6478 U-007-304 .45

TRANSMITTAL OF RESPONSES TO COMMENTS AND RESULTANT CHANGE PAGES FOR THE DRAFT FINAL OPERABLE UNIT 5 REMEDIAL INVESTIGATION REPORT

01/13/95

DOE-0416-95
DOE-FN EPAS
75
RESPONSES

6478

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

DOE-0416-95
January 13, 1995

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V - 5HRE-8J
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:

TRANSMITTAL OF RESPONSES TO COMMENTS AND RESULTANT CHANGE PAGES FOR THE DRAFT FINAL OPERABLE UNIT 5 REMEDIAL INVESTIGATION REPORT

References:
1. Letter, Thomas A. Schneider (OEPA) to Jack Craig (DOE-FN), "Comments - OU 5 RI," dated December 05, 1994.
2. Letter, James A. Saric (U.S. EPA) to Jack Craig (DOE-FN), "Disapproval of the OU5 Remedial Investigation Report," dated December 15, 1994.

Enclosed for your review and approval are comment responses and change pages for the Operable Unit 5 (OU5) Remedial Investigation (RI) Report. Several phone conversations were held with commentors to ensure the acceptability of the responses and actions.

Responses to the 27 comments received (22 from the United States Environmental Protection Agency (U.S. EPA) and 5 from the Ohio Environmental Protection Agency (OEPA)) have been prepared and the draft final RI Report has been revised accordingly. The comments are located in the Responses to Comments binder behind the appropriate tab. Instructions for inserting the replacement pages are provided with the inserts. Bold italics have been used within the report text to indicate revisions due to responses to this round of comments.

The United States Department of Energy, Fernald Area Office (DOE-FN) initiated a number of additional revisions to enhance the accuracy and clarity of the document. For example, while researching the response to Comment 86, the DOE-FN noted that Table A.1-15, Organic Constituents of Potential Concern, would be improved by the addition of two parameters and footnotes. Tables A.2-1 through A.2-12, which summarize the selection of constituents of potential concern, were revised to correct the units and maximum contaminant

levels; the changes do not affect results or conclusions of the risk assessment. The List of Tables was also revised. Table A.IV-20, which was inadvertently omitted from the October 1994 iteration, has been included. Plate D-84 was revised to correct inaccuracies in Fernald Environmental Management Project (FEMP) background features, and a portion of Appendix T was updated. All of the changes are noted as DOE-FN initiated revisions.

Following EPA approval of these responses/changes, replacement covers, spines and title pages marked "Final" will be issued to all holders of the OU5 RI Report and Reference Appendices, as appropriate.

If you or your staff have any questions, please contact Rob Janke at (513) 648-3124 or Kathi Nickel at (513) 648-3166.

Sincerely,

Randi Allen

for Jack R. Craig
Fernald Remedial Action
Project Manager

FN:Nickel

Enclosures: As Stated

cc w/encs:

Volumes 1, 2, and 3 change pages, Plate D-84:
K. H. Chaney, EM-423/QO
D. R. Kozlowski, EM-423/QO
G. Jablonowki, USEPA-V, AT-18J
P. VanLeeuwen, USEPA-V, 5HRE-8J
J. Kwasniewski, OEPA-Columbus
P. Harris, OEPA-Dayton
F. Bell, ATSDR
R. D. George, FERMCO
T. Hagen, FERMCO

Volumes 1 and 2 change pages:
M. Davis, ANL

Volumes 1, 2, 3, and reference appendices change pages, Plate D-84:
L. Griffin, EM-423/QO
M. Proffit, OEPA-Dayton
J. Michaels, PRC
R. Cohen, GeoTrans
R. Owen, ODOH
AR Coordinator

cc w/o enc:

M. Yates, FERMCO

6478

bcc:

R. J. Janke, DOE-FN
J. Kappa, DOE-FN
K. Nickel, DOE-FN
J. Stover, DOE-FN

Fernald Environmental
FERMCO
Restoration Management Corporation

INTEROFFICE MEMORANDUM

To:	Distribution	**Date:**	January 13, 1995
Location:	Various	**Reference:**	
From:	W.A. Hutt For Dennis Carr	**FERMCO #:**	M:CRU5:95-0004
Location:	Fernald, T-80	**Client:**	DOE DE-AC24-92OH21972
Extension:	738-9433	**Subject:**	Transmittal of Responses to Comments on the Draft Final OU5 RI Report and resultant change pages

c: File Record Storage Copy 106.4.19
Dave Brettschneider
Cate Brier
Ken Broberg
Mark Cherry
J.D. Chiou, B&R Pittsburgh
Stephanie Disbro - OU5 Files
Bob Fellman
Bob Galbraith
R.D. George
Terry Hagen
Bill Hertel
R. Holmes
Steve Houser
Daryl Hutson, B&R Pittsburgh
Marc Jewett
Darin Milligan, IT Albuquerque
Tom Mulder, IT Cincinnati
Keith Nelson
Lois Nelson
Paul Pettit
LeeAnn Sinagoga, B&R Pittsburgh
Mike Skriba
Nancy Weatherup

Enclosed are the subject attachments. The comment responses have been prepared and the Remedial Investigation (RI) Report has been revised based on responses to the 27 U.S. EPA and OEPA comments received in December. The change pages and comment responses were transmitted to EPA and OEPA via the attached letter.

As the recipient of the October iteration of this report, change pages are attached for you to insert (in accordance with the instructions provided) in the OU5 RI Report binders. Comments should be placed in the Responses to Comments binder behind the appropriate tab (U.S. EPA or Ohio EPA). Following EPA approval of these changes, replacement covers, spines and title pages marked **FINAL** and **January 1995** will be issued to all holders of the Report and Reference Appendices, as appropriate.

CHANGE PAGE INSTRUCTIONS - COMMENT RESPONSE DOCOMENT

U. S. EPA Tab
Place the U.S. EPA responses behind this tab.

OEPA Tab
Place the OEPA responses behind this tab.

RESPONSES TO U.S. EPA COMMENTS ON THE OCTOBER 1994 OU5 RI REPORT

Page & line numbers in ( ) indicate where response is located in the October RI Report

5. Commenting Organization: U.S. EPA Commentor: Saric
Section#: 2.5.4.2 Pg.#: 2-40 (-39) Line#: 8 (32) Code:
Original Specific Comment# 5
Comment: The U.S. Department of Energy responded that the text will read, "The 1.5 - to 2.0-foot-deep...," while the revised text instead states, "The 1.25- to 2.0-foot-deep...." The text should be revised to be consistent with the response to the comment.
Response: Agree there was inconsistency. The wrong depth (1.25 feet) was typed into the response to comment 5. The depth of 1.5 feet stated in the RI Report is correct.
Action: No action required.

44. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.1.0 Pg.#: Fig. A.1-4 Line#: NA Code:
Original Specific Comment# 41
Comment: The response states that the legend to Figure A.1-4 will be modified to explain that bedrock "separates and demarcates the Great Miami Buried Valley Aquifer from the upland area." Instead, the legend has been revised to read, "Separates Demarcates the...." The legend should be revised to read as the original response stated.
Response: The reviewer is commenting on the fact that the word "and" is missing from the phrase "separates and demarcates....". The reviewer is correct.
Action: Correct legend to read "separates and demarcates....."

72. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.2.4 Pg.#: A.2-12 thru (A.2-14) Line#: (16, 25, 26) Code:
Original Specific Comment# 49
Comment: In response to original comment #49, the text in lines 15 and 16 on page A.2-15 was revised to read, "Polychlorinated biphenyl [PCB] compounds and dioxins/furans were also selected as chemicals of potential concern [CPCs] for human health risk assessment." However, PCBs are not listed in the in-text tables for selected CPCs presented on pages A.2-12 through A.2-14. The report should be revised to incorporate PCBs in one of the in-text tables identified above.
Response: Agree.
Action: The report will be revised to incorporate PCBs in the in-text table presented on page A.2-14.

76. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-17 Line#: (11 ff) Code:
Original Comment# 12
Comment: I noted the slight text changes on page A.3-17. However, the additional proposed text given in the response document, starting with "The text will further note..." could not be located in the revised document. Where are the expanded discussions of the Area 6 contamination?
Response: Please note that the text (page 3-17) already states that Areas 5 and 6 are too small for potential agricultural purposes and that Areas 5, 6, and 7 lie in the predominant downwind direction. We agree to modify the text further to note that Area 6 strongly influences exposure point concentrations for combined Areas 5, 6, and 7.
Action: The following text will be added to page A.3-17, line 13: It should be noted that environmental contamination (soil and groundwater) in Area 6 generally exceeds that detected in Areas 5 and 7. Thus, contaminant concentrations/activities in Area 6 strongly influence exposure point concentrations/activities developed for the combined Areas 5, 6, and 7. Area 6 is a "hot spot" (particularly for radiologicals [e.g., uranium, technetium]) at the FEMP and has been the target of a soil removal action.

78. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-19/20 (-20/21) Line#: Code:
Original Comment# 16
Comment: The reference to Plates E-77 through E-90 did not greatly aid me in locating the "uranium plume", referred to earlier, or the "six distinct plumes" referred to in this text. Some additional text explanation (which plumes on the plates are the ones referred to in the text) or some identification on the maps seems to be needed.
Response: Agree to modify text further. The referenced figures are attached for your information.
Action: The following text will be added below the bulleted list of the plumes presented on page A.3-20: Figure 4-92 (Section 4 in Volume I) depicts the location of perched groundwater contamination areas I through VII. Figure 4-79 depicts uranium concentrations in these 7 areas as well as the remainder of the site.
This text will be added below the bulleted list of the Great Miami Aquifer plumes presented on page A.3-21: Figure 4-95 (Section 4 in Volume I) is a schematic depiction of the major FEMP and PRRS plumes in the Great Miami Aquifer. Figure 4-95 also shows the sources/pathways for each of the plumes while Figure 4-93 shows uranium concentrations in the various plumes.

79. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-28-30 (-29) Line#: 41 Code:
Original Comment# 9
Comment: The response to this comment is acceptable, provided that "exclusion" of the ingestion of groundwater in line 41 is changed to "inclusion" of the ingestion of groundwater.
Response: Agree.
Action: Text modified as suggested by reviewer.

1. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-38 Line#: 9-18 Code:
Original Comment# 18
Comment: A review of the data in Table A.IV-62 indicates that the wells may not be very homogeneous (concentrations of some contaminants differ by more than an order of magnitude); I did not have Appendix I, so I could not compare the data well by well. Also, the distribution of many contaminants is noted in the Table as "undefined"; however the methodology described on page A.2-6, lines 19-21: "For data sets containing less than 20 samples and having undefined distribution, the nonparametric 95th percentile is always the maximum detected concentration" does not seem to have been followed. What methodology was used to determine the "representative concentration" value when this methodology was not used? (I noted that the data in the OU #2 FS was ordered from the largest value to the smallest, instead of the reverse as suggested in Appendix A.II. This would have directed the choice of the value for the 95th percentile from the ordered data to the lowest value rather than the highest value. Was this also done in the OU #5 RI?)
Response: This comment was discussed and resolved via phone calls with EPA (L. Sinagoga, Brown and Root Environmental, and Pat Van Leeuwen, EPA Region 5). To summarize the phone conversations: Note that representative concentrations for the Operable Unit 5 risk assessment were determined as described in Section A.2.2.2. The nonparametric 95th percentile was ALWAYS selected as the representative concentration for the undefined distribution. For data sets containing less than 20 samples and having an undefined distribution, the nonparametric 95th percentile is always the maximum detected value. For data sets containing 20 or more samples and having an undefined distribution, the 95th percentile value was determined using the methods presented in Attachment A.II of the RI.
The data are ordered in ASCENDING order. If n = the number of results and p = the result to be designated as the 95th percentile value, the p is calculated as follows: p = 0.95 (n)

Note that the 95th percentile value may be selected using this formula regardless of the number of values considered. The fact that the maximum concentration is chosen whenever there are less than 20 values is a function of the mathematics of the test.
Table A.IV-62 (showing data for wells off property and to the east) has been reviewed and corrected. Previously the table did not focus on the most recent data (1992/1993) available for the well group in question and did not properly select a datum to represent each well in the statistical analysis. However, the 95th percentile selection was working properly. See response to Comment 81 in the Responses to Comments on the OU5 Remedial Investigation Report of June 1994 for an explanation of the selection of datum to represent a well. Note that this is a FYI only table - it was NOT actually used in the baseline risk assessment because data for wells along the eastern fenceline were used to assess risks to a hypothetical RME receptor along the eastern fenceline. In terms of the risk assessment of contaminant concentrations in soil, groundwater, and air, the fenceline is the logical RME location for off-property receptors.

Action: Correct Table A.IV-62 with the most recent data.

83. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: A.3-64 (-68) Line#: 18-26 (4) Code:
Original Comment# 20

Comment: The response to this comment is acceptable, except for the last sentence (p A.3-68, lines 3-4), which do not seem to be quite correct. I think that you mean that this results in a combined soil ingestion rate of 0.18 g/day for the RME farmer and 0.12 g/day for the CT farmer.

Response: The reviewer is correct. We do mean that this results in a combined soil ingestion rate of 0.18 g/day for the RME farmer and 0.12 g/day for the CT farmer.

Action: Revise text as requested - ...a combined soil ingestion rate of 0.18 g/day for the RME farmer and 0.12 g/day for the CT farmer.

5. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: Tables A.3-3... Line#: Code:
Original Comment# 11

Comment: There is still some inconsistency here. Text, p A.2-13, indicates that carbon tetrachloride was retained as a CPC; however, it is not found in the section 3.0 tables. There may be other missing entries.

Response: The reviewer is correct. Table A.3-3 (and associated tables) do not show the evaluation of carbon tetrachloride in FEMP surface soil samples. Improper coordinates assigned to one of the soil samples created a problem which you have identified (i.e., the mislocation of a sample). Please note that we did not ignore your original comment on carbon tetrachloride. Our original follow-up to your comment indicated that the carbon tetrachloride detection in question was an anomalous off-property detection. A more recent double check of the database noted a correction to the database that places the carbon tetrachloride detection in Area R2 and that the surface soil detections in question are nonvalidated data. Even though the data are nonvalidated, they will be evaluated (quantitatively) because they are the maximum carbon tetrachloride detections reported in surface soil. The results/comments will be presented in the Comment Uncertainty column in Table A.5-22. This does not alter the critical conclusions of the baseline risk assessment. The baseline risk assessment already demonstrated that volatile organic compounds were COCs that must be addressed in the Operable Unit 5 feasibility study. Additionally, while the baseline risk assessment is required to use validated data only, ALL available data are considered in the feasibility study, particularly in the calculation of soil volumes.

Action: Include carbon tetrachloride in the Area R2 analysis, and present the results in the Comment Uncertainty column in Table A.5-22 as follows: The validated analytical database for soil indicates that carbon tetrachloride is not a COPC. However, 1.2 parts per million (ppm) carbon tetrachloride was detected at one production area sampling location based on nonvalidated data.

The cancer risk estimate associated with exposure to 1.2 ppm carbon tetrachloride is approximately 6 x 10^{-5}, considerably lower than the total cancer risk estimate available for the production area.

A final check of tables was performed to ensure that inconsistencies are resolved (i.e., the organics identified as COPCs for surface soil in the in-text tables appearing on pages A.2-12 and A.2-13 do appear in Table A.3-3).

87. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.3 Pg.#: Table A.3-7 (A.3-37,-38a) Line#: (7,4) Code:
Original Comment# 13

Comment: After a second consideration of the Off-Property, Future Land Use scenarios and the Off-Property, Current Land Use scenarios for the off-site resident farmer/child, the explanation given by DOE for the difference in the Surface Soil contaminant levels did not make much sense. The difference between the two scenarios is said to be a difference in the manner for calculating groundwater contaminant concentrations, with the predicted values used for the future land use scenario including fate and transport. Actually, no change in land use is apparent here, only a change in time. The explanation for the difference in soil values indicates that radionuclide decay was considered, but this does not explain why Pb-210, for example, disappears. Doesn't Ra-226 ultimately result in Pb-210? The Ra-226 levels do not decrease, so why isn't there a constant decay to Pb-210? I also noted that no adjustment was made to other radionuclides for decay or in-grow.

I have the feeling that the method for predicting the surface soil contaminant levels (based on radioactive decay of some radionuclides) was different from the manner in which these processes were assessed for groundwater. Also, the scenario described as the Future Land Use with Controls/Off-Property Resident Farmer/Child is really a variation of the Current Land Use without Access Controls scenario and only varies with time, not land use. Please review the methodology for determining the concentration values in surface soil and groundwater in the described future land use scenario for consistency, and explain why this scenario is thought to be associated with a change in land use. Some explanations in the text are clearly needed to clarify these issues.

Response: Agree to add explanation in the text to clarify issue.

Action: Per your request, the following text will be added to Section A.3.3.1, which discusses exposure point concentrations for soil:

"However, there is a difference in the radiological COPC list for the current versus future land-use scenarios (e.g., the COPC lists presented in Tables A.3-5 and A.3-7). The difference in the current and future radiological COPCs in soil is a function of the assumptions made regarding the equilibrium and the properties of the radiologicals (e.g., the daughter products; note the number of daughter products assumed under the current versus the future land-use scenarios). For example, based on the existing analytical data, it was not assumed that Pb-210 is currently in equilibrium with radium-226 and its daughter products. (Radium-226 [in equilibrium with five daughter products] is evaluated under the current land-use scenario.) Instead, actual analytical data is used to determine the representative concentration of Pb-210 under the current land-use conditions. In contrast, it is assumed that Pb-210 is a decay chain product of radium-226 for the evaluation of the future land-use scenario. Radium-226 with eight daughter products is considered for the future land-use scenario. Radon is also a Ra-226 decay chain product. Because some of the radon will be lost to the atmosphere, secular equilibrium between Ra-226 and PB-210 in soil may not be fully achieved.

The following text will be added to Section A.3.3.3, which discusses exposure point concentrations for groundwater: "As discussed in the following paragraphs, the representative concentrations determined for groundwater for the current land-use scenario are based on the currently available analytical data. The radiological equilibrium assumptions are the same as those specified for soil under the current land-use scenario. The representative concentrations

determined for groundwater for the future land-use scenario are modeled values. Therefore, the evaluation of the current versus future Operable Unit 5 off-property receptors differs principally in that modeled groundwater contaminant levels (as opposed to measured groundwater contaminant concentrations) are used as groundwater exposure point concentrations for the future land-use scenario; i.e., there is no actual difference in the land-use assumptions themselves when the future off-property receptor is evaluated. The exposure point concentrations for soil (current versus future) differ only as a consequence of the radiological equilibrium assumptions. The modeled values for groundwater were determined based on the fate and transport methods presented in Section 5.0. Specifically, the modeling considered contaminant levels currently existing in the soil and groundwater (particularly the perched water) as the source term. The migration of the contaminants from the source term to the groundwater was based on contaminant- specific parameters such as the distribution coefficient (the K_d) and the hydrogeological properties of the aquifer underlying and downgradient of the FEMP. The radiological equilibrium assumptions are the same as those specified for soil under the future land-use scenario. Consequently, the method used to predict the activities of radiologicals in the groundwater is identical to that specified for soil; i.e., radiological equilibrium assumptions are the same. However, the contaminant migration is considered using the groundwater modeling methods presented in Section 5.0.

96. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: Table A.3-1 Line#: NA Code:
Original Specific Comment# 98
Comment: Original comment #98 indicated that Table A.3-1 and Figure A.3-2 presented inconsistent information. Specifically, Table A.3-1 indicates that the baseline risk assessment will evaluate exposure via direct radiation as a result of recreational activities. In contrast, Figure A.3-2 indicates that such exposure will not be evaluated because a preliminary screening indicates that the contribution to total exposure from this exposure pathway is negligible. Table A.3-1 and Figure A.3-2 should be revised to eliminate this discrepancy.
Response: Agree.
Action: The "direct radiation" entry specified for recreational receptor exposure to surface water will be eliminated from Table A.3-1 (3rd page of table).

97. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.0 Pg.#: Fig. A.3-6 Line#: NA Code:
Original Specific Comment# 99
Comment: Original comment #99 indicated that the distances presented in Figure A.3-6 were incorrect. While some of the distances appear to have been corrected, others remain incorrect. Specifically, Elda Elementary School is labeled as being 1 mile from the center of the Fernald Environmental Management Project (FEMP). However, the symbol that indicates the location for the school is farther than 1 mile from the center of the FEMP. Figure A.3-6 should be closely reviewed and the distances should be corrected as needed.
Response: Agree to review and correct figure.
Action: Correct Figure A.3-6.

123. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.3.2 Pg.#: A.3-38 Line#: 1-10 (6-26) Code:
Original Specific Comment# 77
Comment: Original comment #77 indicated that Tables A.3-9 through A.3-12 did not contain radon modeling results for the grazing areas as suggested in the text. The response was to add footnote "a" to the in-text table. The footnote would indicate that while radon levels for the grazing areas were not specifically presented in Tables A.3-9 though A.3-12, the grazing areas were within

other risk evaluation areas for which radon data are available. This response is insufficient. Footnote "a" should be revised to refer directly to the tables that present radon levels for the grazing areas.

Response: Agree to further modify the footnote.

Action: The following information will be added: Grazing Areas 1, 2, 3, and 4 are basically (but not exclusively) associated with Areas 10, 8, 7, and 5 through 10, respectively. (See Figures A.3-3 and A.3-5 for the location of these areas.) Radon data for Areas 7, 8, 9, and 5 through 10 are presented in Table A.3-9. The radon levels presented in this table for the grazing areas are those modeled for the associated areas and presented in Table A.3-9.

124. Commenting Organization: U.S. EPA Commentor: Saric
Section#: A.3.3.3 Pg.#: Table A.3-13
Original Specific Comment# 78

Comment: In response to original comment #78 a footnote was to be added to Table A.3-13 indicating that no acceptable remedial investigation (RI) monitoring well data are available for the "Northeast of the FEMP" location. However, this footnote was not added. Table A.3-13 should be revised to include an appropriate footnote.

Response: Agree.

Action: The following will be added to footnote [b] in Table A.3-13: No acceptable remedial investigation monitoring well data are available for the "Northeast of FEMP" location.

143. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.5 Pg.#: A.5-17 (-18) Line#: 17-26 (-17ff) Code:
Original Comment# 23

Comment: The additional text explanation and reference is acceptable. The inclusion of a reference to the Section 5 text and tables would be even better. Please refer also to the discussion in comment #87. Some consistency in the assumptions made for future exposures to groundwater and other media is needed.

Response: Agree to modify text as requested.

Action: The text on page A.5-18 (second paragraph) will be modified as follows: ...(see Appendix F.3; Sections 5.3.3, 5.4.3 and 5.5.3, and Tables 5-38 through 5-41).

149. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.5 Pg.#: Tables A.5-2 - A.5-12/5-20 Line#: Code:
Original Comment# 26

Comment: Not all tables have been corrected. Please change the "0E+00" risk notation in Tables A.5-19 and A.5-20.

Response: Agree

Action: Remove all "0E+00" from Tables A.5-19 and -20 and replace with NA.

152. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.6 Pg.#: A.6-5 Line#: 32-35 Code:
Original Comment# 27

Comment: The response to this comment is acceptable. It would be helpful if I could receive a copy of all such Supplemental documents which are relevant to the Fernald site.

Response:

Action: Requested documents were provided to the reviewer.

154. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.6 Pg.#: A.6-8 (-9) Line#: 21-25 (6) Code:
Original Comment# 29
Comment: The added text seems to be inconsistent with the preceding sentence. The use of "probable" in the preceding sentence instead of the word "plausible" would make more sense. I do not understand the reference to "any of the more plausible landuse scenarios" in line 9; the reader does not know which scenarios DOE has rated as plausible. Also, why are parentheses included in this explanation?
Response: Modify text as requested.
Action: The word "plausible" in line 6 will be changed to "probable." The parentheses will be removed. The last sentence in the first paragraph on page A.6-9 will be modified as follows "....would experience the maximum risk under any of the plausible land-use scenarios (i.e., industrial/commercial, recreational, or agricultural/residential) considered in the Operable Unit 5 baseline risk assessment.

167. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: A.6.3 Pg.#: A.6-12 (-13) Line#: (29) Code:
Original Comment# 31
Comment: The remaining original text appears to be redundant and only confuses the reader. I think you are trying to say that there is uncertainty in the risk assessment due to the uncertainty in knowing the true population exposure, and this uncertainty has been evaluated by preparing a central tendency risk estimate for the maximally exposed individual in addition to the RME estimate. Perhaps a total rewrite of this paragraph would provide more clarification of the point in question. Also the RME exposure is sometimes described as a 95th percentile exposure and sometimes as a 90th percentile exposure. The text should be consistent.
Response: The text will be rewritten as suggested and reviewed with EPA before inclusion in report. Please note we only see reference to the 95th percentile exposure parameter (not the 90th) in Section 6.3.
Action: The paragraph in question will be replaced with the following: The risk assessment for Operable Unit 5 was conducted to estimate the extent of risk to populations exposed (or hypothetically exposed) to contaminant levels detected at the site. The uncertainty associated with the results of the risk assessment is due, in large part, to the uncertainty in knowing the true population exposure. This uncertainty has been evaluated by preparing a central tendency (CT) risk estimate and a reasonable maximum exposure (RME) estimate for maximally exposed individuals. The identification of the risk incurred by 50 percent (the CT evaluation) and by 95 percent (the RME evaluation) of the receptor population is a required component of the risk assessment. The results of the RME evaluation are typically used to make risk management decisions. The results of the CT evaluation help the risk manager to understand, to a certain extent, the level of uncertainty associated with the exposure input values which define the RME and CT evaluations.

210. Commenting Organization: U.S. EPA Commentor: P. Van Leeuwen
Section#: Attachment A.V Pg.#: A.V-68 (-50) Line#: (23) Code:
Original Comment# 33
Comment: I did not see evidence of any attempt to update the lead profile as suggested in the response document. The changes to page A.5-24 are not the same as correcting this toxicological discussion. The last three paragraphs in the tox profile are still badly dated. The 1994 OSWER Directive sets a screening level of 400 ppm for residential exposures. I do not see any reference to the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children, version 0.99d in this profile. This is the Superfund tool for evaluating lead exposures; the Model has been reviewed in 1991 and the revised Model was released for use in 1994.
Response: The text will be rewritten as suggested.

Action: The last 3 paragraphs of the toxicity profile will be replaced with the following text: The EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children, version 0.99d, is an iterative set of equations that estimate blood lead concentrations in children aged 0 to 7 years (EPA 1994d). The biokinetic part of the model describes the movement of lead between the plasma and several body compartments and estimates the resultant blood concentration. The rate of the movement of lead between the plasma and each compartment is a function of the transition or residence time (i.e., the mean time for lead to leave the plasma and enter a given compartment, or the mean residence time for lead in that compartment). Compartments modeled include the erythrocytes, liver, kidneys, all the other soft tissue of the body, cortical bone, and trabecular bone. Excretory pathways and their rates are also modeled. These include the mean time for excretion from the plasma to the urine, from the liver to the bile, and from the other soft tissues to the hair, skin, sweat, etc. The model permits the user to adjust the transition and residence times. EPA guidance (EPA 1994e) establishes a screening level of 400 ppm for lead in soil at Superfund sites. This concentration is considered by EPA to be protective for direct contact with lead-contaminated soil in a residential setting.

224. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.1.2 Pg.#: B.1-12 Line#: 16 Code:
Original Specific Comment# 15
Comment: The original comment recommends discussing the nature and extent of contamination at the FEMP in relation to the environmental media at each of the Operable Unit 5 study areas. DOE responded, in part, that it would add the following sentence to the end of Section B.1.2: "Tables B.2-4 through B.2-6 list the contaminants of potential concern by study area." Although this response is adequate, the sentence that appears in the revised RI report is incomplete. The RI report should be revised to include the complete sentence.
Response: Agree this sentence is incomplete.
Action: The sentence will be revised to read "Tables B.2-4 through B.2-6 list the contaminants of concern by study area."

228. Commenting Organization: U.S. EPA Commentor: Saric
Section#: B.3.0 Pg.#: Table B.3-10 Line#: NA Code:
Original Specific Comment# 16
Comment: The original comment recommends providing information regarding the uncertainty of different risk assessment elements for radiological contaminants. DOE responded by adding Table B.3-10, which summarizes these uncertainties. This response is adequate; however, the second column of the table is apparently incomplete in that it does not discuss the "source term data" factor. A discussion of this factor should therefore be included in the second column of the table.
Response: Agree this portion of the table is incomplete.
Action: The following will be added to the column headings. "Factor": Contaminant concentrations in environmental media (source term data) and "Discussion": How accurately sampling results represent the extent of contamination.

RESPONSES TO OEPA COMMENTS ON THE OCTOBER 1994 OU5 RI REPORT

1. Commenting Organization: OEPA Commentor: DDAGW
Section#: 2.1.3.1 Pg.#: 2-10 Line#: Code: C
Original Comment# 23

Comment: This comment was intended to address the frequency and methodology of sampling and analyzing any water introduced into the borehole. This should be specified in the QAPP. The DOE needs to demonstrate that they complied with the RI workplan.

Response: The RI/FS QAPP (Vol. V, Sect. 5, p. 25 of 70) specifies the following related to this comment: "The source(s) of any water to be used in drilling, grouting, and well and/or piezometer installation must be approved prior to field operations. Water used in the aid of drilling will be analyzed and the results reviewed prior to introduction to the borehole."
The QAPP does not specify a sampling frequency nor does it specify analytical parameters to be tested for in the water used for drilling. The potable water used in the drilling process at the FEMP was sampled and analyzed before the initiation of the RI/FS drilling program in 1987. The potable water at the FEMP was found to be of sufficient quality to be used in the drilling process. The on-site potable water was obtained from the fire hydrants. As stated in the earlier response to this comment, the on-site potable water supply is routinely tested according to OEPA guidelines and found to be acceptable.
The reviewer should note that to remove the potential effects of adding potable water to the borehole, the QAPP also specifies a rigorous well-development process described in Section 2.1.3.4, page 2-14 of this RI report.

Action: Replace the 1st sentence on page 2-10 with the following: The water used in the drilling process was taken from the on-site potable water supply. Before the installation of any RI/FS monitoring wells, this water was tested as specified in the RI/FS QAPP and found to be of sufficient quality to use in the well-installation process.

451. Commenting Organization: OEPA Commentor: OFFO
Section#: 6.5.6.3 Pg.#: 6-19 Line#: 17 Code: C
Original Comment# 169

Comment: This original comment was intended for Section 6.5.6.3 Great Miami River User - Future Land-use, not Section 6.5.3.3 Great Miami River User - Current Land-use. The revised text was mistakenly added to the latter section. Please include the revised text in Section 6.5.6.3 as well.

Response: Agree.

Action: The referenced text in Section 6.5.3.3 will be added to Section 6.5.6.3.

453. Commenting Organization: OEPA Commentor: OFFO
Section#: 6 Pg.#: Table 6-3 Line#: Code: C
Original Comment# 171

Comment: The agreed upon revisions for the Eastern Fenceline Off-Property Child Receptor have not been incorporated as the RTC document indicates. Please incorporate the agreed upon changes.
Eastern Fenceline: Total Risk = 4E-04;
Total HI = 8.3E+02

Response: The problem identified in original Comment #453 occurred because information was not properly "rolled up" from the risk results tables presented in Section A.5. The response to original comment #453 indicated that Table 6-3 would be revised to reflect correct numbers. Table 6-3 currently DOES reflect correct numbers. The numbers do not match the numbers originally suggested by the reviewer because of recent (post-June) corrections to the database which resulted in corrections to the risk assessment. It should be noted the corrections to the database and the risk assessment do not alter risk assessment conclusions.

Action: None.

454. Commenting Organization: OEPA Commentor: OFFO
Section#: 6 Pg.#: Table 6-4 Line#: Code: C
Original Comment# 172
Comment: See above comment. Totals should be as follows:
Eastern Fenceline: Total Risk = 1E-03;
Total HI = 9.7E+02
Response: The response prepared for Comment 453 applies to Comment 454.
Action: None.

560. Commenting Organization: OEPA Commentor: OFFO
Section#: 4 Pg.#: Figure 4-48 Line#: Code: C
Original Comment#
Comment: Figure 4-48 was not included with OEPA's revised copy of the document. Please forward a copy of this page and make sure that it is included in the final RI.
Response: There was a draft Figure 4-48 when the RI Report was being prepared that was dropped from this iteration of the document. It was not possible to renumber all of the subsequent Section 4.0 figures, resulting in a gap in the numbering. This should have been noted in the List of Figures in the Table of Contents.
Action: None.

CHANGE PAGE INSTRUCTIONS - VOLUME 1 OF 5

(Note: Due to double sided copies, in some cases it was necessary to include pages from the October 1994 version before and after the actual change pages)

Table of Contents - List of Figures
Replace pages xxxiv and xxxv.

Section 2
Replace pages 2-9 and 2-10.

Section 4
Replace pages 4-97 and 4-98.

Section 6
Replace pages 6-19 and 6-20.

LIST OF FIGURES
(Continued)

4-38 Total Thorium in Surface Soil, 1.0-1.5 Feet
4-39 Total Thorium in Subsurface Soil, 1.5-3 Feet
4-40 Total Thorium in Subsurface Soil, 3-5 Feet
4-41 Total Thorium in Subsurface Soil, 5-10 Feet
4-42 Total Thorium in Subsurface Soil, 10-15 Feet
4-43 Total Thorium in Subsurface Soil, 15-20 Feet
4-44 Arsenic in Surface Soil, 0-0.5 Foot
4-45 Arsenic in Surface Soil, 0.5-1 Foot
4-46 Arsenic in Surface Soil, 1-1.5 Feet
4-47 Beryllium in Surface Soil, 0-0.5 Foot
4-48 Figure dropped from this iteration
4-49 Cadmium in Surface Soil, 0-0.5 Foot
4-50 Cadmium in Surface Soil, 0.5-1 Foot
4-51 Cadmium in Surface Soil, 1-1.5 Feet
4-52 Cadmium in Subsurface Soil, 1.5-3 Feet
4-53 Cadmium in Subsurface Soil, 3-5 Feet
4-54 Lead in Surface Soil, 0-0.5 Foot
4-55 Lead in Surface Soil, 0.5-1 Foot
4-56 Lead in Surface Soil, 1-1.5 Feet
4-57 Mercury in Surface Soil, 0-0.5 Foot
4-58 Mercury in Surface Soil, 0.5-1 Foot
4-59 Mercury in Surface Soil, 1-1.5 Feet
4-60 Mercury in Subsurface Soil, 1.5-3 Feet
4-61 Volatile Organic Compounds in Surface Soil, 0-0.5 Foot
4-62 Locations of Cross Sections Depicting Total Uranium in Soil
4-63 Total Uranium in the Glacial Overburden-Cross Section KK-KK'
4-64 Total Uranium in the Glacial Overburden-Cross Section V-V'
4-65 Total Uranium in the Glacial Overburden-Cross Section Y-Y'
4-66 Total Uranium in the Glacial Overburden-Cross Section AA-AA'
4-67 Total Uranium in the Glacial Overburden-Cross Section II-II'
4-68 Total Uranium in the Glacial Overburden-Cross Section EE-EE'
4-69 Total Uranium in the Glacial Overburden-Cross Section FF-FF'
4-70 Total Uranium in the Glacial Overburden-Cross Section HH-HH'
4-71 Total Uranium in the Glacial Overburden-Cross Section F-F'
4-72 Total Uranium in the Glacial Overburden-Cross Section A-A'
4-73 Total Uranium in the Glacial Overburden-Cross Section C-C'
4-74 Total Uranium in the Glacial Overburden-Cross Section G-G'
4-75 Total Uranium in the Glacial Overburden-Cross Section H-H'
4-76 Total Uranium in the Glacial Overburden-Cross Section I-I'
4-77 Total Uranium Values (mg/kg) Off Property in Surface Soil at 0-0.5 Feet, OU5, FEMP
4-78 Total Uranium (μg/L) Contamination in FEMP Type 1 Wells-Filtered Samples, 1993 Data Set
4-79 Total Uranium (μg/L) Contamination in FEMP Type 1 Wells-Unfiltered Samples, 1993 Data Set
4-80 Total Thorium (μg/L) Contamination in FEMP Type 1 Wells-Filtered Samples, 1993 Data Set

LIST OF FIGURES
(Continued)

4-81 Total Thorium (μg/L) Contamination in FEMP Type 1 Wells-Unfiltered Samples, 1993 Data Set
4-82 Uranium Distribution Resulting from Aqueous and Particulate Sources
4-83 Uranium Distribution Resulting from Particulate Sources
4-84 Chromium (mg/L) Contamination in FEMP Type 1 Wells-Filtered Samples, 1993 Data Set
4-85 Copper (mg/L) Contamination in FEMP Type 1 Wells-Filtered Samples, 1993 Data Set
4-86 Molybdenum (mg/L) Contamination in FEMP Type 1 Wells-Filtered Samples, 1993 Data Set
4-87 Nickel (mg/L) Contamination in FEMP Type 1 Wells-Filtered Samples, 1993 Data Set
4-88 Selenium (mg/L) Contamination in FEMP Type 1 Wells-Filtered Samples, 1993 Data Set
4-89 Vanadium (mg/L) Contamination in FEMP Type 1 Wells-Filtered Samples, 1993 Data Set
4-90 Zinc (mg/L) Contamination in FEMP Type 1 Wells-Filtered Samples, 1993 Data Set
4-91 Total VOA (μg/L) Contamination in FEMP Type 1 Wells-Unfiltered Samples, 1993 Data Set
4-92 Locations of Perched Groundwater Contamination Areas
4-93 Total Uranium Contamination in FEMP Type 2 Wells-Unfiltered Samples, 1993 Data Set
4-94 Total Uranium Contamination in FEMP Type 2 Wells-Filtered Samples, 1993 Data Set
4-95 Schematic Depiction of the Major FEMP and PRRS Plumes in the Great Miami Aquifer
4-96 Total Uranium Contamination in FEMP Type 3 Wells-Unfiltered Samples, 1993 Data Set
4-97 Total Uranium Contamination in FEMP Type 4 Wells-Unfiltered Samples, 1993 Data Set
4-98 Thorium-232 Contamination in FEMP Type 2 Wells-Unfiltered Samples, 1993 Data Set
4-99 Nitrate Contamination in FEMP Type 2 Wells-Unfiltered Samples, 1993 Data Set
4-100 Sulfate Contamination in FEMP Type 2 Wells-Unfiltered Samples, 1993 Data Set
4-101 Total Uranium Concentration (μg/L) Detected in FEMP Area
4-102 Locations of Cross-Sections Depicting Total Uranium in Groundwater
4-103 Total Uranium in Groundwater-Cross Section A-A'
4-104 Total Uranium in Groundwater-Cross Section B-B'
4-105 Total Uranium in Groundwater-Cross Section C-C'
4-106 Total Uranium in Groundwater-Cross Section D-D'
4-107 Total Uranium in Groundwater-Cross Section E-E'
4-108 Total Uranium in Groundwater-Cross Section F-F'
4-109 Total Uranium in Groundwater-Cross Section G-G'
4-110 Total Uranium in Groundwater-Cross Section H-H'
4-111 Total Uranium in Groundwater-Cross Section J-J'
4-112 Locations of HWMUs to be Closed Under the CERCLA Process

5-1 Overall Operable Unit 5 RI/FS Fate and Transport Modeling Process
5-2 Future Conditions Considered in the Operable Unit 5 No-Action Scenario
5-3 Conceptual Physical and Chemical Processes of Contaminant Fate and Transport
5-4 Receptor Locations for Operable Unit 5 Fate & Transport Modeling
5-5 Operable Unit 5 Risk Assessment Zones
5-6 Supplemental Modeling Characterization of Operable Units 1, 2, and 4
5-7 Operable Unit 5 Baseline Contaminant Sources, Pathways, and Modeling Framework
5-8 Constituent Screening Process - Surface Water Pathway

19

volatiles or full HSL analysis. The samples were also screened for gross alpha radiation using an alpha scintillation probe, and for beta and gamma radiation using a Ludlum detector. These measurements were recorded on the visual classification of soil log. After the trenching was completed and samples collected, they were screened again for radionuclides using a large-volume scintillation detector for confirmatory purposes. The subsurface soil samples were examined and described by a project site geologist. The geologist described and classified the samples based on their color (Munsell Soil Color Charts), texture (USCS), estimated water content, and depth from land surface. All field observations were recorded on standard visual classification of soil forms described in the QAPP and the SCQ. Copies of these field forms describing the characteristics of the subsurface soil are in Appendix P.

2.1.3 General Sampling Methods (Groundwater)

See Section 2.1.2 for a discussion of general sampling methods and quality standards.

2.1.3.1 Well and Piezometer Installation Methods

Borehole advancement into the Great Miami Aquifer was performed using cable-tool drilling techniques. The use of mud rotary or continuous flight hollow-stem augers was determined to be inadequate for advancing through the glacial overburden because of the potential for perched groundwater contamination in the glacial overburden. Continuous flight auger drilling techniques were used as part of the RI to collect soil samples and to install borings and piezometers in the glacial overburden.

The primary consideration when selecting the drilling technique was the prevention of cross contamination during boring advancement; i.e., the transport of contaminants from the glacial overburden through the unsaturated sand and gravel outwash into the Great Miami Aquifer. The cable-tool technique advances a temporary steel casing with a drive shoe at the bottom. This seals the upper borehole and prevents the migration of contaminants to the deeper units. This temporary casing also maintains an open borehole without the use of drilling muds, which could introduce foreign material into the subsurface environment. The temporary steel casing was a nominal 10-inch diameter to allow for construction of a 4-inch well. The temporary casing in wells deeper than 150 feet were sometimes telescoped with a nominal 8-inch diameter casing.

51 A drill hammer was used to dislodge the soil inside the temporary casing. Potable water was added to the boring when necessary to facilitate cuttings removal when drilling in unsaturated material.

351 ***The water used in the drilling process was taken from the on-site potable water supply. Before the installation of any RI/FS monitoring wells, this water was tested as specified in the RI/FS QAPP and found to be of sufficient quality to use in the well-installation process.*** In the glacial overburden and unsaturated sand and gravel outwash, the soil cuttings and potable water were removed from the borehole using a dart bailer. In the saturated sand and gravel material, potable water was not needed to dislodge the soil cuttings. A sand-pump bailer was used to remove the soil cuttings from inside the temporary casing when drilling in the saturated sand and gravel.

On several occasions, sand and fine gravel would heave up into the temporary casing as the drill cuttings were being removed. This occurred when the drill cuttings and water were removed from the temporary casing and a lower hydraulic head was created inside the temporary casing than in the formation. To minimize this situation, additional potable water was added to the borehole to create a hydraulic head that was greater inside the temporary casing than in the formation outside. The result of this practice was that in some borings, significant amounts of potable water were added to the borehole during drilling. Much of this potable water was contained inside the temporary casing and removed as the boring was advanced. Any potable water that did enter the formation was removed during well development.

Before advancing any borings on the FEMP, penetration permits were obtained from the facility engineer. Before advancing any boring off FEMP property, access agreements were obtained by the U.S. Department of Energy (DOE) from the respective property owners. To locate all nearby buried utilities, area utility companies were contacted before drilling began.

2.1.3.2 Well and Boring Identification System

Wells were installed to four different depths; Figure 2-3 diagrams installation depth and well type. Wells with a screen in the glacial overburden are Type 1 wells. Wells with a screen that straddles the water table in the Great Miami Aquifer are Type 2 monitoring wells. Wells with a screen covering the 10-foot interval above the discontinuous clay interbed layer sometimes present near the middle of the Great Miami Aquifer, or at the equivalent elevation if the clay was not encountered, are Type 3 wells. Wells with a screen set 10 feet above bedrock at the bottom of the aquifer are Type 4 wells.

The left-most digit of a well number indicates the well type while the remaining three or four digits identify the well location. There is no geographic significance to the location numbers; they were assigned sequentially as wells were installed. Wells installed at different levels in the aquifer at the same location have the same three- or four-digit location identifier and constitute a cluster. The Work

Semivolatile organic compounds, pesticides, and PCBs were not analyzed in the subsurface soil samples collected from the northwestern area of the FEMP.

4.6.7 Area Outside FEMP Adjacent to Boundary

Soil outside the FEMP property boundary has been investigated since early 1986, when two law suits were filed against the operators of the former Feed Materials Production Center (FMPC) for releasing potentially hazardous amounts of uranium to off-site areas. Soil samples were collected and analyzed for isotopic uranium activities to support the litigation. Additional studies of off-site soil contamination were conducted in subsequent years for radionuclides and chemical compounds.

The area outside the FEMP's adjacent boundary (Figure 4-77) was selected on the basis of the 1986 soil assessment results. This area encompasses an oval area of approximately 3 square miles, excluding the FEMP site itself, and extends 1.3 miles both northeast and southwest of the FEMP. Soil samples in the area outside the boundary were collected and analyzed under four major soil sampling programs. Descriptions of the sampling programs and a detailed discussion on the FEMP adjacent property are provided in Section D.2.30.

Table 4-38 presents the distribution of radiological and chemical constituents in the surface and subsurface soils of the area outside the FEMP boundary. The maximum detection of each constituent is compared to the 95th percentile background value (background), if available, to determine whether the constituent was elevated above background. When background was not available, any detection of these constituents was reported.

Surface Soil: A total of 182 soil samples were taken at various surface soil sampling locations in adjacent areas outside the FEMP property boundary. The majority of the surface soil samples were analyzed for activities of total uranium and isotopic uranium, whereas some were also analyzed for activities of other radionuclides.

418 Surface soil samples within the 0- to 0.5-foot depth interval in this area consisted primarily of samples from the top 0- to 2.0-inch depth, with the remainder from the depth intervals of 2.0 to 4.0 inches and 4.0 to 6.0 inches. Within the 0- to 0.5-foot depth interval, 11 out of 256 samples were detected containing total uranium of levels in excess of five times background. The highest levels of isotopic uranium and total uranium were observed at locations immediately northeast of the FEMP property.

The second highest level of total uranium (approximately 46 mg/kg) was detected at a sampling location located south of Manhole 177 and immediately east of the FEMP property boundary. The remainder of the sampling locations where surface soil samples were collected from the 0- to 0.5-foot-depth interval, levels of total uranium ranged from 1.2 to 39.7 mg/kg. The majority of total uranium levels were present in the lower end of this range, and the average of all positive detections of total uranium was determined to be 7.61 mg/kg.

In addition, thorium and radium isotopes and total thorium were present in samples from the 0- to 0.5-foot-depth interval at levels only slightly above background. Strontium-90 and cesium-137 were detected in a few samples at levels slightly above background. Plutonium-239/-240 and technetium-99 were each observed in one of a total of 12 samples collected from this depth interval. Other decay products, including neptunium-237, plutonium-238, and ruthenium-106, were analyzed but not detected in samples from this depth interval.

No samples were actually collected from the 0.5- to 1.0-foot-depth interval in this area. However, a number of samples were collected at depths of 0 to 1.5 feet and reported as 1.0- to 1.5-foot depth interval samples in the area outside the FEMP boundary.

Within the 1.0- to 1.5-foot depth interval, the highest activities of uranium-238 and uranium-234 were located approximately three-fourths of a mile south of the FEMP property. However, for the other sampling locations in the 1.0- to 1.5-foot-depth interval, relatively low levels of isotopic uranium and total uranium were detected. Thorium isotopes (Th-230, Th-232, and Th-228) and total thorium were detected at levels slightly above background.

DOE Several inorganic analytes were detected in the samples from the 0- to 0.5-foot depth interval. Of these, barium, beryllium, ***calcium***, and cobalt were detected at concentrations slightly above two times background. Other inorganic analytes were either detected at insignificant levels or analyzed for but not detected.

Three volatile organic compounds, including acetone, tetrachloroethene, and toluene, were detected in samples from depths of 0 to 0.5 feet. These VOCs are basic ingredients in common solvents and petroleum products. No VOCs were analyzed for in other depth intervals.

The total carcinogenic risk to the off-property child ranged from 2.1 x 10^{-4} on the eastern fenceline boundary to 6.5 x 10^{-7} for a hypothetical receptor at off-property well Location 2071. The main carcinogenic drivers were strontium-90; technetium-99; isotopes of thorium and uranium; and the carcinogenic PAHs. HIs for this receptor ranged from 150 for the eastern boundary receptor to 0.079 for a hypothetical receptor at off-property well Location 2071. Metals such as uranium and zinc were the dominant chemical toxicants.

6.5.6.3 Great Miami River User - Future Land Use

451 The Great Miami River user was evaluated under the future land use scenario (70+ years) with the assumption that the storm water retention basin is no longer in operation and the effluent line has ceased discharging runoff to the Great Miami River. Under these conditions, storm water runoff from Operable Unit 5 will generally follow site topography and flow to the Paddys Run storm sewer outfall ditch (SSOD) system in the southern and western sections of the study area. Paddys Run discharges to the Great Miami River. With this in mind, the single exposure point chosen for the user of the Great Miami River was the confluence of Paddys Run and the Great Miami River. ***Three water use scenarios were considered:***

- ***Household use of GMR - The exposure pathways evaluated were ingestion of drinking water; inhalation of volatile organics, and dermal contact while bathing.***
- ***Agricultural use of GMR - The exposure pathways evaluated were ingestion of fruits, vegetables, meat and milk products from plants and animals raised using water from the GMR.***
- ***Recreational use of GMR - The exposure pathways evaluated were incidental ingestion while swimming, dermal contact while bathing, and ingestion of fish.***

The total carcinogenic risk to the Great Miami River user was 1.1 x 10^{-4}, 4.5 x 10^{-5}, 1.9 x 10^{-4} for the recreational (i.e., fishing and swimming), agricultural, and household use scenarios, respectively. The primary carcinogenic contaminants of concern were uranium, Aroclor-1254 and Aroclor-1260. Risks associated with the ingestion route of exposure predominate. The HI for the recreational and agriculture use patterns do not exceed unity. The HI for the household use scenario (HI = 1.8) slightly exceeds unity. Uranium and mercury are the primary contaminants contributing to the noncarcinogenic risk.

6.5.7 Background Risks

All site-related risks in the risk assessment are calculated without accounting for the contribution from natural background. In many cases, the concentrations of CPCs in the soil in the Operable Unit 5 are at or only slightly above natural background concentrations, but the ILCRs or HIs for these background levels often exceed 10^{-4} and 1, respectively. Background contributions provide a useful point of comparison for site-related risk estimates.

Risks and HQs are calculated for background concentrations of CPCs in Operable Unit 5 environmental media. These results are presented in Tables A.7-8 through A.7-19. Exposure assumptions and models used for soil, groundwater, and perched groundwater background calculations are the same as those used for evaluating site-related risks to the RME on-property resident farmer. The assumptions used for calculating background risk from sediment and surface water were based on those used for calculating risk to the exploring youth. Soil concentrations used for background risk calculations are the upper confidence limit (UCL) values determined for the site-specific background soil sample analytical results.

Background risks from radionuclides and their short-lived progeny in soil (Table A.7-8) are in the range of 3.1×10^{-4} to 9.1×10^{-8}. The exposure pathway that contributes nearly all of this risk is external radiation exposure to radiologicals such as from radium-226. It is important to note that, using CERCLA methods, the overall lifetime risk from natural background radiation sources (such as cosmic radiation, naturally occurring radionuclides in surface soil, and radon) is approximately 1×10^{-2}. Risks from arsenic and beryllium in soil at background concentrations exceed 1×10^{-4} and 1×10^{-5}, respectively.

Background HQs were calculated for natural background concentrations of inorganic chemicals in soil. Results of these calculations for the RME on-property resident adult are given in Table A.7-9. The soil concentrations used for these calculations are the UCLs of site-specific background soil sample analyses. The HQ for background concentrations of inorganics range from 2.4×10^{-6} for uranium to $1.2 \times 10^{+1}$. The HQs estimated using the background UCLs and the method described in Sections A.1 through A.5 exceed 0.1 for five metals including arsenic, mercury, cadmium, manganese, and thallium. The results of the background risk calculation and the potential for toxic effects to occur from natural background concentrations of radionuclides and inorganic chemicals suggest that the risk assessment methods have a conservative bias. The conservative bias encountered when comparing background risk to the risk attributed to site constituents may make the background risk values appear significant. In reality, even these values seem minimal at approximately 1 percent of the total lifetime cancer risk from all background sources.

6.6 ECOLOGICAL ASSESSMENT

In accordance with the Amended Consent Agreement with the EPA, the Operable Unit 5 remedial investigation is responsible for submitting a comprehensive baseline ecological risk assessment that provides detailed information concerning site ecological receptors and exposure pathways. The Site-Wide Ecological Risk Assessment is included as Appendix B of this RI Report.

CHANGE PAGE INSTRUCTIONS - VOLUME 2 OF 5

(Note: Due to double sided copies, in some cases it was necessary to include pages from the October 1994 version before and after the actual change pages)

Appendix A Table of Contents
Replace pages A-viii and A-ix

Section A.1
Replace Figure A.1-4.

Section A.2
Replace pages A.2-13 and A.2-14.

Replace Tables A.2-1 through A.2-12.

Replace Table A.2-15.

Section A.3
Replace pages A.3-17 through A.3-22.

Replace pages A.3-29 and A.3-30.

Replace pages A.3-37 through A.3-38a.

Replace pages A.3-67 and A.3-68.

Replace Table A.3-1.

Replace Table A.3-13.

Replace Figure A.3-6.

Section A.5
Replace pages A.5-17 and A.5-18.

Replace Tables A.5-19 and A.5-20.

Replace Table A.5-22.

Section A.6
Replace pages A.6-9 and A.6-10.

Replace pages A.6-13 and A.6-14.

CHANGE PAGE INSTRUCTIONS - VOLUME 2 OF 5 (CONT.)

Appendix A References

Replace pages A-R-9 and A-R-10.

Replace pages A-R-27 through A-R-30.

Attachment A.IV

Replace Table A.IV-20.

Replace Table A.IV-62.

Attachment A.V

Replace pages A.V-50 and A.V-51.

