPERTY HAULING (from queue area to ship area)	1,307	LOAD	2.40	3,137	21.06				$66,100			$66,100
WEIGH,CERTIFICATION & STAGE FOR VENDOR	1,307	LOAD										
ROB MAINTENANCE/SURVEY	1,307	LOAD	14.40	18,819	22.64			$100	$426,100		$130,700	$556,800
SLAG AND MISC MOLTEN WASTE – BURIAL ENVIROCARE	45	SWMB					$735			$33,400		$33,400
ON–PROPERTY HAULING, DISPOSAL	1	LOAD	3.02	3	21.06				$100			$100
COMPACTIBLE WASTE – BURIAL IN CELL	190	CF					$4.17			$800		$800
METAL MELT VENDER COST PER LBS.	30,400,000	LBS					$1.22			$37,088,000		$37,088,000
SUBTOTAL				25,096					$558,400	$37,122,200	$503,600	$38,184,200

NOTES

1. Roll–off box prices were provided by Waste Management.
2. Number of ROB and ROB loads needed were based on the following :
   BULKED CF 1,058,592
   DIVIDED BY INTERIOR CF VOLUME LIMIT OF ROB 810
   EQUALS TOTAL NUMBER OF ROB LOADS 1307
   DIVIDED BY ASSUMPTION 25 REUSES PER ROB 25
   EQUALS NUMBER OF ROBS NEEDED 53
3. Weigh, certification, and load rates provided by Waste Management.
4. ROB maintenance hours were provided in OU3 FS, the hours include survey/paperwork time to get the ROB back on site. Material costs to cover replacement of the tarp and general repairs such as rivets, tears
5. and/or welds.
6. Envirocare burial rate provided in OU3 FS.
7. Percentages used to figure volume of slag and misc molten waste were taken from vendors proposals for recyling Plant 7 metals.
7. Costs for the burial of the SWMB of slag and misc molten metal developed using this formula.... ext cf (105) x burial rate (7)...105*7=735.
8. Assumption made that compactible waste volume was 3% of the total unbulked volume based on actuals and vendors quote from Plant 7. The same percentage is then used for this project.
9. Metal melt rates were provided by vendor proposals for recycling Plant 7 metals. This rate includes:
   Shipment of structural steel to vendor, sort and resize, melt provide reports and schedules to FERMCO
   metal into shield blocks, ship of rejected and secondary waste to FERMCO, shipment of empty ROB back to FERMCO, provide reports and schedules to FERMCO
10. On–property burial rate provided by OU2 and is consisting of longterm ground–water monitoring and disposal facility monitoring and maintenance.
11. This estimate does not include risk or contingency.

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Alternative 2
Tables E.II - (1-13)
Risk Budget and Man Hour Calculations

RISK BUDGET/OVERRUN ANALYSIS OUTPUT

PROJECT: OU3 FEASIBILITY STUDY
CLIENT: DOE
CONTRACT: C3-95-01-05-R2

DATE: 08-Dec-95
BASE ESTIMATE: $75,595,700

CHANCES OF OVERRUN	PROJECT COST W/RISK BUDGET	RISK BUDGET ADDED TO BASE ESTIMATE	%RISK BUDGET OF BASE ESTIMATE
0.00%	$131,338,200	$55,742,500	73.7%
0.05%	$114,566,265	$38,970,565	51.6%
5.00%	$105,143,930	$29,548,230	*39.1%*
10.00%	$102,703,144	$27,107,444	35.9%
15.00%	$100,802,618	$25,206,918	33.3%
20.00%	$99,259,529	$23,663,829	31.3%
25.00%	$97,842,995	$22,247,295	29.4%
30.00%	$96,742,554	$21,146,854	28.0%
35.00%	$95,884,726	$20,289,026	26.8%
40.00%	$95,059,133	$19,463,433	25.7%
45.00%	$94,086,980	$18,491,280	24.5%
50.00%	$93,206,445	$17,610,745	*23.3%*
55.00%	$92,255,801	$16,660,101	22.0%
60.00%	$91,350,516	$15,754,816	20.8%
65.00%	$90,428,951	$14,833,251	19.6%
70.00%	$89,468,815	$13,873,115	18.4%
75.00%	$88,565,601	$12,969,901	17.2%
80.00%	$87,119,585	$11,523,885	15.2%
85.00%	$85,756,448	$10,160,748	13.4%
90.00%	$84,300,541	$8,704,841	11.5%
95.00%	$81,474,135	$5,878,435	7.8%
99.95%	$73,707,736	($1,887,964)	-2.5%
100.00%	$55,373,089	($20,222,611)	-26.8%

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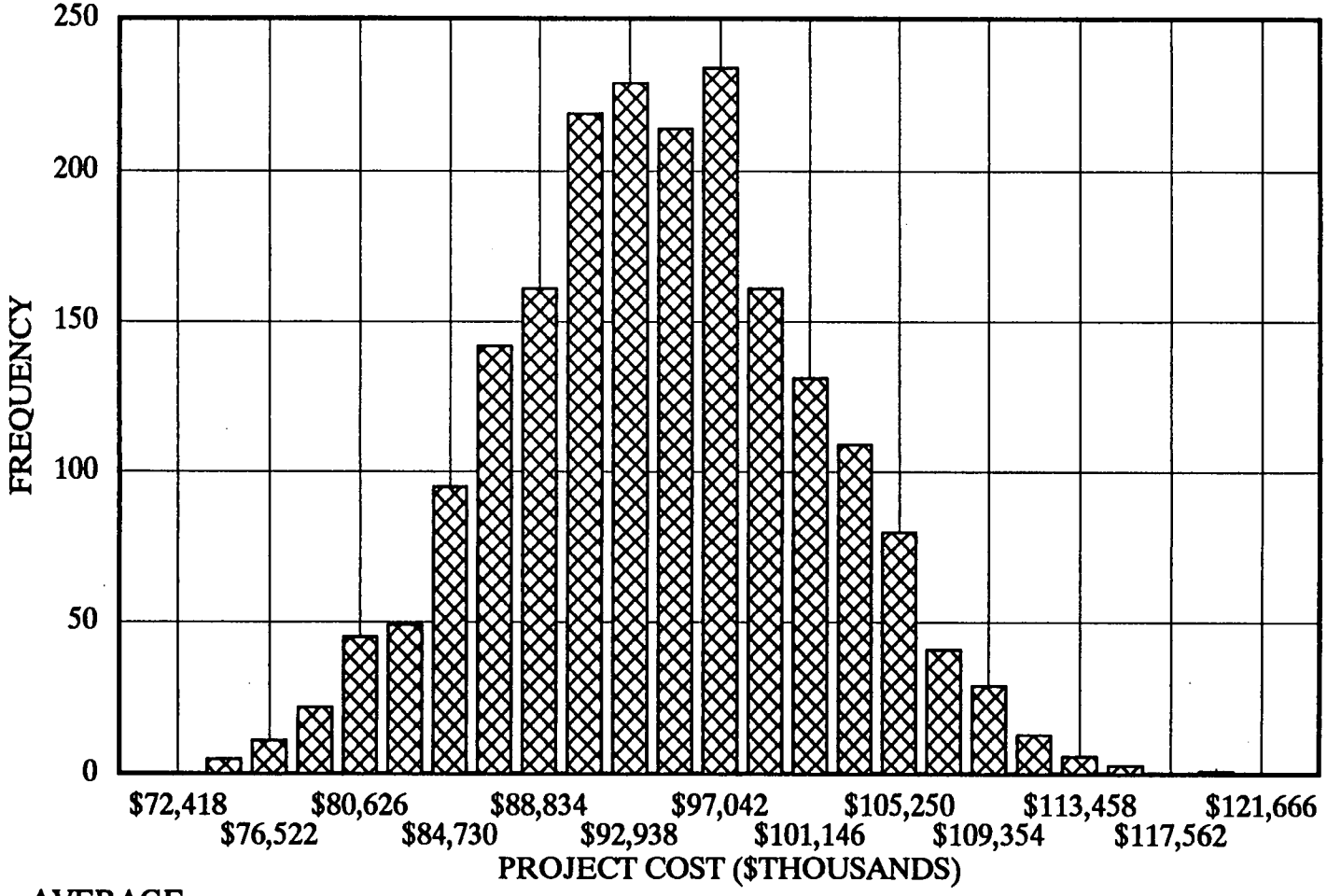
DISTRIBUTION OF 2,000 SAMPLES

OU3 FEASIBILITY STUDY



AVERAGE
$93,241,668

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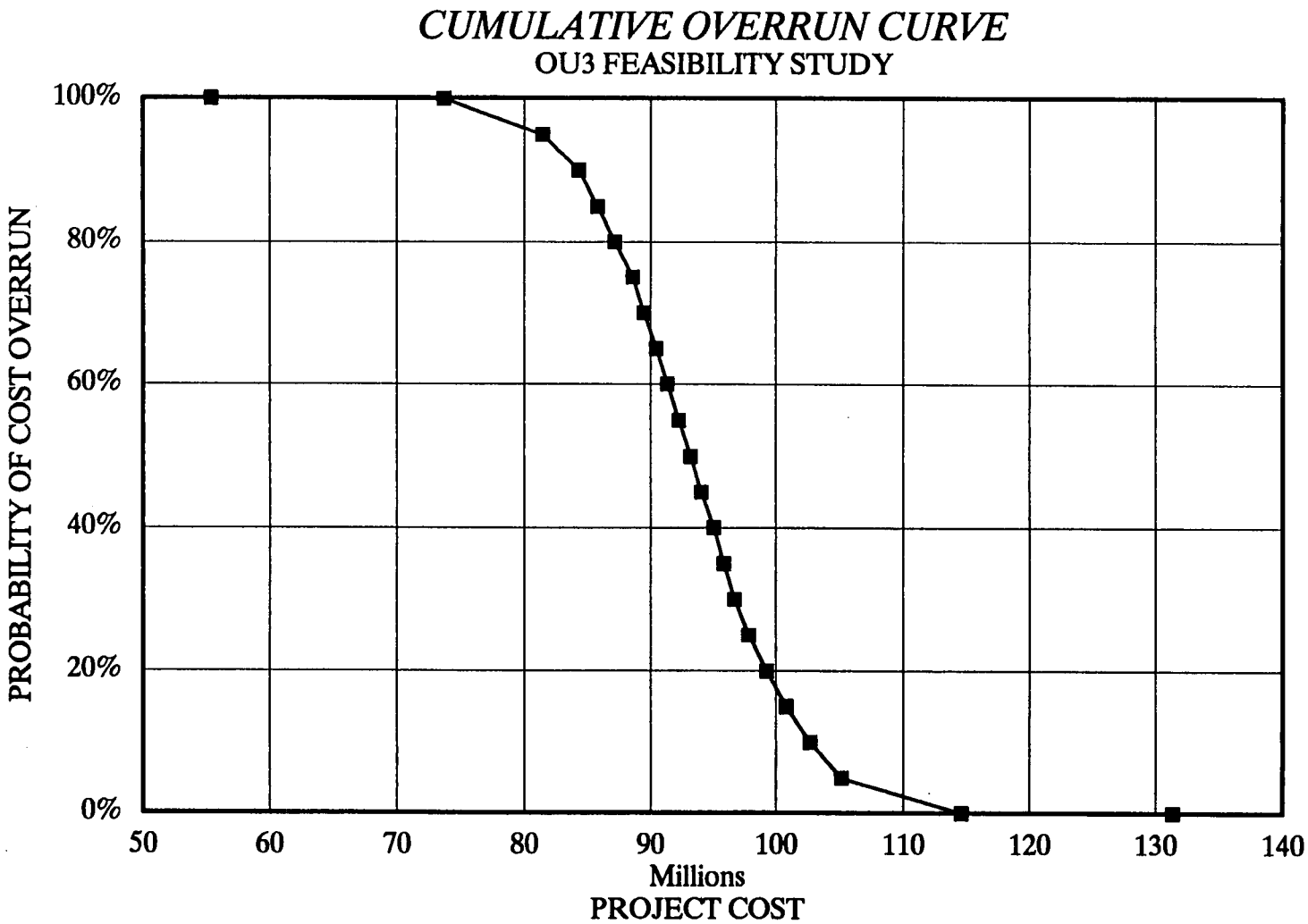

BASE ESTIMATE:
$75,595,700

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FERMCO RISK BUDGET ESTIMATING
INPUT DATA TABLE

PROJECT: OU3 FEASIBILITY STUDY
CLIENT: DOE
CONTRACT: C3-95-01-05-R2

ACCOUNT NO.	ITEM DESCRIPTION	ESTIMATE BASE$	LOW%	LOW$	HIGH%	HIGH$	DIST. TYPE	RELA-TIONS	RANGE FACTOR
1	ACCESSIBLE METALS – LABOR	$730,200	-33%	$489,234	80%	$1,314,360	U		29%
2	ACCESSIBLE METALS – S/Ce	193,400	-25%	145,050	75%	338,450	U		25%
3	ACCESSIBLE METALS – MAT'L	436,400	-25%	327,300	65%	720,060	U		28%
4	INACCESSIBLE METALS – LABOR	2,903,800	-33%	1,945,546	80%	5,226,840	U		29%
5	INACCESSIBLE METALS – S/Ce	5,321,900	-25%	3,991,425	75%	9,313,325	U		25%
6	INACCESSIBLE METALS – MAT'L	2,440,500	-25%	1,830,375	65%	4,026,825	U		28%
7	PROCESS RELATED METALS – LABOR	215,700	-33%	144,519	80%	388,260	U		29%
8	PROCESS RELATED METALS – S/Ce	13,370,600	-25%	10,027,950	75%	23,398,550	U		25%
9	PROCESS RELATED METALS – MAT'L	2,997,200	-25%	2,247,900	65%	4,945,380	U		28%
10	PAINTED LIGHT GAUGE METALS – LABOR	21,400	-33%	14,338	80%	38,520	U		29%
11	PAINTED LIGHT GAUGE METALS – S/Ce	27,000	-25%	20,250	80%	48,600	U		24%
12	PAINTED LIGHT GAUGE METALS – MAT'L	33,200	-25%	24,900	65%	54,780	U		28%
13	CONCRETE – LABOR	4,408,900	-33%	2,953,963	80%	7,936,020	U		29%
14	CONCRETE – S/Ce	14,437,600	-25%	10,828,200	75%	25,265,800	U		25%
15	CONCRETE – MAT'L	6,471,600	-25%	4,853,700	65%	10,678,140	U		28%
16	BRICK – LABOR	77,000	-33%	51,590	80%	138,600	U		29%
17	BRICK – S/Ce	1,806,400	-25%	1,354,800	75%	3,161,200	U		25%
18	BRICK – MAT'L	269,200	-25%	201,900	65%	444,180	U		28%
19	NON-REGULATED ACM – LABOR	63,800	-33%	42,746	80%	114,840	U		29%
20	NON-REGULATED ACM – S/Ce	217,500	-25%	163,125	75%	380,625	U		25%
21	NON-REGULATED ACM – MAT'L	47,500	-25%	35,625	65%	78,375	U		28%
22	REGULATED ACM – LABOR	100,900	-33%	67,603	80%	181,620	U		29%
23	REGULATED ACM – S/Ce	244,600	-25%	183,450	75%	428,050	U		25%
24	REGULATED ACM – MAT'L	67,400	-25%	50,550	65%	111,210	U		28%
25	MISCELLANEOUS COSTS – LABOR	597,500	-33%	400,325	80%	1,075,500	U		29%
26	MISCELLANEOUS COSTS – S/Ce	768,600	-25%	576,450	75%	1,345,050	U		25%
27	MISCELLANEOUS COSTS – MAT'L	73,900	-25%	55,425	65%	121,935	U		28%
28	O&M COST – MAT'L	7,644,100	-30%	5,350,870	80%	13,759,380	U		27%
29	FIELD SUPPORT COSTS – LABOR	3,219,000	-25%	2,414,250	60%	5,150,400	U		29%
30	FIELD SUPPORT COSTS – S/Ce	545,000	-25%	408,750	70%	926,500	U		26%
31	FIELD SUPPORT COSTS – MAT'L	4,238,900	-30%	2,967,230	75%	7,418,075	U		29%
32	SALES TAX – MAT'L	1,605,000	-25%	1,203,750	75%	2,808,750	U		25%
33				0		0			0%
34				0		0			0%
35				0		0			0%
36				0		0			0%
37				0		0			0%
38				0		0			0%
39				0		0			0%
40				0		0			0%
41				0		0			0%
42				0		0			0%
43				0		0			0%
44				0		0			0%
45				0		0			0%
		$75,595,700		$55,373,089		$131,338,200			

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A - ACCESSIBLE METALS
ON-PROPERTY DISPOSAL

COMMODITY: LOW LEVEL WASTE MATERIAL, STAGED IN A PILE @ INTERIM QUEUING AREA. AFTER CELL IS OPENED, MATERIAL IS STAGED IN TARPED ROB'S @ INTERIM QUEUING AREA FOR PICK UP.

1. POSITION ROB FOR LOADING.
2. SHAKE OUT PILED UP STRUCTURAL STEEL MEMBERS.
3. LOAD PIECES OF STRUCTURAL STEEL MEMBERS INTO ROB.
4. MOVE ROB TO ON-PROPERTY DISPOSAL CELL (TRAVEL 1 MILE)
5. ROB IS UNLOADED AND RETURNES TO QUEUING AREA.

CREW SIZE:				COST	COST
LOADING ACTIVITY			WAGE	/HR	/8 HR DAY
EQUIPMENT OPERATOR		1.0	$22.79	$22.79	$182.32
HAZWAT LEAD		1.0	$21.06	$21.06	$168.48
HAZWAT		4.0	$21.06	$84.24	$673.92
		6.0		$128.09	$1,024.72
AVG HOURLY RATE:	$21.35				
ROB HANDLING AND HAULING ACTIVITIES.					
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$6.11	$48.86
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$48.23	$385.82
AVG HOURLY RATE:	$21.06				

EQUIPMENT:
HYDRAULIC CRANE
TRUCK EQUIPED WITH ROB LOADING/DUMPING CAPABILITIES
ASSORTED CUTTING EQUIPMENT & LIFTING CABLES,CHAINS ETC.

CALCULATIONS:		
POSITION ROB FOR LOADING	0.76	
ROB CAP.--- LBS.	33,500	
ROB CAP.--- TONS	16.75	
UNIT RATE--MH/TON	4.00	
EST. HOURS PER ROB	67.76	
POSITION ROB ON TRUCK	0.95	WITH CREW OF 2 WORKERS
HAUL ROB TO DISPOSAL CELL	0.46	SAME
UNLOAD AT DISPOSAL CELL	1.15	
RETURN TO QUEUING AREA	0.46	SAME
ON-PROPERTY HAULING	3.02	HOURS

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B - INACCESSIBLE METALS

ON-PROPERTY DISPOSAL

COMMODITY: LOW LEVEL WASTE MATERIAL IS STAGED IN A PILE AT THE INTERIM QUEUING AREA.
AFTER CELL IS OPENED, MATERIAL IS STAGED IN TARPED ROB @ INTERIM QUEUING AREA FOR PICK UP
PCB MATERIALS, STAGED IN ROB, FLUSHING IS DONE BY OTHERS

1. POSITION TRUCK TO LOAD ROB.
2. SHAKE OUT PILED MATERIAL FOR LOADING INTO ROB.
3. LOAD INTO ROB, TARP WHEN FULL.
4. MOVE ROB TO ON-PROPERTY DISPOSAL CELL. (TRAVEL 1 MILE)
5. ROB IS UNLOADED AND RETURNED TO QUEUING AREA.

CREW SIZE:				COST	COST
LOADING ACTIVITY			WAGE	/HR	/8 HR DAY
EQUIPMENT OPERATOR		1.0	$22.79	$22.79	$182.32
HAZWAT LEAD		1.0	$21.06	$21.06	$168.48
HAZWAT		4.0	$21.06	$84.24	$673.92
		6.0		$128.09	$1,024.72
AVG. HOURLY RATE:	$21.35				
ROB HANDLING, HAULING, AND DISPOSAL ACTIVITIES.					
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$6.11	$48.86
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$48.23	$385.82
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
HYDRAULIC CRANES FOR LOADING ROB
TRUCK EQUIPED WITH ROB LOADING / DUMPING CAPABILITIES

CALCULATIONS: BASED ON EACH ROB HAVING 17 TONS OR 810 CF OF MATERIAL		
POSITION ROB FOR LOADING	0.76	WITH A CREW OF 2 WORKERS
ROB CAP.---LBS.	33,500	
ROB CAP.---TONS	16.75	
UNIT RATE--MH/TON	4.00	
EST HOURS PER ROB	67.76	
POSITION ROB ON TRUCK	0.95	WITH A CREW OF 2 WORKERS
HAUL ROB TO DISPOSAL CELL	0.46	
UNLOAD AT DISPOSAL CELL	1.15	
RETURN TO QUEUING AREA	0.46	
ON-PROPERTY HAULING	3.02	HOURS

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C - PROCESS RELATED METALS

OFF-SITE DISPOSAL - NTS

COMMODITY: LOW LEVEL WASTE MATERIALS, STAGED IN LWMB FOR OFF-SITE BURIAL

1. POSITION TRUCK TO LOAD LWMB AND HAUL TO TRANSPORTATION CENTER.
2. WEIGH, CERTIFICATION & LOAD ON TO TRANSPORTATION CARRIER.
3 RETURN TO QUEUING AREA. (TRAVEL 1 MILE)

CREW SIZE:				COST	COST
ON-PROPERTY HANDLING & HAULING ACTIVITIES.			WAGE	/HR	/8 HR DAY
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$5.27	$42.12
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$47.39	$379.08
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
TRUCK

CALCULATIONS:		
LOAD LWMB ONTO TRUCK	0.75	SAME
HAUL TO TRANSPORTATION CENTER	0.45	SAME
AT TRANSPORTATION CENTER	0.75	SAME
RETURN TO QUEUING AREA.	0.45	SAME
ON-PROPERTY HAULING	2.40	HOURS

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D - PAINTED LIGHT GAUGE METALS

ON-PROPERTY DISPOSAL

COMMODITY: POTENTIALLY MIXED WASTE, STAGED IN B-12's. MATEREIAL WILL BE DISPOSED OF AT THE COMPLETION OF EACH COMPLEX.

1. POSITION TRUCK TO MOVE B-12
2. HAUL B-12 TO ON-PROPERTY ENCAPSULATION S/C FOR PROCESSING
2. RELOAD ONTO TRUCK AND HAUL B-12 TO DISPOSAL CELL. (TRAVEL 1 MILE)
3. RETURN TO QUEUING AREA. (TRAVEL 1 MILE)

CREW SIZE:				COST	COST
HANDLING AND HAULING			WAGE	/HR	/8 HR DAY
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$5.27	$42.12
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$47.39	$379.08
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
TRUCK EQUIPED WITH B-12 LOADING / DUMPING CAPABILITIES

CALCULATIONS:		
POSITION B-12 ON TRUCK.	0.79	WITH CREW OF 2 WORKERS
HAUL TO ENCAPSULATION S/C	0.46	SAME
RETURN TO QUEUING AREA.	0.79	SAME
ON-SITE HAULING	2.04	HOURS

ON-PROPERTY DISPOSAL

COMMODITY: LOW LEVEL MATERIAL, STAGED IN TARPED ROB AT THE QUEUING AREA

1. POSITION TRUCK TO MOVE ROB.
2. HAUL ROB TO DISPOSAL CELL (TRAVEL 1 MILE)
3. ROB IS UNLOADED AND RETURNED TO QUEUING AREA.

CREW SIZE:				COST	COST
HANDLING AND HAULING			WAGE	/HR	/8 HR DAY
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$6.11	$48.86
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$48.23	$385.82
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
TRUCK EQUIPED WITH ROB LOADING / DUMPING CAPABILITIES

CALCULATIONS:		
POSITION ROB ON TRUCK.	0.95	WITH CREW OF 2 WORKERS
HAUL TO TRANSPORTATION CTR.	0.46	SAME
AT TRANSPORTATION CTR.	1.15	SAME
RETURN TO QUEUING AREA.	0.46	SAME
ON-SITE HAULING	3.02	HOURS

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E - CONCRETE

ON-PROPERTY DISPOSAL

COMMODITY: LOW LEVEL WASTE MATERIAL, STAGED IN TARPED ROB's AT QUEUING AREA

1. POSITION TRUCK TO MOVE ROB.
4. HAUL ROB TO ON-PROPERTY DISPOSAL CELL. (TRAVEL 1 MILE)
5. UNLOAD ROB, AND RETURN TO QUEUING AREA.

