APPENDIX A:

TEXT OF PUBLIC LAW 107-206 PERTINENT TO THE MANAGEMENT OF DUF_6

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Section 502 of Public Law 107-206, "2002 Supplemental Appropriations Act for Further Recovery from and Response to Terrorist Attacks on the United States" (signed by the President 08/02/2002)

SEC. 502. Section 1 of Public Law 105-204 (112 Stat. 681) is amended —

(1) in subsection (b), by striking "until the date" and all that follows and inserting "until the date that is 30 days after the date on which the Secretary of Energy awards a contract under subsection (c), and no such amounts shall be available for any purpose except to implement the contract."; and

(2) by striking subsection (c) and inserting the following:
"(c) CONTRACTING REQUIREMENTS —

(1) IN GENERAL — Notwithstanding any other provision of law (except section 1341 of title 31, United States Code), the Secretary of Energy shall —

(A) not later than 10 days after the date of enactment of this paragraph, request offerors whose proposals in response to Request for Proposals No. DE-RP05-010R22717 ('Acquisition of Facilities and Services for Depleted Uranium Hexafluoride (DUF6) Conversion Project') were included in the competitive range as of January 15, 2002, to confirm or reinstate the offers in accordance with this paragraph, with a deadline for offerors to deliver reinstatement or confirmation to the Secretary of Energy not later than 20 days after the date of enactment of this paragraph; and

(B) not later than 30 days after the date of enactment of this paragraph, select for award of a contract the best value of proposals confirmed or reinstated under subparagraph (A), and award a contract for the scope of work stated in the Request for Proposals, including the design, construction, and operation of —

(i) a facility described in subsection (a) on the site of the gaseous diffusion plant at Paducah, Kentucky; and

(ii) a facility described in subsection (a) on the site of the gaseous diffusion plant at Portsmouth, Ohio.

(2) CONTRACT TERMS — Notwithstanding any other provision of law (except section 1341 of title 31, United States Code) the Secretary of Energy shall negotiate with the awardee to modify the contract awarded under paragraph (1) to —

(A) require, as a mandatory item, that groundbreaking for construction occur not later than July 31, 2004, and that construction proceed expeditiously thereafter;

(B) include as an item of performance the transportation, conversion, and disposition of depleted uranium contained in cylinders located at the Oak Ridge K-25 uranium enrichment facility located in the East Tennessee Technology Park

at Oak Ridge, Tennessee, consistent with environmental agreements between the State of Tennessee and the Secretary of Energy; and

(C) specify that the contractor shall not proceed to perform any part of the contract unless sufficient funds have been appropriated, in advance, specifically to pay for that part of the contract.

(3) CERTIFICATION OF GROUNDBREAKING — Not later than 5 days after the date of groundbreaking for each facility, the Secretary of Energy shall submit to Congress a certification that groundbreaking has occurred.

(d) FUNDING —

(1) IN GENERAL — For purposes of carrying out this section, the Secretary of Energy may use any available appropriations (including transferred unobligated balances).

(2) AUTHORIZATION OF APPROPRIATIONS — There are authorized to be appropriated, in addition to any funds made available under paragraph (1), such sums as are necessary to carry out this section."

APPENDIX B:

ISSUES ASSOCIATED WITH DUF_6 CYLINDER CONTAMINATION

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This appendix discusses issues associated with possible contamination of the depleted uranium hexafluoride (DUF_6) within the cylinders and on the cylinders themselves. Section B.1 addresses possible contamination of the DUF_6 with transuranic (TRU) isotopes and technetium-99 (Tc-99). Section B.2 addresses the existence of polychlorinated biphenyls (PCBs) used in the paint on some portion of the cylinder inventory. References are provided in Section B.3.

B.1 POSSIBLE TRANSURANIC CONTAMINATION

B.1.1 Summary

This section addresses the concerns and impacts associated with potential contamination of DUF_6 cylinders with TRU isotopes (these isotopes have an atomic number greater than that of uranium-92 [U-92]) and Tc-99. The extent of contamination is discussed, and potential radiological, chemical, and waste management impacts are evaluated. The results indicate that a small but unknown number of DUF_6 cylinders in the U.S. Department of Energy's (DOE's) inventory are likely to contain relatively high concentrations of TRU and Tc-99 in a small volume inside the cylinders. The TRU and Tc-99 concentrations in a great majority of the cylinders and in the bulk of the small number of contaminated cylinders are expected to be relatively low. The impacts associated with such low concentrations are also expected to be negligibly low (less than 10%) compared with the impacts that would be associated with DUF_6 in the cylinders. In addition, both the concentrations and impacts associated with TRU and Tc-99 in the conversion facility at either the Paducah, Kentucky, or Portsmouth, Ohio, site and in the conversion products are estimated to be negligibly small. However, under certain circumstances, the doses resulting from the high concentrations of TRU and Tc-99 in a small number of emptied cylinders could be relatively high. In addition, depending on how the emptied cylinders are processed and dispositioned, there may be some transuranic waste (TRUW) issues at either conversion site. However, under the proposed action and by using the cylinder disposition strategy proposed by the conversion contractor, Uranium Disposition Services, LLC (UDS), no TRUW is expected to be generated at either the Paducah or Portsmouth site.

B.1.2 Background

At about the time the final programmatic environmental impact statement (PEIS) for DUF_6 was published in April 1999 (DOE 1999), and while DOE was preparing a request for proposals (RFP) to acquire the services of a private firm to design, construct, and operate two plants at Paducah and Portsmouth to convert DOE's inventory of DUF_6 to a more stable

chemical form (DOE 2000a), concern was raised that some portion of DOE's DUF_6 inventory might be contaminated with TRU and Tc. This concern arose because in the period before 1985, some reprocessed uranium from defense production sites was fed into the diffusion cascades in the form of UF_6. The reprocessed uranium was obtained from the fuel that had been irradiated in the production reactors (reactors used by the government to produce nuclear materials for weapons). This irradiation produced a large number of radionuclides that initially had not been present in the fresh fuel. These radionuclides were either TRU or fission products (radionuclides created from the fissioning of uranium atoms). When the used fuel was reprocessed to separate the wanted nuclear materials and the uranium to be used again, a small fraction of the TRU elements and a fission product, Tc-99, ended up in the uranium stream. It was thought that when the reprocessed uranium was converted to UF_6 and fed to the diffusion cascades for reenrichment, part of the contaminants in the uranium might have transferred into the tails cylinders (cylinders containing the DUF_6). The principal isotopes of concern were two TRU isotopes, plutonium-239 (Pu-239) and neptunium-237 (Np-237), and Tc-99.

DOE wanted to determine the extent of contamination in the cylinders so that potential responders to the RFP could properly factor it into their proposals. To resolve this uncertainty, DOE commissioned Oak Ridge National Laboratory (ORNL) to develop a strategy for characterizing TRU and Tc contamination in the tails cylinders (Hightower et al. 2000). The draft strategy developed by ORNL was peer reviewed by a team of scientists and engineers from Lawrence Livermore National Laboratory and Argonne National Laboratory (Brumburgh et al. 2000). The peer review team found that available data and process knowledge was sufficient to establish bounding concentrations of contaminants in the tails cylinders and that additional sampling of the cylinders would not be cost-effective. The ORNL team also concluded that additional characterization of the cylinders would not be likely to result in lower bids by prospective vendors, and that direct sampling of many older cylinders might not be practical. However, during the period December 1999 through August 2000, additional measurements were taken on 14 selected full DUF_6 cylinders and heels cylinders (i.e., empty cylinders containing about 10 to 23 kg (22 to 50 lb) of residual DUF_6, uranium decay products, and, in some cases, TRU and Tc) stored at the Paducah and Portsmouth Gaseous Diffusion Plants. The results of these measurements were included in the final ORNL strategy document (Hightower et al. 2000).

B.1.3 Extent of Transuranic and Technetium Contamination in the DUF_6 Cylinders

Both the ORNL team and the peer review team reviewed the previous characterization studies conducted on the tails cylinders. The ORNL team also interviewed some staff members who worked at the Portsmouth and Paducah Gaseous Diffusion Plant sites when the recycled uranium was being fed to the cascades. On the basis of those reviews and the characterization performed in the period December 1999 to August 2000, it was concluded that the level of contamination in the tails cylinders is very limited. The peer review team stated that the only plausible pathway for the TRU and Tc to get into the DUF_6 cylinders was by way of the heels from prior use of the cylinders to store reactor return feed. It was discovered during the investigations that some cylinders that were used to store reprocessed UF_6 were emptied into the cascades for reenriching the UF_6. The same cylinders were later filled with DUF_6 without first

being cleaned. The TRU contamination in the feed cylinders consisted mainly of nonvolatile fluorides. Therefore, they were concentrated in the heels of the feed cylinders. Any TRU isotopes that were carried into the cascades were thought to have plated out and been captured in the cascades; thus, they never made it into the tails cylinders. Similarly, nonvolatile compounds of Tc stayed in the heels, while the volatile components, because of their low molecular weight compared with UF_6, moved up the cascades and either were released in the purge stream or stayed with the enriched product.

The number of reprocessed uranium feed cylinders that were later used to store DUF_6 was not known, but it was estimated to be in the hundreds (Hightower et al. 2000). This number represents only a portion of the total of approximately 60,000 DUF_6 cylinders that are used to store DOE's inventory of DUF_6 at the three storage sites — Portsmouth, Paducah, and East Tennessee Technology Park.

It is believed that when the cylinders with contaminated heels were filled with DUF_6, the liquid DUF_6 entering the cylinder stirred the heels and caused some fraction of the contamination to be mixed with the DUF_6. It is also possible that a small fraction of the TRU that had been captured in the cascades may have revolatized during the cascade improvement projects and was carried into some DUF_6 cylinders. Therefore, TRU and Tc could be found both in the heels and in the bulk of a small, but unknown, number of DUF_6 cylinders in the DOE inventory. To provide guidance to prospective responders to the RFP, the ORNL study listed bounding concentrations of TRU and Tc in the cylinders in the bulk DUF_6 and in the heels. It also gave an estimated maximum quantity that could exist in the entire cylinder inventory. This information was included in the final RFP issued in October 2000 (DOE 2000a) and is reproduced here in Tables B-1 and B-2. The quantities listed were used in this environmental impact statement (EIS) to estimate the impacts associated with TRU and Tc contamination.