TABLE OF CONTENTS
(continued)

References A-R-1

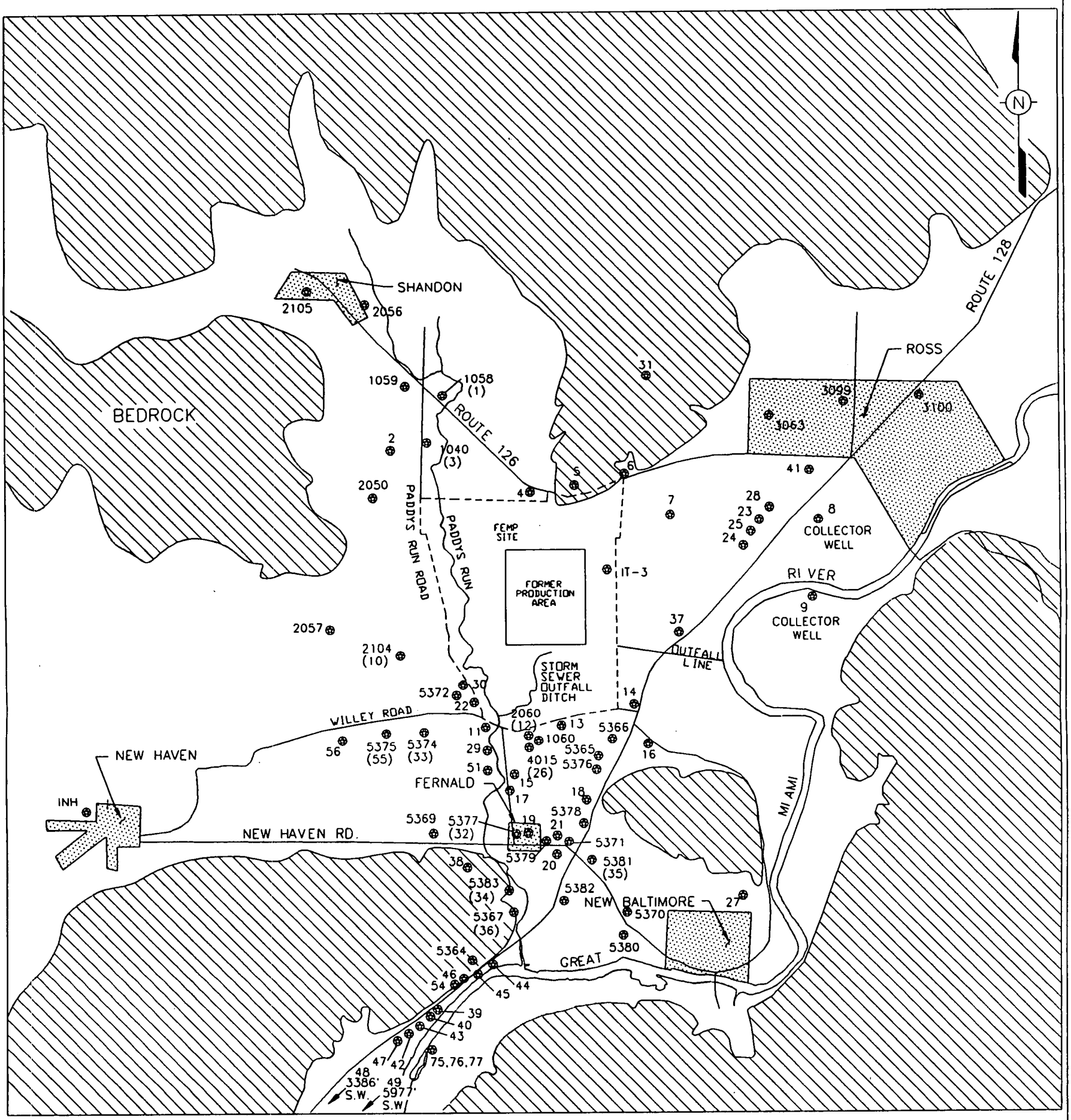
ATTACHMENTS

A.I	Background Tables
A.II	Statistical Procedures and Equations for FEMP Operable Unit 5 Remedial Investigation Report
A.III	Preliminary Toxicity Screening for Organic Constituents Detected in Operable Unit 5
A.IV	Selection of Constituents of Potential Concern and Exposure Point Concentrations
A.V	Toxicity Profiles
A.VI	Calculated Intakes
A.VII	Incremental Lifetime Cancer Risks and Chronic Hazard Indices
A.VIII	Calculation of Radon-222 in Homes Located on Radium-Bearing Soil
A.IX	Radiological and Environmental Monitoring Program Data
A.X	Applicable or Relevant and Appropriate Requirements for Operable Unit 5 Feasibility Study

LIST OF TABLES

	Table	Title
DOE	A.2-1	Selection of Constituents of Potential Concern in Surface Soil (0 to 1.5 feet)
DOE	A.2-2	Selection of Constituents of Potential Concern in Subsurface Soil (> 1.5 feet)
DOE	A.2-3	Selection of Constituents of Potential Concern in Groundwater - Glacial Overburden - Type 1 Monitoring Wells
DOE	A.2-4	Selection of Constituents of Potential Concern in Groundwater - Great Miami Aquifer - Type 2 Monitoring Wells
DOE	A.2-5	Selection of Constituents of Potential Concern in Groundwater - Great Miami Aquifer - Type 3 Monitoring Wells
DOE	A.2-6	Selection of Constituents of Potential Concern in Groundwater - Great Miami Aquifer - Type 4 Monitoring Wells
DOE	A.2-7	Selection of Constituents of Potential Concern in Surface Water - Great Miami ***River***
DOE	A.2-8	Selection of Constituents of Potential Concern in Surface Water - Paddys Run
DOE	A.2-9	Selection of Constituents of Potential Concern in Surface Water - Production Area
DOE	A.2-10	Selection of Constituents of Potential Concern in Sediment - Great Miami ***River***
DOE	A.2-11	Selection of Constituents of Potential Concern in Sediment - Paddys Run ***(and Other FEMP Drainages)***
	A.2-12	Selection of Constituents of Potential Concern in Sediment - Production Area
	A.2-13	Major Chemicals/Radioactive Process Materials Used at the FEMP
	A.2-14	Radiologicals Associated with Process Materials
DOE	A.2-15	Organic Constituents of Potential Concern - Operable Unit 5
	A.3-1	Summary of Exposure Pathways Quantitatively Evaluated in the Baseline Risk Assessment
	A.3-2A	Potential Receptor Locations/Areas/Exposure Points Current Site Conditions, Land Use - With Access Controls
	A.3-2B	Potential Receptor Locations/Areas/Exposure Points Current Site Conditions, Land Use - Without Access Controls
	A.3-2C	Potential Receptor Locations/Areas/Exposure Points Future Land Use - Continued yederal Ownership
	A.3-2D	Potential Receptor Locations/Areas/Exposure Points Future Land Use - Without Federal Ownership
	A.3-3	Summary of Exposure Point Concentrations for Surface Soil On-Property, Current Land Use
	A.3-4	Summary of Exposure Point Concentrations for Surface Soil In Grazing Areas, Current Land Use
	A.3-5	Summary of Exposure Point Concentrations for Surface Soil, Off-Property, Current Land Use
	A.3-6	Summary of Exposure Point Concentrations for Surface Soil, On-Property, Future Land Use

000029



LEGEND:

16 ⊕ WELL LOCATION AND WELL NUMBER

----- FEMP PROPERTY BOUNDARY

MUNICIPAL AREA

BEDROCK (SEPARATES AND DEMARCATES THE GREAT MIAMI BURIED VALLEY AQUIFER FROM THE UPLAND AREA)

(10) REM WELL NUMBER FOR RI/FS MONITORING WELL

NOTE:

1. INVENTORY INCLUDES RESIDENTIAL, COMMERCIAL, INDUSTRIAL, AGRICULTURAL, AND MONITORING WELLS.
2. COMPLETION DEPTHS AND CONSTRUCTION DETAILS FOR SOME WELLS ARE UNKNOWN.

REFERENCE:

IT CORPORATION, 1986. "FINAL INTERIM REPORT-AIR, SOIL, WATER, AND HEALTH RISK ASSESSMENT IN THE VICINITY OF THE FMPC, FERNALD, OHIO."

APPROXIMATE SCALE

0 4000 8000 FEET

ACAD: C:\JUNE1994\A1-4.DWG 1/4/95 LGW

DRAFT
FINAL

FIGURE A.1-4. PRIVATE WELL LOCATIONS IN THE VICINITY OF THE FEMP

000030

6428

Parameter	Surface Soil (0-1.5 feet deep) Frequency of Detection	Surface Soil Maximum Concentration (μg/kg)	Subsurface Soil (>1.5 feet deep) Frequency of Detection	Subsurface Soil Maximum Concentration (μg/kg)
Chloroform	8/349	280	14/377	160
Chrysene	80/343	18,000	19/312	17,000
Dibenzo(a,h)anthracene	25/344	23,000	6/311	1100
Fluoranthene	112/343	33,000	32/312	34,000
Indeno(1,2,3-cd)pyrene	48/344	49,000	11/312	4900
Methylene chloride	59/378	5500	46/378	100
Phenanthrene	90/343	22,000	29/312	18,000
Pyrene	113/343	22,000	36/312	30,000
Vinyl chloride	0/368	-	6/377	110
Tetrachloroethene	37/373	48,000	46/376	21,000
Trichloroethene	46/377	89,000	51/376	150,000
1,1-Dichloroethane	7/349	22	38/377	460
1,1-Dichloroethene	5/368	39	24/377	460
1,1,1-Trichloroethane	38/377	9400	49/376	6600

DOE Benzene and vinyl chloride were selected as CPCs because they are Class A carcinogens (known human carcinogens). (It should be noted that vinyl chloride was detected in subsurface soil only.) Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene are polynuclear aromatic hydrocarbons (PAHs) currently classified as B-2 (probable human) carcinogens. These PAHs are known components of fuels and are produced during the combustion process. Thus, they are probably present in Operable Unit 5 soil as a result of the wide-spread use of fuels at the FEMP and the past operation of incinerators. The maximum concentration of these constituents exceeds 10 mg/kg and the toxicity benchmarks presented in Table A.III-3; thus, they are selected as CPCs. (Three PAHs not currently classified as carcinogens [fluoranthene, phenanthrene, and pyrene] are also selected as CPCs because they were detected frequently [the analytes were detected in approximately 30 percent of the samples analyzed] and at maximum and average concentrations exceeding 10 mg/kg and 1 mg/kg, respectively.)

DOE Several chlorinated volatile organics (tetrachloroethene, trichloroethene, 1,1-dichloroethene, 1,1-dichloroethane, 1,1,1-trichloroethane, carbon tetrachloride, chloroform, and methylene chloride), carbazole, and bis(2-ethylhexyl)phthalate are selected as CPCs because they were detected relatively

frequently in soil and groundwater (parameters detected in greater than five percent of samples analyzed) and/or at maximum concentrations exceeding toxicity benchmarks. Most of these organics are classified as carcinogens. As detailed in Tables A.2-1 and A.2-2, volatile and semivolatile organic constituents not selected as CPCs were detected infrequently (generally 1 to 2 positive detections) and/or were detected at maximum concentrations which do not exceed toxicity screen values.

70 Volatile and semivolatile organics in surface soil which exceeded the screening level but were not selected as CPCs included 3,3'-dichlorobenzidine with a maximum concentration of 190 μg/kg (sampling location KC2-1) and n-nitroso-di-n-propylamine with a maximum concentration of 39 μg/kg (sampling location KC2-4). The organics in subsurface soil which exceeded the screening level but were not selected as CPCs included 2,4-dinitrotoluene, n-nitroso-di-n-propylamine, and trans-1,3-dichloropropene, with maximum concentrations (and sampling locations) of 110 μg/kg (11087), 190 μg/kg (11087), and 1300 μg/kg (1307).

DOE 72 The following pesticides/***PCBs*** were detected in Operable Unit 5 surface and subsurface soil samples:

	Surface Soil (0-1.5 feet deep)		Subsurface Soil (>1.5 feet deep)	
Parameter	Frequency of Detection	Maximum Concentration (μg/kg)	Frequency of Detection	Maximum Concentration (μg/kg)
4,4'-DDE	3/330	38	0/253	-
4,4'-DDT	6/331	19	0/253	-
Aldrin	1/330	1.6	0/253	-
Alpha-BHC	0/333	-	1/253	17
Alpha-chlordane	4/330	9.7	0/253	-
Aroclor-1254	***80/334***	***14,000***	***23/254***	***1700***
Aroclor-1260	***15/335***	***2800***	***5/254***	***2700***
Beta BHC	3/330	220	0/253	-
Dieldrin	5/330	20	0/253	-
Endosulfan I	0/333	-	1/253	1.9
Endosulfan II	1/330	2.0	0/253	-
Endosulfan sulfate	1/330	0.73	0/253	-
Endrin	5/348	19	0/253	-
Endrin aldehyde	2/179	15	1/104	5
Gamma-chlordane	1/348	5.3	0/253	-
Heptachlor epoxide	2/348	2.8	0/253	-
Methoxyclor	3/348	3.5	1/253	22

000032

61
72
73
471
DOE

TABLE A.2-1

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN SURFACE SOIL (0 - 1.5 FEET)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Radionuclides, pCi/g										
Actinium-227	4	21	0.650	3.952	1	30	0.09	0.09	0.0048	X_c[5]
Cesium-137	400	1091	0.209	4.260	30	30	0.16	0.71	0.0021	X_c[5]
Lead-210	8	8	1.251	168.580	30	30	0.53	1.3	0.12	X_c[5]
Neptunium-237	12	575	0.214	2.630	NA	NA	NA	NA	0.0094	X_c[5]
Plutonium-238	42	652	0.207	158.000	NA	NA	NA	NA	0.36	X_c[5]
Plutonium-239/240	35	650	0.215	12.900	NA	NA	NA	NA	0.34	X_c[5]
Polonium-210	10	10	1.455	84.500	NA	NA	NA	NA	0.53	X_c
Protactinium-231	1	21	5.040	5.040	NA	NA	NA	NA	0.14	X_c
Radium-224	21	21	0.313	5.357	30	30	0.54	0.93	0.17	X_c[5]
Radium-226	1104	1256	0.300	2950.000	30	30	0.85	1.48	0.00069	X_c[5]
Radium-228	566	749	0.520	558.000	30	30	0.80	1.27	0.0014	X_c[5]
Ruthenium-106	6	1031	1.879	10.550	0	30	ND	ND	8.4	X_c[5]
Strontium-90	238	648	0.510	26.300	4	30	0.299	0.46	2.2	X_c[5]
Technetium-99	127	659	1.100	602.000	0	30	ND	ND	61	X_c[5]
Total Thorium (mg/kg)	1433	1990	1.010	2581.013	30	30	0.68	13.9	NA	X_c[5]
Thorium-228	889	943	0.200	315.000	29	30	0.9	1.43	0.00074	X_c[5]
Thorium-230	933	980	0.200	7901.000	29	30	0.64	2.01	5.7	X_c[5]
Thorium-232	1223	1435	0.180	283.000	30	30	0.64	1.52	6.4	X_c[5]
Thorium-234	20	21	2.050	2289.000	NA	NA	NA	NA	1.1	X_c[5]

TABLE A.2-1 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Total Uranium (mg/kg)	2235	2583	1.000	90350.000	30	30	2.56	4.03	NA	X_c[5]
Uranium-234	1093	1107	0.200	18093.000	30	30	0.67	1.31	4.7	X_c[5]
Uranium-235/236	774	1123	0.018	1021.000	27	30	0.03	0.2	0.017	X_c[5]
Uranium-236	91	121	0.040	5.000	ND	ND	ND	ND	5.1	
Uranium-238	1411	1588	0.300	19067.000	30	30	0.85	1.33	0.11	X_c[5]
Volatile Organic Compounds, µg/kg										
1,1,1-Trichloroethane	38	377	1.000	9400.000					NA	X_b
1,1,2,2-Tetrachloroethane	2	348	2.000	190.000					319	X_b
1,1,2-Trichloroethane	1	377	14.000	14.000					1121	
1,1-Dichloroethane	7	349	1.000	22.000					NA	X_b
1,1-Dichloroethene	5	368	2.000	39.000					106	X_b
1,2-Dichloroethane	1	368	2.000	2.000					702	X_b
1,2-Dichloroethene (Total)	9	349	1.000	340.000					273,750	X_b
2-Butanone	16	260	1.000	110.000					16,425,000	X_b
2-Hexanone	3	246	2.000	47.000					1,095,000	
4-Methyl-2-pentanone	15	277	1.000	160.000					1,368,750	X_b
Acetone	40	375	3.000	450.000					2,737,500	X_b
Benzene	5	383	2.000	66.7					2203	X_a
Bromomethane	1	349	720.000	720.000					38,325	X_d
Carbon tetrachloride	2	377	1100.000	1200.000					491	X_a
Carbon disulfide	17	371	2.000	790.000					2,737,500	X_b
Chlorobenzene	5	377	1.000	10.000					547,500	X_b
Chloroform	8	349	1.000	280.000					10,471	X_a
Ethylbenzene	9	383								

TABLE A.2-1 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Methylene chloride	59	378	1.000	5500.000					8517	X_a
Styrene	2	347	1.000	28.000					2129	
Tetrachloroethene	37	373	1.000	48000.000					1228	X_a
Toluene	77	383	0.700	794.000					5,475,000	X_b
Total Xylenes	15	373	2.000	6180.000					54,750,000	
Trichloroethene	46	377	1.000	89000.000					5807	X_a
trans-1,2-Dichloroethene	2	19	3.000	3.000					547,500	X_b
Semivolatile Organic Compounds, µg/kg										
2,4-Dichlorophenol	1	332	100.000	100.000					82,125	
2,4-Dimethylphenol	3	343	60.000	100.000					547,500	X_b
2,4-Dinitrotoluene	1	358	53.000	53.000					94	
2,6-Dinitrotoluene	1	340	11.000	11.000					94	X_b
2-Chlorophenol	1	332	48.000	48.000					136,875	X_b
2-Methylnaphthalene	28	340	25.000	1700.000					1,095,000	
2-Methylphenol	1	340	45.000	45.000					1,368,750	
3,3'-Dichlorobenzidine	1	339	190.000	190.000					142	X_d
4-Chloro-3-methylphenol	1	332	46.000	46.000					1,368,750	
4-Methylphenol	4	341	50.000	190.000					136,875	X_b
4-Nitroaniline	1	319	330.000	330.000					82,125	X_d
Acenaphthene	21	340	52.000	4800.000					1,642,500	
Acenaphthylene	12	340	41.000	3100.000					NA	
Anthracene	37	344	1.000	11000.000					8,212,500	
Benzo(a)anthracene	80	344	1.000	61000.000					58	X_a
Benzo(a)pyrene	65	343	1.000	69000.000					8.8	X_a

TABLE A.2-1 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Benzo(b)fluoranthene	77	344	34.000	39000.000					71	X_a
Benzo(g,h,i)perylene	46	344	38.000	48000.000					NA	
Benzo(k)fluoranthene	73	344	19.000	69000.000					168	X_a
Benzoic Acid	9	285	55.000	250.000					109,500,000	
Benzyl alcohol	2	293	69.000	290.000					8,212,500	
Butyl benzyl phthalate	5	342	42.000	750.000					5,475,000	
Carbazole	11	161	7.000	570.000					3194	X_a
Chrysene	80	343	1.000	18000.000					1996	X_a
Di-n-butylphthalate	40	344	1.000	6100.000					2,737,500	X_b
Di-n-octylphthalate	5	342	7.000	630.000					547,500	X_b
Dibenzo(a,h)anthracene	25	344	46.000	23000.000					7.9	X_a
Dibenzofuran	24	340	50.000	3400.000					109,500	X_b
Diethyl phthalate	3	340	1.000	52.000					21,900,000	
Fluoranthene	112	343	1.000	33000.000					1,095,000	X_a
Fluorene	23	340	7.000	5700.000					1,095,000	
Hexachlorobutadiene	1	354	430.000	430.000					819	
Indeno(1,2,3-cd)pyrene	48	344	35.000	49000.000					32	X_a
Isophorone	1	340	830.000	830.000					67,237	
N-Nitroso-di-n-propylamine	1	336	39.000	39.000					9.1	X_b
N-Nitrosodiphenylamine	4	340	43.000	1300.000					13,036	X_b
Naphthalene	27	340	1.000	1800.000					1,095,000	
Phenanthrene	90	343	1.000	22000.000					NA	X_a
Phenol	9	333	1.000	730.000					16,425,000	
Pyrene	113	343	1.000	22000.000					821,250	X_a
Tributyl phosphate	8	37	46.000	1200.000					136,875	X_b

TABLE A.2-1 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Sample Frequency of Detection[1] Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Range of Concentrations Detected in Environmental Samples[2] Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Background Frequency of Detection Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Range of Concentrations Detected in Background Samples Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Bis(2-Chloroisopropyl)ether	2	326	44.000	48.000					913	X_d
Bis(2-Ethylhexyl)phthalate	98	339	36	11000.00					4563	X_a
Pesticides/PCBs, µg/kg										
4-4'-DDE	3	330	11.000	38.000					188	
4-4'-DDT	6	331	3.000	19.000					188	
Aldrin	1	330	1.600	1.600					3.8	
Aroclor 1254	80	334	11.000	14000.000					8.3	X_a
Aroclor 1260	15	335	120.000	2800.000					8.3	X_a
Dieldrin	5	330	0.550	20.000					4.0	X_a
Endosulfan II	1	330	2.000	2.000					164,250	
Endosulfan sulfate	1	330	0.730	0.730					NA	
Endrin	5	348	9.400	19.000					8213	
Endrin aldehyde	2	179	8.700	15.000					8213	
Heptachlor epoxide	2	348	1.000	2.800					7.0	
Methoxychlor	3	348	0.850	3.500					136,875	
Alpha-Chlordane	4	330	2.100	9.700					49	X_d
Beta-BHC	3	330	46.000	220.000					35	X_a
Gamma-Chlordane	1	348	5.300	5.300					49	

000037

9428

TABLE A.2-1 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
PCDDs and PCDFs, ng/g (μg/kg)										
Octachlorodibenzo-p-dioxin	5	18	240.000	1100.000					0.43	X_a
Octachlorodibenzofuran	2	18	240.000	1300.000					0.43	X_a
Heptachlorodibenzofuran	1	18	320.000	320.000					0.043	X_a
Inorganics, mg/kg										
Aluminum	424	424	483.000	25700.000	30	30	5350	15000	NA	
Antimony	40	233	2.800	59.800	0	22	ND	ND	11	X_c[5]
Arsenic	376	390	0.770	81.900	26	30	3.4	9.2	0.037	X_c[5]
Barium	442	442	11.400	587.000	29	29	31	94.1	1916	X_c[5]
Beryllium	245	420	0.280	5.700	1	30	0.6	0.6	0.015	X_c[5]
Boron	1	1	14.300	14.300					2464	X_e
Cadmium	158	432	0.490	12.400	6	30	0.52	0.95	14	X_c[5]
Calcium	414	424	778.000	347000.000	30	30	856	5340	NA	
Chromium	431	436	1.600	80.100	30	30	6.7	17.7	137	X_c[5]
Cobalt	399	424	1.800	32.900	30	30	4.3	16.5	1643	X_c[5]
Copper	382	424	3.800	695.000	27	30	3.2	17.3	1018	X_c[5]
Cyanide	105	381	0.110	22.800	12	30	0.14	0.29	548	X_d
Iron	424	424	24.500	45100.000	30	30	9370	24900	NA	
Lead	405	410	2.800	2180.000	28	30	11.0	36.4	400	X_c[5]
Magnesium	424	424	227.000	65300.000	30	30	1020	3590	265,538	X_c[5]
Manganese	407	409	9.900	4400.000	29	29	189	1500	137	X_c[5]
Mercury	54	437	0.060	6.300	1	30	0.3	0.3	8.2	X_c[5]
Molybdenum	140	399	0.600	13.300	0	30	ND	ND	137	X_c[5]
Nickel	365	418	3.800	72.200	29	30	5.8	22.7	548	X_c[5]

TABLE A.2-1 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Potassium	418	424	222.000	4230.000	29	30	374	1590	NA	
Selenium	56	355	0.230	7.700	1	30	0.72	0.72	137	X_c[5]
Silicon	259	275	31.800	6660.000	29	29	480	2230	NA	X_c[5]
Silver	163	424	0.470	36.400	0	30	ND	ND	137	X_c[5]
Sodium	337	424	25.200	2360.000	27	30	26.9	54.7	NA	
Thallium	58	421	0.110	0.750	1	30	0.58	0.58	1.9	X_c[5]
Vanadium	421	424	4.300	49.000	30	30	11.3	32.7	192	X_c[5]
Zinc	398	416	6.200	2150.000	30	30	29.4	70	8213	X_c[5]

[1]Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
[2]Ranges and means of detected concentrations presented are inclusive of all depth intervals.
[3]Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I-Human Health Evaluation Manual-Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.
[4]An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment:

- X_a This analyte is a CPC for this media based on the results of the toxicity screen.
- X_b This analyte is a CPC in another media (but not in this media) based on the results of the toxicity screen.
- X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in surface soil as identified in Attachment A.IV
- X_d This analyte is a CPC as identified through modeling

[5]Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.

NA Not Available
ND There were no positive detections.

000039

61
62
72
73 471
DOE

TABLE A.2-2

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN SUBSURFACE SOIL (>1.5FEET)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Total Number Samples	Environmental Sample Summary Statistics: Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Environmental Sample Summary Statistics: Range of Concentrations Detected in Environmental Samples[2] Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Background Statistics Surface Soils: Background Frequency of Detection Total Number Samples	Background Statistics Surface Soils: Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Background Statistics Surface Soils: Range of Concentrations Detected in Background Samples Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Radionuclides, pCi/g										
Actinium-227	0	2	ND	ND	3	51	0.06	0.1	0.0048	
Cesium-137	15	390	0.24	2.94	0	51	ND	ND	0.0021	X_c[5]
Lead-210	32	43	0.56	34.00	43	51	0.31	0.97	0.12	X_c[5]
Neptunium-237	2	299	0.29	0.31	NA	NA	NA	NA	0.0094	X_c[5]
Plutonium-238	5	343	0.34	158.00	NA	NA	NA	NA	0.36	X_c[5]
Plutonium-239/240	15	342	0.30	5.50	NA	NA	NA	NA	0.34	X_c[5]
Polonium-210	68	68	0.63	34.37	NA	NA	NA	NA	0.53	X_c[5]
Radium-224	4	4	0.67	1.33	51	51	0.28	1.07	0.17	X_c[5]
Radium-226	415	482	0.30	137.00	51	51	0.59	1.61	0.00069	X_c[5]
Radium-228	204	487	0.51	23.90	51	51	0.36	1.37	0.0014	X_c[5]
Strontium-90	76	347	0.51	47.60	2	51	0.44	0.56	2.2	X_c[5]
Technetium-99	37	415	1.02	205.00	0	51	ND	ND	61	X_c[5]
Total Thorium (mg/kg)	699	1420	0.91	290.00	50	50	2.38	12.3	NA	X_c[5]
Thorium-228	391	530	0.20	19.50	49	50	0.47	1.39	0.00074	X_c[5]
Thorium-230	471	534	0.30	153.00	48	51	0.07	2.34	5.7	X_c[5]
Thorium-232	343	541	0.20	8.07	44	50	0.35	1.35	6.4	X_c[5]
Total Uranium (mg/kg)	1084	1644	0.50	69300.00	48	51	1.81	3.69	NA	X_c[5]

TABLE A.2-2 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Uranium-234	422	496	0.20	319.00	48	51	0.48	1.3	4.8	X_c[5]
Uranium-235/236	106	500	0.05	36.20	46	51	0.03	0.2	NA	X_c[5]
Uranium-238	440	512	0.20	317.00	48	51	0.6	1.23	0.11	X_c[5]
Volatile Organic Compounds, µg/kg										
1,1,1-Trichloroethane	49	376	1.00	6600.00					NA	X_b
1,1,2,2-Tetrachloroethane	9	377	2.00	190.00					319	X_b
1,1,2-Trichloroethane	6	377	1.00	4.00					1121	
1,1-Dichloroethane	38	377	1.00	460.00					NA	X_a
1,1-Dichloroethene	24	377	1.00	460.00					106	X_a
1,2-Dichloroethane	6	376	2.00	10.00					702	X_b
1,2-Dichloroethene (Total)	47	377	1.00	4300.00					273,750	X_b
2-Butanone	26	241	2.00	200.00					16,425,000	X_b
2-Hexanone	7	298	1.00	2600.00					1,095,000	
4-Methyl-2-pentanone	53	299	1.00	2600.00					1,368,750	X_b
Acetone	66	375	4.00	230.00					2,737,500	X_b
Benzene	2	377	1.00	1300.00					2203	X_a
Bromodichloromethane	2	377	7	13					1030	X_d
Carbon tetrachloride	2	377	5	12					491	X_b
Carbon disulfide	94	377	1.00	390.00					2,737,500	X_b
Chlorobenzene	2	377	1.00	2.00					547,500	X_b
Chloroethane	3	377	2	210					NA	
Chloroform	14	377	2.00	160.00					10,471	X_a

000041

9478

TABLE A.2-2 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Chloromethane	1	372	12.00	12.00					4913	X_b
Dibromochloromethane	1	377	1300	1300					760	
Ethylbenzene	5	377	1.00	10.00					2,737,500	
Methylene chloride	46	378	1.00	100.00					8517	X_a
Styrene	2	377	1	2					2129	
Tetrachloroethene	46	376	1.00	21000.00					1228	X_a
Toluene	42	377	1.00	66.00					5,475,000	X_b
Total Xylenes	9	377	3.00	31000.00					54,750,000	
Trichloroethene	51	376	1.00	150000.00					5807	X_a
Vinyl chloride	6	377	2	110					34	X_a
trans-1,3-Dichloropropene	1	365	1300	1300					355	
Semivolatile Organic Compounds, μg/kg										
1,2,4-Trichlorobenzene	1	309	220	220					273,750	X_b
1,4-Dichlorobenzene	1	309	210	210					2661	
2,4-Dimethylphenol	1	309	100.00	100.00					547,500	X_b
2,4-Dinitrotoluene	1	308	110.00	110.00					94	
2-Chlorophenol	3	309	42	390					136,875	X_b
2-Methylnaphthalene	5	309	45.00	200.00					1,095,100	
2-Nitroaniline	1	309	2400	2400					NA	
4-Chloro-3-methylphenol	4	309	43	88					1,368,750	
4-Methylphenol	1	309	110.00	110.00					1,368,750	X_b
4-Nitrophenol	4	307	58	330					136,875	

TABLE A.2-2 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Acenaphthene	2	308	77.00	250.00					1,642,500	
Acenaphthylene	3	309	780.00	2100.00					NA	
Anthracene	7	312	51.00	1400.00					8,212,500	
Benzo(a)anthracene	20	312	38.00	17000.00					58	X_a
Benzo(a)pyrene	13	311	63.00	8600.00					8.8	X_a
Benzo(b)fluoranthene	17	312	39.00	23000.00					71	X_a
Benzo(g,h,i)perylene	9	312	53.00	5900.00					NA	
Benzo(k)fluoranthene	5	312	98.00	280.00					168	X_a
Benzoic Acid	8	289	46.00	200.00					109,500,000	
Butyl benzyl phthalate	5	311	46.00	430.00					5,475,000	
Chrysene	19	312	47.00	17000.00					1996	X_a
Di-n-butylphthalate	17	312	37.00	1400.00					2,737,500	X_b
Di-n-octylphthalate	3	312	50.00	280.00					547,500	X_b
Dibenzo(a,h)anthracene	6	311	42.00	1100.00					7.9	X_a
Dibenzofuran	3	308	36.00	120.00					109,500	X_b
Diethyl phthalate	7	308	43.00	250.00					21,900,000	
Fluoranthene	32	312	40.00	34000.00					1,095,000	X_a
Fluorene	2	307	77.00	370.00					1,095,000	
Hexachlorobutadiene	1	309	350.00	350.00					819	
Indeno(1,2,3-cd)pyrene	11	312	78.00	4900.00					32	X_a
N-Nitroso-di-n-propylamine	1	301	190	190					9.1	X_b
N-Nitrosodimethylamine	1	2	5	5					1.3	
N-Nitrosodiphenylamine	1	308	72.00	72.00					13,036	X_b

TABLE A.2-2 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Naphthalene	3	309	52.00	120.00					1,095,000	
Pentachlorophenol	4	308	49	260					532	X_b
Phenanthrene	29	312	39.00	18000.00					NA	X_a
Phenol	8	309	38.00	710.00					16,425,000	
Pyrene	36	312	43.00	30000.00					821,250	X_a
Bis(2-ethylhexyl)phthalate	100	309	3.00	9100.00					4563	X_a
Pesticides/PCBs, µg/kg										
Aroclor-1248	2	254	110	110					8.3	X_a
Aroclor-1254	23	254	9.90	1700.00					8.3	X_a
Aroclor-1260	5	254	10.00	2700.00					8.3	X_a
Endosulfan I	1	253	1.9	1.9					164,250	
Endrin aldehyde	1	104	5.00	5.00					8213	
Methoxychlor	1	253	22	22					136,875	
Alpha-BHC	1	253	17	17					10	
PCDDs and PCDFs, ng/g (µg/kg)										
Octachlorodibenzofuran	1	6	1500	1500					0.43	X_a
Inorganics, mg/Kg										
Aluminum	331	331	1100.00	142000.00	51	51	3250	16100	NA	X_c[5]
Antimony	11	141	1.20	22.10	0	37	ND	ND	11	X_c[5]
Arsenic	298	302	0.03	74.20	44	51	1.6	14.5	0.037	X_c[5]

TABLE A.2-2 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Concentrations Detected in Environmental Samples[2] Minimum Detected Conc.	Maximum Detected Conc.	Background Statistics Surface Soils: Background Frequency of Detection Number Positives Hits	Total Number Samples	Range of Concentrations Detected in Background Samples Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Barium	331	331	9.90	3610.00	51	51	13.7	134	1916	X_c[5]
Beryllium	228	326	0.29	5.20	15	50	0.48	0.68	0.015	X_c[5]
Cadmium	168	317	0.92	8.00	6	51	0.47	1.3	14	X_c[5]
Calcium	331	331	2180.00	314000.00	51	51	3310	335000	NA	
Chromium	316	318	4.70	115.00	51	51	4.5	22.4	137	X_c[5]
Cobalt	303	331	2.60	105.00	51	51	3.6	17.9	1643	X_c[5]
Copper	298	329	5.00	171.00	50	51	6.8	24.3	1018	X_c[5]
Cyanide	35	307	0.11	9.80	1	51	0.17	0.17	548	X_d,X_c[5]
Iron	331	331	4000.00	193000.00	51	51	8970	30700	NA	
Lead	324	324	0.47	139.00	47	51	3	18.4	400[6]	X_c[5]
Magnesium	331	331	1390.00	93200.00	51	51	2930	54100	265,538	X_c[5]
Manganese	331	331	107.00	12200.00	51	51	251	1750	137	X_c[5]
Mercury	14	331	0.04	2.30	1	51	0.29	0.29	8.2	X_c[5]
Molybdenum	112	311	1.60	11.10	1	51	2.7	2.7	137	X_c[5]
Nickel	286	318	6.70	186.00	51	51	8.5	41.9	548	X_c[5]
Potassium	330	331	204.00	10900.00	51	51	340	2180	NA	
Selenium	26	291	0.32	3.30	0	51	ND	ND	137	X_c[5]
Silicon	134	147	17.60	5950.00	51	51	449	1850	NA	
Silver	162	309	0.41	31.10	0	51	ND	ND	137	X_c[5]
Sodium	281	331	42.20	1700.00	51	51	53.8	345	NA	
Thallium	28	330	0.21	0.72	3	51	0.49	0.55	1.9	X_c[5]
Vanadium	327	331	4.70	190.00	51	51	8.4	44.5	192	X_c[5]
Zinc	326	329	16.70	780.00	51	51	27.3	101	8,213	X_c[5]

TABLE A.2-2 (Continued)

---

(1)Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
(2)Ranges and means of detected concentrations presented are inclusive of all depth intervals.
(3)Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I-Human Health Evaluation Manual-Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.
(4)An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment:

- X_a This analyte is a CPC for this media
- X_b This analyte is a CPC in another media, but not in this media
- X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in subsurface soil as identified in Attachment A.IV
- X_d This analyte is a CPC as identified through modeling

(5)Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.

NA Not available
ND There were no positive hits.

61
72
73
DOE

TABLE A.2-3

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN GROUNDWATER GLACIAL OVERBURDEN - TYPE 1 MONITORING WELLS

	Environmental Sample Summary Statistics				Background Statistics						
	Sample Frequency of Detection[1]		Range of Concentrations Detected in Environmental Samples		Background Frequency of Detection		Range of Concentrations Detected in Background Samples		U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Radionuclide/Chemical	Filtered Number of Hit/Samples	Unfiltered Number of Hit/Samples	Filtered Min/Max Detection	Unfiltered Min/Max Detection	Filtered Number of Hit/Samples	Unfiltered Number of Hit/Samples	Filtered Min/Max Detection Conc.	Unfiltered Min/Max Detection Conc.			
Radionuclides, pCi/L											
Cesium-137	6/86	4/131	5.7 - 24	4.9 - 20					0.17	110 [6]	
Neptunium-237	17/61	5/308	0.537 - 6.81	0.626 - 1.94		3/10		0.043 - 0.25	0.022	1.23 [6]	X_c[5]
Plutonium-238	11/74	6/326	0.69 - 22.4	0.56 - 1		1/13		0.075 - 0.075	0.022	1.71 [6]	X_c[5]
Plutonium-239/240	10/75	3/327	0.506 - 2.67	1-1					0.021	1.55 [6]	X_c[5]
Radium, Total		3/3		1 - 1					NA	NA	
Radium-226	38/202	147/557	1.07 - 241	1.01 - 279	1/4	9/22	0.9 - 0.9	0.14 - 0.9	0.032	20 [MCL][P]	X_c[5]
Radium-228	40/199	49/549	3.1 - 820	3.090-219	1/4	4/22	2.2 - 2.2	1.9 - 5.2	0.048	20 [MCL][P]	X_c[5]
Ruthenium-106	1/79		192 -192						0.50	35.8 [6]	
Strontium-90	25/92	22/295	1.09 - 152	1.01 - 106		1/16		2 - 2	0.13	4 [6]	X_c[5]
Technetium-99	74/185	107/504	15.1 - 3520	15.8 - 6130	1/4	2/26	30 - 30	30 - 49.3	3.7	3750[6]	X_c[5]
Total Thorium (μg/L)	58/101	223/478	0.912 - 5390	0.7 - 23000		1/10		3.1 - 3.1		6.78 [6]	X_c[5]
Thorium-228	41/179	246/606	0.3 - 634	0.216 - 19	1/2	11/24	0.1 - 0.1	0.23 - 1.62	0.087	10 [6]	X_c[5]
Thorium-230	71/180	264/607	0.25 - 12200	0.202 - 28		11/25		0.14 - 2	0.37	2.01 [6]	X_c[5]
Thorium-232	32/179	136/553	0.216 - 592	0.234 - 23.1		3/14		0.2 - 0.34	0.4	400 [6]	X_c[5]
Total Uranium (μg/L)	368/382	1173/1225	0.29 - 23000000	0.00-696000	2/3	8/15	1.0 - 1.4	0.48 - 1.5		20 [MCL][P]	X_c[5]
Uranium-234	178/181	575/633	0.3 - 147000	0.001-127982	1/1	9/13	0.6 - 0.6	0.25 - 1.1	0.30		X_c[5]
Uranium-235		44/51		0.015 - 680					0.3		
Uranium-236		40/41		0.002 - 450					0.32		
Uranium-235/236	115/182	258/590	0.236 - 27200	0.208 - 7494					0.30		X_c[5]

TABLE A.2-3 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Uranium-238	176/181	579/650	0.400 - 426000	0.252 - 121642		9/13		0.23 - 0.99	0.24		X_c[5]
Volatile Organic Compounds, µg/L											
1,1,1-Trichloroethane	19/30	73/571	1 - 840000	0.5 - 360					200	200 [MCL][F]	X_a
1,1,2,2-Tetrachloroethane	1/31	4/573	6 - 6	1 - 5					0.0090	NA	X_a
1,1,2-Trichloroethane	1/31	3/573	1 - 1	1 - 2					0.032	5 [MCL][F]	
1,1-Dichloroethane	14/31	113/618	10-500000	1 - 800					137	NA	X_a
1,1-Dichloroethene	15/31	50/576	2 - 12000	1 - 490					0.0067	7 [MCL][F]	X_a
1,2-Dichloroethane	14/31	20/598	1 - 1100	1 - 140					0.020	5 [MCL][F]	X_a
1,2-Dichloroethene (Total)	3/31	68/517	1 - 180	0.6 - 1000					NA	NA	X_a
2-Butanone	20/31	10/526	4 - 3500	1 - 67					2190	NA	X_a
2-Hexanone	18/31	4/557	1 - 89	1 - 6					146	NA	
2-Picoline (L*)	1/10		51 - 51						NA	NA	
4-Methyl-2-pentanone	20/31	12/558	2 - 210	2 - 18					183	NA	X_a
Acetone	21/30	30/591	4 - 3800	2 - 290					365	NA	X_a
Acetonitrile (L*)	7/14		12 - 180						22	NA	
Acrolein (L*)	2/14		21 - 80						73	NA	
Acrylontrile (L*)	3/5		7 - 34						0.016	NA	
Benzene	8/31	18/596	1-55	0.5 - 14					0.062	5[MCL][T]	X_a
Bromodichloromethane		2/573		3 - 5					0.14	100 [MCL][T]	X_d
Bromoform	1/31	2/573	5 - 5	1 - 2					0.38	100 [MCL][T]	X_a
Carbon tetrachloride		6/573		3 - 21					0.026	5[MCL][F]	X_a
Carbon disulfide	2/31	12/556	1 - 2	1-9					2.8	NA	X_a

TABLE A.2-3 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection: Filtered Number of Hit/Samples	Background Frequency of Detection: Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Chlorobenzene	1/31	2/573	4 - 4	1 - 1					5.2	100[MCL][F]	X,
Chloroethane	6/31	7/504	2 - 1700	1 - 26					71	NA[MCL][L]	
Chloroform	19/31	13/573	1 - 1300	1.6 - 47					0.028	100 [MCL][T]	X,
Chloromethane	1/31	2/568	3 - 3	0.6 - 2					0.23	3 [Lifetime HA, 70 kg adult][F]	X,
Dibromochloromethane		1/573		1 - 1					0.10	100 [MCL][T]	
Dichlorodifluoromethane		1/32		7.4 - 7.4					52	100 [Lifetime HA, 70 kg adult][F]	
Ethylbenzene	9/31	4/592	1 - 22	1 - 38					158	700 [MCL][F]	
Ethyl cyanide (L*)	7/15		1 - 5600						NA		
Isobutyl alcohol (L*)	7/15		19 - 2100						1095	5[MCL][F]	
Methacrylonitrile (L*)	1/15		1 - 1						0.365		
Methyl methacrylate (L*)	1/16		11 - 11						292		
Methylene chloride	7/31	9/617	20 - 490	1 - 19					0.63	5 [MCL][F]	X,
Styrene		1/559		3 - 3					0.28	100[MCL][F]	
Tetrachloroethene	12/31	58/619	1 - 140	0.7 - 2600					0.14	5[MCL][F]	X,
Toluene	13/31	19/641	1 - 180	1 - 50					93	1000 [MCL][F]	X,
Total Xylenes	15/31	8/582	1 - 130	2-400					7300	10,000 [MCL][F]	
Trans-1,2-Dichloroethene		5/177		6 - 18					73	100 [MCL][F]	X,

000049

TABLE A.2-3 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection: Filtered Number of Hit/Samples	Background Frequency of Detection: Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Trans-1,4-Dichloro-2-butene (L*)	1/16		81 - 81						0.00024		
Trichloroethene	11/31	67/617	1-120	1-12000					0.25	5 [MCL][F]	X,
Trichlorofluoromethane	2/16		1 - 2						165	2000 [Lifetime HA 70 kg adult][F]	
Vinyl acetate		2/467		1 - 2					3650	NA	
Vinyl chloride	10/31	19/572	1 - 160	1 - 120					0.0028	2[MCL][F]	X,
cis-1,3-Dichloropropene (L*)	1/31		1 - 1						0.013	0[T] [MCLG]	
Semivolatile Organic Compounds, µg/L											
1,2,4-Trichlorobenzene	3/25		3 - 5						2.3	70 [MCL][F]	X,
1,2-Dichlorobenzene		1/181		4 - 4					47	600 [MCL][F]	
1,4-Dioxane (L*)	9/10		12 - 1000						NA	NA	
2,3,4,6-Tetrachlorophenol		1/9		4.2 - 4.2					110	NA	
2,4-Dichlorophenol (L*)	1/18		4 - 4						11	20 [Lifetime, 70 kg adult][D]	
2,4-Dimethylphenol	7/19		12 - 86						73	NA	X,
2,4-Dinitrophenol (L*)	4/21		2 - 24						7.3	40 [DWEL, 70 kg adult][F]	
2,6-Dinitrotoluene	3/25	4/206	3 - 11	4 - 6					0.013	40 [DWEL, 70 kg adult][F]	X,
2-Benzyl-4-Chlorophenol (L*)	1/12		32-32						NA	NA	

TABLE A.2-3 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
2-Chlorophenol	1/18	1/195	4 - 4	160 - 160					18	40 [Lifetime HA, 70 kg adult][D]	X_a
2-Methylnaphthalene (L*)	4/25		1 - 16						146	NA	
2-Methylphenol (L*)	5/19		6 - 110						183	NA	
2-Nitrophenol	3/20	2/194	3 - 5	2 - 7.2					NA	NA	
3-Methylphenol (L*)	2/9		6 - 9						183	NA	
4,6-Dinitro-2-methylphenol (L*)	2/19		3 - 12						NA	NA	
4-Chloro-3-methylphenol	4/20	1/194	3 - 49	200 - 200					NA	NA	
4-Methylphenol (L*)	9/22		1 - 140						18	NA	X_b
4-Nitrophenol	3/19	3/190	2 - 12	3 - 80					226	NA	
Acenaphthene	4/26	1/194	4 - 12	3 - 3					219	NA	
Acetophenone (L*)	1/8		4 - 4						0.0055	NA	
Anthracene (L*)	3/28		2 - 17						1095	NA	
Benzo(a)anthracene (L*)	1/28		1 - 1						0.0077	0.1 [MCL][P]	X_b
Benzoic Acid	5/14	6/166	1 - 150	2 - 4					14600	NA	
Benzyl alcohol (L*)	2/17		1 - 3						1095	NA	
Butyl benzyl phthalate		3/205		1-3					100	100[MCL][P]	
Carbazole (L*)	2/18		7 - 18						0.43	NA	X_a
Chrysene (L*)	1/28		2 - 2						0.20	0.2 [MCL][P]	X_b
Di-n-butylphthalate		4/205		0.4 - 4					365	4000 [DWEL, 70 kg adult]	X_b
Dibenzofuran (L*)	3/26		2 - 8						15	NA	X_b

TABLE A.2-3 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Diethyl phthalate	2/25	9/206	2 - 14	0.6 - 25					2920	5000 [Lifetime HA, 70 kg adult][D]	
Fluoranthene (L*)	3/28		2 - 9						146	NA	X_b
Fluorene (L*)	4/26		4 - 13						146	NA	
Hexachloroethane (L*)	1/25		19 - 19						0.13	1 [Lifetime HA, 70 kg adult][F]	
N-Nitroso-di-n-propylamine	1/25	2/203	1 - 1	2 - 8					0.0012	NA	X_a
N-Nitrosodiethylamine (L*)		1/11		4 - 4					0.000057	NA	
N-Nitrosodiphenylamine		3/206		2 - 3					1.7	NA	X_a
Naphthalene	10/25	1/205	1 - 16	2 - 2					146	20 [Lifetime HA, 70 kg adult][F]	
Nitrobenzene (L*)	2/25		5 - 6						0.43	NA	
Pentachlorophenol	3/20	3/195	3 - 200	5 - 94					0.071	1 [MCL][F]	X_a
Phenanthrene (L*)	1/27		35 - 35						NA	NA	X_b
Phenol	5/16	8/196	25 - 220	1 - 80					2190	4000 [Lifetime HA, 70 kg adult][D]	
Pyrene	2/29	1/205	7 - 8	5 - 5					110	NA	X_b
Tributyl phosphate	2/6	8/59	89 - 130	1 - 450					18	NA	X_a
Bis(2-ethylhexyl)phthalate	5/28	16/205	1 - 7	0.4 - 350					0.61	6 [MCL][F]	X_a
Pesticides/PCBs, µg/L											
4-4'-DDT		1/183		3 - 3					0.025	NA	

TABLE A.2-3 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection: Filtered Number of Hit/Samples	Background Frequency of Detection: Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Aroclor 1248 (L*)	1/15		3.1 - 3.1						0.0011	NA	
Chlorobenzilate	1/15		10 - 10						NA	NA	
Heptachlor epoxide		1/183		0.058 - 0.058					0.0002	0.2 [MCL][F]	
PCDDs and PCDFs, ug/L											
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1/13		0.64 - 0.64							NA	X,
1,2,3,7,8-Pentachlorodibenzo-furan	1/13		0.64 - 0.64						1.1E-06	NA	X,
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	2/13		1.9 - 3.3						5.7E-06	NA	X,
Octachlorodibenzo-p-dioxin	5/13		1.6 - 25.5						5.7E-05	NA	X,
Heptachlorodibenzo-p-dioxin	2/13		1.2 - 3.5						5.7E-06	NA	X,
2,3,7,8-Tetrachlorodibenzo-furan	1/13		2.6 - 2.6						5.7E-07	NA	X,
2,3,4,7,8-Pentachlorodibenzo-furan	1/13		0.91 - 0.91						1.1E-07	NA	X,
Octachlorodibenzofuran	4/13		0.55 - 1.6						5.7E-05	NA	X,
Tetrachlorodibenzofuran	2/13	1/9	3 - 12.4	0.120 - 0.120					5.7E-07	NA	X,
Pentachlorodibenzofuran	1/13	1/9	5.9 - 5.9	0.35 - 0.35					1.1E-07	NA	X,
Hexachlorodibenzofuran		1/8		0.32 - 0.32					5.7E - 07	NA	X,
Heptachlorodibenzofuran	2/13		0.92 - 1.5						5.7E - 06	NA	X,

000053
6478

TABLE A.2-3 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Environmental Sample Summary Statistics: Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Environmental Sample Summary Statistics: Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Statistics: Background Frequency of Detection Unfiltered Number of Hit/Samples	Background Statistics: Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Background Statistics: Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Inorganics, mg/L											
Aluminum	198/477	347/406	0.004 - 43.5	0.043 - 10500	3/7	2/5	0.0375 - 0.123	0.774 - 2.29	NA	NA	X_c[5]
Antimony	54/414	53/374	0.002 - 0.679	0.005 - 0.956	2/4		0.0141 - 0.0272		0.006	0.006 [MCL][F]	X_c[5]
Arsenic	123/607	225/406	0.001 - 0.515	0.001 - 1.49	5/17	3/5	0.0042 - 0.122	0.0031 - 0.0194	0.0000049	0.05 [MCL][*]	X_c[5]
Barium	484/634	298/396	0.008 - 2.69	0.006 - 3.35	22/23	5/5	0.034 - 0.452	0.0486 - 0.454	0.26	2[MCL][F]	X_c[5]
Beryllium	47/454	58/392	0.001 - 0.101	0.001 - 0.081	2/6		0.001 - 0.0018		0.000002	0.004 [MCL][F]	X_c[5]
Boron	9/11	16/18	0.24 - 2.23	0.228 - 7.36					0.329	0.6 [Lifetime HA, 70 kg adult][D]	X_c[5]
Cadmium	121/592	77/383	0.002 - 0.279	0.001 - 0.475	2/22		0.006 - 0.007		0.0018	0.005 [MCL][F]	X_c[5]
Calcium	636/640	417/417	4.65 - 4000	24.5 - 4580	25/25	5/5	74.4 - 155	81.1 - 172	NA	NA	
Chromium	172/528	305/514	0.002 - 2.75	0.002 - 3.48	8/24	1/5	0.006 - 0.0345	0.0046 - 0.0046	0.1 Cr, total	0.1 [MCL][F]	X_c[5]
Cobalt	62/465	134/404	0.004 - 1.78	0.006 - 0.595					0.219	NA	X_c[5]
Copper	142/634	204/397	0.003 - 1.5	0.004 - 1.030	4/23	3/5	0.013 - 0.03	0.0053 -0.0294	0.136	1.3 [MCLG] [F]	X_c[5]
Cyanide	27/157	31/439	0.004 - 1.27	0.002 - 0.552					0.073	0.2 [MCL][P]	X_d,X_c[5]
Iron	364/639	378/410	0.005 - 60.2	0.027 - 1110	18/25	5/5	0.0467 - 4.9	0.249 - 6.35	NA	0.3 [SMCL][F]	
Lead	106/630	223/427	0.001 - 1.82	0.001 - 1.61	6/17	3/4	0.0014 - 0.0087	0.0013 - 0.0016	NA	0.015	X_c[5]

TABLE A.2-3 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection: Filtered Number of Hit/Samples	Background Frequency of Detection: Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Magnesium	634/637	414/415	0.738 - 4730	0.782 - 4950	25/25	5/5	20.4 - 47.8	23.1 - 50.7	35.405	NA	X_c[5]
Manganese	529/614	398/407	0.002 - 559	0.004 - 558	19/23	4/5	0.0025 - 0.22	0.0035 - 0.205	0.018	0.05 [SMCL][F]	X_c[5]
Mercury	55/582	19/372	0.0002 - 30.2	0.0002 - 0.027	1/22		0.0004 - 0.0004		0.001	0.002 [MCL][F]	X_c[5]
Molybdenum	138/475	96/281	0.005 - 804	0.0885 - 708	2/20		0.017 - 0.028		0.018	0.04 [Lifetime HA, 70 kg adult][D]	X_c[5]
Nickel	199/636	240/408	0.004 - 13.4	0.004 - 2.13	4/24	1/5	0.021 - 0.026	0.0072 - 0.0072	0.073	0.1 [MCL][F]	X_c[5]
Potassium	516/565	375/389	0.001 - 12400	0.337 - 1280	21/23	4/5	0.891 - 31.5	0.963 - 17.2		NA	
Selenium	44/565	37/362	0.001 - 0.178	0.001 - 0.14					0.018	0.05 [MCL][F]	X_c[5]
Silicon	145/147	107/107	0.338 - 41.7	0.1168 - 102	4/4	4/4	5.62 - 7.43	5.6 - 10.7		NA	
Silver	110/627	80/405	0.003 - 1.29	0.001 - 1.31	5/25	1/5	0.0105 - 0.052	0.0031 - 0.0031	0.018	0.1 [Lifetime HA, 70 kg adult][D]	X_c[5]
Sodium	591/594	412/415	1.6 - 5260	2.59 - 4620	23/23	5/5	5.71 - 56.3	8.81 - 50		20 [DWEL][***]	
Thallium	13/393	16/371	0.001 - 0.422	0.001 - 0.435					0.000256	0.002 [MCL][F]	X_c[5]
Vanadium	113/472	174/405	0.003 - 2.58	0.005 - 3.25	2/7	1/5	0.018 - 0.0195	0.0051 - 0.0051	0.02555	NA [MCL][L]	X_c[5]
Zinc	196/466	267/402	0.002 - 1.78	0.0939 - 3380	5/7	4/5	0.0104 -0.0443	0.0192 - 0.352	1.095	2 [Lifetime HA, 70 kg adult][F]	X_c[5]

000055

6478

TABLE A.2-3 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection: Filtered Number of Hit/Samples	Background Frequency of Detection: Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Miscellaneous Parameters, mg/L											
Ammonia	16/17	297/529	0.2 - 2625	0.00014 - 253		11/22		0.1 - 4.5	NA	NA	X_a
Chloride	14/16	639/666	1102 - 33000	0.032 - 6300		20/25		1.4 - 50		250 [SMCL][F]	
Fluoride	5/11	624/628	8.55 - 61	0.1 - 8.12		25/25		0.2 - 1.3	0.219	4 [MCL][*]	X_a
Nitrate	13/17	390/616	0.759 - 6574	0.012 - 2673		9/11		0.012 - 0.3	5.84	10 [MCL][F]	X_a
Nitrate as Nitrogen		128/170		0.02 - 3440						10 [MCL][F]	X_a
Nitrate/Nitrite		112/170		0.02 - 10000		1/4		0.07 - 0.07		10 [MCL][F]	X_a
Nitrite, as Nitrogen		11/40		0.04 - 122					0.365	1 [MCL][F]	
Phenols		133/600		0.002 - 0.47		11/21		0.007 - 0.03		NA	
Phosphate	2/7	9/10	0.381 - 4.97	0.1 - 5.6		1/1		0.191 - 0.191		NA	
Phosphorus	9/11		0.15 - 32			12/20		0.026 - 0.18		NA	
Sulfate	10/16	653/667	1.85 - 4800	0.17 - 6200		22/25		3 - 175		250 [SMCL][F]	
Sulfide	1/18	10/168	1.48 - 1.48	0.620 - 7.87						NA	

[1]Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
[2]Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, Part B" (Publication 9285.7-01B, December 1991). *Attachment III provides the methodology used to develop the screening levels.*
[3]Acquired from U.S. EPA Drinking Water Standards and Health Advisories, May 1994.
[4]An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment:

- X_a This analyte is a CPC for this media
- X_b This analyte is a CPC in another media, but not in this media
- X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in groundwater as identified in Attachment A.IV
- X_d This analyte is a CPC as identified through modeling

[5]Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.