CREW SIZE:				COST	COST
MATERIAL HANDLING			WAGE	/HR	/8 HR DAY
EQUIPMENT OPERATOR		1.0	$22.79	$22.79	$182.32
HAZWAT LEAD		1.0	$21.06	$21.06	$168.48
HAZWAT		4.0	$21.06	$84.24	$673.92
		6.0		$128.09	$1,024.72
AVG. HOURLY RATE:	$21.35				
HAULING AND DISPOSAL					
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$6.11	$48.86
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$48.23	$385.82
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
TRUCK EQUIPED WITH ROB LOADING / DUMPING CAPABILITIES.

CALCULATIONS:		
POSITION ROB ON TRUCK	0.95	WITH CREW OF 2 WORKERS
HAUL TO DISP. CELL	0.46	SAME
DISCHARGE LOAD	1.15	SAME
RETURN TO QUEUING AREA	0.46	SAME
ON-PROPERTY HAULING	3.02	HOURS

OFF-SITE DISPOSAL - ENVIROCARE

COMMODITY: POTENTIALLY MIXED WASTE MATERIAL STAGED IN B-12's.

1. POSITION FLAT BED TRUCK TO LOAD CONTAINERS
2. HAUL TO THE TRANSPORTATION CENTER. (TRAVEL 1 MILE)
3. WEIGH, CERTIFICATION & LOAD ONTO TRANSPORTATION CARRIER.
4. RETURN TO QUEUING AREA.

CREW SIZE:				COST	COST
MATERIAL HANDLING / HAULING			WAGE	/HR	/8 HR DAY
B-12 HAULING AND HANDLING					
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$5.27	$42.12
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$47.39	$379.08
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
TAYLOR FORKLIFT
FLAT BED TRUCK.

CALCULATIONS:		
HAUL TO TRANSPORTATION CENTER	0.45	SAME
AT TRANSPORTATION CENTER	0.75	SAME
RETURN TO QUEUING AREA	0.45	SAME
ON-PROPERTY HAULING	1.65	HOURS

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F - BRICK

OFF-SITE DISPOSAL - ENVIROCARE

COMMODITY: POTENTIALLY MIXED MATERIAL, STAGED IN B-25's AT QUEUING AREA.

1. POSITION TRUCK TO MOVE B-25's
3. HAUL B-25 TO TRANSPORTATION CENTER. (TRAVEL 1 MILE)
4. WEIGH, CERTIFICATION, AND LOAD ONTO TRANSPORTATION CARRIER.
5. RETURN TO QUEUING AREA.

CREW SIZE:				COST	COST
HANDLING AND HAULING.			WAGE	/HR	/8 HR DAY
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$5.27	$42.12
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$47.39	$379.08
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
TAYLOR FORKLIFT
FLAT BED TRUCK.

CALCULATIONS:		
POSITION TRUCK TO LOAD B-25	0.19	WITH CREW OF 3 WORKERS
LIFT B-25 ONTO TRUCK.	0.19	SAME
HAUL TO TRANSPORT. CTR.	0.45	SAME
AT TRANSPORTATION CENTER	0.36	SAME
RETURN TO QUEUING AREA.	0.45	SAME
ON-PROPERTY HAULING	1.65	HOURS

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G - NON-REGULATED ACM

ON-PROPERTY DISPOSAL

COMMODITY: LOW LEVEL WASTE MATERIAL
COMMODITY: LOW LEVEL WASTE MATERIAL STAGED IN PALLETIZED BUNDELS AND SHRINK WRAPED AT THE QUEUING AREA. AFTER THE DISPOSAL CELL IS OPERATIONAL MATERIAL WILL BE STAGED IN TARPED ROB'S AT QUEUING AREA FOR PICK UP.

1. POSITION ROB TO LOAD.
2. USING SLINGS AND HYDRAULIC CRANE, LOAD PALLETIZED MATERIALS INTO ROB AND TARP WHEN FULL.
3. HAUL ROB TO ON-PROPERTY DISPOSAL CELL. (TRAVEL 1 MILE)
4. UNLOAD ROB, AND RETURN TO QUEUING AREA.

CREW SIZE:				COST	COST
LOADING ACTIVITY			WAGE	/HR	/8 HR DAY
EQUIPMENT OPERATOR		1.0	$22.79	$22.79	$182.32
HAZWAT LEAD		1.0	$21.06	$21.06	$168.48
HAZWAT		4.0	$21.06	$84.24	$673.92
		6.0		$128.09	$1,024.72
AVG. HOURLY RATE:	$21.35				
HANDLING AND HAULING.					
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$6.11	$48.86
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$48.23	$385.82
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
HYDRAULIC CRANE
TRUCK EQUIPED WITH ROB LOADING / DUMPING CAPABILITIES.

CALCULATIONS:		
POSITION ROB FOR LOADING	0.75	
ROB CAP.---CF	810	
UNIT RATE--MH/CF	0.015	
EST. HOURS PER ROB	12.90	
POSITION ROB ON TRUCK	0.95	
HAUL TO DISPOSAL CELL	0.46	
UNLOAD AT DISPOSAL CELL	1.15	
RETURN TO QUEUING AREA	0.46	
ON-PROPERTY HAULING	3.02	HOURS

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H - REGULATED ACM

ON-PROPERTY DISPOSAL

COMMODITY: LOW LEVEL WASTE MATERIAL STAGED IN T/L CONTAINERS AT INTERIM STORAGE AREA.

1. PREP T/L FOR UNLOADING.
2. USING A HYDRAULIC CRANE TO LIFT AND OVERTURN CONTENTS OF T/L INTO A PILE
3. USING A FRONT END LOADER TO SCOOPE UP MATERIAL AND LOAD ROB
4. LABORER CREW TO DIRECT WORK AND MAINTAIN AREA. ROB IS TARPED FOR ON-PROPERTY HAULIN
5. HAUL ROB TO ON-PROPERTY DISPOSAL CELL. (TRAVEL 1 MILE)
6. UNLOAD ROB, AND RETURN TO QUEUING AREA.

CREW SIZE:				COST	COST
T/L AND ROB LOADING ACTIVITIES			WAGE	/HR	/8 HR DAY
EQUIPMENT OPERATOR		2.0	$22.79	$45.58	$364.64
HAZWAT LEAD		1.0	$21.06	$21.06	$168.48
HAZWAT		4.0	$21.06	$84.24	$673.92
		7.0		$150.88	$1,207.04
AVG. HOURLY RATE:	$21.55				
HAULING AND DISPOSAL					
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$6.11	$48.86
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$48.23	$385.82
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
HYDRAULIC CRANE
FRONT END LOADER W/ 1 CY BUCKET.
TRUCK EQUIPED WITH ROB LOADING / DUMPING CAPABILITIES.

CALCULATIONS:		
PREP T/L FOR UNLOADING	10.50	WITH CREW OF 6 WORKERS
LIFT AND UNLOAD T/L	3.50	SAME
ON-PROPERTY HANDLING OF T/L	14.00	HOURS
POSITION ROB FOR LOADING	0.75	
ROB CAP.---CY	30.00	
UNIT RATE--MH/CY	0.40	
HOURS TO FILL ROB	12.75	
POSITION ROB ON TRUCK	0.95	WITH CREW OF 2 WORKERS
HAUL TO DISP. CELL	0.46	SAME
DISCHARGE LOAD	1.15	SAME
RETURN TO QUEUING AREA	0.46	SAME
ON-PROPERTY HAULING	3.02	HOURS

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I - MISCELLANEOUS MATERIALS

ON-PROPERTY DISPOSAL

COMMODITY: LOW LEVEL WASTE MATERIAL STAGED IN TARPED ROB'S AT QUEUING AREA.

1. POSITION TRUCK TO MOVE ROB
3. ROB IS HAULED TO THE ON-PROPERTY DISPOSAL CELL. (TRAVEL 1 MILE)
3. MATERIAL IS DEPOSITED AT CELL AND ROB IS RETURNED TO QUEUING AREA.

CREW SIZE:				COST	COST
ROB HANDLING AND HAULING.			WAGE	/HR	/8 HR DAY
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$6.11	$48.86
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$48.23	$385.82
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
TRUCK EQUIPED WITH ROB LOADING / DUMPING CAPABILITIES.

CALCULATIONS:		
POSITION ROB ON TRUCK	0.95	WITH CREW OF 2 WORKERS
HAUL TO DISPOSAL CELL	0.46	SAME
UNLOAD AT DISPOSAL CELL	1.15	SAME
RETURN TO QUEUING AREA	0.46	SAME
ON-PROPERTY HAULING	3.02	HOURS

UNRESTRICTED RELEASE

COMMODITY: BELOW BASELINE MATERIAL STAGED VENDOR SUPPLIED ROB @ VARIOUS LOCATIONS CLOSE TO D&D CONTRACTOR WORK AREA.

1. BEFORE THE D&D CONTRACTOR IS ALLOWED TO REMOVE ANY MATERIAL IT IS SURVEYED BY FERMCO RAD-TECH'S.
2. ONCE THE AREA HAS BEEN RELEASED TO THE D&D CONTRACTOR, THE MATERIAL IS SURVEYED ON A RANDOM BASIS AS THE MATERIAL IS BEING LOADED INTO THE COMMERCIAL LANDFILL ROB.
3. AN ALLOWANCE OF FIVE (5) DAYS PER ROB TO BE FILLED AND TARPED FOR OVER THE HIGHWAY HAULING.
4. THE COMMERCIAL LANDFILL CONTRACTOR IS CONTACTED FOR A ROB PICK UP.
5. A ROB IS DROPED OFF WHEN ONE IS PICKED UP.

CREW SIZE:				COST	COST
SURVEY TECH'S.			WAGE	/HR	/8 HR DAY
RAD TECHNICIANS (3A)		1.0	$20.26	$20.26	$162.08
		1.0		$20.26	$162.08
AVG. HOURLY RATE:	$20.26				

EQUIPMENT:
RADIATION SURVEY EQUIPMENT

CALCULATIONS:		
INITAL SURVEY	0.013	PER CUBIC FOOT
RANDOM SURVEY	15.00	PER ROB LOAD

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Alternative 3
Tables E.II - (14-21)
Risk Budget and Man Hour Calculations

RISK BUDGET/OVERRUN ANALYSIS OUTPUT

PROJECT: OU3 FEASIBILITY STUDY
CLIENT: DOE
CONTRACT: C3-95-01-07-R3

DATE: 08-Dec-95
BASE ESTIMATE: $149,742,900

CHANCES OF OVERRUN	PROJECT COST W/RISK BUDGET	RISK BUDGET ADDED TO BASE ESTIMATE	%RISK BUDGET OF BASE ESTIMATE
0.00%	$261,845,050	$112,102,150	74.9%
0.05%	$232,739,600	$82,996,700	55.4%
5.00%	$218,277,723	$68,534,823	***45.8%***
10.00%	$212,873,484	$63,130,584	42.2%
15.00%	$208,055,801	$58,312,901	38.9%
20.00%	$204,234,233	$54,491,333	36.4%
25.00%	$200,501,622	$50,758,722	33.9%
30.00%	$197,254,251	$47,511,351	31.7%
35.00%	$193,988,263	$44,245,363	29.5%
40.00%	$190,997,135	$41,254,235	27.6%
45.00%	$188,221,073	$38,478,173	25.7%
50.00%	$185,091,253	$35,348,353	***23.6%***
55.00%	$182,006,166	$32,263,266	21.5%
60.00%	$179,068,261	$29,325,361	19.6%
65.00%	$176,429,107	$26,686,207	17.8%
70.00%	$173,581,524	$23,838,624	15.9%
75.00%	$170,702,526	$20,959,626	14.0%
80.00%	$167,009,087	$17,266,187	11.5%
85.00%	$163,032,563	$13,289,663	8.9%
90.00%	$158,765,713	$9,022,813	6.0%
95.00%	$153,785,976	$4,043,076	2.7%
99.95%	$139,421,323	($10,321,577)	-6.9%
100.00%	$109,922,131	($39,820,769)	-26.6%

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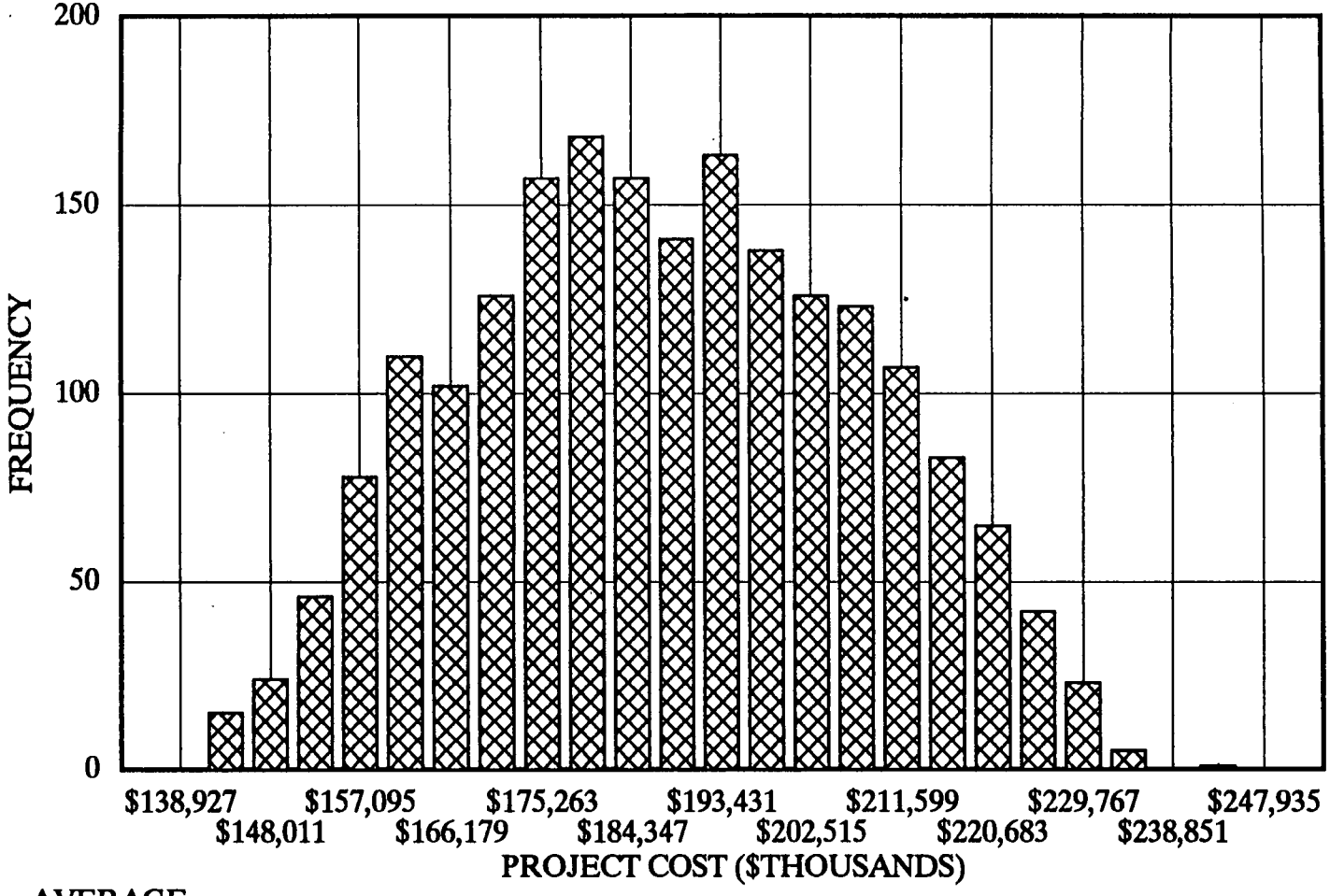
DISTRIBUTION OF 2,000 SAMPLES

OU3 FEASIBILITY STUDY



AVERAGE
$185,449,373

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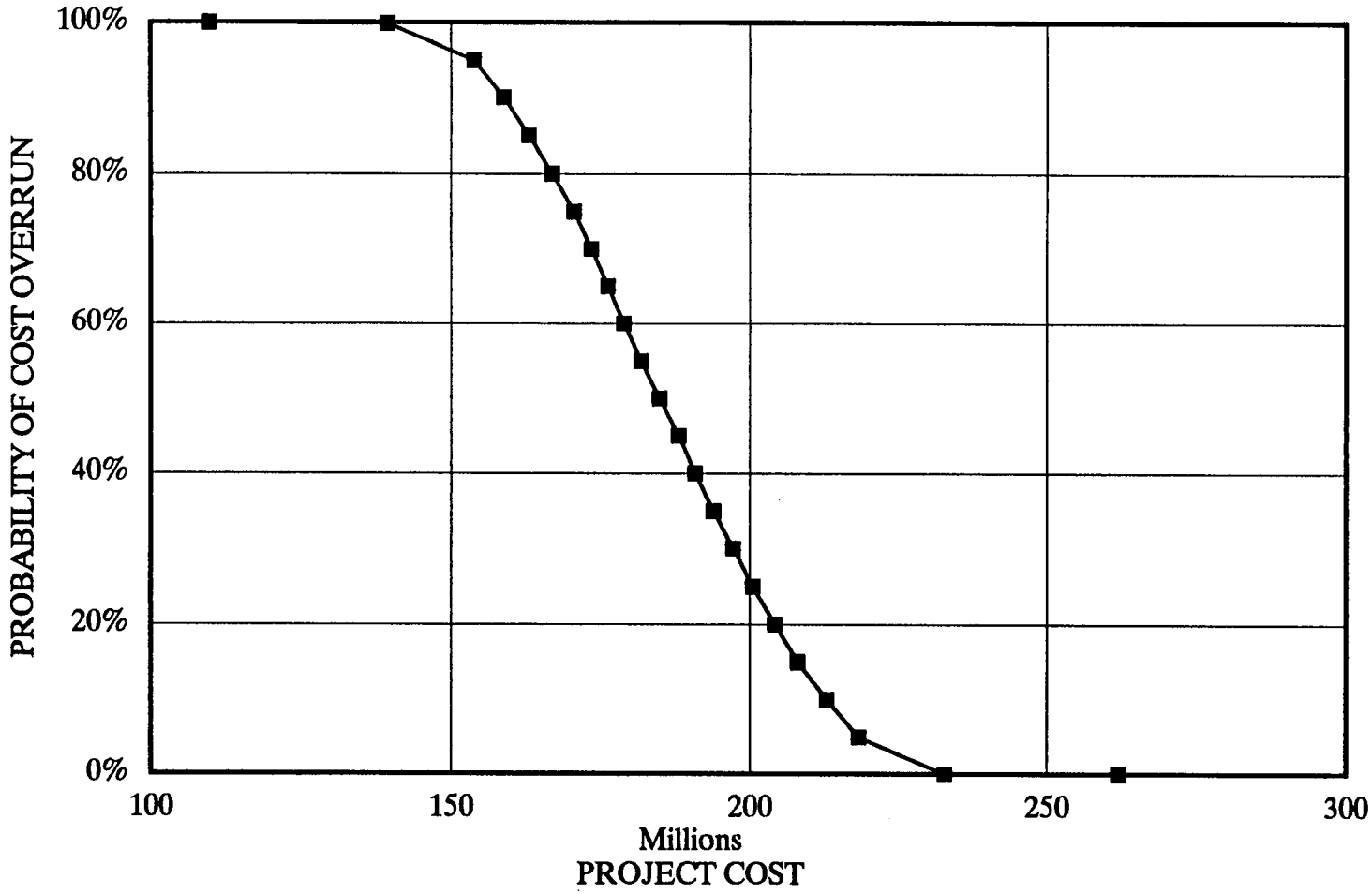
CUMULATIVE OVERRUN CURVE

OU3 FEASIBILITY STUDY



BASE ESTIMATE:
$149,742,900

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2397

000746

FERMCO RISK BUDGET ESTIMATING
INPUT DATA TABLE

PROJECT: OU3 FEASIBILITY STUDY
CLIENT: DOE
CONTRACT: C3-95-01-07-R3

ACCOUNT NO.	ITEM DESCRIPTION	ESTIMATE BASE$	LOW%	LOW$	HIGH%	HIGH$	DIST. TYPE	RELA-TIONS	RANGE FACTOR
1	ACCESSIBLE METALS – LABOR	$1,258,800	-33%	$843,396	80%	$2,265,840	U		29%
2	ACCESSIBLE METALS – S/Ce	2,577,500	-25%	1,933,125	75%	4,510,625	U		25%
3	ACCESSIBLE METALS – MAT'L	332,000	-25%	249,000	65%	547,800	U		28%
4	INACCESSIBLE METALS – LABOR	7,035,800	-33%	4,713,986	80%	12,664,440	U		29%
5	INACCESSIBLE METALS – S/Ce	24,140,600	-25%	18,105,450	75%	42,246,050	U		25%
6	INACCESSIBLE METALS – MAT'L	1,845,100	-25%	1,383,825	65%	3,044,415	U		28%
7	PROCESS RELATED METALS – LABOR	215,700	-33%	144,519	80%	388,260	U		29%
8	PROCESS RELATED METALS – S/Ce	13,370,600	-25%	10,027,950	75%	23,398,550	U		25%
9	PROCESS RELATED METALS – MAT'L	2,997,200	-25%	2,247,900	65%	4,945,380	U		28%
10	PAINTED LIGHT GAUGE METALS – LABOR	64,600	-33%	43,282	80%	116,280	U		29%
11	PAINTED LIGHT GAUGE METALS – S/Ce	164,000	-25%	123,000	80%	295,200	U		24%
12	PAINTED LIGHT GAUGE METALS – MAT'L	22,000	-25%	16,500	65%	36,300	U		28%
13	CONCRETE – LABOR	14,490,600	-33%	9,708,702	80%	26,083,080	U		29%
14	CONCRETE – S/Ce	57,462,800	-25%	43,097,100	75%	100,559,900	U		25%
15	CONCRETE – MAT'L	3,798,500	-25%	2,848,875	65%	6,267,525	U		28%
16	BRICK – LABOR	64,700	-33%	43,349	80%	116,460	U		29%
17	BRICK – S/Ce	789,000	-25%	591,750	75%	1,380,750	U		25%
18	BRICK – MAT'L	27,800	-25%	20,850	65%	45,870	U		28%
19	NON-REGULATED ACM – LABOR	191,300	-33%	128,171	80%	344,340	U		29%
20	NON-REGULATED ACM – S/Ce	823,300	-25%	617,475	75%	1,440,775	U		25%
21	NON-REGULATED ACM – MAT'L	55,600	-25%	41,700	65%	91,740	U		28%
22	REGULATED ACM – LABOR	245,000	-33%	164,150	80%	441,000	U		29%
23	REGULATED ACM – S/Ce	976,700	-25%	732,525	75%	1,709,225	U		25%
24	REGULATED ACM – MAT'L	68,400	-25%	51,300	65%	112,860	U		28%
25	MISCELLANEOUS COSTS – LABOR	850,800	-33%	570,036	80%	1,531,440	U		29%
26	MISCELLANEOUS COSTS – S/Ce	1,997,500	-25%	1,498,125	75%	3,495,625	U		25%
27	MISCELLANEOUS COSTS – MAT'L	93,300	-25%	69,975	65%	153,945	U		28%
28	FIELD SUPPORT COSTS – LABOR	3,219,000	-25%	2,414,250	60%	5,150,400	U		29%
29	FIELD SUPPORT COSTS – S/Ce	545,000	-25%	408,750	70%	926,500	U		26%
30	FIELD SUPPORT COSTS – MAT'L	8,633,200	-30%	6,043,240	75%	15,108,100	U		29%
31	SALES TAX – MAT'L	1,386,500	-25%	1,039,875	75%	2,426,375	U		25%
32				0		0			0%
33				0		0			0%
34				0		0			0%
35				0		0			0%
36				0		0			0%
37				0		0			0%
38				0		0			0%
39				0		0			0%
40				0		0			0%
41				0		0			0%
42				0		0			0%
43				0		0			0%
44				0		0			0%
45				0		0			0%
		$149,742,900		$109,922,131		$261,845,050			

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A – ACCESSIBLE METALS
B – INACCESSIBLE METALS
[illegible] – CONCRETE
F – BRICK MATERIALS
G – NON-REGULATED ACM
H – REGULATED ACM

OFF-SITE DISPOSAL – ENVIROCARE

COMMODITY: LOW LEVEL WASTE MATERIALS ARE STAGED IN I.T.C. @ INTERIM QUEUING AREA.