TABLE B-1 Bounding Concentrations of Dispersed Transuranic and Tc-99 Contamination in the DUF_6 Full and Heels Cylinders

Contaminant[a]	Concentration in Full Cylinders (ppb)[b]	Concentration in Heels Cylinders (ppb)[b]
Pu-238	0.00012	5
Pu-239	0.043	1,600
Np-237	5.2	54,000
Tc-99	15.9	5,700,000
Am-241	0.0013	0.57

[a] Am = americium, Np = neptunium, Pu = plutonium, and Tc = technetium.

[b] Equivalent to grams of contaminant per billion grams of uranium.

B.1.4 Extent of Transuranic and Technetium Contamination in the Conversion Facility

It is expected that when cylinders with TRU and Tc contamination would be fed into the conversion facility, the TRU and the Tc contamination, which would principally exist in the form of nonvolatile fluorides, would remain in the heels of the emptied cylinders (Brumburgh et al.

2000; Hightower et al. 2000). Although a small fraction of TRU might be carried out of the cylinders with the gaseous UF_6 as particulates, it is expected that it would instead be captured in the filters through which the UF_6 would pass before it entered the conversion equipment. Therefore, the only places at the entire conversion facility where TRU contamination could be of concern would be in some full cylinders before they were emptied, in some heels cylinders after they were emptied, and in the filters at the front end of the facility.

TABLE B-2 Maximum Total Quantities of Transuranics and Technetium in the DUF_6 Inventory

Radionuclide	Maximum Quantity (g)
Pu	24
Np	17,800
Tc	804,000

It is also expected that most of the Tc that existed in the cylinders would remain in the heels or be captured in the filters. However, because of the existence of some volatile technetium fluoride compounds, and for the purposes of analyses in this EIS, it was assumed that all of the Tc would volatilize with UF_6 and be carried into the conversion process equipment. Any Tc compounds transferred into the reaction chambers would be oxidized in the reaction chambers along with the DUF_6. For this EIS, it was also assumed that the Tc in the form of oxides would partition into the triuranium octaoxide (U_3O_8) and hydrogen fluoride (HF) products in the same ratio as the uranium.

Under the proposed action, it is assumed that after the emptied cylinders were removed from the autoclaves, a stabilizing agent would be introduced in the cylinders to neutralize residual fluoride in the heels. The cylinders would then be moved out to the aging yard and stored for at least 4 months to allow short-lived daughter products of uranium to decay. Then the cylinders would be transported to the cylinder disposition facility on site, where they would be compacted and dissected. Finally, the sectioned cylinder parts with heels in them would be transported to the Envirocare of Utah, Inc., facility for disposal. The emptied cylinders would be surveyed by using nondestructive assay (NDA) techniques to determine the presence of a significant quantity of TRU isotopes. If TRU isotopes were detected, samples would be taken and analyzed. Cylinders that exceeded the disposal site limits at the Envirocare of Utah facility would be treated to immobilize the heel (e.g., with grout) within the cylinder, compacted, and sectioned; then the cylinder/heel waste stream would be sent to the Nevada Test Site (NTS) and disposed of as low-level radioactive waste (LLW).

Because of a recent design change, UDS is now planning to fill the emptied cylinders with the depleted U_3O_8 product, transport the filled cylinders to the Envirocare of Utah disposal facility, and dispose of them there. Previously, the depleted U_3O_8 product was to have been poured into 11,340-kg (25,000-lb) capacity bulk bags, transported to the same disposal facility, and disposed of there. The cylinders were to be treated and disposed of as a separate waste stream, as discussed above. This EIS considers both options.

A small quantity of nonvolatile TRU contamination, which might be entrained in the gaseous DUF_6 during the cylinder emptying operations and carried out of the cylinders, would be captured in the filters that would be used between the cylinders and the conversion equipment.

These filters would be monitored and changed out periodically to prevent buildup of TRU, and they would be disposed of as LLW.

Under the proposed action, there would not be any TRUW (radioactive waste that contains transuranic radionuclides with half-lives greater than 20 years and in concentrations greater than 100 nCi/g) generated at the conversion plant at either the Paducah or Portsmouth site. However, to provide a conservative estimate of the impacts associated with the management of TRU- and Tc-contaminated heels materials, this EIS also considers the option of washing the emptied cylinders, removing the heels from the emptied cylinders, and disposing of the solids from the washing solution as waste. Under this option, it is shown that some of the waste thus generated might possibly be classified as TRUW.

B.1.5 Impact Areas

TRU contamination of DUF_6 is of concern with regard to its potential impact on the health and safety of the workers and the public primarily because the radiological toxicity of TRU radionuclides is higher than that of uranium isotopes. If the TRU was concentrated in waste materials generated during the conversion process, potential generation of TRUW would also be of concern.

As discussed above, TRU and Tc could occur in some full and heels cylinders. They could also be collected in the filters used in the front end of the conversion plant process. TRU and Tc would be health and safety concerns primarily if they were released to the environment in forms that could be taken internally by workers and the general public through inhalation, ingestion, or dermal absorption. The primary pathway of exposure is inhalation of particulates in air. The chemical toxicity of both the TRU and Tc is not much different than that of uranium, but because the concentrations of TRU and Tc are much less than that of uranium, their chemical impacts compared with those of uranium would be negligibly small.

During normal operations, the DUF_6 and any contaminants in it would be contained in the cylinders or the process equipment to prevent any measurable internal contamination of the workers or the public. However, if an accident caused the DUF_6 to be released to the atmosphere, the potential would arise for internal exposures. As discussed above, the TRU contaminants would be present in some of the cylinders and in the filters, but they would not enter the conversion process areas. Tc-99 could also be present in the same locations and could transfer into the process areas and conversion products. The highest concentration of the contaminants would be in the heels of some of the emptied cylinders. Therefore, potential impacts of any TRU and Tc contamination would be the greatest in cases involving accidents during storage, transportation, or handling of the cylinders, and during the management of wastes associated with the cleaning and disposition of empty cylinders.

Relative contributions of TRU and Tc to radiological doses under accident conditions are discussed below and in the main text of this EIS. Also discussed is the potential quantity of TRUW that could be generated at a conversion plant if the empty cylinders were to be washed and the heels separated.

In 1999 and 2000, a team of experts from DOE conducted a study on the historical generation and flow of recycled uranium (through reprocessing and reusing) in the DOE complex. The team report provided evaluation guidelines for the health and safety impacts associated with the contaminants found in the recycled uranium (DOE 2000b). In particular, Appendix A of the report provided the technical basis for identifying the relative radiological health hazards of the constituents. For each constituent and for a range of uranium enrichments, the appendix listed the concentrations of TRU radionulides in the reprocessed uranium that would result in a 10% increase in the dose received by an individual over and above the dose the individual would receive from the uranium alone. The concentrations that corresponded to the depleted uranium (0.2% U-235) are reproduced in Table B-3 for three different clearance classes, D, W, and Y. The clearance class indicates the speed by which the radionuclides taken internally by an individual would leave the body through biological mechanisms. Depending on the chemical from of the radionuclide, it could be on the order of days (D class), weeks (W class), or years (Y class). Among the chemical forms of uranium that are of concern in this EIS, UF_6 and uranyl fluoride (UO_2F_2) are considered to be D class, whereas the oxides and uranium tetrafluoride (UF_4) are considered to be W class.

A comparison of the concentrations given in Tables B-1 and B-3 shows that the concentrations of all the constituents in full cylinders (Column 2 in Table B-1) are less than the concentrations given in Table B-3. This indicates that each constituent would contribute less than 10% to dose. By applying the sum of fractions rule, it can be shown that the contribution to dose

TABLE B-3 Concentrations of Transuranic Constituents and Tc-99 in Depleted Uranium That Would Result in 10% Contribution to Dose

	ppb U[a]			pCi/g[b]		
	Clearance Class			Clearance Class		
Contaminant	D	W	Y	D	W	Y
Pu-238	0.0115	0.0227	0.804	201	395	14,000
Pu-239	2.17	4.34	193	133	266	11,900
Np-237	189	379	5,630	133	266	3,950
Am-241	0.0387	0.0775	1.15	133	266	3,950
Tc-99	NL[c]	NL	NL	NL	NL	NL

[a] ppb U = parts per billion of uranium.

[b] pCi/g = picocuries of constituent per gram of total uranium.

[c] NL = no limit.

Source: DOE (2000b).

by all the constituents combined would also be less than 10% even under the most restrictive clearance class (D class). According to this rule, if the sum of the concentration of each constituent from Table B-1 divided by the concentration of the same constituent from Table B-3 is less than 1, then the sum of contributions to dose from all the constituents would be expected to be less than 10%. Under the D class, this sum would be 0.00012/0.0115 (Pu-238) + 0.043/2.17 (Pu-239) + 5.2/189 (Np-237) + 0.0013/0.0387 (Am-241) + 0 (Tc-99) = 0.091. For the W and Y classes, the same sum of ratios would be 0.046 and 0.0024, respectively.

Thus, on the basis of the above analysis, it can be concluded that as long as the TRU and Tc-99 existed in uranium streams at concentrations equal to or less than those shown in Column 2 of Table B-1, their contribution to dose would be less than 10% of the dose due to uranium alone. In fact, because the sum of ratios is considerably below 1.0, the contribution would be much less than 10%. Given the uncertainties associated with the estimation of doses, this type of contribution to dose would be considered negligible. The analyses performed for this EIS (see Section B.1.6.1 below) also demonstrate the fact that when the TRU and Tc-99 concentrations are at or below the levels shown in Table B-1, Column 2, for full cylinders, their contribution to dose is negligibly small. However, as discussed below, doses that can be attributed to TRU and Tc-99 found in the heels of some of the cylinders under accident conditions can be relatively high compared to uranium doses.

B.1.6 Conservative Estimates of Impacts

B.1.6.1 Cylinder Accidents

The TRU and Tc contaminants in the cylinders could become available for human uptake as a result of accidents involving the release of some portion of the contents of a cylinder. Such accidents could occur during storage, handling, or transportation of cylinders. A spectrum of cylinder accidents was analyzed for the DUF_6 PEIS (Policastro et al. 1997). The resulting impacts were estimated on the basis of projected release quantities of DUF_6. For purposes of this analysis, it is assumed that in accidents involving full cylinders, TRU and Tc would exist at their maximum concentrations, as listed in Table B-1. It is also assumed that these contaminants would be released and transported through environmental media at the same relative concentration as that present in the cylinder (i.e., it is assumed that the mass concentration of TRU divided by the mass concentration of total uranium isotopes would remain constant). When DUF_6 is released to the environment, it interacts with moisture in the air and converts to depleted UO_2F_2, which is solid at atmospheric conditions. Therefore, the assumption that depleted UO_2F_2 particles and particulate forms of TRU and Tc travel in tandem is considered to be reasonable.