000056
L:\PGH\OUS-RI\D-01-94-7\January 10, 1995 6:10pm

TABLE A.2-3 (Continued)

[6]Concentration corresponds to an average annual dose limit of 4 mrems/yr for beta and gamma emitters. May also be applicable to alpha emitters. Derived using Oral Dose Conversion Factors (DCF_{os}) from U.S. Environmental Protection Agency (EPA), "Radiation Protection of the Public and the Environment; Proposed Rule," 58 Federal Register 56, Washington, D.C., 1993, assuming an annual water intake of 730 L/yr.

[MCL] Maximum Contaminant Level (MCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[SMCL] Secondary Maximum Contaminant Level (SMCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[MCLG] Maximum Contaminant Level Goal (MCLG) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[HA] Health Advisory (HA) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[DWEL] Drinking Water Equivalent Level (DWEL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[D] Draft
[F] Final
[L] Listed for regulation
[P] Proposed
[T] Tentative
[*] Currently undergoing review.
[**] Deferred
[***] Guidance
PCDDs Polychlorinated dibenzo-p-dioxins
PCDFs Polychlorinated dibenzofurans
NA Not available
(L*) Parameter only detected in type 1 groundwater samples labeled "groundwater/leachate."

000052

6478

000058
PGH\OU5-RI\D-01-94-7\January 10, 1995 6:18pm

61
72
73
DOE

TABLE A.2-4

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN GROUNDWATER GREAT MIAMI AQUIFER - TYPE 2 MONITORING WELLS

	Environmental Sample Summary Statistics				Background Statistics						
	Sample Frequency of Detection[1]		Range of Concentrations Detected in Environmental Samples		Background Frequency of Detection		Range of Concentrations Detected in Background Samples		U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Radionuclide/Chemical	Filtered Number of Hit/Samples	Unfiltered Number of Hit/Samples	Filtered Min/Max Detection	Unfiltered Min/Max Detection	Filtered Number of Hit/Samples	Unfiltered Number of Hit/Samples	Filtered Min/Max Detection Conc.	Unfiltered Min/Max Detection Conc.			
Radionuclides, pCi/L											
Cesium-137	33/183	2/177	20-20	20-20	0/1	2/70	ND	5.8-6.7	0.17	110 [6]	
Neptunium-237+1D	27/166	9/482	0.698-2.5	0.52-1	1/1	4/81	0.12	0.25-0.62	0.022	1.23 [6]	X_c[5]
Plutonium-238	32/237	3/503	0.67-1.12	0.637-1	0/1	6/62	ND	0.022-0.089	0.022	1.71 [6]	X_c[5]
Plutonium-239/240	28/237	7/499	1-1.93	0.675-1.4	1/1	5/59	0.042	0.016-0.083	0.021	1.55 [6]	X_c[5]
Potassium-40		2/3		0-55					0.43	295 [6]	
Total Radium		4/4		1-2.36					NA	NA	
Radium-226	48/356	88/753	1.01-5.46	1.01-14.9	10/11	56/105	0.20-2	0.071-2	0.032	20 [MCL] [P]	X_c[5]
Radium-228	11/350	36/751	3.02-8.2	3.1-15.3	0/13	23/106	ND	1-52	0.048	20 [MCL] [P]	X_c[5]
Ruthenium-106	0/175	0/161	ND	ND	0/1	0/76	ND	ND	0.50	35.8 [6]	
Strontium-90	40/261	28/459	1.17-13.8	1.21-38.5	0/1	4/87	ND	0.65-4.8	0.13	4 [6]	X_c[5]
Technetium-99	40/268	51/589	19.2-204	15.4-6860	0/1	2/99	ND	22-26	3.7	3750[6]	X_c[5]
Total Thorium (μg/L)	77/271	104/639	0-13.1	0-34.8	NA	3/50	NA	0.97-2.1		6.78 [6]	X_c[5]
Thorium-228	132/348	218/833	0.21-11.3	0.214-15.3	4/10	37/101	0.2-0.4	0.075-2.9	0.087	10 [6]	X_c[5]
Thorium-230	95/349	258/840	0.253-5.48	0.211-15	2/11	44/98	0.1-0.29	0.18-2.5	0.37	2.01 [6]	X_c[5]
Thorium-232	41/349	43/779	0.3-2.7	0.221-3.86	3/11	9/71	0.1-0.3	0.1-0.77	0.4	400 [6]	X_c[5]
Total Uranium (μg/L)	531/620	1068/1221	0.2-1129	0-2070	10/12	69/115	0.1-0.8	0.1-3.1		20 [MCL] [F]	X_c[5]
Uranium-234	273/353	600/814	0.25-357.5	0.23-662	9/11	65/98	0.23-0.9	0.14-1.3	0.30		X_c[5]
Uranium-235/236	119/352	185/807	0.21-15.7	0.201-60.3	0/10	5/97	ND	0.094-0.26	0.30		X_c[5]

TABLE A.2-4 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Uranium-235	1/1	10/19	0.1-0.1	0.014-4					0.30		
Uranium-236		8/9		0.004-1		9/11		0.23-0.9	0.32		
Uranium-238		588/825		0.209-707		42/104		0.14-0.93	0.24		X_c[5]
Volatile Organic Compounds, µg/L											
1,1,1-Trichloroethane		30/563		0.7-550					200	200 [MCL] [F]	X_a
1,1,2,2-Tetrachloroethane		1/551		3-3					0.0090	NA	X_a
1,1-Dichloroethane		15/594		1.1-58					137	NA	X_a
1,1-Dichloroethene		1/560		110-110					0.0067	7 [MCL] [F]	X_a
1,2-Dichloroethane		1/577		310-310					0.020	5 [MCL] [F]	X_a
1,2-Dichloroethene (Total)		9/501		3-8.3					37	NA	X_a
2-Butanone		9/528		1-64					2190	NA	X_a
2-Hexanone		5/539		1-17					146	NA	
4-Methyl-2-pentanone		3/541		2-13					183	NA	X_a
Acetone		33/579		1-83.4					365	NA	X_a
Benzene		9/570		1-160					0.062	5 [MCL] [F]	X_a
Bromoform		1/552		2-2					0.38	100 [MCL] [T]	X_a
Carbon disulfide		19/540		1-26					2.8	NA	X_a
Chloroform		8/553		1-29					0.028	100 [MCL] [T]	X_a
Chloromethane		2/537		2-13					0.23	3 [Lifetime HA, 70-kg adult] [F]	X_a
Ethylbenzene		4/555		1-21					158	700 [MCL] [F]	
Methylene chloride		13/606		0.5-14					0.63	5 [MCL] [F]	X_a
Tetrachloroethene		2/608		1.3-3					0.14	5 [MCL] [F]	X_a

TABLE A.2-4 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection: Filtered Number of Hit/Samples	Background Frequency of Detection: Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Toluene		10/612		0.8-5					93	1000 [MCL] [F]	X_a
Total Xylenes		9/558		1-190					7,300	10,000 [MCL] [F]	
Trichloroethene		12/606		1-243					0.25	5 [MCL] [F]	X_a
Trichlorofluoromethane		1/46		66-66					165	2000 [Lifetime HA, 70-kg adult] [F]	
Vinyl chloride		1/553		1.2-1.2					0.0028	2 [MCL] [F]	X_a
trans-1,2-Dichloroethene		1/235		1.5-1.5					73	100 [MCL] [F]	X_a
Semivolatile Organic Compounds, µg/L											
2,4-Dimethylphenol		1/135		170-170					73	NA	X_a
4-Nitrophenol		1/128		3-3					226	NA	
Butylbenzylphthalate		19/140		1-4					100	100 [MCL] [P]	
Di-n-butylphthalate		14/139		0.7-60					365	4000 [DWEL, 70-kg adult]	X_b
Di-n-octylphthalate		1/125		2-2					73	NA	X_b
Diethylphthalate		3/140		1-20					2,920	5000 [Lifetime HA, 70-kg adult] [D]	
Isophorone		1/140		2-2					9.0	NA [LR]	
N-Nitrosodiphenylamine		2/140		3-10					1.7	NA	X_a
Phenol		8/137		2-50					2190	4000 [Lifetime HA, 70-kg adult] [D]	
Bis(2-ethylhexyl)phthalate		19/140		0.8-50					0.61	6 [MCL] [F]	X_a

000080

TABLE A.2-4 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Pesticides/PCBs, µg/L											
Aldrin		1/126		0.11-0.11					0.0005	0.001 [DWEL, 70-kg adult]	
Endosulfan II		1/124		0.15-0.15					21.9	NA	
Endosulfan sulfate		1/126		2.6-2.6					21.9	NA	
Heptachlor		1/126		0.07-0.07					0.00039	0.2 [MCL] [F]	
PCDDs and PCDFs, ng/L											
2,3,7,8-Tetrachlorodibenzo-p-dioxin		1/15		1.7-1.7					0.000000057	0.00003 [MCL] [F]	X_a
Octachlorodibenzo-p-dioxin		1/12		0.7-0.7					0.000057	NA	X_a
PCDFs											
2,3,7,8-Tetrachlorodibenzo-furan		1/10		1.2-1.2					0.00000057	NA	X_a
Total PCDFs											
Tetrachlorodibenzofuran		1/17		0.22-0.22					0.00000057	NA	X_a
Pentachlorodibenzofuran		1/17		0.31-0.31					0.00000011	NA	X_a
Hexachlorodibenzofuran		1/17		0.38-0.38					0.00000057	NA	X_a
Inorganics, mg/L											
Aluminum	223/609	199/375	0.011-104	0.016-208	11/27	4/15	0.062-0.175	0.06-0.225	NA	NA	X_c[5]
Antimony	13/388	11/348	0.001-41.2	0.001-0.175	0/10	0/11	ND	ND	0.0015	0.006 [MCL] [F]	X_c[5]

000064

TABLE A.2-4 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection: Filtered Number of Hit/Samples	Background Frequency of Detection: Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Arsenic	119/834	140/389	0.001-0.55	0.001-0.35	27/89	7/16	0.002-0.55	0.0011-0.0294	0.0000049	0.05 [MCL] [*]	X_c[5]
Barium	616/821	246/379	0.003-26.9	0.003-23.6	97/110	14/16	0.021-0.82	0.0368-0.768	0.26	2 [MCL] [F]	X_c[5]
Beryllium	14/427	5/371	0.001-0.003	0.002-0.012	6/23	0/16	0.001-0.0023	ND	0.000002	0.004 [MCL] [F]	X_c[5]
Boron									0.33	0.6 [Lifetime HA, 70-kg adult] [D]	X_c[5]
Cadmium	252/796	38/356	0.001-4	0.002-4.7	16/106	3/16	0.002-0.01	0.0022-0.0135	0.0018	0.005 [MCL] [F]	X_c[5]
Calcium	828/838	378/379	5.8-83600	1.63-101000	110/111	16/16	63.6-181	78-162	NA	NA	
Chromium	284/688	181/524	0.002-25.7	0.002-27.2	35/111	2/16	0.008-0.0441	0.0067-0.0211	0.1	0.1 [MCL] [F]	X_c[5]
Cobalt	12/428	25/371	0.009-0.02	0.005-0.305	0/23	1/15	ND	0.0086-0.0086	0.22	NA	X_c[5]
Copper	184/835	79/379	0.003-0.384	0.004-10.3	31/110	2/16	0.01-0.176	0.011-0.035	0.136	1.3 [MCLG] [F]	X_c[5]
Cyanide	3/115	8/401	0.023-0.07	0.001-0.044	0/12	0/16	ND	ND	0.073	0.2 [MCL] [P]	X_d,X_e[5]
Iron	604/839	341/380	0.005-34.6	0.006-913	74/111	14/15	0.027-5.42	0.312-5.5	NA	0.3 [SMCL] [F]	
Lead	121/829	140/403	0.001-0.259	0.001-0.262	13/79	1/15	0.0016-0.029	0.002-0.002	NA	0.015	X_c[5]
Magnesium	831/838	379/379	1.8-22200	0.285-32100	111/111	16/16	15.7-46	20.1-39	35	NA	X_c[5]
Manganese	669/821	336/380	0.001-18.6	0.001-139	83/106	16/16	0.002-0.916	0.0043-0.904	0.018	0.05 [SMCL] [F]	X_c[5]
Mercury	60/778	6/363	0.0002-0.012	0.0002-0.001	10/104	0/15	0.0002-0.001	ND	0.0011	0.002 [MCL] [F]	X_c[5]

TABLE A.2-4 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection: Filtered Number of Hit/Samples	Background Frequency of Detection: Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Molybdenum	90/682	18/232	0.003-378	0.007-573	21/90	0/8	0.004-0.04	ND	0.018	0.04 [Lifetime HA, 70-kg adult] [D]	X_c[5]
Nickel	126/838	105/380	0.004-0.589	0.004-3.93	14/111	1/16	0.012-0.0279	0.0514-0.0514	0.073	0.1 [MCL] [F]	X_c[5]
Phosphorus						75/102		0.01-3.08		NA	
Potassium	707/784	329/370	0.003-2390	0.724-182	94/101	13/16	0.664-4.03	0.648-1.96		NA	
Selenium	50/779	37/355	0.001-0.2	0.001-0.056	6/79	1/5	0.00105-0.006	0.00075-0.00075	0.018	0.05 [MCL] [F]	X_c[5]
Silicon	237/240	42/42	0.015-7540	2.05-5760	4/4	1/1	2.6-3.46	5.81-5.81		NA	
Silver	191/827	15/376	0.003-22.6	0.003-24	13/110	1/16	0.0031-0.034	0.0117-0.0117	0.018	0.1 [Lifetime HA, 70-kg adult] [D]	X_c[5]
Sodium	809/814	389/391	1.96-4000	3.73-11900	106/106	16/16	1.96-101	3.08-50.4		20 [DWEL] [***]	
Thallium	2/378	2/349	0.002-0.002	0.001-0.002	0/16	0/15	ND	ND	0.00026	0.002 [MCL] [F]	X_c[5]
Vanadium	177/606	34/375	0.003-14	0.003-14.6	12/27	2/16	0.01-0.0244	0.00076-0.0117	0.026	[MCL] [L]	X_c[5]
Zinc	166/433	175/375	0.002-2.3	0.005-1.18	10/23	2/14	0.0068-0.133	0.0087-0.021	1.1	2 [Lifetime HA, 70-kg adult] [F]	X_c[5]
Miscellaneous Parameters, mg/L											
Ammonia	1/3	353/817	0.4-0.4	0.02-17	NA	40/101	NA	0.045-12.6	NA	NA	X_n
Chloride	3/3	989/1013	10-89.4	0.003-661	NA	98/110	NA	0.02-120		2 [SMCL] [F]	
Fluoride	2/3	877/927	0.12-0.3	0-4.51	NA	110/113	NA	0.1-1.9	0.22	4 [MCL] [*]	X_n

000063
6478

TABLE A.2-4 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Nitrate	3/3	386/479	0.18-4	0.00017-216	NA	52/64	NA	0.014-24.9	5.8	10 [MCL] [F]	X_a
Nitrate/Nitrite	0/1	116/169	ND	0.02-210	NA	4/12	NA	0.02-4.1		10 [MCL] [F]	X_a
Nitrite, as Nitrogen		6/33		0.03-3	NA		NA		0.37	1 [MCL] [F]	X_a
Phenols	0/4				NA	46/94	NA	0.00575-0.091		NA	
Phosphate		13/13		0.01-7.2	NA		NA			NA	
Phosphorus	9/10	588/804	0.02-307.760	0.001-541	NA	75/102	NA	0.01-3.08		NA	
Sulfate	4/5	986/1010	28-52	0.042-5431	NA	101/110	NA	2.79-321		250 [SMCL] [F]	
Sulfide	2/2	56/289	9.6-80	0.02-310	NA	0/6	NA	ND		NA	

[1]Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
[2]Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I-Human Health Evaluation Manual-Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.
[3]Acquired from U.S. EPA Drinking Water Standards and Health Advisories, May 1994.
[4]An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment.

- X_a This analyte is a CPC for this media
- X_b This analyte is a CPC in another media, but not in this media
- X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in groundwater as identified in Attachment A.IV
- X_d This analyte is a CPC as identified through modeling

[5]Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.
[6]Concentration corresponds to an average annual dose limit of 4 mrems/yr for beta and gamma emitters. May also be applicable to alpha emitters. Derived using Oral Dose Conversion Factors (DCF_{os}) from U.S. Environmental Protection Agency (EPA), "Radiation Protection of the Public and the Environment; Proposed Rule," 58 Federal Register 56, Washington, D.C., 1993, assuming an annual water intake of 730 L/yr.

[MCL] Maximum Contaminant Level (MCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[SMCL] Secondary Maximum Contaminant Level (SMCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[MCLG] Maximum Contaminant Level Goal (MCLG) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[HA] Health Advisory (HA) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.

TABLE A.2-4 (Continued)

[DWEL] Drinking Water Equivalent Level (DWEL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[D] Draft
[F] Final
[L] Listed for regulation
[P] Proposed
[T] Tentative
[*] Currently undergoing review.
[**] Deferred
[***] Guidance
NA Not available
ND There were no positive hits

000065

000066
PGH\005-RI\D-01-94-7\January 10, 1995 6:16pm

61
72
73
DOE

TABLE A.2-5

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN GROUNDWATER GREAT MIAMI AQUIFER - TYPE 3 MONITORING WELLS

	Environmental Sample Summary Statistics				Background Statistics						
	Sample Frequency of Detection[1]		Range of Concentrations Detected in Environmental Samples		Background Frequency of Detection		Range of Concentrations Detected in Background Samples		U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Radionuclide/Chemical	Filtered Number of Hit/Samples	Unfiltered Number of Hit/Samples	Filtered Min/Max Detection	Unfiltered Min/Max Detection	Filtered Number of Hit/Samples	Unfiltered Number of Hit/Samples	Filtered Min/Max Detection Conc.	Unfiltered Min/Max Detection Conc.			
Radionuclides, pCi/L											
Cesium-137	7/78	0/69	20-20	ND	0/1	2/70	ND	5.8-6.7	0.17	110 [6]	
Neptunium-237+1D	7/66	0/278	1-3.25	ND	1/1	4/81	0.12	0.25-0.62	0.022	1.23 [6]	X_c[5]
Plutonium-238	8/106	3/282	0.59-1	0.65-2.7	0/1	6/62	ND	0.022-0.089	0.022	1.71 [6]	X_c[5]
Plutonium-239/240	7/106	2/278	1-2.15	0.6-0.6	1/1	5/59	0.042	0.016-0.083	0.021	1.55 [6]	X_c[5]
Total Radium		2/2		1-1					NA	NA	
Radium-226	29/184	36/429	1.1-39.8	1.07-8.5	10/11	56/105	0.2-2	0.071-2	0.032	20 [MCL] [P]	X_c[5]
Radium-228	4/180	16/440	3.8-4.28	3.1-7.1	0/13	23/106	ND	1-52	0.048	20 [MCL] [P]	X_c[5]
Strontium-90	9/122	3/276	5-7.57	1.83-6.21	0/1	4/87	ND	0.65-4.8	0.13	4 [6]	X_c[5]
Technetium-99	9/128	6/346	24.4-30	24.4-44.5	0/1	2/99	ND	22-26	3.7	3750[6]	X_c[5]
Total Thorium (μg/L)	38/132	72/360	0-8.82	0.6-2000	NA	3/50	NA	0.97-2.1		6.78 [6]	X_c[5]
Thorium-228	63/179	89/488	0.3-14.2	0.236-5.53	4/10	37/101	0.2-0.4	0.075-2.9	0.087	10 [6]	X_c[5]
Thorium-230	51/179	113/488	0.3-12.1	0.243-9.86	2/11	44/98	0.1-0.29	0.18-2.5	0.37	2.01 [6]	X_c[5]
Thorium-232	19/181	25/454	0.275-1	0.221-1.1	3/11	9/71	0.1-0.3	0.1-0.77	0.4	400 [6]	X_c[5]
Thorium-234		266/475		171-475					1.2	NA	
Total Uranium (μg/L)	257/339	545/753	0.13-110	0-110	10/12	69/115	0.1-0.8	0.1-3.1		20 [MCL] [P]	X_c[5]
Uranium-234	103/180	266/475	0.3-28.7	0.222-32	9/11	65/98	0.23-0.9	0.14-1.3	0.30		X_c[5]
Uranium-235		7/13		0.01-0.13					0.30		
Uranium-236		6/7		0.003-0.099					0.32		
Uranium-235/236	26/181	41/466	0.3-3.16	0.203-1.96	0/10	5/97	ND	0.094-0.26	0.30		X_c[5]
Uranium-238		237/480		0.203-31.6		42/104		0.14-0.93	0.17		X_c[5]

TABLE A.2-5 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Volatile Organic Compounds, µg/L											
1,1-Dichloroethene		2/314		2-2					0.0067	7 [MCL] [F]	X_a
2-Butanone		7/304		3-270					2190	NA	X_a
2-Chloroethyl vinyl ether		1/131		60-60					NA	NA	
2-Hexanone		1/305		2-2					146	NA	
4-Methyl-2-pentanone		3/308		2.7-7					183	NA	X_a
Acetone		14/340		2-120					365	NA	X_a
Benzene		8/311		0.3-4					0.062	5 [MCL] [F]	X_a
Carbon disulfide		11/305		0.5-109					2.8	NA	X_a
Chlorobenzene		3/311		2-10					5.2	100 [MCL] [F]	X_a
Chloroform		2/311		0.3-2.1					0.028	100 [MCL] [T]	X_a
Ethylbenzene		1/311		10-10					158	700 [MCL] [F]	
Methylene chloride		6/346		0.7-6					0.63	5 [MCL] [F]	X_a
Styrene		1/305		10-10					0.28	100 [MCL] [F]	
Tetrachloroethene		2/346		1-1					0.14	5 [MCL] [F]	X_a
Toluene		16/346		0.7-32					93	1000 [MCL] [F]	X_a
Total Xylenes		3/305		0.5-10					7,300	10,000 [MCL] [F]	
Trichloroethene		3/346		2-9					0.25	5 [MCL] [F]	X_a
Semivolatile Organic Compounds, µg/L											
Butyl benzyl phthalate		6/34		1-3					100	100 [MCL] [P]	
Di-n-butyl phthalate		4/34		0.8-36					365	4000 [DWEL, 70-kg adult]	X_b

000067

6478

TABLE A.2-5 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Diethyl phthalate		2/34		1-2					2920	5000 [Lifetime HA, 70-kg adult] [D]	
Phenol		3/35		2-17					2190	4000 [Lifetime HA, 70-kg adult] [D]	
Bis(2-ethylhexyl)phthalate		7/34		0.4-17					0.61	6 [MCL] [F]	X_b
Pesticides/PCBs, µg/L											
Dieldrin		1/32		0.016-0.016					0.00053	NA	X_b
Endosulfan I		1/32		0.025-0.025					22	NA	
PCDDs and PCDFs, ng/L											
Tetrachlorodibenzo-p-dioxin		1/7		3.8-3.8					0.00000057	NA	X_b
Tetrachlorodibenzofuran		1/7		1.1-1.1					0.00000057	NA	X_b
Pentachlorodibenzofuran		1/7		0.43-0.43					0.000000114	NA	X_b
Inorganics, mg/L											
Aluminum	102/340	55/220	0.02-5.77	0.021-4.03	11/27	4/15	0.062-0.175	0.06-0.225	NA	NA	X_c[5]
Antimony	8/216	3/200	0.031-0.116	0.07-0.096	0/10	0/11	ND	ND	0.006	0.006 [MCL] [F]	X_c[5]
Arsenic	80/539	56/231	0.001-0.31	0.001-0.234	27/89	7/16	0.002-0.55	0.0011-0.0294	0.0000049	0.05 [MCL] [*]	X_c[5]
Barium	379/515	143/221	0.006-0.72	0.022-0.720	97/110	14/16	0.021-0.82	0.0368-0.768	0.26	2 [MCL] [F]	X_c[5]
Beryllium	15/250	4/220	0.001-0.174	0.002-0.178	6/23	0/16	0.001-0.0023	ND	0.000002	0.004 [MCL] [F]	X_c[5]
Cadmium	126/453	11/201	0.001-3	0.003-0.211	16/106	3/16	0.002-0.01	0.0022-0.0135	0.0018	0.005 [MCL] [F]	X_c[5]
Calcium	518/521	221/221	5.5-359	5.8-308	110/111	16/16	63.6-181	78-162	NA	NA	

TABLE A.2-5 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Chromium	150/428	83/314	0.004-2.017	0.002-0.405	35/111	2/16	0.008-0.0441	0.0067-0.0211	0.1	0.1 [MCL] [F]	X_c[5]
Cobalt	6/250	12/220	0.006-0.516	0.005-0.528	0/23	1/15	ND	0.0086-0.0086	0.22	NA	X_c[5]
Copper	80/521	26/221	0.003-0.318	0.003-0.303	31/110	2/16	0.01-0.176	0.011-0.035	0.136	1.3 [MCLG] [F]	X_c[5]
Cyanide	1/72	2/210	0.354-0.354	0.261-0.36	0/12	0/16	ND	ND	0.073	0.2 [MCL] [P]	X_d, X_c[5]
Iron	425/521	202/221	0.007-31.3	0.012-78.9	74/111	14/15	0.007-5.42	0.312-5.5	NA	0.3 [SMCL] [F]	
Lead	66/502	51/221	0.001-0.3	0.001-1.15	13/79	1/15	0.0016-0.029	0.002-0.002	NA	0.015	X_c[5]
Magnesium	517/520	221/221	0.5-232	14.1-76.6	111/111	16/16	15.7-46	20.1-39	35	NA	X_c[5]
Manganese	470/502	218/221	0.004-4.62	0.002-3.33	83/106	16/16	0.002-0.916	0.0043-0.904	0.018	0.05 [SMCL] [F]	X_c[5]
Mercury	37/473	6/209	0.0002-0.034	0.0002-0.143	10/104	0/15	0.0002-0.001	ND	0.0011	0.002 [MCL] [F]	X_c[5]
Molybdenum	56/409	2/117	0.004-0.2	0.015-0.086	21/90	0/8	0.004-0.04	ND	0.018	0.04 [Lifetime HA, 70-kg adult] [D]	X_c[5]
Nickel	62/521	19/221	0.005-0.78	0.005-0.547	14/111	1/16	0.012-0.0279	0.0514-0.0514	0.073	0.1 [MCL] [F]	X_c[5]
Phosphorus					NA	75/102	NA	0.01-3.08			
Potassium	445/499	173/211	0.215-2300	0.819-268	94/101	13/16	0.664-4.03	0.648-1.96			
Selenium	33/474	20/201	0.001-0.246	0.001-0.234	6/79	1/5	0.00105-0.006	0.00075-0.00075	0.018	0.05 [MCL] [F]	X_c[5]
Silicon	108/108	4/4	0.402-11.2	3.35-8.83	4/4	1/1	2.6-3.46	5.81-5.81		NA	
Silver	88/519	8/221	0.004-0.086	0.003-0.08	13/110	1/16	0.0031-0.034	0.0117-0.0117	0.018	0.1 [Lifetime HA, 70-kg adult] [D]	X_c[5]
Sodium	515/519	231/231	2.75-407	3.08-439	106/106	16/16	1.96-101	3.08-50.4		20 [DWEL] [***]	

TABLE A.2-5 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection: Filtered Number of Hit/Samples	Background Frequency of Detection: Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Thallium	4/206	3/197	0.002-0.112	0.057-0.093	0/16	0/15	ND	ND	0.00026	0.002 [MCL] [F]	X_c[5]
Vanadium	77/340	4/220	0.004-0.282	0.07-0.29	12/27	2/16	0.01-0.0244	0.00076-0.0117	0.026	NA [MCL] [L]	X_c[5]
Zinc	91/256	95/221	0.002-0.311	0.006-0.493	10/23	2/14	0.0068-0.133	0.0087-0.021	1.1	2 [Lifetime HA, 70-kg adult] [F]	X_c[5]
Miscellaneous Parameters, mg/L											
Ammonia	0/1	248/473	ND	0.018-28.6	NA	40/101	NA	0.045-12.6	NA	NA	X_a
Chloride	1/2	596/612		0.052-826	NA	98/110	NA	0.02-120		250 [SMCL] [F]	
Fluoride	1/1	509/561	0.2-0.2	0.23-23	NA	110/113	NA	0.1-1.9	0.22	4 [MCL] [*]	X_a
Nitrate		149/245	4.7-4.7	0.02-71	NA	52/64	NA	0.014-24.9	5.8	10 [MCL] [F]	X_a
Nitrate/Nitrite		55/105		0.02-10	NA	4/12	NA	0.02-4.1		10 [MCL] [F]	X_a
Phenol					NA	46/94	NA	0.00575-0.091		NA	
Nitrite, as Nitrogen		7/27		0.03-1.59					0.37	NA	X_a
Phosphate		11/11		0.01-1.1						NA	
Phosphorus	26/26	293/476	0.01-101.1	0.01-568	NA	75/102	NA	0.01-3.08		NA	
Sulfate	1/1	593/610	28-28	0.064-951	NA	101/110	NA	2.79-321		250 [SMCL] [F]	X_d
Sulfide		22/116		0.001-78	NA	0/6	NA	ND		NA	

[1]Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
[2]Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.
[3]Acquired from U.S. EPA Drinking Water Standards and Health Advisories, May 1994.

TABLE A.2-5 (Continued)

[4]An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment.

- X_a This analyte is a CPC for this media
- X_b This analyte is a CPC in another media, but not in this media
- X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in groundwater as identified in Attachment A.IV
- X_d This analyte is a CPC as identified through modeling

[5]Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.

[6]Concentration corresponds to an average annual dose limit of 4 mrems/yr for beta and gamma emitters. May also be applicable to alpha emitters. Derived using Oral Dose Conversion Factors (DCF_{oa}) from U.S. Environmental Protection Agency (EPA), "Radiation Protection of the Public and the Environment; Proposed Rule," 58 Federal Register 56, Washington, D.C., 1993, assuming an annual water intake of 730 L/yr.

[MCL] Maximum Contaminant Level (MCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[SMCL] Secondary Maximum Contaminant Level (SMCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[MCLG] Maximum Contaminant Level Goal (MCLG) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[HA] Health Advisory (HA) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[DWEL] Drinking Water Equivalent Level (DWEL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[D] Draft
[F] Final
[L] Listed for regulation
[P] Proposed
[T] Tentative
[*] Currently undergoing review.
[**] Deferred
[***] Guidance
PCDDs Polychlorinated dibenzo-p-dioxins
PCDFs Polychlorinated dibenzofurans
NA Not available
ND There were no positive hits

PGH\OU5-RI\D-01-94-7\January 10, 1995 6:21pm

000072

61
72
73
DOE

TABLE A.2-6

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN GROUNDWATER GREAT MIAMI AQUIFER - TYPE 4 MONITORING WELLS

	Environmental Sample Summary Statistics				Background Statistics						
	Sample Frequency of Detection[1]		Range of Concentrations Detected in Environmental Samples		Background Frequency of Detection		Range of Concentrations Detected in Background Samples		U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Radionuclide/Chemical	Filtered Number of Hit/Samples	Unfiltered Number of Hit/Samples	Filtered Min/Max Detection	Unfiltered Min/Max Detection	Filtered Number of Hit/Samples	Unfiltered Number of Hit/Samples	Filtered Min/Max Detection Conc.	Unfiltered Min/Max Detection Conc.			
Radionuclides, pCi/L											
Cesium-137	2/7	2/28	20-20	4.8-20	0/1	2/70	ND	5.8-6.7	0.17	110 [6]	
Neptunium-237+1D	2/7	1/96	1-1	1-1	1/1	4/81	0.12-0.12	0.25-0.62	0.022	1.23 [6]	X_c[5]
Plutonium-238	2/11	1/93	1-1	1-1	0/1	6/62	ND	0.022-0.089	0.022	1.71 [6]	X_c[5]
Plutonium-239/240	2/11	2/93	1-1	1-1.02	1/1	5/59	0.042	0.016-0.083	0.021	1.55 [6]	X_c[5]
Radium-226	7/34	7/156	1.1-3.9	1.1-2.5	10/11	56/105	0.2-2	0.071-2	0.032	20 [MCL][P]	X_c[5]
Radium-228	0/36	4/159	ND	3.1-5.6	0/13	23/106	ND	1-52	0.048	20 [MCL][P]	X_c[5]
Strontium-90	3/14	3/87	2.5-5	1.2-5	0/1	4/87	ND	0.65-4.8	0.13	4 [6]	X_c[5]
Technetium-99	2/14	1/122	30-30	30-30	0/1	2/99	ND	22-26	3.7	3750[6]	X_c[5]
Total Thorium (μg/L)	13/21	22/121	0.912-10.944	0.6-21.888	NA	3/50	NA	0.97-2.1		6.78 [6]	X_c[5]
Thorium-228	8/36	32/172	0.3-5.64	0.239-3	4/10	37/101	0.2-0.4	0.075-2.9	0.087	10 [6]	X_c[5]
Thorium-230	9/36	36/174	0.3-1.93	0.218-3.2	2/11	44/98	0.1-0.29	0.18-2.5	0.37	2.01 [6]	X_c[5]
Thorium-232	9/36	6/158	0.4-2.4	0.3-2.4	3/11	9/71	0.1-0.3	0.1-0.77	0.4	400 [6]	X_c[5]
Total Uranium (μg/L)	38/62	140/289	0.2-30.3	0.127-103	10/12	69/115	0.1-0.8	0.1-3.1		20 [MCL][P]	X_c[5]
Uranium-234	20/34	73/183	0.4-2	0.253-29.7	9/11	65/98	0.23-0.9	0.14-1.3	0.3		X_c[5]
Uranium-235/236	2/34	11/179	1-1	0.238-2.42	0/10	5/97	ND	0.094-0.26	0.3		X_c[5]
Uranium-235		1/5		0.112-0.112					0.3		
Uranium-236		1/2		0.015-0.015					0.32		
Uranium-238	20/34	52/184	0.3-1.6	0.223-31.5	9/11	42/104	0.23-0.9	0.14-0.93	0.24		X_c[5]

TABLE A.2-6 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Volatile Organic Compounds, μg/L											
2-Butanone		2/120		24-88					2,190	NA	X_a
Acetone		3/153		3-38.9					365	NA	X_a
Bromodichloromethane		1/122		2.6-2.6					0.14	100 [MCL][T]	X_d
Bromoform		1/122		5.4-5.4					0.38	100 [MCL][T]	X_a
Chlorobenzene		1/122		1-1					5.2	100[MCL][F]	X_a
Chloromethane		1/119		12-12					0.23	3 [Lifetime HA, 70 kg adult][F]	X_a
Dibromochloromethane		1/122		6.1-6.1					0.1	100 [MCL][T]	
Methylene chloride		1/153		9-9					0.63	5 [MCL][F]	X_a
Toluene		6/153		1-8					93	1000[MCL] [F]	X_a
Semivolatile Organic Compounds, μg/L											
Di-n-butylphthalate		1/10		20-20					365	4000 [DWEL, 70 kg adult]	X_b
Bis(2-ethylhexyl)phthalate		3/10		5-12					0.61	6 [MCL][F]	X_a
Pesticides/PCBs, μg/L											
Dieldrin		1/8		0.006-0.006					0.00053	NA	X_b
Endrin ketone		1/4		0.01-0.01					NA	NA	

000023

6428

TABLE A.2-6 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Inorganics, mg/L											
Aluminum	25/127	22/101	0.04-0.24	0.021-29.7	11/27	4/15	0.062-0.175	0.06-0.225	NA	NA	X_c[5]
Antimony	4/85	3/81	0.031-0.09	0.066-0.112	0/10	0/11	ND	ND	0.006	0.006[MCL][F]	X_c[5]
Arsenic	45/179	34/101	0.001-0.025	0.001-0.071	27/89	7/16	0.002-0.55	0.0011-0.0294	0.0000049	0.05 [MCL][*]	X_c[5]
Barium	123/190	63/100	0.025-0.584	0.028-0.757	97/110	14/16	0.021-0.82	0.0368-0.768	0.26	2[MCL][F]	X_c[5]
Beryllium	8/114	1/100	0.001-0.002	0.011-0.011	6/23	0/16	0.001-0.0023	ND	0.000002	0.004 [MCL][F]	X_c[5]
Cadmium	24/161	7/82	0.002-0.012	0.001-0.045	16/106	3/16	0.002-0.01	0.0022-0.0135	0.0018	0.005 [MCL][F]	X_c[5]
Calcium	186/187	101/101	6.16-270	9.1-912	110/111	16/16	63.6-181	78-162	NA	NA	
Chromium	36/136	39/156	0.008-0.062	0.002-1.56	35/111	2/16	0.008-0.0441	0.0067-0.0211	0.1	0.1 [MCL][F]	X_c[5]
Cobalt	2/114	5/100	0.009-0.014	0.006-0.069	0/23	1/15	ND	0.0086-0.0086	0.22	NA	X_c[5]
Copper	23/191	9/101	0.005-0.104	0.01-0.273	31/110	2/16	0.01-0.176	0.011-0.035	0.136	1.3 [MCLG][F]	X_c[5]
Iron	171/190	101/101	0.03-15.9	0.[illegible]375	74/111	14/15	0.007-5.42	0.312-5.5	NA	0.3 [SMCL][F]	
Lead	17/182	25/101	0.001-0.05	0.[illegible] 1.88	13/79	1/15	0.0016-0.029	0.002-0.002	NA	0.015	X_c[5]
Magnesium	186/186	101/101	0.463-91.7	[illegible]	111/111	16/16	15.7-46	20.1-39	35	NA	X_c[5]
Manganese	177/180	101/101	0.009-1.11	0.00[illegible]5	83/106	16/16	0.002-0.916	0.0043-0.904	0.018	0.05 [SMCL][F]	X_c[5]
Mercury	11/158	2/84	0.002-0.006	0.0002-0.00024	10/104	0/15	0.0002-0.001	ND	0.0011	0.002 [MCL][F]	X_c[5]

TABLE A.2-6 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples: Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples: Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection: Filtered Number of Hit/Samples	Background Frequency of Detection: Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples: Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples: Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Molybdenum	19/139	5/59	0.004-0.06	0.01-0.051	21/90	0/8	0.004-0.04	ND	0.018	0.04 [Lifetime HA, 70 kg adult][D]	X_c[5]
Nickel	20/191	14/101	0.006-13.4	0.007-0.898	14/111	1/16	0.012-0.0279	0.0514-0.0514	0.073	0.1 [MCL][F]	X_c[5]
Phosphorus					NA	75/102		0.01-3.08			
Potassium	137/150	68/82	0.664-8.75	0.483-6.5	94/101	13/16	0.664-4.03	0.648-1.96			
Selenium	7/155	5/82	0.001-0.003	0.001-0.003	6/79	1/15	0.00105-0.006	0.00075-0.00075	0.018	0.05 [MCL][F]	X_c[5]
Silicon	13/13	1/1	0.086-6.43	4.91-4.91	4/4	1/1	2.6-3.46	5.81-5.81		NA	
Silver	22/189	4/101	0.010-0.023	0.002-0.023	13/110	1/16	0.0031-0.034	0.0117-0.0117	0.018	0.1 [Lifetime HA, 70 kg adult][D]	X_c[5]
Sodium	173/173	101/101	3.81-144	3.76-136	106/106	16/16	1.96-101	3.08-50.4		20 [DWEL][***]	
Vanadium	19/127	5/101	0.011-0.098	0.004-0.078	12/27	2/16	0.01-0.0244	0.00076-0.0117	0.026	NA [MCL][L]	X_c[5]
Zinc	41/119	39/100	0.005-0.402	0.008-3	10/23	2/14	0.0068-0.133	0.0087-0.021	1.1	2 [Lifetime HA, 70 kg adult][F]	X_c[5]
Miscellaneous Parameters, mg/L											
Ammonia		127/157		0.03-6.63	NA	40/101	NA	0.045-12.6	NA	NA	X_n
Chloride		227/230		2.63-472	NA	98/110	NA	0.02-120		250 [SMCL][F]	
Fluoride		209/216		0.062-1.18	NA	110/113	NA	0.1-1.9	0.22	4 [MCL][*]	X_n
Nitrate		45/81		0.03-7.2	NA	52/64	NA	0.014-24.9	5.8	10 [MCL][F]	X_n

000073

6478

TABLE A.2-6 (Continued)

Radionuclide/Chemical	Environmental Sample Summary Statistics: Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Environmental Samples Filtered Min/Max Detection	Range of Concentrations Detected in Environmental Samples Unfiltered Min/Max Detection	Background Statistics: Background Frequency of Detection Filtered Number of Hit/Samples	Background Frequency of Detection Unfiltered Number of Hit/Samples	Range of Concentrations Detected in Background Samples Filtered Min/Max Detection Conc.	Range of Concentrations Detected in Background Samples Unfiltered Min/Max Detection Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Nitrate/Nitrite		17/41		0.02-0.59	NA	4/12	NA	0.02-4.1		10 [MCL][F]	X_a
Nitrite, as Nitrogen		1/9		0.04-0.04					0.37	1 [MCL][F]	X_a
Phosphate		5/5		0.15-0.22						NA	
Phosphorus		121/154		0.02-2.54	NA	75/102	NA	0.01-3.08		NA	
Sulfate		224/228		2-500	NA	101/110	NA	2.79-321		250 [SMCL] [F]	X_c
Sulfide		5/16		9.6-40	NA	0/6	NA	ND		NA	

[1]Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
[2]Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.
[3]Acquired from U.S. EPA Drinking Water Standards and Health Advisories, May 1994.
[4]An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment:

- X_a This analyte is a CPC for this media
- X_b This analyte is a CPC in another media, but not in this media
- X_c *This analyte is a CPC because it is a CPC in an "Area of Concern" in groundwater as identified in Attachment A.IV*
- X_d This analyte is a CPC as identified through modeling

[5]Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.
[6]Concentration corresponds to an average annual dose limit of 4 mrems/yr for beta and gamma emitters. May also be applicable to alpha emitters. Derived using Oral Dose Conversion Factors (DCF_{ow}) from U.S. Environmental Protection Agency (EPA), "Radiation Protection of the Public and the Environment; Proposed Rule," 58 Federal Register 56, Washington, D.C., 1993, assuming an annual water intake of 730 L/yr.

[MCL] Maximum Contaminant Level (MCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[SMCL] Secondary Maximum Contaminant Level (SMCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[MCLG] Maximum Contaminant Level Goal (MCLG) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[HA] Health Advisory (HA) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[DWEL] Drinking Water Equivalent Level (DWEL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[D] Draft
[F] Final
[L] Listed for regulation

1 6428

TABLE A.2-6 (Continued)

[P] Proposed
[T] Tentative
[*] Currently undergoing review.
[**] Deferred
[***] Guidance
PCDDs Polychlorinated dibenzo-p-dioxins
PCDFs Polychlorinated dibenzofurans
NA Not available
ND There were no positive hits

000022

61
72
73
DOE

TABLE A.2-7

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN SURFACE WATER GREAT MIAMI RIVER

Radionuclide/Chemical	Sample Statistics - Great Miami River: Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Range of Detected Sample Concentrations Unfiltered Min/Max Detect Conc.	Range of Detected Sample Concentrations Filtered Min/Max Detect Conc.	Background Statistics - Great Miami River: Background Frequency of Detection Unfiltered Number of Hit/Samples	Background Frequency of Detection Filtered Number of Hit/Samples	Range of Detected Background Concentrations Minimum Detected Dect. Conc.	Range of Detected Background Concentrations Maximum Detected Dect. Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Radionuclides, pCi/L											
Radium-226	2/38	3/30	1.6 - 2.4	1.2 - 2.8	1/4	0/3	0.12 - 0.41	ND	0.032	20 [MCL][P]	X_c[5]
Radium-228	1/38	4/30	5 - 5	3.2 - 5	1/5	0/3	2.2 - 2.2	ND	0.048	20 [MCL][P]	X_c[5]
Technetium-99	2/35	17/52	40.1 - 95.9	31.4 - 57.2	0/5	0/2	ND	ND	3.7	3750	X_c[5]
Total Thorium (μg/L)	1/1	1/34	1.8	0.9	NA	NA	NA	NA		6.78[6]	X_c[5]
Thorium-228	4/36	3/53	1.5 - 2.6	1.1 - 2.4	3/5	2/3	0.54-0.62	0.79-0.86	0.087	10[6]	X_c[5]
Thorium-230	2/36	4/53	0.4 - 1.3	0.3 - 0.7	4/5	2/3	0.26 - 0.36	0.38 - 0.62	0.37	2.01[6]	X_c[5]
Total Uranium (μg/L)	39/42	54/67	1 - 5	0.4 - 7	5/5	3/3	0.74 - 1.4	0.52 - 1.1		20 [MCL][P]	X_c[5]
Uranium-234	15/37	32/63	0.5 - 2.2	0.6 - 2.3	5/5	3/3	0.3 - 1.1	0.44 - 0.5	0.30		X_c[5]
Uranium-235/236	0/37	0/63	ND	ND	1/5	0/3	0.25 - 0.25	ND	0.30		X_c[5]
Uranium-238	11/37	29/63	0.5-2	0.4 - 1.9	3/5	3/3	0.59 - 0.76	0.44 - 0.5	0.24		X_c[5]
Volatile Organic Compounds, μg/L											
Trichloroethene	1/4		2 - 2						0.25	5 [MCL][F]	X_a

TABLE A.2-7 (Continued)

Radionuclide/Chemical	Sample Statistics - Great Miami River: Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Range of Detected Sample Concentrations Unfiltered Min/Max Detect Conc.	Range of Detected Sample Concentrations Filtered Min/Max Detect Conc.	Background Statistics - Great Miami River: Background Frequency of Detection Unfiltered Number of Hit/Samples	Background Frequency of Detection Filtered Number of Hit/Samples	Range of Detected Background Concentrations Minimum Detected Dect. Conc.	Range of Detected Background Concentrations Maximum Detected Dect. Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Semivolatile Organic Compounds, µg/L											
Di-n-butylphthalate	1/4		3 - 3						365	4000 [DWEL, 70 kg adult]	X_b
Di-n-octylphthalate	1/4		2 - 2						73	NA	X_a
Bis(2-ethylhexyl)phthalate	2/4		2 - 160						0.61	6 [MCL][F]	X_a
Inorganics, mg/L											
Aluminum	4/6	1/5	0.668 - 19.1	0.856 - 0.856	2/2	2/2	1.3 - 1.89	0.086 - 0.115	NA	NA	X_c[5]
Arsenic	5/24	3/19	0.0021 - 0.0062	0.0011 - 0.0024	2/4	2/3	0.0018 - 0.0036	0.0016 - 0.0024	0.0000049	0.05 [MCL][*]	X_c[5]
Barium	24/24	19/19	0.0379 - 0.228	0.0315 - 0.1	5/5	4/4	0.049 - 0.1	0.075 - 0.1	0.26	2 [MCL][F]	X_c[5]
Beryllium	1/6	0/5	0.0077 - 0.0077	ND	0/2	0/2	ND	ND	0.000002	0.004 [MCL][F]	X_c[5]
Cadmium	8/24	2/19	0.0017 - 0.0184	0.0027 - 0.0053	2/5	0/4	0.006 - 0.0098	ND	0.0018	0.005 [MCL][F]	X_c[5]
Calcium	24/24	19/19	48.6 - 123	19.8 - 82.6	5/5	4/4	61.2 - 77	66 - 79.3	NA	NA	
Chromium	3/24	0/19	0.0037 - 0.0264	ND	0/5	0/4	ND	ND	0.1	0.1 [MCL][F]	X_c[5]
Copper	2/24	0/19	0.0119 - 0.0308	ND	1/5	0/4	0.0118 - 0.0118	ND	NA	NA	X_c[5]
Cyanide	2/4	1/5	0.00610 - 0.0214	0.0168 - 0.0168	2/2	2/2	0.003 - 0.0052	0.0022 - 0.0041	0.073	0.2 [MCL][P]	X_d, X_c[5]
Iron	23/24	6/19	0.175 - 18.7	0.09 - 0.869	5/5	0/4	0.164 - 2.23	ND	NA	0.3 [SMCL][F]	
Lead	7/24	5/19	0.0021 - 0.09	0.0014 - 0.08	1/4	0/3	0.01 - 0.01	ND	NA	0.015	X_c[5]
Magnesium	24/24	19/19	16.4 - 47.5	7.68 - 36.1	5/5	4/4	21.5 - 33.9	27.2 - 34.9	35	NA	X_c[5]

000029

6478

TABLE A.2-7 (Continued)

Radionuclide/Chemical	Sample Statistics - Great Miami River: Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Range of Detected Sample Concentrations Unfiltered Min/Max Detect Conc.	Range of Detected Sample Concentrations Filtered Min/Max Detect Conc.	Background Statistics - Great Miami River: Background Frequency of Detection Unfiltered Number of Hit/Samples	Background Frequency of Detection Filtered Number of Hit/Samples	Range of Detected Background Concentrations Minimum Detected Dect. Conc.	Range of Detected Background Concentrations Maximum Detected Dect. Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Manganese	24/24	7/19	0.0044 - 0.561	0.002 - 0.083	5/5	0/4	0.009 - 0.082	ND	0.018	0.05 [SMCL][F]	X_c[5]
Mercury	3/24	2/19	0.0006 - 0.0019	0.0002 -0.001					0.0011	0.002 [MCL][F]	X_c[5]
Molybdenum	7/24	6/19	0.007 - 0.04	0.024 - 0.06	1/5	0/4	0.02 - 0.02	ND	0.018	0.04 [Lifetime HA, 70 kg adult][D]	X_c[5]
Nickel	7/24	1/19	0.0072 - 0.0259	0.0113 - 0.0113	2/5	0/4	0.11 - 0.023	ND	0.073	0.1 [MCL][F]	X_c[5]
Potassium	24/24	19/19	2.17 - 8	2.09 - 7.95	5/5	4/4	2.3 - 6.08	3.4 - 6.2		NA	
Silicon	6/6	5/5	2.26 - 51.7	2.02 - 3.33	2/2	2/2	4.47 - 5.9	2.5 - 3.04		NA	
Silver	0/24	1/19	ND	0.13 - 0.13	0/5	0/3	ND	ND	0.018	0.1 [Lifetime HA, 70 kg adult][D]	X_c[5]
Sodium	23/23	18/18	12.2 - 84.9	12.7 - 80.1	5/5	4/4	12.9 - 75.8	27.1 - 77.2		20 [DWEL][***]	
Zinc	1/5	0/5	0.112 - 0.112	ND	1/2	0/2	0.0446 - 0.0446	ND	1.1	2 [Lifetime HA, 70 kg adult][F]	X_c[5]
Miscellaneous Parameters, mg/L											
Ammonia	17/23		0.0322 - 1.9		2/4	NA	0.1 - 0.11	NA	NA	NA	X_s
Chloride	23/23		10 - 252		5/5	NA	18 - 325	NA		250 [SMCL][F]	
Fluoride	23/23		0.25 - 0.9		5/5	NA	0.27 - 0.9	NA	0.22	4 [MCL][*]	X_s
Nitrate	18/19		0.4 - 8.27		5/5	NA	0.4 - 6.58	NA	5.8	10 [MCL][F]	X_s
Nitrate/Nitrite	3/3		3.5 - 6.3							10 [MCL][F]	X_s

000080

TABLE A.2-7 (Continued)

Radionuclide/Chemical	Sample Statistics - Great Miami River: Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Range of Detected Sample Concentrations Unfiltered Min/Max Detect Conc.	Range of Detected Sample Concentrations Filtered Min/Max Detect Conc.	Background Statistics - Great Miami River: Background Frequency of Detection Unfiltered Number of Hit/Samples	Background Frequency of Detection Filtered Number of Hit/Samples	Range of Detected Background Concentrations Minimum Detected Dect. Conc.	Range of Detected Background Concentrations Maximum Detected Dect. Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Phenols	8/17		0.01 - 0.03		1/4	NA	0.01 - 0.01	NA		NA	
Phosphate	4/4		0.1 - 0.155							NA	
Phosphorus	19/19		0.05 - 4.9		5/5	NA	0.12 - 1.1	NA		NA	
Sulfate	23/23		61 - 191.9		4/4	NA	45.6 - 138	NA		250 [SMCL][F]	

[1]Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.

[2]*Screening levels developed per methodology presented in U.S. EPA guidance entitled* "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.

[3]Acquired from U.S. EPA Drinking Water Standards and Health Advisories, May 1994.

[4]An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment:

- X_a This analyte is a CPC for this media
- X_b This analyte is a CPC in another media, but not in this media
- X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in surface water as identified in Attachment A.IV
- X_d This analyte is a CPC as identified through modeling

[5]Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.

[6]Concentration corresponds to an average annual dose limit of 4 mrems/yr for beta and gamma emitters. May also be applicable to alpha emitters. Derived using Oral Dose Conversion Factors (DCFos) from U.S. Environmental Protection Agency (EPA), "Radiation Protection of the Public and the Environment; Proposed Rule," 58 Federal Register 56, Washington, D.C., 1993, assuming an annual water intake of 730 L/yr.