1. POSITION TRUCK TO MOVE INTERMODAL TRANSPORT CONTAINERS
2. HAUL INTERMODAL TRANSPORT CONTAINER TO TRANSPORTATION CENTER. (TRAVEL 1 MILE)
3. WEIGH, CERTIFICATION AND LOAD ONTO ARTICULATED CONTAINER RAIL CAR.
4. TRUCK RETURNS TO QUEUING AREA.

CREW SIZE:				COST	COST
INTERMODAL TRANSPORT CONTAINER HANDLING			WAGE	/HR	/8 HR DAY
EQUIPMENT OPERATOR		1.0	$22.79	$22.79	$182.32
HAZWAT LEAD		1.0	$21.06	$21.06	$168.48
HAZWAT		4.0	$21.06	$84.24	$673.92
		6.0		$128.09	$1,024.72
AVG. HOURLY RATE:	$21.35				
INTERMODAL TRANSPORT CONTAINER HAULING					
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
LABORER FOREMAN		0.3	$21.06	$5.27	$42.12
LABORER		1.0	$21.06	$21.06	$168.48
		2.3		$47.39	$379.08
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
INTERMODAL TRANSPORT CONTAINER LOADING EQUIPMENT (PIGGY PACKER)

CALCULATIONS:		
SECURE I.T.C. ON R.R. CAR	7.50	WITH CREW OF 6 WORKERS
POSITION I.T.C. ON TRUCK	0.75	WITH CREW OF 2 WORKERS
HAUL TO TRANSPORTATION CENTER	0.45	WITH CREW OF 2 WORKERS
WEIGH, CERTIFICATION	0.75	WITH CREW OF 2 WORKERS
RETURN TO QUEUING AREA	0.45	WITH CREW OF 2 WORKERS
ON-PROPERTY HAULING	2.40	HOURS

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C - PROCESS RELATED METALS

OFF-SITE DISPOSAL - NTS

COMMODITY: LOW LEVEL WASTE MATERIALS, STAGED IN LWMB FOR OFF-SITE BURIAL

1. POSITION TRUCK TO LOAD LWMB AND HAUL TO TRANSPORTATION CENTER.
2. WEIGH, CERTIFICATION & LOAD ON TO TRANSPORTATION CARRIER.
3 RETURN TO QUEUING AREA. (TRAVEL 1 MILE)

CREW SIZE:				COST	COST
ON-PROPERTY HANDLING & HAULING ACTIVITIES.			WAGE	/HR	/8 HR DAY
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$5.27	$42.12
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$47.39	$379.08
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
TRUCK

CALCULATIONS:		
LOAD LWMB ONTO TRUCK	0.75	SAME
HAUL TO TRANSPORTATION CENTER	0.45	SAME
AT TRANSPORTATION CENTER	0.75	SAME
RETURN TO QUEUING AREA.	0.45	SAME
ON-PROPERTY HAULING	2.40	HOURS

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D - PAINTED LIGHT GAUGE METALS

OFF-SITE DISPOSITION DISPOSAL - ENVIROCARE

COMMODITY: LOW LEVEL WASTE MATERIAL STAGED IN COVERED INTERMODAL TRANSPORT CONTAINERS STAGED AT THE QUEUING AREA.

1. POSITION TRUCK TO MOVE INTERMODAL TRANSPORT CONTAINERS.
2. HAUL I.T.C. TO TRANSPORTATION CENTER. (TRAVEL 1 MILE)
3. WEIGH, CERTIFICATION AND LOAD ONTO ARTICULATED CONTAINER CAR.
4. TRUCK RETURNS TO QUEUING AREA.

CREW SIZE:				COST	COST
INTERMODAL TRANSPORT CONTAINER HANDLING			WAGE	/HR	/8 HR DAY
EQUIPMENT OPERATOR		1.0	$22.79	$22.79	$182.32
HAZWAT LEAD		1.0	$21.06	$21.06	$168.48
HAZWAT		4.0	$21.06	$84.24	$673.92
		6.0		$128.09	$1,024.72
AVG HOURLY RATE:	$21.35				
HANDLING AND HAULING			WAGE	/HR	/8 HR DAY
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$5.27	$42.12
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$47.39	$379.08
AVG HOURLY RATE:	$21.06				

EQUIPMENT:
INTERMODAL TRANSPORT CONTAINER LOADING EQUIPMENT.
TRUCK EQUIPED WITH ROB LOADING / DUMPING CAPABILITIES

CALCULATIONS:		
SECURE I.T.C. ON R.R. CAR	7.50	
POSITION ROB ON TRUCK.	0.75	WITH CREW OF 2 WORKERS
HAUL TO TRANSPORTATION CTR.	0.45	SAME
AT TRANSPORTATION CENTER.	0.75	SAME
RETURN TO QUEUING AREA.	0.45	SAME
ON-PROPERTY HAULING	2.40	HOURS

OFF-SITE DISPOSITION DISPOSAL - ENVIROCARE

COMMODITY: POTENTIALLY MIXED WASTE MATERIAL STAGED IN B-12's.

1. POSITION FLAT BED TRUCK TO LOAD CONTAINERS
2. HAUL TO THE TRANSPORTATION CENTER. (TRAVEL 1 MILE)
3. WEIGH, CERTIFICATION & LOAD ONTO TRANSPORTATION CARRIER.
4. RETURN TO QUEUING AREA.

CREW SIZE:				COST	COST
MATERIAL HANDLING / HAULING			WAGE	/HR	/8 HR DAY
B-12 HAULING AND HANDLING					
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$5.27	$42.12
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$47.39	$379.08
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
TAYLOR FORKLIFT
FLAT BED TRUCK.

CALCULATIONS:		
HAUL TO TRANSPORTATION CENTER	0.45	SAME
AT TRANSPORTATION CENTER	0.75	SAME
RETURN TO QUEUING AREA	0.45	SAME
ON-PROPERTY HAULING	1.65	HOURS

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I - MISCELLANIOUS MATERIALS

OFF-SITE DISPOSAL - ENVIOCARE

COMMODITY: LOW LEVEL WASTE MATERIALS ARE STAGED IN I.T.C. @ QUEUING AREA.

1. POSITION TRUCK TO MOVE INTERMODAL TRANSPORT CONTAINER.
2. HAUL INTERMODAL TRANSPORT CONTAINER TO TRANSPORTATION CENTER. (TRAVEL 1 MILE)
3. WEIGH, CERTIFICATION AND LOAD ONTO ARTICULATED CONTAINER RAIL CAR.
4. TRUCK RETURNS TO QUEUING AREA.

CREW SIZE:				COST	COST
I.T.C. LOADING ACTIVITY ONTO RAIL CAR			WAGE	/HR	/8 HR DAY
EQUIPMENT OPERATOR		1.0	$22.79	$22.79	$182.32
HAZWAT LEAD		1.0	$21.06	$21.06	$168.48
HAZWAT		4.0	$21.06	$84.24	$673.92
		6.0		$128.09	$1,024.72
AVG. HOURLY RATE:	$21.35				
I.T.C. HAULING ACTIVITIES.					
MOTOR VEHICAL OPERATOR		1.0	$21.06	$21.06	$168.48
HAZWAT LEAD		0.3	$21.06	$5.27	$42.12
HAZWAT		1.0	$21.06	$21.06	$168.48
		2.3		$47.39	$379.08
AVG. HOURLY RATE:	$21.06				

EQUIPMENT:
INTERMODAL TRANSPORT CONTAINER LOADING EQUIPMENT
TRUCK EQUIPED WITH ROB OR I.T.C LOADING / DUMPING CAPABILITIES.

CALCULATIONS:		
SECURE WASTE PACKER ON R.R. CAR	7.50	WITH CREW OF 6 WORKERS
POSITION W.P. ON TRUCK	0.75	WITH CREW OF 2 WORKERS
HAUL TO TRANSPORTATION CENTER	0.45	WITH CREW OF 2 WORKERS
WEIGH, CERTIFICATION	0.75	WITH CREW OF 2 WORKERS
RETURN TO STORAGE AREA	0.45	WITH CREW OF 2 WORKERS
ON-PROPERTY HAULING	2.40	HOURS

UNRESTRICTED RELEASE TO COMMERCIAL LANDFILL

COMMODITY: BELOW BASELINE MATERIAL STAGED IN VENDOR SUPPLIED ROB @ VARIOUS LOCATIONS CLOSE TO D&D CONTRACTOR WORK AREA.

1. BEFORE D&D CONTRACTOR IS ALLOWED TO REMOVE ANY MATERIALIT IS SURVEYED BY FERMCO RAD-TECH'S.
2. ONCE THE AREA HAS BEEN RELEASED TO THE D&D CONTRACTOR THE MATERIAL IS SURVEYED ON A RANDOM BASIS AS THE MATERIAL IS BEING LOADED INTO THE COMMERCIAL LANDFILL ROB.
3. AN ALLOWANCE OF FIVE (5) DAYS PER ROB TO BE FILLED AND TARPED FOR OVER THE HIGHWAY TRAVEL.
4. THE COMMERCIAL LANDFILL CONTRACTOR IS CONTACTED FOR A ROB PICK UP.
5. A ROB IS DROPED OFF WHEN ONE IS PICKED UP.

CREW SIZE:				COST	COST
SURVEY TECH'S			WAGE	/HR	/8 HR DAY
RAD TECHNICIANS (3A)		3.0	$19.25	$57.75	$462.00
		3.0		$57.75	$462.00
AVG. HOURLY RATE:	$19.25				

EQUIPMENT:
RADIATION SURVEY EQUIPMENT

CALCULATIONS:	
INITIAL SURVEY	0.013
RANDOM SURVEY	15.00

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APPENDIX G

to be highly contaminated materials because of the presence of visible residues or holdup remaining after decontamination, and Brick (Category F) was found to have high contaminant levels through the characterization process, as discussed in Section 3 of this report. Based on the balanced approach concept developed through previous site decisions, on-property disposal of these materials is not evaluated. Therefore, WAC for on-property disposal will not be developed for Categories J, C or F, and material quantities and source terms for these material categories are not considered in the WAC development process. All other materials are considered potentially acceptable materials for on-property disposal, which must be screened against contaminant-specific WAC developed in this appendix.

G.1.2 Integration with Other Operable Units

As discussed in Section 5 of this report, the number of alternatives identified and evaluated for final remediation of OU3 is limited in part due to previous site decisions. During the Remedial Investigation/Feasibility Study (RI/FS) development process for each of the other OUs, on-property disposal of remediation wastes was evaluated. Acceptability criteria for disposing remediation wastes in an on-property disposal facility were established to support remedial alternatives involving on-property disposal. The OU2 and draft OU5 RODs document on-property disposal as a major component of the respective selected remedies.

In the development of Alternative 2 for OU3, it is assumed that OU3 construction debris would be consolidated with excavated soils from OU2 and OU5 in a common disposal facility. The design of the on-property disposal facility is currently in its conceptual stages. The design provides capacity for disposing OU3 construction materials within the facility, as the quantities of OU3 materials, relative to the combined quantity estimates for OU2 and OU5, are minimal. ~~The final design of the facility will be the controlling factor for establishing final acceptance criteria for on-property disposal of OU3 construction materials~~. The final design of the facility may stipulate acceptance criteria for debris in addition to the WAC established in this report. Any additional WAC applicable to OU3 debris that are developed during the final design and approved by the regulatory agencies will be met in order to dispose OU3 debris in the on-property disposal facility.

Under the RODs for OU1 (DOE 1994e) and OU4 (DOE 1994f), it is documented that the final decision for disposition of OU1 and OU4 construction debris will be in accordance with the disposition decision for OU3 materials, as appropriate. The largest portion of OU4 construction

- Provide for deed restrictions and monuments identifying the disposal facility to further reduce the potential for inadvertent human intrusion.
- Minimize the potential for gas formation within the disposal facility by distributing degradable organic material throughout the disposal facility to the extent practical.

Multilayer Composite Cap and Liner

The details of the cap and liner configurations are depicted in Figure G-2. The cap is based upon a composite design employing both natural materials (e.g., gravel and clay) and synthetic materials (e.g., high density polyethylene [HDPE] and bentonite geocomposite barriers), and it would slope at a minimum of three percent from the crown out to the berms. The liner would be constructed on a subgrade of clean compacted native soil and consists of both natural and synthetic materials.

Size and Capacity of Disposal Facility

As mentioned in Section G.1, the disposal facility design will provide capacity for disposing remediation materials from OU3 if on-property disposal is selected for OU3 materials that meet protective WAC. The estimated volume of contaminated materials for on-property disposal from OU2, OU3, and OU5 combined would be 2,500,000 yd^3; OU3 materials would represent a small portion of this total. The total unbulked volume of OU3 construction materials considered for on-property disposal is estimated to be ~~270~~273,000 yd^3. Although some of these OU3 materials may be dispositioned off-site (i.e., materials exceeding WAC or materials available for unrestricted release), this maximum quantity represents approximately ten percent of the total volume of waste materials. Based on the estimated capacity of 2,500,000 yd^3 of waste materials, the footprint of the disposal facility, as shown in Figure G-1, would cover approximately 70 to 80 acres of land and have a maximum range in height (including the cap) from 40 to 65 feet.

G.2.3 Material Placement

Waste placement operations would be conducted concurrently with berm construction and final cap installation. The active working face of the waste placement area would be kept relatively small over a short time, thus minimizing contaminated storm water runoff and exposure to wind erosion. The materials placed in the disposal facility would include contaminated construction materials, soil, flyash, dried sludges, sediment, and gravel. Construction of the disposal facility would need to

- An iterative procedure was used to back calculate an acceptable leachate concentration from the contaminated materials (i.e., initial liquid-phase WAC) based on the respective source loading assumptions applied and the goal to meet groundwater exposure criteria for 1,000-years. The Great Miami Aquifer groundwater criteria were MCLs or criteria developed for the RME Resident Farmer/Child exposure scenario at 1 x 10^{-5} ILCR or HQ of 0.2.

- The acceptable leachate concentrations are then converted to solid-phase WAC using material- and contaminant-specific leaching characteristics or conservative assumptions regarding leachability.

This procedure is consistent among all OUs. Additional details of the procedure regarding the model input parameters, infiltration rate calculation, and conceptual long-term performance evaluation of the on-property disposal facility can be found in Appendix F of the OU5 FS.

G.4.3 Bounding Screening Approach

In order to focus the WAC development process for the numerous OU3 material types and COCs identified for construction materials, a screening process was applied to minimize additional investigations. This section explores the following bounding screening steps for focusing the resource- and time-intensive leaching tests and WAC development process:

- Identifying potential breakthrough COCs by determining COC travel times through ~~the liner and~~ the underlying overburden under the natural infiltration rate (i.e., 6 in/yr);

- Comparing the maximum OU3 concentrations detected for potential breakthrough COCs to the OU5 soil WAC (due to differences in soil and construction debris leachabilities, this step is only for demonstration purposes and not for screening out COCs);

- Identifying post-remediation COCs by comparing the allowable mass of OU3 COCs in the disposal facility based on the EPA 70-year rule (EPA 1988) to the estimated source terms; and

- Identifying the material categories that contribute significantly to the post-remediation COC source terms, based on available characterization data.

Figure G-5 outlines the above listed steps.

There are many COCs identified for OU3; however, not all of these COCs would have future impacts on the aquifer after materials are safely disposed in the on-property disposal facility. Out of the sixty total COCs identified for OU3 materials, thirteen were identified based only on concentrations

detected in loose media, sediment, or soil (materials in Category J), as discussed in Appendix A. This list includes the following constituents: 2,4-Dinitrotoluene, Benzene, Benzo(k)fluoranthene, bis(2-Ethylhexyl)phthalate, Carbazole, Chrysene, Dibenzo(a,h)anthracene, N-Nitroso-di-n-dipropylamine, Pentachlorophenol, Indeno(1,2,3-cd)pyrene, Selenium, Silver, and Styrene. As presented in Appendix A, none of these COCs were detected at concentrations above the part B screening criteria for any construction materials. Loose media and sediment will be collected during Safe Shutdown (Removal Action No. 12) and building decontamination activities; these materials will be dispositioned off-site in accordance with Removal Action No. 9 (removal actions are discussed in Section 1.2.2.1). All OU3 soils will be dispositioned with OU5 soil in accordance with soil WAC. Therefore, these constituents have been removed from further consideration in the WAC development process for construction materials.

G.4.3.1 Constituent of Concern Screening

The remaining OU3 COC list consists of 44 contaminants (i.e., 17 radionuclides, 14 inorganics, and 13 organics). Two screening steps and a comparison check that were used to identify post-remediation COCs from this initial COC list are described in the following subsections. Travel time, maximum concentration, and allowable mass are the three factors considered in this bounding screening approach.

G.4.3.1.1 Travel Time Screening

Once disposal of wastes is completed, vertical migration through the liner system and overburden to the Great Miami Aquifer is the primary exposure pathway of contaminants to receptors. The OU5 RI (DOE 1994g) presented a screening process based on the contaminant's mobility, or travel time in the vertical direction, under natural conditions. The natural infiltration rate used in this screening was 6 inches/year, which is much higher than the representative infiltration rate of the disposal facility (i.e., 0.89 inches/year) used for WAC development purposes (see Section F.5 of the OU5 FS). Because the required maximum protective timeframe is 1,000 years, those contaminants that failed to reach the aquifer in 1,000 years are screened out. In addition, this screening process considered the organic or radiological decay rate for contaminants. A COC is screened out if it would proceed through 30 half-lives during a minimum calculated travel time, since the contaminant mass remaining after 30 half-lives for any decaying contaminant would be insignificant regardless of the initial mass. Travel time calculation input parameters are provided in Table F.3.5-3 of the OU5 RI, and the results of the travel time screening are presented in Table F.3.5-2 of the OU5 RI Report. Table G-3

meet the travel time screening criteria. Several contaminants which were not COCs for OU5 are also included in the table. The same calculation procedure used in the OU5 RI was conducted for these contaminants to complete the COC travel time screening in this appendix.

As shown in Table G-3, 34 initial COCs were removed from further consideration for WAC development through the travel time screening procedure. The remaining ten contaminants have the potential to ~~break through the disposal facility liner and~~ migrate through the overburden to the aquifer within the 1,000-year period and, therefore, are considered potential breakthrough COCs based on characteristics of the individual contaminants. This screening step does not consider the actual source terms found in OU3 materials.

G.4.3.1.2 Maximum Concentration Comparison

The purpose of this comparison is to demonstrate that concentrations of most of the ten OU3 potential breakthrough COCs are below allowable soil concentrations (i.e., soil WAC). The maximum concentrations detected in OU3 materials considered for on-property disposal (excluding Material Categories C, F, and J) are compared to the OU5 soil WAC, which are listed in Tables F.5-8 and F.5.1-9 of the OU5 FS. This comparison, presented in Table G-4, shows that uranium, technetium-99, and tetrachloroethene are the only contaminants detected at concentrations which exceed the corresponding soil WAC. For gamma-Chlordane and nitrobenzene, no soil WAC were developed; therefore, a comparison cannot be made.

It is important to note that this comparison does not imply that construction debris would have the same leachability as soil. Since the actual leachabilities of OU3 materials are not considered, results of this comparison cannot be used as a screening step. Specific leaching coefficients for post-remediation COCs and critical materials are presented in Section G.4.4.2. However, this simple comparison evaluates the relative impacts to the Great Miami Aquifer from contaminant concentrations detected in OU3 materials.

G.4.3.1.3 70-Year Rule Allowable Mass Screening

Conservative assumptions regarding contaminant leachability, which can be defined from the lifetime exposure risk standpoint, are applied to determine the contaminant mass that can be safely placed in the disposal facility. Before OU3 leaching parameters are defined, the "allowable mass" of potential

OU3 breakthrough COCs is used to screen out those COCs that could not create unacceptable future impacts on the aquifer, based on current and maximum source inventories of these COCs.

Allowable Mass Determination

The method used to determine the allowable OU3 contaminant mass in the disposal facility conservatively assumes that all contaminant mass associated with OU3 materials will dissolve into infiltrating water through the waste layer within a 70-year period. This assumption is consistent with the EPA 70-year rule (EPA 1988), which considers the maximum potential lifetime impact to human health. The 70-year rule is intended for determining the maximum lifetime average exposure concentration for risk assessment purposes and has been applied to estimate the worst case leaching potential for contaminants when more specific information is not available (see Figure F.3.4-3 in the OU5 RI). Two steps are followed to determine the allowable OU3 contaminant mass in the disposal facility. The first step determines the acceptable total mass in the disposal facility regardless of sources under the 70-year rule assumption. The second step calculates the portion of the total allowable mass that could be contributed from OU3 materials, considering estimated contributions from other OUs and making no assumptions about actual leachability from OU3 materials. This exercise simulates the worst-case impacts on a human life from OU3 materials buried in an engineered disposal facility.

In general, the acceptable liquid-phase concentration under a 70-year constant source loading pattern was modeled using the same protective timeframe (1,000 years), infiltration rate, groundwater criteria, hydrogeological assumptions, and modeling tools as for developing the soil WAC. A summary of the geochemical parameters for the potential breakthrough COCs used for OU5 WAC development in this allowable mass screening is provided in Table G-5. The K_d value describes the adsorption/desorption processes in the respective environmental layers and does not influence source leaching rates, as illustrated in Figure G-4. It should be noted that the adsorption coefficient (K_d) for technetium-99 in the natural gray clay and disposal facility liner was updated in the allowable mass determination, based on adsorption/desorption studies conducted to determine site-specific geochemical parameters (IT 1993). The most conservative K_d value (0.118 L/kg) found in a literature search was assumed for OU5 WAC development purposes. However, the site-specific K_d value (0.62 L/kg) available from adsorption/desorption studies on samples taken from the unweathered gray clay in the area of the future disposal facility are more representative of site conditions. This site-specific K_d value is reasonable when compared to the range of values identified in the literature

In order to effectively evaluate materials in OU3, certain materials that are expected to have similar physical and chemical properties were grouped and evaluated together. For example, Material Categories A, B, and D include all the metals in OU3 with potential for on-property disposal. In the OU3 RI/FS Work Plan Addendum (WPA) (DOE 1993b), it was assumed in developing the OU3 characterization program that construction metals are non-porous materials and therefore would not be contaminated at depth. This assumption was used to support WAC development as well. At-depth contamination of metals, regardless of the type of metal, is not anticipated (although background levels are considered). However, contaminated metal surfaces (i.e., paint coatings or a contaminated "film" on unpainted surfaces) are expected and would be independent of the metal on which it is found. Any leaching studies for OU3 construction metals would be performed on paint coatings from metal surfaces rather than on the metal itself. For this reason, all metals are grouped and evaluated together.

The other materials that are grouped and evaluated together are concrete/masonry (Material Category E) and transite (Material Category G) because of similar physical and chemical characteristics that would affect leaching potential from these materials. All materials identified as masonry are expected to be comprised of concrete block. Concrete, masonry, and transite are anticipated to have similar leaching potential for uranium and technetium-99 due to their similar chemical composition. The primary constituent of these materials that would affect the chemical composition of the leachate is the cement due to the high calcium content. These three materials also have similar densities (between 100 and 150 lbs/ft^3), which would affect contaminant diffusion rates. Concrete, masonry, and transite are hereinafter collectively referred to as "cementicious materials."

All other materials are evaluated based on the respective RI/FS material categories. The relative volume of these material groupings and associated source terms for total uranium and technetium-99 are presented in Table G-9. The table shows that cementicious materials comprise the largest quantity of OU3 materials considered for on-property disposal. These materials represent approximately 80 percent of the total weight and ~~60~~57 percent of the total unbulked material volume of OU3 materials with potential for on-property disposal. The metals grouping comprises the second largest material grouping (approximately 11 percent of the total weight and 25 percent of the unbulked volume). Therefore, concrete and paint coatings on metals were selected as critical material categories for conducting leachability studies.