The possibility of an accident involving heels cylinders with the highest TRU concentrations as shown in Table B-1 is also considered. Table B-4 shows the pertinent radiological data for the radionuclides under consideration. Table B-5 shows the relative doses (relative to uranium, assuming that the uranium is 0.25% U-235, with the remaining being U-238) for the TRU isotopes and Tc-99. The data show that when TRU isotopes are present at

TABLE B-4 Radiological Parameters for Uranium, Transuranic, and Technetium Isotopes

	Dose Conversion Factor			Nuclide Constants	
Radionuclide	Inhalation (mrem/pCi)	Ingestion (mrem/pCi)	External Surface ([mrem/yr]/[pCi/cm^2])	Half-Life (yr)	Atomic Mass
U-238	0.118	2.69×10^{-4}	3.25×10^{-2}	4.47×10^{9}	238
U-235	0.123	2.67×10^{-4}	0.194	7.04×10^{8}	235
Pu-238	0.392	3.2×10^{-3}	9.79×10^{-4}	87.74	238
Pu-239	0.429	3.54×10^{-3}	4.29×10^{-4}	2.41×10^{4}	239
Np-237	0.54	4.44×10^{-3}	0.261	2.14×10^{6}	237
Tc-99	8.33×10^{-6}	1.46×10^{-6}	9.11×10^{-5}	2.13×10^{5}	99
Am-241	0.444	3.64×10^{-3}	3.21×10^{-2}	432.2	241

TABLE B-5 Relative Contributions of Transuranic and Technetium Isotopes to Dose

	Bounding Concentration in ppb (U)[a]		TRU Contribution[b]	
Radionuclide	Tails	Heels	Inhalation Dose (conservative heels concentration)	Inhalation Dose (realistic tails concentration)
Pu-238	1.2×10^{-4}	5	0.835	2.00×10^{-5}
Pu-239	4.3×10^{-2}	1.6×10^{3}	1.06	2.85×10^{-5}
Np-237	5.2	5.4×10^{4}	0.511	4.92×10^{-5}
Tc-99	15.9	5.7×10^{6}	2.00×10^{-2}	5.59×10^{-8}
Am-241	1.3×10^{-3}	0.57	2.16×10^{-2}	4.93×10^{-5}
Total			2.45	1.47×10^{-4}

[a] Equivalent to grams of contaminant per billion grams of uranium.

[b] Relative to uranium; e.g., the dose from Pu-238 would be 0.835 times the dose from uranium for a conservative heels concentration.

the maximum bulk concentrations, the TRU and Tc add only about 0.015% to the dose calculated on the basis of DUF_6 alone. However, when they are present in maximum heels concentrations, the dose can be increased by about a factor of 4 (2.45 + 1 for uranium) over what it would be for DUF_6 alone.

In the accident analyses performed for the DUF_6 PEIS, accidents involving both full cylinders and heels were considered. However, it was found that the releases and, consequently, the impacts from the accidents involving full cylinders were considerably higher than those

involving only the heels cylinders. In fact, in the source document for the PEIS, the Engineering Analysis Report (Dubrin et al. 1997, Section 7, p. 7-5), an accident involving two heels cylinders was described. The estimated amount of DUF_6 leaving each cylinder was 7 kg (15 lb), for a total release of about 14 kg (31 lb) of DUF_6. A similar accident was also postulated for full cylinders. In that case, it was estimated that about 1,500 kg (3,306 lb) of DUF_6 would be released from the cylinders. As expected, the estimated impacts from the accident involving the full cylinders were considerably greater than the estimated impacts from the heels cylinder accident; therefore, only the impacts for the full cylinder accident were discussed in the PEIS.

Dose contributions from potential TRU and Tc contaminants were not considered in the PEIS. If such contributions were added, the dose from a heels cylinder accident would increase by a factor of about 4, which would be equivalent to about 60 kg (132 lb) of DUF_6 being released (the dose is directly proportional to the quantity of DUF_6 released from the cylinders), whereas the dose from the full cylinder accident would remain the same, with about 1,500 kg (3,307 lb) of DUF_6 being released. Because the doses from the full cylinder accident were much greater and because the frequencies of the two accidents were considered to be about the same (they were both considered to belong to the extremely unlikely category, with a frequency range of 10^{-4} to 10^{-6} per year), the full cylinder accident was discussed in the PEIS, but the heels cylinder accident was not. As the analyses above show, even after including the contributions from TRU and Tc, the full cylinder accident would still produce a much greater dose than the heels cylinder accident and, therefore, would still be bounding for the group of accidents belonging to the extremely unlikely frequency category.

The relative contributions of Tc-99 to dose from exposure to bulk DUF_6 in the cylinders and to heels material with maximum contaminant concentrations (Table B-1) are 0.000006% and 0.2%, respectively (Table B-5). Similar to TRU contaminants, most of Tc-99 would be expected to remain in the heels or be captured in the filters when the cylinders were emptied. However, if it did transfer into the conversion equipment, there it would be expected to (a) convert to technetium oxide during the conversion of DUF_6 to U_3O_8 and (b) partition into the uranium and HF products at about the same ratio as the uranium. As a result, the relative concentration of Tc-99 in both products (relative to uranium) would be about the same as in the bulk DUF_6; namely, 15.9 ppb. Its relative contribution to dose (relative to uranium) would be about 0.000006%. Given such a low contribution and the low doses that would result from exposure to U_3O_8 (see Section 5.2.3) and HF product (see Section 5.2.6), the radiological impacts of Tc-99 in the conversion products can be considered to be negligible.

B.1.6.2 Waste Management

As mentioned previously, no TRUW would be generated at either conversion facility in Paducah or Portsmouth under the proposed action. The empty cylinders would be refilled with the depleted U_3O_8 product and disposed of. The impacts associated with management of LLW, including transportation to a disposal facility, are discussed in Sections 5.2.3 and 5.2.5 of this EIS. The option of disposing of the emptied cylinders as a separate LLW stream is also discussed. This section provides a conservative estimate of waste management impacts associated with the heels material in emptied cylinders, under the assumption that they are

cleansed by washing the cylinders with water and treating the wash solution to generate solid U_3O_8 and a small quantity of solid CaF_2. Such an option was discussed in the Engineering Analysis Report (Dubrin et al. 1997, Section 6.3) and in the PEIS. Under the approach considered, no liquid radioactive waste would be generated.

Table B-6 shows that if the heels in the emptied cylinders contained TRU and Tc at the maximum concentrations shown in Table B-1, and if the heels material was separated and declared waste, it would be classified as TRUW because the concentration of TRU radionuclides would exceed 100 nCi/g. If the heels were left in the form of DUF_6, the calculated TRU activity concentration would be about 150 nCi/g. If the heels were converted to U_3O_8 and dried and the TRU were also converted to oxides, the TRU activity concentration would be about 190 nCi/g (Table B-7).

Table B-2 indicates that there is a maximum of 24 g (0.85 oz.) of Pu and 17.8 kg (3.97 lb) of Np in the DUF_6 inventory. If this amount of TRU was distributed uniformly in the heels of as many cylinders as possible and if the concentration of TRU in the converted U_3O_8 heels material was 100 nCi/g, there would be approximately 240 drums of converted U_3O_8 (each drum containing 627 kg [1,382 lb] of U_3O_8) that could be classified as TRUW (see Table B-8). The total number of drums of converted U_3O_8 heels material would be about 820 (61,422 cylinders $\times$ 8 kg [18 lb] heels U_3O_8 per cylinder/627 kg [1,382 lb] per drum $\times$ 1.023, where the factor 1.023 accounts for the presence of granulating binder, water, etc., in the final product). That would mean that about 30% of the heels-generated U_3O_8 would be classified as TRUW; the remainder (about 580 drums) would be classified as LLW. In actuality, the amount of waste that would fall under the definition of TRUW would be considerably less than 30%. The assumptions made in deriving the above TRUW quantities are highly conservative. These assumptions include the following:

1. The quantity of heels material in an emptied cylinder was assumed to be 10 kg (22 lb). This amount is actually likely to be greater than 10 kg (22 lb). In fact, it could be greater than 20 kg (44 lb) per cylinder, in which case none of the heels material would be classified as TRUW.

2. It is very unlikely that TRU would be distributed uniformly at a concentration just high enough to make the waste TRUW. Some might be present at concentrations greater than 100 nCi/g, with the result that the volume and the number of drums of TRUW would be less.

Filters used to process the DUF_6 leaving the cylinders would be monitored and replaced before the concentration of TRU reached the stage where the filters would have to be managed as TRUW. Therefore, no TRUW is assumed to be generated from the filters. However, an estimate was made of the amount of LLW that could be generated. The following assumptions were used in the estimation:

1. The filters are metallic, cylindrical in shape (6-in. [5-cm] diameter and 15-in. [38-cm] height), and weigh about 38 kg (84 lb);

TABLE B-6 Estimated Maximum Transuranic Radioactivity Concentration in Heels

Contaminant	Concentration (ppb) (U)[a]	Quantity of DUF_6 in Heel (kg)	Quantity of U in Heel (kg)	Quantity of Contaminant in Heel (g)	Specific Activity (Ci/g)	Radioactivity in Heel	
						in Ci	in nCi
Pu-238	5	10	6.8	3.38×10^{-5}	1.71×10^{1}	5.79×10^{-4}	5.79×10^{5}
Pu-239	1,600	10	6.8	1.08×10^{-2}	6.22×10^{-2}	6.72×10^{-4}	6.72×10^{5}
Np-237	54,000	10	6.8	3.65×10^{-1}	7.05×10^{-4}	2.57×10^{-4}	2.57×10^{5}
Am-241	0.57	10	6.8	3.85×10^{-6}	3.43	1.32×10^{-5}	1.32×10^{4}
Total				3.76×10^{-1}		1.52×10^{-3}	1.52×10^{6}

[a] Equivalent to grams of contaminant per billion grams of uranium.