[MCL] *Maximum Contaminant Level (MCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.*

[SMCL] Secondary Maximum Contaminant Level (SMCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.

[MCLG] Maximum Contaminant Level Goal (MCLG) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.

[HA] Health Advisory (HA) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.

[DWEL] Drinking Water Equivalent Level (DWEL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.

[D] Draft

[F] Final

[L] Listed for regulation

[P] Proposed

[T] Tentative

TABLE A.2-7 (Continued)

[*] Currently undergoing review.
[**] Deferred
[***] Guidance
NA Not availalbe
ND There were no positive hits

61
72
73
DOE

TABLE A.2-8

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN SURFACE WATER PADDYS RUN

	Sample Statistics - Paddys Run				Background Statistics - Paddys Run				U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
	Sample Frequency of Detection[1]		Range of Detected Sample Concentrations		Background Frequency of Detection		Range of Detected Background Concentrations				
Radionuclide/Chemical	Unfiltered Number of Hit/Samples	Filtered Number of Hit/Samples	Unfiltered Min/Max Detect. Conc.	Filtered Min/Max Detect. Conc.	Unfiltered Number of Hit/Samples	Filtered Number of Hit/Samples	Unfiltered Min/Max Detect. Conc.	Filtered Min/Max Detect. Conc.			
Radionuclides, pCi/L											
Cesium-137	0/7	0/12	ND	ND	1/1	1/1	3.1 - 3.1	3.9 - 3.9	0.17	110[6]	
Neptunium-237	0/5	0/15	ND	ND	NA	1/1	0.42 - 0.42	NA	0.022	1.23[6]	X_c[5]
Plutonium-239/240	0/5	0/22	ND	ND	1/1	1/1	0.093 - 0.093	0.29 - 0.29	0.021	1.55[6]	X_c[5]
Radium-226	0/33	3/29	ND	1.4 - 2	1/2	0/2	0.35 - 0.35	ND	0.032	20 [MCL][P]	X_c[5]
Radium-228	0/34	2/28	ND	3.2 - 3.7	1/2	0/2	2.1 - 2.1	ND	0.048	20 [MCL][P]	X_c[5]
Strontium-90	1/25	0/21	24 - 24	ND	1/1	1/1	0.96 - 0.96	0.86 - 0.86	0.13	4[6]	X_c[5]
Technetium-99	0/13	2/21	ND	59.9 - 62.5	0/2	0/2	ND	ND	3.7	3750[6]	X_c[5]
Total Thorium (μg/L)	3/24	4/22	0.91201 - 3.648	0.912 - 3.64803	0/1	0/1	ND	ND		6.78[6]	X_c[5]
Thorium-228	9/31	7/29	1.78 - 4.82	1 - 5.48	0/2	0/2	ND	ND	0.087	10[6]	X_c[5]
Thorium-230	7/31	6/29	0.3 - 6.74	0.4 - 1.98	0/2	1/2	ND	0.28 - 0.28	0.37	2.01[6]	X_c[5]
Thorium-232	1/31	1/29	0.4 - 0.4	0.4 - 0.4	0/2	0/2	ND	ND	0.4	400[6]	X_c[5]
Total Uranium (μg/L)	34/35	40/40	1.7 - 26.1	1.6 - 34.2	2/2	2/2	0.9 - 1.1	0.81 - 1.1		20 [MCL][P]	X_c[5]
Uranium-234	29/30	25/27	1.3 - 10.9	1 - 9.7	1/1	2/2	0.7 - 0.7	0.45 - 0.7	0.30		X_c[5]
Uranium-235/236	1/30	3/27	0.4 - 0.4	0.4 - 1.98	0/2	0/2	ND	ND	0.30		X_c[5]
Uranium-238	29/30	24/25	2 - 14.1	1 - 9.2	2/2	2/2	0.6 - 0.73	0.48 - 0.5	0.24		X_c[5]
Volatile Organic Compounds, μg/L											
Trichloroethene	2/10		2 -2						0.25	5 [MCL][F]	X_c

000083

6478

TABLE A.2-8 (Continued)

Radionuclide/Chemical	Sample Statistics - Paddys Run: Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Range of Detected Sample Concentrations Unfiltered Min/Max Detect. Conc.	Range of Detected Sample Concentrations Filtered Min/Max Detect. Conc.	Background Statistics - Paddys Run: Background Frequency of Detection Unfiltered Number of Hit/Samples	Background Frequency of Detection Filtered Number of Hit/Samples	Range of Detected Background Concentrations Unfiltered Min/Max Detect. Conc.	Range of Detected Background Concentrations Filtered Min/Max Detect. Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Semivolatile Organic Compounds, µg/L											
Di-n-octylphthalate	2/8		52 - 89						73	NA	X_a
Diethyl phthalate	1/8		2 - 2						2,920	5000 [Lifetime HA, 70 kg adult][D]	
N-Nitrosodiphenylamine	1/8		4 - 4						1.7	NA	X_a
Bis(2-ethylhexyl)phthalate	3/8		11 - 40						0.61	6 [MCL][F]	X_a
Inorganics, mg/L											
Aluminum	11/16	9/22	0.0639 - 2.95	0.271 - 0.114	2/2	1/2	0.195 - 0.64	0.132 - 0.132	NA	NA	X_c[5]
Antimony	1/2	1/10	0.0025 - 0.0025	0.0146 - 0.0146	0/2	0/2	ND	ND	0.006	0.006 [MCL] [F]	X_c[5]
Arsenic	3/16	4/23	0.002 - 0.0037	0.0022 - 0.0188	0/2	0/2	ND	ND	0.0000049	0.05 [MCL][*]	X_c[5]
Barium	12/16	22/23	0.0378 - 0.0658	0.0288 - 0.0493	2/2	2/2	0.034 - 0.0534	0.0304 - 0.0526	0.26	2 [MCL][F]	X_c[5]
Beryllium	2/12	0/10	0.0011 - 0.0012	ND	0/1	0/1	ND	ND	0.000002	0.004 [MCL] [F]	X_c[5]
Cadmium	8/16	11/23	0.0027 - 0.005	0.003 -0.004	0/2	0/2	ND	ND	0.0018	0.005 [MCL] [F]	X_c[5]
Calcium	15/15	23/23	52.3 - 102	45.2 - 110	2/2	2/2	86.6 - 107	85.3 - 107	NA	NA	
Chromium	7/16	11/23	0.0139 - 0.018	0.017 - 0.053	0/2	0/2	ND	ND	0.1	0.1 [MCL] [F]	X_c[5]
Copper	7/16	3/23	0.0038 - 0.0147	0.0106 - 0.0121	0/1	0/1	ND	ND	0.136	1.3 [MCLG] [F]	X_c[5]

TABLE A.2-8 (Continued)

Radionuclide/Chemical	Sample Statistics - Paddys Run: Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Range of Detected Sample Concentrations Unfiltered Min/Max Detect. Conc.	Range of Detected Sample Concentrations Filtered Min/Max Detect. Conc.	Background Statistics - Paddys Run: Background Frequency of Detection Unfiltered Number of Hit/Samples	Background Frequency of Detection Filtered Number of Hit/Samples	Range of Detected Background Concentrations Unfiltered Min/Max Detect. Conc.	Range of Detected Background Concentrations Filtered Min/Max Detect. Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Cyanide	1/12	0/9	0.0053 - 0.0053	ND	0/2	0/1	ND	ND	0.073	0.2 [MCL][P]	X_d, X_c[5]
Iron	8/16	18/23	0.107 - 2.84	0.0064 - 0.464	2/2	0/2	0.129 - 0.513	ND	NA	0.3 [SMCL] [F]	
Lead	3/15	7/22	0.0044 - 0.156	0.0021 - 0.0107	0/2	0/2	ND	ND	NA	0.015	X_c[5]
Magnesium	15/15	23/23	12.7 - 28.2	9.97 - 27.6	2/2	2/2	20.7 - 27.8	20.4 - 27.7	35	NA	X_c[5]
Manganese	16/16	22/23	0.0075 - 0.0545	0.0048 - 0.0921	1/1	1/1	0.035 - 0.035	0.0257 - 0.0257	0.018	0.05 [SMCL] [F]	X_c[5]
Mercury	0/16	3/23	ND	0.0002 - 0.0003	0/2	0/2	ND	ND	0.0011	0.002 [MCL] [F]	X_c[5]
Molybdenum	1/16	0/23	0.0205 - 0.0205	ND	0/2	0/2	ND	ND	0.018	0.04 [Lifetime HA, 70 kg adult][D]	X_c[5]
Nickel	2/16	1/23	0.0128 - 0.0141	0.025 - 0.025	0/1	0/1	ND	ND	0.073	0.1 [MCL][F]	X_c[5]
Potassium	16/16	21/23	2.13 - 3.95	1.32 - 5.01	2/2	2/2	2.12 - 3.58	1.96 - 3.5		NA	
Selenium	0/13	1/20	ND	0.0169 - 0.0169	0/2	0/2	ND	ND	0.018	0.05 [MCL][F]	X_c[5]
Silicon	9/9	18/18	2.29 - 4.27	1.73 - 5.91	2/2	2/2	2.95 - 3.36	2.43 - 3.01		NA	X_c[5]
Silver	4/13	11/20	0.081 - 0.019	0.004 - 0.0228	0/2	0/2	ND	ND	0.018	0.1 [Lifetime HA, 70 kg adult][D]	X_c[5]
Sodium	15/15	23/23	8.39 - 86	5.55 - 20	2/2	2/2	13 - 18.2	12.9 - 18.3		20 [DWEL] [***]	
Thallium	0/11	1/10	ND	0.0014 - 0.0014	0/1	0/1	ND	ND	0.00026	0.002 [MCL][F]	X_c[5]

TABLE A.2-8 (Continued)

Radionuclide/Chemical	Sample Statistics - Paddys Run: Sample Frequency of Detection[1] Unfiltered Number of Hit/Samples	Sample Frequency of Detection[1] Filtered Number of Hit/Samples	Range of Detected Sample Concentrations Unfiltered Min/Max Detect. Conc.	Range of Detected Sample Concentrations Filtered Min/Max Detect. Conc.	Background Statistics - Paddys Run: Background Frequency of Detection Unfiltered Number of Hit/Samples	Background Frequency of Detection Filtered Number of Hit/Samples	Range of Detected Background Concentrations Unfiltered Min/Max Detect. Conc.	Range of Detected Background Concentrations Filtered Min/Max Detect. Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Vanadium	3/16	5/22	0.0127 - 0.0177	0.01 - 0.0145	0/1	0/1	ND	ND	0.026	NA [MCL][L]	X_c[5]
Zinc	5/12	2/10	0.0051 - 0.0368	0.0036 - 0.0038	0/1	0/1	ND	ND	1.1	2 [Lifetime HA, 70 kg adult][F]	X_c[5]
Miscellaneous Parameters, mg/L											
Ammonia	11/30		0.08 - 0.452		1/2	NA	0.0387 -0.0387	NA	NA	NA	X_n
Chloride	30/30		0.021 - 38.9		2/2	NA	27.8 - 31.6	NA		250 [SMCL][F]	
Fluoride	30/30		0.23 - 0.3		2/2	NA	0.022 - 0.22	NA	0.22	4 [MCL][*]	X_n
Nitrate	20/20		0.863 - 12.1		1/2	NA	1.66 - 1.66	NA	5.8	10 [MCL][F]	X_n
Nitrate/Nitrite	8/9		1.6 - 7.57							10 [MCL][F]	X_n
Nitrite, as Nitrogen	1/1		1.5 - 1.5						0.37	1 [MCL][F]	X_n
Phenols	5/30		0.01 - 0.02		0/2	NA	ND	NA		NA	
Phosphate	5/5		0.159 - 0.459							NA	
Phosphorus	23/25		0.06 - 0.541		1/1	NA	0.228 - 0.228	NA		NA	
Sulfate	26/26		28.57 - 88.9		2/2	NA	46.8 - 55.7	NA		250 [SMCL][F]	

[1]Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
[2]Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.
[3]Acquired from U.S. EPA Drinking Water Standards and Health Advisories, May 1994.
[4]An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment:

TABLE A.2-8 (Continued)

X_a This analyte is a CPC for this media
X_b This analyte is a CPC in another media, but not in this media
X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in surface water as identified in Attachment A.IV
X_d This analyte is a CPC as identified through modeling

(5)Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.

(6)Concentration corresponds to an average annual dose limit of 4 mrems/yr for beta and gamma emitters. May also be applicable to alpha emitters. Derived using Oral Dose Conversion Factors (DCFos) from U.S. Environmental Protection Agency (EPA), "Radiation Protection of the Public and the Environment; Proposed Rule," 58 Federal Register 56, Washington, D.C., 1993, assuming an annual water intake of 730 L/yr.

[MCL] Maximum Contaminant Level (MCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[SMCL] Secondary Maximum Contaminant Level (SMCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[MCLG] Maximum Contaminant Level Goal (MCLG) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[HA] Health Advisory (HA) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[DWEL] Drinking Water Equivalent Level (DWEL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.
[D] Draft
[F] Final
[L] Listed for regulation
[P] Proposed
[T] Tentative
[*] Currently undergoing review.
[***] Guidance
NA Not available
ND There were no positive hits

000087

000588

61
72
73
DOE

TABLE A.2-9

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN SURFACE WATER PRODUCTION AREA

Radionuclide/Chemical	Sample Statistics - Production Area: Sample Frequency of Detection[1] Filtered Number of Hits/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hits/Samples	Range of Detected Sample Concentrations Filtered Min/Max Conc.	Range of Detected Sample Concentrations Unfiltered Min/Max Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Radionuclides, pCi/L							
Neptunium-237	1/9	0/11	0.75-0.75	ND	0.022	1.23[6]	X_c[5]
Plutonium-238	0/9	0/11	ND	ND	0.022	1.71[6]	
Plutonium-239/240	0/9	1/11	ND	0.81 - 0.81	0.021	1.55[6]	X_c[5]
Radium-226	0/16	1/22	ND	2.4 - 2.4	0.032	20 [MCL][P]	X_c[5]
Radium-226 + 8D					0.0059	3.83[6]	
Radium-228	1/16	0/22	4.1 - 4.1	ND	0.048	20 [MCL][P]	X_c[5]
Technetium-99	2/9	1/11	41.3 - 88.5	83.8 - 83.8	3.7	3750[6]	X_c[5]
Total Thorium (µg/L)	3/6	2/10	0.87 - 1.8	1.08 - 1.8		6.78[6]	X_c[5]
Thorium-228	0/11	2/16	ND	0.3 - 1	0.087	10[6]	X_c[5]
Thorium-230	3/11	2/16	0.3-0.5	0.4 - 2.51	0.37	2.01[6]	X_c[5]
Total Uranium (µg/L)	30/30	43/43	4.7 - 2360	7.1 - 2890		20 [MCL][P]	X_c[5]
Uranium-234	12/12	19/19	3.1 - 1170	3.2 - 1040	0.30		X_c[5]
Uranium-235/236	9/12	16/19	1.11 - 38.4	0.4 - 41.8	0.30		X_c[5]
Uranium-238	12/12	19/19	3.1 - 1210	4.3 - 1050	0.24		X_c[5]
Volatile Organic Compounds, µg/L							
1,1,1-Trichloroethane		1/11		4 - 4	200	200 [MCL][F]	X_b
1,1-Dichloroethane		1/11		10 - 10	137	NA	X_b
1,2-Dichloroethene (Total)		1/11		67 - 67	NA	NA	X_b
2-Hexanone		1/11		19 - 19	146	NA	

TABLE A.2-9 (Continued)

Radionuclide/Chemical	Sample Statistics - Production Area: Sample Frequency of Detection[1] Filtered Number of Hits/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hits/Samples	Range of Detected Sample Concentrations Filtered Min/Max Conc.	Range of Detected Sample Concentrations Unfiltered Min/Max Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
4-Methyl-2-pentanone		1/11		16 - 16	183	NA	X_b
Tetrachloroethene		4/11		1 - 240	0.14	5[MCL][F]	X_a
Trichloroethene		3/11		2 - 18	0.25	5 [MCL][F]	X_a
Semivolatile Organic Compounds, µg/L							
Di-n-butylphthalate		2/12		2 - 3	365	4000 [DWEL 70 kg adult]	X_b
Diethyl phthalate		1/12		3 - 3	2,920	NA	
Bis(2-ethylhexyl)phthalate		2/12		1 - 2	0.61	6 [MCL][F]	X_a
Inorganics, mg/L							
Aluminum	4/7	13/15	0.133 - 0.201	0.14 - 14.4	NA	NA	X_c[5]
Arsenic	1/7	2/15	0.0026 - 0.0026	0.0032 - 0.0034	0.0000049	0.05 [MCL][*]	X_c[5]
Barium	7/7	15/15	0.0405 - 0.0711	0.0385 - 0.223	0.26	2[MCL][F]	X_c[5]
Beryllium	1/7	1/15	0.0062 - 0.0062	0.0015 - 0.0015	0.000002	0.004 [MCL][F]	X_c[5]
Calcium	7/7	15/15	95.1 - 132	47 - 198	NA	NA	
Chromium	0/7	2/15	ND	0.0114 - 0.0175	0.1	0.1 [MCL][F]	X_c[5]
Cobalt	0/7	1/15	ND	0.0136 - 0.0136	0.22	NA	X_c[5]
Copper	0/7	2/15	ND	0.0156 - 0.0202	0.136	1.3 [MCLG][F]	X_c[5]
Cyanide	2/4	5/18	0.0024 - 0.0094	0.0024 - 0.0319	0.073	0.2 [MCL][P]	X_d, X_c[5]
Iron	3/7	9/15	0.0402-0.102	0.0866 - 17.7	NA	0.3 [SMCL][F]	
Lead	0/7	2/15	ND	0.0091 - 0.0158	NA	0.015	X_c[5]
Magnesium	7/7	15/15	25.7 - 37.7	10.7 - 65.7	35	NA	X_c[5]
Manganese	7/7	15/15	0.0089 - 0.483	0.0147 - 0.825	0.018	0.05 [SMCL][F]	X_c[5]
Mercury	0/7	1/15	ND	0.0006 - 0.0006	0.0011	0.002 [MCL][F]	X_c[5]
Molybdenum	0/7	1/15	ND	0.023 - 0.023	0.018	0.04 [Lifetime HA, 70 kg adult][D]	X_c[5]

000089
6478

TABLE A.2-9 (Continued)

Radionuclide/Chemical	Sample Statistics - Production Area: Sample Frequency of Detection[1] Filtered Number of Hits/Samples	Sample Frequency of Detection[1] Unfiltered Number of Hits/Samples	Range of Detected Sample Concentrations Filtered Min/Max Conc.	Range of Detected Sample Concentrations Unfiltered Min/Max Conc.	U.S. EPA RAGS, Part B Groundwater Screening Level Residential Scenario[2]	U.S. EPA Drinking Water Standards and Health Advisories[3]	Retained as CPC?[4]
Nickel	0/7	3/15	ND	0.0104-0.027	0.073	0.1 [MCL][F]	X_c[5]
Potassium	7/7	15/15	0.869 - 9.55	0.865 - 9.15		NA	
Selenium	1/7	0/15	0.0046 - 0.0046	ND	0.018	0.05 [MCL][F]	X_c[5]
Silicon	7/7	13/13	2.03 - 6.72	1.91 - 30.2		NA	X_c[5]
Sodium	7/7	15/15	13 - 46	4.96 - 46.4		20 [DWEL][***]	
Zinc	2/7	10/15	0.0134 - 0.0384	0.0054 - 0.51	1.1	2 [Lifetime HA, 70 kg adult][F]	X_c[5]
Miscellaneous Parameters, mg/L							
Ammonia		4/12		0.0682 - 0.446	NA	NA	X_a
Chloride		12/12		7 - 97.94		250 [SMCL][F]	
Fluoride		12/12		0.14 - 0.56	0.22	4 [MCL][*]	X_a
Nitrate		6/9		0.74 - 2.67	5.8	10 [MCL][F]	X_a
Nitrate/Nitrite		2/3		2.61 - 5.66		10 [MCL][F][3]	X_a
Phosphate		1/1		0.292 - 0.292		NA	
Sulfate		11/12		31.8 - 129		250 [SMCL][F]	
Sulfide		1/10		1.01 - 1.01		NA	

[1]Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
[2]Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.
[3]Acquired from U.S. EPA Drinking Water Standards and Health Advisories, May 1994.
[4]An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment:

- X_a This analyte is a CPC for this media
- X_b This analyte is a CPC in another media, but not in this media
- X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in surface water as identified in Attachment A.IV
- X_d This analyte is a CPC as identified through modeling

[5]Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.

TABLE A.2-9 (Continued)

[6]Concentration corresponds to an average annual dose limit of 4 mrems/yr for beta and gamma emitters. May also be applicable to alpha emitters. Derived using Oral Dose Conversion Factors (DCFos) from U.S. Environmental Protection Agency (EPA), "Radiation Protection of the Public and the Environment; Proposed Rule," 58 Federal Register 56, Washington, D.C., 1993, assuming an annual water intake of 730 L/yr.

[MCL] Maximum Contaminant Level (MCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.

[SMCL] Secondary Maximum Contaminant Level (SMCL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.

[MCLG] Maximum Contaminant Level Goal (MCLG) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.

[HA] Health Advisory (HA) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.

[DWEL] Drinking Water Equivalent Level (DWEL) obtained from Drinking Water Regulations and Health Advisories, U.S. EPA, Office of Water. May 1994.

[D] Draft

[F] Final

[L] Listed for regulation

[P] Proposed

[T] Tentative

[*] Currently undergoing review.

[***] Guidance

NA Not available

ND There were no positive hits

61
72
73
DOE

TABLE A.2-10

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN SEDIMENT GREAT MIAMI RIVER

Radionuclide/Chemical	Sample Statistics - Sediments: Sample Frequency of Detection[1] Number Positive Hits	Sample Frequency of Detection[1] Total Number Samples	Range of Detected Sample Concentrations[2] Minimum Detected Conc.	Range of Detected Sample Concentrations[2] Maximum Detected Conc.	Background Statistics - Sediments: Background Frequency of Detection Number Positives Hits	Background Frequency of Detection Total Number Samples	Range of Detected Background Concentrations Minimum Detected Conc.	Range of Detected Background Concentrations Maximum Detected Conc.	U.S. EPA RAGS, Part B, Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Radionuclides, pCi/g										
Radium-226	24	24	0.385	0.912	3	3	0.4	0.57	0.00069	X_c[5]
Strontium-90	1	18	0.8	0.8	0	3	ND	ND	2.2	X_c[5]
Total Thorium (mg/kg)	12	12	1.824	7.296	1	1	3	3	NA	X_c[5]
Thorium-228	6	30	0.3	0.8	0	4	ND	ND	0.00074	X_c[5]
Thorium-230	22	30	0.3	2.3	2	4	0.7	0.72	5.7	X_c[5]
Thorium-232	6	30	0.2	0.8	1	3	0.8	0.8	0.00049	X_c[5]
Uranium, Total (mg/kg)	28	31	1	11	2	3	1.3	3	NA	X_c[5]
Uranium-234	13	29	0.2	1.4	2	4	0.6	0.88	4.8	X_c[5]
Uranium-238	13	29	0.2	1.1	1	4	1	1	0.17	X_c[5]
Volatile Organic Compounds, µg/kg										
Acetone	1	5	37	37					2,737,500	X_b
Carbon disulfide	1	5	2	2					2,737,500	X_b
Chlorobenzene	1	4	2	2					547,500	X_b
Ethylbenzene	1	4	5	5					2,737,500	
Toluene	2	4	2	110					5,475,000	X_b

TABLE A.2-10 (Continued)

Radionuclide/Chemical	Sample Statistics - Sediments: Sample Frequency of Detection[1] Number Positive Hits	Sample Frequency of Detection[1] Total Number Samples	Range of Detected Sample Concentrations[2] Minimum Detected Conc.	Range of Detected Sample Concentrations[2] Maximum Detected Conc.	Background Statistics - Sediments: Background Frequency of Detection Number Positives Hits	Background Frequency of Detection Total Number Samples	Range of Detected Background Concentrations Minimum Detected Conc.	Range of Detected Background Concentrations Maximum Detected Conc.	U.S. EPA RAGS, Part B, Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Semivolatile Organic Compounds, μg/kg										
4-Methylphenol	1	5	200	200					136,875	X_a
Acenaphthene	1	5	120	120					1,642,500	
Anthracene	1	5	470	470					8,212,500	
Benzo(a)anthracene	5	5	51	2600					58	X_a
Benzo(a)pyrene	3	5	77	2100					8.8	X_a
Benzo(b)fluoranthene	5	5	74	2700					71	X_a
Benzo(g,h,i)perylene	1	5	1300	1300					NA	
Benzo(k)fluoranthene	5	5	81	2100					168	X_a
Benzoic Acid	3	5	65	210					109,500,000	
Chrysene	5	5	70	2700					1,996	X_a
Di-n-butylphthalate	1	5	81	81					2,737,500	X_a
Dibenzo(a,h)anthracene	1	5	580	580					8.8	X_a
Dibenzofuran	1	5	63	63					109,500	X_a
Fluoranthene	5	5	150	5500					1,095,000	X_a
Fluorene	1	5	130	130					1,095,000	
Indeno(1,2,3-cd)pyrene	2	5	58	1600					32	X_a
Phenanthrene	5	5	78	2200					NA	X_b
Pyrene	5	5	130	4400					821,250	X_a

000093

TABLE A.2-10 (Continued)

Radionuclide/Chemical	Sample Statistics - Sediments: Sample Frequency of Detection[1] Number Positive Hits	Sample Frequency of Detection[1] Total Number Samples	Range of Detected Sample Concentrations[2] Minimum Detected Conc.	Range of Detected Sample Concentrations[2] Maximum Detected Conc.	Background Statistics - Sediments: Background Frequency of Detection Number Positives Hits	Background Frequency of Detection Total Number Samples	Range of Detected Background Concentrations Minimum Detected Conc.	Range of Detected Background Concentrations Maximum Detected Conc.	U.S. EPA RAGS, Part B, Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Inorganics, mg/kg										
Aluminum	5	5	4590	11600					NA	X_c[5]
Arsenic	5	5	1.7	11.7					0.037	X_c[5]
Barium	5	5	57.8	130					1,916	X_c[5]
Beryllium	3	5	1.4	3					0.015	X_c[5]
Calcium	5	5	44700	120000					NA	
Chromium	5	5	9.2	15.9					137	X_c[5]
Cobalt	5	5	4.7	12.7					1,643	X_c[5]
Copper	5	5	13.5	36.9					1,018	X_c[5]
Cyanide	1	4	0.39	0.39					548	X_c[5]
Iron	5	5	10500	21000					NA	
Lead	5	5	16	78.4					NA	X_c[5]
Magnesium	5	5	12300	21500					265,538	X_c[5]
Manganese	5	5	402	1400					137	X_c[5]
Nickel	5	5	12.9	19.8					548	X_c[5]
Potassium	5	5	698	1410					NA	
Selenium	1	1	0.75	0.75					137	X_c[5]
Silicon	5	5	135	1140					NA	X_c[5]
Sodium	1	5	91.1	91.1					NA	
Vanadium	5	5	11.1	24.3					192	X_c[5]
Zinc	5	5	61	171					8,213	X_c[5]

TABLE A.2-10 (Continued)

---

(1)Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
(2)Ranges and means of detected concentrations presented are inclusive of all depth intervals.
(3)Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I-Human Health Evaluation Manual-Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.
(4)An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment:

- X_a This analyte is a CPC for this media
- X_b This analyte is a CPC in another media, but not in this media
- X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in sediment as identified in Attachment A.IV
- X_d This analyte is a CPC as identified through modeling

(5)Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.
NA Not available
ND There were no positive hits.

000095

6478

61
72
73
DOE

TABLE A.2-11

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN SEDIMENT PADDYS RUN (AND OTHER FEMP DRAINAGES[6])

Radionuclide/Chemical	Sample Statistics - Sediments: Sample Frequency of Detection[1] Number Positive Hits	Sample Frequency of Detection[1] Total Number Samples	Range of Detected Sample Concentrations[2] Minimum Detected Conc.	Range of Detected Sample Concentrations[2] Maximum Detected Conc.	Background Statistics - Sediments: Background Frequency of Detection Number Positives Hits	Background Frequency of Detection Total Number Samples	Range of Detected Background Concentrations Minimum Detected Conc.	Range of Detected Background Concentrations Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Radionuclides, pCi/g										
Cesium-137	1	12	0.258	0.258					0.0021	
Neptunium-237	4	11	0.285	0.625					0.0094	X_c[5]
Plutonium-238	1	12	1.89	1.89					0.36	
Plutonium-239/240	1	12	0.374	0.374					0.34	
Radium-226	40	42	0.001	3.53	3	3	0.4	0.5	0.00069	X_c[5]
Radium-228	20	42	0.001	2.92	0	3	ND	ND	0.0014	X_c[5]
Strontium-90	5	12	0.546	1.01					2.2	X_c[5]
Total Thorium (mg/kg)	20	20	1.84	23.4					NA	X_c[5]
Thorium-228	20	24	0.3	2.8					0.00074	X_c[5]
Thorium-230	24	24	0.5	8.96					5.7	X_c[5]
Thorium-232	21	24	0.2	2.57					0.00049	X_c[5]
Uranium, Total (mg/kg)	57	59	1	51.8	3	3	1	3	NA	X_c[5]
Uranium-234	25	25	0.004	7.95					4.8	X_c[5]
Uranium 235/236	9	25	0.1	0.9					NA	X_c[5]
Uranium-238	25	25	0.007	10.8					0.17	X_c[5]

TABLE A.2-11 (Continued)

Radionuclide/Chemical	Sample Statistics - Sediments: Sample Frequency of Detection[1] Number Positive Hits	Sample Frequency of Detection[1] Total Number Samples	Range of Detected Sample Concentrations[2] Minimum Detected Conc.	Range of Detected Sample Concentrations[2] Maximum Detected Conc.	Background Statistics - Sediments: Background Frequency of Detection Number Positives Hits	Background Frequency of Detection Total Number Samples	Range of Detected Background Concentrations Minimum Detected Conc.	Range of Detected Background Concentrations Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Volatile Organic Compounds, µg/kg										
1,1-Dichloroethane	1	26	3	3					NA	X_b
2-Hexanone	1	26	11	11					1,095,000	
Acetone	3	26	2	180					2,737,500	X_b
Ethylbenzene	1	26	1	1					2,737,500	
Methylene chloride	5	26	2	7					8,517	X_a
Toluene	6	26	2	35					5,475,000	X_b
Semivolatile Organic Compounds, µg/kg										
2-Methylnaphthalene	1	24	56	56					1,095,000	
4-Methylphenol	2	24	310	310					136,875	X_a
Acenaphthene	1	24	98	98					1,642,500	
Anthracene	1	24	240	240					8,212,500	
Benzo(a)anthracene	8	24	49	500					58	X_a
Benzo(a)pyrene	6	23	54	550					8.8	X_a
Benzo(b)fluoranthene	9	23	59	730					71	X_a
Benzo(g,h,i)perylene	4	23	100	240					NA	
Benzo(k)fluoranthene	10	23	54	300					168	X_a
Benzoic Acid	4	16	45	200					109,500,000	
Carbazole	1	14	120	120					3,194	X_a
Chrysene	10	24	50	510					1,996	X_a
Di-n-butylphthalate	3	24	53	80					2,737,500	X_a
Fluoranthene	13	24	50	1400					1,095,000	X_a

TABLE A.2-11 (Continued)

Radionuclide/Chemical	Sample Statistics - Sediments: Sample Frequency of Detection[1] Number Positive Hits	Sample Frequency of Detection[1] Total Number Samples	Range of Detected Sample Concentrations[2] Minimum Detected Conc.	Range of Detected Sample Concentrations[2] Maximum Detected Conc.	Background Statistics - Sediments: Background Frequency of Detection Number Positives Hits	Background Frequency of Detection Total Number Samples	Range of Detected Background Concentrations Minimum Detected Conc.	Range of Detected Background Concentrations Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Indeno(1,2,3-cd)pyrene	4	23	99	310					32	X_a
Naphthalene	1	24	51	51					1,095,000	
Phenanthrene	9	24	62	1000					NA	X_b
Phenol	1	24	56	56					16,425,000	
Pyrene	13	24	58	990					821,250	X_a
Bis(2-ethylhexyl)phthalate	7	24	53	2200					4,563	X_a
Pesticides/PCBs, µg/kg										
Aroclor 1254	1	13	96	96					8.3	X_a
Inorganics, mg/kg										
Aluminum	24	24	888	20500	1	1	1970	1970	NA	X_c[5]
Arsenic	24	24	2	75.6	1	1	7	7	0.037	X_c[5]
Barium	24	24	14	212	1	1	21	21	1,916	X_c[5]
Beryllium	15	24	0.5	4.6	1	1	0.5	0.5	0.015	X_c[5]
Cadmium	4	19	0.73	5.5	1	1	3.7	3.7	14	X_c[5]
Calcium	24	24	5340	294000	1	1	25900	25900	NA	
Chromium	23	24	2.5	27.8	1	1	18.3	18.3	137	X_c[5]
Cobalt	17	24	3.7	19.4	1	1	4.9	4.9	1,643	X_c[5]
Copper	23	24	3.3	122	1	1	10.8	10.8	1,018	X_c[5]
Cyanide	4	26	0.18	0.54					548	X_d,X_c[5]
Iron	24	24	5350	33000	1	1	6700	6700	NA	
Lead	22	23	4.3	91.5					NA	X_c[5]

TABLE A.2-11 (Continued)

Radionuclide/Chemical	Sample Statistics - Sediments: Sample Frequency of Detection[1] Number Positive Hits	Sample Frequency of Detection[1] Total Number Samples	Range of Detected Sample Concentrations[2] Minimum Detected Conc.	Range of Detected Sample Concentrations[2] Maximum Detected Conc.	Background Statistics - Sediments: Background Frequency of Detection Number Positives Hits	Background Frequency of Detection Total Number Samples	Range of Detected Background Concentrations Minimum Detected Conc.	Range of Detected Background Concentrations Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Magnesium	24	24	1180	72500	1	1	18300	18300	265,538	X_c[5]
Manganese	24	24	32.5	1640	1	1	411	411	137	X_c[5]
Mercury	2	24	0.07	0.19	0	1	ND	ND	8.2	X_c[5]
Molybdenum	3	26	6.3	6.6	0	1	ND	ND	137	X_c[5]
Nickel	21	24	5	36.4	1	1	13.7	13.7	548	X_c[5]
Potassium	22	25	214	2600	1	1	307	307	NA	
Selenium	3	11	0.86	9.6	0	1	ND	ND	137	X_c[5]
Silicon	20	20	164	1670	0	1	ND	ND	NA	X_c[5]
Silver	5	18	0.25	6.8	0	1	ND	ND	137	X_c[5]
Sodium	18	24	67.1	357	1	1	197	197	NA	
Thallium	3	25	0.76	4.4					1.9	X_c[5]
Vanadium	24	24	6.1	53.6	1	1	12.4	12.4	192	X_c[5]
Zinc	21	22	13.4	118	1	1	13.5	13.5	8,213	X_c[5]
Miscellaneous Parameters, mg/kg										
Ammonia	2	2	50.4	93.6					NA	X_n
Fluoride	2	2	5.69	7.58					1,643	X_n
Nitrate	2	2	2.62	2.76					43,800	X_n
Phosphorus	2	2	37.4	38.9					NA	
Sulfate	2	2	418	697					NA	

TABLE A.2-11 (Continued)

[1]Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
[2]Ranges and means of detected concentrations presented are inclusive of all depth intervals.
[3]Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I-Human Health Evaluation Manual-Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.
[4]An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment:

- X_a *This analyte is a CPC for this media*
- X_b This analyte is a CPC in another media, but not in this media
- X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in sediment as identified in Attachment A.IV
- X_d This analyte is a CPC as identified through modeling

[5]Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.
NA Not available
ND There were no positive hits.
[6]Conservatively, contaminants in sediments in drainages from source areas (such as Operable Unit 2) leading to Paddys Run were also considered in the selection of CPCs for human health risk assessment. Because these drainages were within other operable units, they were not evaluated by the Operable Unit 5 exposure assessment. The reader is referred to Attachment IV tables for an accounting of CPCs in surface water drainages evaluated in the Operable Unit 5 risk assessment.

61
72
73
DOE

TABLE A.2-12

SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN IN SEDIMENT PRODUCTION AREA

Radionuclide/Chemical	Sample Statistics - Sediments: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Detected Sample Concentrations[2] Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Radionuclides, pCi/g						
Cesium-137	1	1	0.456	0.456	0.0021	
Plutonium-238	1	1	4.85	4.85	0.36	
Radium-226	12	12	0.70	10.60	0.00069	X_c[5]
Radium-228	10	12	0.60	21.70	0.0014	X_c[5]
Strontium-90	1	1	3.24	3.24	2.2	X_c[5]
Technetium-99	1	1	1.83	1.83	61	
Total Thorium (mg/kg)	5	6	5.472	51.00	NA	X_c[5]
Thorium-228	5	5	0.60	9.90	0.00074	X_c[5]
Thorium-230	5	5	2.90	8.50	5.7	X_c[5]
Thorium-232	5	5	0.60	9.55	6.4	X_c[5]
Total Uranium (mg/kg)	17	17	3.60	486.00	NA	X_c[5]
Uranium-234	5	5	4.10	116.00	4.8	X_c[5]
Uranium 235/236	5	5	0.20	8.56	NA	X_c[5]
Uranium-238	5	5	4.60	158.00	0.17	X_c[5]
Volatile Organic Compounds, µg/kg						
Ethylbenzene	1	5	3.00	3.00	2,737,500	
Methylene chloride	1	5	2.00	2.00	8,517	X_c
Total Xylenes	1	5	4.00	4.00	54,750,000	

000101

6478

TABLE A.2-12 (Continued)

Radionuclide/Chemical	Sample Statistics - Sediments: Sample Frequency of Detection[1] Number Positive Hits	Total Number Samples	Range of Detected Sample Concentrations[2] Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Semivolatile Organic Compounds, µg/kg						
Anthracene	1	5	130.00	130.00	8,212,500	
Benzo(a)anthracene	4	5	68.00	660.00	58	X_a
Benzo(a)pyrene	3	5	61.00	1400.00	8.8	X_a
Benzo(b)fluoranthene	4	5	110.00	1800.00	71	X_a
Benzo(g,h,i)perylene	2	5	480.00	2600.00	NA	
Benzo(k)fluoranthene	4	5	66.00	1200.00	168	X_a
Chrysene	5	5	62.00	1100.00	1,996	X_a
Di-n-butylphthalate	2	5	78.00	550.00	2,737,500	X_a
Dibenzo(a,h)anthracene	1	5	280.00	280.00	8.8	X_a
Fluoranthene	5	5	150.00	1300.00	1,095,000	X_a
Indeno(1,2,3-cd)pyrene	2	5	460.00	2300.00	32	X_a
Phenanthrene	5	5	62.00	380.00	NA	X_b
Pyrene	5	5	110.00	1300.00	821,250	X_a
Bis(2-ethylhexyl)phthalate	2	5	63.00	560.00	4,563	X_a
Pesticides/PCBs, µg/kg						
Aroclor 1254	1	1	1800.00	1800.00	8.3	X_a
Inorganics, mg/kg						
Aluminum	5	6	2490.00	10200.00	NA	X_c[5]
Arsenic	5	6	3.50	9.10	0.037	X_c[5]
Barium	6	6	0.028	134.00	1,916	X_c[5]
Beryllium	2	6	1.40	1.50	0.015	X_c[5]
Calcium	6	6	43.90	146000.00	NA	

TABLE A.2-12 (Continued)

Radionuclide/Chemical	Sample Statistics - Sediments: Sample Frequency of Detection[1]: Number Positive Hits	Total Number Samples	Range of Detected Sample Concentrations[2]: Minimum Detected Conc.	Maximum Detected Conc.	U.S. EPA RAGS, Part B Soil Screening Level Residential Scenario[3]	Retained as CPC?[4]
Chromium	5	6	14.70	27.80	137	X_c[5]
Cobalt	5	6	2.40	11.80	1,643	X_c[5]
Copper	5	6	21.00	61.60	1,018	X_c[5]
Iron	5	6	17300.00	19200.00	NA	
Lead	6	6	0.004	95.70	NA	X_c[5]
Magnesium	6	6	6.05	30100.00	265,538	X_c[5]
Manganese	6	6	0.008	791.00	137	X_c[5]
Molybdenum	1	6	5.00	5.00	137	X_c[5]
Nickel	5	6	12.60	23.50	548	X_c[5]
Potassium	6	6	3.25	2220.00	NA	
Silicon	6	6	3.86	2830.00	NA	X_c[5]
Silver	1	5	5.60	5.60	137	X_c[5]
Sodium	6	6	30.70	382.00	NA	
Vanadium	5	6	12.60	32.90	192	X_c[5]
Zinc	5	6	83.30	231.00	8,213	X_c[5]
Miscellaneous Parameters, mg/kg						
Chloride	4	4	0.37	4.10	NA	

[1]Overall frequency of detection is presented as the number of detected concentrations over the total number of analyses.
[2]Ranges and means of detected concentrations presented are inclusive of all depth intervals.
[3]Screening levels developed per methodology presented in U.S. EPA guidance entitled "Risk Assessment Guidance for Superfund Volume I-Human Health Evaluation Manual-Part B" (Publication 9285.7-01B, December 1991). Attachment III provides the methodology used to develop the screening levels.

TABLE A.2-12 (Continued)

[4]An "X" present in the "Retained as CPC?" column indicates the analyte was selected as a CPC for quantitative risk assessment:

- X_a This analyte is a CPC for this media
- X_b This analyte is a CPC in another media, but not in this media
- X_c This analyte is a CPC because it is a CPC in an "Area of Concern" in sediment as identified in Attachment A.IV
- X_d This analyte is a CPC as identified through modeling

[5]Radiologicals and metals were selected as CPCs based on a comparison to background. The statistical methods used to determine if an analyte was detected above background are detailed in this section (Section A.2) and Attachment A.II. The results of the comparison to backgrounds are presented on an "Area of Concern" basis in Attachment IV.

NA Not available

ND There were no positive hits.

TABLE A.2-13

MAJOR CHEMICALS/RADIOACTIVE PROCESS MATERIALS USED AT THE FEMP

Plant	Chemical	Use
1	a. Magnesium fluoride (slag), MgF_2	Grind for Plant 2/3
	[1]b. Nitric acid, HNO_3	Digestion of enriched feed materials
	c. Uranium, metal	Recycle feed to Plant 2/3
	[1]d. Uranium dioxide, UO_2	Recycle feed to Plant 2/3
	e. Uranium octo-oxide (yellowcake), U_3O_8	Feed material to Plant 2/3
	[1]f. Uranyl nitrate hexahydrate (UNH), $UO_2(NO_3)_2 \bullet 6H_20$	Feed from digestion of enriched feed materials to Plant 2/3
2/3	[1]a. Calcium oxide, lime, CaO	Neutralize raffinate and other wastes for disposal
	b. Kerosene	Solvent for TBP for uranyl nitrate extraction
	c. Magnesium fluoride (slag), MgF_2	Recycle from Plant 5 for leaching with HNO_3 to recover enriched or natural uranium
	[1]d. Nitric acid, HNO_3	Digestion of uranium feed and recycled oxides, leachate for MgF_2, scrubber acid
	[1]e. Sodium carbonate, Na_2CO_3	Treat TBP solvent after uranyl nitrate back-extraction into water
	[1]f. Sodium diuranate, $Na_2\ U_2O_7$	Recycle material from Plant 8 ADU process
	g. Tributyl phosphate (TBP), $(C_4H_9)_3PO_4$	Solvent extraction of uranyl nitrate
	[1]h. Thorium nitrate hexahydrate, TNT, $Th(NO_3)_4 \bullet 6H_2O$	Product, and perhaps converted to THO_2
	[1]i. Thorium oxide (thoria), ThO_2	Product of TNT denitration

6478

TABLE A.2-14 (Continued)

Source	Radionuclide		Half-Life[a]	Decay Mode[b]	Significant Level in Processed Material[c]
4. Activation Products	a.1	^{241}Pu	14.4 y	β^-	N
	a.2	^{241}Am	432.2 y	α	N
	a.3	^{237}Np	2.14×10^6 y	α	N
	b.	^{240}Pu	6,569 y	α	N
	c.	^{239}Pu	24,131 y	α	N
	d.	^{238}Pu	87.75 y	α	N
	e.	^{236}U	2.341×10^7 y	α	P
5. Fission Products	a.1	^{90}Sr	28.6 y	β^-	N
	a.2	^{90}Y	64.1 h	β^-	N
	b.	^{99}Tc	2.13×10^5 y	β^-	P
	c.1	^{106}Ru	368.2 d	β^-	N
	c.2	^{106}Rh	29.92 s	β^-	N
	d.1	^{137}Cs	30.17 y	β^-	N
	d.2	^{137m}Ba	2.552 m	IT	N

[a]David C. Kocher, "Radioactive Decay Data Tables," Technical Information Center, Department of Energy, DOE/TIC-11026, April 1981.
[b]α = alpha, β = beta, IT = internal transition.
[c]Y = yes, N = no, P = possible; material could be present at significant levels in unprocessed material.

DOE

TABLE A.2-15

ORGANIC CONSTITUENTS OF POTENTIAL CONCERN[a]
OPERABLE UNIT 5

Parameter	Groundwater[b]	Surface Soil	Subsurface Soil	Surface Water[c]	Sediment[c]
Volatile Organic Compounds					
1,1,1-Trichloroethane	X				
1,1,2,2-Tetrachloroethane	X				
1,1-Dichloroethane	X		X		
1,1-Dichloroethene	X		X		
1,2-Dichloroethane	X				
1,2-Dichloroethene	X			X	
2-Butanone	X				
4-Methyl-2-pentanone	X				
Acetone	X				
Benzene	X	X	X		
Bromoform	X				
Carbon tetrachloride	X	X			
Carbon disulfide	X				
Chloroform	X	X	X		
Chloromethane	X				
Chlorobenzene	X				
Methylene chloride	X	X	X		X
Tetrachloroethene	X	X	X	X	
Toluene	X				
Trichloroethene	X	X	X	X	
Vinyl chloride	X		X		
Pesticides/PCBs					
Aroclor-1254		X	X		X
Aroclor-1260		X	X		
Beta BHC		X			
Dieldrin		X			

6478

TABLE A.2-15 (Continued)

Parameter	Groundwater[b]	Surface Soil	Subsurface Soil	Surface Water[c]	Sediment[c]
Dioxins/Furans					
Dioxins					
2,3,7,8-Tetrachlorodibenzo-p-dioxin	X				
Tetrachlorodibenzo-p-dioxins	X				
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	X				
Heptachlorodibenzo-p-dioxins	X				
Octachlorodibenzo-p-dioxin	X	X			
Furans					
2,3,7,8-Tetrachlorodibenzofuran	X				
Tetrachlorodibenzofurans	X				
1,2,3,7,8-pentachlorodibenzofuran	X				
2,3,4,7,8-pentachlorodibenzofuran	X				
Pentachlorodibenzofurans	X				
Hexachlorodibenzofurans	X				
Heptachlorodibenzofurans	X	X			
Octachlorodibenzofuran	X	X	X		
Semivolatile Organic Compounds					
1,2,4-Trichlorobenzene	X				
2,4-Dimethylphenol	X				
2,6-Dinitrotoluene	X				
2-Chlorophenol	X				
4-Methylphenol					X
Benzo(a)anthracene		X	X		X
Benzo(a)pyrene		X	X		X
Benzo(b)fluoranthene		X	X		X
Benzo(k)fluoranthene		X	X		X
Carbazole	X	X			X
Chrysene		X	X		X
Di-n-butylphthalate					X

TABLE A.2-15 (Continued)

Parameter	Groundwater[b]	Surface Soil	Subsurface Soil	Surface Water[c]	Sediment[c]
Di-n-octylphthalate				X	
Dibenzo(a,h)anthracene		X	X		X
Dibenzofuran					X
Fluoranthene		X	X		X
Indeno(1,2,3-cd)pyrene		X	X		X
N-Nitroso-di-n-propylamine	X				
N-Nitrosodiphenylamine	X			X	
Pentachlorophenol	X				
Phenanthrene		X	X		
Pyrene		X	X		X
Tributyl phosphate	X				
Bis(2-ethylhexyl)phthalate	X	X	X	X	X
Miscellaneous Parameters					
Cyanide	X				
Nitrate	X				
Nitrite	X				
Ammonia	X				
Fluoride	X				

[a]In addition to the chemicals listed herein, alpha chlordane, bis(2-chloroisopropyl)ether, bromodichloromethane, bromomethane, 3,3'-dichlorobenzidine and 4-nitroaniline were selected as CPCs through groundwater and surface water modeling.

[b]*The organic constituents of potential concern for groundwater were selected based on a review of the Operable Unit 5 groundwater data regardless of source or date of sample collection. However, as detailed in Section A.3, both monitoring well location and date of sample collection were considered in the selection of data for quantitative risk analysis. COPCs for the baseline risk assessment are identified on an "area of concern" basis in the Appendix A.IV tables.*

[c]*The organic constituents of potential concern for surface water/sediment were selected, conservatively, based on a review of data available for Paddys Run, the Great Miami River, and associated drainages (some of which are not in Operable Unit 5 proper or to which the potential for exposure is extremely limited). However, as detailed in Section A.3, both sampling location and date of sample collection were considered in the selection of data for quantitative risk assessment. COPCs for the baseline risk assessment are identified on an "area of concern" basis in the Appendix A.IV tables.*

the river reach between the outfall and the confluence with Paddys Run, 2) in the river at and below the confluence with Paddys Run, and 3) in the off-property surface water and sediment of Paddys Run. Figure A.3-6 depicts the off-property receptor locations.

76 Risk evaluation areas considered for the future land-use scenarios reflect potential future land use on property and off property in the vicinity of the FEMP. It is assumed that the FEMP may be used for agricultural purposes. Consequently, some of the on-property risk evaluation areas identified for the current land-use scenario have been combined to consider the potential for agricultural use of larger areas. For example, Areas 1 through 4 were combined into the production area. Areas 5 and 6, both being smaller than 1 acre, are too small for potential agricultural purposes. Hence, Area 5 and 6 were combined with their adjoining area, Area 7, forming the northeast area. ***It should be noted that environmental contamination (soil and groundwater) in Area 6 generally exceeds that detected in Areas 5 and 7. Thus, contaminant concentrations/activities in Area 6 strongly influence exposure point concentrations/activities developed for the combined Areas 5, 6, and 7. Area 6 is a "hot spot" (particularly for radiologicals [e.g., uranium, technetium]) at the FEMP and has been the target of a soil removal action.*** In addition, because the northeast region of the site lies in the predominant downwind direction, the combination appears appropriate for risk evaluation. Area 10, however, the largest on-property study area, was subdivided into three areas (study area 10A, 10B, and 10C) because it is large enough to be subdivided and used for different purposes, because of the location of Operable Unit 2, and because contamination profiles of constituents of potential concern (CPCs) (particularly lead) appear to be significantly different in the soil samples collected across Area 10. For example, maximum lead concentrations in risk area 10A (the former shooting range) exceed the EPA limit for lead concentrations in soil (1000 mg/kg). Historical information available for the site indicates that minimal site activities were conducted in risk evaluation area 10B (the eastern half of area 10). Operable Unit 2 source areas exist in risk area 10C (the western half of area 10). The on-property risk evaluation areas for the future land-use scenarios and their corresponding current land use risk evaluation areas are presented below:

On-Property Risk Evaluation Areas for Future Land-Use Scenarios

Production Area	Corresponds with Areas 1-4 under current land use
Northeast Area	Corresponds with Areas 5-7 under current land use
Northwest Area	Corresponds with Area 8 under current land use
Waste Pit Area	Corresponds with Area 9 under current land use
Southeast Area	Corresponds with the eastern half of Area 10 (southeast corner of FEMP) under current land use
Southwest Area	Corresponds with the western half of Area 10 (southwest corner of FEMP) under current land use
Shooting Range	Corresponds with the northeast corner of Area 10

105 Figure A.3-7 presents the on-site receptor locations under future land-use scenarios. The fenceline and off-property risk evaluation areas for the future land-use scenario are listed below:

Off-Property Risk Evaluation Areas for Future Land-Use Scenarios

Northern boundary
Southern boundary
Eastern boundary
Western boundary
Northeast corner of FEMP
Southeast corner of FEMP
Well 2071
Well 2119
Well near GMR
Great Miami River - confluence with Paddys Run

106 The fenceline areas and northeast and southeast corner receptors are the same as those specified for the current land use scenarios. Additionally, three off-property discrete receptor locations (Well 2071, Well 2119, Well near GMR) downgradient and downwind of the site are evaluated. Figures, A.3-4 and A.3-6 present the fenceline and off-property receptor locations.

Sections A.3.2.1 through A.3.2.4 describe the elements of the conceptual site model in detail. At the end of Section A.3.2.4, a summary table presents a matrix of the conceptual model's exposure pathways and receptors that will be carried through the quantitative risk assessment. The matrix presents exposure pathways and receptors separately for each of the four land-use scenarios. A summary of quantitative risk results are presented in Section A.5.0 of the risk assessment.

A.3.2.1 CPCs in Environmental Media

Surface Water and Sediment

107 Surface water and sediments were sampled during the RI/FS field sampling programs to examine contaminant concentrations in drainages that transport surface water runoff from the FEMP to potential offsite receptors. The major drainages, which are discussed in the following paragraphs, are the storm sewer outfall ditch (SSOD), the pilot plant drainage ditch, Paddys Run, and the Great Miami River. Organic contaminants detected in surface water and sediments and selected as CPCs were identified in Section A.2. Metals and radiologicals selected as CPCs on the basis of a comparison to background are presented in Attachment A.IV.

105 The SSOD drains to Paddys Run on FEMP property. This drainage rarely runs except when the storm water retention basins (SWRBs) overflow during a storm event that exceeds their capacity. The

6478

SWRB system was built to hold runoff from the production area and parking lot areas resulting from a 10-year, 24-hour rainfall event.

The Pilot Plant drainage ditch originates on site and drains into Paddys Run onsite, just south of the K-65 silos. Contaminants present in the Pilot Plant drainage ditch include radionuclides (particularly uranium), organic compounds, and inorganics.

77 Paddys Run flows into the Great Miami River. Elevated levels of uranium, radium, and thorium isotopes have been detected in the surface water of Paddys Run. Sediments in stretches of Paddys Run that are on site show above-background levels of uranium; uranium concentrations in off-property sediments are similar to background levels. In general, the available data suggest contaminants appear to be bound to the sediment of Paddys Run, as opposed to partitioning to the surface water; thus, significant contamination is not observed in the surface water of Paddys Run. Additionally, contaminated sediment in Paddys Run is periodically scoured from the creek bed during rain events. This explains why significant contamination is not observed in either the surface water or sediment of Paddys Run, particularly off property. Many of these explanations are supported by the modeling exercises conducted for the FEMP site. Based on the information presented in Section 4.0 of the RI report, Paddys Run is currently considered to contribute minimal contamination from the FEMP to the Great Miami River.