In evaluating the uranium and technetium-99 source terms for the critical material categories (i.e., concrete and paint coatings on metals), concrete is by far the largest contributor to technetium-99. Approximately 90 percent of the technetium-99 source term is associated with concrete. Concrete is the predominant source of uranium as well (approximately ~~83~~82 percent). This is consistent with selecting concrete as a critical material category. Metals contribute the second highest technetium-99 contribution (approximately five percent) and uranium contribution (approximately ten percent). All other materials contribute less than ten percent of the contaminant source terms for both uranium and technetium-99.

The remaining material categories represent a wide range of material descriptions, including: asphalt/clay piping (Material Category E), non-regulated ACM (excluding Transite) (Material Category G), regulated ACM (Material Category H), and miscellaneous materials (Material Category I). Reasons for separating these materials in the development of alternatives are based on process options applicable to these materials and the special material handling requirements of all ACM. However, none of these factors affects leachability. It was assumed that excluding certain materials with minimal quantities (i.e., less than ten percent of the total OU3 material quantity for potential on-property disposal) from on-property disposal would be more cost-effective than performing leachability studies to determine acceptability criteria. Conservative assumptions (i.e., 70-year rule) will continue to be applied to these materials collectively for establishing their acceptability in the on-property disposal facility. Figure G-7 illustrates how material categories were broken down to perform this evaluation and re-grouped based on the results.

G.4.3.3 Summary of Bounding Screening Approach Results

A summary of the COC screening process is provided in Table G-10, which results in two OU3 post-remediation COCs: technetium-99 and total uranium. The critical materials which have the most significant sources of uranium and technetium-99 are cementicious materials and paint coatings on metals. All other materials are grouped and evaluated together, as shown in Figure G-7. Leachability studies were necessary for the post-remediation COCs and critical material categories to aid in the determination of OU3-specific WAC, which provides the basis for estimating quantities of materials that meet the WAC and post-remediation source terms.

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for concrete and less readily for paint (high K_L), but the extractable percentage of overall technetium-99 mass is moderate (range of K_e values were calculated).

G.4.4.3 General Chemical Conditions in the Disposal Facility

This section summarizes the geochemical conditions in the disposal facility for soil leachate, cement leachate, and a mixture of soil and cement leachate as simulated with a thermodynamic geochemical model. Potential breakthrough COCs that are considered in the geochemical model include chromium, mercury, strontium-90, technetium-99, neptunium-237, and uranium. The model is developed for an inorganic system, as thermodynamic data are unavailable for the organic post-remediation COCs. Geochemical simulations of conditions in the disposal facility highlight COCs that reach a solubility limit, which is generally the maximum concentration a COC can have in solution. The predicted COC solubility limits are compared to COC concentrations developed using the 70-year rule to demonstrate that this approach for COC screening and WAC development is conservative. Details on the principal chemical reactions and geochemical model used for this analysis are presented in Attachment G.II.

Chemical conditions in the on-property disposal facility will be controlled by the interaction of infiltrating water with the materials placed in the facility. As discussed in Section G.3, approximately 67 percent by volume of the materials placed in the disposal facility will be contaminated soils from other OUs, and approximately 33 percent by volume will consist of construction debris. It is assumed that concrete and cementicious materials will control the chemical conditions in the leachate produced from construction debris, since these materials represent approximately ~~60~~57 percent of the volume and 80 percent of the total weight of construction debris (Table G-9). Since soils and cement are assumed to control the chemical conditions in the disposal facility, this discussion will focus on infiltrating water reacting with these contaminated materials.

The conceptual configuration of materials in the disposal facility assumes that contaminated soils will be used as void fill between blocks of rubble such as concrete. Therefore, infiltrating water will be in contact with the soil matrix and concrete rubble, yielding leachate that is a mixture of a cement endmember and a soil endmember. The geochemistry of the leachate will be dominated by dissolution/leaching reactions between water and soil, as soil comprises approximately 67 percent by volume of the material placed into the disposal facility (based on a 2:1 soil to debris ratio). In Attachment G.II, chemical conditions in the water/soil system and in the water/cement conditions are

65,800 kg. In order to be conservative, the maximum mass of uranium that is expected to leach within a 70-year period from OU3 construction materials is based on the maximum leachate concentrations detected in the leachability study for concrete and paint (1,060 μg/L and 26,400 μg/L, respectively) multiplied by the estimated volume of infiltration water in a 70-year period (1.58×10^8 L). For concrete and paint leachate combined, approximately 4,300 kg of uranium would leach into infiltration water within a 70-year period. Subtracting this amount from the total allowable uranium mass for OU3 materials would result in an allowable mass of approximately 61,500 kg for all other materials. The total source term for OU3 materials considered for on-property disposal is even lower than this limit (~~59,700~~58,400 kg), and the uranium source term for non-critical materials is much lower than this allowable mass (~~4,200~~4,170 kg). This simplified and conservative calculation demonstrates the overall minimal impact expected from OU3 materials contaminated with uranium on the underlying aquifer. Because the source term estimates are significantly lower (approximately ~~14~~15 times) than the allowable mass for these materials, and because of the inherent conservatism in the calculation, no material-specific uranium WAC need to be established as a performance specification.

Technetium-99

The leachability study results for technetium-99 also indicated that use of the allowable mass under the 70-year rule is most appropriate as a contaminant-specific WAC for OU3 materials. However, due to the findings of the leachability study related to technetium-99, a mass-based WAC for all material categories, not solely non-critical material categories, will need to be applied. In the leachability study, results showed that a significant amount of the technetium-99 leached from the samples within a three month period. In addition, regardless of the solid concentrations for the concrete samples, leachate concentrations were all high. Although technetium-99 leachability was much lower for paint than concrete, it is simpler to develop an implementation strategy and more conservative to specify an allowable mass of technetium-99 for all OU3 materials considered for on-property disposal. As presented in Table G-8, the final allowable mass for OU3 materials in the on-property disposal facility would be 105 grams of technetium-99. The mass of technetium-99 will be the only contaminant-specific WAC for OU3 materials for which an implementation strategy to meet this WAC needs to be developed. A general strategy for meeting this WAC is provided in Section G.4.6. Section 5 of the RI/FS report contains the details of how this allowable mass will be met.

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TABLE G-1

MATERIAL QUANTITIES CONSIDERED FOR ON-PROPERTY DISPOSAL BY MATERIAL CATEGORY

RI/FS Material Category	Total Weight (kg)	Unbulked Volume (ft^3)
A - Accessible Metals	13,800,000	63,400
B - Inaccessible Metals	23,200,000	1,740,000
D - Painted Light Guage Metals	1,230,000	7,150
E - Concrete/Masonry	270,000,000	4,140,000
E - Asphalt/Clay Piping	20,800,000	560,000
G - Transite	2,470,000	48,600
G - Non-Regulated ACM (excluding transite)	941,000	22,700
H - Regulated ACM	1,300,000	80,200
I - Miscellaneous Materials	4,130,000	704,000
Totals	**338,000,000**	**7,370,000**

Note: Material Categories C, F, and J are excluded from potential on-property disposal.

TABLE G-3

NATURAL CONDITION TRAVEL TIME SCREENING

Analyte	Travel Time[d] (Yr)	Half Life (Yr)	Screened Out
Radionuclides			
Americium-241[a]	1,070	432	Yes
Cesium-137	36,800	30.2	Yes
Lead-210	28,000	22.3	Yes
Neptunium-237	581	2,140,000	No
Plutonium-238	17,000	87.9	Yes
Plutonium-239/240	17,000	24,100	Yes
Plutonium-241[a]	17,000	13.2	Yes
Polonium-210	29,700	0.379	Yes
Radium-226	7,940	1,600	Yes
Radium-228	7,940	5.76	Yes
Strontium-90	132	28.6	No
Technetium-99	10.5	213,000	No
Thorium-227	100,000	18.2	Yes
Thorium-228	100,000	1.91	Yes
Thorium-230	100,000	77,000	Yes
Thorium-232	100,000	14,000,000,000	Yes
Total Uranium[b]	58.6	4,470,000,000	No
Inorganics			
Antimony	2,960	NA	Yes
Arsenic	4,780	NA	Yes
Barium	10,700	NA	Yes
Beryllium	15,600	NA	Yes
Cadmium	4,760	NA	Yes
Chromium VI[c]	397	NA	No
Copper	1,660	NA	Yes
Lead	28,000	NA	Yes
Manganese	2,390	NA	Yes
Mercury	243	NA	No
Nickel	11,800	NA	Yes
Thallium	35,800	NA	Yes
Vanadium	12,100	NA	Yes
Zinc	24,900	NA	Yes

Analyte	Travel Time[d] (Yr)	Half Life (Yr)	Screened Out
Organics			
1,4-Dichlorobenzene	166	1.00	Yes
alpha-Chlordane	43.9	NA	No
Aroclor-1248[a]	70,800	NA	Yes
Aroclor-1254	70,800	NA	Yes
Aroclor-1260	85,300	NA	Yes
Benzo(a)anthracene	26,500	7.60	Yes
Benzo(b)fluoranthene	246,000	6.78	Yes
Benzo(a)pyrene	63,100	7.60	Yes
Dieldrin	818	7.00	Yes
gamma-Chlordane	43.9	NA	No
Hexachlorobutadiene	3,990	1.00	Yes
Nitrobenzene	8.71	1.10	No
Tetrachloroethene	26.5	4.52	No

[a] Additional OU3 COCs screened out using same methodology presented in OU5 RI
[b] Total uranium represents isotopic uranium
[c] Assume Chromium analytical results represent Chromium VI
[d] Input parameters used to calculate travel time are provided in Table F.3.5-3 of the OU5 RI. Parameters for Zone III were used since this is the area with a minimum grey clay thickness in the vicinity of the on-property disposal facility.

TABLE G-8

COMPARISON OF SOURCE TERM ESTIMATES TO ALLOWABLE MASS

Potential Breakthrough COCs	Source Term[c] (kg)	Maximum Source Term[c] (kg)	OU3 Allowable Mass Under 70-Year Constant Source Loading (kg)
Radionuclides			
Neptunium-237	~~6.606~~.99 x 10^{-2}	6.84 x 10^{0}	5.05 x 10^{7}
Strontium-90	~~2.907~~.96 x 10^{-6}	1.17 x 10^{-4}	3.70 x 10^{4}
Technetium-99	~~1.171~~.16 x 10^{-1}	1.25 x 10^{2}	1.05 x 10^{-1}
Total Uranium[a]	~~5.975~~.84 x 10^{4}	1.72 x 10^{7}	6.58 x 10^{4}
Inorganics			
Chromium VI[b]	~~2.222~~.21 x 10^{6}	2.39 x 10^{6}	4.99 x 10^{10}
Mercury	~~2.512~~.47 x 10^{1}	3.39 x 10^{3}	3.30 x 10^{6}
Organics			
alpha-Chlordane	~~7.894~~.00 x 10^{-2}	1.87 x 10^{1}	9.69 x 10^{2}
gamma-Chlordane	~~8.414~~.26 x 10^{-2}	2.00 x 10^{1}	9.69 x 10^{2}
Nitrobenzene	1.55 x 10^{2}	1.40 x 10^{3}	Pure Product
Tetrachloroethene	3.51 x 10^{2}	2.92 x 10^{3}	Pure Product

[a] Total uranium represents isotopic uranium
[b] Assumes chromium analytical results represents chromium VI
[c] Excludes Material Categories C, F, and J (developed in Appendix B)

TABLE G-9
MATERIAL CATEGORY EVALUATION

Material Description	Total Weight		Unbulked Volume		Technetium-99		Uranium, Total	
	Weight (kg)	Relative Percent	Volume (cu. ft.)	Relative Percent	Source Term (kg)	Relative Percentage	Source Term (kg)	Relative Percentage
Cementicious Materials (E and G)	272,000,000	80.60%	4,190,000	56.88%	1.04E-01	89.53%	49,400	82.66%
Metals (A, B, and D)	38,300,000	11.35%	1,810,000	24.57%	6.42E-03	5.53%	6,190	10.36%
Asphalt/Clay Piping (E)	20,800,000	6.16%	560,000	7.60%	5.05E-03	4.35%	2,570	4.30%
Miscellaneous Materials (I)	4,130,000	1.22%	704,000	9.56%	1.37E-04	0.12%	248	0.41%
Non-Regulated ACM (excluding transite)(G)	941,000	0.28%	22,700	0.31%	4.90E-04	0.42%	1,240	2.07%
Regulated ACM (H)	1,300,000	0.39%	80,200	1.09%	5.99E-05	0.05%	116	0.19%
Total	337471000	100.00%	7366900	100.00%	1.16E-01	100.00%	59764	100.00%

Note: Categories C, F, and J are excluded from potential on-property disposal.

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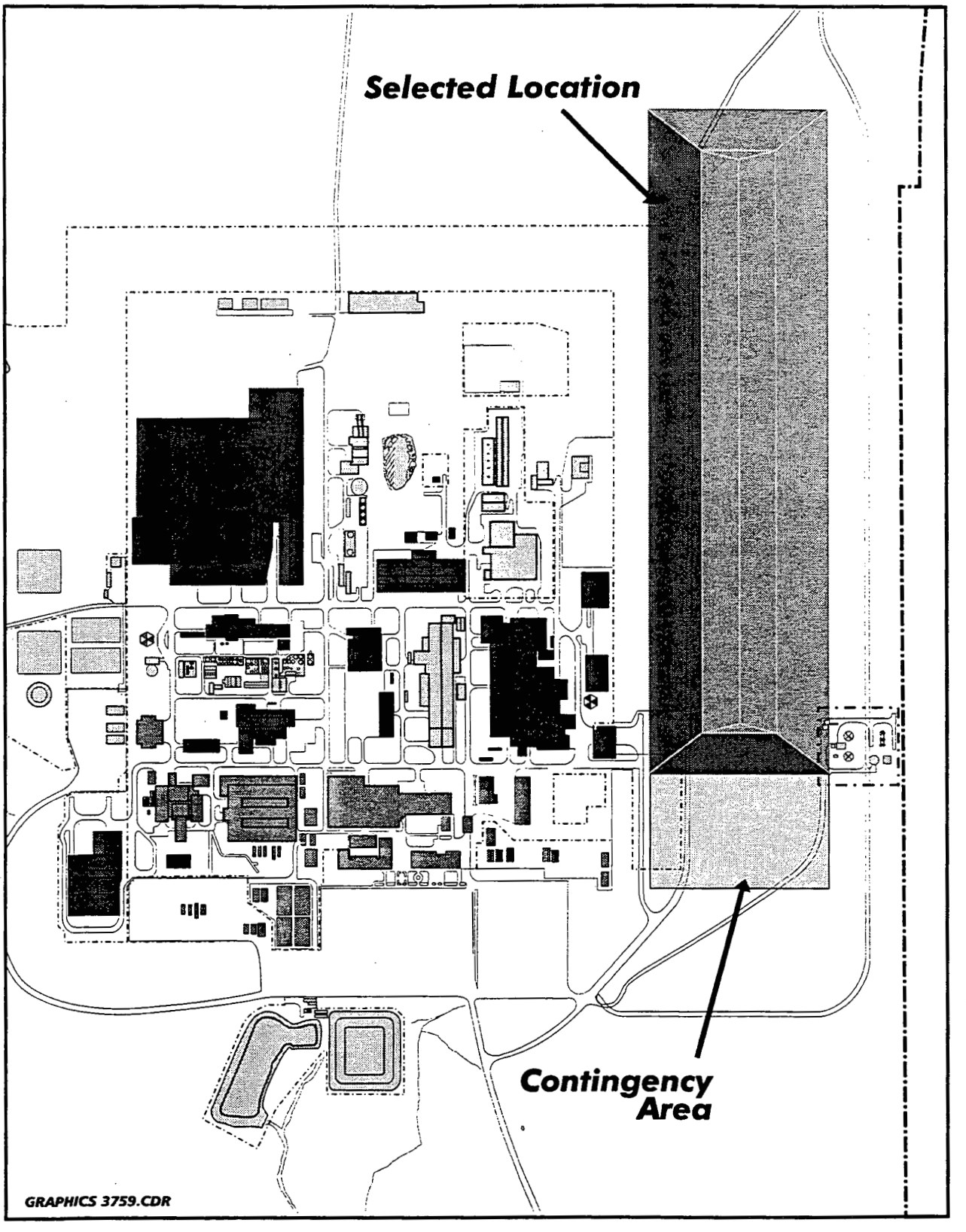

FIGURE G-1 SELECTED LOCATION FOR THE ON-PROPERTY DISPOSAL FACILITY

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concentrations. Final solid phase concentrations were analyzed for solid total uranium and technetium-99 concentrations at an off-site laboratory at ASL D after the second batch test was complete.

Liquid concentrations were analyzed periodically throughout both batch tests. Because a quick turnaround time was needed in order to assess the equilibrium state of the samples, these intermediate samples were analyzed for uranium at the FEMP laboratory. These results were considered preliminary data and were used primarily to determine when equilibrium conditions had been achieved. When the equilibrium state had been obtained, liquid phase concentrations at the conclusion of both batch tests were analyzed at both an off-site laboratory and the FEMP laboratory. The results obtained from the off-site laboratory were used in the final calculations of the leaching parameters.

~~Most~~All results reported by the off-site laboratories have been validated according to FEMP validation procedures, including all initial solid phase, final solid phase after batch test two, and liquid phase results for uranium and technetium-99 analyzed at the conclusion of ~~the first~~each batch test. All radiological and chemical composite results have also been validated. Validated results and validated qualifiers are provided in Appendix L.6. ~~Preliminary data have been received for the liquid phase concentrations at the conclusion of the second batch test, as well as final solid phase concentrations. Preliminary data received from the off site laboratory are reported~~ These results are also summarized in Tables G.I-5 and G.I-6. ~~However, these results are currently undergoing the data validation process. The unvalidated results are used for the calculation of results since preliminary examination of this data appear to yield results that meet FEMP data quality levels.~~Appendix L.5 provides a crosswalk from the raw data in Appendix L.6 to the sample and times presented in this appendix.

G.I.4 DEFINITION OF LEACHING PARAMETERS AND DERIVATION OF EQUATIONS

The intent of this leaching study is to determine the leachability of contaminants from contaminated source materials. The leachability of contaminants from OU3 materials are determined by the source leaching coefficient K_L. The source leaching coefficient is different than the standard partition coefficient (K_D), since K_D only considers the adsorption/desorption processes. K_L considers the combined effect of all transport mechanisms including dissolution, diffusion, and precipitation, as well as the adsorption/desorption processes. The parameters resulting from the batch test which describe the leaching/extraction process are K_{L1}, the average leaching coefficient for the total contaminant

contaminant did not change significantly. The data taken from the best-fit lines supports the data from the off-site analysis; uranium will leach from concrete and paint only in small quantities.

Table G.I-15 lists the leaching coefficient data for technetium-99. K_{L1} values for concrete are relatively low, ranging between 7.28 L/kg and 430 L/kg. Paint K_{L1} values are significantly higher, falling between 728 L/kg and ~~1,940~~1,840 L/kg. The K_{L2} values for concrete range from 1.94 L/kg to 10.0 L/kg. The paint results ranged from 37.8 L/kg to 422 L/kg. The low K_{L1} results for technetium-99 show that much of it will leach from concrete. The low K_{L2} results show that it will leach quickly.

G.I.6.2 Uranium Filter Series Results

Paint and concrete leachate samples were filtered through a series of 0.45 and 0.2 micron filters as part of an initial investigation into the presence of colloids in the samples. Results in Table G.I-9 report unfiltered, 0.45 micron filtered, and 0.2 micron filtered uranium concentrations for batch tests one and two. The ratio of unfiltered uranium concentration to the 0.45 micron fraction uranium concentration is defined here as an enrichment factor to examine possible trends based on the degree of colloidal formation of uranium particles in the leachate. Plots of this enrichment factor versus pH for paint and concrete are given in Figures G.I-24 and G.I-25, respectively.

For batch test one paint samples, there is a slight reduction in the uranium concentration for the 0.45 micron filtered samples relative to the unfiltered samples, but little difference between the 0.45 and 0.2 micron samples. An exception to this observation is sample 32, where the uranium concentration increases in the 0.2 micron fraction relative to the 0.45 micron fraction. These is no satisfactory explanation for the observed increase in uranium concentration in the 0.2 micron fraction at this time. Batch test two paint samples from all three fractions show little difference in uranium concentration, suggesting few, if any, colloids exist that are greater than 0.2 microns in size. This is borne out by the enrichment plot in Figure G.I-24 which shows all samples but one have enrichment factors of 1 to 1.4. Figure G.I-24 also shows that enrichment factor is probably independent of pH.

Uranium concentrations in the three fractions analyzed from batch test one concrete samples indicate substantial particulate and possible colloids are removed from the unfiltered sample when passed through a 0.45 micron filter. The enrichment factors in Figure G.I-25 show a range of 2 to 1,225 and there is some indication of a weak trend with pH if the samples with the highest and two lowest

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G.I.6.4 Technetium-99 Diffusion in Concrete Cores

It appears from the leachability study data, technetium-99 exhibits little or no affinity to concrete. Because of this, technetium-99 leaching into and out of the concrete matrix is controlled primarily by diffusion. Data obtained from the characterization process, summarized in Section 3 of this report, support the diffusion characteristics of technetium-99.

The distribution of technetium-99 in several representative concrete cores was examined with a diffusion model to investigate the hypothesis that diffusion will control the release of technetium-99 from the concrete. The model is based on the following solution to Fick's second law for the appropriate boundary and initial conditions:

$$C = C_i \mathrm{erfc}\{x/2(D^* t)^{0.5}\}$$

where

C	=	concentration at depth x (cm) below the concrete surface at time t (sec) since diffusion began
C_i	=	initial concentration
D*	=	effective diffusion coefficient
erfc	=	complementary error function

A value of 10^{-7} cm^2/sec was used for D^* based on diffusion studies with technetium-99 and concrete at Oak Ridge (Lee 1993). Results from this analysis are presented on Figures G.I-28 and G.I-29.

Figures G.I-28 and G.I-29 plot the measured technetium-99 values for 11 concrete cores and the modeled diffusion profiles. The good match between measured and predicted concentration profiles suggests that diffusion is the primary mechanism responsible for technetium-99 distribution in the cores. Based on the diffusion profiles, the original surfaces of cores 13A-007R and 13A-001A were exposed to the greatest technetium-99 concentration (Figure G.I-28) and cores 13A-002C and 74R-001 to the least (Figure G.I-29). The initial or source concentrations were estimated by extrapolating the diffusion model curve back to x=0 (i.e., the surface of the floor). However, these extrapolated source concentrations cannot be verified since characterization results are not available at the exact surface (x=0). Source concentrations estimated in Figures G.I-28 and G.I-29 are presumed to have been generated by spill events.