TABLE B-7 Estimated Maximum Transuranic Activity Concentration in Converted Heels Material

Final Form	Quantity in Heel (g)	Total TRU Activity Concentration (nCi/g)
$^{238}PuO_2$	3.8×10^{-5}	72.6
$^{239}PuO_2$	1.2×10^{-2}	84.3
$^{237}NpO_2$	4.1×10^{-1}	32.3
$^{241}AmO_2$	4.4×10^{-6}	1.66
U_3O_8	8.0×10^{3}	0
Total	8.0×10^{3}	191

TABLE B-8 Estimated Maximum Number of Drums Containing Potential Transuranic Waste

Contaminant	Maximum Quantity (g)	Isotope-Averaged Specific Activity (Ci/g)	Maximum Activity (Ci)	Total Quantity in One Drum (g)	TRUW Concentration Limit (nCi/g)	Radioactivity in One Drum (nCi)	No. of Drums
Pu	24	1.15×10^{-1}	2.77	627,273	100	62,727,273	44
Np	17,800	7.05×10^{-4}	12.5	627,273	100	62,727,273	200
Total			15.3	627,273	100	62,727,273	244

2. About 10% of the TRU in the cylinders is entrained during emptying of the cylinders by sublimation and captured in the filters;

3. Filters are replaced when the activity concentration reaches 50 nCi/g; and

4. Filters are macroencapsulated and placed in 55-gal drums for disposal.

On the basis of the above assumptions, it is estimated that on average, 1 drum of LLW would be generated per year of operation, and overall there would be about 26 drums generated over the lifetime of the conversion campaign at both plants combined (Folga 2002).

B.1.6.3 Transportation

Transportation impacts estimated for the PEIS and this EIS include the impacts of transporting all wastes and all products of the conversion process as LLW, low-level mixed waste (LLMW), or nonradioactive/nonhazardous waste (see Section 5.2.5). Under the proposed action, no TRUW would be generated at either the Paducah or Portsmouth site. However, as discussed in Section B.1.6.2, there could be up to 244 drums of TRUW generated over the lifetime of the conversion campaign at both conversion facilities combined, if the heels cylinders were to be washed and the heels materials disposed of as waste. Under these conditions, the TRUW would need to be shipped from the conversion facilities to a disposal site authorized to receive such waste. The total number of truck shipments required would be 6 (assuming 14 drums per TRUPACT-II container and 3 containers per truck) from both conversion plants combined. This number is much less than the approximately 6,000 to 36,000 truck shipments of LLW from the two facilities.

On a single-shipment basis, the impacts associated with incident-free transportation of a TRUW shipment and with a LLW shipment of U_3O_8 drums would be comparable, because the external exposure rate in the vicinity of the truck would be about the same. However, the accident risks would be larger for the TRU shipments if the same amount of material spilled to the environment. The factor of increase in doses would be similar to what was estimated for heels cylinder accidents, namely a factor of 4. However, the TRUW would be shipped in drums placed in TRUPACT-II containers. TRUPACT-II containers are much stronger than the drums themselves. As a result, the probability of material being released to the environment from TRUW shipments as a result of an accident is much smaller than the probability associated with LLW shipments. (LLW drums are generally shipped “as is,” without additional protection.) The overall relative risk of shipping the U_3O_8 generated during cylinder washing in the cylinder treatment facility (if one is constructed) to a disposal facility would be about the same, irrespective of whether it was classified as TRUW or LLW.

B.2 ISSUES ASSOCIATED WITH POLYCHLORINATED BIPHENYLS IN CYLINDER PAINT

B.2.1 Background

B.2.1.1 PCBs in Cylinder Paint

The three-site cylinder inventory contains cylinders of diverse ages, with cylinders having been generated from the early 1950s to the present time. The paints applied to the cylinders had various compositions and included some PCBs. Up until 1977, when the manufacture and use of PCBs in the United States was generally discontinued, certain paints contained up to 10% by weight PCBs. The PCBs were added to the paints to act as a fungicide and to increase durability and flexibility.

Records of the PCB concentrations in the paints used were not kept, so it is currently unknown how many cylinders are coated with paint containing PCBs. However, paint chips from a representative sample of cylinders at the ETTP site have been analyzed for PCBs. The results indicate that up to 50% of the cylinders at ETTP may have coatings on them containing PCBs. Because the Portsmouth and Paducah inventories contain a large number of cylinders produced before 1978, it is reasonable to assume that a significant number of cylinders at those sites also contain PCBs.

The PCBs in dried paint generally have a low environmental mobility, but as the paint ages and chips off the cylinders, there is a potential for transport and subsequent exposure to the PCBs. There is also a potential for the volatilization of the PCBs if the cylinders are heated enough during processing.

B.2.1.2 PCB Use, Contamination, and Distribution at ETTP, Portsmouth, and Paducah

PCB use was very prevalent and widespread in the United States prior to 1978. As a result, PCBs are often detected in locations with no known source of contamination. Because of their tendency to bioaccumulate, PCBs are also widespread in fish and other biota.

For each of the three storage sites, the PCBs in cylinder paints constitute an extremely small proportion of the PCBs that were previously and are currently at the sites. For example, although the Paducah site has been working for several years to dispose of PCB-containing equipment, the site still had about 870 liquid PCB-containing items (mostly capacitors) in service at the end of 2001 (DOE 2002a). The Portsmouth and ETTP sites also still have a large number of liquid PCB-containing items in service.

The three current DUF_6 cylinder storage sites are suspected to have had spills of PCB liquids during past operations, prior to the identification of the health and environmental hazards

of PCBs. Each of the three sites has an existing program for managing PCB-contaminated waste under the Toxic Substances Control Act (TSCA). In addition, the environmental monitoring program at each site includes monitoring of PCB concentrations in soil, sediment, groundwater, surface water, and biota on and in the vicinity of the sites (results are presented in Sections 3.1 and 3.2). Soil, water, sediment, and biota samples obtained from on and near each of the sites since the early 1990s have periodically contained detectable levels of PCBs. Background samples have also had detectable levels of PCBs.

B.2.1.3 Regulation of PCBs

Processing, use, storage, transportation, and disposal of cylinders with applied dried paint that contains PCBs are subject to the federal TSCA regulations applicable to PCBs and PCB items. These federal regulations are located in Title 40, Part 761 of the *Code of Federal Regulations* (40 CFR Part 761), "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," and are implemented by the U.S. Environmental Protection Agency (EPA). 40 CFR Part 761 requires that after PCB items have been designated for disposal, they be packaged and marked in compliance with applicable U.S. Department of Transportation (DOT) hazardous materials regulations (HMRs), which are located in 49 CFR Parts 171 through 180. If DOT HMRs do not apply to a PCB waste, then 40 CFR Part 761 identifies applicable packaging and marking requirements.

B.2.2 Potential Impacts from PCBs in Cylinder Paint

The remainder of this appendix discusses the potential impacts associated with PCBs in cylinder paint during storage, transport, processing, and disposal of the cylinders. The presence of PCBs in the coatings of some cylinders is not expected to result in health and safety risks to workers or the public, as detailed in the sections that follow.

B.2.2.1 Storage

During cylinder storage, the risk to cylinder handlers from dermal contact with the PCBs on cylinders is negligible. The PCBs are bound in a matrix from which dermal absorption is insignificant (Fowler 1999). Because the PCBs are bound in the paint, the potential for them to volatilize under ambient conditions and be inhaled by the workers or the general public would be negligible. In addition, in the case of a cylinder accident involving a fire, the impacts associated with PCBs released from the paint on the cylinders would be negligibly small when compared with the impacts associated with the DUF_6 released from the cylinders.

Cylinder paint chips deposited on the cylinder yard soils can be carried to surface water via runoff. All three sites monitor their surface water discharges for PCBs and also conduct some downstream surface water and sediment monitoring. In general, PCBs have been below detection limits. However, PCBs have occasionally been detected (see Affected Environment in Sections 3.1 and 3.2 of the EIS).

At the Paducah site, effluent at Kentucky Pollutant Discharge Elimination System (KPDES) outfall 017 (which receives runoff from the cylinder yards) contained a maximum of 0.415 µg/L PCBs in 2001 samples; this was not a KPDES permit violation (DOE 2002a). PCBs were not detected in 2002 samples (DOE 2003b). At the Portsmouth site in 2001, seven samples from five different sampling locations that receive runoff from the cylinder yards were obtained throughout the year (DOE 2002b); no PCBs were detected in these samples. PCBs are also monitored in outfalls, sediment, and surface water at and near the ETTP site. Several outfalls at the site (S14, S20, and 113) have contained PCBs at levels of up to 6 µg/L (DOE 2000c, 2001, 2003a). The PCBs in samples from ETTP outfalls are likely attributable to past releases of liquid PCB oils at the plant. The primary source of PCBs in environmental samples is past releases of liquid PCBs. Movement of nonliquid PCBs from the cylinder yards via paint chips in runoff is likely a very minor contributor to environmental releases of PCBs from the sites.

B.2.2.2 Transportation

Transport of cylinders from the ETTP site to either Portsmouth or Paducah would occur under the action alternatives addressed in this EIS. Under the proposed action, to the extent practicable, emptied cylinders at the conversion facilities would be refilled with uranium oxide product, welded shut, and shipped to the designated disposal facility. As a precautionary measure, cylinders with loose paint chips may be bagged for transport to avoid loss of potentially PCB-containing material.

B.2.2.3 Cylinder Processing

Potential impacts during cylinder processing might occur if PCBs volatilized during autoclaving to remove the DUF_6 from the cylinders or if PCBs were released and/or transformed during the cutting and welding process.

During autoclaving, desorption of pure-phase PCBs from the paint matrix would be unlikely, given that the PCBs are bound into the paint structure. PCBs by their very nature are not highly volatile, and losses from PCBs bound in the paint matrix would also be unlikely. However, initial experiments conducted at the University of British Columbia have indicated that some lower chlorinated PCBs may volatize from PCB-containing paints at 70°C (Gill et al. 1997). Because the DUF_6 autoclaves would operate at approximately 95°C, testing should be conducted either prior to or during the conversion facility startup operations to determine if the air vented from the autoclaves should be monitored or if any alternative measures would need to be taken to ensure that worker exposures to PCBs above allowable Occupational Safety and Health Administration (OSHA) limits do not occur.