77 The Great Miami River is the primary drainage feature in the vicinity of the FEMP. The Great
108 Miami River receives a steady flow of contaminated water in the form of effluent from the FEMP via the outfall line. A sediment sample collected in 1993 from GMR2 (located just below the outfall line) had a total uranium concentration of 2.1 mg/kg, a radium-226 activity of 0.8 pCi/g, and concentrations of aluminum at 11,600 mg/kg and zinc at 96.9 mg/kg. Concentraitons of PAHs ranged from 580 to 2700 μg/kg. However, these levels decrease rapidly downstream. The Great Miami River sediment is not greatly affected at the outfall because the volume of surface water entering the Great Miami River from the outfall is considerably less than the volume flowing in the Great Miami River. (Dilution does affect the contaminant load to surface water and sediment.) The Great Miami River is also turbulent. (Sediment does not readily settle.) Thus, a minimal impact occurs at the outfall and downstream of the outfall. The most recent data suggest that surface water and sediments in the Great Miami River have been minimally affected, due to dilution upon entry into the river.

Perched Groundwater

Perched groundwater has been characterized at more than 260 Type 1 monitoring well locations. The RI/FS field sampling has revealed the presence of seven broadly contaminated areas where multiple contaminants (radionuclides, organics, and inorganics) are present above background concentrations in the perched groundwater:

- Production area (Area I Plume)
- Sewage treatment plant area (Area II Plume)
- Operable Unit 2 South Field/fly ash pile area (Area III Plume)
- Operable Unit 4 K-65 silos area (Area IV Plume)
- Operable Unit 1 waste pit/Operable Unit 2 solid waste landfill area (Area V Plume)
- Fire training area (Area VI Plume)
- Operable Unit 2 lime sludge pond area (Area VII Plume)

78 ***Figure 4-92 (Section 4 in Volume I) depicts the location of perched groundwater contamination areas I through VII. Figure 4-79 depicts uranium concentrations in these seven areas as well as the remainder of the site.***

With the possible exception of the eastern edge of the Area II plume in the sewage treatment plant area, none of the seven perched groundwater plumes extend off site. However, further migration of the Area II plume eastward is not anticipated, as the direction of perched groundwater flow is westward in the vicinity of the sewage treatment plant. (Further discussion is provided in Section 4.0.) CPCs detected in the perched water underlying the production area and the sewage treatment plant are presented in Attachment A.IV.

Great Miami Aquifer Groundwater

78 The groundwater in the Great Miami Aquifer has been characterized at more than 320 Types 2, 3 and 4 monitoring well locations. The RI/FS field sampling has revealed the presence of six distinct plumes in the Great Miami Aquifer that each result from discrete points of contaminant entry into the aquifer. These entry points are found at locations where the glacial overburden is thin or absent and site contaminants are available for infiltration. Plates E-77 through E-90 display the uranium plumes underlying and downgradient of the FEMP.

109 Uranium-238, -235/236, and -234, and some inorganic contaminants were detected in most of the plumes. Other contaminants, including radionuclides, inorganics, and volatile organic compounds (VOCs), are also present in the Great Miami Aquifer; the set of these contaminants may overlap with the set existing in plumes. However, the appearance of these contaminants represents only isolated occurrences above background, disassociated with any plume in the Great Miami Aquifer. In addition, VOCs are always considered above background, since they do not naturally occur.

6478

The six identified plumes and their accompanying source relationships are as follows:

- Waste Storage Area A Plume: This plume results from the direct infiltration of leachate from areas in the Operable Unit 1 waste pits. Contaminants move eastward from the point of entry.
- Waste Storage Area B Plume: This plume originates from the infiltration of contaminated surface water runoff through the Paddys Run streambed south of the Operable Unit 1 waste pits. Contaminants move southeastward from the point of entry.
- Plant 6 Area Plume: This plume results from the entry of contaminated perched groundwater into the Great Miami Aquifer in the vicinity of Plant 6. Contaminants move eastward from the point of entry.
- South Plume A: This plume originates as infiltration that occurs adjacent to and beneath the Operable Unit 2 southfield and fly ash pile waste units. Contaminants flow eastward from the source area to a point where it is commingled with South Plume B.
- South Plume B: This plume results from infiltration that occurred from the surface water in the SSOD and Paddys Run. Contaminants move eastward in the northern portion of South Plume B, and southeastward in the southern portion of South Plume B. At its southern margin, South Plume B is commingled with the Paddys Run Road Site (PRRS) plume.
- South Plume C: This plume originated as contaminated surface water flow of Paddys Run south of South Plume B. Contaminants move southeastward away from Paddys Run. South Plume C is also commingled with the PRRS plume.

78 ***Figure 4-95 (Section 4 in Volume I) is a schematic depiction of the major FEMP and PRRS plumes in the Great Miami Aquifer. Figure 4-95 also shows the sources/pathways for each of the plumes while Figure 4-93 shows uranium concentrations in the various plumes.***

South Plume B, South Plume C, and the western margins of the Waste Storage Area A and B Plumes extend off site. The Plant 6 Area Plume and South Plume A remain on site. CPCs detected in GMA fenceline monitoring wells and off-property South Plume wells north of the Paddys Run Road Site Industries are presented in Attachment A.IV.

Soil Within the Former Production Area

110 Surface and subsurface soils within the former production area were sampled during the RI/FS field sampling programs and other programs to characterize that fraction of vertical and horizontal contamination in soil due to air deposition of particulate emissions. Other sources of surface and subsurface soil contamination are spills, leaks, and surface water runoff. Above-background concentrations of uranium isotopes are prevalent in surface soil across the former production area and portions of the administrative and laboratory areas. Other radiological and chemical constituents were also detected within the former processing areas. The occurrence of these other constituents was generally more localized and encompassed within areas exhibiting above-background concentrations of uranium. Figures in Attachment A.IV profile the representative concentrations of several radionuclides

and metals detected in on-property surface soil at concentrations exceeding background. CPC in soil of the designated current and future risk evaluation areas are presented in Attachment A.IV.

Soil Outside the FEMP Property

Surface and subsurface soils outside the FEMP were sampled to determine whether radionuclides had been released into the surrounding soil. Elevated radionuclide levels were found predominantly in the 0- to 0.167-foot samples. Radionuclide levels decreased significantly with depth, indicating contamination is limited to the surface soil.

Isolated higher concentrations of uranium were found primarily along the north and east property boundary and the outfall line. The probable source for the elevated levels of uranium is airborne contaminants from sources within the FEMP.

Subsurface contamination for radionuclides is found primarily along the outfall line, located to the east of the FEMP. Two potential sources are leakage from the old outfall pipeline in the untested section near Manhole 181 and/or phosphate fertilizers, which are known to contain uranium and thorium.

A.3.2.2 Release Mechanisms

Chemicals and radionuclides may be released to the environment by a number of processes referred to as release mechanisms in this report. The release mechanisms of interest may change under different land-use assumptions and are affected by the passage of time.

Release-mechanism influences are considered by evaluating current and future land-use scenarios. The first scenario, called the current land-use scenario, reflects the physical state of the operable unit as it exists today. The second, or future land-use scenario, considers the potential changes that may occur on the operable unit over time. These two source-term scenarios bound the range of types and relative magnitudes of releases reasonably expected to occur within the defined boundaries of Operable Unit 5.

A.3.2.2.1 Potential Release Mechanisms Under Current Land Use

The current land-use scenario considers the types of environmental releases reasonably expected to occur under two types of access control: with access controls and without access controls. As stated previously, current land use with access controls assumes that access restrictions and engineering controls

In contrast, the groundskeeper receptor is assumed to have access to all sections of the production area in the course of his/her duties. Also, off-property residential receptors (the off-property user of the Great Miami River, off-property residential receptors) are evaluated for this scenario. The receptor exposure scenarios included in the Operable Unit 5 conceptual model include:

- Trespassing Youth Receptor - This hypothetical exposure considers the risk incurred by a trespassing youth in all areas of the FEMP except the production area (Areas 1-4). Exposure routes include:

  - Inhalation of fugitive dust, volatiles, and gases

  - Incidental ingestion of, direct radiation exposure from, and dermal contact with contaminated soil and sediment

  - Incidental ingestion of and dermal contact with surface waters of Paddys Run and on-site surface drainage ditches

- Groundskeeper Receptors - This scenario evaluates industrial/occupational exposure to an individual. It assumes that non-DOE workers are present on the property. The groundskeepers are full-time employees who work in a plant/building in the production area, but also maintain fences, cut grass, and perform general security on a regular basis (one day per week) in all areas of Operable Unit 5 (including the production area). Exposure routes for this receptor include:

  - Inhalation of fugitive dust, volatiles, and radon
  - Incidental ingestion of soil
  - Dermal contact with CPCs in soil
  - External radiation exposure from contaminated soil.

79 79 - Off-Property Farmer and Child Receptors - This exposure scenario assumes that a farm family lives immediately adjacent to or close to the FEMP property boundary (fencelines). Exposures to the farm family were evaluated along the four fenceline boundaries of the FEMP (north, south, east and west), and at the northeast and southeast corners of the FEMP. The farm family is exposed to air, groundwater and soil; however under the assumption of access controls (i.e., continued government ownership), it is assumed that the farm family would be supplied with bottled water for ingestion. As described in Section A.3.2.4.2 under current land use without access controls, the farm family is assumed to have unrestricted use of groundwater. Please note that the evaluation of the off-property farmer and child receptors for the "current land use without access controls" scenario does not assume that bottled water is provided. Instead it assumes that groundwater is used as the drinking water supply source. The ***inclusion*** of the ingestion of groundwater pathway under the "current land use without access controls" scenario is an acknowledgement of the fact that other industrial concerns may eventually own, maintain, or operate the site even if the current land use (industrial) is continued. Exposure routes include:

  - Inhalation of fugitive dust, volatiles, and gases
  - Consumption of farm-produced foodstuffs, including vegetables, meat, and milk

- Dermal contact and inhalation while using groundwater in the home
- Incidental ingestion of, direct radiation exposure from, and dermal contact with contaminated soil.

- Off-Property Use of Surface Water from the Great Miami River - This exposure scenario assumes that an individual obtains water from the river for either domestic, agricultural, or recreational uses, or any combination of the three. This receptor was evaluated at the Outfall Effluent Line and the Great Miami River Confluence with Paddys Run. Exposure routes evaluated include:

  - Incidental ingestion of surface water while swimming
  - Inhalation of VOCs from use of water in the home
  - Dermal contact with surface water
  - Ingestion of farm-produced foodstuffs, including vegetables, meat, and milk
  - Ingestion of fish caught in the river
  - Ingestion of drinking water.

- Visitor - This scenario investigates the exposures incurred by the activities of a regular visitor to the FEMP site who is not covered by a health and safety or radiation protection program. An example of this receptor would be a delivery person making regular deliveries to the administration building in the former production area (Area 1). Exposure routes for this receptor include:

  - Inhalation of fugitive dust, volatiles, and gases
  - External radiation exposure from contaminated soil.

- Consumer of Milk and Meat Products (On-property grazing) - This scenario considers the risks associated with off-property use of animal products produced by cattle currently grazing on FEMP property (Grazing Areas 1-3). Exposure routes evaluated are:

  - Ingestion of meat
  - Ingestion of milk.

- Off-Property Critical subpopulations - This scenario considers exposure to local school children and youths (identified in section A.3.1.10 - grades K through 8 for elementary students and grades 9 through 12 for high school students) from potential resuspension of soil from the FEMP. The route evaluated is:

  - Inhalation of fugitive dust, volatiles, and gases.

A.3.2.4.2 Current Land Use Without Access Controls

In this scenario, no access controls exist, access restrictions at the FEMP site historically provided by DOE are assumed to be discontinued by DOE, and the FEMP site is operated by an industrial concern other than DOE. In addition, no remedial action of Operable Unit 5 environmental media is assumed to have been taken beyond that already accomplished. Under current land use, this represents the most conservative scenario for assessing baseline risks.

6478

87 representative concentrations for soil in FEMP risk areas 1 through 10, the four fenceline areas, and the four grazing areas and the northeast and southeast corner of the FEMP. Tables A.3-6 and A.3-7 present exposure point concentrations for surface soil for future land use. These concentrations for CPCs in areas evaluated under current land use (or a combination of these areas) were used to determine potential risks to both current and potential future on-site receptors such as the groundskeeper, the visitor, the trespassing youth, the exploring youth, the expanded trespasser, the home builder, and the future on-property resident farmer. ***However, there is a difference in the radiological COPC list for the current versus future land-use scenarios (e.g., the COPC lists presented in Tables A.3-5 and A.3-7). The difference in the current and future radiological COPCs in soil is a function of the assumptions made regarding the equilibrium and the properties of the radiologicals (e.g., the daughter products; note the number of daughter products assumed under the current versus the future land-use scenarios). For example, based on the existing analytical data, it was not assumed that Pb-210 is currently in equilibrium with radium-226 and its daughter products. (Radium-226 [in equilibrium with five daughter products] is evaluated under the current land-use scenario.) Instead, actual analytical data is used to determine the representative concentration of Pb-210 under the current land-use conditions. In contrast, it is assumed that Pb-210 is a decay chain product of radium-226 for the evaluation of the future land-use scenario. Radium-226 with eight daughter products is considered for the future land-use scenario. Radon is also a Ra-226 decay chain product. Because some of the radon will be lost to the atmosphere, secular equilibrium between Ra-226 and Pb-210 in soil may not be fully achieved.*** Table A.3-8 presents exposure point concentrations for subsurface soil for future land use. Representative concentrations developed based on contaminant concentrations in subsurface soil were compared to representative concentrations developed based on surface soil contamination. The higher value was used for the evaluation of the homebuilder receptor.

A.3.3.2 Exposure Point Concentrations of Air

Airborne concentrations of contaminants from surface soil across Operable Unit 5 were modeled for both on- and off-property locations. The model employed to predict the exposure point concentrations assumes mass loading (fugitive dust emissions) from surface soil and gas emission (radon) to the air from contaminated soil across the FEMP. Only the PM-10 fraction was modeled. Actual deposition rates were not modeled for the Operable Unit 5 area, but a default deposition factor was used in the food-chain calculations (EPA 1991d). The model and parameters for air dispersion are described in Section 5.0 of the Operable Unit 5 RI Report.

123 Tables A.3-9 to A.3-12 present the on- and off-property air concentrations predicted by the air dispersion model. Table A.3-11b presents modeled air concentrations at locations of critical subpopulations off site. The modeling results presented in these tables predict radon-222, a noble gas decay product from the uranium decay series, at the following levels as indicated:

pCi/m³		
0.1 ≤ 1.0	>1 ≤ 10	>10
Southern boundary	Grazing Area 1[a]	Northeast area[a]
	Grazing Area 2[a]	Production area (Areas 1-4)
	Grazing Area 4[a]	Grazing Area 3[a]
	Northern boundary	Area 3 (Production Area)
	Western boundary	Area 4 (Production Area)
	Eastern boundary	Area 5 (Fire Training Area)
	Area 1 (Production Area)	Area 7 (Northeast Boundary)
	Area 2 (Production Area)	
	Area 6 (Sewage Treatment Plant)	
	Area 8 (Northwest Boundary)	
	Area 9 (Waste Pit)	
	Area 10 (Southeast, Southwest and Shooting Range)	

123 *[a] Grazing Areas 1, 2, 3, and 4 are basically (but not exclusively) associated with Areas 10, 8, 7, and 5 through 10, respectively. (See Figures A.3-3 and A.3-5 for the location of these areas.) Radon data for Areas 7, 8, 9, and 5 through 10 are presented in Table A.3-9. The radon levels presented in this table for the grazing areas are those modeled for the associated areas and presented in Table A.3-9.*

The elevated levels of radon arise from the decay of uranium decay products in soil.

A.3.3.3 Exposure Point Concentrations for Groundwater

The focus of the Operable Unit 5 baseline risk assessment is the evaluation of current or future risks associated with exposure to contaminants in groundwater underlying and downgradient of the FEMP. Operable Unit 5 is responsible for the evaluation of perched water outside other source-term operable unit boundaries (i.e., Operable Units 1, 2, and 4). The contamination observed in the Great Miami Aquifer is also evaluated in the Operable Unit 5 risk assessment. As discussed in Section 4.0 of the Operable Unit 5 RI Report, site-related contaminants (e.g., uranium-238) have been detected in off-property monitoring wells installed to monitor water quality in the Great Miami Aquifer. A few off-property receptors (private well owners) are currently supplied bottled water by the DOE because of the off-property migration of the uranium contaminant plume. Because of the demonstrated off-property

6478

migration of contaminants, the groundwater exposure pathways are the most critical pathways evaluated in the Operable Unit 5 baseline risk assessment.

87 ***As discussed in the following paragraphs, the representative concentrations determined for groundwater for the current land-use scenario are based on the currently available analytical data. The radiological equilibrium assumptions are the same as those specified for soil under the current land-use scenario. The representative concentrations determined for groundwater for the future land-use scenario are modeled values. Therefore, the evaluation of the current versus future Operable Unit 5 off-property receptors differs principally in that modeled groundwater contaminant levels (as opposed to measured groundwater contaminant concentrations) are used as groundwater exposure point concentrations for the future land-use scenario; i.e., there is no actual difference in the land-use assumptions themselves when the future off-property receptor is evaluated. The exposure point concentrations for soil (current versus future) differ only as a consequence of the radiological equilibrium assumptions. The modeled values for groundwater were determined based on the fate and transport methods presented in Section 5.0. Specifically, the modeling considered contaminant levels currently existing in the soil and groundwater (particularly the perched water) as the source term. The migration of the contaminants from the source term to the groundwater was based on contaminant-specific parameters such as the distribution coefficient (the K_d) and the hydrogeological properties of the aquifer underlying and downgradient of the FEMP. The radiological equilibrium assumptions are the same as those specified for soil under the future land-use scenario. Consequently, the method used to predict the activities of radiologicals in the groundwater is identical to that specified for soil; i.e., radiological equilibrium assumptions are the same. However, the contaminant migration is considered using the groundwater modeling methods presented in Section 5.0.***

81 Representative concentrations of CPCs detected in the Great Miami Aquifer in wells located along the northern, southern, western, and eastern boundary, and wells at the northeast and southeast corners of the site are presented in Table A.3-13. Table A.3-13 also presents the representative concentrations calculated for the off-property monitoring wells in the South Plume. Analytical data available for the following wells (presented in Appendix I) were used to determine the representative concentration/activities of CPCs:

This page intentionally left blank!

The soil ingestion rate is the mass of soil ingested daily by a receptor. The soil ingestion rate of the RME adult farmer estimated for this risk assessment is a site-specific, time-weighted average ingestion rate. It is based on ingestion rates for specific activities performed during the course of the receptor's lifetime, and the relative length of time spent engaged in those activities.

83 The literature was consulted to determine an appropriate soil incidental ingestion rate for a farmer. However, no default values were found. Therefore, this value was estimated assuming the following:

- Soil ingestion rate on days while tilling, plowing, planting, or harvesting would assume a higher average daily value of 0.48 g/day from EPA default exposure assumptions (EPA 1991f).
- For all other activities, an average daily soil ingestion rate of 0.1 g/day will be used.

To determine the amount of time a farmer is engaged in the described activities, a review of farming parameters (farm size and crop configuration) was conducted for Hamilton County. The 1987 Census of Agriculture (U.S. Department of Commerce 1989) indicates that 1284 of the 1364 farms in Hamilton and Butler counties (95 percent) are under 500 acres (5 percent are 500 acres or above). Therefore, 500 acres was selected as the RME farm size. The soil ingestion rate for the CT farmer was based on similar farm configuration but using an average (CT) farm size of 125 acres (U.S. Department of Agriculture 1976; 1979). To determine the times associated with farming, a farmer was assumed to follow recommended agricultural practices for the region. A farmer is assumed to rotate his crops and plant 35 percent (175 acres) in corn, 35 percent in soybeans, 20 percent (100 acres) in wheat, and 10 percent (50 acres) in hay. It must be acknowledged that this configuration is a typical configuration and may represent an average value because each crop has a different time associated with field preparation, planting, and harvesting. However, data are not available to determine a RME configuration. Therefore, an alternative configuration could result in a slightly higher or slightly lower exposure. The RME farm size of 500 acres was assumed to be adequate to compensate for this uncertainty.

The U.S. Soil Conservation Service Field Technical Guide (U.S. Department of Agriculture 1992) indicates that a farmer spends about 1.24 hours per acre farming corn, 1 hour per acre farming soybeans, 1.28 hours per acre farming wheat, and 2.73 hours per acre farming hay. Assuming the farm configuration described above, an RME farmer would spend approximately 660 hours farming (plowing, discing, planting, and/or harvesting). An additional 20 percent is added to this time to account for miscellaneous activities and the uncertainty with the farm configuration described above for a total of

83 800 hours or 100 working days. Therefore, it is assumed that a farmer would incidentally ingest 0.48 g/day of soil for 100 days per year spent tilling the soil and 0.1 g/day for the remaining 250 days per year. This results in a combined soil ingestion rate of ***0.18 g/day for the RME farmer and 0.12 g/day for the CT farmer.*** Table A.3-25 details the calculations and parameters used in the derivation of these soil ingestion rates.

The soil ingestion rates of 0.1 g/day for the groundskeeper, trespassing youth, exploring youth, and youth, and adult-aged recreational receptors and 0.2 g/day for the on-property resident child and the child recreational receptor are specified by EPA (EPA 1991j, 1993h). It was assumed that all on-property receptors received 100 percent of their soil intake from the site. This includes the on-property RME child and adult, the on-property CT adult, the groundskeeper, and the home builder. The trespassing child was assumed to receive only 25 percent of his daily soil/sediment intake from the site, as only 4 of 16 waking hours are spent on property; and the recreational receptors receive a percent of the daily soil intake rates, based upon the number of hours spent on the site out of 16 waking hours (DOE 1993e (see Table A.3-21b). A higher occupational soil ingestion rate (0.48 g/day) as specified in EPA (1991j) for construction scenarios was selected for the on-property home builder.

Because default values specific to sediment are not available, the soil ingestion rate of 0.1 g/day was used for evaluating scenarios involving contact with surface waters and hence, sediment. This value was adjusted by a fraction ingested (FI), based upon the number of hours spent at the source out of 16 waking hours.

A.3.4.6.6 Water Ingestion Rates

The water ingestion rate is the volume of water drunk daily by a receptor. Generally this intake is from drinking water, but may be from incidental ingestion during swimming or wading.

This assessment uses a drinking water ingestion rate of 2 liters per day for all RME adult receptors and 1 liter per day for the RME child, as stipulated in EPA (1989a). EPA suggests assuming that the CT adult drinks 1.4 liters per day (EPA 1993h).

The hypothetical Great Miami River user accidentally ingests water while swimming in the river. The ingestion rate of this receptor is 0.05 liters per hour of exposure (EPA 1992e). A value slightly less than this (0.035 L/hr) was selected for trespassing youth and recreational receptors, who may contact Paddys

TABLE A.3-1

SUMMARY OF EXPOSURE PATHWAYS QUANTITATIVELY EVALUATED IN THE BASELINE RISK ASSESSMENT

Scenario/Receptor[a]	Soils	Surface Water	Sediment	Air	Groundwater
CURRENT LAND WITH/WITHOUT ACTIVE ACCESS CONTROLS					
Trespassing Youth/ Exploring Youth	• Incidental ingestion of surface soils • Dermal contact with surface soils • Direct radiation	• Incidental ingestion of surface waters (Paddys Run; On-site Surface Waters) • Dermal contact with surface waters	• Incidental ingestion of sediments (Paddys Run, On-site Drainage) • Dermal contact with sediments • Direct radiation	• Inhalation of VOCs, gases, and particulates	NA[b]
Groundskeeper	• Incidental ingestion of surface soils • Dermal contact with surface soils • Direct radiation	NA	NA	• Inhalation of VOCs, gases, and particulates	NA
Consumer of Meat and Milk Products	• Ingestion of meat and dairy products	NA	NA	NA	NA
Off-Property RME Adult Farmer/Child (at fenceline and point locations)[d]	• Incidental ingestion of surface soils • Dermal contact with surface soils • Direct radiation • Ingestion of vegetables and fruits • Ingestion of meat and dairy products	NA	NA	• Inhalation of VOCs, gases, and particulates • Ingestion of vegetables and fruit • Ingestion of meat and dairy products	• Ingestion of drinking water • Inhalation of VOCs and gases • Dermal contact while bathing • Ingestion of vegetables and fruit • Ingestion of meat and dairy products

TABLE A.3-1 (Continued)

Scenario/Receptor[a]	Soils	Surface Water	Sediment	Air	Groundwater
Off-Property User of Surface Water from the Great Miami River	NA	• Incidental ingestion while swimming • Dermal contact while swimming • Drinking water ingestion • Inhalation of VOCs from use of water in the home • Dermal contact while bathing • Ingestion of vegetables and fruit • Ingestion of meat and dairy products • Ingestion of fish	NA	NA	NA
Visitor	• Direct radiation exposure from contaminated soils	NA	NA	• Inhalation of VOCs, gases, and particulates	NA
Critical Subpopulations	NA	NA	NA	• Inhalation of VOCs, gases, and particulates	NA

TABLE A.3-1 (Continued)

Scenario/Receptor[a]	Soils	Surface Water	Sediment	Air	Groundwater
FUTURE LAND USE WITH FEDERAL OWNERSHIP/INSTITUTIONAL CONTROLS					
Off-Property Farmer/Child (at fenceline and point locations)[d]	• Incidental ingestion of surface soils • Dermal contact with surface soils • Direct radiation • Ingestion of vegetables and fruit • Ingestion of meat and dairy products	NA	NA	• Inhalation of VOCs, gases, and particulates • Ingestion of vegetables and fruits • Ingestion of meat and dairy products	• Ingestion of drinking water • Inhalation of VOCs from home water use • Dermal contact while bathing • Ingestion of vegetables and fruit • Ingestion of meat and dairy products
Recreational Receptors -Wildlife reserve -Nondeveloped Park -Developed Park	• Incidental ingestion of soils • Dermal contact with soils • Direct radiation	• Incidental ingestion of surface water • Dermal contact with surface water	• Incidental ingestion of sediments • Dermal contact with sediments • Direct radiation	• Inhalation of VOCs, gases, and particulates	NA
Groundskeeper(s)	• Incidental ingestion of soils • Dermal contact with soils • Direct radiation	NA	NA	• Inhalation of fugitive dust, VOCs, and gases	NA
Off-Property User of Surface Water from the Great Miami River[e]	NA	• Incidental ingestion while swimming • Dermal contact while swimming • Drinking water ingestion • Inhalation of VOCs from use of water in the home • Dermal contact while bathing • Ingestion of vegetables and fruits • Ingestion of meat and dairy products • Ingestion of fish	NA	NA	NA

TABLE A.3-1 (Continued)

Scenario/Receptor[a]	Soils	Surface Water	Sediment	Air	Groundwater
FUTURE LAND USE WITHOUT FEDERAL OWNERSHIP/INSTITUTION CONTROLS					
On-Property RME or CT Resident Farmer and On-Property RME Child	• Incidental ingestion of soils • Dermal contact with soils • Direct radiation • Ingestion of vegetables and fruit • Ingestion of meat and dairy products	NA	NA	• Inhalation of VOCs, gases, and particulates • Ingestion of vegetables and fruit potentially contaminated by air deposition of soil particulates • Ingestion of meat and dairy products from animals grazed on lands potentially contaminated by air deposition of soil particulates	• Ingestion of drinking water • Dermal contact while bathing • Inhalation of volatiles and radon while showering • Ingestion of vegetables and fruit irrigated with groundwater • Ingestion of meat and dairy products from animals grazed on irrigated lands or watered using groundwater
Off-Property Farmer/Child (at fenceline and point locations)[d]	• Incidental ingestion of surface soils • Dermal contact with surface soils • Direct irradiation • Ingestion of vegetables and fruit • Ingestion of meat and dairy products	NA	NA	• Inhalation of VOCs, gases and particulates • Ingestion of fruits and vegetables • Ingestions of meat and milk products	• Ingestion of drinking water • Inhalation of VOCs and gases • Dermal contact while bathing • Ingestion of fruits and vegetables • Ingestion of meat and milk products
Construction Worker (Home Builder)	• Incidental ingestion of soils • Dermal contact with soils • Direct radiation	NA	NA	• Inhalation of particulates, volatiles, and gases	NA

TABLE A.3-1 (Continued)

[a]Receptors which are presented in bold are plausible for the "current land use without active access controls" scenario. However, these receptors will have the same risks as those predicted for the "current land use with access control" scenario.
[b]Not applicable.
[c]The off-property user of surface water from the Great Miami river is also a plausible receptor for the "future land use without Federal ownership/institutional controls." However, this receptor will have the same risks as those predicted for the "future land use with Federal ownership/institutional controls."
[d]The off-property farmer and child are evaluated at several locations surrounding the FEMP. Direct soil pathways will only be evaluated at fenceline locations and not at off-site point locations not adjacent to the FEMP. However other pathways listed are evaluated at both fenceline and off-site point locations.
[e]It is assumed that under the assumption of access controls (i.e., continued government ownership), the farm family would be supplied with bottled water for ingestion.

000127

6478

84
85

TABLE A.3-2A

POTENTIAL RECEPTOR LOCATIONS/AREAS/EXPOSURE POINTS CURRENT SITE CONDITIONS, LAND USE - WITH ACCESS CONTROLS

Receptor	Location/Area/Exposure Points	Data Evaluated
• Off-Property Resident Farmer/Child	• Agricultural areas exist to the northwest, south, east, and west of the FEMP property boundary. A forested area exists to the northeast of the site. Private wells are located in proximity of the FEMP property line. Particular emphasis was placed on gathering information from soils and wells located downgradient of the site. RME Receptor Locations/Areas: - Rural/agricultural area along eastern fenceline of site. - Rural/agricultural area along southern fenceline of the site. - Rural/agricultural area along northern fenceline of the site (this area is of lesser importance as it is generally upgradient of the general groundwater flow direction) - Rural/agricultural area along western fenceline of site. - Rural/agricultural area at the northeast corner of site. - Rural/agricultural area at the southeast corner of site.	• Modeled air concentrations. • Measured concentrations (95% upper confidence limit [UCL]) in soils: 1) Soils along eastern boundary of site. 2) Offsite South Plume soils. 3) Soils along northern boundary of the site. 4) Soils along western boundary of site. 5) Soils at northeast corner of site. 6) Soils at southeast corner of site. • Measured contaminant concentrations (95% UCL) in groundwater (1993 data whenever possible): 1) Wells along eastern boundary of the site. 2) Offsite South Plume wells. 3) Wells along northern border. 4) Wells along western border. 5) Well at northeastern corner of site. 6) Well at southeastern corner of site.
• Consumer of Meat and Milk Products	• Grazing areas (No. 1, No. 2, No. 3) exist (within the FEMP property boundary) to the northwest, northeast, south and west of the FEMP production area. Off-property farmers use these areas for grazing dairy cattle.	• Measured concentrations (95% UCL) in soils in each of the three current grazing areas (No. 1-3). • Measured concentrations in the surface waters of the SSOD and Paddys Run will also be evaluated.

000128

TABLE A.3-12 (Continued)

Constituents	Southern Fenceline	Eastern Fenceline	Northern Fenceline	Western Fenceline	Northeast of FEMP	Southeast of FEMP	At Well 2071	At Well 2119	Near the GMR
nickel	1.9E-08	6.8E-08	2.9E-08	2.2E-08	4.7E-08	2.9E-08	3.3E-08	3.6E-08	6.2E-10
selenium	8.0E-10	1.7E-09	1.1E-09	7.3E-10	1.6E-09	1.0E-09	1.0E-09	1.1E-09	2.1E-11
silver	6.4E-09	2.0E-08	1.0E-08	7.6E-09	1.5E-08	1.1E-08	1.0E-08	1.2E-08	2.0E-10
thallium	2.4E-10	9.1E-10	4.9E-10	3.0E-10	7.3E-10	3.9E-10	4.6E-10	4.8E-10	8.7E-12
uranium-total	1.6E-06	5.1E-06	1.3E-06	9.3E-07	2.6E-06	2.0E-06	2.4E-06	3.0E-06	4.8E-08
vanadium	2.1E-08	7.0E-08	2.9E-08	2.0E-08	4.8E-08	3.3E-08	3.4E-08	3.8E-08	6.4E-10
zinc	1.1E-07	4.8E-07	3.1E-07	1.1E-07	4.9E-07	1.6E-07	2.6E-07	2.2E-07	4.5E-09

[a]Exposure point concentrations/activities are modeled concentrations/activities per methodology presented in Section 5 and Appendix F.

0001129

6478

0001230
PGH\OU5-RI\D-01-94-7\January 11, 1995 2:27pm

TABLE A.3-13

SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR GROUNDWATER OFF-PROPERTY, CURRENT LAND USE[a]

Constituents	Eastern Fenceline[b]	Northern Fenceline[b]	Southern Fenceline[b]	Western Fenceline[b]	Northeast of FEMP[b]	Southeast of FEMP
Radionuclides	**(pCi/L)**	**(pCi/L)**	**(pCi/L)**	**(pCi/L)**	**(pCi/L)**	**(pCi/L)**
Np_{237+1d}	ND	ND	2.50E+00[g]	ND	NA	ND
Ra_{226+5d}	2.20E+00[g]	1.50E+00[g]	3.20E+00[f]	2.30E+00[g]	NA	1.20E+00[g]
Ra_{228+1d}	ND	3.90E+00[g]	4.40E+00[f]	ND	NA	ND
Sr_{90+1d}	ND	ND	5.69E+00[g]	ND	NA	ND
Tc_{99}	ND	ND	2.44E+01[g]	ND	NA	ND
Th_{228+7d}	**3.00E-01[c,g]**	1.49E+00[g]	5.85E+00[f]	1.60E+00[g]	NA	6.00E-01[g]
Th_{230}	2.50E+00[g]	1.30E+00[g]	2.13E+00[f]	**4.0E-01[g]**	NA	7.00E-01[g]
Th_{232}	ND	4.81E-01[g]	2.70E+00[g]	ND	NA	3.00E-01[g]
U_{234}	2.50E+00[g]	3.40E+00[g]	1.04E+02[g]	2.10E+00[g]	NA	6.00E-01[g]
$U_{235/236}$	ND	ND	3.60E+00[g]	ND	NA	ND
U_{238+2d}	2.40E+00[g]	3.80E+00[g]	1.04E+02[g]	1.80E+00[g]	NA	7.00E-01[g]
Organic Chemicals	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**
1,1-dichloroethane	ND	ND	5.80E-02[g]	ND	NA	ND
1,1-dichloroethene	ND	ND	1.10E-01[g]	ND	NA	ND
1,1,1-trichloroethane	ND	ND	1.00E-02[f]	ND	NA	ND
1,2-dichloroethene	ND	ND	4.00E-03[g]	ND	NA	ND
1,2-dichloroethane	ND	ND	3.10E-01[g]	ND	NA	ND
2-Butanone	2.60E-02[g]	ND	ND	ND	ND	ND
acetone	8.00E-03[g]	2.00E-03[g]	5.00E-03[g]	ND	NA	ND

TABLE A.3-13 (Continued)

Constituents	Eastern Fenceline[b]	Northern Fenceline[b]	Southern Fenceline[b]	Western Fenceline[b]	Northeast of FEMP[b]	Southeast of FEMP
bis(2-ethylhexyl)phthalate	ND	ND	1.00E-03[g]	ND	NA	ND
carbon disulfide	5.00E-03[g]	ND	ND	ND	NA	ND
chloroform	ND	ND	2.90E-02	ND	NA	ND
di-N-butylphthalate	5.60E-02[g]	ND	2.00E-03[g]	1.00E-02[g]	ND	ND
methylene chloride	ND	ND	ND	1.00E-03[g]	NA	ND
toluene	8.00E-03	ND	ND	ND	NA	ND
trichloroethene	9.00E-03[g]	ND	3.40E-02[g]	ND	NA	ND
Inorganics	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**
aluminum	1.50E-01[g]	**1.17E-01[g]**	1.56E+01[g]	ND	NA	ND
antimony	ND	4.40E-02[g]	3.10E-02[g]	ND	NA	ND
arsenic	**2.76E-02[g]**	1.56E-01[g]	**3.10E-01[g]**	**1.50E-02[g]**	NA	ND
barium	6.21E-01[g]	8.20E-01[g]	**2.75E-01[g]**	**1.77E-01[g]**	NA	**9.07E-02[g]**
beryllium	2.00E-03[g]	ND	ND	ND	NA	ND
cadmium	1.97E-02[g]	6.50E-03[g]	2.85E-02[g]	**2.20E-03[g]**	NA	3.40E-03[g]
chromium	3.70E-02[g]	**3.53E-02[g]**	1.51E-01[f]	2.00E-02	NA	7.32E-02[g]
cobalt	9.00E-03[g]	ND	4.36E-02[g]	ND	NA	ND
copper	6.30E-03[g]	**1.43E-02[g]**	6.04E-02[g]	**3.54E-02[g]**	NA	7.10E-03[g]
cyanide	ND	ND	5.50E-02[g]	ND	NA	ND
lead	2.80E-03[g]	3.30E-03[g]	**2.40E-02[g]**	2.20E-02[g]	NA	ND
magnesium	4.80E+01[e]	584E+01[g]	5.70E+01[f]	3.73E_01[d]	NA	3.13E+01[g]
manganese	4.50E-1[g]	**1.31E-01[g]**	6.13E+00[g]	**3.40E-01[g]**	NA	2.97E-01[g]
mercury	7.00E-04[g]	ND	1.50E-03[g]	ND	NA	ND
molybdenum	ND	4.50E-02[g]	**3.50E-02[g]**	ND	NA	ND

TABLE A.3-13 (Continued)

Constituents	Eastern Fenceline[b]	Northern Fenceline[b]	Southern Fenceline[b]	Western Fenceline[b]	Northeast of FEMP[b]	Southeast of FEMP
nickel	**2.20E-02**[g]	**2.22E-02**[g]	2.91E-02[f]	**5.14E-02**[g]	NA	6.50E-02[g]
selenium	6.70E-03[g]	**1.60E-03**[g]	2.20E-03[g]	1.20E-03[g]	NA	2.80E-03[g]
silver	1.70E-02[g]	2.90E-02[g]	1.96E-02[f]	**3.10E-03**[g]	NA	ND
uranium-total	6.50E-03[g]	1.58E-03[g]	5.21E-01[g]	6.60E-03[g]	NA	9.00E-04[g]
vanadium	2.60E-02[g]	**1.88E-02**[g]	2.95E-02[f]	3.80E-03[g]	NA	ND
zinc	2.78E-01[g]	ND	**9.80E-02**[g]	1.85E-01[g]	NA	5.00E-03[g]
General Chemistries	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**		**(mg/L)**
ammonia	4.56E+00[g]	2.50E+01[g]	3.20E-01[g]	3.90E+00[g]	NA	ND
fluoride	4.18E-01[g]	9.40E-01[g]	3.09E-01[e]	5.32E-01[e]	NA	1.60E-01[g]
nitrate	1.70E-01[g]	2.30E-01[g]	7.48E+00[d]	6.87E+00[g]	NA	2.28E+00[g]
sulfate	2.42E+02[g]	1.70E+01[g]	1.02E+02[e]	1.40E+02[d]	NA	9.30E+01[g]

[a]Detailed summary statistics are presented in Tables A.IV-41, -42, -43, -44, -47, -48, -49, -50, -51, -52, -53, and -56.
[b]The maximum representative concentration of the Types 2, 3, and 4 wells was used as the exposure point concentration for that area of concern. ***No acceptable remedial investigation monitoring well data are available for the "Northeast of FEMP" location.***
[c]Shaded values were at or below background levels.
[d]95 percent upper confidence limit (UCL) - Statistical analysis indicates that the data are normally distributed.
[e]95 percent upper confidence limit (UCL) - Statistical analysis indicates that data are log-normally distributed.
[f]95th percentile activity/concentration - the distribution of the data is undefined.
[g]Maximum detected activity/concentration because the 95 percent UCL or 95th percentile value is greater than the maximum concentration, or the number of samples (or locations) analyzed is less than or equal to six.
[h]No acceptable RI monitoring well data are available for this exposure point location.
ND Not detected
NA Not analyzed

6478

This page intentionally left blank!

TABLE A.3-14

SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR GROUNDWATERa ON-PROPERTY, FUTURE LAND USE[a]

Constituents	Production Area[b]	Northwest Area[b]	Northeast Area[b]	Southeast Area[b]	Southwest Area[b]	Waste Pit Area[b]	Trap Range Area[b]	Perched GW Production Area[c]
Radionuclides	**(pCi/L)**	**(pCi/L)**	**(pCi/L)**	**(pCi/L)**	**(pCi/L)**	**(pCi/L)**	**(pCi/L)**	**(pCi/L)**
Np_{237+1d}	5.8E-02	2.4E-03	2.0E-02	6.1E-01	4.8E-01	2.5E-01	6.1E-01	2.0E+00g
Pu_{238}	NA	NA	NA	NA	NA	NA	NA	9.1E-01g
$Pu_{239/240}$	NA	NA	NA	NA	NA	NA	NA	5.1E-01g
Ra_{226+8d}	3.2E+00	3.3E+00	3.3E+00	1.6E+01	1.4E+01	1.2E+01	1.6E+01	2.1E+00e
Sr_{90+1d}	3.3E-01	1.4E-04	8.1E-03	1.4E+01	9.0E+00	3.3E+00	1.4E+01	3.5E+00f
Tc_{99}	3.3E+03	1.2E+02	1.1E+03	6.8E+03	4.8E+03	3.3E+02	6.8E+03	2.0E+03f
Th_{230}	NA	NA	NA	NA	NA	NA	NA	1.8E+00e
$Th_{232+10d}$	NA	NA	NA	NA	NA	NA	NA	4.0E+00f
U_{234}	9.4E+02	2.2E+00	5.0E+02	3.1E+03	2.1E+03	5.8E+01	3.1E+03	1.1E+04f
$U_{235/236}$	4.3E+01	9.9E-02	2.3E+01	1.4E+02	9.8E+01	2.6E+00	1.4E+02	1.3E+03e
U_{238+2d}	9.2E+02	2.1E+00	4.9E+02	3.0E+03	2.1E+03	5.7E+01	3.0E+03	1.3E+04e
Organic Chemicals	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**	**(mg/L)**
1,1-dichloroethane	NA	NA	NA	NA	NA	NA	NA	5.2E-02f
1,1-dichloroethene	NA	NA	NA	NA	NA	NA	NA	1.5E-02f
1,1,1-trichloroethane	NA	NA	NA	NA	NA	NA	NA	6.7E-02f
1,1,2-trichloroethane	NA	NA	NA	NA	NA	NA	NA	1.0E-03g
1,2-dichloroethene	NA	NA	NA	NA	NA	NA	NA	6.8E-02f

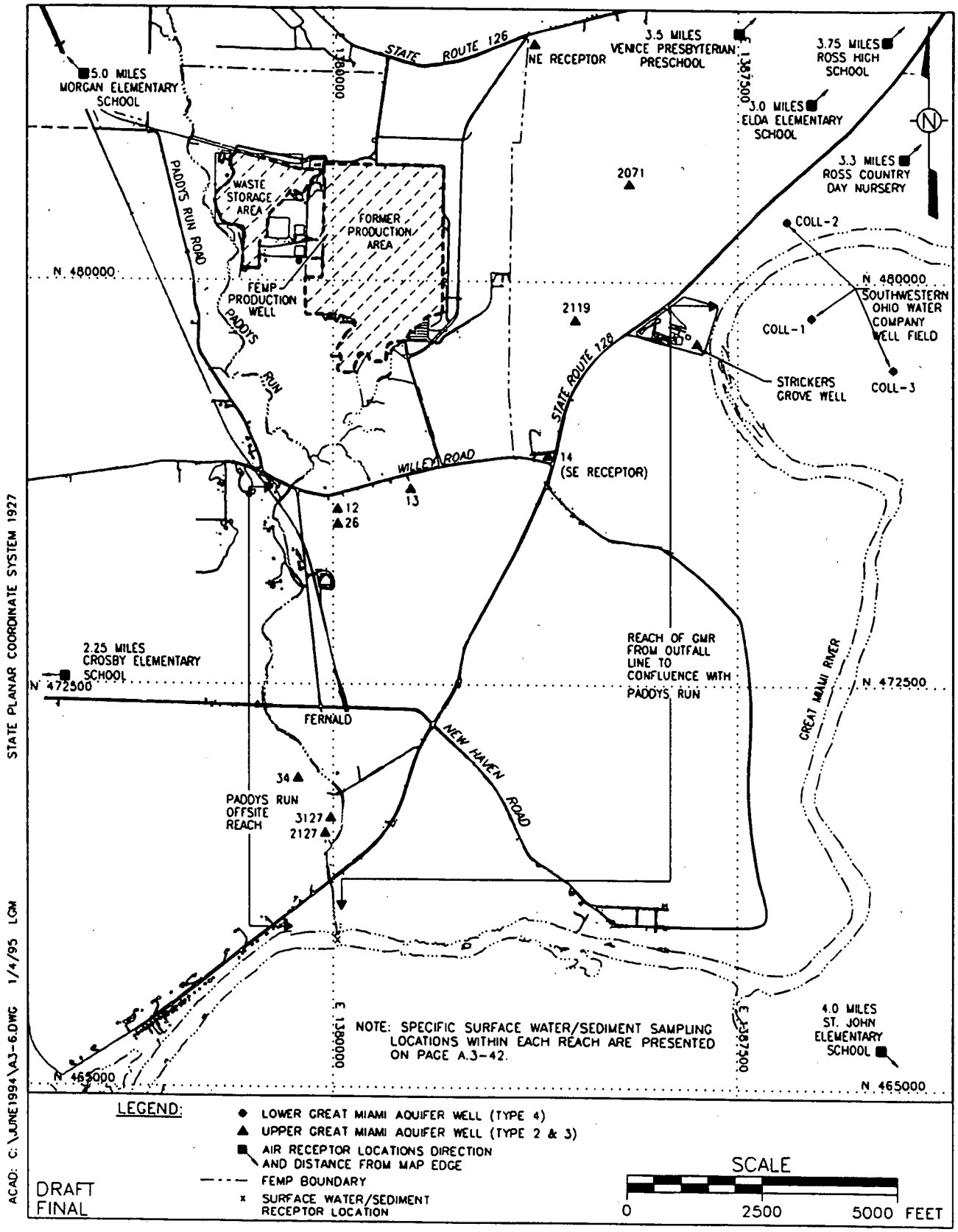


FIGURE A.3-6. OFF PROPERTY RECEPTOR LOCATIONS FOR OU5
FATE & TRANSPORT MODELING AND BASELINE RISK ASSESSMENT

evaluated. In most cases, uranium is the primary contributor to noncarcinogenic risk. Risk associated with CPC concentrations in sediment in the waste pit, southeast, and southwest areas predominate. The primary exposure pathway contributing to risk is dermal exposure to CPS in sediments. However, the majority of the risk in the production area and the northeast and northwest areas is attributable to CPCs in soil.

A.5.3.3 Off-Property Farmer

Table A.5-11 summarizes risks for the off-property farmer receptor considered under future land use with and without access controls. As a result of the migration of groundwater contaminants, exposure-point concentrations for groundwater are modeled values. Consistent with the off-property farmer evaluated under the current land-use scenario, the areas undergoing evaluation include the northern, southern, western, and eastern fencelines of Operable Unit 5. In addition, several off-property locations beyond the fencelines were evaluated to reflect possible future development. The following additional fenceline and the off-property receptor locations were included in the risk analysis of the off-property farmer for the future land-use scenario: 1) the northeast corner of the FEMP, 2) the southeast corner of the FEMP, 3) off-property Well 2071, 4) off-property Well 2119, and 5) an off-property receptor location near the Great Miami River.

Media considered for exposure assessment to this receptor are:

- Soil at the property boundary
- Air at the property boundary
- Groundwater at the property boundary

It should be noted that the evaluation of the hypothetical receptors at the off-property well locations did not include an evaluation of soil exposures. Validated RI/FS soil data are not available for these locations. However, unvalidated analytical data are available for off-property soil. These data were discussed in Section 4.0. Risk contours based on validated and nonvalidated data are presented in Section A.7.0 of the RI report (Figures A.7-1 through A.7-6). Modeled air and groundwater concentrations were used to assess risk at these receptor locations.

The total carcinogenic risk to the off-property farmer under the future land-use scenario ranged from 2.3×10^{-3} for the hypothetical receptor at the eastern fenceline to 1.0×10^{-4} for the hypothetical receptor near the Great Miami River. Risk associated with CPCs in groundwater predominate for

receptors at the southern fenceline, the southeast corner of the FEMP, and the selected off-property well locations. Risk associated with CPCs in groundwater and soil at the eastern fenceline exceed 1×10^{-3}. Risks associated with CPCs in soil predominate for hypothetical receptors at the northern and western fencelines and the northeast corner of the FEMP. (No change was assumed for CPC representative concentrations in soil. However, radiological decay is taken into account in the determination of appropriate cancer slope factors for risk analysis.) The distribution of risk changed significantly for air and groundwater based on future modeled concentrations when compared to concentrations evaluated under the current land-use scenario. Risks to the RME farmer in the future scenario significantly increase for radionuclides in groundwater. The principal carcinogenic CPCs contributing to risk are the isotopes of uranium, thorium, and radium; cesium-137, technetium-99, arsenic, beryllium, strontium-90, bis(2-chloroisopropyl)ether, and the carcinogenic PAHs.

143 HIs for this receptor ranged from 37 for the receptor at the eastern fenceline to 3.1×10^{-2} for the
143 hypothetical receptor at off-property well Location 2071. Uranium, zinc, cyanide, magnesium, 4-methyl phenol, and manganese are dominant chemical toxicants. HIs associated with CPCs in soil are the same as those developed for the current land-use scenario. In general, HIs for groundwater are significantly lower for chemicals because future modeling (see Appendix F.3; ***Sections 5.3.3, 5.4.3 and 5.5.3, and Tables 5-38 through 5-41***) predicts significantly lower concentrations in these areas, with the exception of total uranium, which is assumed to increase over time. HIs for air also change for the future land-use scenario because it is assumed that the on-property vegetative cover has decreased to 50 percent (i.e., the on-property land use is agricultural). (Risks associated with CPCs in air at the eastern fenceline increase when compared to that predicted for the current land-use scenario.)

In summary, carcinogenic risks estimated for the off-property farmer under the future land-use scenario were approximately 1 order of magnitude greater than the EPA 10^{-4} benchmark when the hypothetical receptors at the eastern and southern fenceline and the southeast corner receptor are evaluated. The locations evaluated were determined to be RME locations based on existing and potential future on- and off-property land use. The calculated risks reflect a conservative analysis for exposure to off-site receptors.