TABLE G.I-3
SUMMARY OF ON-SITE URANIUM DATA vs TIME

Sample Number	Filter	Batch Test One - C_W, (µg/L)										Batch Test Two - C_W, (µg/L)													
Time (hrs)		24	72	288	360	408	504	648	816	1008	1152	24	72	288	360	408	552	744	912	1152	1344	1488	1560	1680	1872
31	Unfiltered	210	350	980	1100	1300	1400	1600	1800	2200	1900	146	144	200	245	290	320	380	400	480	520	540	560	560	600
32	Unfiltered	18000	19000	16000	15400	14900	13100	13300	11300	9800	9000	1400	1500	1600	1500	1400	1800	1660	1587	1600	1800	1700	--	--	--
33	Unfiltered	27000	32000	27200	30600	29700	29300	28800	26500	26700	24800	1300	1700	2500	2700	2700	3100	3100	3291	3440	3900	3700	3800	3600	4200
34	Unfiltered	4300	4000	3100	2900	2400	2500	2900	2800	2900	3000	1400	1900	2100	2100	2000	2200	2000	2014	2010	2300	2000	--	--	--
35	Unfiltered	460	390	200	300	233	210	177	160	--	140	100	99	120	98	110	110	100	98	99	110	93	--	--	--
36	Unfiltered	2400	2300	1000	900	500	689	569	540	--	460	57	67	110	100	120	120	140	140	160	170	160	170	170	170
37	Unfiltered	12.0	13.0	7.3	6.3	5.4	3.5	8	2.7	--	2	16	9.7	3.2	2.5	3.0	17	2.0	2.7	12.0	--	--	--	--	--
38	Unfiltered	3.9	6.5	5.3	8.1	2.7	3.7	2.8	4	--	2.5	2.5	1.8	1.6	1.4	1.2	1.1	0.8	1.0	16.0	--	--	--	--	--
39	Unfiltered	4.1	2.1	2.7	2.5	1	1.8	0.9	2.8	--	0.4	0.6	0.4	0.4	0.3	0.2	0.2	0.5	0.3	17.0	--	--	--	--	--
40	Unfiltered	1.1	0.9	0.7	0.8	0.7	0.8	1.1	1	--	0.6	0.8	1.4	0.9	2.0	0.5	0.5	1.9	2.9	8.2	--	--	--	--	--
41	Unfiltered	13.0	14.0	14	12	13	9.7	23	11	--	15	11	6.1	9.4	4.4	4.4	4.3	3.4	18	31	--	--	--	--	--
42	Unfiltered	15.0	18.0	12	39	8.8	16	54	13	--	41	18	10	13	4.2	14	21	3.1	5.3	33	--	--	--	--	--
43	Unfiltered	690	530	500	600	200	504	600	530	--	540	150	190	200	170	180	180	180	170	160	130	130	--	--	--
44	Unfiltered	550	400	200	300	251	247	290	280	--	290	130	130	150	120	150	150	140	120	110	100	99	--	--	--
45	Unfiltered	1.0	1.3	0.6	0.5	0.3	0.3	0.3	0.6	--	0.2	2.0	1.6	0.9	0.4	3.5	0.8	0.3	0.3	3.3	--	--	--	--	--
46	Unfiltered	13.0	9.0	6.8	4	3.2	3.7	7	1.8	--	3.7	6.7	5.6	0.9	0.7	0.6	0.5	0.3	0.4	13	--	--	--	--	--
47	Unfiltered	8.3	2.2	1.8	4.2	1.4	1	0.8	1.3	--	0.5	0.9	1.0	0.6	0.4	0.7	0.7	0.3	0.5	5.2	--	--	--	--	--
48	Unfiltered	3.0	0.9	0.2	0.5	0.3	0.3	1.1	0.4	--	0.8	3.2	6.5	23	27	32	45	56	70	91	110	110	110	110	120
31	0.45 µm filter	210	340	950	1100	1300	1400	1600	1800	2100	1900	144	143	300	231	280	310	370	400	480	520	550	560	570	590
32	0.45 µm filter	18000	18000	15100	15400	13700	13200	13100	10700	9700	8900	1300	1500	1600	1600	1300	1700	1570	1456	1410	1700	1500	--	--	--
33	0.45 µm filter	27000	32000	30400	30900	28800	31800	29000	27300	26600	25100	1300	1700	2600	2700	2700	3100	3100	3319	3330	3800	3600	3800	3600	4200
34	0.45 µm filter	4100	3800	2700	2600	1900	2300	2500	2800	2800	2700	1500	1900	2100	2000	2000	2200	1960	1955	1970	2200	2000	--	--	--
35	0.45 µm filter	430	340	200	200	217	201	170	160	--	130	96	97	110	98	110	110	98	95	94	100	87	--	--	--
36	0.45 µm filter	2400	2300	700	700	200	381	299	330	--	320	49	59	110	96	110	110	130	130	140	150	150	150	150	160
37	0.45 µm filter	8.6	8.4	6.6	6.2	5	3.5	2.8	2.6	--	0.7	14	6.1	3.1	2.3	2.6	2.4	1.9	2.4	4.5	--	--	--	--	--
38	0.45 µm filter	2.4	2.2	1.5	1.7	1.5	1.4	1.6	1.3	--	0.7	2.0	1.4	1.0	0.8	0.8	0.7	0.5	0.5	4.1	--	--	--	--	--
39	0.45 µm filter	0.4	0.5	0.3	0.4	0.3	0.3	0.3	0.3	--	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	1.7	--	--	--	--	--
40	0.45 µm filter	1.0	0.8	0.5	0.7	0.6	0.6	0.7	0.7	--	0.5	0.7	0.9	0.7	0.6	0.5	0.5	0.4	0.4	0.7	--	--	--	--	--
41	0.45 µm filter	11.0	11.0	9.7	9.5	8.6	7.7	8.4	8.1	--	5.0	5.7	5.9	6.1	4.3	4.1	3.7	3.0	2.7	3.0	--	--	--	--	--
42	0.45 µm filter	11.0	15.0	9.4	8.9	7.6	6.9	7	6	--	3.3	10	8.7	5.9	3.7	3.8	3.3	2.8	2.7	2.3	--	--	--	--	--
43	0.45 µm filter	570	520	300	500	200	512	560	520	--	440	150	180	190	160	180	170	180	170	150	130	130	--	--	--
44	0.45 µm filter	390	320	200	300	243	249	260	260	--	230	110	120	140	120	140	130	120	110	110	98	94	--	--	--
45	0.45 µm filter	0.8	0.9	0.2	0.3	0.2	0.2	0.2	0.3	--	0.1	1.8	1.6	0.6	0.4	0.4	0.2	0.3	0.3	1.0	--	--	--	--	--
46	0.45 µm filter	10.0	6.8	3.5	3.2	2.8	2.3	2.4	1.7	--	0.9	6.6	5.1	0.9	0.6	0.6	0.4	0.3	0.3	0.5	--	--	--	--	--
47	0.45 µm filter	2.7	1.8	0.7	0.9	0.7	0.6	0.6	0.5	--	0.2	0.6	0.7	0.4	0.3	0.3	0.3	0.2	0.2	0.8	--	--	--	--	--
48	0.45 µm filter	0.8	0.5	0.1	0.2	0.2	0.2	0.2	0.3	--	0.6	3.2	6.5	22	28	31	46	58	68	91	110	110	110	110	120

Note: Double dash (--) indicates samples were not taken at the respective time.

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TABLE G.I-6
SUMMARY OF OFF-SITE LABORATORY TECHNETIUM-99 RESULTS

Sample Number	Material Type	C_{S2} (pCi/g)	C_{W1-U} (pCi/L)	C_{W1-F} (pCi/L)	C_{W2-U} (pCi/L)	C_{W2-F} (pCi/L)
31	Paint	137	96	81	34	42
32	Paint	397	599	485	343	234
33	Paint	1480	1000	1000	538	446
34	Paint	1104	1340	899	312	290
35	Paint	89	109	129	23	20.4
36	Paint	114	106	126	48	41
37	Concrete	**0.3**	13	9.6	**3.7**	**2.94**
38	Concrete	2.0	60.9	53.3	23.5	15.9
39	Concrete	**0.4**	50.7	45	15.7	21
40	Concrete	52.0	918	963	404	398
41	Concrete	5.0	532	493	80	112
42	Concrete	10.3	1060	982	179	153
43	Concrete	69.8	12900	11600	1320	1800
44	Concrete	40.9	3030	3520	720	864
45	Concrete	**0.3**	50.1	57.2	12.2	12.5
46	Concrete	**0.3**	72.7	77.6	10	20
47	Concrete	**0.3**	13.3	6.6	**2.775**	**2.94**
48	Concrete	7.3	14.5	17.5	14	**6.5**

NOTES:
Bold values denote 1/2 Minimum Detectable Concentration (MDC) for results reported < MDC.

DEFINITIONS:
C_{S2} = Concentration of contaminant in solid phase at second batch test equilibrium
C_{W1-U} = Concentration of contaminant in unfiltered leachate at first batch test equilibrium
C_{W1-F} = Concentration of contaminant in 0.45 micron filtered leachate at first batch test equilibrium
C_{W2-U} = Concentration of contaminant in unfiltered leachate at second batch test equilibrium
C_{W2-F} = Concentration of contaminant in 0.45 micron filtered leachate at second batch test equilibrium

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TABLE G.I-7
CHEMICAL COMPOSITE RESULTS

BATCH TEST	MATERIAL	PARAMETER	RESULT	UNITS
1	Paint	Aluminum	548	µg/L
1	Paint	Antimony	12.9	µg/L
1	Paint	Arsenic	1.0	µg/L
1	Paint	Barium	37.8	µg/L
1	Paint	Beryllium	0.1	µg/L
1	Paint	Cadmium	4.1	µg/L
1	Paint	Calcium	17100	µg/L
1	Paint	Chromium	6.5	µg/L
1	Paint	Cobalt	11.2	µg/L
1	Paint	Copper	50.2	µg/L
1	Paint	Iron	190	µg/L
1	Paint	Lead	612	µg/L
1	Paint	Magnesium	4720	µg/L
1	Paint	Manganese	109	µg/L
1	Paint	Mercury	0.1	µg/L
1	Paint	Molybdenum	5.1	µg/L
1	Paint	Nickel	12.3	µg/L
1	Paint	Potassium	1870	µg/L
1	Paint	Selenium	3.3	µg/L
1	Paint	Silver	1.7	µg/L
1	Paint	Sodium	2970	µg/L
1	Paint	Thallium	1.5	µg/L
1	Paint	Vanadium	1.1	µg/L
1	Paint	Zinc	2160	µg/L
1	Paint	Chloride	0.5	mg/L
1	Paint	Sulfate	38.8	mg/L
1	Paint	Ammonia	3.69	mg/L
1	Paint	Nitrate	25.3	mg/L
1	Paint	Total Inorganic Carbon	1	mg/L
1	Paint	Total Organic Carbon	7.9	mg/L
1	Paint	Fluoride	8	mg/L
1	Paint	Phosphate	0.12	mg/L
2	Paint	Aluminum	381	µg/L
2	Paint	Calcium	65,000	µg/L
2	Paint	Magnesium	2640	µg/L
2	Paint	Potassium	7910	µg/L
2	Paint	Silicon	9490	µg/L
2	Paint	Sodium	8530	µg/L
2	Paint	Sulfate	0.5	µg/L
1	Concrete	Aluminum	1120	µg/L
1	Concrete	Antimony	12.9	µg/L

TABLE G.I-7
CHEMICAL COMPOSITE RESULTS

BATCH TEST	MATERIAL	PARAMETER	RESULT	UNITS
1	Concrete	Arsenic	**1.0**	µg/L
1	Concrete	Barium	71.1	µg/L
1	Concrete	Beryllium	**0.1**	µg/L
1	Concrete	Cadmium	**0.7**	µg/L
1	Concrete	Calcium	86400	µg/L
1	Concrete	Chromium	**3.4**	µg/L
1	Concrete	Cobalt	**2.3**	µg/L
1	Concrete	Copper	**2.1**	µg/L
1	Concrete	Iron	414	µg/L
1	Concrete	Lead	**1.8**	µg/L
1	Concrete	Magnesium	2590	µg/L
1	Concrete	Manganese	19.6	µg/L
1	Concrete	Mercury	**0.1**	µg/L
1	Concrete	Nickel	**5.1**	µg/L
1	Concrete	Potassium	22800	µg/L
1	Concrete	Selenium	**1.0**	µg/L
1	Concrete	Silver	**1.7**	µg/L
1	Concrete	Sodium	18800	µg/L
1	Concrete	Thallium	**1.2**	µg/L
1	Concrete	Vanadium	**1.2**	µg/L
1	Concrete	Zinc	**5.5**	µg/L
1	Concrete	Molybdenum	**10.2**	µg/L
1	Concrete	Silicon	6090	µg/L
1	Concrete	Chloride	16.6	mg/L
1	Concrete	Sulfate	**0.5**	mg/L
1	Concrete	Ammonia	0.26	mg/L
1	Concrete	Nitrate	63.3	mg/L
1	Concrete	Total Organic Carbon	7.2	mg/L
1	Concrete	Total Inorganic Carbon	4.1	mg/L
1	Concrete	Fluoride	0.79	mg/L
1	Concrete	Phosphate	**0.1**	mg/L
1	Concrete	Total Dissolved Solid	408	mg/L
2	Concrete	Aluminum	171	µg/L
2	Concrete	Calcium	5050	µg/L
2	Concrete	Magnesium	1270	µg/L
2	Concrete	Potassium	1100	µg/L
2	Concrete	Silicon	792	µg/L
2	Concrete	Sodium	788	µg/L
2	Concrete	Sulfate	**0.5**	µg/L

Bold values denote 1/2 Minimum Detectable Concentration (MDC) for results reported < MDC.

TABLE G.I-8
RADIOLOGICAL COMPOSITE RESULTS

BATCH TEST	MATERIAL	PARAMETER	RESULT (pCi/L)
1	Paint	Cesium-137	1.49
1	Paint	Neptunium-237	7.69
1	Paint	Plutonium-238	21.95
1	Paint	Plutonium-239	9.9
1	Paint	Radium-226	0.443
1	Paint	Radium-228	1.62
1	Paint	Strontium-90	0.928
1	Paint	Thorium-228	1.26
1	Paint	Thorium-230	4.83
1	Paint	Thorium-232	1.12
1	Paint	Uranium-234	2550
1	Paint	Uranium-235/236	317
1	Paint	Uranium-238	2420
1	Concrete	Cesium-137	1.425
1	Concrete	Neptunium-237	0.183
1	Concrete	Plutonium-238	4.854
1	Concrete	Plutonium-239	2.275
1	Concrete	Radium-226	1.89
1	Concrete	Radium-228	3.25
1	Concrete	Strontium-90	0.445
1	Concrete	Thorium-228	0.8[illegible]
1	Concrete	Thorium-230	0.857
1	Concrete	Thorium-232	0.856
1	Concrete	Uranium-234	68.7
1	Concrete	Uranium-235/236	1.64
1	Concrete	Uranium-238	56.4

TABLE G.I-12
CALCULATION OF INITIAL TECHNETIUM-99 SOLID-PHASE CONCENTRATIONS

Sample Number	W (g)	V (L)	C_{W1} (pCi/L)	M_{W1} (pCi)	C_{W2} (pCi/L)	M_{W2} (pCi)	C_{S2} (pCi/g)	M_{S2} (pCi)	M_{SO} (pCi)	C_{SO} (pCi/g)
31	17.56	3.5	96	336	42.0	147	137	2406	2888	164
32	9.82	3.5	599	2097	343	1201	397	3899	7196	733
33	6.67	3.5	1000	3500	538	1883	1480	9872	15255	2287
34	9.49	3.5	1340	4690	312	1092	1104	10477	16259	1713
35	17.40	3.5	129	452	23.0	81	89.2	1553	2085	120
36	7.25	3.5	126	441	48.0	168	114	824	1433	198
37	318.21	3.5	13.0	46	3.7	13	0.33	103	162	0.51
38	340.45	3.5	60.9	213	23.5	82	1.95	664	959	2.82
39	336.09	3.5	50.7	177	21.0	74	0.40	134	385	1.15
40	310.12	3.5	963	3371	404	1414	52.0	16126	20911	67.4
41	381.04	3.5	532	1862	112	392	4.95	1886	4140	10.9
42	306.79	3.5	1060	3710	179	627	10.3	3160	7496	24.4
43	330.59	3.5	12900	45150	1800	6300	69.8	23075	74525	225
44	378.13	3.5	3520	12320	864	3024	40.9	15466	30810	81.5
45	355.41	3.5	57.2	200	12.5	44	0.3	119	363	1.02
46	274.39	3.5	77.6	272	20.0	70	0.31	85	427	1.55
47	277.10	3.5	13.3	47	2.9	10	0.29	80	137	0.50
48	222.81	3.5	17.5	61	14.0	49	7.3	1627	1737	7.79

DEFINITIONS:

W = Mass of test media

V = Volume of leachant

C_{SO} = Initial concentration of contaminant in solid phase

C_{S2} = Concentration of contaminant in solid phase at second batch test equilibrium

C_{W1} = Concentration of contaminant unfiltered or filtered leachate at first batch test equilibrium (whichever is higher)

C_{W2} = Concentration of contaminant unfiltered or filtered leachate at second batch test equilibrium (whichever is higher)

M_{SO} = Initial activity in solid phase (pCi)

M_{W1} = Activity of contaminant in leachate at first batch test equilibrium

M_{W2} = Activity of contaminant in leachate at second batch test equilibrium

M_{S2} = Activity of contaminant in solid phase at second batch test equilibirium

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TABLE G.I-13
URANIUM LEACHING COEFFICIENT CALCULATIONS BASED ON OFF-SITE LABORATORY DATA

Sample Number	Material Type	W (g)	V (L)	C_{SO} (µg/g)	$C_{W1 \cdot F}$ (µg/L)	$C_{W2 \cdot F}$ (µg/L)	K_o (%)	K_{L1} (L/kg)	K_{L2} (L/kg)
31	Paint	17.56	3.50	5658	2410	522	10.8	2150	55.1
32	Paint	9.82	3.50	33297	8710	1390	11.1	3470	67.7
33	Paint	6.67	3.50	90274	26400	3050	17.4	2890	68.5
34	Paint	9.49	3.50	65622	3570	1870	4.21	18000	410
35	Paint	17.40	3.50	17457	199	103	0.475	87500	216
36	Paint	7.25	3.50	2349	172	157	41.4	13200	5170
37	Concrete	318.21	3.50	430	14.60	4.08	0.052	29400	4.26
38	Concrete	340.45	3.50	42	11.00	2.60	0.35	3820	3.18
39	Concrete	336.09	3.50	4	7.09	1.20	2	600	2
40	Concrete	310.12	3.50	14	4.88	0.41	0.44	2800	1
41	Concrete	381.04	3.50	143	9.02	2.07	0.0750	15900	2.7
42	Concrete	306.79	3.50	145	6.38	2.30	0.0787	22600	6.43
43	Concrete	330.59	3.50	597	402	120	1.02	1470	4.51
44	Concrete	378.13	3.50	1789	204	88	0.19	8800	7.02
45	Concrete	355.41	3.50	14.5	3.92	0.41	0.30	3700	1.2
46	Concrete	274.39	3.50	36	2.32	0.41	0.10	16000	2.8
47	Concrete	277.10	3.50	3	8.97	0.41	4	300	0.6
48	Concrete	222.81	3.50	65.8	1.03	123	100	63854	undefined

Concrete	Geometric Mean =	0.5	4928.7	5
Paint	Geometric Mean =	7	8748	221

DEFINITIONS:

W = Mass of test media

V = Volume of leachant

C_{SO} = Initial concentration of contaminant in solid phase

$C_{W1 \cdot F}$ = Concentration of contaminant in 0.45 micron filtered leachate at first batch test equilibrium

$C_{W2 \cdot F}$ = Concentration of contaminant in 0.45 micron filtered leachate at second batch test equilibrium

K_o = Total extractable fraction of contaminant in initial sample

K_L = Leaching coefficient of the extractable portion of contaminant

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TABLE G.I-15
TECHNETIUM-99 LEACHING COEFFICIENT CALCULATIONS

Sample Number	W (g)	V (L)	C_{so} (pCi/g)	C_{W1-F} (pCi/L)	C_{W2-F} (pCi/L)	K_e (%)	K_{L1} (L/kg)	K_{L2} (L/kg)
31	17.56	3.50	164.5	80.6	42.0	20.4	1840	217
32	9.82	3.50	733	485	234	45.6	1150	332
33	6.67	3.50	2287	1000	446	41.4	1760	422
34	9.49	3.50	1713	899	290	28.6	1540	176
35	17.40	3.50	119.8	129	20.4	25.7	728	37.8
36	7.25	3.50	197.7	126	41.0	45.6	1090	233
37	318.21	3.50	0.51	9.62	2.94	30.0	41.9	4.84
38	340.45	3.50	2.82	53.3	15.9	27.7	42.6	4.37
39	336.09	3.50	1.15	44.7	21.0	76.6	15.2	9.23
40	310.12	3.50	67.43	963	398	27.5	58.7	7.95
41	381.04	3.50	10.87	493	112	53.9	12.9	2.70
42	306.79	3.50	24.44	982	153	54.3	13.5	2.11
43	330.59	3.50	225.4	11600	1800	64.5	8.85	1.94
44	378.13	3.50	81.48	3520	864	53.0	13.9	3.01
45	355.41	3.50	1.02	57.2	12.5	70.6	8.01	2.75
46	274.39	3.50	1.55	77.6	20.0	85.8	7.28	4.43
47	277.10	3.50	0.50	6.64	2.94	30.4	61.9	10.0
48	222.81	3.50	7.79	17.5	6.50	5.61	430	9.28

Concrete	Geometric Mean =	40	25	4
Paint	Geometric Mean =	33	1287	190

DEFINITIONS:

W = Mass of test media

V = Volume of leachant

C_{SO} = Initial concentration of contaminant in solid phase

C_{W1-F} = Concentration of contaminant in 0.45 micron filtered leachate at first batch test equilibrium

C_{W2-F} = Concentration of contaminant in 0.45 micron filtered leachate at second batch test equilibrium

K_e = Total extractable fraction of contaminant in initial sample

K_L = Leaching coefficient of the extractable portion of contaminant

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carbonate [$CaCO_3$]) dissolution, CO_2 dissolution, and carbonic acid (H_2CO_3) dissociation. Important reactions in this system are:

(1) $CaCO_3 + H_2O \rightleftarrows Ca^{+2} + HCO_3^- + OH^-$
(2) $CO_2 + H_2O \rightleftarrows H_2CO_3$
(3) $H_2CO_3 \rightleftarrows H^+ + HCO_3^-$

The dissolution of $CaCO_3$ in water (Reaction 1) contacting air containing about 0.03 percent CO_2 results in an equilibrium pH of about 8. Lower pH values are generally observed in FEMP soils because CO_2 activity (i.e., partial pressure of CO_2) in the soils is greater than in rainwater equilibrated with air, due to decomposition of organic debris and respiration of microorganisms. Measurements of the composition of gas samples from soils generally show CO_2 partial pressures from 10^{-3} to 10^{-1} atmospheres (Freeze and Cherry 1979). Rainwater equilibrated with air has a CO_2 partial pressure of approximately $10^{-3.5}$ atmospheres. The higher CO_2 activity in soils drives Reaction 2 to the right to produce more H_2CO_3, which dissociates immediately to release H^+ and lowers the pH (Reaction 3). The large reservoir of carbonate minerals (approximately 47 percent of the soil) and biogenic sources of CO_2 allow the water/soil system to be buffered between pH of 7 and 8 by the interplay of the above three reactions.

Silicate minerals present in the soil (e.g., quartz, feldspar, and clay minerals) have less influence on the chemistry of the infiltrating water due to their low solubilities (relative to carbonate minerals) at near neutral pH values. These minerals provide silica, potassium, sodium, aluminum, and various trace metals to the infiltrating water via dissolution and ion-exchange reactions.