Before the emptied cylinders were refilled with depleted uranium oxide product, a solvent would be applied to a small area on each cylinder to remove the paint before cut/weld operations occurred (McCoy 2004). Any paint removed from the surface would be managed as Resource Conservation and Recovery Act (RCRA) hazardous waste, TSCA hazardous waste, or LLMW, as appropriate. Removing the paint before welding would reduce or eliminate the

potential for the volatilization of PCBs or for the generation of other toxic chemicals during welding operations. The quantity of waste generated by this operation would be negligibly small when compared with the quantities generated by other operations at either the Paducah or Portsmouth sites.

B.2.2.4 Disposal

The proposed action alternatives of this EIS assume that the cylinders (either filled with depleted uranium oxide or empty) would be disposed of at Envirocare of Utah, located in Utah, or at NTS, located in Nevada. The waste acceptance criteria for both facilities indicate that they have units permitted to receive LLW containing PCBs.

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APPENDIX C:

SCOPING SUMMARY REPORT FOR DEPLETED URANIUM HEXAFLUORIDE CONVERSION FACILITIES

ENVIRONMENTAL IMPACT STATEMENT SCOPING PROCESS

APPENDIX C

This appendix contains the summary report prepared after the initial public scoping period for the depleted uranium hexafluoride conversion facilities environmental impact statement (EIS) project. The scoping period for the EIS began with the September 18, 2001, publication of a Notice of Intent (NOI) in the *Federal Register* (66 FR 23213) and was extended to January 11, 2002. The report summarizes the different types of public involvement opportunities provided and the content of the comments received.

While the EIS preparation was underway, the U.S. Congress passed and the President signed Public Law No. 107-206, which directed the U.S. Department of Energy (DOE) to award a contract for conversion facilities to be built at the Paducah and Portsmouth sites. Accordingly, DOE awarded a contract to Uranium Disposition Services, LLC (UDS), on August 29, 2002. In light of Public Law 107-206, DOE reevaluated its approach for conducting the National Environmental Policy Act (NEPA) process and decided to prepare two separate site-specific EISs in parallel: one EIS for the plant proposed for the Paducah site and a second EIS for the Portsmouth site. This change was announced in a *Federal Register* Notice of Change in NEPA Compliance Approach published on April 28, 2003 (the Notice is included as Attachment B) One set of comments in response to the Change in NEPA Compliance Approach was received from the Oak Ridge Reservation Local Oversight Committee. These comments were similar to those received during public scoping and were considered in the preparation of this EIS.

SCOPING SUMMARY REPORT FOR DEPLETED URANIUM HEXAFLUORIDE CONVERSION FACILITIES

ENVIRONMENTAL IMPACT STATEMENT SCOPING PROCESS

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June 17, 2002

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SCOPING SUMMARY REPORT

Depleted Uranium Hexafluoride Conversion Facilities Project

1 INTRODUCTION

On September 18, 2001, the U.S. Department of Energy (DOE) published a notice of intent (NOI) in the *Federal Register* (66 FR 23213) announcing its intention to prepare an environmental impact statement (EIS) for a proposal to construct, operate, maintain, and decontaminate and decommission two depleted uranium hexafluoride (DUF_6) conversion facilities, one at Portsmouth, Ohio, and one at Paducah, Kentucky. DOE would use the proposed facilities to convert its inventory of DUF_6 to a more stable chemical form suitable for storage, beneficial use, or disposal. Approximately 730,000 metric tons of DUF_6 in about 60,000 cylinders are stored at Portsmouth and Paducah, and at an Oak Ridge, Tennessee, site.[1] The EIS would address potential environmental impacts of the construction, operation, maintenance, and decontamination and decommissioning (D&D) of the conversion facilities. A copy of the NOI is included in Attachment A.

The purpose of the NOI was to encourage early public involvement in the EIS process and to solicit public comments on the proposed scope of the EIS, including the issues and alternatives it would analyze. To facilitate public comments, the NOI included a detailed discussion of the project's background, listings of the preliminary alternatives and environmental impacts DOE proposed to evaluate in the EIS, and a project schedule. The NOI announced that the scoping period for the EIS would be open until November 26, 2001. The scoping period was later extended to January 11, 2002, for reasons discussed in Section 1.3.

This report presents a summary of the scoping process for the DUF_6 conversion facilities project. The first section of the report includes a short summary of the preliminary alternatives and environmental issues described in the NOI and a discussion of how the scoping process was conducted. The second section summarizes the comments submitted to DOE for its consideration in preparing the EIS; the comments are categorized and summarized to capture their substance.

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[1] At the time the NOI was issued and the scoping meetings were held, DOE's inventory of DUF_6 consisted of approximately 700,000 metric tons of the material in about 57,700 cylinders. The inventory increased with the signing of an agreement between DOE and the United States Enrichment Corporation (USEC) on June 17, 2002, which could result in the transfer of up to 23,300 metric tons of DUF_6 from USEC to DOE.

1.1 PRELIMINARY ALTERNATIVES IDENTIFIED IN THE NOI

The preliminary alternatives were identified in the NOI; they are described here to provide the background information necessary to understand the substance of comments summarized in Section 2.

Preferred Alternative

Under the preferred alternative, two conversion facilities would be built: one at the Paducah Gaseous Diffusion Plant (GDP) site in Kentucky and another at the Portsmouth GDP site in Ohio. The cylinders currently stored at the East Tennessee Technology Park (ETTP) site near Oak Ridge, Tennessee, would be transported to Portsmouth for conversion. The conversion products (i.e., depleted uranium as well as fluorine components produced during the conversion process) would be stored, put to beneficial uses, or disposed of at an appropriate disposal facility. This alternative is consistent with the Conversion Plan, which DOE submitted to Congress in July 1999 in response to Public Law 105–204. Several subalternatives would be considered for the preferred alternative:

- Conversion technology processes identified in response to the final Request for Proposals (RFP) for conversion services, plus any other technologies that DOE believes must be considered;

- Local siting alternatives for building and operating conversion facilities within the Paducah and Portsmouth plant boundaries; and

- Timing options, such as staggering the start of the construction and operation of the two conversion facilities.

One Conversion Plant Alternative

An alternative of building and operating only one conversion facility at either the Portsmouth or the Paducah site was proposed in the NOI. This plant could differ in size or production capacity from the two proposed for Portsmouth and Paducah. Technology and local siting subalternatives would be considered as with the preferred alternative.

Use of Existing UF_6 Conversion Capacity Alternative

DOE proposed the possibility of using existing UF_6 conversion capacity at commercial nuclear fuel fabrication facilities in lieu of constructing one or two new conversion plants. DOE is evaluating the feasibility of using existing conversion capacity, although no expression of interest has been received from such facilities.

No Action Alternative

As required by the National Environmental Policy Act (NEPA), the EIS would include a "no action" alternative. Under the no action alternative, cylinder management activities (e.g., handling, inspection, monitoring, and maintenance) would continue the "status quo" at the three current storage sites indefinitely, consistent with the DUF_6 Cylinder Project Management Plan and the consent orders, which include actions needed to meet safety and environmental requirements.

Where applicable under the alternatives listed above, transportation options, such as truck, rail, and barge, would be considered for shipping DUF_6 cylinders to a conversion facility and conversion products to a storage or disposal facility. For each technology alternative, alternatives for conversion products, including storage, use, and disposal at one or more disposal sites, would also be considered.

1.2 PRELIMINARY ENVIRONMENTAL AND OTHER ISSUES IDENTIFIED IN THE NOI

In the NOI, DOE announced its intent to address the following preliminary environmental issues when assessing the potential environmental impacts of the alternatives in the EIS:

- Potential impacts on health from DUF_6 conversion activities, including those to workers and the public from exposure to radiation and chemicals during routine and accident conditions for the construction, operation, maintenance, and D&D of DUF_6 conversion facilities;

- Potential impacts to workers and the public from exposure to radiation and chemicals during routine and accident conditions for the transport of DUF_6 cylinders from ETTP to one of the conversion sites;

- Potential impacts to workers and the public from exposure to radiation and chemicals during routine and accident conditions for the transport of conversion products that are not beneficially used to a low-level waste disposal facility;

- Potential impacts to surface water, groundwater, and soil during construction activities and from emissions and water use during facility operations;

- Potential impacts on air quality from emissions and noise during facility construction and operations;

- Potential cumulative impacts of the past, present, and reasonably foreseeable future actions, including impacts from activities of the United States Enrichment Corporation (USEC);

- Potential impacts from facility construction on historically significant properties, if present, and on access to traditional use areas;

- Potential impacts from land requirements, potential incompatibilities, and disturbances;

- Potential impacts on local, regional, or national resources from materials and utilities required for construction and operation;

- Potential impacts on ecological resources, including threatened and endangered species, floodplains, and wetlands;

- Potential impacts on local and DOE-wide waste management capabilities;

- Potential impacts on local employment, income, population, housing, and public services from facility construction and operations, and environmental justice issues; and

- Pollution prevention, waste minimization, and energy and water use reduction technologies to decrease the use of energy, water, and hazardous substances and to mitigate environmental impacts.

1.3 SCOPING PROCESS

During the scoping process, the public was provided with six options for submitting comments to DOE on the DUF_6 conversion project proposal:

- Public scoping meetings held in Piketon, Ohio; Paducah, Kentucky; and Oak Ridge, Tennessee;

- Traditional mail delivery;

- Toll-free facsimile transmission;

- Toll-free voice message;

- Electronic mail; and

- Directly through the Depleted UF_6 Management Information Network web site on the Internet (http://web.ead.anl.gov/uranium).

The reason for providing such a variety of ways to communicate issues and submit comments was to encourage maximum participation. All comments, regardless of how they were submitted, received equal consideration.

The scoping period commenced with the publication of the NOI on September 18, 2001, and was originally scheduled to close November 26, 2001. Following publication of the NOI, the scoping period was extended 46 days through January 11, 2002, for the reasons discussed below.

As announced in the NOI, the three public scoping meetings were originally scheduled for the first week of November 2001. However, the meetings were postponed to allow review of DOE's approach for complying with NEPA for the DUF_6 conversion project. The review was not completed in time to hold the scoping meetings as originally scheduled. Consequently, the meetings were postponed, and the scoping period was extended from November 26, 2001, to January 11, 2002. The public was notified of the postponement through a press release, ads in local newspapers, an announcement posted on the Depleted UF_6 Management Information Network web site (http://web.ead.anl.gov/uranium), and by e-mail for those on the DUF_6 program distribution mailing list.