000136

6478

TABLE A.5-19
SUMMARY OF CANCER RISKS FROM AIR PATHWAY FOR SENSITIVE SUBPOPULATIONS: GRADE AND HIGH SCHOOL STUDENTS

Constituents	Crosby School	Morgan School	Elda School	St. John's School	Ross Middle / High School
RADIONUCLIDES					
Cs_{137+1d}	2.5E-16	1.3E-16	3.1E-16	2.3E-16	1.2E-16
Np_{237+1d}	1.0E-13	2.7E-14	1.1E-13	6.9E-14	4.2E-14
Pu_{238}	4.0E-12	7.4E-13	3.9E-12	2.3E-12	1.4E-12
$Pu_{239/240}$	5.6E-13	1.0E-13	5.7E-13	3.4E-13	2.1E-13
Ra_{226+5d}	8.9E-12	3.5E-13	1.3E-11	4.8E-12	4.3E-12
Ra_{228+1d}	5.9E-13	2.0E-14	7.1E-13	3.0E-13	2.3E-13
Ru_{106}	3.0E-15	1.0E-16	2.5E-15	1.2E-15	8.9E-16
Sr_{90+1d}	1.3E-15	4.3E-17	1.5E-15	6.3E-16	5.0E-16
Tc_{99}	1.8E-15	5.8E-16	2.5E-15	1.4E-15	9.0E-16
Th_{228+7d}	2.3E-11	1.1E-11	2.9E-11	2.1E-11	1.1E-11
Th_{230}	2.2E-10	8.6E-12	3.0E-10	1.2E-10	9.7E-11
Th_{232}	1.4E-11	4.6E-12	1.7E-11	1.1E-11	6.4E-12
U_{234}	2.7E-10	2.0E-11	2.9E-10	1.4E-10	9.6E-11
$U_{235/236}$	2.3E-11	3.1E-12	2.4E-11	1.3E-11	8.4E-12
U_{238+2d}	3.0E-10	6.5E-11	3.2E-10	1.9E-10	1.2E-10
Rn_{222+4d}	3.4E-09	1.6E-09	8.9E-09	3.4E-09	2.6E-09
TOTAL RAD RISK:	4.3E-09	1.7E-09	9.9E-09	3.9E-09	2.9E-09
CHEMICALS					
arsenic	1.2E-10	4.3E-12	1.0E-10	4.7E-11	3.5E-11
beryllium	6.1E-12	2.1E-13	5.9E-12	2.7E-12	2.0E-12
cadmium	1.9E-11	7.3E-13	1.8E-11	8.0E-12	6.2E-12
chromium vi	5.3E-10	1.9E-11	5.3E-10	2.4E-10	1.8E-10
nickel	1.3E-11	4.7E-13	1.2E-11	5.7E-12	4.3E-12
benzene	1.3E-19	3.1E-20	2.9E-19	1.1E-19	8.4E-20
chloroform	1.9E-18	8.5E-20	4.3E-18	1.6E-18	1.2E-18
methylene chloride	8.7E-18	1.7E-21	1.7E-17	8.7E-18	3.9E-18
tetrachloroethene	1.1E-11	2.1E-21	1.3E-11	5.1E-12	4.1E-12
trichloroethene	6.3E-11	6.3E-21	7.6E-11	3.0E-11	2.5E-11
benzo(a)anthracene	1.2E-14	6.4E-19	2.4E-14	1.1E-14	6.3E-15
benzo(a)pyrene	1.3E-13	6.4E-18	2.8E-13	1.3E-13	7.4E-14
benzo(b)fluoranthene	1.3E-14	6.4E-19	2.6E-14	1.1E-14	7.4E-15
benzo(k)fluoranthene	1.3E-15	6.4E-20	2.6E-15	1.2E-15	7.1E-16
chrysene	1.0E-16	6.4E-21	2.1E-16	9.0E-17	6.0E-17
dibenzo(a,h)anthracene	4.3E-14	6.4E-18	9.0E-14	4.0E-14	2.4E-14
dieldrin	2.7E-16	1.7E-17	4.4E-16	2.2E-16	1.3E-16
indeno(1,2,3-cd)pyrene	7.7E-15	6.4E-19	1.6E-14	7.1E-15	4.6E-15
bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA
octachlorodibenzo-p-dioxin	3.5E-16	1.6E-16	5.7E-16	2.5E-16	1.8E-16
octachlorodibenzofuran	1.6E-16	1.6E-16	3.8E-16	1.4E-16	1.1E-16
chlordane	1.8E-17	1.4E-18	2.6E-17	1.3E-17	7.9E-18
aroclor-1254	NA	NA	NA	NA	NA
aroclor-1260	NA	NA	NA	NA	NA
4,4-dde	NA	NA	NA	NA	NA
4,4-ddt	2.3E-17	3.6E-19	4.7E-17	1.9E-17	1.4E-17
carbazole	NA	NA	NA	NA	NA
n-nitrosodipropylamine	NA	NA	NA	NA	NA
n-nitrosodiphenylamine	NA	NA	NA	NA	NA
TOTAL CHEM RISK:	7.6E-10	2.5E-11	7.6E-10	3.4E-10	2.6E-10
TOTAL RISK:	5.1E-09	1.8E-09	1.1E-08	4.3E-09	3.2E-09

NA - not applicable(i.e. inhalation toxicity criteria are not available for this parameter)

TABLE A.5-20
SUMMARY OF HAZARD QUOTIENTS FROM AIR PATHWAY TO CRITICAL SUBPOPULATIONS

Constituents	Crosby School	Morgan School	Elda School	St. John's School	Ross Middle / High School
TOXICANTS					
aluminum	NA	NA	NA	NA	NA
antimony	NA	NA	NA	NA	NA
arsenic	NA	NA	NA	NA	NA
barium	5.0E-06	1.7E-07	4.8E-06	2.2E-06	3.7E-06
beryllium	NA	NA	NA	NA	NA
cadmium	NA	NA	NA	NA	NA
chromium vi	NA	NA	NA	NA	NA
cobalt	1.7E-04	6.3E-06	1.7E-04	7.6E-05	1.3E-04
copper	NA	NA	NA	NA	NA
cyanide	NA	NA	NA	NA	NA
lead	NA	NA	NA	NA	NA
magnesium	NA	NA	NA	NA	NA
manganese	3.7E-04	1.3E-05	3.5E-04	1.6E-04	2.7E-04
mercury	2.3E-08	7.8E-10	2.4E-08	1.1E-08	1.8E-08
molybdenum	NA	NA	NA	NA	NA
nickel	NA	NA	NA	NA	NA
selenium	NA	NA	NA	NA	NA
silver	NA	NA	NA	NA	NA
thallium	NA	NA	NA	NA	NA
vanadium	NA	NA	NA	NA	NA
zinc	NA	NA	NA	NA	NA
uranium-total	NA	NA	NA	NA	NA
chloroform	NA	NA	NA	NA	NA
methylene chloride	4.8E-14	9.6E-18	9.6E-14	4.8E-14	4.9E-14
tetrachloroethene	NA	NA	NA	NA	NA
bis(2-ethylhexyl)phthalate	NA	NA	NA	NA	NA
chlordane	NA	NA	NA	NA	NA
dieldrin	NA	NA	NA	NA	NA
4,4-ddt	NA	NA	NA	NA	NA
TOTAL HAZARD INDEX	5.5E-04	2.0E-05	5.2E-04	2.4E-04	4.0E-04

NA - not applicable(i.e. inhalation toxicity criteria are not available for this parameter)

000138

TABLE A. 5-22

SUMMARY OF RISK ASSESSMENT RESULTS FOR OPERABLE UNIT 5 FUTURE LAND USE SCENARIO

		Carcinogenic Risk Results			Noncarcinogenic Risk Results			
Receptor	Media Evaluated	Summary Results	Percent of ILCR by Source Term and Predominant Pathways	Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Summary Results	Percent of HI by Source Term and Predominant Pathway	Predominant CPCs (HI > 1.0)	Comment Uncertainty
Groundskeeper in Production Area (PA)	Air, Soil	$1.1x10^{-3}$	Approximately 90 percent of risk is due to CPCs in soil. The primary exposure pathway contributing to risk is external exposure to radiological CPCs in soils.	Greater than $1x10^{-6}$: *Cs-137 (s) *Arsenic (s) *Beryllium (s) Greater than $1x10^{-5}$: *Ra-226 (s) *Th-230 (a) *U-235/236 (s) *Rn-222 (a) *U-234 (a) *U-238 (a, s) *PCBs (s) *PAHs (s) Greater than $1x10^{-4}$: *Th-232 (s)	4.5	At least 98 percent of risk is due to CPCs in soil. The primary exposure pathway contributing to risk is dermal contact with soil.	*Uranium (s)	None

TABLE A.5-22 (Continued)

		Carcinogenic Risk Results			Noncarcinogenic Risk Results			
Receptor	Media Evaluated	Summary Results	Percent of ILCR by Source Term and Predominant Pathways	Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Summary Results	Percent of HI by Source Term and Predominant Pathway	Predominant CPCs (HI > 1.0)	Comment Uncertainty
Groundskeeper at the Northeast (NE) and Waste Pit (WPA) Areas	Air, Soil	$2.1x10^{-4}$ (NE) $8.6x10^{-4}$ (WPA)	At least 90 percent of risk is due to CPCs in soil. The primary exposure pathway contributing to risk is external exposure to radiological CPCs in soils.	Greater than $1x10^{-6}$: *Cs-137 (s) *Np-237 (s) *U-234 (a) *U-235/236 (s) *Arsenic (s) *Beryllium (s) *PAHs (s) *PCBs (s) Greater than $1x10^{-5}$: *Th-230 (a) *Th-232 (s) *U-238 (s) *Rn-222 (a) Greater than $1x10^{-4}$: *Ra-226 (s)	0.96 (WPA) 1.5 (NE)	At least 90 percent of risk is due to CPCs in soil. The primary exposure pathways contributing to risk are dermal contact with and incidental ingestion of soils.	None	None
Groundskeeper at Northwest (NW), Southeast (SE), Southwest (SW), and Trap Range (TR) Area	Air, Soil	$1.9x10^{-5}$ (NW) $2.6x10^{-5}$ (SE) $3.7x10^{-5}$ (SW) $3.1x10^{-5}$ (TR)	At least 61 percent of risk is due to CPCs in soil; for air, at least 72 percent of risk in air is due to CPCs. The primary exposure pathway contributing to risk in soil is external exposure, and the primary exposure pathway contributing to risk in air is inhalation.	Greater than $1x10^{-6}$: *Cs-137 (s) *Th-230 (a) *U-234 (a) *Np-237 (s) *U-235/236 (s) *U-238 (a) *Rn-222 (a) *Arsenic (s) *Beryllium (s)	0.34 (NW) 0.39 (SE) 0.66 (SW) 0.82 (TR)	At least 95 percent of risk is due to CPCs in soil. The primary exposure pathway contributing to risk is dermal contact.	None	None

TABLE A.5-22 (Continued)

		Carcinogenic Risk Results			Noncarcinogenic Risk Results			
Receptor	Media Evaluated	Summary Results	Percent of ILCR by Source Term and Predominant Pathways	Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Summary Results	Percent of HI by Source Term and Predominant Pathway	Predominant CPCs (HI > 1.0)	Comment Uncertainty
Recreational User, Developed Park, at Production Area (PA), Northwest (NW), Northeast (NE), Southeast (SE), Southwest (SW), Waste Pit (WPA), and Trap Range (TR) Areas, With Access Controls	Air, Soil, Surface Water, Sediment	$5.8x10^{-6}$ (TR) $5.9x10^{-6}$ (NW) $4.2x10^{-5}$ (SW) $5.9x10^{-5}$ (SE) $8.0x10^{-5}$ (NE) $3.9x10^{-4}$ (WPA) $4.8x10^{-4}$ (PA)	Estimated for PA, NW, NE, WPA, and TR that the majority of risk is due to CPCs in soil; estimated for SE and SW that the majority of risk is due to CPCs in surface water and sediment. The primary exposure pathway contributing to risk from soil and sediment is external exposure.	Greater than $1x10^{-6}$: *Cs-137 (s) *Th-230 (a) *U-234 (a) *Rn-222 (a) *Arsenic (s) *bis(2-ethylhexyl)phthalate (sw) *Tetrachloroethene (sw) Greater than $1x10^{-5}$: *U-235/236 (s) *U-238 (s) *PCBs (s) Greater than $1x10^{-4}$: *Ra-226 (s) *Th-232 (s)	0.07 (NW) 0.17 (TR) 0.33 (NE) 0.73 (WPA) 1.0 (PA) 1.5 (SW) 1.7 (SE)	Estimated for PA, NW, NE, and TR that the majority of risk is due to CPCs in soil; estimated for SE, SW, and WPA that the majority of risk is due to CPCs in sediment. The primary exposure pathway contributing to risk from soil and sediment is dermal contact.	*Uranium (sd)	●Non-food pathways only ●HQ for total uranium due to dermal contact with sediment ●Risk due to inhalation of air was highest for radionuclide contaminants in PA, NE, SE, SW, and TR areas ●External exposure risk for radionuclides and chemicals in soil or sediment was evident in ILCRs for all areas except TR. ●Risk $>=10^{-4}$ was found for Th-232 in PA for external exposure to soil, and Ra-226 in WPA for external exposure to soil

TABLE A.5-22 (Continued)

		Carcinogenic Risk Results			Noncarcinogenic Risk Results			
Receptor	Media Evaluated	Summary Results	Percent of ILCR by Source Term and Predominant Pathways	Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Summary Results	Percent of HI by Source Term and Predominant Pathway	Predominant CPCs (HI > 1.0)	Comment Uncertainty
Recreational User, Undeveloped Park, at Production Area (PA), Northwest (NW), Northeast (NE), Southeast (SE), Southwest (SW), Waste Pit (WPA), and Trap Range (TR) Areas, With Access Controls	Air, Soil, Surface, Water, Sediment	$2.6x10^{-6}$ (TR) $3.0x10^{-6}$ (NW) $3.6x10^{-5}$ (NE) $3.7x10^{-5}$ (SW) $5.7x10^{-5}$ (SE) $1.8x10^{-4}$ (WPA) $2.3x10^{-4}$ (PA)	Estimated for PA, NW, NE, WPA, TR that the majority of risk is due to CPCs in soil; estimated for SE and SW that the majority of risk is due to CPCs in sediment. The primary exposure pathway contributing to risk from soil and sediment is external exposure.	Greater than $1x10^{-6}$: *Cs-137 (s) *U-235/236 (s) *bis(2-ethylhexyl)phthalate (sw) *Tetrachloroethene (sw) Greater than $1x10^{-5}$: *U-238 (s) *PCBs (s) Greater than $1x10^{-4}$: *Ra-226 (s) *Th-232 (s)	0.059 (NW) 0.15 (TR) 0.28 (NE) 0.69 (WPA) 0.86 (PA) 1.4 (SW) 1.7 (SE)	Estimated for PA, NW, NE and TR that the majority of risk is due to CPCs in soil; estimated for SE, SW, and WPA that the majority of risk is due to CPCs in sediment. The primary exposure pathway contributing to risk in soil and sediment is dermal exposure.	*Uranium (sd)	•Non-food pathways only •HI for total uranium is due to dermal contact with sediment •Air is a significant pathway for radionuclide CPCs in PA •Surface water is a significant pathway for chemical CPCs in SW, SE, and WPA •Soil is a significant pathway for radionuclide CPCs in all study areas •Sediment is a significant pathway for radionuclide CPCs in WPA, SW, and SE

TABLE A.5-22 (Continued)

		Carcinogenic Risk Results			Noncarcinogenic Risk Results			
Receptor	Media Evaluated	Summary Results	Percent of ILCR by Source Term and Predominant Pathways	Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Summary Results	Percent of HI by Source Term and Predominant Pathway	Predominant CPCs (HI > 1.0)	Comment Uncertainty
Recreational User, Wildlife Reserve, at Production Area (PA), Northwest (NW), Northeast (NE), Southeast (SE), Southwest (SW), Waste Pit (WPA), and Trap Range (TR) Areas, With Access Controls	Air, Soil, Surface Water, Sediment	$2.2x10^{-6}$ (TR) $2.6x10^{-6}$ (NW) $3.2x10^{-5}$ (NE) $3.7x10^{-5}$ (SW) $5.6x10^{-5}$ (SE) $1.6x10^{-4}$ (WPA) $2.0x10^{-4}$ (PA)	The majority of risk estimated for PA, NW, NE, WPA, TR is due to CPCs in soil. The majority of risk estimated for SE and SW is due to CPCs in sediment. The primary exposure pathway contributing to risk from soil and sediment is external exposure to radiological CPCs in soil.	Greater than: $1x10^{-6}$: *Cs-137 (s) *U-235/236 (s) *bis(2-ethylhexyl)phthalate (sw) *Tetrachloroethene (sw) Greater than $1x10^{-5}$: *U-238 (s) *PCBs (s) Greater than $1x10^{-4}$: *Th-232 (s) *Ra-226 (s)	0.049 (NW) 0.12 (TR) 0.24 (NE) 0.67 (WPA) 0.72 (PA) 1.4 (SW) 1.6 (SE)	None	None	•Non-food pathways only •Risk due to inhalation of air or dermal contact with soil was highest for radionuclides in PA •Risk due to external exposure to contaminated soil was highest for radionuclides in PA, NE, and WPA •Risk due to dermal contact or incidental exposure to surface water was highest for radionuclides in SE •Risk due to external exposure to sediment was highest for radionuclides in SW •Risk due to exposure to tetrachloroethene was highest for dermal contact with surface water in WPA while this pathway was at risk for bis(2-ethylhexyl)phthalate) in SE and 4-methylphenol and Aroclor-1260 in SW

TABLE A.5-22 (Continued)

Receptor	Media Evaluated	Carcinogenic Risk Results: Summary Results	Carcinogenic Risk Results: Percent of ILCR by Source Term and Predominant Pathways	Carcinogenic Risk Results: Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Noncarcinogenic Risk Results: Summary Results	Noncarcinogenic Risk Results: Percent of HI by Source Term and Predominant Pathway	Noncarcinogenic Risk Results: Predominant CPCs (HI > 1.0)	Comment Uncertainty
Off-Property RME Farmer at the Eastern (EF), Northern (NF), Southern (SF), or Western (WF) Fencelines, or on a Farm Northeast (NE) or Southeast (SE) of the FEMP With and Without Access Controls	Air, Soil, Groundwater	$3.1x10^{-4}$ (NF) $4.0x10^{-4}$ (WF) $6.2x10^{-4}$ (NE) $9.4x10^{-4}$ (SE) $1.7x10^{-3}$ (SF) $2.3x10^{-3}$ (EF)	At least 70 percent of the risk estimated for the NF, WF, and NE farmer is due to CPCs in soils. At least 60 percent of the risk estimated for the SF and SE farmer is attributable to CPCs in groundwater. Risks estimated for the EF receptor are attributable to CPCs in groundwater (50 percent) and soil (50 percent). The primary exposure pathways contributing to risk from soil are ingestion of milk, meat, and vegetables; and the external exposure to CPCs in soils. The primary exposure pathways contributing to risk from groundwater are ingestion of drinking water and the consumption of milk, meat, and vegetables (from plant grown/animals grazed at the targeted receptor locations).	Greater than $1x10^{-6}$: *Np-237 (g) *Rn-222 (a) *bis(2-chloroisopropyl) ether (g) Greater than $1x10^{-5}$: *Cs-137 (s) *Ra-226 (g) *U-235/236 (g, s) *Beryllium (s) *PAHs (s) *Th-230 (a) *Arsenic (g) Greater than $1x10^{-4}$: *Sr-90 (s) *Tc-99 (s) *Th-232 (s) *U-234 (g) *U-238 (g)	0.65 (WF) 6.1 (NE) 7.6 (NF) 11 (SE) 24 (SF) 37 (EF)	At least 80 percent of estimated risk for EF, NF, and NE receptor locations is due to CPCs in soil. At least 90 percent of estimated risk for SF, WF, and SE receptor locations is due to CPCs in groundwater. The primary exposure pathways contributing to risk from soil are ingestion of milk and meat. The primary exposure pathways contributing to risk from groundwater are ingestion of drinking water and ingestion of vegetables and fruits.	*Magnesium (s) *Uranium (g) *Zinc (s)	• For the EF, risk associated with radionuclides was highest for pathways such as inhalation, ingestion, and external exposure across all transfer media; dermal contact was selected under certain chemical CPCs, while notable chemicals included benzo(a)pyrene and the fluoranthene series in soil • Bioaccumulation factored strongly into the risk profile for many radionuclides and bis(2-chloroisopropyl)ether and in the groundwater pathway for the SF; inhalation of air laden with radionuclides and external exposure to rad CPCs in soil were present in addition to bioaccumulation pathways for soil in the SF area

TABLE A.5-22 (Continued)

		Carcinogenic Risk Results			Noncarcinogenic Risk Results			
Receptor	Media Evaluated	Summary Results	Percent of ILCR by Source Term and Predominant Pathways	Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Summary Results	Percent of HI by Source Term and Predominant Pathway	Predominant CPCs (HI > 1.0)	Comment Uncertainty
Off-Property RME Farmer on a Farm at Well 2071 (2071), at Well 2119 (2119), or at a Well near the Great Miami River (GMR) With and Without Access Controls	Air, Groundwater	$1.7x10^{-5}$ (2071) $1.7x10^{-4}$ (2119) $1.0x10^{-4}$ (GMR)	At least 90 percent of risk for receptor locations 2119 and GMR is due to CPCs in groundwater. The primary exposure pathway contributing to risk is ingestion of drinking water.	Greater than $1x10^{-6}$: *Ra-226 (g) *Tc-99 (g) *Th-230 (a) *U-235/236 (g) *Rn-222 (a) Greater than $1x10^{-5}$: *U-234 (g) *U-238 (g)	0.031 (2071) 2.6 (2119) 1.5 (GMR)	At least 90 percent of risk estimated for receptor locations 2119 and GMR is due to CPCs in groundwater. The primary exposure pathway contributing to risk is ingestion of drinking water.	*Uranium (g)	•Groundwater at 2119 and GMR presents risk to consumer of drinking water, vegetable/fruit, or milk due to radiological CPCs; groundwater at 2071 presents chemical risk to consumer of drinking water, vegetables/fruit, inhalation of VOCs and radon, or dermal contact •Air at all locations presents risk due to inhalation only
Off-Property Child at the Eastern (EF), Northern (NF), Southern (SF), or Western (WF) Fencelines, or at a Farm Northeast (NE) or Southeast (SE) of the FEMP With and Without Access Controls	Air, Soil, Groundwater	$4.1x10^{-5}$ (NF) $5.5x10^{-5}$ (WF) $7.1x10^{-5}$ (SE) $1.1x10^{-4}$ (SF) $1.3x10^{-4}$ (NE) $2.1x10^{-4}$ (EF)	For SE and SF at least 97 percent of risk is due to CPCs in groundwater; for NE, WF, NF, and EF at least 44 to 99 percent or risk is due to CPCs in soil. The primary exposure pathway contributing to risk from groundwater is ingestion of drinking water. The primary exposure pathways contributing to risk from soil are ingestion of milk and meat and secondarily from ingestion of vegetables and fruits.	Greater than $1x10^{-6}$: *Cs-137 (s) *Ra-226 (g) *U-235/236 (s) *Arsenic (g) *Beryllium (s) *bis(2-chloroisopropyl) ether (g) Greater than $1x10^{-5}$: *Sr-90 (s) *Tc-99 (s, g) *U-234 (g) *U-238 (g) *PAHs (s)	2.4 (WF) 28 (NE) 29 (SE) 42 (NF) 68 (SF) 150 (EF)	For NE, NF, and EF at least 66 to 99 percent of risk is due to CPCs in soil; for SE, WF, and SF at least 89 to 99 percent of risk is due to CPCs in groundwater. The primary exposure pathways contributing to risk in soil are ingestion of milk, meat, and vegetables and fruit.	*Cadmium (s) *Cyanide (g) *Magnesium (s, g) *Manganese(s) *Molybdenum (s) *Uranium (g) *Zinc (s) *4-methyl phenol (g)	•HI significant for toxicants in soil and groundwater in EF, NF, SF (groundwater), NE (soil), SE (groundwater) •Ingestion indicates bioaccumulative effects for radionuclide CPCs •Soil is a significant pathway of exposure for radionuclide and chemical CPCs for some exposure pathways in each study area indicating bioaccumulation as well as direct contact •Groundwater is highly significant for radionuclide CPCs in EF, SF, SE and for chemical CPCs in SF, SE for all exposure pathways except ingestion of meat and inhalation or dermal contact •Groundwater is least significant for CPCs in NE, but drinking water raises a risk flag for all other study areas

TABLE A.5-22 (Continued)

Receptor	Media Evaluated	Carcinogenic Risk Results: Summary Results	Carcinogenic Risk Results: Percent of ILCR by Source Term and Predominant Pathways	Carcinogenic Risk Results: Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Noncarcinogenic Risk Results: Summary Results	Noncarcinogenic Risk Results: Percent of HI by Source Term and Predominant Pathway	Noncarcinogenic Risk Results: Predominant CPCs (HI > 1.0)	Comment Uncertainty
Off-Property Child at a Farm at Well 2071 (2071), Well 2119 (2119), or at a Well Near the Great Miami River (GMR) With and Without Access Controls	Air, Groundwater	$6.5x10^{-7}$ (2071) $5.8x10^{-6}$ (GMR) $9.0x10^{-6}$ (2119)	For GMR, 2071, and 2119 100 percent of risk is due to CPCs in groundwater. The primary exposure pathway contributing to risk is ingestion of drinking water.	Greater than $1x10^{-6}$: *U-234 (g) *U-238 (g)	0.079 (2071) 4.1 (GMR) 7.4 (2119)	For GMR, 2119, and 2071 SF at least 78 percent of risk is due to CPCs in groundwater. The primary exposure pathways contributing to risk are ingestion of drinking water and ingestion of vegetables and fruits.	*Uranium (g)	• HI for toxicants indicates risk due to radiological CPC present in groundwater via exposure at 2119 to drinking water and irrigated vegetables and fruits • Groundwater-borne radiological and chemical CPCs create significant risk in groundwater via exposure at GMR and 2119 to drinking water (rad) and irrigated vegetables and fruits (rad) indicating direct and bioaccumulative effects
Household (HH), Agricultural (AGR), or Recreational (REC) User of Great Miami River at Confluence with Paddys Run With and Without Access Controls	Surface Water	$4.5x10^{-5}$ (AGR) $1.1x10^{-4}$ (REC) $1.9x10^{-4}$ (HH)	The predominant exposure pathways are ingestion of drinking water (HH receptor); ingestion of vegetables, fruits, meat, and milk (AGR receptor); and dermal contact and ingestion of fish (REC receptor).	Greater than $1x10^{-6}$: *U-235/236 (sw) *Tc-99 (sw) Greater than $1x10^{-5}$: *Ra-226 (sw) *U-234 (sw) *U-238 (sw) *Arsenic (sw) *PCBs (sw)	0.53 (AGR) 0.85 (REC) 1.8 (HH)	The predominant exposure pathway is ingestion of drinking water (HH receptor).	*Uranium (sw)	• Greatest concentration of risk factors for radionuclides and total uranium • For ILCRs, ingestion of drinking water, vegetables and fruits, fish, and milk products predominate, indicating bioaccumulation effects. • For the HI, the pathway for total uranium is ingestion of drinking water, which is non-indicative of bioaccumulation

TABLE A.5-22 (Continued)

Receptor	Media Evaluated	Carcinogenic Risk Results: Summary Results	Carcinogenic Risk Results: Percent of ILCR by Source Term and Predominant Pathways	Carcinogenic Risk Results: Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Noncarcinogenic Risk Results: Summary Results	Noncarcinogenic Risk Results: Percent of HI by Source Term and Predominant Pathway	Noncarcinogenic Risk Results: Predominant CPCs (HI > 1.0)	Comment Uncertainty
On-Property RME Farmer at Production (PA), Northeast (NE), Southeast (SE), Waste Pit (WPA) Trap Range (TR), Northwest (NW), and Southwest (SW) Areas	Air, Soil, Groundwater	$6.1x10^{-3}$ (NE) $6.7x10^{-3}$ (SW) $8.9x10^{-3}$ (SE) $9.0x10^{-3}$ (TR) $9.1x10^{-3}$ (NW) $1.4x10^{-2}$ (WPA) $2.2x10^{-2}$ (PA)	At least 70 percent of estimated risk in PA, NE, and WPA is due to CPCs in soil. At least 90 percent of estimated risk in NW, SE, SW, and TR is due to CPCs in groundwater. The primary exposure pathways contributing to risk from soil are external exposure and ingestion of milk. The primary exposure pathway contributing to risk from groundwater is ingestion of drinking water.	Greater than $1x10^{-6}$: *Pu-238 (s) *Pu-239/240 (s) *Tetrachloroethene (a) *Trichloroethene (a) *1,1-Dichloroethene (s) *2,6-Dinitrotoluene (s) Greater than $1x10^{-5}$: *Cs-137 (s) *Np-237 (s) *Th-230 (a) *Rn-222 (a) *Beryllium (g, s) *Dioxins (s) Greater than $1x10^{-4}$: *Ra-226 (s, g) *Sr-90 (s) *Tc-99 (s, g) *Th-232 (s) *U-234 (g, s) *U-235/236 (g, s) *U-238 (g, s) *Arsenic (g, s) *PAHs (s) *PCBs (s)	23 (WPA) 27 (NW) 53 (NE) 88 (SW) 93 (PA) 120 (SE) 370 (TR)	For the PA, NE, and NW about 50 percent of risk is due to CPCs in soil and about 50 percent due to CPCs in groundwater. For the TR, 70 percent of risk is due to CPCs in soil. For the SE and SW, 92 percent is due to CPCs in groundwater. The primary exposure pathways contributing to risk from soil are ingestion of milk and meat and dermal contact. For groundwater, ingestion of vegetables and fruits and drinking water are primary exposure pathways.	*Antimony (g) *Arsenic (g) *Magnesium (s, g) *Mercury (s) *Silver (s) *Uranium (s) *Zinc (s)	• HI most prevalent in soil and groundwater media; bioaccumulation of radiological and chemical CPCs into food materials ingested are the pathways with greatest risk • For PA, WPA, and NE both radiological and chemical CPCs most prevalent for all exposure pathways in soil (with some exceptions); secondary groundwater and air contamination posed smaller risk to receptor • For SE and TR risk due to chemical CPCs was mainly not calculated; radiologically SE and TR similar in risk to PA, etc. • *The validated analytical database for soil indicates that carbon tetrachloride is not a COPC. However, 1.2 part per million (ppm) carbon tetrachloride was detected at one production area sampling location based on nonvalidated data. The cancer risk estimate associated with exposure to 1.2 ppm carbon tetrachloride is approximately 6 x 10^{-5}, considerably lower than the total cancer risk estimate available for the production area.*

TABLE A.5-22 (Continued)

		Carcinogenic Risk Results			Noncarcinogenic Risk Results			
Receptor	Media Evaluated	Summary Results	Percent of ILCR by Source Term and Predominant Pathways	Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Summary Results	Percent of HI by Source Term and Predominant Pathway	Predominant CPCs (HI > 1.0)	Comment Uncertainty
On-Property CT Farmer at the Production (PA), Northwest (NW), Northeast (NE), Southeast (SE), Southwest (SW), Waste Pit Area (WPA), or the Trap Range (TR) Area Without Access Controls (Future Agricultural Use)	Air, Soil, Groundwater	$3.8x10^{-4}$ (NE) $3.9x10^{-4}$ (SW) $5.2x10^{-4}$ (SE) $5.3x10^{-4}$ (TR) $5.4x10^{-4}$ (NW) $1.0x10^{-3}$ (WPA) $1.5x10^{-3}$ (PA)	Estimated for PA, NE, and WPA that the majority of risk is due to CPCs in soil; estimated for NW that equal majority of risk is due to CPCs in soil and groundwater; estimated for SE, SW, and TR that the majority of risk is due to CPCs in groundwater. The primary exposure pathways contributing to risk from soil are external exposure and ingestion of milk and meat. The primary exposure pathway contributing to risk from groundwater is ingestion of drinking water.	Greater than $1x10^{-6}$: *Cs-137 (s) *Np-237 (s) *Sr-90 (g, s) *Rn-222 (a) *Beryllium (s) *Dioxins/Furans (s) Greater than $1x10^{-5}$: *Tc-99 (g, s) *U-235/236 (s) * PAHs (s) * PCBs (s) Greater than $1x10^{-4}$: *Ra-226 (s) *Th-232 (s) *U-234 (g) *U-238 (g) *Arsenic (g)	9.2 (WPA) 12 (NW) 21 (NE) 37 (PA) 39 (SW) 55 (SE) 150 (TR)	Estimated for PA, NE, SE, SW, and WPA that the majority of risk is due to CPCs in groundwater; estimated for NW and TR that the majority of risk is due to CPCs in soil. The primary exposure pathways contributing to risk from groundwater are ingestion of drinking water and ingestion of vegetables and fruits. The primary exposure pathways contributing to risk from soil are ingestion of meat and milk products.	*Arsenic (g) *Antimony (g) *Magnesium (g) *Mercury (s) *Silver (s) *Uranium (g) *Zinc (s)	• Hazard quotients > = 10 exist for total uranium in drinking water from the groundwater in the SE, SW, PA, and TR, and bioaccumulated mercury uptake from ingestion of meat taken from cattle raised on the PA and TR.

TABLE A.5-22 (Continued)

		Carcinogenic Risk Results			Noncarcinogenic Risk Results			
Receptor	Media Evaluated	Summary Results	Percent of ILCR by Source Term and Predominant Pathways	Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Summary Results	Percent of HI by Source Term and Predominant Pathway	Predominant CPCs (HI > 1.0)	Comment Uncertainty
On-Property RME Child at Production (PA), Northwest (NW), Northeast (NE), Southeast (SE), Southwest (SW), Waste Pit (WPA), or the Trap Range (TR) Area With and Without Access Controls (Future Agricultural Use)	Air, Soil, Groundwater	$5.0x10^{-4}$ (SW) $6.0x10^{-4}$ (SE) $6.6x10^{-4}$ (TR) $1.1x10^{-3}$ (NE) $2.0x10^{-3}$ (NW) $2.3x10^{-3}$ (WPA) $4.5x10^{-3}$ (PA)	For the SE, SW, and TR between 82 and 93 percent of risk is due to CPCs in groundwater; for the PA, NW, NE, and WPA from 65 to 97 percent of risk is due to CPCs in soil. The primary exposure pathway contributing to risk from groundwater is ingestion of drinking water. The primary exposure pathways contributing to risk from soil are external exposure and ingestion of milk.	Greater than $1x10^{-6}$: *Cs-137 (s) *Np-237 (s) *Beryllium (s) *2,6-dinitrotoluene (s) *bis(2-chloroisopropyl) ether (s) *n-nitrosodipropylamine (s) *1,1,2,2-tetrachloroethane (s) Greater than $1x10^{-5}$: *Sr-90 (s) *U-235/236 (s) Greater than $1x10^{-4}$: *Ra-226 (s) *Tc-99 (s) *Th-232 (s) *U-234 (g) *U-238 (g) *Arsenic (g) *PAHs (s) *PCBs (s) *Dioxin/Furans (s)	110 (WPA) 110 (NW) 210 (NE) 280 (SW) 300 (PA) 390 (SE) 840 (TR)	For the WPA, NE, NW, PA, and TR between 55 and 90 percent of risk is due to CPCs in soil; for the SE and SW at least 82 percent of risk is due to CPCs in groundwater. The primary exposure pathways contributing to risk are ingestion of milk and meat.	*Cyanide (s) *Antimony (g) *Arsenic (g) *Boron (s) *Cadmium (s) *Copper (s) *Magnesium (s) *Manganese (s) *Mercury (s) *Molybdenum (s) *Silver (s) *Uranium (g) *Zinc (s)	• HIs for soil and groundwater include exposure pathways for bioaccumulation as well as direct contact via ingestion in all study areas; boron (never seen as HI factor until this scenario) through ingestion of milk products from soil in NW • HIs nonextant for air pathway • Soil-borne chemical CPCs were present for bioaccumulation and direct ingestion/contact in PA and WPA, and were also present but less diverse for the other study areas • Although less abundant, radiological CPCs in soil followed a similar trend for the external exposure pathway • Groundwater radiological and chemical CPCs presented risk $>= 10^{-6}$ in all areas for bioaccumulation-derived

TABLE A.5-22 (Continued)

		Carcinogenic Risk Results			Noncarcinogenic Risk Results			
Receptor	Media Evaluated	Summary Results	Percent of ILCR by Source Term and Predominant Pathways	Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Summary Results	Percent of HI by Source Term and Predominant Pathway	Predominant CPCs (HI > 1.0)	Comment Uncertainty
On-Property RME Farmer in the Production Area Using Perched Groundwater Without Access Controls (Future Agricultural Use)	Air, Soil, Perched Groundwater, and Great Miami Aquifer (GMA) Groundwater	$5.2x10^{-2}$	Approximately 60 percent of risk is due to CPCs in the perched groundwater. The primary exposure pathways contributing to risk is ingestion of drinking water and external exposure to CPCs in soils.	Greater than $1x10^{-6}$: *Pu-239/240 (p) *Pu-238 (p) *Th-230 (a) *Th-232 (p) *bis(2-ethylhexyl)phthalate (p) *Methylene chloride (p) *2,6-Dinitrotoluene (s) *1,1,2-Trichloroethane (p) Greater than $1x10^{-5}$: *Rn-222 (a) *Cs-137 (s) *Sr-90 (s) *Np-237 (p) *Ra-226 (p) *Benzene (p) *Carbon tetrachloride (p) *Tetrachloroethene (p) *1,1,2,2-Tetrachloroethene (p) *Trichloroethane (p) *Dioxins (s)	1500	At least 90 percent of risk is due to CPCs in the perched groundwater. The primary exposure pathway contributing to risk is ingestion of drinking water.	*Antimony (p) *Arsenic (p) *Mercury (s) *Silver (s) *Thallium (p) *Uranium (p) *Zinc (s) *Pentachloro-phenol (p) *Magnesium (g)	•Risk factors $>=10^{-4}$ are present for many VOC and BNA CPCs in perched groundwater for all exposure pathways indicating more direct exposure routes and in soil for ingestion of meat/milk products indicating bioaccumulation of CPCs •Risk factors greater than or equal to 10^{-4} are present for uranium and Tc-99 *Hazard quotients for Thallium and Total Uranium in the ingestion of drinking water from the perched groundwater pathway are $>=10$

TABLE A.5-22 (Continued)

Receptor	Media Evaluated	Carcinogenic Risk Results: Summary Results	Carcinogenic Risk Results: Percent of ILCR by Source Term and Predominant Pathways	Carcinogenic Risk Results: Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Noncarcinogenic Risk Results: Summary Results	Noncarcinogenic Risk Results: Percent of HI by Source Term and Predominant Pathway	Noncarcinogenic Risk Results: Predominant CPCs (HI > 1.0)	Comment Uncertainty
				Greater than $1x10^{-4}$: *Tc-99 (s) *U-234 (p) *U-235/236 (p) *U-238 (p) *PCBs (s) *Arsenic (p) *Beryllium (p) *PAHs (s) *Chloroform (p) *1,1-Dichloroethene (p) *1,2-Dichloroethane (p) *N-nitrosodipropylamine (p) *Pentachlorophenol (p) *Vinyl chloride (p)				
On-Property Home-Builder at Production (PA), Northwest (NW), Northeast (NE), Southeast (SE), Southwest (SW), Waste Pit (WPA), or Trap Range (TR) Areas Without Access Controls (Agricultural Use)	Air, Soil	$8.7x10^{-7}$ (NW) $1.0x10^{-6}$ (SE) $1.5x10^{-6}$ (SW) $1.9x10^{-6}$ (TR) $1.1x10^{-5}$ (NE) $4.3x10^{-5}$ (WPA) $4.3x10^{-5}$ (PA)	The majority of risk is due to CPCs in soil. The primary exposure pathway contributing to risk is external exposure to CPCs in soil.	Greater than $1x10^{-6}$: *U-235/236 (s) *U-238 (s) *Arsenic (s) *PAHs (s) Greater than $1x10^{-5}$: *Ra-226 (s) *Th-232 (s)	0.82 (SE) 1.2 (SW) 1.7 (TR) 3.2 (NE) 3.2 (NW) 3.2 (PA) 3.5 (WPA)	The majority of risk is due to CPCs in soil. The primary exposure pathway contributing to risk is dermal contact.	*Uranium (s)	•Most risk for CPS in soil related to external exposure

TABLE A.5-22 (Continued)

Receptor	Media Evaluated	Carcinogenic Risk Results: Summary Results	Carcinogenic Risk Results: Percent of ILCR by Source Term and Predominant Pathways	Carcinogenic Risk Results: Predominant CPCs (Cancer Risk Estimate Greater than $1x10^{-4}$, $1x10^{-5}$ and $1x10^{-6}$)[a]	Noncarcinogenic Risk Results: Summary Results	Noncarcinogenic Risk Results: Percent of HI by Source Term and Predominant Pathway	Noncarcinogenic Risk Results: Predominant CPCs (HI > 1.0)	Comment Uncertainty

[a] The transfer media associated with risk estimates for predominant CPCs are annotated as follows:
- (a) air
- (g) groundwater
- (s) soil
- (sd) sediment
- (sw) surface water
- (p) perched water

8478

A.6.2.4 Selection of Receptors

54 The receptors selected for evaluation in this assessment generally reflect and encompass those types of
54 activities which can define the RME individual. Some of these receptors, such as the on-property farmer living in the former production area, may possibly exist in the future but do not represent probable receptors. Risks to such a receptor may overstate risk from the property when considered against more plausible land-use alternatives. The future residential/agricultural land-use scenario is a ***probable*** scenario for the purposes of risk assessment. Results of the analysis of this scenario provide useful information to those making risk management decisions because they illustrate risk to the receptors who, without question, would experience the maximum risk under any of the plausible land-use scenarios ***(i.e., industrial/commercial, recreational, or agricultural/residential) considered in the Operable Unit 5 baseline risk assessment***.

155 The selection of receptors for the Operable Unit 5 baseline risk assessment is based on actual current land-use/anticipated future land-use scenarios and the associated receptor behavior patterns on-property and off-property. The selection of receptors considers the rural character of the site and the adjoining area. As demonstrated in Section A.5, risk assessment results for exposure pathways associated with agricultural activities and behavior patterns (e.g., food production and consumption) often predominate. Future receptors (and the associated behavior patterns) may differ from those anticipated if land use changes in the area (e.g., if farms are purchased and developed for residential/commercial use).

A.6.2.5 Selection of Exposure Factors

Each exposure factor selected for use in this risk assessment has some uncertainty associated with it. Generally, these factors are based on surveys of physiological and lifestyle profiles across the United States. The attributes and activities studied in these surveys generally have a broad distribution. To avoid the underestimation of exposure, this risk assessment follows EPA's recommendation and uses the 95th percentile for most of the exposure factors. In other words, the values used generally represent the habits of a small percentage of the population (usually 5 or 10 percent). For example, receptors are assumed to live at the location of highest concentration for 70 years. It is unlikely that an actual resident would follow this activity pattern. Another example is the evaluation of dermal exposure to the 95th percentile body surface area on receptors of average body weight. Body surface area and body weight are directly proportional; therefore, this assumption would tend to overestimate risk from dermal absorption.

A major uncertainty associated with predicting future exposures at the FEMP is the future disposition of the property itself. Because it is not possible to accurately predict what the future uses of the land may be or how much remediation the site may undergo, the most conservative (rather than the most likely) land use is evaluated, as stipulated by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). As noted in Section A.3.0, one of the on-property residents evaluated under future land use for Operable Unit 5 is the resident farmer. An agricultural receptor is assumed to represent the upper-bound values for the exposure assessment. Comparison of the RME adult to the central-tendency adult illustrates the range of uncertainty associated with the application of the future land-use scenario to Operable Unit 5.

A.6.2.6 Toxicity Assessment

Considerable uncertainty is associated with the qualitative (hazard assessment) and quantitative (dose-response) evaluations of a CERCLA risk assessment. The hazard assessment deals with characterizing the nature and strength of the evidence of causation, or the likelihood that a chemical that induces adverse effects in animals will induce adverse effects in humans.

Hazard assessment of carcinogenicity is evaluated as a weight-of-evidence determination, using either the IARC (1987) or EPA (1986b) guidance. Positive animal cancer test data suggest that humans contain tissue(s) that may be provoked into a carcinogenic response; however, the animal data cannot necessarily be used to predict the target tissue in humans. In the hazard assessment of noncancer effects, positive animal data suggest the nature of the effects (i.e., the target tissues and type of effects) anticipated in humans (EPA 1989i).

Uncertainty in hazard assessment arises from the nature and quality (sensitivity and selectivity) of the animal and human data. Uncertainty is decreased when similar effects are observed across species, strain, sex, and exposure route; when the magnitude of the response is clearly dose-related; when pharmacokinetic data indicate a similar fate in animals and humans; when postulated mechanisms of toxicity are similar for humans and animals; and when the CPC is structurally similar to other chemicals for which the toxicity is more completely characterized. A unique source of uncertainty in cancer hazard assessment involves the relevance of liver tumors in strains of mice with a high background incidence, especially when these tumors provide the only positive response (Scala 1991). Many chlorinated organic chemicals in EPA cancer weight-of-evidence Group B2 fall into this category.

6478

uniform radionuclide concentration. To manage complicated calculations for photon attenuation and scattering in soil, EPA has assumed that the activity in the slab source is present on an infinite plane with uniform surface concentration. The slope factors for external radiation exposure are, therefore, based on calculated exposures (and associated risks of cancer incidence) from the hypothetical plane source.

EPA calculates slope factors for ingestion of many radionuclides using the maximum value for the gastrointestinal (GI) absorption factor. The actual chemical form(s) that influence the magnitude of this absorption factor have not been considered.

166 Finally, there is uncertainty contributed by the lack of risk factors (RFDs, CSFs) for some CPCs. However, CSFs and/or RFDs are available for all the predominant contaminants detected in the environmental media samples collected to date.

A.6.2.7 Risk Characterization

The additivity of risks from radionuclides and chemical carcinogens is the subject of considerable debate. EPA guidance (EPA 1989a) indicates that the two sets of estimates be considered separately because chemical cancer slope factors (CSFs) are developed using laboratory experiments and radionuclide toxicity values are based on human epidemiological data. Chemical CSFs represent an upper-bound limit value, whereas radionuclide slope factors are only best estimates.

A.6.3 SUMMARY OF UNCERTAINTIES IN OPERABLE UNIT 5 BASELINE RISK ASSESSMENT

Uncertainties encountered during the preparation of this assessment are based on the unique considerations inherent in Operable Unit 5. While many of the uncertainties are shared between operable units, others are specific to Operable Unit 5. This is primarily because of the much larger area of Operable Unit 5 and the volume and variety of environmental media evaluated.

167 ***The risk assessment for Operable Unit 5 was conducted to estimate the extent of risk to populations exposed (or hypothetically exposed) to contaminant levels detected at the site. The uncertainty associated with the results of the risk assessment is due, in large part, to the uncertainty in knowing the true population exposure. This uncertainty has been evaluated by preparing a central tendency (CT) risk estimate and a reasonable maximum exposure (RME) estimate for maximally exposed individuals. The identification of the risk incurred by 50 percent (the CT evaluation) and by***

95 percent (the RME evaluation) of the receptor population is a required component of the risk assessment. The results of the RME evaluation are typically used to make risk management decisions. The results of the CT evaluation help the risk manager to understand, to a certain extent, the level of uncertainty associated with the exposure input values which define the RME and CT evaluations.

000156

Harting, F. H., and W. Hesse, 1879, "Der Lungenkrebs, die Bergkrnkheit in den Schneeberger Gruben," Vierteljahrsschr. f. Gerichtl. Med. u. Offentl. Gensundheitswesen, Vol. 30, pp. 296-309, Vol. 31, pp. 102-132, 313-337.

Hausler, M., and R. Lenich, 1968, "Effect of Chronic Occupational Allyl Chloride Exposure," Archives of Toxicology, Vol. 23, pp. 209-214, (Cited in EPA 1992).

Hayes, M. A., 1987, "Carcinogenic and Mutagenic Effects of PCBs," S. Safe, ed., Environmental Toxin Series, Vol. A. Polychlorinated Biphenyls (PCBs): Mammalian and Environmental Toxicology, Springer-Verlag., New York, pp. 77-95.

Hayes, W., Ed., 1982, "Chlorinated Hydrocarbon Insecticides," Pesticides Studied in Man, Baltimore: Williams and Wilkins, pp. 186-195, (Cited in ATSDR 1989).

He, F., D. Shen, Y. Guo, and B. Lu, 1980, "Toxic Polyneuropathy Due to Chronic Allyl Chloride Intoxication: A Clinical and Experimental Study," Chinese Medical Journal, Vol. 93, pp. 177-182, (Cited in EPA 1992).

He, F., B. Lu, S. Zhang, S. Dong, A. Yu, and B. Wang, 1985, "Chronic Allyl Chloride Poisoning, An Epidemiology, Clinical, Toxicological and Neuropathological Study," Giornale Italiano Di Medicina Lavoro (Pavia), Vol. 7, pp. 5-15, (Cited in EPA 1992).

DOE Helsel, D. R., and R. M. Hirsch, 1992, "Statistical Methods in Water Resources," U.S. Geological Survey, Water Resources Division, Reston, VA.

Högberg, J., and J. Alexander, 1986, "Selenium," Handbook on the Toxicology of Metals, L. Friberg, G. F. Nordberg, and V. B. Vouk, eds., Vol. II, 2nd ed., Elsevier Science Publishers B.V., New York, pp. 482-520.

Holness, D. L., J. T. Purdham, and J. R. Nethercott, 1989, "Acute and Chronic Respiratory Effects of Occupational Exposure to Ammonia," American Industrial Hygiene Association J., Vol. 50, pp. 646-650, (Cited in EPA 1992).

Horta, J. da Silva, M. E. Horta, L. C. da Motta, and M. H. Tavares, 1978, "Malignancies in Portuguese Thorotrast Patients," Health Physics, Vol. 35, pp. 137-152.

Howard, P. H., 1989, Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volume I, Large Production and Priority Pollutants, Lewis Publishers, Chelsea, MI.

DOE Howard, P. H., 1990, Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volume II, Solvents, Lewis Publishers, Chelsea, MI.

DOE Howard, P. H., 1991, Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Volume III, Pesticides, Lewis Publishers, Chelsea, MI.

Hursch, J. B., W. R. Neuman, T. Toribara, H. Wilson, and C. Waterhouse, 1969, "Ingestion of Uranium by Man," Health Physics, Vol. 17, pp. 619-621.

Hursh, J. B., and N. L. Spoor, 1973, "Data on Man," Uranium, Plutonium and the Transuranic Elements, C. H. Hodge, J. N. Stannard, and J. B. Hursh, eds.,

Iffland, R., 1988, "Antimony," Handbook on Toxicity of Inorganic Compounds, Seiler, H. G., H. Sigel, and A. Sigel, eds., Marcel Dekker, Inc., New York, pp. 67-76.

International Agency for Research on Cancer (IARC), 1980, IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 23, Some Metals and Metallic Compounds, World Health Organization, Lyon, France, (Cited in EPA 1992).

International Agency for Research on Cancer (IARC), 1987, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Overall Evaluations of Carcinogenicity: An Updating of IARC Monographs, Vols. 1 to 42, Preamble, Supplement 7, WHO: Lyon, France, pp. 17-34.

Ishinishi, N., K. Tsuchiya, M. Vahter, and B. A. Fowler, 1986, "Arsenic," Handbook on the Toxicology of Metals, L. Friberg, G. F. Nordberg, and V. B. Vouk, eds., Vol. II, 2nd ed., Elsevier Science Publishers B. V., New York, pp. 43-83.

IT Corporation (IT), 1986, "Final Interim Report - Air, Soil Water and Health Risk Assessment in the Vicinity of the FMPC, Fernald, OH." Report and Data Package Prepared for the U.S. Department of Energy in Support of the Fernald Litigation, Oak Ridge Operations Office, Oak Ridge, TN.

Ito, N., H. Nagasaki, M. Arai, et al., 1973, "Histopathologic Studies on Liver Tumorigenesis in Rats Treated with Polychlorinated Biphenyls and Its Promoting Effect on Liver Tumors Induced by Benzene Hexachloride," Journal of the National Cancer Institute, Vol. 51, pp. 1637-1646, (Cited in EPA 1992a).

Jacobson, J. L., G. G. Fein, S. W. Jacobson, et al., 1984, "The Transfer of Polychlorinated Biphenyls (PCBs) and Polybrominated Biphenyls (PBBs) Across the Human Placenta and Into Maternal Milk," Journal of Public Health, Vol. 74, pp. 378-379, (Cited in ATSDR 1991).

Johnson, A., D. Norton, and B. Yake, 1988, "Persistence of DDT in the Yakima River Drainage, Washington," Archaeological Environmental Contamination Toxicology, Vol. 17, pp. 289-297.

Jensen, S., and G. Sundstrom, 1974, "Structures and Levels of Most Chlorobiphenyls in Two Technical PCB Products and In Human Adipose Tissue," Ambio, Vol. 3, pp. 70-76, (Cited in ATSDR 1991).

Jones, T. D., and B. A. Owen, 1989, "Health Risks from Mixtures of Radionuclides and Chemicals in Drinking Water," Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Kanisawa, M., and H. A. Schroeder, 1969, "Life Term Studies on the Effect of Trace Elements on Spontaneous Tumors in Mice and Rats," Cancer Research, Vol. 29, pp. 892-895, (Cited in EPA 1992).

Kazantzis, G., 1986, "Thallium," Handbook on the Toxicology of Metals, Friberg, L., G. F. Nordberg, and V. B. Vouk, eds., Vol. II, 2nd ed., Elsevier Science Publishers B. V., New York, pp. 549-567.

Kato, Y., T. Mori, and T. Kumatori, 1979, "Thorotrast Dosimetric Study in Japan," Environmental Research, Vol. 18, pp. 32-36.

Kato, Y., T. Mori, and T. Kumatori, 1983, "Estimated Absorbed Dose in Tissues and Radiation Effects in Japanese Thorotrast Patients," Health Physics, Vol. 44, Suppl. 1, pp. 273-279.

U.S. Environmental Protection Agency (EPA), 1991f, "Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals." Publication 9285.7-01B. EPA, Office of Emergency and Remedial Response.

U.S. Environmental Protection Agency (EPA), 1991g, "Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses," Hazardous Site Evaluation Division, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1991h, "Laboratory Data Validation - Functional Guidelines for Evaluating Inorganic Analyses," Hazardous Site Evaluation Division, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1991i, "Update on OSWER Soil Lead Cleanup Guidance, Memorandum from D. R. Clay, Office of Solid Waste and Emergency Response, August 1991.

U.S. Environmental Protection Agency (EPA), 1991j, Standard Default Exposure Factors, (OSWER Directive 9285.6-03).

DOE U.S. Environmental Protection Agency (EPA), 1991k, "Recommended and Foundation Fill Materials Construction Standard of the Florida Radon Research Program," Research Triangle Park, NC, Prepared by V. C. Rogers and K. Nielson for the U.S. Environmental Protection Agency, Report EPA-600/891-206, October.

U.S. Environmental Protection Agency (EPA), 1992a, "Risk Assessment Guidance for Superfund, Vol. I, HHEM, Supplemental Guidance for Superfund, Dermal Risk Assessment, Interim Guidance, Public 9285.7-01B. EPA, OERR.

U.S. Environmental Protection Agency (EPA), 1992b, "Health Effects Assessment Summary Tables, Annual Update FY1992," Prepared by the Environmental Criteria Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1992c, "Supplemental Guidance to RAGS: Calculating the Concentration Term," Prepared by the Office of Solid Waste and Emergency Response, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1992d, "Guidance on Risk Characterization for Risk Assessors and Risk Managers," memorandum dated February 26, 1992.

U.S. Environmental Protection Agency (EPA), 1992e, "Dermal Exposure Assessment: Principles and Applications," EPA/600/8-91/011B, Prepared by the Office of Research and Development, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1992f, "Drinking Water Regulations and Health Advisories," Office of Water, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1992g, Memorandum from D. L. Forman, U.S. EPA Region III, Philadelphia, PA, Subject: Cobalt Toxicity, dated March 12, 1992.

U.S. Environmental Protection Agency (EPA), 1992h, Risk Assessment Teleconference for Superfund (RATS), May 13, 1992 meeting notes, Superfund Technical Support Center, Environmental Criteria and Assessment Office, Cincinnati, OH.

U.S. Environmental Protection Agency (EPA), 1992i, "Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual. Supplemental Guidance for Superfund, Dermal Risk Assessment, Interim Guidance." Publication 9285.7-01B. EPA, Office of Emergency and Remedial Response, Washington, DC.

DOE U.S. Environmental Protection Agency (EPA), 1992j, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Draft, Addendum to Interim Final Guidance.

DOE U.S. Environmental Protection Agency (EPA), 1992k, Environmental Criteria Assessment Office, Risk Assessment Issue Paper for: "Provisional RfD for Cobalt (7440-48-4)."

DOE U.S. Environmental Protection Agency (EPA), 1992l, "Statistical Training Course for Ground-Water Monitoring Data Analysis," EPA 530/R-93-003, July.

DOE U.S. Environmental Protection Agency (EPA), 1992m, Environmental Criteria Assessment Office, Cincinnati, OH, Memorandum 10/5/92.

139 U.S. Environmental Protection Agency (EPA), 1993a, "Integrated Risk Information System (IRIS)," Computer Database, EPA, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1993b, "Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening," Region III Technical Guidance Manual.

U.S. Environmental Protection Agency (EPA), 1993c, "Risk-Based Concentration Table," 3rd quarter, EPA Region 3, Philadelphia, PA.

U.S. Environmental Protection Agency (EPA), 1993d, Memorandum from J. Dollaride, ECAO, to P. VanLeeuwen, EPA Region V, July 21, 1993. Attachment G: "Review of Position Paper on Proposed Modifications to Soil Cleanup Levels."

U.S. Environmental Protection Agency (EPA), 1993e, "Drinking Water Regulations and Health Advisories," May 1993, Office of Water, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1993f, "Provisional Guidance for Qualitative Risk Assessment of Polycyclic Aromatic Hydrocarbons," March 1993, ECAO-CIN-842.

U.S. Environmental Protection Agency (EPA), 1993g, "Health Effects Assessment Summary Tables, Annual Update FY 1993," including Suppl. A, March 1993, Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC.

U.S. Environmental Protection Agency (EPA), 1993h, "Superfund Standard Default Exposure Factors for Central Tendency and Reasonable Maximum Exposure," Preliminary Draft, May 5.