Based on the above assumptions and expected geochemical reactions, a good analog for infiltrating water is groundwater obtained from FEMP Type 1 (perched water) background wells. Therefore, it is assumed that FEMP perched groundwater is the infiltrating water that enters the disposal facility to react with contaminated soil and concrete. The composition of the FEMP perched groundwater and source loading terms used for input data in the geochemical model are summarized in Table G.II-2. Source terms for the model were obtained by converting the total mass of the constituent reported in soil estimated to leach in 70 years (Table G-7) and ~~cementicious materials~~in all OU3 materials considered for on-property disposal (Table G-~~9~~8) to moles and dividing the number of moles by the expected 70-year infiltration water volume (1.58×10^8 liters). Note that the source term for chromium in non-cement debris reflects removal of the chromium component in stainless steel, for the purpose of geochemical modeling as this is background for stainless steel and stainless steel is not

TABLE G.II-2

COMPOSITION OF FEMP PERCHED WATER AND SOURCE TERMS FOR GEOCHEMICAL MODEL

FEMP Perched Water[a]	Soil Source Terms[b] (moles per liter)		Concrete Source Terms[b] (moles per liter)	
pH = 7.2 Eh = 485 mV				
Aluminum = 3.75×10^{-2} mg/L				
Calcium = 9.60×10^{1} mg/L				
Iron = 1.54×10^{1} mg/L				
Potassium = 8.10×10^{0} mg/L				
Magnesium = 3.27×10^{1} mg/L				
Sodium = 2.42×10^{1} mg/L				
Silica = 6.03×10^{0} mg/L				
Bicarbonate = 4.40×10^{2} mg/L				
Chloride = 4.00×10^{1} mg/L				
Fluoride = 5.90×10^{-1} mg/L				
Phosphate = 2.17×10^{-1} mg/L				
Nitrate = 6.20×10^{-1} mg/L				
Chromium = 6.0×10^{-3} mg/L	1.62×10^{-6}		9.35×10^{-4}	[9.33E-04][c]
Mercury = 1.0×10^{-4} mg/L	2.71×10^{-7}		7.93×10^{-7}	[7.80E-07]
Neptunium-237 = 3.0×10^{-7} mg/L	1.11×10^{-10}		1.76×10^{-9}	[1.87E-09]
Strontium-90 = 1.5×10^{11} mg/L	3.08×10^{-14}		2.04×10^{-13}	[5.60E-13]
Technetium-99 = 1.8×10^{-6} mg/L	3.37×10^{-11}		7.49×10^{-9}	[7.42E-09]
Uranium = 5.4×10^{-4} mg/L	2.80×10^{-5}		1.59×10^{-3}	[1.55E-03]

a Background concentrations obtained from Tables 5-1, 5-2, and 5-3 in DOE, May 1994.

b Source terms given for COCs only. Units are given in moles per liter, as the geochemical model is based on a liter of water.

c Brackets denote current source term estimates as presented in Table G-8. These revised estimates reflect very slight changes from estimates used in previous geochemical model runs (unbracketed numbers). However, using these revised values for mercury, neptunium-237, and uranium would not change these elemental concentrations in the cement leachate endmember results, because the liquid concentrations are constrained by solubility limits with the phases HgO, NpO_2, and $CaUO_4$. Leachate concentrations for chromium, strontium-90, and technetium-99 would change slightly, as these elements are unconstrained by solubility. However, since using the revised source terms would result in insignificant changes in the geochemical model outputs, the model was not re-run using the revised source terms.

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APPENDIX H

such as personal protective equipment, and administrative controls, such as exposure duration limits. The expected effect of these protective measures on potential exposures to these receptors is discussed below.

H.2.3.4.1 Remediation Worker

During remedial operations, engineering controls, such as dust suppression technologies and enclosures would be used to protect the remediation worker and lessen potential inhalation of contaminants. Personal protective equipment would be worn by the workers to reduce the potential for inhalation, dermal contact, and ingestion exposures, as determined and directed in the project health and safety plan. The reduction in potential exposure afforded from personal protective equipment has not been quantified or evaluated in this assessment. Hence the results in exposure and risk from inhalation are conservative.

H.2.3.4.2 Nonremediation Workers

The nonremediation worker may inhale airborne particulates and volatiles released from on-property remedial activities. However, the distance from the remediation work, the dust suppression techniques used, the shielding provided by the office facilities (including air filtering systems), and the low levels of airborne contamination would combine to mitigate both the inhalation and direct radiation exposure pathways. Nonremediation workers are assumed to be located in the center of the administrative area ~~at least 290 meters from the nearest OU3 contaminated materials~~ and approximately 380 ~~1,100~~ meters from the center of the on-property disposal facility.

H.2.3.4.3 Transportation Worker

The transportation worker would be protected from inhalation and direct contact exposures by the containers in which materials would be shipped. Direct radiation exposures are expected to be kept within regulated limits for workers through application of distance and shielding.

H.2.3.4.4 Off-Site Resident (Adult and Child)

The off-site resident's location, which is assumed to be at a greater distance from the contamination source than the nonremediation worker, is the prime mitigating factor preventing exposures. The off-site resident is assumed to reside approximately 215 ~~over 500~~ meters from the stored waste materials and directly downwind from the on-property disposal facility at the site's fenceline. The

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engineering controls used at the FEMP which would also contribute to reduction in exposure to these receptors are wetting for dust suppression, waste containers and the surface water runoff controls at

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The following assumptions were made to calculate inhalation intakes for the receptors evaluated:

- Remediation Worker's exposure time, frequency and duration (ET, EF, and ED) are 8 hrs/day, 250 days/yr, 7 years (27 years for worst case).
- Nonremediation Worker's ET, EF and ED are 8 hrs/day, 250 days/yr, 7 yrs (or 27 yrs for worse case).
- 80 percent of Nonremediation Worker's time on-property is indoors.
- The Nonremediation Worker's indoor air concentration on-property is 20 percent the concentration modelled for outdoors as a result of air filtration and ventilation exchange rates.
- Nonremediation Worker's adjusted exposure per day based on time is 2.88 hrs.
- Off-site resident adult's and child's ET and EF = 8 hrs/day, 250 days/yr.
- Off-site resident child's ED = 6 years
- Off-site resident adult's ED = 7 years and 27 years for worse case.
- Remediation Worker's inhalation rate (IR) = 60 m^3/day.
- Nonremediation Worker's IR = 20 m^3/day.
- Off-site resident child's IR = 12 m^3/day.
- Off-site resident adult's IR = 20 m^3/day.
- Body weight (BW) of all adults = 70 kg.
- Off-site resident child's BW = 15 kg.

The exposure durations utilized in this short term risk assessment mirror the actual durations anticipated for receptor exposures. In operating the on-property disposal facility, waste placement operations are expected to occur eight hours per day for 260 days per year. Additionally, each receptor is assumed to take a week vacation period away from the site. OU3 impacts to air quality are expected only during waste placement within the on-property disposal facility. Therefore, the resulting exposure duration for each receptor is eight hours per day and 250 days per year.

Inhalation intakes were calculated from resuspension of concrete being placed in the disposal facility, and from potential resuspension of released materials during a hypothetical rail accident. Potential

360 mrem/yr (NCRP-93 1987), would result in an ILCR of 2.7 x 10^{-4} within one year. Therefore, the use of the risk coefficient results in highly conservative ILCR estimates.

Eight metals and eleven organic compounds did not have inhalation toxicity values available from either the Integrated Risk Information System (IRIS) or Health Effects Assessment Summary Tables (HEAST). The absence of published toxicity information for these compounds results in their exclusion from the quantitative risk assessment and the potential underestimation of the total risk. In particular lead, certain PAHs, and xylene, which have oral toxicity values or toxicity equivilent values, were not addressed in this risk assessment. However, assuming that the EPA prioritizes the establishment of toxicity values based on potential effects, the overall contribution of these missing compounds to the risk assessment is considered to be minimal relative to the risk from compounds with documented carcinogenic or non-carcinogenic toxicity values.

Another major source of uncertainty in this assessment occurs in the evaluation of mechanical hazards associated with transportation. As the mechanical hazard risks are strictly a function of the miles traveled, increasing or decreasing the miles traveled would increase or decrease the risks. This can be seen easily in the case of rail transport, where doubling the size of the train would lower the mechanical hazard risks by a factor of two. Changes in the containers used would also result in a change in the number of shipments. A corresponding change in the cancer risks would also occur as the load sizes change, though it would be applicable only to one-way travel instead of round-trip estimates. For Alternatives 2 and 3, cancer and noncarcinogenic risks are very small and mechanical hazard risks, where serious injuries or fatalities may occur, may be of greater significance.

H.5.2 Cumulative Uncertainty

Numerous sources of uncertainty are identified for this remedial action risk assessment. Each of these factors is addressed in a fashion that ensures that the final estimate of the risk is quite conservative, meaning that while the magnitude of uncertainty is moderate to high overall, the likelihood that risks have been understated is very low.

H.6 SUMMARY AND DISCUSSION

This summary includes a synopsis of the potential risks calculated for each remedial alternative, and presents analyses of significant trends associated with those risks. This section consists of three parts. Section H.6.1 briefly reviews the salient points of the short-term risk assessment. A brief comparison of the potential mechanical hazards and human health effects from various remedial actions to five

TABLE H-1

EXPOSURE POINT CONCENTRATIONS FOR MATERIAL CATEGORIES A (ACCESSIBLE METALS) AND B (INACCESSIBLE METALS)

Parameter	Source Term (kg)	Specific Activity (Ci/g)	Weight (tons)	Unbulked Volume (cu.ft.)	Weighted Average Concentration (pCi/g)[a]
Americium-241	5.69E-07	3.24E+00	4.09E+04	1.81E+06	4.98E-02
Cesium-137	5.62E-09	8.71E+01	4.09E+04	1.81E+06	1.32E-02
Lead-210	5.05E-07	8.11E+01	4.09E+04	1.81E+06	1.10E+00
Neptunium-237	3.57E-03	7.05E-04	4.09E+04	1.81E+06	6.79E-02
Plutonium-238	9.03E-07	1.75E+01	4.09E+04	1.81E+06	4.26E-01
Plutonium-239/240	8.22E-05	2.27E-01	4.09E+04	1.81E+06	5.03E-01
Plutonium-241	1.26E-07	1.12E+02	4.09E+04	1.81E+06	3.80E-01
Polonium-210	9.37E-09	4.49E+03	4.09E+04	1.81E+06	1.14E+00
Radium-226	2.46E-04	9.88E-01	4.09E+04	1.81E+06	6.55E+00
Radium-228	4.20E-07	2.34E+02	4.09E+04	1.81E+06	2.65E+00
Strontium-90	1.38E-08	1.42E+02	4.09E+04	1.81E+06	5.30E-02
Technetium-99	4.82E-03	1.70E-02	4.09E+04	1.81E+06	2.21E+00
Thorium-228	3.47E-08	8.22E+02	4.09E+04	1.81E+06	7.70E-01
Thorium-230	1.55E-02	1.94E-02	4.09E+04	1.81E+06	8.10E+00
Thorium-232	1.80E+02	1.09E-07	4.09E+04	1.81E+06	5.29E-01
Uranium-233/234	2.86E-03	9.48E-03	4.09E+04	1.81E+06	7.32E-01
Uranium-234	4.39E-01	6.19E-03	4.09E+04	1.81E+06	7.32E+01
Uranium-235/236	4.32E+01	6.34E-05	4.09E+04	1.81E+06	7.39E+01
Uranium-236	0.00E+00	6.34E-05	4.09E+04	1.81E+06	0.00E+00
Uranium-238	8.10E+03	3.33E-07	4.09E+04	1.81E+06	7.28E+01
Uranium, Total [b]	4.71E+03	N/A	4.09E+04	1.81E+06	1.27E+02

Note: [a] These average concentrations are used as exposure point concentrations for calculating direct radiation doses from piles being placed into the disposal facility, under Alternative 2.

[b] The units for the Total Uranium concentration are ug/g, NOT pCi/g.

TABLE H-2

EXPOSURE POINT CONCENTRATIONS OF CONCRETE (RADIOLOGICAL) TO BE PLACED INTO THE ON-PROPERTY DISPOSAL FACILITY

Parameter	Source Term (kg)	Specific Activity (Ci/g)	Weight (tons)	Unbulked Volume (cu.ft.)	Weighted Average Concentration (pCi/g)[a]
Americium-241	1.05E-05	3.24E+00	3.20E+05	4.70E+06	1.17E-01
Cesium-137	2.91E-07	8.71E+01	3.20E+05	4.70E+06	8.72E-02
Lead-210	4.24E-06	8.11E+01	3.20E+05	4.70E+06	1.18E+00
Neptunium-237	5.06E-02	7.05E-04	3.20E+05	4.70E+06	1.23E-01
Plutonium-238	4.11E-06	1.75E+01	3.20E+05	4.70E+06	2.47E-01
Plutonium-239/240	1.46E-04	2.27E-01	3.20E+05	4.70E+06	1.14E-01
Plutonium-241	1.03E-05	1.12E+02	3.20E+05	4.70E+06	3.97E+00
Polonium-210	1.00E-07	4.49E+03	3.20E+05	4.70E+06	1.55E+00
Radium-226	5.70E-04	9.88E-01	3.20E+05	4.70E+06	1.94E+00
Radium-228	5.85E-06	2.34E+02	3.20E+05	4.70E+06	4.72E+00
Strontium-90	7.73E-06	1.42E+02	3.20E+05	4.70E+06	3.78E+00
Technetium-99	4.45E-02	1.70E-02	3.20E+05	4.70E+06	2.60E+00
Thorium-228	1.28E-06	8.22E+02	3.20E+05	4.70E+06	3.61E+00
Thorium-230	3.35E-02	1.94E-02	3.20E+05	4.70E+06	2.24E+00
Thorium-232	2.92E+03	1.09E-07	3.20E+05	4.70E+06	1.09E+00
Uranium-233/234	1.36E+00	9.48E-03	3.20E+05	4.70E+06	4.44E+01
Uranium-234	2.81E+00	6.19E-03	3.20E+05	4.70E+06	5.99E+01
Uranium-235/236	2.55E+02	6.34E-05	3.20E+05	4.70E+06	5.56E+01
Uranium-236	0.00E+00	6.34E-05	3.20E+05	4.70E+06	0.00E+00
Uranium-238	5.24E+04	3.33E-07	3.20E+05	4.70E+06	6.01E+01
Uranium, Total[b]	3.16E+04	N/A	3.20E+05	4.70E+06	1.09E+02

Note: [a] These weighted average concentrations are used as exposure point concentrations for calculating direct radiation doses to receptors. The weighted averages are also used to develop inhalation exposure point concentrations.

[b] The units for the Total Uranium concentration are ug/g, NOT pCi/g.

TABLE H-3

EXPOSURE POINT CONCENTRATION OF MATERIAL CATEGORY E (SCABBLED CONCRETE RESIDUE) TO BE SHIPPED OFF-SITE

Parameter	Source Term (kg)	Specific Activity (Ci/g)	Weight (tons)	Unbulked Volume (cu.ft.)	Weighted Average Concentration (pCi/g)[a]
Americium-241	5.45E-08	3.24E+00	1.64E+02	2.19E+03	1.18E+00
Cesium-137	1.06E-09	8.71E+01	1.64E+02	2.19E+03	6.21E-01
Lead-210	1.74E-08	8.11E+01	1.64E+02	2.19E+03	9.44E+00
Neptunium-237	2.59E-03	7.05E-04	1.64E+02	2.19E+03	1.22E+01
Plutonium-238	1.94E-08	1.75E+01	1.64E+02	2.19E+03	2.28E+00
Plutonium-239/240	1.95E-05	2.27E-01	1.64E+02	2.19E+03	2.96E+01
Plutonium-241	6.28E-08	1.12E+02	1.64E+02	2.19E+03	4.72E+01
Polonium-210	3.55E-10	4.49E+03	1.64E+02	2.19E+03	1.07E+01
Radium-226	1.28E-06	9.88E-01	1.64E+02	2.19E+03	8.50E+00
Radium-228	1.97E-09	2.34E+02	1.64E+02	2.19E+03	3.09E+00
Strontium-90	2.27E-08	1.42E+02	1.64E+02	2.19E+03	2.16E+01
Technetium-99	5.78E-02	1.70E-02	1.64E+02	2.19E+03	6.59E+03
Thorium-228	1.18E-09	8.22E+02	1.64E+02	2.19E+03	6.52E+00
Thorium-230	4.26E-03	1.94E-02	1.64E+02	2.19E+03	5.54E+02
Thorium-232	5.85E+00	1.09E-07	1.64E+02	2.19E+03	4.28E+00
Uranium-233/234	6.19E-03	9.48E-03	1.64E+02	2.19E+03	3.94E+02
Uranium-234	7.45E-01	6.19E-03	1.64E+02	2.19E+03	3.09E+04
Uranium-235/236	9.67E+01	6.34E-05	1.64E+02	2.19E+03	4.11E+04
Uranium-236	0.00E+00	6.34E-05	1.64E+02	2.19E+03	0.00E+00
Uranium-238	1.01E+04	3.33E-07	1.64E+02	2.19E+03	2.26E+04
Uranium, Total[b]	5.48E+03	N/A	1.64E+02	2.19E+03	3.67E+04

Note: [a] These weighted average concentrations are used as exposure point concentrations for calculating direct radiation doses to receptors from containers.

[b] The units for the Total Uranium concentration are ug/g, NOT pCi/g.

TABLE H-4

WEIGHTED AVERAGE CONCENTRATIONS OF CONCRETE TO BE PLACED INTO THE ON-PROPERTY DISPOSAL FACILITY (NON-RADIOLOGICAL)

Parameter	Source Term (kg)[b]	Weight (tons)	Unbulked Volume (cu.ft.)	Weighted Average Concentration (ppm)[a]
1,4-Dichlorobenzene	0.00E+00	3.20E+05	4.70E+06	NA
2,4-Dinitrotoluene	0.00E+00	3.20E+05	4.70E+06	NA
alpha-Chlordane	4.00E-02	3.20E+05	4.70E+06	1.38E-04
Antimony	5.97E+02	3.20E+05	4.70E+06	2.06E+00
Aroclor-1248	4.43E-02	3.20E+05	4.70E+06	1.52E-04
Aroclor-1254	8.38E+00	3.20E+05	4.70E+06	2.89E-02
Aroclor-1260	5.30E+00	3.20E+05	4.70E+06	1.82E-02
Arsenic	1.81E+03	3.20E+05	4.70E+06	6.25E+00
Barium	1.98E+04	3.20E+05	4.70E+06	6.82E+01
Benzene	0.00E+00	3.20E+05	4.70E+06	NA
Benzo(a)anthracene	2.19E+00	3.20E+05	4.70E+06	7.55E-03
Benzo(a)pyrene	0.00E+00	3.20E+05	4.70E+06	NA
Benzo(b)fluoranthene	0.00E+00	3.20E+05	4.70E+06	NA
Benzo(k)fluoranthene	0.00E+00	3.20E+05	4.70E+06	NA
Beryllium	3.91E+02	3.20E+05	4.70E+06	1.35E+00
bis(2-Ethylhexyl)phthalate	4.68E+00	3.20E+05	4.70E+06	1.61E-02
Cadmium	6.88E+02	3.20E+05	4.70E+06	2.37E+00
Carbazole	0.00E+00	3.20E+05	4.70E+06	NA
Chromium	3.13E+03	3.20E+05	4.70E+06	1.08E+01
Chrysene	6.48E+00	3.20E+05	4.70E+06	2.23E-02
Copper	5.40E+03	3.20E+05	4.70E+06	1.86E+01
Dibenzo(a,h)anthracene	0.00E+00	3.20E+05	4.70E+06	NA
Dieldrin	7.95E-03	3.20E+05	4.70E+06	2.74E-05
gamma-Chlordane	4.26E-02	3.20E+05	4.70E+06	1.47E-04
Hexachlorobutadiene	0.00E+00	3.20E+05	4.70E+06	NA
Indeno(1,2,3-cd)pyrene	0.00E+00	3.20E+05	4.70E+06	NA
Lead	2.73E+03	3.20E+05	4.70E+06	9.41E+00
Manganese	1.31E+05	3.20E+05	4.70E+06	4.52E+02
Mercury	1.52E+01	3.20E+05	4.70E+06	5.22E-02
N-Nitroso-di-n-propylamine	0.00E+00	3.20E+05	4.70E+06	NA
Nickel	4.46E+03	3.20E+05	4.70E+06	1.54E+01
Nitrobenzene	0.00E+00	3.20E+05	4.70E+06	NA
Pentachlorophenol	0.00E+00	3.20E+05	4.70E+06	NA
Selenium	1.21E+01	3.20E+05	4.70E+06	4.15E-02
Silver	2.84E+03	3.20E+05	4.70E+06	9.77E+00
Styrene	0.00E+00	3.20E+05	4.70E+06	NA
Tetrachloroethene	6.36E-02	3.20E+05	4.70E+06	2.19E-04
Thallium	9.15E+01	3.20E+05	4.70E+06	3.15E-01
Vanadium	6.49E+03	3.20E+05	4.70E+06	2.23E+01
Zinc	1.67E+04	3.20E+05	4.70E+06	5.76E+01

Note: [a] Weighted average concentrations are used to develop inhalation exposure point concentrations at receptor's locations.

[b] Zero values represent a COC that was not detected in concrete. However, it was a COC in one or more other media which will either not be entering the disposal facility or will not create an airborne respirable fraction.

TABLE H-5

EXPOSURE POINT CONCENTRATIONS OF MATERIALS[a] TO BE SHIPPED OFF-SITE UNDER ALTERNATIVE 2

Parameter	Source Term (kg)	Specific Activity (Ci/g)	Weight (tons)	Unbulked Volume (cu.ft.)	Weighted Average Concentration (pCi/g)[b]
Americium-241	4.17E-06	3.24E+00	4.34E+03	1.74E+05	3.43E+00
Cesium-137	1.02E-07	8.71E+01	4.34E+03	1.74E+05	2.25E+00
Lead-210	7.75E-06	8.11E+01	4.34E+03	1.74E+05	1.60E+02
Neptunium-237	4.16E-03	7.05E-04	4.34E+03	1.74E+05	7.45E-01
Plutonium-238	2.95E-05	1.75E+01	4.34E+03	1.74E+05	1.31E+02
Plutonium-239/240	5.34E-04	2.27E-01	4.34E+03	1.74E+05	3.08E+01
Plutonium-241	3.42E-06	1.12E+02	4.34E+03	1.74E+05	9.72E+01
Polonium-210	2.35E-07	4.49E+03	4.34E+03	1.74E+05	2.68E+02
Radium-226	2.44E-04	9.88E-01	4.34E+03	1.74E+05	6.13E+01
Radium-228	2.97E-06	2.34E+02	4.34E+03	1.74E+05	1.76E+02
Strontium-90	3.87E-08	1.42E+02	4.34E+03	1.74E+05	1.40E+00
Technetium-99	6.58E-02	1.70E-02	4.34E+03	1.74E+05	2.84E+02
Thorium-228	3.07E-08	8.22E+02	4.34E+03	1.74E+05	6.41E+00
Thorium-230	1.36E-02	1.94E-02	4.34E+03	1.74E+05	6.70E+01
Thorium-232	1.05E+02	1.09E-07	4.34E+03	1.74E+05	2.90E+00
Uranium-233/234	6.37E-03	9.48E-03	4.34E+03	1.74E+05	1.53E+01
Uranium-234	1.04E+00	6.19E-03	4.34E+03	1.74E+05	1.63E+03
Uranium-235/236	1.18E+02	6.34E-05	4.34E+03	1.74E+05	1.90E+03
Uranium-236	0.00E+00	6.34E-05	4.34E+03	1.74E+05	0.00E+00
Uranium-238	1.61E+04	3.33E-07	4.34E+03	1.74E+05	1.37E+03
Uranium, Total[c]	5.56E+04	N/A	4.34E+03	1.74E+05	1.41E+04

Note: [a] From Material Categories C and F plus 1" scabbled concrete from 9A (PA 2,4) and 8A (PA 4).

[b] These weighted average concentrations are used as exposure point concentrations for calculating direct radiation doses to receptors.

[c] The units for the Total Uranium concentration are ug/g, NOT pCi/g.

TABLE H-6

EXPOSURE POINT CONCENTRATIONS OF MATERIALS TO BE SHIPPED OFF-SITE UNDER ALTERNATIVE 3

Parameter	Source Term (kg)	Specific Activity c (/i g)	Weight (tons)	Unbulked Volume (cu.ft.)	Weighted Avgerage /oncentration (p/i g)[a]
Americium-241	2.24E-05	3.24E+00	3.76E+05	7.54E+06	2.12E-01
/esium-137	7.44E-07	8.71E+01	3.76E+05	7.54E+06	1.90E-01
Lead-210	3.11E-05	8.11E+01	3.76E+05	7.54E+06	7.39E+00
Neptunium-237	7.15E-02	7.05E-04	3.76E+05	7.54E+06	1.48E-01
Plutonium-238	3.57E-05	1.75E+01	3.76E+05	7.54E+06	1.83E+00
Plutonium-239 240	9.23E-04	2.27E-01	3.76E+05	7.54E+06	6.14E-01
Plutonium-241	1.45E-05	1.12E+02	3.76E+05	7.54E+06	4.76E+00
Polonium-210	4.37E-07	4.49E+03	3.76E+05	7.54E+06	5.74E+00
Radium-226	5.85E-03	9.88E-01	3.76E+05	7.54E+06	1.69E+01
Radium-228	9.95E-06	2.34E+02	3.76E+05	7.54E+06	6.81E+00
Strontium-90	7.97E-06	1.42E+02	3.76E+05	7.54E+06	3.31E+00
Technetium-99	1.24E-01	1.70E-02	3.76E+05	7.54E+06	6.18E+00
Thorium-228	1.41E-06	8.22E+02	3.76E+05	7.54E+06	3.39E+00
Thorium-230	1.40E-01	1.94E-02	3.76E+05	7.54E+06	7.97E+00
Thorium-232	3.63E+03	1.09E-07	3.76E+05	7.54E+06	1.16E+00
Uranium-233 234	1.37E+00	9.48E-03	3.76E+05	7.54E+06	3.80E+01
Uranium-234	5.05E+00	6.19E-03	3.76E+05	7.54E+06	9.15E+01
Uranium-235 236	4.77E+02	6.34E-05	3.76E+05	7.54E+06	8.86E+01
Uranium-236	0.00E+00	6.34E-05	3.76E+05	7.54E+06	0.00E+00
Uranium-238	8.82E+04	3.33E-07	3.76E+05	7.54E+06	8.60E+01
Uranium, Total[b]	1.09E+05	N A	3.76E+05	7.54E+06	3.18E+02

Note: [a] These weighted average concentrations are used as exposure point concentrations for calculating direct radiation doses to receptors during transportation under Alternative 3.