The three public scoping meetings were rescheduled and held in Piketon on November 28, in Oak Ridge on December 4, and in Paducah on December 6, 2001. Announcements of the rescheduled meetings were made on the web site, through a press release, by mailing a postcard directly to individuals on the program mailing list, by e-mail to individuals on the mailing list, and through public service radio advertisements. In addition, advertisements appeared in the local newspapers listed in Table 1.

Each public scoping meeting was presided over by an independent facilitator responsible for conducting the meetings. Background materials, including four fact sheets, the NOI, a video describing characteristics of DUF_6, and a laptop-based demonstration of the web site, were made available at the meetings (all materials distributed at the scoping meetings are available on the Web site at http://web.ead.anl.gov/uranium/eis/eisscoping/).

TABLE 1 Newspapers in Which Rescheduled Scoping Meetings Were Advertised

Meeting	Newspaper	Ad Run Dates
Piketon **Wednesday, November 28**	*Pike County News*	Sunday, Nov. 25 Wednesday, Nov. 28
	Portsmouth Daily Times	Sunday, Nov. 25 Tuesday, Nov. 27
	Chillicothe Gazette	Sunday, Nov. 25 Tuesday, Nov. 27
Oak Ridge **Tuesday, December 4**	*The Oak Ridger*	Friday, Nov. 30 Monday, Dec. 3
	Roane County News	Friday, Nov. 30 Monday, Dec. 3
	Knoxville News-Sentinel	Sunday, Dec. 2 Monday, Dec. 3
Paducah **Thursday, December 6**	*Paducah Sun*	Sunday, Dec. 2 Wednesday, Dec. 5

Each public scoping meeting consisted of an introduction by the facilitator and a 20-minute overview by the DOE DUF_6 Management Program manager, which described DOE's approach to meeting its obligations under NEPA. The presentation was followed by (1) a question and answer session in which the DOE manager responded to questions from the attendees and (2) a comment period where attendees were invited to formally make comments on the record. A court reporter recorded an official transcript of each meeting in its entirety. Transcripts, as well as the presentation slides, can be viewed on the web site at the address given above.

A total of approximately 100 individuals attended the three scoping meetings, and 20 individuals provided oral comments. Persons attending included representatives of federal officials, state regulators, local officials, site oversight committee members, representatives of interested companies, local media, and private individuals. In addition, about 20 individuals and organizations commented through the other means available (i.e., fax, telephone, mail, e-mail, and the web site). Some of the comments received through these means were duplicates of some of the comments made at the scoping meetings. During the scoping period (September 18–January 11), the Depleted UF_6 Management Information Network web site received significant use. A total of 64,366 pages viewed (an average of 554 per day) during 9,983 user sessions (an average of 85 per day) by 4,784 unique visitors.

2 SUMMARY OF SCOPING COMMENTS

Approximately 140 comments were received from about 30 individuals and organizations during the scoping period. The comments were evaluated and grouped into several general categories for this summary. The following sections summarize the substance of the comments received. The wording is intended to capture the substance of the comments, rather than reproduce the exact wording of individual comments. The order in which the issues are presented is not intended to reflect their relative importance. Because of the wide range of interests and opinions about the proposed DUF_6 conversion project, many of the comments in each category illustrate the varied, and perhaps contradictory, issues, concerns, and desired future conditions expressed by individuals, organizations, and public agencies.

2.1 POLICY COMMENTS AND ISSUES

2.1.1 Support for Project

Several commentors expressed general support for DOE's DUF_6 conversion project. Several noted that the project was the culmination of a long process involving DOE and state regulatory agencies, and many stated that the project should be done as quickly as possible. Several commentors noted that the removal of cylinders from ETTP is vital for site reindustrialization efforts.

2.1.2 Importance of Safety

Many commentors stressed that the project should be conducted in a safe and environmentally sound manner. One commentor expressed the opinion that too many past DOE decisions regarding the cylinders have been driven by cost and budget considerations, such as the use of thin-walled cylinders and stacking the cylinders two high, and that these decisions have caused enormous problems.

2.1.3 Impacts of Past Site Operations

Several commentors expressed concern and fear as residents living near the existing diffusion plant sites, citing health problems from past site operations. One individual stated that he feels hostage to the Paducah plant and that residents near the plant do not feel safe and secure. The commentor believed that an alternative should be provided so they do not have to live close to the plant. Another commentor stated that it should be recognized that health problems and contamination are present around the Paducah site.

2.1.4 Need for an EIS

One commentor stressed that the conversion project requires a detailed, site-specific study typical of an EIS, and not an environmental assessment.

2.1.5 NEPA Process

One commentor stated the belief that the NEPA process was being prejudiced by the contracting chronology, specifically stating that the contract award should be made only after the EIS is completed. Another commentor felt that DOE had already made decisions, and that input from the public should have been requested earlier in the process.

2.1.6 Use

One organization expressed its opposition to the use of depleted uranium in weaponry. Several commentors recommended banning the use of depleted uranium in commercial facilities, consumer products, and building and industrial production. In addition, they stated that all mining and processing of uranium should be stopped. The Kentucky Radiation Health and Toxic Agents Branch stated that release of any material from a conversion facility to the public domain must be evaluated by them and the public sector. One commentor noted that depleted uranium is a very important national energy resource and can be used in breeder reactors to provide 200 to 300 years of electrical energy, stressing that the United States needs to think of its energy policy not in the short term, but in terms of hundreds of years. The State of Tennessee Department of Environment and Conservation noted that consideration should be given to the possibility that conversion products should not be free-released because of radiological contamination.

2.1.7 USEC

One individual requested that DOE address the contracts entered into with USEC, whereby DOE continues to take possession of USEC-owned cylinders. The commentor claimed that DOE is using taxpayer dollars to subsidize USEC and that the money paid to DOE by USEC is pathetically low.

2.1.8 Portsmouth Cleanup

One commentor stated that DOE should clean up the Portsmouth site, put the plant in cold storage, restore the quality of air and water, end pollution at the source, and perform D&D of the site before building another facility.

2.1.9 Interaction with State Agencies

The Kentucky Radiation Health and Toxic Agents Branch stated that DOE has not interacted with the responsible radiation agency in Kentucky to provide sufficient information for assessment of the impacts of construction of a conversion facility on public health. In addition, they requested that DOE provide the Radiation Health and Toxic Agents Branch access to the facility to ensure protection of worker and public health. They also stated that handling and disposing of radioactive material and scrap metal must be properly addressed by DOE and evaluated by the Radiation Health and Toxic Agents Branch.

2.1.10 Self-Regulation

The Kentucky Radiation Health and Toxic Agents Branch stated that it is opposed to self-regulation of the facility by the DOE.

2.1.11 DUF_6 as Hazardous Waste

Representatives of the Kentucky Division of Waste Management stated that they believe DUF_6 is a hazardous waste because of its corrosivity and reactivity.

2.2 ALTERNATIVES

2.2.1 Support for DOE's Preferred Alternative

Several individuals and organizations expressed support for DOE's preferred alternative of building two conversion plants, one at Portsmouth and one at Paducah. Supportive organizations included the Ohio Environmental Protection Agency (OEPA), the Kentucky Division of Waste Management, McCracken County administrators, Paducah area business associations, labor representatives, and local Oak Ridge stakeholder groups. The OEPA expressed support for the shipment of cylinders from ETTP to the Portsmouth site, but only after construction of the conversion facility.

2.2.2 Opposition to Proposed Alternatives

One commentor opposed the consideration of a one conversion plant alternative in the EIS. The commentor stated that such an option is not consistent with the intent of Public Law 105-204 and is not a reasonable alternative because no funds have been provided for this option. Another commentor stated that it is a mistake to consider the use of existing U.S. conversion facilities because of transportation issues and potential local opposition.

2.2.3 Recommended Conversion Technologies

Commentors recommended two conversion technology options: (1) building a conversion plant in parallel with a new centrifuge enrichment plant, which would allow the depleted uranium to be used for reenrichment prior to conversion, and (2) not building a conversion plant but directly disposing of the DUF_6 in a vitreous melt within a disposal area (this recommendation was accompanied by a technical proposal). One commentor recommended a specific laser technology to monitor for and alarm against dangerous levels of hydrogen fluoride (HF).

2.2.4 Preferred Chemical Form of Uranium for Disposal

Several commentors expressed the opinion that U_3O_8 is the preferable and prudent chemical form of uranium for disposal based on stability and solubility. They noted that U_3O_8 is the most stable form of uranium and is found in nature. Also, foreign countries store this form of depleted uranium. Several commentors stated that disposal of DUF_4 will pose disposal problems and consideration of UF_4 is a mistake, identifying generation of HF, expansion of disposal containers, and U.S. Nuclear Regulatory Commission concerns as some potential problems. One commentor expressed opposition to converting to depleted uranium metal and provided qualified support for converting to UO_2.

2.2.5 Use of Hydrogen Fluoride

Several commentors stated that there is no credible market for aqueous HF and that anhydrous HF is clearly a better choice in terms of marketable fluoride products. It was stated that aqueous HF is a low value product that would be sold into a saturated market. These commentors strongly recommended the production of anhydrous HF and its subsequent use within the nuclear fuel cycle to avoid problems with the stigma from potential uranium contamination. One commentor noted that anhydrous HF production technology was previously demonstrated at a DOE pilot facility in 1998. One commentor stated that the specifications for allowable uranium in the HF produced must be made clear because HF will always contain some uranium. The commentor noted that the final use of the HF will affect the allowable uranium content and will need to be considered (the commentor stressed the possible accumulation of uranium if HF evaporation processes are used).

2.2.6 Disposition Options

One commentor stated that DUF_6 should be disposed of immediately as high-level waste due to the variety of unknown contaminants and decay products, and further, it should be disposed of in deep, dry areas. The commentor also noted that DOE should address disposal of all forms of converted depleted uranium. Another commentor stated a preference for a disposal process that binds the radionuclides, rendering them benign and immobile before final

disposition. One commentor stated that the depleted uranium should be assigned to safe storage facilities with constant monitoring.

2.3 CYLINDER INVENTORY COMMENTS AND ISSUES

2.3.1 ETTP Cylinder Inventory

A number of commentors stated that DOE needs to specifically state the number of UF_6 cylinders stored at the ETTP site, including test and in-line process cylinders that are not the typical 10- and 14-ton cylinders, and rectify inconsistencies between the number of full cylinders reported by DOE Headquarters personnel compared with that of Oak Ridge operations personnel. They claimed that DOE has continued to provide an inaccurate count of the cylinders at the ETTP site. In addition, several commentors stated that all cylinders should be removed from ETTP and that it would make sense to move them all to Portsmouth because handling would be similar. They recommended that the EIS consider removing all the ETTP cylinders.