DOE U.S. Environmental Protection Agency (EPA), 1993i, "Risk-Based Concentration Table," 4th quarter, EPA Region 3, Philadelphia, PA.

DOE U.S. Environmental Protection Agency (EPA), 1993j, "Radiation Protection of the Public and the Environment; Proposed Rule," 58 Federal Register 56, Washington, DC.

DOE U.S. Environmental Protection Agency (EPA), 1994a, "Integrated Risk Information System (IRIS)" Computer Database, EPA, Washington, DC.

E U.S. Environmental Protection Agency (EPA), 1994b, Health Effects Assessment Summary Tables (HEAST), Annual Update FY 1994, EPA 540-R-94-020, Prepared by the Office of Health and Environmental Assessment for the Office of Solid Waste and Emergency Response and the Office of Water, Washington, DC.

DOE U.S. Environmental Protection Agency (EPA), 1994c, Environmental Criteria Assessment Office, Memorandum 9/21/94.

DOE U.S. Environmental Protection Agency, 1994d, "Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children," draft final, and "Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead," version 0.99d, software program, EPA, Washington, DC.

DOE U.S. Environmental Protection Agency, 1994e, "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities," Pub. 9355.4-12, EPA, Office of Solid Waste and Emergency Response, Washington, DC.

U.S. Nuclear Regulatory Commission (NRC), 1977, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I,: Regulatory Guide 1.109, NRC, Office of Standards Development, Washington, DC.

U.S. Nuclear Regulatory Commission (NRC), 1983, "Radiological Assessment: A Textbook on Environmental Dose Analysis," NUREG/CR-3322, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC.

U.S. Nuclear Regulatory Commission (NRC), 1984a, "De Minimis Waste Impacts Analysis Methodology," Prepared for Division of Waste Management, NRC FIN B7318, U.S. NRC, Washington, DC.

U.S. Nuclear Regulatory Commission (NRC), 1984b, De Minimis, Waste Impacts Analysis Methodology, NUREG/CR-3585.

Uzhdavini, E. R., I. K. Astaf'yeva, A. A. Mamayeva, and G. Z. Bakhtizina, 1972, "Inhalation Toxicity of o-Cresol," Tr. Ufimskogo Nauchno-Issledovatel'skogo Instituta Gigiyeny Profzabolevaniya, Vol. 7, pp. 115-119, (English translation) (Cited in EPA 1992).

Vainich, et al., 1976, "The Fate of Intratracheally Instilled Benzo(a)pyrene in the Isolated Perfused Rat Lung of Both Control and 20-Methylcholanthrene Pretreated," Research Communications in Chemical Pathology and Pharmacology, Vol. 13, pp. 259, (Cited in EPA 1980).

Van Bruwaene, R. Hegela, M. Gerber, G. B. Kirchmann, and R. Maisin, 1986, "Toxicity of Long-term Application of Dietary Technetium to Rats and the Offspring Bound to Food," Desmet, G. Myttenaere, C. eds., Technetium in the Environment, Elsevier App. Science Publ., London, New York, pp. 385-398.

Van Duuren, B. L., B. M. Goldschmidt, G. Loewengart, A. C. Smith, S. Melchionne, I. Seldman, and D. Roth, 1979, "Carcinogenicity of Halogenated Olefinic and Aliphatic Hydrocarbons in Mice," Journal of the National Cancer Institute, Vol. 63, pp. 1433-1439, (Cited in EPA 1992).

van Kaick, G., A. Kaul, D. Lorenz, H. Muth, K. Wegener, and H. Wesch, 1978a, "Late Effects and Tissue Dose in Thorotrast Patients. Recent Results of the German Thorotrast Study," Late Biological Effects of Ionizing Radiation, International Atomic Energy Agency, Vienna, Austria, Vol. 1, pp. 263-276.

van Kaick, G., D. Lorenz, H. Muth, and A. Kaul, 1978b, "Malignancies in German Thorotrast Patients and Estimated Tissue Dose," Health Physics, Vol. 35, pp. 127-136.

van Kaick, G., H. Muth, and A. Kaul, H. Immich, D. Liebermann, D. Lorenz, W. J. Lorenz, H. Luhrs, K. E. Scheer, G. Wagner, K. Wegener, and H. Wesch, 1983, "Recent Results of German Thorotrast Study -Epidemiological Results and Dose Effect Relationships in Thorotrast Patients," Health Physics, Vol. 44, Supp. 1, pp. 299-306.

van Kaick, G., H. Muth, A. Kaul, H. Immich, D. Liebermann, D. Lorenz, W. J. Lorenz, W. J. Luhrs, K. E. Scheer, G. Wagner, K. Wegener, and H. Wesch, 1984a, "Results of the German Thorotrast Study," Radiation Carcinogenesis, Epidemiology and Biological Significance, J. D. Boice, Jr. and J. F. Fraumeni, Jr., eds., Raven, NY.

van Kaick, G., H. Muth, and A. Kaul, 1984b, "The German Thorotrast Study," Results of Epidemiological, Clinical and Biophysical Examinations on Radiation-Induced Late Effects in Man Caused by Incorporated Colloidal Thorium Dioxide (Thorotrast), Report No. EUR 9504 EN, Commission of the European Communities, Luxembourg, Germany.

van Kaick, G., H. Muth, A. Kaul, H. Wesch, H. Immich, D. Liebermann, W. J. Lorenz, H. Luhrs, K. E. Scheer, G. Wagner, and K. Wegener, 1986, "Report on the German Thorotrast Study," Strahlentherapie, Vol. 80, pp. 114-118.

Van Miller, J. P., R. J. Marlar, and J. R. Allen, 1976, "Tissue Distribution and Excretion of Tritiated Tetrachlorodibenzo-p-dioxin in Non-human Primates and Rats," Food and Cosmetic Toxicology, Vol. 14, pp. 31-34, (Cited in EPA 1985).

Velsicol Chemical Co., 1983, "Thirty-month Chronic Toxicity and Tumorigenicity Test in Rats by Chlordane Technical," Unpublished study by Research Institute for Animal Science in Biochemistry and Toxicology (RIASBT), Japan, (Cited in ATSDR 1989; EPA 1992).

Wagoner, J. K., V. E. Archer, B. E. Carroll, and D. A. Holaday, 1964, "Cancer Mortality Patterns Amongst U.S. Uranium Miners and Millers, 1950 Through 1962," Journal of the National Cancer Institute, Vol. 32, pp. 787-801.

Watkins, J. S., and A. M. Speiker, 1971 "Seismic Refraction Survey of Pleistocene Drainage Channels in the Lower Great Miami River Valley, Ohio," USGS Professional Paper 605-B.

Waxweiler, R. J., V. E. Archer, R. J. Roscoe, A. Watanabe, and J. J. Thun, 1983, "Mortality Patterns Among a Retrospective Cohort of Uranium Mill Workers," Proceedings of the Health Physics Society, presented at Epidemiology Applied to Health Physics, pp. 428-435.

Wesch, H., H. Kampmann, and K. Wegener, 1973, "Assessment of Organ Distribution of Thorium by Neutron-Activation-Analysis," Proceedings of the Third International Meeting on the Toxicity of Thorotrast, Riso Report 294, M. Faber, ed., Danish Atomic Energy Commission, Copenhagen, Denmark, pp. 52-60.

Wesch, H., W. Riedel, K. Wegener, A. Kaul, H. Immich, K. Hasenohrl, H. Muth, and G. van Kaick, 1983, "Recent Results of the German Thorotrast Study - Statistical Evaluation of Animal Experiments With Regard to the Nonradiation Effect in Human Thorotrastosis," Health Physics, Vol. 44, Suppl. 1, pp. 317-321.

000162

Notes

(1) Distribution: Norm = Normal; Log = Lognormal; Und = Undefined.

(2) Representative Concentration:

(a) The upper 95% confidence limit for the normal distribution was used.

(b) The upper 95% confidence limit for the lognormal distribution was used.

(c) The nonparametric 95th percentile was used.

(d) The maximum detected value was used for one or more of the following reasons: There were less than 7 samples; the sample set had less than 50% detects; the 95th percentile (nonparametric) was greater than the maximum detect in an undefined distribution; the upper confidence limit (normal or lognormal) in the appropriately defined distribution was greater than the maximum detect.

(e) The minimum detected value was used, because the 95th percentile-nonparametric was a non-detect value.

(3) Above Background: Metals and radionuclides detected at concentrations exceeding background were selected as CPCs as indicated by a Y. Organics detected at concentrations exceeding the EPA RAGS, Part B (EPA 1991) toxicity screen were retained as CPCs.

(4) Comment: Professional Judgement

a Constituent is selected as a CPC based on statistical analysis of the data.

b Constituent is NOT selected as a CPC based on statistical analysis of the data.

c Constituent is selected as a CPC based on inspection of the data.

d Constituent is NOT selected as a CPC based on inspection of the data.

e Constituent is selected as a CPC based on the EPA RAGS, Part B toxicity screen as presented in Section A.2.0.

f Constituent is selected as a CPC since no background samples were available for statistical comparison.

g Constituent is NOT selected as a CPC based on the EPA RAGS, Part B toxicity screen as presented in Section 2.0.

Statistical test qualifiers:

na not applicable

* The statistical test concluded that a statistically significant difference exists between the background and the study area data. However, by inspection, it was evident that the background data set was the greater of the two data sets.

Results appear in three significant figures except for volatile organic compounds, semivolatile organic compounds, and pesticides or polychlorinated biphenyl chemicals; these results were reported in whole numbers due to the mass spectrometry analytical method.

000164

DOE

TABLE A. IV - 20
FINAL SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
GRAZING AREA 2
SURFACE SOIL

Constituents	Frequency of Detection	Minimum Detect	Maximum Detect	Dist. (1)	Average of Positive Hits	Representative Concentration (2)	T-Test Y-reject Ho N-accept Ho na-not applicable	WRS Test Y-reject Ho N-accept Ho na-not applicable	Test of Proportions Y-reject Ho N-accept Ho na-not applicable	Exceed the 95th Percentile Y-Yes N-No na-not applicable	Above Back-ground Y-Yes N-No (3)		Comment (4)
Radionuclides (pCi/g)													
URANIUM-238	14/14	0.900	7.80	Log	3.28	4.54(b)	na	Y	na	Y	Y	a	
URANIUM-234	14/14	0.700	6.20	Log	2.62	3.67(b)	na	Y	na	Y	Y	a	
THORIUM-230	15/15	0.800	3.14	Log	1.72	2.11(b)	na	N	na	Y	Y	a	
RADIUM-226	15/15	0.300	1.20	Und	0.920	1.20(d)	na	Y*	na	N	N	b, d	
URANIUM-235/236	1/13	1.60	1.60	Und	1.60	1.60(d)	na	na	Y	Y	Y	a	
THORIUM-232	14/15	0.500	1.24	Und	1.02	1.24(d)	na	N	na	N	N	b	
RADIUM-228	12/15	0.600	1.35	Norm	1.06	1.07(a)	na	N	na	Y	N	d	
THORIUM-228	14/15	0.600	13.6	Log	2.56	4.20(b)	na	Y	na	Y	Y	a	
NEPTUNIUM-237	0/8												
PLUTONIUM-239/240	0/15												
PLUTONIUM-238	0/15												
STRONTIUM-90	4/13	0.600	2.50	Und	1.23	2.50(d)	na	na	N	Y	Y	a	
TECHNETIUM-99	0/13												
RUTHENIUM-106	0/14												
CESIUM-137	11/15	0.33	1.00	Log	0.546	0.781(b)	na	N	na	Y	Y	a	
Metals (mg/kg)													
ALUMINUM	17/17	4080	13400	Norm	9030	10200(a)	na	N	na	Y	Y	a	
ANTIMONY	0/17												
ARSENIC	17/17	2.40	5.80	Log	4.08	4.52(b)	na	N	na	N	N	b	
BARIUM	17/17	37.4	185	Log	89.3	108(b)	na	Y	na	Y	Y	a	
BERYLLIUM	8/17	0.610	1.70	Und	1.01	1.70(d)	na	na	Y	Y	Y	a	
BORON	1/1	14.3	14.3	Und	14.3	14.3(d)	na	na	na	na	na	f	
CADMIUM	5/17	0.510	1.90	Und	1.48	1.90(d)	na	na	N	Y	Y	a	
CHROMIUM	17/17	5.90	19.4	Norm	12.6	14.2(a)	na	Y	na	Y	Y	a	
COBALT	17/17	5.10	17.9	Norm	10.8	12.1(a)	N	na	na	Y	Y	a	
COPPER	17/17	6.80	23.6	Log	13.1	15.4(b)	na	Y	na	Y	Y	a	
CYANIDE	6/17	0.150	1.70	Und	0.480	1.70(d)	na	Y	na	Y	Y	a	
LEAD	14/14	12.7	33.3	Log	20.6	23.9(b)	na	Y	na	Y	Y	a	
MAGNESIUM	17/17	1230	22500	Und	4460	22500(d)	na	Y	na	Y	Y	a	
MANGANESE	17/17	294	1470	Log	857	1060(b)	Y	na	na	Y	Y	a	
MERCURY	0/17												
MOLYBDENUM	6/17	6.90	13.3	Und	10.1	13.3(d)	na	na	na	na	na	c	Background - 0/30
NICKEL	17/17	6.20	25.8	Log	14.0	17.1(b)	Y	na	na	Y	Y	a	
SELENIUM	4/15	0.480	0.770	Und	0.583	0.770(d)	na	na	Y	Y	Y	a	
SILVER	0/17												
THALLIUM	1/17	0.670	0.670	Und	0.670	0.670(d)	na	na	N	Y	Y	a	
THORIUM, TOTAL	7/8	8.74	11.2	Norm	10.3	11.2(d)	na	N	na	N	N	b	

TABLE A. IV - 20
FINAL SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
GRAZING AREA 2
SURFACE SOIL

Constituents	Frequency of Detection	Minimum Detect	Maximum Detect	Dist. (1)	Average of Positive Hits	Representative Concentration (2)	T-Test Y-reject Ho N-accept Ho na-not applicable	WRS Test Y-reject Ho N-accept Ho na-not applicable	Test of Proportions Y-reject Ho N-accept Ho na-not applicable	Exceed the 95th Percentile Y-Yes N-No na-not applicable	Above Back-ground Y-Yes N-No (3)		Comment (4)
URANIUM, TOTAL	16/16	1.00	26.0	Log	10.4	19.3(b)	na	Y	na	Y	Y	a	
VANADIUM	17/17	12.2	28.8	Norm	20.4	22.4(a)	na	N	na	Y	N	d	
ZINC	15/17	28.5	137	Log	61.9	78.9(b)	na	Y	na	Y	Y	a	
4-METHYL-2-PENTANONE	1/15	14	14	Und	14	14(d)	na	na	na	na	na	c	
Semivolatile Organics (ug/kg)													
BIS(2-ETHYLHEXYL)PHTHALATE	3/17	57	65	Und	62	65(d)	na	na	na	na	na	c	
CHRYSENE	1/17	40	40	Und	40	40(d)	na	na	na	na	na	c	
DI-N-BUTYL PHTHALATE	1/17	82	82	Und	82	82(d)	na	na	na	na	na	c	
PHENANTHRENE	2/17	45	65	Und	55	65(d)	na	na	na	na	na	c	
PYRENE	2/17	63	65	Und	64	65(d)	na	na	na	na	na	c	
Pesticides/PCBs (μg/kg)													
ENDRIN ALDEHYDE	1/28	15	15	Und	15	15(d)	na	na	na	na	na	g	

This page intentionally left blank!

Notes

(1) Distribution: Norm = Normal; Log = Lognormal; Und = Undefined.

(2) *Representative Concentration:*

(a) The upper 95% confidence limit for the normal distribution was used.

(b) The upper 95% confidence limit for the lognormal distribution was used.

(c) The nonparametric 95th percentile was used.

(d) The maximum detected value was used for one or more of the following reasons: There were less than 7 samples; the sample set had less than 50% detects; the 95th percentile (nonparametric) was greater than the maximum detect in an undefined distribution; the upper confidence limit (normal or lognormal) in the appropriately defined distribution was greater than the maximum detect.

(e) The minimum detected value was used, because the 95th percentile-nonparametric was a non-detect value.

(3) Above Background: Metals and radionuclides detected at concentrations exceeding background were selected as CPCs as indicated by a Y. Organics detected at concentrations exceeding the EPA RAGS, Part B (EPA 1991) toxicity screen were retained as CPCs.

(4) Comment: Professional Judgement

a Constituent is selected as a CPC based on statistical analysis of the data.

b Constituent is NOT selected as a CPC based on statistical analysis of the data.

c Constituent is selected as a CPC based on inspection of the data.

d Constituent is NOT selected as a CPC based on inspection of the data.

e Constituent is selected as a CPC based on the EPA RAGS, Part B toxicity screen as presented in Section A.2.0.

f Constituent is selected as a CPC since no background samples were available for statistical comparison.

g Constituent is NOT selected as a CPC based on the EPA RAGS, Part B toxicity screen as presented in Section 2.0.

Statistical test qualifiers:

na not applicable

* The statistical test concluded that a statistically significant difference exists between the background and the study area data. However, by inspection, it was evident that the background data set was the greater of the two data sets.

Results appear in three significant figures except for volatile organic compounds, semivolatile organic compounds, and pesticides or polychlorinated biphenyl chemicals; these results were reported in whole numbers due to the mass spectrometry analytical method.

000167

TABLE A. IV - 62
FINAL SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN
EASTERN WELLS (TYPE 2, TYPE 3, AND TYPE 4 WELLS)
UNFILTERED GROUNDWATER

Constituents	Frequency of Detection	Minimum Detect	Maximum Detect	Dist. (1)	Average of Positive Hits	Representative Concentration (2)	T-Test Y-reject Ho N-accept Ho na-not applicable	WRS Test Y-reject Ho N-accept Ho na-not applicable	Test of Proportions Y-reject Ho N-accept Ho na-not applicable	Exceed the 95th Percentile Y-Yes N-No na-not applicable	Above Back-ground Y-Yes N-No (3)	Comment (4)
Radionuclides (pCi/L)												
URANIUM-238	5/11	0.500	1.70	Und	0.840	1.70(d)	na	Y	na	Y	Y	a
URANIUM, TOTAL (mg/L)	11/12	0.300	5.10	Log	1.60	5.10(d)	na	Y	na	Y	Y	a
URANIUM-234	8/11	0.400	1.70	Log	0.788	1.00(b)	na	Y	na	Y	Y	a
THORIUM-230	4/12	0.300	1.70	Und	0.925	1.70(d)	na	N	na	Y	N	b,d
THORIUM-232	2/12	1.20	2.40	Und	1.800	2.40(d)	na	na	N	Y	Y	a
THORIUM-TOTAL (mg/L)	2/11	2.00	24.6	Und	13.3	24.6(d)	na	na	N	Y	Y	a
THORIUM-228	1/12	4.92	4.92	Und	4.92	4.92(d)	na	na	Y	N	N	b,d
Metals (mg/L)												
ALUMINUM	3/10	0.0213	0.2250	Und	0.0928	0.225(d)	na	na	N	N	N	b
ARSENIC	2/10	0.00210	0.00770	Und	0.0049	0.00770(d)	na	na	N	N	N	b
BARIUM	10/10	0.0368	0.153	Log	0.0747	0.0976(b)	na	Y*	na	N	N	b, d
CALCIUM	10/10	77.9	135	Norm	104	116(b)	na	N	na	N	N	b
CHROMIUM	2/10	0.0067	0.0732	Und	0.0400	0.0732(d)	na	na	N	Y	Y	a
COPPER	2/10	0.0045	0.00710	Und	0.00580	0.00710(d)	na	na	N	N	N	b
IRON	7/10	0.655	2.66	Norm	1.36	1.47(b)	na	Y*	na	N	N	b,d
LEAD	3/10	0.00140	0.00200	Und	0.00160	0.00200(d)	na	na	N	N	N	b
MAGNESIUM	10/10	20.4	39.0	Log	29.1	33.0(b)	na	N	na	N	N	b
MANGANESE	9/10	0.00340	0.429	Log	0.177	0.429(d)	N	na	na	N	N	b
NICKEL	2/10	0.0299	0.0650	Norm	0.0475	0.0650(d)	na	na	N	Y	Y	a
SELENIUM	2/10	0.00100	0.00280	Und	0.00190	0.00280(d)	na	na	N	Y	Y	a
VANADIUM	1/10	0.00760	0.00760	Und	0.00760	0.00760(d)	na	na	N	N	N	b
ZINC	3/10	0.00500	0.0102	Und	0.00730	0.0102(d)	na	na	N	N	N	b
General Chemistries (mg/L)												
CHLORIDE	12/12	17.0	51.0	Log	31.7	38.5(b)	na	na	na	na	na	f
FLUORIDE	11/12	0.140	0.35	Norm	0.288	0.256(a)	na	na	na	na	na	f
NITRATE/NITRITE	7/9	0.290	25.2	Log	5.90	25.2(d)	na	na	na	na	na	f

Notes

(1) Distribution: Norm = Normal; Log = Lognormal; Und = Undefined.

(2) Representative Concentration:

(a) The upper 95% confidence limit for the normal distribution was used.

(b) The upper 95% confidence limit for the lognormal distribution was used.

(c) The nonparametric 95th percentile was used.

(d) The maximum detected value was used for one or more of the following reasons: There were less than 7 samples; the sample set had less than 50% detects; the 95th percentile (nonparametric) was greater than the maximum detect in an undefined distribution; the upper confidence limit (normal or lognormal) in the appropriately defined distribution was greater than the maximum detect.

(e) The minimum detected value was used, because the 95th percentile-nonparametric was a non-detect value.

(3) Above Background: Metals and radionuclides detected at concentrations exceeding background were selected as CPCs as indicated by a Y. Organics detected at concentrations exceeding the EPA RAGS, Part B (EPA 1991) toxicity screen were retained as CPCs.

(4) Comment: Professional Judgement

a Constituent is selected as a CPC based on statistical analysis of the data.

b Constituent is NOT selected as a CPC based on statistical analysis of the data.

c Constituent is selected as a CPC based on inspection of the data.

d Constituent is NOT selected as a CPC based on inspection of the data.

e Constituent is selected as a CPC based on the EPA RAGS, Part B toxicity screen as presented in Section A.2.0.

f Constituent is selected as a CPC since no background samples were available for statistical comparison.

g Constituent is NOT selected as a CPC based on the EPA RAGS, Part B toxicity screen as presented in Section 2.0.

Statistical test qualifiers:

na not applicable

* The statistical test concluded that a statistically significant difference exists between the background and the study area data. However, by inspection, it was evident that the background data set was the greater of the two data sets.

Results appear in three significant figures except for volatile organic compounds, semivolatile organic compounds, and pesticides or polychlorinated biphenyl chemicals; these results were reported in whole numbers due to the mass spectrometry analytical method.

1-6478

000168

This page intentionally left blank!

EPA (1992b) presents no inhalation RfC for lead, but referred to the National Ambient Air Quality Standard (NAAQS) for lead, which could be used in lieu of an inhalation RfC. The NAAQSs are based solely on human health considerations and are designed to protect the most sensitive subgroup of the human population. The NAAQS for lead is 1.5 $\mu g/m^3$, averaged quarterly (EPA 1992b). The NAAQS is equivalent to 0.00043 mg/kg/day, assuming a body weight of 70 kg and an inhalation rate of 20 m^3/day.

The EPA (1990c, 1993a) determined that it is inappropriate to derive an RfD for oral exposure to lead for several reasons. First, the use of an RfD assumes that a threshold for toxicity exists, below which adverse effects are not expected to occur; however, the most sensitive effects of lead exposure, impaired neurobehavioral development in children and altered blood enzyme levels associated with anemia, may occur at blood lead concentrations so low as to be considered practically nonthreshold in nature. Second, RfD values are specific for the route of exposure for which they are derived. Lead, however, is ubiquitous, so that exposure occurs from virtually all media and by all pathways simultaneously, making it practically impossible to quantify the contribution to blood lead from any one route of exposure. Finally, the dose-response relationships common to many toxicants, and upon which derivation of an RfD is based, do not hold true for lead. This is because the fate of lead within the body depends, in part, on the amount and rate of previous exposures, the age of the recipient, and the rate of exposure. There is, however, a reasonably good correlation between blood lead concentration and effect. Therefore, blood lead concentration is the appropriate parameter on which to base the regulation of lead.

210 *The EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children, version 0.99d, is an iterative set of equations that estimate blood lead concentrations in children aged 0 to 7 years (EPA 1994d). The biokinetic part of the model describes the movement of lead between the plasma and several body compartments and estimates the resultant blood concentration. The rate of the movement of lead between the plasma and each compartment is a function of the transition or residence time (i.e., the mean time for lead to leave the plasma and enter a given compartment, or the mean residence time for lead in that compartment). Compartments modeled include the erythrocytes, liver, kidneys, all the other soft tissue of the body, cortical bone, and trabecular bone. Excretory pathways and their rates are also modeled. These include the mean time for excretion from the plasma to the urine, from the liver to the bile, and from the other soft tissues to the hair, skin, sweat, etc. The model permits the user to adjust the transition and residence times. EPA*

guidance (EPA 1994e) establishes a screening level of 400 ppm for lead in soil at Superfund sites. This concentration is considered by EPA to be protective for direct contact with lead-contaminated soil in a residential setting.

A.V.72.3 Carcinogenicity

EPA (1993a) classifies lead in cancer weight-of-evidence Group B2 (probable human carcinogen), based on inadequate evidence of cancer in humans and sufficient animal evidence. The human data consist of several epidemiologic occupational studies that yielded confusing results. All of the studies lacked quantitative exposure data and failed to control for smoking and concomitant exposure to other possibly carcinogenic metals. Rat and mouse bioassays showed statistically significant increases in renal tumors following dietary and subcutaneous exposure to several soluble lead salts. Various lead compounds were observed to induce chromosomal alterations in vivo and in vitro, sister chromatid exchange in exposed workers, and cell transformation in Syrian hamster embryo cells; to enhance simian adenovirus induction; and to alter molecular processes that regulate gene expression. EPA (1993a) declined to estimate risk for oral exposure to lead because many factors (e.g., age, general health, nutritional status, existing body burden and duration of exposure) influence the bioavailability of ingested lead, introducing a great deal of uncertainty into any estimate of risk.

A.V.73 NITROBENZENE

A.V.73.1 Health Effects

When nitrobenzene is ingested or inhaled, the outstanding systemic effect is methemoglobin formation. When the iron component of hemoglobin is converted from the ferrous state to the ferric state, the resultant methemoglobin is no longer capable of releasing oxygen to the tissue of the body.

CHANGE PAGE INSTRUCTIONS - VOLUME 3 OF 5

(Note: Due to double sided copies, in some cases it was necessary to include pages from the October 1994 version before and after the actual change pages)

Section B.1
Replace pages B.1-11 and B.1-12.

Section B.3
Replace Table B.3-10.

6478

The predominant inorganic chemicals used to process uranium at the FEMP were nitric acid, hydrochloric acid, hydrofluoric acid, magnesium metal, calcium hydroxide (lime), and calcium-magnesium carbonate (dolomite). The ore concentrates processed at the FEMP contained elevated concentrations of inorganic impurities including arsenic, calcium, magnesium, phosphorus, sodium, thorium, and vanadium. Magnesium metal represented a major waste product of the refining process.

Relatively few organics were employed directly in the refining process. A kerosene-tributyl phosphate mixture was used as a solvent in the extraction of uranyl nitrate. Other organic materials used at the FEMP included lubricants, cutting oils, coolants and water soluble oils, PCBs from lubricants and electrical equipment, pesticides, herbicides, solvents and cleaning fluids. As a result of the many oils and oily materials burned at the FEMP, chlorinated dibenzo p-dioxins/dibenzofurans (CDDs/CDFs), polycyclic aromatic hydrocarbons (PAHS) and phenols may have been produced.

Surface water and sediment contaminants detected in drainage ditches in the production area and the waste storage areas include various radionuclides (e.g., total and isotopic uranium), hazardous substance list (HSL) organics, and HSL inorganics. Contaminants present in the sediments and surface waters in Paddys Run include radionuclides (primarily isotopic uranium), and HSL inorganics. Contaminated sediments are confined primarily to on-property areas. The periodic scouring of Paddys Run during high flow tends to limit sediment contaminant accumulations.

Surface water contamination in the Great Miami River consists primarily of uranium and low levels of isotopic radium and thorium. Sediment contaminants include radionuclides, HSL inorganics, and organic compounds. Relatively similar concentrations of radionuclides are found at all sampling locations downstream of the FEMP NPDES outfall line. HSL organic and inorganic contamination appears to be confined to the area immediately downstream of the outfall.

224 Uranium contamination of FEMP surface soils is widespread and occurs in all study areas. The occurrence of other radionuclides tend to be more localized. The highest concentrations of uranium have been found in surface soils in:

- The vicinity of Plants 2/3, 5, 6 and 8.
- The northeastern portion of the former production area.
- Localized areas of the northwestern portion of the processing area .
- The fire training area.

- Locations within the administrative area adjacent to the Plant 8 and Plant 4 stacks.
- A localized area of contamination adjacent to the former solid waste incinerator.

Inorganic surface soil constituents detected in above-background concentrations are generally associated with elevated concentrations of uranium and include beryllium, cadmium, selenium, and silver. This association between elevated concentrations of uranium and inorganic constituents is expected, as processing activities at the FEMP did not selectively isolate or concentrate metals other than uranium.

Volatile organic and semi-organic compounds and PCBs were detected in samples collected in the vicinity of all major FEMP processing and support facilities. However, these contaminants have not been detected in samples collected near the sewage treatment plant. Like the elevated concentrations of inorganic constituents, these organic contaminants tend to be located in areas exhibiting elevated concentrations of uranium.

224 Tables B.2-4 through B.2-6 list the contaminants of potential concern *by study area*.

224

B.1.3 REMOVAL ACTIONS

225 As summarized in Section 1.0 of the Operable Unit 5 RI Report, twenty-nine removal actions and other abatement actions have been completed or are underway at the FEMP. These actions are or are being implemented as best management practice initiatives or to achieve compliance with DOE orders or state discharge limits. The following is a summary of those removal actions most likely to directly impact ecological receptors. The greatest impact removal actions have on ecological receptors is by significantly reducing the amount of contamination in an area. For example, by controlling contaminated storm water, lower concentrations of contaminants will be present in on-property ditches, the SSOD, and in Paddys Run. Thus, the potential risk to both terrestrial receptors using the ditches and creeks as sources of drinking water, as well as the aquatic ecological receptors — especially those in Paddys Run — will be reduced if not eliminated. A more detailed discussion of all these activities is provided in Section 1.0 of the RI report.

Until recently, storm water runoff at the FEMP has not been controlled but simply collected via a network of storm sewers. During low and normal rainfall, storm water was diverted through the outfall line into the Great Miami River. However, during heavy rainfall, runoff was sent directly into

TABLE B.3-10

FACTORS CONTRIBUTING TO UNCERTAINTY

Factor	Discussion	Impact on uncertainty	Impact on Risk Estimation
Contaminant concentrations in environmental media (source term data)	***How accurately sampling results represent the extent of contamination.***	Increases uncertainty	May under or overestimate risk
Soil-to-grub transfer factors	Conservatively assumed to be 1 - only published value that was located was 0.01 for radium	Increases uncertainty	Results in an overestimation
Mouse soil, grub, vegetation, and water ingestion rates	Assumed to be constant	Increases uncertainty	Results in an overestimation; assumed to feed all year-long
Vole soil, grub, vegetation, and water ingestion rates	Assumed to be constant	Increases uncertainty	Results in an overestimation; assumed to feed all year-long
Plant-to-soil concentration ratio	Because values for pine trees were not available, used values for grasses from Till and Meyer, 1983.	Increases uncertainty	May under or overestimate risk
Shiner bioaccumulation factors	For radium, strontium, and thorium, bioaccumulation factors were provided in reference for both flesh and bone. In these cases, because the percentage of bone versus flesh for shiners was not known, for conservatism, the higher of the two values was used.	Increases uncertainty	Results in a moderate overestimation of risk as these CPCs tend to end up in bone tissue
Shiner benthic macroinvertebrate ingestion rate	Calculated assuming that benthic macroinvertebrates constitute 20% (by mass) of the shiner's diet and that the shiner consumes 10% of its body weight per day.	Increases uncertainty	Moderate overestimation of risk; assumed to feed all year long

CHANGE PAGE INSTRUCTIONS - VOLUME 13 OF 13

(Note: Due to double sided copies, in some cases it was necessary to include pages from the October 1994 version before and after the actual change pages)

Appendix T, Groundwater Tab

Replace pages for Plate E-59.

Replace pages for Plate E-67.

Replace pages for Plate E-132.

Replace pages for Plate E-133.

FOR PLATE NO. E-59

Sample	Sampdate	Boring	North	East	Total	Qual
NA	/ /	1008	480660.43	1378925.89	0.0000	
NA	/ /	1010	481452.64	1379690.67	0.0000	
120262	07/16/93	1011	482247.85	1377960.96	(27.0000)	
NA	/ /	1018	479450.19	1378661.75	0.0000	
003149	05/04/88	1019	481657.56	1379094.87	34.0000	
NA	/ /	1020	479160.31	1379581.26	0.0000	
NA	/ /	1021	481566.50	1378897.33	0.0000	
NA	/ /	1022	481706.62	1378686.73	0.0000	
EMGW_SYSGEN_34	02/18/90	1024	482481.13	1378892.98	2.7000	
003231	05/23/88	1025	482021.62	1378309.51	2.0000	
NA	/ /	1027	481980.79	1379319.50	0.0000	
NA	/ /	1028	481821.60	1378158.13	0.0000	
120522	07/12/93	1029	480826.11	1378398.38	(2.0000)	
GW930707_4	07/07/93	1030	481232.33	1378976.48	(6.0000)	
066596	09/08/89	1031	481167.08	1378136.61	1013.0000	
NA	/ /	1032	480515.31	1378296.87	0.0000	
120527	07/12/93	1033	480412.89	1378675.20	(22.0000)	
120532	07/12/93	1034	480240.85	1378410.34	(2.0000)	
NA	/ /	1035	482200.60	1379710.46	0.0000	
GW930707-1	07/07/93	1037	482151.80	1379796.71	(5.0000)	
066667	11/22/89	1038	482055.43	1379622.49	2.7000	
EMGW_SYSGEN_112	03/04/91	1039	480729.12	1379659.11	20.1000	
NA	/ /	1040	485833.34	1376759.84	0.0000	
EMGW_SYSGEN_121	03/04/91	1041	480550.15	1379798.68	21.0000	
NA	/ /	1042	480388.77	1379543.28	0.0000	
NA	/ /	1045	477134.70	1379751.55	0.0000	
NA	/ /	1046	478054.76	1379428.51	0.0000	
NA	/ /	1047	478258.45	1379062.49	0.0000	
110900	04/28/93	1048	477477.45	1379877.21	(1.0000)	
EMGW_SYSGEN_136	05/16/90	1052	482506.58	1380147.61	16.6000	
NA	/ /	1053	479920.97	1380342.06	0.0000	
EMGW_SYSGEN_150	06/25/90	1054	480050.26	1381524.14	9.6000	
NA	/ /	1055	481476.15	1380703.31	0.0000	
NA	/ /	1059	487827.16	1376077.06	0.0000	
EMGW_SYSGEN_162	03/11/91	1060	475865.60	1380010.66	13.9000	
NA	/ /	1064	480718.76	1382193.03	0.0000	
NA	/ /	1065	477860.01	1380415.98	0.0000	
003228	05/23/88	1073	481417.66	1378202.78	83.0000	
003229	05/23/88	1074	481187.08	1378638.85	2.0000	
NA	/ /	1075	481637.42	1378535.90	0.0000	
NA	/ /	1076	481425.85	1378748.89	0.0000	
NA	/ /	1078	481868.89	1378704.35	0.0000	
NA	/ /	1079	482273.70	1378165.47	0.0000	
066565	08/31/89	1080	482229.86	1378630.51	3.0000	
EMGW_SYSGEN_211	05/24/90	1081	482041.23	1379003.75	2.1000	
NA	/ /	1082	482011.44	1379087.20	0.0000	
066433	06/18/93	1083	481804.99	1379240.05	(31.0000)	
NA	/ /	1084	481925.26	1378934.37	0.0000	
NA	/ /	1085	481970.37	1381739.56	0.0000	
NA	/ /	1086	481984.52	1381716.38	0.0000	
NA	/ /	1087	481963.01	1381686.38	0.0000	
020252	04/12/88	1088	481977.23	1381668.87	12.0000	
NA	/ /	1089	481966.04	1381716.47	0.0000	
EMGW_SYSGEN_273	03/05/91	1090	481995.45	1381684.46	21.1000	
113869	06/30/93	11032	478072.47	1379787.13	(6.0000)	
NA	/ /	11064	478443.35	1379495.01	0.0000	
NA	/ /	11067	480193.68	1382782.71	0.0000	
NA	/ /	11068	480148.51	1378746.78	0.0000	
NA	/ /	11069	479652.53	1379447.35	0.0000	
119427	07/27/93	11070	479980.13	1379476.95	(1.0000)	
NA	/ /	11071	481543.62	1379799.50	0.0000	
NA	/ /	11072	481310.61	1379767.85	0.0000	
NA	/ /	11073	481062.69	1379791.53	0.0000	
NA	/ /	11077	481247.74	1378975.42	0.0000	
NA	/ /	11078	482143.60	1379841.59	0.0000	
NA	/ /	11079	481038.41	1378471.71	0.0000	
NA	/ /	11085	477869.01	1379926.48	0.0000	
NA	/ /	1110	480426.28	1381889.78	0.0000	
NA	/ /	1111	480196.16	1381878.06	0.0000	
120333	06/10/93	1112	479991.52	1381663.15	(0.5000)	
NA	/ /	1113	479992.70	1381403.26	0.0000	
NA	/ /	1117	480703.47	1381662.46	0.0000	
NA	/ /	11214	481495.52	1379217.52	0.0000	
NA	/ /	11216	481756.64	1379409.16	0.0000	
30916-11229-01	09/16/93	11229	482516.93	1380834.44	(794.0000)	
NA	/ /	11230	481837.12	1381868.46	0.0000	
NA	/ /	1124	483033.12	1382783.19	0.0000	
NA	/ /	1131	480724.38	1381019.82	0.0000	
062950	06/30/92	1135	480557.30	1380909.27	3.0000	

FOR PLATE NO. E-59

Sample	Sampdate	Boring	North	East	Total	Qual
062952	06/26/92	1138	480479.10	1380906.25	2.0000	
066899	07/23/90	1145	480450.66	1381683.44	5005.0000	
062408	02/03/93	1148	480424.65	1381655.96	(1391.0000)	
045659	02/28/90	1149	480374.92	1381683.22	7546.0000	
NA	/ /	1150	480419.86	1380749.86	0.0000	
NA	/ /	1151	480443.07	1381171.66	0.0000	
NA	/ /	1152	480411.02	1382105.62	0.0000	
NA	/ /	1153	480301.97	1381241.64	0.0000	
098996	10/28/92	1154	480206.13	1380744.14	485.0000	
NA	/ /	1157	480163.38	1381153.01	0.0000	
062956	06/30/92	1158	480210.55	1381229.23	81.0000	
NA	/ /	1160	480183.25	1382104.51	0.0000	
066897	07/24/90	1161	480118.86	1381704.87	3.0000	
NA	/ /	1167	480022.72	1380741.19	0.0000	
NA	/ /	1171	479941.71	1382070.58	0.0000	
045120	04/04/89	1172	479911.95	1381513.34	410.0000	
EMGW_SYSGEN_305	06/25/90	1173	479751.25	1381394.46	1.8000	
NA	/ /	1177	480728.72	1380078.62	0.0000	
120352	06/16/93	1179	480729.63	1380238.50	(2.0000)	
NA	/ /	1181	480741.91	1380299.96	0.0000	
046647	06/06/90	1182	480705.07	1380322.72	3.0000	
046654	06/06/90	1183	480704.01	1380355.30	4.0000	
066907	07/25/90	1186	480701.93	1380533.38	32.0000	
120369	06/28/93	1189	480640.16	1380213.18	(51.0000)	
NA	/ /	1193	480634.42	1380378.43	0.0000	
120247	06/28/93	1195	480636.53	1380456.82	(9.0000)	
066905	07/31/90	1196	480627.89	1380507.31	37.0000	
066906	07/31/90	1197	480626.41	1380538.45	58.0000	
066908	07/16/90	1199	480598.61	1380213.23	109.0000	
NA	/ /	1201	480574.08	1380390.62	0.0000	
045599	05/07/90	1203	480568.95	1380486.92	7.0000	
045607	05/17/90	1206	480546.57	1380525.92	82.0000	
NA	/ /	1207	480567.12	1380054.83	0.0000	
098924	06/22/92	1208	480550.53	1380198.75	25.0000	
066909	07/16/90	1209	480549.50	1380231.87	3.0000	
120267	07/14/93	1210	480485.42	1379844.46	(2.0000)	
066911	07/16/90	1212	480483.60	1380175.49	26.0000	
099028	11/03/92	1213	480519.86	1380217.86	4.0000	
120256	06/29/93	1214	480469.95	1380286.69	(13.0000)	
099004	10/15/92	1215	480505.99	1380534.02	3.0000	
120201	06/09/93	1216	480465.42	1380461.50	(7.0000)	
NA	/ /	1218	480411.88	1379952.56	0.0000	
NA	/ /	1223	480400.12	1380287.03	0.0000	
NA	/ /	1226	480415.64	1380700.31	0.0000	
NA	/ /	1229	480262.59	1379834.54	0.0000	
NA	/ /	1230	480281.12	1380055.01	0.0000	
066913	07/18/90	1231	480236.98	1380209.43	33.0000	
066916	07/18/90	1232	480283.91	1380232.42	33.0000	
066915	07/18/90	1233	480245.01	1380269.37	10.0000	
118323	05/17/93	1234	480207.90	1380230.49	(76.0000)	
062960	07/02/92	1235	480225.25	1380394.38	1.0000	
118328	05/17/93	1236	480307.05	1380517.69	(3.7000)	
NA	/ /	1237	480279.81	1380686.21	0.0000	
NA	/ /	1239	480033.76	1379829.46	0.0000	
NA	/ /	1240	480039.84	1380055.08	0.0000	
NA	/ /	1241	480029.99	1380277.94	0.0000	
NA	/ /	1242	480030.60	1380507.21	0.0000	
120466	07/23/93	1246	479886.27	1379873.45	(312.0000)	
046837	06/18/90	1250	479809.04	1379858.62	25.0000	
118215	05/13/93	1255	479801.60	1380248.75	(9.0000)	
NA	/ /	1267	479607.63	1379898.88	0.0000	
118288	05/16/93	1270	479572.21	1380466.33	(2.0000)	
NA	/ /	1273	482071.10	1381241.49	0.0000	
NA	/ /	1276	482052.32	1381885.01	0.0000	
NA	/ /	1278	481854.87	1380973.36	0.0000	
NA	/ /	1279	481851.10	1381358.44	0.0000	
NA	/ /	1281	481844.00	1381864.34	0.0000	
118420	05/25/93	1283	481703.70	1381087.91	(2253.0000)	
118412	05/25/93	1287	481634.92	1380992.27	(3029.6000)	
NA	/ /	1299	481185.14	1381203.59	0.0000	
NA	/ /	1301	481161.40	1381649.39	0.0000	
NA	/ /	1304	481099.70	1380871.00	0.0000	
NA	/ /	1317	480947.54	1381246.91	0.0000	
EMGW_SYSGEN_319D	10/29/90	1318	480941.25	1381434.52	3.3500	
966901	07/25/90	1324	480828.51	1381681.83	12466.0000	
NA	/ /	1332	482077.01	1380737.53	0.0000	
NA	/ /	1336	481829.27	1380728.87	0.0000	
120437	07/07/93	1339	481614.27	1380504.33	(3.0000)	
NA	/ /	1340	481618.58	1380734.93	0.0000	

FOR PLATE NO. E-59

Sample	Sampdate	Boring	North	East	Total	Qual
NA	/ /	1342	481365.07	1380265.73	0.0000	
120445	07/09/93	1343	481347.63	1380490.25	(4.0000)	
NA	/ /	1344	481363.02	1380728.33	0.0000	
GW930527-6	05/28/93	1345	481240.48	1380144.50	(69.0000)	
NA	/ /	1346	481245.67	1380178.90	0.0000	
NA	/ /	1348	481129.55	1380247.52	0.0000	
NA	/ /	1351	480940.44	1379899.75	0.0000	
NA	/ /	1352	480889.77	1380004.40	0.0000	
120389	07/07/93	1353	480927.26	1380251.72	(10.0000)	
120384	07/09/93	1354	480893.54	1380491.66	(16.0000)	
NA	/ /	1356	480828.63	1380037.72	0.0000	
NA	/ /	1357	480808.23	1380037.70	0.0000	
NA	/ /	1359	480803.98	1380140.07	0.0000	
NA	/ /	1360	480783.43	1380506.36	0.0000	
062964	07/07/92	1361	481163.68	1380165.82	3.0000	
046617	06/14/90	1363	481611.99	1381150.58	1.0000	
118280	05/16/93	1403	479781.60	1380561.35	(5.0000)	
046625	06/14/90	1411	479800.96	1379914.91	171.0000	
045267	06/05/90	1412	480702.37	1380398.11	316.0000	
NA	/ /	1418	480684.10	1381882.72	0.0000	
066902	07/30/90	1423	480932.91	1381617.26	480.0000	
NA	/ /	1433	477991.53	1379116.16	0.0000	
118399	05/25/93	1441	480091.99	1383021.42	(32.0000)	
118737	07/08/93	1442	480085.14	1383110.69	(75.0000)	
046760	06/05/90	1443	480123.12	1383232.48	2.0000	
046754	05/17/90	1444	480070.16	1383192.35	112.0000	
046786	06/05/90	1447	479991.53	1383019.18	5.0000	
046772	05/21/90	1448	479986.38	1383111.86	19.0000	
046865	05/02/90	1508	482565.57	1380840.06	3.0000	
NA	/ /	1510	482519.62	1380877.90	0.0000	
118543	06/12/93	1511	482563.57	1380881.74	(4.2000)	
NA	/ /	1512	482541.56	1380926.10	0.0000	
NA	/ /	1513	482549.47	1380951.40	0.0000	
118559	10/31/80	1515	482532.10	1380949.31	2.8000	
GW930416-9	04/16/93	1523	479406.88	1379945.37	(2.0000)	
064007	05/29/91	1615	480575.03	1378436.87	10.0000	
064052	07/09/91	1616	480469.31	1378400.91	41.0000	
NA	/ /	1617	480348.37	1378432.37	0.0000	
NA	/ /	1619	480476.98	1378529.22	0.0000	
004342	09/20/90	1643	481890.76	1378724.03	66.0000	
EMGW_SYSGEN_340	10/23/91	1644	481616.21	1378641.29	8.2000	
NA	/ /	1645	481583.25	1379060.26	0.0000	
070020	04/03/92	1646	481743.08	1379094.86	2.0000	
NA	/ /	1675	481182.80	1381060.63	0.0000	
NA	/ /	1676	481187.51	1380979.41	0.0000	
NA	/ /	1685	478498.46	1380433.06	0.0000	
GW930707_2	07/07/93	1719	482215.57	1379699.18	(21.0000)	
062411	02/04/93	1778	480305.19	1381672.31	(104.0000)	
NA	/ /	1779	480592.55	1380159.30	0.0000	
062029	09/19/91	1783	480690.77	1380507.82	52.0000	
062030-1	09/18/91	1784	480678.39	1380546.32	25.0000	
062218	09/14/92	1785	480270.45	1380260.86	83.0000	
062219	09/15/92	1786	480828.53	1381681.73	10330.0000	
NA	/ /	1836	481090.87	1378734.69	0.0000	
NA	/ /	1837	480839.19	1378727.10	0.0000	
098958	08/05/92	1838	481173.00	1378540.70	7.0000	
NA	/ /	1839	480433.90	1379149.98	0.0000	
098981	08/20/92	1840	479964.90	1380658.84	0.5000	
108869	05/14/93	1842	479927.25	1381972.92	(8.0000)	
NA	/ /	1843	479905.60	1382522.39	0.0000	
NA	/ /	1844	479900.92	1382800.94	0.0000	
NA	/ /	1869	479696.13	1380941.76	0.0000	
120496	07/30/93	1887	482410.68	1380855.73	(84.0000)	
108902	02/13/93	1890	482531.73	1380778.07	(166.0000)	
109032	04/23/93	1892	480445.99	1378339.25	(7.0000)	
NA	/ /	1934	480394.07	1379744.81	0.0000	
NA	/ /	1937	480645.51	1379534.49	0.0000	
NA	/ /	1940	480457.72	1379525.12	0.0000	
NA	/ /	1941	477932.76	1379691.99	0.0000	
NA	/ /	1942	477662.53	1379627.53	0.0000	
NA	/ /	1947	482108.00	1379906.05	0.0000	
NA	/ /	1950	482202.10	1379549.67	0.0000	
115468	05/15/93	1952	482057.73	1379766.45	(16.0000)	
NA	/ /	1954	477864.72	1379400.07	0.0000	

1,1-DICHLOROETHANE Type 1 UNFILTERED [GWP306U1.XLS]

FOR PLATE NO. E-60

Sample	Sampdate	Boring	North	East	Maxresult	Qual
GW930413-9	04/13/93	1008	480660.43	1378925.89	(10.0000)	U
120225	06/16/93	1010	481452.64	1379690.67	(10.0000)	U
120262	07/16/93	1011	482247.85	1377960.96	(10.0000)	U
EMGW_SYSGEN_19	10/16/90	1018	479450.19	1378661.75	1.0000	
EMGW_SYSGEN_21	03/04/91	1019	481657.56	1379094.87	2.3000	
118172	05/02/93	1020	479160.31	1379581.26	(10.0000)	UJ
EMGW_SYSGEN_29	02/20/91	1021	481566.5	1378897.33	1.0000	
EMGW_SYSGEN_32	02/11/91	1022	481706.62	1378686.73	1.0000	
GW930412-6	04/12/93	1024	482481.13	1378892.98	(10.0000)	U
GW930707-3	07/07/93	1025	482021.82	1378309.51	(10.0000)	U
GW930416-2	04/16/93	1027	481980.79	1379319.5	(10.0000)	U
068428	06/18/89	1028	481821.6	1378158.13	5.0000	UJ
120522	07/12/93	1029	480826.11	1378398.38	(10.0000)	U
GW930707-4	07/07/93	1030	481232.33	1378976.48	(10.0000)	U
099073	04/26/93	1031	481167.08	1378136.61	(21.0000)	-
EMGW_SYSGEN_86	10/24/90	1032	480515.31	1378296.87	1.0000	
120527	07/12/93	1033	480412.89	1378675.2	(10.0000)	U
120532	07/12/93	1034	480240.85	1378410.34	(10.0000)	U
111552	05/05/93	1035	482200.6	1379710.46	(10.0000)	UJ
GW930707-1	07/07/93	1037	482151.8	1379796.71	(10.0000)	U
GW930416-14	04/16/93	1038	482055.43	1379622.49	(10.0000)	U
GW930415-1	04/15/93	1039	480729.12	1379659.11	(10.0000)	U
30928-1040-02	09/28/93	1040	485833.34	1376759.84	(10.0000)	U
116220	05/05/93	1041	480550.15	1379798.68	(10.0000)	U
110889	01/20/93	1042	480388.77	1379543.28	(10.0000)	U
GW930707-5	07/07/93	1045	477134.7	1379751.55	(10.0000)	U
113312	05/28/93	1046	478054.76	1379428.51	(10.0000)	U
110892	04/27/93	1047	478258.45	1379062.49	(10.0000)	U
110900	04/28/93	1048	477477.45	1379877.21	(10.0000)	U
GW930429-4	04/29/93	1052	482506.58	1380147.61	(10.0000)	U
EMGW_SYSGEN_149	09/26/90	1053	479920.97	1380342.06	1.0000	
120237	06/23/93	1054	480050.26	1381524.14	(10.0000)	U
GW930515-7	05/15/93	1055	481476.15	1380703.31	(10.0000)	U
30929-1059-02	09/29/93	1059	487827.16	1376077.06	(10.0000)	U
30929-1060-02	09/29/93	1060	475865.6	1380010.66	(10.0000)	U
GW930405-1	04/06/93	1064	480718.78	1382193.03	(10.0000)	UJ
112013	05/04/93	1065	477860.01	1380415.98	(10.0000)	UJ
120458	07/15/93	1073	481417.66	1378202.78	(48.0000)	-
GW930413-8	04/13/93	1074	481187.08	1378638.85	(10.0000)	U
003253	06/01/88	1075	481637.42	1378535.9	5.0000	U
003226	05/23/88	1076	481425.85	1378748.89	5.0000	U
003227	05/23/88	1078	481888.89	1378704.35	5.0000	U
GW930416-13	04/16/93	1079	482273.7	1378165.47	(10.0000)	U
GW930417-1	04/17/93	1080	482229.86	1378630.51	(10.0000)	U
GW930413-12	04/13/93	1081	482041.23	1379003.75	(10.0000)	U
GW930413-11	04/13/93	1082	482011.44	1379087.2	(10.0000)	U
GW930416-1	04/16/93	1083	481804.99	1379240.05	(10.0000)	U
120482	07/24/93	1084	481925.26	1378934.37	(10.0000)	U
GW930421-1	04/21/93	1085	481970.37	1381739.56	(10.0000)	U
EMGW_SYSGEN_255	03/05/91	1086	481984.52	1381716.38	1.0000	
EMGW_SYSGEN_260	03/05/91	1087	481963.01	1381686.38	1.0000	
EMGW_SYSGEN_265	03/05/91	1088	481977.23	1381668.87	1.0000	
EMGW_SYSGEN_269	03/05/91	1089	481966.04	1381716.47	1.0000	
EMGW_SYSGEN_273	03/05/91	1090	481995.45	1381684.46	1.0000	
113869	06/30/93	11032	478072.47	1379787.13	(10.0000)	U
119234	06/27/93	11064	478443.35	1379495.01	(10.0000)	U
119228	06/27/93	11067	480193.68	1382782.71	(10.0000)	U
119402	07/25/93	11068	480148.51	1378746.78	(10.0000)	U
119392	07/24/93	11069	479652.53	1379447.35	(10.0000)	U
119427	07/27/93	11070	479980.13	1379476.95	(10.0000)	U
119239	07/01/93	11071	481543.62	1379799.5	(10.0000)	U
119378	07/15/93	11072	481310.61	1379767.85	(10.0000)	U
119246	07/12/93	11073	481062.69	1379791.53	(10.0000)	U
119411	07/26/93	11077	481247.74	1378975.42	(10.0000)	U
119386	07/22/93	11078	482143.6	1379841.59	(10.0000)	U
119418	07/27/93	11079	481038.41	1378471.71	(10.0000)	U
113792	06/16/93	11085	477869.01	1379926.48	(10.0000)	U
120208	06/10/93	1110	480426.28	1381889.78	(10.0000)	U
120105	06/10/93	1111	480196.16	1381878.06	(10.0000)	U
120333	06/10/93	1112	479991.52	1381863.15	(10.0000)	U
120205	06/09/93	1113	479992.7	1381403.26	(10.0000)	U
EMGW_SYSGEN_295	09/18/90	1117	480703.47	1381662.46	1.0000	
30926-11214-05	09/26/93	11214	481495.52	1379217.52	(10.0000)	U
30914-11216-01	09/14/93	11216	481756.64	1379409.16	(10.0000)	U
30916-11229-01	09/16/93	11229	482516.93	1380834.44	(520.0000)	-
30908-11230-03	09/08/93	11230	481837.12	1381868.48	(10.0000)	U
EMGW_SYSGEN_297	10/25/90	1124	483033.12	1382783.19	1.0000	
062950	06/30/92	1135	480557.3	1380909.27	2.0000	J
062952	06/26/92	1136	480479.1	1380906.25	2.0000	J