[b] The units for the Total Uranium concentration are ug/g, NOT pCi/g.

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TABLE H-9

ASSUMPTIONS AND PARAMETERS USED TO CALCULATE INHALATION EXPOSURE POINT CONCENTRATIONS

Parameter	Parameter symbol, Equation Reference	Value
Disposal cell fill rate	DR, Eq H.3-2	438 yd^3 per week for 10 year plan 113 yd^3 per week for 31 year plan
Concrete density	ρ, Eq H.3-1	2.4 gm/cm^3
Cell filling schedule	ET*EF*ED, Eq H.3-6 & 7	1 shift/day, 5 day/week/ 52 week/yr
Duration of cell filling schedule		7 yrs for 10-year plan 27 yrs for 31-year plan
Dump height [a]	h, Eq H.3-1	150 cm
Disposal Cell width	W_b, Eq H.3-3	140.3 m
Exposure height	H_b, Eq H.3-3	1.8 m
Average Wind speed	U_m, Eq H.3-3	0.66 m/s
Average wind speed at 10 m	U_{10}, Eq H.3-3	2.0 m/s
Pasquill Stability Class	Eq H.3-5 (to determine σ_y and σ_z)	F
Distance from center of cell to off-property public residents	Eq H.3-3 (to determine HQ) σ_y and σ_z)	215 m
Distance from center of cell to nonremediation worker	Eq H.3-3 (to determine X/Q) σ_y and σ_z)	380 m

[a] Dump height represents one half of actual drop height. This accounts for the steady reduction in the drop height as material is dumped due to the increasing height of the material in the cell over time.

Disposal cell refers to the on-property disposal facility.

TABLE H-10

ASSUMPTIONS USED FOR THE MICROSHIELD CALCULATIONS

Container	Contents	Assumptions
Large Metal Box (LMB)	Bulk Steel	• Container internal dimensions were 19 ft L x 7 ft W x 7.7 ft H. • Container volume equals 1025 ft^3. • The thickness of the container is 1/8 in. steel. • The density of bulk steel is 7.9 g/cm^3. • The weight capacity of the box will be reached prior to the volume limit when filled with bulk steel. This equates to 35,000 lbs steel per box.
B-12	Concrete Residue	• Container dimensions were 1.92 ft L x 3.83 ft W x 6.00 ft H with an internal volume of 44 cubic ft. • The thickness of the container is 10 gauge steel (0.1382"). • The weight capacity (9,000 lbs) of the B-12 Box will not be reached prior to the volume limit when filled with concrete chips. This calculation assumes the box will hold approximately 6,500 lbs of concrete.
B-25	Brick	• Container dimensions were 6.25 ft L x 4.17 ft W x 3 ft H with an internal volume of 80.3. • The thickness of the container is 1/8" steel. • The density of brick used in the calculation was 120 lbs/ft^3. • The weight capacity (6,800 lbs) of the box will be reached prior to the volume limit when filled with brick.
Intermodal Transportation Containers (ITCs)	Bulk Concrete	• Container external dimensions were 20 ft L x 8 ft W x 6.4 ft H and the internal dimentions were 19.25 ft L x 7.1 ft W x 5.6 ft H. Container volume equals 766~~675~~ ft^3. • The thickness of the container is 1/8" steel. • The density of bulk concrete is 2.4 g/cm^3 (or 150 lb/ft^3). • The weight capacity of the ITC will be reached prior to the volume limit when filled with bulk concrete. This equates to 20 tons of concrete per ITC.
Pile	Bulk Concrete	• The dimensions of the pile are 100 ft x 50 ft x 25 ft. • Concrete bulking factor is 1.3. • Contaminant concentrations and concrete density will be same as that for Alternative 2 concrete. • The pile will be surveyed every worker shift. The survey will last approximately 15 minutes.
Pile	Bulk Steel	• The dimensions of the pile are 120 ft x 90 ft x 25 ft. • Steel bulking factor is 16.8. • Paint density is 1.2 g/cm^3. • Paint thickness is 10 mil. • The reference steel beam is a W36x359. • Reference steel beam surface area is 11.5 ft^2. • Reference steel beam cross section is 105 in^2. • The pile will be surveyed every worker shift. The survey will last approximately 15 minutes. • Contaminant concentrations will be same as that for Alternative 2 Steel.

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APPENDIX I

After excavation of OU2 waste materials, residual contaminated soil and waste materials will be evaluated using the area- and COC-specific final remediation levels (FRLs) presented in the draft OU5 ROD. If soils and waste are found to be present above the FRLs, additional excavations would be completed to attain OU5 FRLs in the OU2 area. After additional excavation, the areas will be regraded, backfilled with soil as necessary, and revegetated.

Operable Unit 3 Leading Remedial Alternative

OU3 structures and facilities will be decontaminated and dismantled as specified under the ROD for the Interim Remedial Action (IROD) (DOE 1994d). The OU3 leading remedial alternative (LRA) is on-property disposal of construction materials from the interim remedial action with limited off-site disposition. It is estimated that a maximum volume of ~~7.29~~ 7.36 x 10^6 ft^3 of contaminated material from OU3 will be disposed in the on-property disposal facility. This volume includes all OU3 material categories except for the following materials:

- Process-Related Metals (Material Category C), which will be disposed off-site because of the presence of residues and hold-up material;
- Brick (Material Category F), which contains high concentrations of COCs due to processing activities;
- Product, Residues, and Special Materials (Material Category J), which will be dispositioned off-site in accordance with Removal Action No. 9 (Removal of Waste Inventories); and
- Scabbled concrete residues to meet OU3-specific WAC.

Additionally, approximately 5.41~~9.86~~ x 10^5 ft^3 of materials have the potential for unrestricted release, as discussed in Section 5 of this report. At this time, it is assumed that no OU3 materials will be recycled based on economic considerations. If recycling becomes economically feasible, it will be performed to the maximum extent practical. Therefore, the listed OU3 volume for on-property disposal (Table I-2) should be considered as a maximum estimate. However, the volume of materials associated with Material Category C may vary because of its development and segregation in the field during D&D activities.

Operable Unit 4 Remedy

The selected remedy for OU4 includes removing the waste stored in Silos 1, 2, and 3, stabilizing it by vitrification, and transporting the stabilized waste to the Nevada Test Site (NTS). Silos 1, 2, 3, and 4 will be decontaminated to the extent practical and demolished. Contaminated construction

much lower than the allowable mass of uranium that could be placed within the disposal facility. Therefore, uranium was eliminated from being a post-remediation COC for all OU3 materials considered for on-property disposal.

On the other hand, technetium-99 was determined to be highly mobile from OU3 materials, and source term estimates exceeded the conservative allowable mass for on-property disposal. The leachability study demonstrated that technetium-99 has the potential to leach at unacceptable levels. To meet the technetium-99 WAC, a WAC implementation strategy was developed in Section 5 of this report. In addition to disposing all materials in Categories C and F off-site, removing the top inch of concrete slabs in three process areas would be performed to meet the technetium-99 WAC and provide an adequate safety margin. Disposing of the removed concrete residues off-site would significantly reduce the estimated residual source term for technetium-99, as well as for many other contaminants, including uranium. A thorough discussion of the OU3 WAC development process is presented in Appendix G of this report. Post-remediation source term and material quantity estimates are provided and compared with previous estimates used in the OU5 CRARE in the following sections. These updated source terms represent the anticipated realistic conditions of OU3 materials that would be dispositioned in the on-property disposal facility under the leading remedial alternative for OU3.

I.4.4 Comparison of Estimated OU3 Volume and COC Mass for On-Property Disposal

The volume estimates used for OU3 construction materials are based on the volume estimates presented in Appendix B. The current total estimated volume of all OU3 materials is ~~9,300,000~~ 9,260,000 ft^3. Of this volume, Material Categories C, F, and J have been administratively removed from consideration for on-property disposal since they are considered principal threat materials. Therefore, it was assumed that ~~7,290,000~~ 7,370,000 ft^3 of the total ~~9,300,000~~ 9,260,000 ft^3 are subject to the WAC screening process for determining which materials can be disposed within the on-property disposal facility. Furthermore, 7,360,000 ft^3 of OU3 materials meet the WAC for on-property disposal (see Table I-3). With the limited information available at the time of the OU5 FS submittal, an OU3 materials volume of 8,050,000 ft^3 was considered in the OU5 CRARE for on-property disposal. Therefore, the OU5 CRARE bounded the potential volume for on-property disposal from OU3 materials, which would affect the size of the facility.

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the extremely limited data set available in March 1995 that was used to generate the previous estimate. Because of a smaller data set, the analyte maximum value was applied over a greater volume of material, resulting in a higher source term value. The source terms developed and evaluated within the OU5 CRARE were 150,000 kg of uranium and 325 grams of technetium-99. The current source term estimates associated with OU3 materials considered for on-property disposal, after the WAC screening process was applied, for uranium and technetium-99 are ~~55,000~~ 53,000 kg and 59 grams, respectively, as presented in Table I-4.

I.5 LEVEL OF CONSERVATIVENESS

Since the refined OU3 volumes and source terms are within the bounds that were evaluated for OU3 in the OU5 CRARE, performing additional fate and transport modeling for an OU3 CRARE, is not necessary. Therefore, it is necessary to determine the level of conservativeness in the OU5 CRARE, given the refined estimate of OU3 contributions to the on-property disposal facility presented in this report. Considering all the OU3 materials, only uranium and technetium-99 have sufficient mass available to produce leachate concentrations in the disposal facility that could potentially impact the underlying aquifer, using conservative assumptions regarding contaminant leachability. The following two subsections discuss the level of conservativeness in the OU5 CRARE assumptions regarding technetium-99 and uranium sources in OU3.

I.5.1 Technetium-99

As described in the OU5 CRARE, the average OU3 technetium-99 concentration estimated in March 1995 was just under the conservatively estimated soil concentration in the disposal facility based on a limited database for OU3 characterization results (both values were approximately 17 pCi/g). Based on current source term estimates presented in Section 5 of this report, the actual average post-remediation technetium-99 concentration in OU3 materials (after screening materials against WAC) is 2.9 pCi/g, which is much lower than earlier estimates.

Although technetium-99 has higher leachability from OU3 materials than from soil, all the OU3 materials to be placed in the disposal facility satisfy the OU3-specific WAC, which are developed using very conservative assumptions regarding leaching potential of technetium-99 (see Appendix G). Furthermore, OU3 materials would contribute only about ten percent of the total volume in the disposal facility, and the technetium-99 leached from OU3 materials could react with soils in the facility. Given the significantly lower actual concentration and mass of technetium-99 from OU3

materials and the basis of the WAC development process, the evaluation conducted in the OU5 CRARE is sufficiently conservative regarding the potential post-remediation impacts due to technetium-99.

In addition to the lower concentrations/source terms estimated in OU3, the average soil concentration in the OU5 CRARE was reevaluated since the final version. The original soil concentration was significantly affected by the high detection limit (1 pCi/g) for technetium-99 used in previous soil remediation investigations. In a more recent study conducted by OU5, most soil to be placed in the disposal facility would have technetium-99 concentrations much lower than 0.5 pCi/g. This revised estimate from OU5 further demonstrates that contributions from OU3 materials will not increase previously estimated future impacts to the Great Miami Aquifer from the disposal facility.

I.5.2 Uranium

The range of overall average uranium concentration in OU3 materials considered for on-property disposal after screening materials to meet the technetium-99 WAC is ~~160~~ 157 μg/g. This is higher than the average OU5 soil concentration of 100 μg/g (DOE 1995a). The OU5 CRARE used the K_L value of 15 L/kg to estimate the uranium leachate concentration from all the materials in the disposal facility. Geochemical modeling results used to support WAC development for OU3 demonstrate that the leachability of uranium from concrete and paint is significantly lower for OU3 media than for soil. The source terms of all other OU3 materials were evaluated based on conservative leaching assumptions and were found to be significantly lower than allowable levels. As a result, OU3 materials would not cause a significant increase in future uranium leachate concentrations through the disposal facility. The actual leachate concentration from OU3 materials would be much lower than the concentrations assumed in the OU5 CRARE.

A sensitivity analysis on potential future impacts to the Great Miami Aquifer from the on-property disposal facility, including the possible range of average OU3 uranium concentrations (300 to 450 μg/g), was conducted in the OU5 CRARE. As indicated by the analysis, variation in groundwater concentrations resulting from average OU3 concentrations in this range were negligible relative to the groundwater uranium PRL. The conservative soil K_L of 15 L/kg was also applied to all materials in the disposal facility for this analysis, when realistic K_L values calculated for critical OU3 material categories are orders of magnitude greater than 15 L/kg (the higher the K_L value, the lower the leaching rate).

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TABLE I-2

OPERABLE UNITS 1 THROUGH 5 MATERIAL DISPOSITION FOR THE ADOPTED SITEWIDE REMEDY[a]

Operable Unit	Volume (yd^3)	Volume (ft^3)	Disposition
1	6.28×10^5	1.70×10^7	Off-site disposal
2	3.60×10^3 3.45×10^5	9.72×10^4 9.32×10^6	Off-site disposal On-property disposal facility
3	~~7.46~~ 7.03 $\times 10^4$ ~~2.70~~ 2.73 $\times 10^5$	~~2.01~~ 1.89 $\times 10^6$ ~~7.29~~ 7.36 $\times 10^6$	Off-site disposal On-property disposal facility
4	1.40×10^4 3.00×10^3	3.78×10^5 8.10×10^4	Off-site disposal On-property disposal facility
5[b]	2.50×10^4 1.75×10^6	6.75×10^5 4.73×10^7	Off-site disposal On-property disposal facility
Adopted Sitewide Remedy	~~7.45~~ 7.41 $\times 10^5$ 2.37×10^6 [c]	~~2.02~~ 2.01 $\times 10^7$ ~~6.40~~ 6.41 $\times 10^7$	Off-site disposal On-property disposal facility

[a] Remedial action volumes for Operable Units 1, 2, 4, and 5 are from their draft or draft final FS reports or RODs. The volumes for OU3 materials are the current best estimate for the leading remedial alternative.

[b] Volumes estimated for OU5 account for residual soils and waste remaining after Operable Units 1 through 4 have been remediated. These volumes do not include the wastes designated by other operable units for on-property disposal.

[c] Summation of volumes identified for on-property disposal from Operable Units 1 through 5.

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TABLE I-3
MATERIAL CATEGORIES AND VOLUMES

Material Category	Description	Current OU3 Volume Estimates for On-Property Disposal (ft^3)	Current OU3 Volume Estimates for Off-site Disposal (ft^3)
A	Accessible Metals	63,400	----
B	Inaccessible Metals	~~1,710,000~~ 1,740,000	----
C	Process-Related Metals	----	~~191,000~~ 151,000
D	Painted, Light-Gauge Metals	7,150	----
E	Concrete	~~4,800,000~~ 4,700,000	~~2,200~~ 2,190
F	Brick	----	20,700
G	Non-Regulated ACM	~~60,300~~ 71,300	----
H	Regulated ACM	80,200	----
I	Miscellaneous Materials	~~564,000~~ 704,000	----
J	Product, Residues, and Special Materials	----	~~1,800,000~~ 1,720,000
Total		~~7,290,000~~ 7,360,000	~~2,010,000~~ 1,890,000

Note: Material Categories C, F, and J are not considered for on-property disposal.

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TABLE I-4

OPERABLE UNIT 3 SOURCE TERM COMPARISON

Post-Remediation COC	OU3 Source Terms Evaluated in Final OU5 CRARE (kg)	Current OU3 Post-Remediation Source Term Estimates (kg)
Technetium-99	0.325	0.059
Total Uranium	150,000	~~55,000~~ 53,000

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APPENDIX J

J.0 NATIONAL ENVIRONMENTAL POLICY ACT CUMULATIVE IMPACT ANALYSIS

This appendix provides a cumulative assessment of the impacts that would result from implementing the Operable Unit 3 (OU3) representative alternative (i.e., the alternative most likely to be selected based on the Remedial Investigation/Feasibility Study [RI/FS] evaluation), with the selected or preferred alternatives for each of the remaining four OUs at the Fernald Environmental Management Project (FEMP) site.

J.1 PURPOSE

Preliminary leading remedial alternatives (LRAs) for OUs 1 through 5 were developed in the Sitewide Characterization Report (SWCR) (DOE 1992a) and are considered leading remedial alternatives until they are analyzed in an FS document. For the purpose of an FS evaluation, the term representative alternative is used. Representative alternatives are those alternatives analyzed in RI/FS documents that are likely to be identified as preferred based on preliminary information. The term preferred alternative refers to the alternative identified in the proposed plan (PP) based on detailed analysis in the RI/FS. The term selected alternative identifies the alternative chosen in the Record of Decision (ROD); this alternative is chosen based on comments received on the PP and draft ROD from the public and regulators.

This assessment provides the reader with the most current information on how the potential impacts from OUs 1, 2, 4, and 5 relate to the potential impacts of OU3. This appendix is an update of the cumulative impact analysis provided in the OU4 FS/PP-Environmental Impact Statement and the OUs 1, 2, and 5 FS/PP. The description of the OU3 representative alternative has changed slightly from that evaluated in the OUs 1, 2, 4, and 5 documents; therefore, this appendix is being updated for the OU3 evaluation.

The OU3 RI/FS is an integrated CERCLA/NEPA evaluation. DOE's revised secretarial policy on NEPA requires inclusion of only the substantive aspects of NEPA. However, DOE agrees that opportunities exist to expand the text and further define cumulative impact as appropriate. ~~In this evaluation, efforts have been made to further quantify impacts in the cumulative impact analysis.~~ Since the preferred alternatives for all OUs have been identified, impacts to wetlands, biotic resources, etc., have been accurately quantified. The original cumulative impact analysis prepared by

contains a description of the preferred alternative for each operable unit. The cumulative environmental impacts of proposed on-property actions are described in Section J.3, which analyzes the potential impacts on the environment from concurrent implementation of remedial activities for the OUs and sitewide facilities.

Federal, state, and local agencies consulted during the compilation of data for the FS/PP-NEPA evaluation and the relationship of remediation at the FEMP site to the objectives of local, state, regional, and federal land use plans, policies, and controls, are described in Section J.4. An updated discussion of irreversible and irretrievable commitment of resources resulting from remedial activities at the FEMP site is in Section J.5.

J.1.3 Scope of Cumulative Impact Analysis

The detailed evaluation in this cumulative impact analysis includes incremental impacts of the proposed action when added to other past, present, and future actions. The actions on immediate adjacent lands to the FEMP site which are not ~~The detailed evaluation in this cumulative impact analysis has been limited to impacts on, and immediately adjacent to, the FEMP site. The activities on adjacent lands which are not~~ related to the FEMP site will not impose significant cumulative impacts to the environment when combined with remediation activities at the FEMP. These activities will be addressed in this section. The cumulative impacts of remediating OUs 1 through 5 will be addressed in Section J.3.

The specific sites, separate from the FEMP site, that warrant some discussion of cumulative impacts include:

- A CERCLA site immediately south of the FEMP site (approximately one mile) that is undergoing the RI/FS process for an organic contamination plume in the Great Miami Aquifer. Two other sites are being evaluated as potential CERCLA sites, but their proximity to the FEMP site does not justify or warrant a discussion.
- A small quarry located less than a mile from the eastern boundary of the FEMP site.
- The potential for disposal of waste at an off-site location. The remaining areas around the FEMP site are primarily used for agricultural (i.e., cultivated fields) and limited residential domains.

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The cumulative groundwater impact to the health of off-site receptors was summarized in the OU5 RI/FS and FS reports. The RI/FS baseline risk assessment evaluated more current conditions and the FS CRARE risk assessment evaluated future residual conditions.

The Off-Property RME Farmer (Farmer) was evaluated as a maximumly exposed off-site receptor. The highest estimated cancer risk (ILCR) to the off-property farmer was 1.5×10^{-2}. Pathways included in the RI/FS baseline risk assessment included drinking water, and dermal contact while bathing, as well as the use of groundwater in growing fruits and vegetables and raising cattle and the ultimate ingestion of these food products.

The CRARE risk assessment also evaluated the off-site receptors for groundwater exposure, however the impact of groundwater on food products was not evaluated separately. Thus, the groundwater pathways included in the FS CRARE risk assessment included drinking water and dermal contact. The estimated cancer risk (ILCR) to the off-property farmer was 1.81×10^{-5}.

Activities at the quarry east of the site involve some excavation and movement of soil and rock and is in the prevailing wind direction from the FEMP site. However, the quarry operation is on a relatively small scale when compared to the overall remediation of the FEMP site. In addition, cultivated fields are the predominant land use downwind of both the quarry site and the FEMP site. Therefore, the cumulative impacts associated with dust emissions from the quarry and the site will be minimal.

Fugitive dust from cultivated fields adjacent to the site, in combination with that associated with the excavation and transportation to and from the site, poses a very limited potential for cumulative impacts. These cumulative impacts to air quality will be minimal since (1) the dust remains suspended for a limited time and (2) the number of downwind receptors is limited. The focus of the detailed analysis in this appendix will, therefore, be limited to the concurrent response actions for the five OUs carried out at the FEMP site because their cumulative impacts to the environment and residents in the region are distinctly greater than those in combination with other activities in the area.

Efforts have been made throughout the cumulative impact analysis to quantify impacts to the extent possible. For example, impacts to wetlands and habitats have been quantified (i.e., estimation of acres disturbed) wherever possible. In addition, the overall impacts of the FEMP remedial activities on the local socioeconomic structure have been quantified to the extent possible. Due to the timing of

J.3 CUMULATIVE IMPACTS OF PROPOSED ON-PROPERTY ACTIONS

Under the current $276 million funding case, scheduling indicates that all of the OUs will be conducting ~~the~~ remediation activities concurrently, with most actions completing by 2005. All on-property actions will avoid or minimize environmental impacts to the extent practicable. Mitigative measures will be employed to minimize adverse impacts. A discussion of the more significant environmental cumulative impacts due to concurrent implementation of remedial activities follows.

J.3.1 Soil and Geology

The mechanical and/or hydraulic removal of pit wastes, soil, and buildings and other structures from the former Production Area poses a potential short-term threat of releases through subsurface soil to groundwater. Adverse impacts could result if there is a breach of a pit liner during the removal process or if loose contamination is released from the structures. If contaminants remain on the ground surface for extended periods of time, infiltration of rainwater or storm water runoff could cause migration of the contaminants into the subsurface soil. Mitigative measures ~~However, appropriate excavation techniques and controls,~~ such as routine covering of excavated areas~~,~~ will minimize the potential for these impacts.

The selected alternative ~~remedy~~ for OU1 would result in the temporary disturbance of approximately 36.4 acres of land due to the excavation of the waste pits and associated soil. However, these areas would be regraded and evaluated to promote positive drainage. Furthermore, the preferred alternative for OU1 does not involve on-property disposal, so there will be no ~~long-term~~ impacts to soil and geology.