2.3.2 Cylinder Condition, Surveillance, and Maintenance

Several commentors expressed their concern over the deteriorated condition of cylinders and continued inadequacies of current inspection programs and procedures. They claimed that DOE does not assure the public the cylinders currently stored will not breach due to external corrosion and that there is a high likelihood of future breaches. One commentor stated that a response team is needed at each site to manage potential breaches. One commentor stated that thousands of cylinders no longer have identification tags, which are necessary to determine the amount of DUF_6 in the cylinder, and that DOE must address that issue.

2.3.3 Transuranic Contamination

A number of commentors noted the presence of transuranic (TRU) contaminants in the DUF_6 cylinder inventory. It was stated that the EIS should specifically address the plutonium or TRU present in the stockpile and that DOE should make it a priority to assess the types and amounts of TRU contaminants in the inventory. One commentor stated that the affected environment section of the EIS should describe the contents of cylinders, including possible TRU and decay product elements, specifically americium-241, cadmium-109, cerium-141, curium-42, curium-244, neptunium-239, promethium-149, technetium, thorium-234, uranium-234, uranium-236, xenon-131m, and xenon-133m.

2.3.4 Disposition of Emptied Cylinders

Several commentors requested that DOE consider the possibility that the free release of emptied cylinders may not be an option because of residual contamination. One commentor expressed opposition to the idea of filling the emptied cylinders with conversion products or wastes for on-site storage or disposal.

2.4 TRANSPORTATION ISSUES

2.4.1 Importance of Transportation Safety

A number of commentors stressed the importance of transportation safety, noting that it will be challenging and expensive. One commentor suggested that traveling Hazmat teams should accompany each shipment. The Kentucky Radiation Health and Toxic Agents Branch expressed serious concerns regarding the transport of DUF_6 cylinders from Oak Ridge to Portsmouth, stating that without the proper risk assessments, evaluation of accident scenarios, and other DOE actions, they cannot support the movement of cylinders and are opposed to DOE obtaining any exemption from the U.S. Department of Transportation for the shipment of cylinders. One individual opposed shipping ETTP cylinders to Portsmouth and Paducah and sending conversion products to western sites, stating that the sites should deal with their own wastes.

2.4.2 Shipment Options

One organization stated that if DUF_6 is to be transported via truck, routes should be designated and appropriate risk analysis performed, taking into consideration road conditions. One commentor noted that rail transportation and the minimization of trans-loading can reduce project risks and improve safety. Two commentors stressed that the 11-mile ETTP rail right-of-way is in bad shape, and DOE should consider providing funding for and upgrading of the rail line. One organization stated that the EIS must include a comprehensive analysis of shipments by barge, including assessment of the condition of the barge terminal at ETTP, necessary upgrades, and the impact of possible dredging.

2.4.3 Schedule

With respect to the removal of ETTP cylinders, several commentors stated that the proposed time schedule should be adhered to or bettered. Commentors stated that the current time line is too long, and consideration should be given in the EIS to the removal of ETTP cylinders sooner than 2009.

2.5 SCOPE OF ENVIRONMENTAL IMPACT ANALYSIS

2.5.1 Human Health and Safety

One commenter stated that the EIS must consider the health and safety of construction and demolition workers if the Portsmouth GDP is demolished to build the conversion plant. The Kentucky Radiation Health and Toxic Agents Branch requested that DOE develop monitoring systems that ensure compliance with as low as reasonably achievable requirements. Another commentor requested that the assessment consider all site releases, not just separate sources. Several commentors requested that all actions and exposure pathways that are likely to affect the health and safety of the workers and the general public be considered. The activities mentioned included storage and movement of cylinders, washing of emptied cylinders, and conversion operations.

2.5.2 Air, Water, and Ecological Impacts

Several commentors stated that the EIS should consider off-site contamination of air, water, and soil, and effects from past practices, in particular, HF gas being transported off site. Similarly, water quality analyses should include effects on streams, the watershed, river basin, aquifers, and resident wildlife (in particular, deformed fish and mammals in the vicinity of the site). One commentor was concerned that different pollutants are bioaccumulating in the environment around the Paducah plant and that the long-term impacts are not well understood.

2.5.3 Cumulative Impacts

Commentors requested that the cumulative impact assessment consider the risk of handling old containers and the buildup of contaminants in infrastructures with repeated exposures and breaches; delayed effects of radiation exposures; long-term health monitoring; inventory of plants and wildlife to monitor migration of DNA defects up the food chain; additive effects of multiple contaminants in the environment; indirect and secondary effects; and other activities ongoing at the sites (including non-federal activities). One commentor noted that data already being used by the health care and insurance industries (i.e., mortality and morbidity rates in the communities and areas surrounding these sites) can more accurately predict exposures and resulting illnesses and should be collected and made available for public and independent analysis. According to the commentor, these data can prove a link between people's illnesses and the DOE site. One commentor specifically requested that the effects of uranium-235 be included under the cumulative impacts.

2.5.4 Environmental Justice

One commentor stated that the EIS should consider the cost of retraining workers and noted that pollution-based jobs are offered in areas where workers are "depressed for work." The commentor expressed environmental justice concerns.

2.5.5 Socioeconomics

One commentor requested that extensive socioeconomic analysis be included in the EIS, specifically the economic impact of the facility on the region, including conducting a health inventory of current and past workers and civilians within a 36-mile radius of the Portsmouth and Paducah sites to determine the costs to the community when workers become too ill to work or are laid off; the number of jobs from construction and operation of the conversion facility compared with the number of jobs that can be provided with the reclamation and restoration of the environment and final cleanup during shutdown, D&D, and cold storage; an analysis of the cost to handle, transport, and dispose of depleted uranium that is contaminated; the cost to build, maintain, and operate the conversion facility; and the long-term economic impacts on the community, for example, the loss of other industries because of decreases in land values, contaminated air and water, etc. One commentor requested that the social and psychological effects on the community and the effects on property values in the vicinity of the Paducah site be considered.

2.5.6 Accident Analysis

One commentor stated that the EIS must adequately address the risk from earthquakes at the Paducah site and from large plane crashes into the cylinder yards at all sites, noting that such risks had been inadequately addressed in previous evaluations, including the programmatic environmental impact statement (PEIS). The commentor expressed concern over HF released in an accident and the difficulty site personnel would have in responding to such an accident, noting the proximity of the Barkley Airport to the Paducah site and the crash of a B-1 bomber near the Paducah site during the PEIS public hearings. The commentor requested that serious analysis be conducted to develop approaches to mitigate such events, such as considering building additional yards and stacking cylinders one high to allow better access in the event of an accident. The State of Tennessee Department of Environment and Conservation also requested that the chance of a catastrophic event, such as a plane crash into a cylinder yard, be explored and the possibility of a deliberate act be considered.

2.5.7 Disposal Analysis

One commentor stated that the methods of disposal of this material should be considered for their long- and short-term risks. Another stated that the EIS must address what to do with any metal conversion product if the DUF_6 were converted to metal.

2.5.8 Use Analysis

One commentor stated that if any future production takes place at the Paducah site using the DUF_6 conversion products, it should be included in the EIS; specifically, the EIS should consider any products produced, the actual production techniques, and associated waste production. One commentor requested that DOE evaluate the impacts associated with the use of conversion products. Another commentor stated that making products from converted materials should be considered outside the scope of the EIS and also be considered in other documents when actual conversion products are known.

2.5.9 Life-Cycle Impacts

A number of commentors recommended that the EIS consider the full life cycle of the material, including conversion, packaging, transportation, disposal, and D&D of the facilities. Several commentors stated that the EIS must consider what to do with the empty cylinders. One commentor stated that the maintenance and D&D evaluation should consider the possibility that it may not be possible to ship the conversion products off site immediately.

2.5.10 Waste Management

One commentor requested that the EIS address the disposition of wastes generated from the conversion process. Another commentor stated that the Paducah GDP waste treatment plant may not be adequate to meet the needs of the conversion facility and other facilities at the site.

2.5.11 Cultural Resources

One commentor requested that DOE evaluate the corrosive effects of fluorine compounds released to the environment from the conversion plant at Paducah GDP on buildings and art work in Paducah and other towns in western Kentucky and southern Illinois.

ATTACHMENT A:

NOTICE OF INTENT TO PREPARE AN ENVIRONMENTAL IMPACT STATEMENT FOR DEPLETED URANIUM HEXAFLUORIDE CONVERSION FACILITIES

AGENCY: Department of Energy.

ACTION: Notice of Intent.

SUMMARY: The U.S. Department of Energy (DOE) announces its intention to prepare an Environmental Impact Statement (EIS) for a proposal to construct, operate, maintain, and decontaminate and decommission two depleted uranium hexafluoride (DUF_6) conversion facilities, at Portsmouth, Ohio, and Paducah, Kentucky. DOE would use the proposed facilities to convert its inventory of DUF_6 to a more stable chemical form suitable for storage, beneficial use, or disposal. Approximately 700,000 metric tons of DUF_6 in about 57,700 cylinders are stored at Portsmouth and Paducah, and at an Oak Ridge, Tennessee site. The EIS will address potential environmental impacts of the construction, operation, maintenance, and decontamination and decommissioning of the conversion facilities. DOE will hold public scoping meetings near the three involved sites.

DATES: DOE invites public comments on the proposed scope of the DUF_6 conversion facilities EIS. To ensure consideration, comments must be postmarked by November 26, 2001. Late comments will be considered to the extent practicable. Three public scoping meetings will be held near Portsmouth, Ohio; Paducah, Kentucky; and Oak Ridge, Tennessee. The scoping meetings will provide the public with an opportunity to present comments on the scope of the EIS, and to ask questions and discuss concerns with DOE officials regarding the EIS. The location, date, and time for these public scoping meetings are as follows:

Portsmouth, Ohio: Thursday, November 1, 2001, from 6-9 p.m. at the Vern Riffe Pike County Vocational School, 175 Beaver Creek Road - off State Route 32, Piketon, Ohio 45661.

Paducah, Kentucky: Tuesday, November 6, 2001, from 6-9 p.m. at the Information Age Park Resource Center, 2000 McCracken Blvd., Paducah, Kentucky 42001.