000179

Sample	Sampdate	Boring	North	East	Total	Qual
003418	08/09/88	1008	480660.43	1378925.89	50.0000	
NA	/ /	1010	481452.64	1379690.67	0.0000	
NA	/ /	1011	482247.85	1377960.96	0.0000	
NA	/ /	1018	479450.19	1378661.75	0.0000	
NA	/ /	1019	481657.56	1379094.87	0.0000	
118172	05/02/93	1020	479160.31	1379581.26	(16.0000)	
NA	/ /	1021	481566.50	1378897.33	0.0000	
NA	/ /	1022	481706.62	1378686.73	0.0000	
NA	/ /	1024	482481.13	1378892.98	0.0000	
066595	09/11/89	1025	482021.82	1378309.51	3.0000	
NA	/ /	1027	481980.79	1379319.50	0.0000	
123363	/ /	1029	480826.11	1378398.38	1.0000	
099073	11/13/92	1031	481167.08	1378136.81	333.0000	
NA	/ /	1032	480515.31	1378296.87	0.0000	
NA	/ /	1033	480412.89	1378675.20	0.0000	
NA	/ /	1034	480240.85	1378410.34	0.0000	
NA	/ /	1035	482200.60	1379710.46	0.0000	
NA	/ /	1038	482055.43	1379622.49	0.0000	
NA	/ /	1039	480729.12	1379659.11	0.0000	
NA	/ /	1040	485833.34	1376759.84	0.0000	
116220	05/05/93	1041	480550.15	1379798.68	(2.0000)	
NA	/ /	1042	480388.77	1379543.28	0.0000	
NA	/ /	1045	477134.70	1379751.55	0.0000	
116231	05/11/93	1046	478054.76	1379428.51	(4.0000)	
NA	/ /	1047	478258.45	1379062.49	0.0000	
NA	/ /	1048	477477.45	1379877.21	0.0000	
066930	08/28/90	1052	482506.58	1380147.61	4.0000	
NA	/ /	1053	479920.97	1380342.06	0.0000	
NA	/ /	1054	480050.26	1381524.14	0.0000	
NA	/ /	1055	481476.15	1380703.31	0.0000	
NA	/ /	1060	475865.60	1380010.66	0.0000	
NA	/ /	1064	480718.78	1382193.03	0.0000	
NA	/ /	1065	477860.01	1380415.98	0.0000	
003228	05/23/88	1073	481417.66	1378202.78	3.0000	
066597	09/08/89	1074	481187.08	1378638.85	2.0000	
NA	/ /	1075	481637.42	1378535.90	0.0000	
NA	/ /	1076	481425.85	1378748.89	0.0000	
123362	07/15/93	1077	481407.65	1378815.68	(4.0000)	
003227	05/23/88	1078	481888.89	1378704.35	3.0000	
EMGW_SYSGEN_188	05/11/90	1079	482273.70	1378165.47	35.4000	
NA	/ /	1080	482229.86	1378630.51	0.0000	
NA	/ /	1081	482041.23	1379003.75	0.0000	
NA	/ /	1082	482011.44	1379087.20	0.0000	
003171	05/09/88	1083	481804.99	1379240.05	2.0000	
NA	/ /	1084	481925.26	1378934.37	0.0000	
NA	/ /	1085	481970.37	1381739.56	0.0000	
NA	/ /	1086	481984.52	1381716.38	0.0000	
NA	/ /	1087	481963.01	1381686.38	0.0000	
020252	04/12/88	1088	481977.23	1381668.87	6.0000	
NA	/ /	1089	481966.04	1381716.47	0.0000	
NA	/ /	1090	481995.45	1381684.46	0.0000	
113869	06/30/93	11032	478072.47	1379787.13	(2.0000)	
119234	06/27/93	11064	478443.35	1379495.01	(1.0000)	
NA	/ /	11067	480193.68	1382782.71	0.0000	
NA	/ /	11068	480148.51	1378746.78	0.0000	
NA	/ /	11069	479652.53	1379447.35	0.0000	
NA	/ /	11071	481543.62	1379799.50	0.0000	
NA	/ /	11072	481310.61	1379767.85	0.0000	
NA	/ /	11073	481062.69	1379791.53	0.0000	
119411	07/26/93	11077	481247.74	1378975.42	(2.0000)	
119386	07/22/93	11078	482143.60	1379841.59	(2.0000)	
NA	/ /	11085	477869.01	1379926.48	0.0000	
NA	/ /	1110	480426.28	1381889.78	0.0000	
NA	/ /	1111	480196.16	1381878.06	0.0000	
NA	/ /	1112	479991.52	1381663.15	0.0000	
NA	/ /	1113	479992.70	1381403.26	0.0000	
NA	/ /	1117	480703.47	1381662.46	0.0000	
NA	/ /	11214	481495.52	1379217.52	0.0000	
NA	/ /	11216	481756.64	1379409.16	0.0000	
NA	/ /	11229	482516.93	1380834.44	0.0000	
NA	/ /	11230	481837.12	1381868.48	0.0000	
NA	/ /	1124	483033.12	1382783.19	0.0000	
NA	/ /	1135	480557.30	1380909.27	0.0000	
NA	/ /	1136	480479.10	1380906.25	0.0000	
NA	/ /	1145	480450.66	1381683.44	0.0000	
NA	/ /	1148	480424.65	1381655.96	0.0000	
066917	07/24/90	1149	480374.92	1381683.22	3.0000	
NA	/ /	1150	480419.86	1380749.86	0.0000	
NA	/ /	1153	480301.97	1381241.84	0.0000	

FOR PLATE NO. E-67

Sample	Sampdate	Boring	North	East	Total	Qual
NA	/ /	1154	480206.13	1380744.14	0.0000	
NA	/ /	1158	480210.55	1381229.23	0.0000	
NA	/ /	1160	480183.25	1382104.51	0.0000	
NA	/ /	1161	480118.86	1381704.87	0.0000	
NA	/ /	1167	480022.72	1380741.19	0.0000	
NA	/ /	1173	479751.25	1381394.46	0.0000	
NA	/ /	1178	480719.82	1380195.61	0.0000	
NA	/ /	1179	480729.83	1380238.50	0.0000	
048803	06/01/90	1180	480728.25	1380268.21	450.0000	
NA	/ /	1182	480705.07	1380322.72	0.0000	
NA	/ /	1183	480704.01	1380355.30	0.0000	
NA	/ /	1186	480701.93	1380533.38	0.0000	
NA	/ /	1193	480634.42	1380378.43	0.0000	
066939	11/07/90	1195	480636.53	1380456.82	28.0000	
NA	/ /	1196	480627.89	1380507.31	0.0000	
NA	/ /	1197	480626.41	1380538.45	0.0000	
NA	/ /	1199	480598.61	1380213.23	0.0000	
NA	/ /	1203	480568.95	1380486.92	0.0000	
045607	05/07/90	1206	480546.57	1380525.92	10.0000	
NA	/ /	1207	480567.12	1380054.83	0.0000	
NA	/ /	1208	480550.53	1380198.75	0.0000	
066909	07/16/90	1209	480549.50	1380231.87	4.0000	
NA	/ /	1212	480483.60	1380175.49	0.0000	
099028	11/03/92	1213	480519.86	1380217.86	110.0000	
NA	/ /	1215	480505.99	1380534.02	0.0000	
NA	/ /	1223	480400.12	1380287.03	0.0000	
099009	10/20/92	1226	480415.64	1380700.31	4.0000	
NA	/ /	1229	480262.59	1379834.54	0.0000	
NA	/ /	1231	480236.98	1380209.43	0.0000	
NA	/ /	1232	480283.91	1380232.42	0.0000	
NA	/ /	1233	480245.01	1380269.37	0.0000	
NA	/ /	1235	480225.25	1380394.38	0.0000	
NA	/ /	1237	480279.81	1380686.21	0.0000	
045840	06/18/90	1246	479886.27	1379873.45	1.0000	
NA	/ /	1250	479809.04	1379858.62	0.0000	
NA	/ /	1276	482052.32	1381885.01	0.0000	
NA	/ /	1283	481703.70	1381087.91	0.0000	
045930	06/18/90	1287	481634.92	1380992.27	1.0000	
046687	04/20/90	1324	480828.51	1381681.83	12.0000	
NA	/ /	1332	482077.01	1380737.53	0.0000	
099108	12/17/92	1339	481614.27	1380504.33	60.0000	
NA	/ /	1342	481385.07	1380265.73	0.0000	
099110	12/18/92	1343	481347.63	1380490.25	626.0000	
NA	/ /	1344	481363.02	1380728.33	0.0000	
NA	/ /	1345	481240.48	1380144.50	0.0000	
NA	/ /	1346	481245.67	1380178.90	0.0000	
120452	07/13/93	1348	481129.55	1380247.52	(3.0000)	
062964	07/07/92	1361	481163.68	1380165.82	5.0000	
046617	06/14/90	1363	481611.99	1381150.58	1.0000	
NA	/ /	1411	479800.96	1379914.91	0.0000	
NA	/ /	1412	480702.37	1380398.11	0.0000	
NA	/ /	1423	480932.91	1381617.26	0.0000	
NA	/ /	1433	477991.53	1379116.16	0.0000	
046748	05/16/90	1441	480091.99	1383021.42	7.0000	
NA	/ /	1442	480085.14	1383110.69	0.0000	
NA	/ /	1443	480123.12	1383232.48	0.0000	
NA	/ /	1444	480070.16	1383192.35	0.0000	
046786	06/05/90	1447	479991.53	1383019.18	1.0000	
NA	/ /	1448	479986.38	1383111.86	0.0000	
NA	/ /	1508	482565.57	1380840.06	0.0000	
NA	/ /	1510	482519.62	1380877.90	0.0000	
NA	/ /	1511	482563.57	1380881.74	0.0000	
NA	/ /	1512	482541.56	1380926.10	0.0000	
NA	/ /	1513	482549.47	1380951.40	0.0000	
NA	/ /	1515	482532.10	1380949.31	0.0000	
NA	/ /	1523	479406.88	1379945.37	0.0000	
NA	/ /	1615	480575.03	1378436.87	0.0000	
NA	/ /	1616	480469.31	1378400.91	0.0000	
064009	08/10/91	1617	480348.37	1378432.37	353.0000	
064154	08/20/91	1618	480371.07	1378511.33	8.0000	
NA	/ /	1619	480476.98	1378529.22	0.0000	
NA	/ /	1643	481890.76	1378724.03	0.0000	
NA	/ /	1644	481616.21	1378641.29	0.0000	
NA	/ /	1645	481583.25	1379060.26	0.0000	
NA	/ /	1646	481743.08	1379094.86	0.0000	
NA	/ /	1778	480305.19	1381672.31	0.0000	
NA	/ /	1779	480592.55	1380159.30	0.0000	
NA	/ /	1783	480690.77	1380507.82	0.0000	
NA	/ /	1784	480678.39	1380546.32	0.0000	

000181

FOR PLATE NO. E-67

Sample	Sampdate	Boring	North	East	Total	Qual
082014	09/13/91	1785	480270.45	1380260.86	4.0000	
NA	/ /	1786	480828.53	1381681.73	0.0000	
NA	/ /	1836	481090.87	1378734.69	0.0000	
NA	/ /	1837	480839.19	1378727.10	0.0000	
NA	/ /	1838	481173.00	1378540.70	0.0000	
NA	/ /	1839	480433.90	1379149.98	0.0000	
NA	/ /	1840	479964.90	1380658.84	0.0000	
NA	/ /	1842	479927.25	1381972.92	0.0000	
NA	/ /	1843	479905.60	1382522.39	0.0000	
NA	/ /	1844	479900.92	1382800.94	0.0000	
NA	/ /	1869	479696.13	1380941.76	0.0000	
NA	/ /	1887	482410.68	1380855.73	0.0000	
108914	06/08/93	1890	482531.73	1380778.07	(1.4000)	
NA	/ /	1934	480394.07	1379744.81	0.0000	
114617	05/11/93	1937	480645.51	1379534.49	(1.0000)	
NA	/ /	1940	480457.72	1379525.12	0.0000	
NA	/ /	1941	477932.76	1379691.99	0.0000	
NA	/ /	1942	477662.53	1379627.53	0.0000	
NA	/ /	1947	482108.00	1379906.05	0.0000	
NA	/ /	1950	482202.10	1379549.67	0.0000	
NA	/ /	1952	482057.73	1379766.45	0.0000	
NA	/ /	1954	477864.72	1379400.07	0.0000	

CHLORIDE Type 1 UNFILTERED [GWP715U1.XLS]

FOR PLATE NO. E-68

Sample	Sampdate	Boring	North	East	Maxresult	Qual
GW930413-9	04/13/93	1008	480660.43	1378925.89	(18.0000)	-
120225	06/16/93	1010	481452.64	1379690.67	(18.0000)	-
120262	07/16/93	1011	482247.85	1377960.96	(10.0000)	-
003488	01/23/89	1012	483703.23	1380912.78	116.0000	J
003858	01/22/89	1018	479450.19	1378661.75	2.2000	U
EMGW_SYSGEN_21	03/04/91	1019	481657.56	1379094.87	64.0000	
118172	05/02/93	1020	479160.31	1379581.26	(3.4000)	-
EMGW_SYSGEN_29	02/20/91	1021	481566.5	1378897.33	17.0000	
EMGW_SYSGEN_32	02/11/91	1022	481706.62	1378686.73	3.0000	
GW930412-6	04/12/93	1024	482481.13	1378892.98	(13.0000)	-
GW930707-3	07/07/93	1025	482021.82	1378309.51	(993.0000)	-
GW930416-2	04/16/93	1027	481980.79	1379319.5	(0.5000)	-
066428	06/18/89	1028	481821.6	1378158.13	520.0000	-
120522	07/12/93	1029	480828.11	1378398.38	(1.2200)	-
GW930707-4	07/07/93	1030	481232.33	1378976.48	(2.9700)	-
GW930426-1	04/26/93	1031	481167.08	1378136.61	(823.0000)	-
003851	01/22/89	1032	480515.31	1378296.87	310.0000	-
120527	07/12/93	1033	480412.89	1378675.2	(13.7000)	-
120532	07/12/93	1034	480240.85	1378410.34	(4.1400)	-
111552	05/05/93	1035	482200.6	1379710.46	(3.9500)	-
GW930707-1	07/07/93	1037	482151.8	1379796.71	(23.7000)	-
111548	04/16/93	1038	482055.43	1379622.49	(17.7200)	-
111990	04/15/93	1039	480729.12	1379659.11	(360.2300)	-
30928-1040-02	09/28/93	1040	485833.34	1376759.84	(45.0000)	-
116220	05/05/93	1041	480550.15	1379798.68	(44.0700)	-
110889	01/20/93	1042	480388.77	1379543.28	(88.0900)	-
GW930707-5	07/07/93	1045	477134.7	1379751.55	(1.1900)	-
116231	05/11/93	1046	478054.76	1379428.51	(2.5000)	-
110892	04/27/93	1047	478258.45	1379062.49	(3.8500)	-
110900	04/28/93	1048	477477.45	1379877.21	(7.3100)	-
GW930429-4	04/29/93	1052	482506.58	1380147.61	(7.3000)	-
003910	02/26/89	1053	479920.97	1380342.06	6.3000	U
120237	06/23/93	1054	480050.26	1381524.14	(16.0000)	-
GW930515-7	05/15/93	1055	481476.15	1380703.31	(3.0000)	-
003982	03/15/89	1058	487510.79	1377375.53	20.0000	-
30929-1059-02	09/29/93	1059	487827.16	1376077.06	(9.2000)	-
30929-1060-02	09/29/93	1060	475865.6	1380010.66	(39.0000)	-
GW930405-1	04/06/93	1064	480718.78	1382193.03	(2.7000)	-
112013	05/04/93	1065	477860.01	1380415.98	(2.7700)	-
120463	07/16/93	1073	481417.66	1378202.78	(1100.0000)	-
GW930413-8	04/13/93	1074	481187.08	1378638.85	(180.0000)	-
003953	03/12/89	1075	481637.42	1378535.9	6300.0000	-
003954	03/12/89	1076	481425.85	1378748.89	13.0000	U
003955	03/12/89	1077	481407.65	1378815.68	8.2000	U
003932	03/10/89	1078	481888.89	1378704.35	270.0000	J
GW930416-13	04/16/93	1079	482273.7	1378165.47	(1.4000)	-
GW930417-1	04/17/93	1080	482229.86	1378630.51	(7.0000)	-
GW930413-12	04/13/93	1081	482041.23	1379003.75	(38.0000)	-
GW930413-11	04/13/93	1082	482011.44	1379087.2	(45.0000)	-
GW930416-1	04/16/93	1083	481804.99	1379240.05	(49.0000)	-
120482	07/24/93	1084	481925.26	1378934.37	(2.6000)	-
GW930421-1	04/21/93	1085	481970.37	1381739.56	(11.0000)	-
EMGW_SYSGEN_255	03/05/91	1086	481984.52	1381716.38	8.0000	
EMGW_SYSGEN_260	03/05/91	1087	481963.01	1381686.38	11.0000	
EMGW_SYSGEN_265	03/05/91	1088	481977.23	1381668.87	22.0000	
EMGW_SYSGEN_269	03/05/91	1089	481966.04	1381716.47	14.0000	
EMGW_SYSGEN_273	03/05/91	1090	481995.45	1381684.46	12.0000	
113869	06/30/93	11032	478072.47	1379787.13	(8.8900)	-
119234	06/27/93	11064	478443.35	1379495.01	(3.7800)	-
119228	06/27/93	11067	480193.68	1382782.71	(15.9800)	-
119402	07/25/93	11068	480148.51	1378746.78	(9.4000)	J
119392	07/24/93	11069	479652.53	1379447.35	(3.0000)	J
119239	07/01/93	11071	481543.62	1379799.5	(35.9000)	-
119378	07/15/93	11072	481310.61	1379767.85	(14.0000)	-
119246	07/12/93	11073	481062.69	1379791.53	(7.1000)	-
119411	07/26/93	11077	481247.74	1378975.42	(3.1000)	J
119386	07/22/93	11078	482143.6	1379841.59	(2.9000)	J
119418	07/27/93	11079	481038.41	1378471.71	(2.7000)	J
113792	06/16/93	11085	477869.01	1379926.48	(6.7800)	-
120212	06/10/93	1110	480426.28	1381889.78	(5.1000)	-
120105	06/10/93	1111	480196.16	1381878.06	(9.0000)	-
120333	06/10/93	1112	479991.52	1381683.15	(120.0000)	-
120205	06/09/93	1113	479992.7	1381403.26	(69.0000)	-
30929-11132-01	09/29/93	11132	482206.62	1381840.99	(25.0000)	-
EMGW_SYSGEN_295	09/18/90	1117	480703.47	1381662.46	457.0000	
30926-11214-05	09/26/93	11214	481495.52	1379217.52	(32.0000)	-
30914-11216-01	09/14/93	11216	481756.64	1379409.16	(5.3200)	-
30916-11229-01	09/16/93	11229	482516.93	1380834.44	(35.0000)	-
30908-11230-03	09/08/93	11230	481837.12	1381868.48	(20.0000)	-

000183

ZINC Type 2 UNFILTERED [GW[illegible]

FOR PLATE NO. E-131

Sample	Sampdate	Boring	North	East	Maxresult	Qual
GW930514-10	05/14/93	2396	474169.75	1379213.52	(0.0050)	U
GW930512-3	05/12/93	2397	478270.65	1380995.05	(0.0105)	U
GW930722-8	07/22/93	2398	476590.05	1381346.22	(0.0215)	U
GW930424-2	04/24/93	2399	477314.57	1381548.79	(0.0087)	J
120295	08/11/93	2400	477899.48	1381815.81	(0.0146)	-
116229	05/11/93	2401	478127.83	1379105.21	(0.0200)	-
116225	05/05/93	2402	478193.48	1378776.56	(0.0411)	-
GW930727-7	07/27/93	2417	480303.49	1382933.86	(0.0088)	-
120061	07/15/93	2420	480457.16	1382619.75	(0.0340)	-
GW930406-6	04/06/93	2421	481651.85	1382074.36	(0.0094)	U
120038	08/30/93	2423	482556.52	1381770.68	(0.0180)	U
GW930728-1	07/28/93	2424	482347.01	1383280.98	(0.0224)	-
GW930728-2	07/28/93	2426	480820.82	1383202.73	(0.0470)	-
GW930921-2	09/21/93	2429	480082.6	1383293.04	(0.0244)	U
GW930914-1	09/14/93	2430	479753.77	1382997.32	(0.0158)	U
GW930914-4	09/14/93	2431	478856.8	1383075.02	(0.0534)	-
GW930728-5	07/28/93	2432	478002.22	1383082.27	(0.0271)	-
GW930728-6	07/28/93	2434	476412.18	1380716.08	(0.0235)	-
120603	08/27/93	2454	481201.04	1379310.18	(0.0168)	U
GW930525-3	05/25/93	2545	474173.899	1379479.75	(0.0974)	U
GW930908-11	09/08/93	2548	473251.341	1380335.2	(1.1200)	-
GW930525-11	05/25/93	2549	473649.481	1380226.5	(0.0196)	U
GW930511-3	05/11/93	2550	475756.24	1379348.13	(0.0169)	UJ
GW930517-3	05/17/93	2551	475347.36	1379005.94	(0.0050)	U
GW930517-2	05/17/93	2552	473909.82	1379195.32	(0.0064)	U
GW930514-3	05/14/93	2558	469183.69	1379930.77	(0.0148)	-
GW930514-2	05/14/93	2559	469960.98	1380593.38	(0.0053)	-
GW930515-1	05/15/93	2560	468758.4	1379713.84	(0.0066)	-
GW930525-1	05/25/93	2624	474576.41	1379551.48	(0.2320)	U
GW930908-3	09/08/93	2625	473704.841	1379696.54	(0.0877)	-
GW930908-13	09/08/93	2636	473377.076	1379955.07	(0.0362)	U
GW930408-6	04/08/93	2643	481904.04	1378738.65	(0.0064)	U
GW930416-3	04/16/93	2648	481508.29	1379062.57	(0.0060)	U
GW930426-2	04/26/93	2649	481167.42	1378125.73	(0.0050)	U
GW930524-1	05/24/93	2679	483923.14	1378278.45	(0.0199)	U
GW930524-3	05/24/93	2728	483301.63	1377960.59	(0.0083)	U
GW930728-4	07/28/93	2733	477070.67	1383161.03	(0.0332)	-
GW930722-3	07/22/93	2754	484149.05	1383465.72	(1.1800)	-
GW930407-1	04/07/93	2821	481337.23	1378625.21	(0.0088)	U
GW930426-3	04/26/93	2822	481233.45	1378484.44	(0.0050)	U
120271	07/22/93	2897	474980.72	1380901.7	(0.0101)	-
109951	07/28/93	2898	474369.1	1381298.76	(0.0260)	U
GW930907-24	09/07/93	2899	474138.4	1380694.74	(0.0088)	U
110004	08/10/93	2900	473920.1	1379922.63	(0.0117)	-
114921	06/13/93	2935	480499.49	1379855.38	(0.0231)	U
114789	06/12/93	2936	480677.56	1379862.08	(0.0157)	U
114924	06/13/93	2939	480671.47	1379531.05	(0.0098)	U
113315	05/27/93	2943	477474.62	1379635.87	(0.0114)	-
113866	06/30/93	2944	477514.06	1379493.03	(0.0801)	-
113313	05/26/93	2945	477972.18	1379119.83	(0.0094)	-
115475	05/19/93	2947	482120.02	1379906.75	(0.0050)	U
115479	05/26/93	2949	482338.1	1379718.25	(0.0117)	-
115478	05/25/93	2951	482158.8	1379554.77	(0.0163)	-
115488	06/23/93	2953	482020.08	1379744.25	(0.0584)	-
113795	06/21/93	2954	477804.29	1379406.47	(0.0110)	-
113801	06/22/93	2955	478103.82	1378953.07	(0.0074)	-

FOR PLATE NO. E-132

Sample	Sampdate	Boring	North	East	Total	Qual
NA	/ /	2002	474767.00	1380663.00	0.0000	
120060	07/13/93	2004	481185.10	1377945.09	(2.8000)	
068788	12/05/89	2006	480353.44	1380563.69	7.0000	
EMGW_SYSGEN_372	06/25/90	2007	480605.50	1380638.55	8.7000	
003193	05/17/88	2008	480661.42	1378918.03	6.0000	
120035	06/07/93	2009	479540.71	1378007.77	(10.0000)	
003195	05/07/88	2010	481460.53	1379691.07	18.0000	
EMGW_SYSGEN_402	05/29/90	2011	482271.62	1377959.33	83.4000	
003064	03/28/88	2014	476802.99	1379584.94	2.0000	
EMGW_SYSGEN_425	01/02/91	2015	476148.92	1380201.29	7.5000	
NA	/ /	2016	477615.38	1379157.77	0.0000	
NA	/ /	2017	476259.20	1379157.09	0.0000	
NA	/ /	2018	479447.70	1378671.57	0.0000	
066567	08/28/89	2019	481674.46	1379093.84	68.0000	
EMGW_SYSGEN_456	12/06/90	2020	479168.75	1379519.37	16.0000	
EMGW_SYSGEN_463	02/20/91	2021	481567.90	1378913.40	1.9000	
NA	/ /	2022	481695.17	1378680.21	0.0000	
GW930412-7	04/12/93	2024	482487.51	1378880.72	(34.0000)	
066599	09/10/89	2027	481969.29	1379317.37	10.0000	
NA	/ /	2028	481811.42	1378152.28	0.0000	
109217	05/14/93	2032	480503.68	1378298.59	(1.0000)	
NA	/ /	2033	480411.10	1378687.33	0.0000	
NA	/ /	2034	480240.05	1378419.45	0.0000	
066570	08/25/89	2037	482140.97	1379801.07	11.0000	
003150	05/04/88	2042	480394.27	1379542.73	7.0000	
EMGW_SYSGEN_528	07/16/91	2043	481760.81	1377051.97	3.9000	
GW930514-8	05/14/93	2044	477783.56	1378156.80	(1.0000)	
112003	04/28/93	2045	477129.91	1379760.54	(3.0000)	
NA	/ /	2046	478058.45	1379418.68	0.0000	
NA	/ /	2047	478263.85	1379054.18	0.0000	
EMGW_SYSGEN_555	09/10/90	2048	477480.23	1379866.55	2.1000	
NA	/ /	2049	477020.51	1380072.04	0.0000	
NA	/ /	2050	482407.69	1376516.93	0.0000	
NA	/ /	2051	481597.05	1383279.97	0.0000	
EMGW_SYSGEN_581	07/18/91	2052	482507.16	1380139.73	6.2000	
004113	06/07/89	2053	479935.12	1380352.25	2.0000	
NA	/ /	2054	480030.82	1381523.36	0.0000	
NA	/ /	2055	481488.08	1380703.99	0.0000	
EMGW_SYSGEN_608	06/13/90	2060	475865.60	1380010.60	11.0000	
EMGW_SYSGEN_614D	03/07/91	2061	474775.50	1379665.90	24.8000	
NA	/ /	2064	480720.10	1382183.97	0.0000	
112008	05/03/93	2065	477868.51	1380434.37	(10.0000)	
EMGW_SYSGEN_636	10/02/91	2066	483938.95	1376703.45	10.7000	
EMGW_SYSGEN_645	09/09/91	2067	479761.00	1382997.00	8.7000	
EMGW_SYSGEN_652	12/04/90	2068	478683.00	1381391.00	20.0000	
NA	/ /	2069	476416.30	1380705.58	0.0000	
GW930922-1	07/23/93	2070	476752.00	1382029.00	(108.0000)	
NA	/ /	2071	481528.00	1384984.00	0.0000	
NA	/ /	2084	481922.56	1378940.30	0.0000	
NA	/ /	2091	477826.61	1384448.64	0.0000	
NA	/ /	2092	476613.61	1384177.17	0.0000	
NA	/ /	2093	475317.29	1381403.28	0.0000	
003875	11/15/88	2094	470750.00	1380615.00	351.0000	
PRS209502-R2	07/31/90	2095	475115.00	1379500.00	4.7000	
NA	/ /	2096	476531.14	1377204.11	0.0000	
NA	/ /	2097	480283.63	1386936.00	0.0000	
NA	/ /	2098	483385.79	1386326.37	0.0000	
NA	/ /	21033	477278.10	1380181.18	0.0000	
NA	/ /	2104	477575.00	1377655.00	0.0000	
004236	03/02/90	2106	476096.82	1379580.27	12.0000	
119369	07/27/93	21064	478443.48	1379482.59	(26.0000)	
NA	/ /	21065	478483.28	1380037.41	0.0000	
120033	06/03/93	2107	478567.08	1378527.61	(1.0000)	
NA	/ /	2108	480056.37	1377920.72	0.0000	
NA	/ /	2109	480492.35	1381798.38	0.0000	
NA	/ /	2118	480013.14	1381795.87	0.0000	
NA	/ /	2119	479309.36	1384594.27	0.0000	
NA	/ /	21190	477617.13	1379149.12	0.0000	
046945	07/17/90	21192	477022.52	1379642.08	31.0000	
NA	/ /	2120	480186.92	1382123.05	0.0000	
NA	/ /	2125	474354.95	1379479.44	0.0000	
PRS212602-R2	07/31/90	2126	472154.00	1379000.00	24.0000	
067987	04/20/91	2127	470038.58	1380153.30	24.0000	
EMGW_SYSGEN_781	03/07/91	2128	473552.11	1379795.75	12.3000	
EMGW_SYSGEN_787D	06/22/90	2129	472654.00	1379885.00	1.3000	
NA	/ /	2171	479937.91	1382076.33	0.0000	
NA	/ /	2383	480500.26	1377374.38	0.0000	
NA	/ /	2384	479054.45	1377550.69	0.0000	
NA	/ /	2385	477886.51	1379923.25	0.0000	

FOR PLATE NO. E-132

Sample	Sampdate	Boring	North	East	Total	Qual
NA	/ /	2386	477633.90	1380783.98	0.0000	
NA	/ /	2387	477119.12	1380441.15	0.0000	
NA	/ /	2388	480483.16	1381424.85	0.0000	
NA	/ /	2389	480143.91	1381322.27	0.0000	
NA	/ /	2390	476548.05	1379876.56	0.0000	
NA	/ /	2391	472144.98	1381487.82	0.0000	
GW930519-5	05/19/93	2392	471422.36	1381580.52	(3.0000)	
2394-02-R2	08/22/90	2394	473192.00	1381423.00	1.9000	
NA	/ /	2396	474169.75	1379213.52	0.0000	
NA	/ /	2397	478270.65	1380995.05	0.0000	
NA	/ /	2398	476590.05	1381346.22	0.0000	
NA	/ /	2399	477314.57	1381548.79	0.0000	
NA	/ /	2400	477899.48	1381815.81	0.0000	
NA	/ /	2401	478127.83	1379105.21	0.0000	
116225	05/05/93	2402	478193.48	1378776.56	(26.0000)	
120058-1	06/08/93	2417	480303.49	1382933.86	(35.0000)	
NA	/ /	2420	480457.16	1382619.75	0.0000	
NA	/ /	2421	481651.85	1382074.36	0.0000	
NA	/ /	2423	482556.52	1381770.68	0.0000	
NA	/ /	2424	482347.01	1383280.98	0.0000	
NA	/ /	2426	480820.82	1383202.73	0.0000	
GW930921-2	09/21/93	2429	480082.60	1383293.04	(3.0000)	
GW930914-1	09/14/93	2430	479753.77	1382997.32	(2.0000)	
GW930914-4	09/14/93	2431	478856.80	1383075.02	(4.0000)	
GW930728-5	07/28/93	2432	478002.22	1383082.27	(5.0000)	
NA	/ /	2434	476412.18	1380716.08	0.0000	
NA	/ /	2454	481201.04	1379310.18	0.0000	
NA	/ /	2544	474536.36	1379975.55	0.0000	
NA	/ /	2545	474173.90	1379479.75	0.0000	
NA	/ /	2548	473251.34	1380335.20	0.0000	
NA	/ /	2549	473649.48	1380226.50	0.0000	
GW930511-3	05/11/93	2550	475756.24	1379348.13	(5.0000)	
NA	/ /	2551	475347.36	1379005.94	0.0000	
NA	/ /	2552	473909.82	1379195.32	0.0000	
NA	/ /	2558	469183.69	1379930.77	0.0000	
GW930514-2	05/14/93	2559	469960.98	1380593.38	(23.0000)	
NA	/ /	2560	468758.40	1379713.84	0.0000	
NA	/ /	2624	474576.41	1379551.48	0.0000	
NA	/ /	2625	473704.84	1379696.54	0.0000	
GW930525-8	05/25/93	2636	473377.08	1379955.07	(1.0000)	
070003	01/30/92	2643	481904.04	1378738.65	33.0000	
004347	11/22/90	2648	481508.29	1379062.57	1.0000	
EMGW_SYSGEN_873	07/30/91	2649	481167.42	1378125.73	278.0000	
NA	/ /	2679	483923.14	1378278.45	0.0000	
NA	/ /	2728	483301.63	1377960.59	0.0000	
NA	/ /	2733	477070.67	1383161.03	0.0000	
GW930722-3	07/22/93	2754	484149.05	1383465.72	(7.0000)	
NA	/ /	2821	481337.23	1378625.21	0.0000	
NA	/ /	2822	481233.45	1378484.44	0.0000	
NA	/ /	2897	474980.72	1380901.70	0.0000	
NA	/ /	2898	474369.10	1381298.76	0.0000	
NA	/ /	2900	473920.10	1379922.63	0.0000	
NA	/ /	2935	480499.49	1379855.38	0.0000	
NA	/ /	2936	480677.56	1379862.08	0.0000	
NA	/ /	2939	480671.47	1379531.05	0.0000	
NA	/ /	2943	477474.62	1379635.87	0.0000	
NA	/ /	2944	477514.06	1379493.03	0.0000	
112994	04/28/93	2945	477972.18	1379119.93	(4.0000)	
NA	/ /	2947	482120.02	1379906.75	0.0000	
NA	/ /	2949	482338.10	1379718.25	0.0000	
NA	/ /	2951	482158.80	1379554.77	0.0000	
NA	/ /	2953	482020.08	1379744.25	0.0000	
NA	/ /	2954	477804.29	1379406.47	0.0000	
113801	06/22/93	2955	478103.82	1378953.07	(1.0000)	

000186

FOR PLATE NO. E-133

Sample	Sampdate	Boring	North	East	Total	Qual
003352	01/11/93	3001	481311.58	1378727.34	(17.0000)	
NA	/ /	3003	481630.71	1377878.49	0.0000	
NA	/ /	3004	481427.82	1377896.26	0.0000	
NA	/ /	3005	481081.70	1378080.27	0.0000	
EMGW_SYSGEN_901	05/16/90	3008	480662.16	1379220.41	27.3000	
NA	/ /	3009	479551.92	1378023.78	0.0000	
066449	06/13/93	3010	481572.21	1379809.87	(10.0000)	
NA	/ /	3011	482246.10	1377954.23	0.0000	
GW930506-1	05/06/93	3014	476805.31	1379579.24	(1.0000)	
EMGW_SYSGEN_955	03/11/91	3015	476136.76	1380201.38	8.1000	
NA	/ /	3016	477613.84	1379163.66	0.0000	
NA	/ /	3017	476265.77	1379163.52	0.0000	
NA	/ /	3018	479449.10	1378689.56	0.0000	
NA	/ /	3020	479167.41	1379535.37	0.0000	
GW930412-8	04/12/93	3024	482477.17	1378902.73	(37.0000)	
NA	/ /	3027	481975.07	1379308.29	0.0000	
NA	/ /	3034	480240.23	1378431.39	0.0000	
EMGW_SYSGEN_1007D	05/07/90	3037	482141.43	1379791.96	119.5000	
066455	10/22/89	3043	481770.91	1377050.35	11.0000	
EMGW_SYSGEN_1029	09/11/90	3044	477773.57	1378162.79	1.2000	
NA	/ /	3045	477139.87	1379742.30	0.0000	
NA	/ /	3046	478051.23	1379438.66	0.0000	
NA	/ /	3049	477021.22	1380061.42	0.0000	
066455	06/22/89	3051	481588.05	1383278.57	17.0000	
120084	06/17/93	3054	480040.30	1381524.47	(2.0000)	
NA	/ /	3055:	481464.81	1380702.55	0.0000.	
NA	/ /	3062	474015.60	1379612.30	0.0000	
NA	/ /	3064	480730.53	1382184.22	0.0000	
NA	/ /	3065	477856.08	1380406.96	0.0000	
EMGW_SYSGEN_1077	07/17/91	3066	483951.29	1376706.24	13.7000	
NA	/ /	3067	479760.13	1382988.18	0.0000	
NA	/ /	3068	478672.21	1381392.56	0.0000	
NA	/ /	3069	476422.17	1380713.62	0.0000	
NA	/ /	3070	476762.23	1382026.06	0.0000	
NA	/ /	3091	477835.27	1384454.06	0.0000	
NA	/ /	3092	476611.63	1384185.47	0.0000	
GW930519	05/22/93	3093	475318.41	1381389.92	(2.0000)	
PRS309402-R2	07/31/90	3094	470750.00	1380615.00	4.0000	
EMGW_SYSGEN_1134	03/11/91	3095	475115.00	1379500.00	12.2000	
NA	/ /	3096.	476541.50	1377206.26	0.0000	
NA	/ /	3097	480290.96	1386943.18	0.0000	
NA	/ /	3098	483386.93	1386314.65	0.0000.	
NA	/ /	3106	476094.40	1379589.66	0.0000	
NA	/ /	3107	478558.59	1378532.93	0.0000	
120042-1	06/07/93	3108	480060.05	1377927.11	(8.0000)	
GW930104-10	01/04/93	3120	480167.23	1382095.20	(300.8000)	
NA	/ /	31217	481606.89	1383217.10	0.0000	
NA	/ /	3125	474344.53	1379479.82	0.0000	
EMGW_SYSGEN_1166	09/04/90	3126	472154.00	1379000.00	30.1000	
NA	/ /	3127	470050.35	1380153.65	0.0000	
NA	/ /	3128	473541.84	1379798.33	0.0000	
NA	/ /	3385	477883.04	1379932.66	0.0000	
NA	/ /	3387	477117.30	1380451.65	0.0000	
NA	/ /	3390	476540.71	1379881.55	0.0000	
NA	/ /	3391	472155.60	1381487.69	0.0000	
NA	/ /	3396	474161.21	1379208.13	0.0000	
NA	/ /	3397	478276.43	1381003.53	0.0000	
GW930413-15	04/13/93	3398	476585.58	1381334.81	(1.0000)	
NA	/ /	3402	478196.71	1378786.49	0.0000	
NA	/ /	3417	480285.10	1382932.46	0.0000	
NA	/ /	3421	481662.64	1382074.74	0.0000	
038334	04/02/92	3423	482555.67	1381755.76	3.0000	
NA	/ /	3424	482362.74	1383262.64	0.0000	
NA	/ /	3426	480830.90	1383202.18	0.0000	
NA	/ /	3429	480072.93	1383292.88	0.0000	
GW93027-3	07/27/93	3431	478866.58	1383075.73	(27.0000)	
NA	/ /	3432	478014.99	1383084.30	0.0000	
NA	/ /	3550	475766.47	1379346.62	0.0000	
NA	/ /	3551	475336.88	1379005.93	0.0000	
NA	/ /	3552	473902.78	1379186.92	0.0000	
NA	/ /	3624	474565.87	1379554.39	0.0000	
NA	/ /	3636	473380.42	1379962.27	0.0000	
GW930524-4	05/24/93	3679	483926.78	1378250.50	(2.0000)	
NA	/ /	3689	474361.16	1379607.18	0.0000	
NA	/ /	3733	477087.25	1383145.35	0.0000	
065411	07/16/92	3821	481345.97	1378630.88	47.0000	
NA	/ /	3880	475035.45	1380078.75	0.0000	
109979	08/08/93	3899	474118.71	1380685.82	(8.0000)	
110040	08/19/93	3900	473904.35	1379956.32	(13.0000)	

FOR PLATE NO. E-133

Sample	Sampdate	Boring	North	East	Total	Qual
066501	08/16/89	4001	481297.33	1378768.32	5.0000	
066459	06/30/89	4008	480661.25	1379215.51	12.0000	
EMGW_SYSGEN_1237	02/25/91	4010	481455.45	1379699.16	17.0000	
EMGW_SYSGEN_1245	02/21/91	4011	482257.09	1377955.38	38.9000	
NA	/ /	4013	481659.30	1382016.82	0.0000	
NA	/ /	4014	476786.78	1379582.56	0.0000	
NA	/ /	4015	475864.90	1380046.70	0.0000	
NA	/ /	4016	477618.74	1379138.31	0.0000	
NA	/ /	4064	480730.23	1382193.62	0.0000	
NA	/ /	4067	479772.61	1382994.40	0.0000	
NA	/ /	4091	477843.69	1384459.58	0.0000	
GW930506-7	05/06/93	4096	476552.30	1377207.31	(96.0000)	
NA	/ /	4097	480297.99	1386949.96	0.0000	
NA	/ /	4101	480719.01	1379873.23	0.0000	
NA	/ /	4102	480319.66	1379862.32	0.0000	
EMGW_SYSGEN_1325	09/26/91	4103	479929.00	1379851.00	14.1000	
119406	07/25/93	41066	482026.17	1381289.27	(2.0000)	
NA	/ /	41217	481575.83	1383219.24	0.0000	
NA	/ /	41240	444265.87	1393646.37	0.0000	
NA	/ /	4125	474367.01	1379481.77	0.0000	
GW930413-16	04/13/93	4398	476579.29	1381342.97	(25.0000)	
NA	/ /	4424	482354.82	1383272.92	0.0000	
GW930922-3	09/22/93	4426	480836.24	1383193.80	(12.0000)	
NA	/ /	4432	478025.28	1383089.83	0.0000	

ALKALINITY AS CACO3 Type 2 UNFILTERED [GWP703U2.XLS]

FOR PLATE NO. E-135

Sample	Sampdate	Boring	North	East	Maxresult	Qual
GW930511-1	05/11/93	2002	474718.98	1380615.04	(280.0000)	-
120060	07/13/93	2004	481185.1	1377945.09	(240.0000)	-
120075-1	06/14/93	2006	480353.44	1380563.69	(272.0000)	-
120076	06/15/93	2007	480605.5	1380638.55	(240.0000)	-
GW930408-8	04/08/93	2008	480661.42	1378918.03	(280.0000)	-
120035	06/07/93	2009	479540.71	1378007.77	(248.0000)	-
GW930414-1	04/15/93	2010	481460.53	1379691.07	(270.0000)	-
120071-1	06/10/93	2011	482271.62	1377959.33	(264.0000)	-
111992	04/30/93	2014	476802.99	1379584.94	(240.0000)	-
GW930524-16	08/10/93	2015	476148.92	1380201.29	(244.0000)	J
111996	04/30/93	2016	477615.38	1379157.77	(245.0000)	-
GW930426-14	04/26/93	2017	476259.2	1379157.09	(360.0000)	-
EMGW_SYSGEN_443	10/16/90	2018	479447.7	1378671.57	188.0000	
EMGW_SYSGEN_451	10/15/91	2019	481674.46	1379093.84	250.0000	
120040	06/03/93	2020	479168.75	1379519.37	(216.0000)	-
EMGW_SYSGEN_466	10/16/91	2021	481567.9	1378913.4	235.0000	
EMGW_SYSGEN_472	10/23/90	2022	481695.17	1378680.21	222.0000	
GW930412-7	04/12/93	2024	482487.51	1378880.72	(280.0000)	-
GW930423-15	04/23/93	2027	481969.29	1379317.37	(430.0000)	-
118728	07/28/93	2028	481811.42	1378152.28	(230.0000)	-
120315	06/07/93	2032	480503.68	1378298.59	(269.0000)	J
120080	06/15/93	2033	480411.1	1378687.33	(236.0000)	-
120054-1	06/14/93	2034	480240.05	1378419.45	(224.0000)	-
GW930422-16	04/22/93	2037	482140.97	1379801.07	(320.0000)	-
110994	05/04/93	2042	480394.27	1379542.73	(258.0000)	-
GW930407-12	04/07/93	2043	481760.81	1377051.97	(430.0000)	-
GW930514-6	05/14/93	2044	477783.56	1378156.8	(232.0000)	-
GW930428-4	04/28/93	2045	477129.91	1379760.54	(348.0000)	-
GW930511-10	05/11/93	2046	478058.45	1379418.68	(370.0000)	-
110894	04/27/93	2047	478263.85	1379054.18	(224.0000)	-
GW930427-2	08/11/93	2048	477480.23	1379866.55	(340.0000)	-
113305	08/11/93	2049	477020.51	1380072.04	(400.0000)	-
GW930520-8	05/20/93	2050	482407.69	1376516.93	(390.0000)	-
GW930406-13	09/20/93	2051	481597.05	1383279.97	(330.0000)	-
GW930429-7	04/29/93	2052	482507.16	1380139.73	(360.0000)	-
EMGW_SYSGEN_588	09/26/90	2053	479935.12	1380352.25	262.0000	
120082	06/17/93	2054	480030.82	1381523.36	(296.0000)	-
GW930413-21	04/13/93	2055	481488.08	1380703.99	(248.0000)	-
EMGW_SYSGEN_610	11/26/90	2060	475865.6	1380010.6	202.0000	
EMGW_SYSGEN_614D	03/07/91	2061	474775.5	1379665.9	249.0000	
GW930405-2	04/05/93	2064	480720.1	1382183.97	(310.0000)	-
112008	05/03/93	2065	477866.51	1380434.37	(437.5000)	-
GW930407-14	04/07/93	2066	483938.95	1378703.45	(350.0000)	-
GW930422-6	04/22/93	2067	479761	1382997	(290.0000)	-
120051-1	06/08/93	2068	478683	1381391	(252.0000)	-
EMGW_SYSGEN_658	09/24/91	2069	476416.3	1380705.58	218.0000	
GW930407-6	09/22/93	2070	476752	1382029	(270.0000)	-
EMGW_SYSGEN_672	10/25/90	2071	481528	1384984	283.0000	
GW930408-12	04/08/93	2084	481922.56	1378940.3	(460.0000)	-
GW930501-1	08/10/93	2091	477826.61	1384448.64	(370.0000)	-
GW930515-2	05/15/93	2092	476613.61	1384177.17	(366.0000)	-
GW930513-9	05/22/93	2093	475317.29	1381403.28	(260.0000)	J
120287	07/26/93	2094	470832.49	1380701.68	(270.0000)	-
GW930511-2	05/11/93	2095	475052.04	1379568.71	(270.0000)	-
GW930506-5	05/06/93	2096	476531.14	1377204.11	(300.0000)	-
GW930519-8	08/09/93	2097	480283.63	1386936	(324.0000)	-
GW930520-9	05/20/93	2098	483385.79	1386326.37	(270.0000)	-
116970	06/17/93	21033	477278.1	1380181.18	(380.0000)	-
GW930513-14	05/13/93	2104	477575	1377655	(320.0000)	-
GW930407-8	09/16/93	2106	476096.82	1379580.27	(280.0000)	-
119373	07/27/93	21064	478443.48	1379482.59	(310.0000)	-
119363	07/26/93	21065	478483.28	1380037.41	(320.0000)	-
120033	06/03/93	2107	478567.08	1378527.61	(256.0000)	-
120039	06/07/93	2108	480056.37	1377920.72	(344.0000)	-
120063-1	06/10/93	2109	480492.35	1381798.38	(256.0000)	-
120065-1	06/10/93	2118	480013.14	1381795.87	(280.0000)	-
105623	07/30/93	2119	479309.36	1384594.27	(365.0000)	-
GW930401-1	04/01/93	2120	480186.92	1382123.05	(280.0000)	-
GW930520-1	05/20/93	2125	474354.95	1379479.44	(240.0000)	-
120072-1	06/14/93	2126	473049.47	1378966.19	(292.0000)	-
GW930513-16	05/13/93	2128	473552.11	1379795.75	(350.0000)	-
EMGW_SYSGEN_790	03/07/91	2129	472632.99	1379884.49	453.0000	
104460	01/25/93	2166	476523.77	1381106.59	(253.0000)	-
120048-1	06/07/93	2171	479937.91	1382076.33	(256.0000)	-
GW930519-2	05/19/93	2383	480500.26	1377374.38	(288.0000)	-
GW930520-7	05/20/93	2384	479054.45	1377550.69	(360.0000)	-
GW930428-3	08/11/93	2385	477886.51	1379923.25	(404.0000)	-
GW930424-3	05/07/93	2386	477633.9	1380783.98	(230.0000)	-
GW930423-6	04/23/93	2387	477119.12	1380441.15	(360.0000)	-

000189

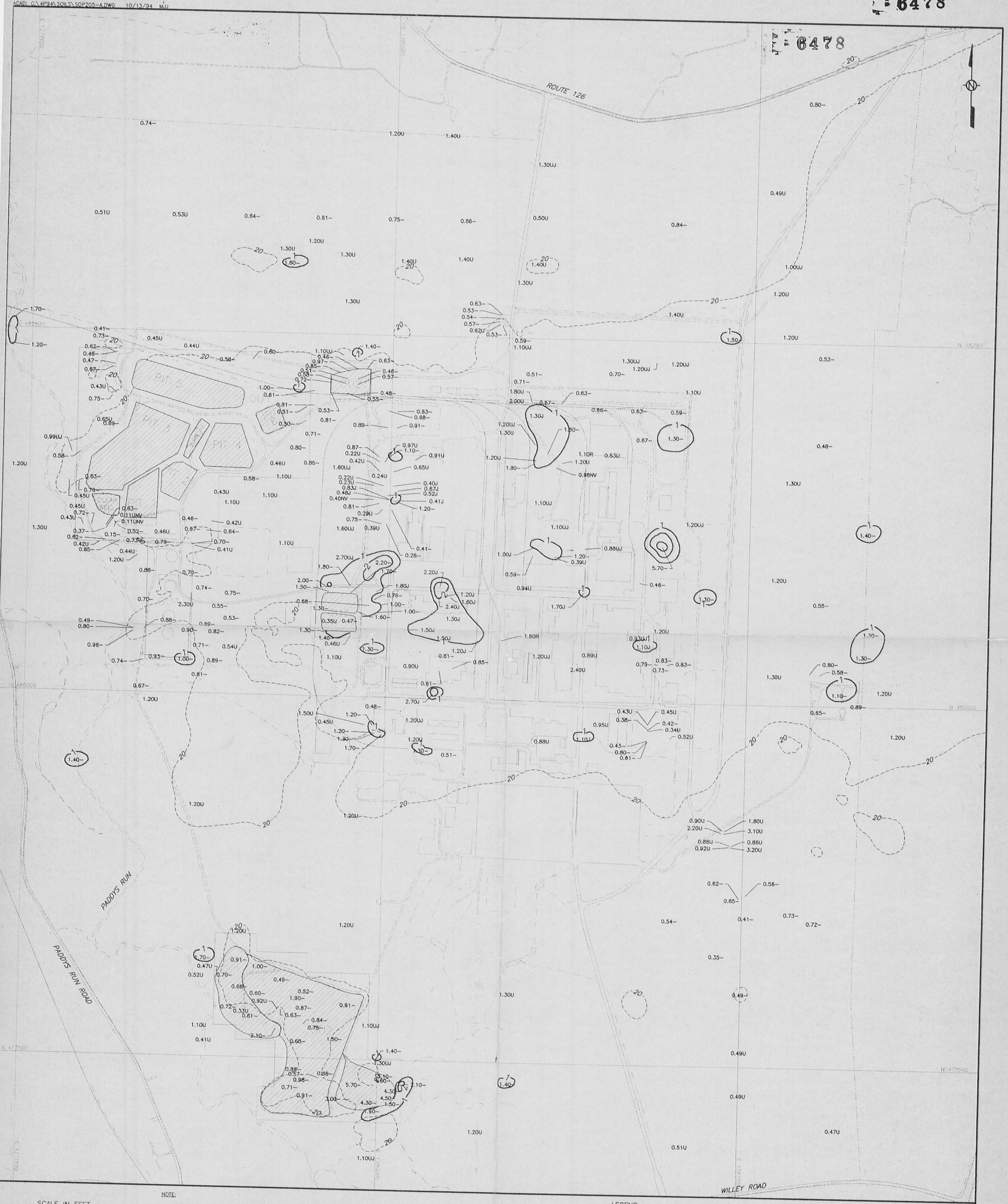
10/19/94

CHANGE PAGE INSTRUCTIONS - PLATES

Appendix D Plates
Replace Plate D-84

ACAD: C:\4P94\SOILS\SOP205-A.DWG 10/13/94 MJU

6478



SCALE IN FEET

0 400 800 FEET

FINAL

NOTE:

1. STATE PLANAR COORDINATE SYSTEM 1927
2. 95th PERCENTILE SURFACE SOIL BACKGROUND VALUE 0.600 mg/kg
3. RANGE OF SURFACE SOIL BACKGROUND VALUES 0.60 mg/kg

LEGEND:

20 mg/kg URANIUM ENVELOPE CONTOUR (SEE PLATE D-10A)

OTHER OPERABLE UNIT WASTE AREAS

ISOCONCENTRATION CONTOUR CONTOUR INTERVALS: 1, 2 & 5 (mg/kg)

1.00– SAMPLING LOCATION IS MIDDLE OF TEXT OR END OF LEADER LINE

DATA QUALIFIERS

NV	NOT VALIDATED DATUM
–	DATA VALIDATED, NO QUALIFIERS APPLIED
J	ESTIMATED VALUE
U	NON-DETECT, DETECTION LIMIT IS SHOWN
R	REJECTED DATUM

SEE SECTION 2.12 FOR DETAILED DESCRIPTION OF QUALIFIERS

PLATE D-84. BERYLLIUM (mg/kg) IN SURFACE SOIL AT 0-0.5 FOOT, OU5, FEMP