The selected alternative ~~remedy~~ for OU2 and OU5 and the representative ~~leading remedial~~ alternative for OU3 involves on-property disposal of remediation generated wastes. This would result in temporary impact to approximately 75 acres and the permanent commitment of an area approximately 800 ft by 4,300 ft or 80 acres for on-property disposal.

Removal of wastes from OU4 would temporarily disturb approximately eight acres of soil. Disturbed areas would be regraded and returned to their previous elevations following remediation.

When the selected ~~preferred~~ alternatives ~~selected remedies~~ in the OUs 1, 2, 4 and 5 4 RODs are combined with the representative ~~preferred~~ alternatives for OU3 ~~and OU5~~, it is likely that

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is the potential for spills to occur during the handling and packaging of waste as well as during transport to the treatment facility. Spills would be expected to affect only localized areas; therefore, impacts on surface soil from spills would likely be minor. Appropriate spill prevention and response procedures would be performed in accordance with the site standard operating procedure (SSOP-0067) entitled "Spill Incident Reporting and Clean-up" and site plan #2194 entitled "Spill Prevention Control and Countermeasure Plan" (SPCC). If spills are encountered, mitigative measures such as adequate containment dikes and use of absorbent pads would be employed to minimize adverse impacts. ~~Spills would be expected to affect only localized areas, and surface soil contaminated by a spill could be excavated and dispositioned of with the waste material.~~ Therefore, impacts on surface soil from spills would likely be minor. Appropriate spill prevention and response procedures will ensure impacts related to spills are negligible.

The removal of contaminated structures from the former Production Area (i.e., OU3), along with waste treatment and decontamination associated with OUs 1, 2, 4 and 5, would have beneficial long-term effects on both surface and subsurface soil due to the removal of contaminant sources. Pumping and treatment of the contaminated perched and regional groundwater should stop contaminant migration in the subsurface soil. No impacts are anticipated on the regional geology of the area as a result of OU remedial activities.

J.3.2 Water Quality and Hydrology

Adverse impacts to both the perched groundwater and the regional aquifer would not be increased by concurrent remedial activities. The possibility of contaminant migration to the aquifer exists during any remedial activity, whether the activities are performed individually or concurrently. The rate at which contaminants are supplied to the regional aquifer may be increased with concurrent remediation activities, but the overall contaminant load would remain the same. The EPA proposed drinking water standard for uranium in drinking water is 20 parts per billion (EPA 1986).

Groundwater monitoring will continue throughout, and upon completion of, remedial actions to ensure that areas exceeding the standards are identified and appropriate response actions are implemented. A groundwater monitoring and contingency plan will be developed during the remedial design process. Long-term groundwater quality should improve through implementation of the selected and preferred remedial alternatives since FEMP wastes will be eliminated and/or isolated from rainwater and storm water runoff, preventing the potential infiltration of these contaminants to perched groundwater and

the regional aquifer. The on-property disposal facility has been determined to be protective through conservative modeling assumptions. The modeling utilized to establish the uranium waste acceptance criteria for the on-property disposal facility was based on the natural protection of the gray clay located under the proposed location of the on-property disposal facility and did not consider the additional protection due to the synthetic membranes in the engineered disposal facility, the clay liner, or the leachate collection and leak detection system. The Leachate Collection and Detection Systems, combined with appropriate maintenance activities, would be the primary mititgative measures for the disposal facility. ~~Any waste disposal facility would comply with the requirements specified in the facility permit for the uppermost aquifer underlying the waste management area beyond the point of compliance. The concentration of chemicals in groundwater should not exceed background levels of the listed maximum concentration of the constituent for groundwater protection (10 Code of Federal Regulations [CFR] 264.94).~~

~~The findings of the OU5 Comprehensive Response Action Risk Evaluation (CRARE) (Appendix H of the OU5 FS Report) identified the consumption of drinking water obtained from wells drilled into the~~

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~~groundwater as the greatest pathway of exposure to a hypothetical on property resident farmer. Groundwater modeling in the CRARE predicted that the highest cancer risk in this pathway would be associated with arsenic leaching from sitewide soil. However, the carcinogenic risk levels associated with the groundwater pathway under the Case 7 land use scenario (which proposes use of the FEMP as an undeveloped park under continuing DOE ownership) are within the target risk range of 10^{-6} to 10^{-4} to the undeveloped park users and offsite resident farmer receptors.~~

Future land use of the FEMP has not been determined. A land use scenario of an undeveloped park was used in the Operable Unit 5 FS for risk assessment purposes to determine final remediation levels. These final remediation levels established the permissible concentration of contaminants which could remain at the site following the completion of remedial actions, presenting a potential for exposure and risk to future users of the FEMP. The degree of exposure and risk associated with remaining concentrations would be directly linked to the type and duration of future land use. Future land uses contemplating direct contact for longer intervals would be expected to yield a higher calculated exposure and risk than would future uses which involve less opportunities for long-term exposure. DOE will work with the local communities during remedial design on establishing a final land use for the FEMP property. Mitigative measures to minimize long-term impacts will be considered upon establishing final land use.

Groundwater monitoring will continue throughout, and upon completion of, remedial actions to ensure that areas exceeding the standards are identified and appropriate response actions are implemented.

J.3.3 Air Quality

Cumulative air quality impacts will be based on projected emissions from the remedial alternatives for each of the OUs at the FEMP. The emissions of primary short- and long-term concern with respect to ambient air involve the reentrainment of radiologically contaminated fugitive dust and the volatilization of toxic chemicals.

Remedial alternatives that involve substantial waste handling, excavation, ground clearing, demolition, cut-and-fill operations, loading/unloading trucks, or heavy equipment traffic have the potential to generate radiologically contaminated dust and other waste constituents. During these activities, periods of turbulent wind conditions can resuspend particles of disturbed surface materials (e.g., contaminated soil) in ambient air and transport them to on-property and/or off-site receptors. The amount of dust resuspended depends on wind speed and other site conditions such as soil moisture, particle size, and vegetative cover. Engineering controls such as dust suppressants and revegetation would be employed to keep these levels as low as reasonably achievable.

Additional potential airborne pollutants associated with remedial activities at the FEMP site include inorganic constituents, volatile organics, semivolatiles, PCBs, dichlorodiphenyl trichloroethane (DDT), herbicides, radionuclides, and radon. Emissions of these pollutants could result from the removal and handling of volatile or semivolatile wastes, waste segregation activities, and vitrification processes.

In the past, radon has been a significant portion of the annual dose to the public adjacent to the FEMP site. Until remedial activities are complete, DOE Order 5400.5 regulates radon concentrations in the atmosphere above facility surfaces or openings at and adjacent to the FEMP. When added to background levels, the concentrations mandated by DOE Order 5400.5 must not exceed an annual average concentration of 30 picocuries per liter (pCi/L) at the facility and 3 pCi/L at or above any location outside the facility. Once remedial activities have been completed, the National Emissions Standards for Hazardous Air Pollutants (NESHAP) Subpart Q standard (40 CFR 61 Subpart Q) of 20 pCi/m^2/s for radon-222 will be applied to site storage and disposal areas for radon-producing wastes. An active monitoring system has been in place at the FEMP site since the early 1980s. As a point of comparison, the average site boundary total radon concentration of 0.57 pCi/L in 1992 was about 29 percent of the average indoor radon concentration (2.0 pCi/L) for homes in the Cincinnati area. Monitoring will continue throughout the remedial activities and upon completion of remedial regulations.

Guidelines for concentrations of radionuclides other than radon-222 are also established by DOE Order 5400.5. These concentrations, referred to as derived concentration guidelines, are concentrations of radionuclides that, under conditions of continuous exposure for one year by one exposure mode, would result in a dose of 100 mrem. In addition to the derived concentration guidelines, radiological emissions to the ambient air from the FEMP site will also be subject to the NESHAP Subpart H standard (40 CFR Part 61 Subpart H), which stipulates that radiological emissions from the site cannot exceed those amounts that might cause any member of the public to receive an annual effective dose equivalent of 10 mrem per year. Monitoring of the air pathway for radionuclides during the FEMP site remedial activities will continue to ensure that emission levels do not exceed applicable derived concentration guidelines or the NESHAP Subpart H standard. If emission levels are exceeded, a compliance strategy would be prepared to assess the impact. The purpose of the compliance strategy is to remain in compliance with applicable regulations and to ensure non-compliant conditions do not reoccur.

The impacts associated with the generation of fugitive dust and the volatilization of toxic chemicals tend to be short term. Cumulative air quality impacts that would occur during phases of remedial activity at the FEMP site would include pollutants generated off-site as well as those generated on-property. Although there are no major sources of pollutants in the vicinity of the FEMP site, there would be an increase of transportation-related particulates generated off-site by the large number of trucks necessary to supply construction materials for the disposal facility (see Section J.6.3.4). In addition to particulates generated on-property by disposal facility construction, filling, soil excavation and closure, the cumulative air quality impact would also depend on: 1) the remedial alternatives chosen, 2) the remediation schedule (e.g., the extent of simultaneous remedial activities across the FEMP site), 3) the mitigating measures or controls chosen, and 4) their effectiveness. Typical control methods for various remedial activities and qualitative evaluations of their effectiveness, advantages, and disadvantages are included in the OU4 FS Report, Appendix I, Attachment I.I, Table I.I-3 (DOE 1994b). The potential for long-term residual risks associated with the FEMP site in a postremediation condition is evaluated in the OU5 CRARE. The assumed future land use of an undeveloped park would not impact air quality.

J.3.4 Biotic Resources

Cumulative impacts on vegetation could result from short- and long-term removal and disturbance of habitat associated with remediation of contaminated soils and waste units; construction of staging areas, support facilities, and the disposal facility; and general physical disturbance of soil. The

facility for OUs 2, 3, 4, and 5 could also disturb introduced grasslands, old field, and mid-successional and riparian woodland habitats resulting in a total loss of approximately 196 acres. Construction of support facilities would have a similar impact, although restoration may be possible once wastes are removed from the FEMP site.

Concurrent implementation of remediation activities could have impacts on wildlife primarily through the short- and long-term removal and disturbance of habitat as described above, with correlated reductions in local wildlife populations. Cumulative impacts on wildlife would differ from the impacts of these same preferred alternatives considered separately. For example, if remedial activities were spread out over time, adjacent undisturbed areas could provide refuges for displaced wildlife. These "safe" areas would not be available if activities are conducted simultaneously. Cumulative project-related noise and increased levels of human activity could disrupt nearby wildlife. However, it is not expected that wildlife will be permanently displaced from the site since the approximate 100 acre northern woodland represents the majority of wood and wetland habitat on the site and is not expected to be impacted. Impacts to migratory bird species would be minimal since the FEMP is not a primary stopover for these species. Cumulative impacts on aquatic organisms from remedial actions involve the potential contamination of Paddys Run, the Great Miami River, and various drainageways, floodplains and wetland areas. Potentially affected aquatic organisms include fish, invertebrates, amphibians, reptiles, and semiaquatic species such as muskrats. Loss of habitat or contaminant exposure could also lead to a reduction in species biodiversity.

Contaminant levels could increase in Paddys Run and in wetland drainage areas from soil erosion and runoff during concurrent waste removal, stabilization, and isolation activities. Additionally, disruption of aquatic habitat in these areas from the excavation of contaminated sediments for OU5 could adversely affect organisms residing in this area. Small affected areas in Paddys Run and the wetland drainages resulting from isolated remedial actions would probably recover quickly, but recovery from simultaneous impacts over a larger area would likely require a much longer time to restabilize. Adverse cumulative impacts on aquatic organisms could be substantially mitigated by diversion and collection of runoff and by performing removal activities when flow in Paddys Run and the storm sewer outfall ditch is low or nonexistent.

Waste removal, stabilization, and isolation activities conducted for OU1 would likely result in short-term adverse cumulative impacts on the organisms in the wetland drainages in this area. Long-term, negative effects on aquatic organisms would be minimized if the areas were revegetated to

prevent erosion after completion of the activities. Of particular concern is the 26-acre tract of forested wetlands in the northern portion of the FEMP site. This area would be avoided as much as possible. The cumulative impacts would be beneficial in the long term by reducing or eliminating exposure of biotic resources to wastes, reducing the potential for contaminant transfer through the food chain. ~~The cumulative effects would be beneficial in the long term by reducing or eliminating~~

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~~exposure to wastes.~~

J.3.4.1 Threatened and Endangered Species

Cumulative impacts on threatened and endangered species include the potential loss of habitat, disruption of breeding activities, and loss of individuals. Disturbances in the riparian corridor along Paddys Run could result in impacts to the Sloan's crayfish (*Orconectes sloanii*) and suitable habitat for the Indiana bat (*Myotis sodalis*). The use of relocation and erosion control measures will be employed to minimize short-term adverse impacts on Sloan's crayfish. Since the FEMP is not a primary stopover for threatened and endangered migratory birds, minimal impacts would occur to these species. In the long term, the cumulative impacts of FEMP site remedial activities will be beneficial due to the prevention of releases of contaminants into the environment.

J.3.5 Wetlands and Floodplains

A sitewide delineation was conducted in February 1993 in accordance with the 1987 Army Corps of Engineers Wetlands Delineation Manual and approved on August 12, 1993. The purpose of the delineation was to determine the extent of jurisdictional wetlands and waters of the United States at the FEMP site and to avoid or minimize impacts to these resources during future activities. Results from the sitewide delineation indicate a total of 35.9 acres of jurisdictional freshwater wetlands on the FEMP site. Wetland impacts as a result of remedial activities would be minimized by implementing best management practices during and following remediation. Proper notification and mitigative measures (placement of silt fences, minimization of heavy equipment traffic) would ~~occur to these specieswould~~ be executed if impacts are expected to occur.

Cumulative wetland impacts may also arise from the implementation of the remedial alternatives, particularly ~~in the forested wetland in the northern part of the site and~~ the various emergent wetlands associated with site drainage ditches. ~~The greatest~~ Wetland impacts could result from siting a disposal facility and from excavation during waste removal and construction activities. Proposed DOE actions in these wetlands would first be evaluated for potential adverse effects on the wetlands (10 CFR 1022), and consideration would be given to natural and beneficial values provided by the

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J.3.6.5 Noise

Noise is defined as unwanted or undesirable sounds that have an adverse effect on human beings and their environment including land, structures, natural wildlife, and ecological systems (Canter 1977). The measurements of noise are expressed in a logarithmic ratio of sound pressure referred to as the sound pressure level and are quantified using the term "decibel" (dB). To obtain a representative sound level that contains a wide range of frequencies to which humans respond to, the "sound pressure level" is A-weighted, resulting in the term dBA. Normal human hearing capabilities range from 0 dBA (the threshold of hearing) to 140 dBA (a jet plane on the ground at 20 ft).

With a population density of 917 residents/ml^2, combined with the presence of industry in the area, land use within a five mile radius around the FEMP site could operationally be classified as agricultural/quiet residential. This classification provided by Canter (1977), combined with noise-level data, recorded by the Westinghouse Environmental Management Company of Ohio in 1991, indicate that the current average background noise level within the five mile radius of the FEMP is approximately 50 dBA.

Rather than increasing and decreasing in a linear fashion, noise propagating from a point source changes logarithmatically. Consequently, for every doubling of the distance away from the source of the noise, the sound level decreases by six dBA. Most remedial activities will take place towards the center of the FEMP site. Consequently, an activity emitting a sound level of 100 dBA would decrease to 60 dBA once the sound wave reaches a resident one mile away from the sound source. It is assumed noise levels emitted from remedial activities will fluctuate according to the type of activity and might very well be heard by surrounding communities; however, the noise levels to the nearest resident will not increase more than 10 to 15 dBA over the background noise level of 50 dBA during a normal eight-hour working day. Although no sound barriers will be constructed during remedial activities, noise levels will be reduced though engineering controls. Noise levels for on-property workers will not exceed the 85 dBA (Occupational Safety and Health Act 29 CFR Part 1910.95) standard through the implementation of the noise conservation program currently enforced at the FEMP site.

J.3.6.6 Transportation

The activity with potentially the greatest direct effect on local residents from concurrent implementation of OU remedial activities is the increased traffic flow from waste shipment. ~~Possibly the greatest environmental impact, both at the FEMP and to local residents, from concurrent~~

~~implementation of OU remdial activities is from the increase in traffic flow.~~ Transportation routes off-site will be impacted by four categories of shipments: (1) transport of waste for off-site disposal

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either at the NTS or a permitted commercial disposal facility; (2) bringing backfill and construction materials from off-site regional sources; (3) movement of backfill waste and material within site boundaries; and (4) a variety of wastes, hazardous materials, laboratory, and treatability samples which are to be dispositioned during CERCLA removal actions. Category 4 includes RCRA wastes, hazardous wastes, mixed waste, low-level waste, PCB-contaminated waste (currently stored on-property and awaiting final disposal), and hazardous materials which resulted from past production operations (e.g., low-level residues, high-grade residues, orange oxide [UO_3], green salt [UF_4], uranium derbies, and refinery feedstock currently awaiting final disposition). Facilities that are to receive and ship the waste, hazardous materials, and samples include, but are not limited to, the following: privately owned, licensed treatment and disposal facilities; privately owned laboratories; privately owned nuclear facilities; and federal facilities (e.g., other DOE sites).

~~Transport of Waste for Off-Site Disposal~~

OUs 1, 3, 4, and 5 are likely to ship waste off-site for disposal during concurrent implementation of remedial actions. OU1 estimates 638 train shipments over five years will depart for a permitted commercial disposal facility in Clive, Utah. OU3 will transport waste by truck to a representative commercial disposal facility in Clive, Utah and NTS. OUs 4 and 5 will transport waste by truck to NTS located in Mercury, Nevada. The following truck trips are estimated: OU3 (734 truck trips over 10 years); OU4 (2,231 truck trips over six years); and OU5 (833 truck trips over 22 years). OU2 may transport waste material which exceeds the on-property Waste Acceptance Criteria. This waste would be transported by rail to the representative permitted commercial disposal facility and consist of approximately 3,300 yd^3 of waste material which would not significantly increase rail shipments.

The transportation route for rail shipments would traverse through the following cities and states: Hamilton, Dayton, and Lima, Ohio; Gary, Indiana; Chicago, Illinois; Cedar Rapids, Iowa; Fremont, Nebraska; Cheyenne, Wyoming; Ogden, Salt Lake City, and Clive, Utah. The transportation route for truck shipments would traverse through the following cities and states: Indianapolis, Indiana or Louisville, Kentucky; St. Louis and Joplin, Missouri; Tulsa and Oklahoma City, Oklahoma; Amarillo, Texas; Albuquerque, New Mexico; Flagstaff and Kingman, Arizona; Las Vegas and Mercury, Nevada.

The lifetime cancer risk to an individual living along the rail or truck route, as evaluated in each OU's respective FS report is less than 1×10^{-6} for all off-site waste shipments. The average monthly

increase in truck traffic (Monday through Friday) would be approximately 17 truck trips/month. Train traffic would increase by approximately 11 trains per month. This increase in traffic flow would impact local residents from increased noise and dust.

Air emissions in the forms of total hydrocarbons, carbon monoxide, and nitrogen oxides would occur from truck transport of OUs 3, 4, and 5 waste. Air emissions were calculated assuming 8,640 heavy duty diesel powered vehicles would be traveling 4,130 miles round trip at a speed of 55 miles per hour. The model year of the vehicles is assumed to be 1990. Air emissions were also calculated based on the following factors: total hydrocarbons 1.60 grams/mile, carbon monoxide 5.45 grams/mile, and nitrogen oxides 18.15 grams/mile (EPA 1985). The calculated air emissions converted from grams to tons are as follows: total hydrocarbons 56.2 tons, carbon monoxide 191.4 tons, and nitrogen oxides 637.4 tons.

Backfill for all OUs is expected to be obtained on site and therefore would not significantly contribute to local traffic impacts.

J.3.6.7 Community Services

Community services that could be affected by remedial activities include schools, health care facilities, housing, emergency and protective services, and water and wastewater treatment systems. Impacts to these services would primarily arise from relocating large numbers of workers during major activities such as the remediation. Because the employment requirements for FEMP site remediation are not expected to result in a major influx of workers during remedial activity, due in part to the work being spread over time, no long-term impacts on these services are anticipated.

J.3.7 Cultural Resources

Pursuant to Section 106 of the National Historic Preservation Act, DOE must take into account the effects of remedial activities on historic properties. An Historic property is defined as any prehistoric or historic building, archeological site, structure, or object that is listed or eligible for listing on the National Register of Historic Places. DOE must also afford the Advisory Council on Historic Preservation (the Council) a reasonable opportunity to comment on the effects of a project to historic properties. To accomplish this, DOE is developing a process for the survey, avoidance, and mitigation of historic properties in conjunction with the Ohio Historic Preservation Office (OHPO) and the Council. For archeological sites, DOE will survey for historic properties within uncontrolled areas prior to the initiation of remeidal action and consult with OHPO and the Council regarding

appropriate mitigation actions. For all buildings and structures, DOE will document the architecture and history of the primary facilities, using existing information whenever possible. These two approaches to compliance with Section 106 of the National Historic Preservation Act are being developed through two separate Programmatic Agreements with OHPO and the Council, as promulgated in 36 CFR 800.13. ~~Any federal activity that may adversely affect a site or structure that is listed in the National Register of Historic Places (NRHP) or is considered eligible for inclusion on the list must undergo rigorous scrutiny to ensure that the adverse effect is avoided. This examination is also necessary to determine potentially significant sites such as uncovered archaeological remains. To ensure that no resources will be affected by remedial activities in the other OUs, an archaeological survey of the property would be performed. The rainbow arch bridge over Paddys Run on Willey Road may be affected by transport of materials to the FEMP site. The Ohio Historic Preservation Office and the Ohio Department of Transportation would be contacted for consultation. Any additional construction proposed beyond the boundaries of the FEMP site would require an archaeological survey and consultation with state and national preservation officials before initiation.~~

J.4 AGENCIES CONSULTED AND RELATIONSHIP TO OBJECTIVES OF LOCAL, STATE, REGIONAL, AND FEDERAL LAND USE PLANS, POLICIES, AND CONTROLS

During the development of the OU4 FS a number of federal, regional, state, and local organizations were contacted for information or assistance. This information has been referenced herein for the OU3 RI/FS/PP-NEPA evaluation. Some of these agencies were also contacted for consultation under 40 CFR 1502.16, which requires a discussion of "possible conflicts with the objectives of state, federal, regional, and local land use plans, policies, and controls" in environmental documents. Agencies were contacted under this provision to determine whether any conflicts would arise as a result of remedial activity at the FEMP site. No agency or organization that was contacted considered future remedial actions at the FEMP site to be in conflict with its land use plans, policies, or controls in the area. The following organizations were contacted:

Federal

- U.S. Environmental Protection Agency
- U.S. Department of the Interior
- U.S. Department of Transportation
- Bureau of Land Management
- U.S. Fish and Wildlife Service
- Federal Emergency Management Agency

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APPENDIX L

Analytical reports for trace metal analytes and organic analytes contain the following information for each sample:

- Laboratory qualifier (LQ)
- Validated analytical result
- Units for the sample
- Validation qualifier (VQ)

Laboratory Qualifiers

U The reported value was obtained from a reading that was less than Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL). This qualifier applies to inorganic analyses.

B Laboratory background contamination was detected for this analyte in the associated method blank. The method blank is an analytical control sample consisting of all reagents, internal standards, and surrogate standards that is carried through the entire analytical procedure. ~~This qualifier applies to organic analyses.~~

C Result was confirmed by a second instrument (for pesticide/PCB analyses only).

D Sample result shown is a dilution result.

E Organic analyses - Instrument range was exceeded. Some laboratories use "X" for this qualifier.

E Inorganic analyses - The reported value was estimated because of the presence of interference.

J Data may be biased, and the associated numerical value is considered an estimated quantity.

N Spiked sample recovery was not within control limits. This qualifier applies to inorganic analyses.

S The reported value was determined by the Method of Standard Additions.

+ The correlations coefficient for the Method of Standard Additions was less than 0.995.

W Post-digestion spike for Furnace Atomic Absorption Analysis was outside of control limits (85-115%) while sample absorbance was less than 50% of spike absorbance.

X Instrument range was exceeded.

* Duplicate analysis was not within control limits.

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