Oak Ridge, Tennessee: Thursday, November 8, 2001, from 6-9 p.m. at the Pollard Auditorium, Oak Ridge Institute for Science and Education, 210 Badger Avenue, Oak Ridge, Tennessee 37831.

ADDRESSES: Please direct comments or suggestions on the scope of the EIS and questions concerning the proposed project to: Kevin Shaw, U.S. Department of Energy, Office of Environmental Management, Office of Site Closure - Oak Ridge Office (EM–32), 19901 Germantown Road, Germantown, Maryland 20874, fax (301) 903–3479, e-mail DUF6.Comments@em.doe.gov (please use 'NOI Comments' for the subject).

FOR FURTHER INFORMATION CONTACT: For information regarding the proposed project, contact Kevin Shaw, as above. For general information on the DOE NEPA process, please contact Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (EH-42), U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585-0119, telephone (202) 586-4600 or leave a message at (800) 472-2756.

SUPPLEMENTARY INFORMATION:

Background

Depleted UF_6 results from the process of making uranium suitable for use as fuel in nuclear reactors or for military applications. The use of uranium in these applications requires increasing the proportion of the uranium-235 isotope found in natural uranium, which is approximately 0.7 percent (by weight), through an isotopic separation process. A U–235 "enrichment" process called gaseous diffusion has historically been used in the United States. The gaseous diffusion process uses uranium in the form of UF_6, primarily because UF_6 can conveniently be used in the gas form for processing, in the liquid form for filling or emptying containers, and in the solid form for storage. Solid UF_6 is a white, dense, crystalline material that resembles rock salt.

Over the last five decades, large quantities of uranium were enriched using gaseous diffusion. "Depleted" UF_6 (DUF_6) is a product of the process and was stored at the three uranium enrichment sites located at Paducah, Kentucky; Portsmouth, Ohio; and the East Tennessee Technology Park (ETTP - formerly known as the K-25 Site) in Oak Ridge, Tennessee. Depleted uranium is uranium that, through the enrichment process, has been stripped of a portion of the uranium-235 that it once contained so that it has a lower uranium-235 proportion than the 0.7 weight-percent found in nature. The uranium in most of DOE's DUF_6 has between 0.2 to 0.4 weight-percent uranium-235.

DOE has management responsibility for approximately 700,000 metric tons (MT) of DUF_6 contained in about

57,700 steel cylinders at the Portsmouth, Paducah, and ETTP sites, where it has stored such material since the 1950s. The characteristics of UF_6 pose potential health and environmental risks. DUF_6 in cylinders emits low levels of gamma and neutron radiation. Also, when released to the atmosphere, DUF_6 reacts with water vapor in the air to form hydrogen fluoride (HF) and uranyl fluoride (UO_2F_2), both chemically toxic substances. In light of such characteristics, DOE stores DUF_6 in a manner designed to minimize the risk to workers, the public, and the environment.

In October 1992, the Ohio Environmental Protection Agency (OEPA) issued a Notice of Violation (NOV) alleging that DUF_6 stored at the Portsmouth facility is subject to regulation under State hazardous waste laws applicable to the Portsmouth Gaseous Diffusion Plant. The NOV stated that OEPA had determined DUF_6 to be a solid waste and that DOE had violated Ohio laws and regulations by not evaluating whether such waste was hazardous. DOE disagreed with this assessment, and, in February 1998, DOE and OEPA reached an agreement. This agreement sets aside the issue of whether the DUF_6 is subject to Resource Conservation and Recovery Act regulation and institutes a negotiated management plan governing the storage of the Portsmouth DUF_6. The agreement also requires DOE to continue its efforts to evaluate potential use or reuse of the material. The agreement expires in 2008.

In 1994, DOE began work on the Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride (DUF_6 PEIS). The DUF_6 PEIS was completed in 1999 and identified conversion of DUF_6 to another chemical form for use or long-term storage as part of a preferred management alternative. In the corresponding Record of Decision for the Long-Term Management and Use of Depleted Uranium Hexafluoride (ROD) (64 FR 43358, August 10, 1999), DOE decided to promptly convert the DUF_6 inventory to depleted uranium oxide, depleted uranium metal, or a combination of both. The ROD further explained that depleted uranium oxide will be used as much as possible, and the remaining depleted uranium oxide will be stored for potential future uses or disposal, as necessary. In addition, according to the ROD, conversion to depleted uranium metal will occur only if uses are available.

During the time that DOE was analyzing its long-term strategy for managing the DUF_6 inventory, several other events occurred related to DUF_6 management. In 1995, the Department began an aggressive program to better manage the DUF_6 cylinders, known as the DUF_6 Cylinder Project Management Plan. In part, this program responded to the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 95–1, Safety of Cylinders Containing Depleted Uranium. This program included more rigorous and frequent inspections, a multi-year program for painting and refurbishing of cylinders, and construction of concrete-pad cylinder yards. Implementation of the DUF_6 Cylinder Project Management Plan has been successful, and, as a result, on December 16, 1999, the DNFSB closed out Recommendation 95-1.

In February 1999, DOE and the Tennessee Department of Environment and Conservation entered into a consent order which included a requirement for the performance of two environmentally beneficial projects: the implementation of a negotiated management plan governing the storage of the small inventory (relative to other sites) of all UF_6 (depleted, low enriched, and natural) cylinders stored at the ETTP site, and the removal of the DUF_6 from the ETTP site or the conversion of the material by December 31, 2009.

In July 1998, the President signed Public Law (P.L.) 105–204. This law directed the Secretary of Energy to prepare "a plan to ensure that all amounts accrued on the books" of the United States Enrichment Corporation (USEC) for the disposition of DUF_6 would be used to commence construction of, not later than January 31, 2004, and to operate, an on-site facility at each of the gaseous diffusion plants at Paducah and Portsmouth, to treat and recycle DUF_6 consistent with the National Environmental Policy Act (NEPA). DOE responded to P.L. 105–204 by issuing the Final Plan for the Conversion of Depleted Uranium Hexafluoride (referred to herein as the "Conversion Plan") in July 1999. The Conversion Plan describes DOE's intent to chemically process the DUF_6 to create products that would present both a lower long-term storage hazard and provide a material that would be suitable for use or disposal.

DOE initiated the Conversion Plan with the announced availability of a draft Request for Proposals (RFP) on July 30, 1999, for a contractor to design, construct, and operate DUF_6 conversion facilities at the

Paducah and Portsmouth uranium enrichment plant sites. Based on comments received on the draft RFP, DOE revisited some of the assumptions about management of the DUF_6 inventory made previously in the PEIS and ROD. For example, as documented in the Oak Ridge National Laboratory study, Assessment of Preferred Depleted Uranium Disposal Forms (ORNL/TM– 2000/161, June 2000), four potential conversion forms (triuranium octoxide (U_30_8), uranium dioxide ($U0_2$), uranium tetrafluoride (UF_4), and uranium metal) were evaluated and found to be acceptable for near-surface disposal at low-level radioactive waste disposal sites such as those at DOE's Nevada Test Site and Envirocare of Utah, Inc. Therefore, the RFP was modified to allow for a wide range of potential conversion product forms and process technologies. However, any of the proposed conversion forms must have an assured environmentally acceptable path for final disposition.

On October 31, 2000, DOE issued a final RFP to procure a contractor to design, construct, and operate DUF_6 conversion facilities at the Paducah and Portsmouth plant sites. Any conversion plants that result from this procurement would convert the DUF_6 to a more stable chemical form that is suitable for either beneficial use or disposal. The selected contractor would design the conversion plants using the technology it proposes and construct the plants. The selected contractor also would operate the plants for a five-year period, which would include maintaining depleted uranium and product inventories, transporting all uranium hexafluoride storage cylinders in Tennessee to a conversion plant at Portsmouth, as appropriate, and transporting converted product for which there is no use to a disposal site. The selected contractor would also prepare excess material for disposal at an appropriate site.

DOE received five proposals in response to the DUF_6 conversion RFP, and DOE anticipates that a contract will be awarded during the first quarter of fiscal year 2002. Since the site-specific NEPA process will not be completed prior to contract award, the contract shall be contingent on completion of the NEPA process and will be structured such that the NEPA process will be completed in advance of a go/no-go decision. (See NEPA Process below.) DOE initiated the NEPA review by issuing an Advance Notice of Intent to prepare an EIS for the DUF_6 conversion facilities on May 7, 2001 (66 FR 23010).

Purpose and Need for Agency Action

DOE needs to convert its inventory of DUF_6 to a more stable chemical form for storage, use, or disposal. This need follows directly from the decision presented in the August 1999 "Record of Decision for Long-Term Management and Use of Depleted Uranium Hexafluoride," namely to begin conversion of the DUF_6 inventory as soon as possible.

This EIS will assess the potential environmental impacts of constructing, operating, maintaining, and decontaminating and decommissioning DUF_6 conversion facilities at the Portsmouth and Paducah sites, as well as other reasonable alternatives. The EIS will aid decision making on DUF_6 conversion by evaluating the environmental impacts of the range of reasonable alternatives, as well as providing a means for public input into the decision making process. DOE is committed to ensuring that the public has ample opportunity to participate in this review.

Relation to the DUF_6 PEIS

This EIS represents the second level of a tiered environmental review process being used to evaluate and implement the DUF_6 management program. Tiering refers to the process of first addressing general (programmatic) matters in a PEIS followed by more narrowly focused (project level) environmental review that incorporates by reference the more general discussions. The DUF_6 PEIS, issued in April 1999, was the first level of this tiered approach.

The DUF_6 PEIS addressed the potential environmental impacts of broad strategy alternatives, including analyses of the impacts of: (1) continued storage of DUF_6 at DOE's current storage sites; (2) technologies for converting the DUF_6 to depleted U_3O_8, UO_2, or uranium metal; (3) long-term storage of depleted U_3O_8 and UO_2 for subsequent use or disposal; (4) long-term storage of DUF_6 in cylinders at a consolidated site; (5) use of depleted UO_2 and uranium metal conversion products; (6) transportation of materials; and (7) disposal of depleted U_3O_8 and UO_2 at generic disposal sites. The results of the PEIS analysis, as well as supporting documentation, will be incorporated into this EIS to the extent appropriate.

The ROD for the DUF_6 PEIS declared DOE's decision to promptly convert the DUF_6 inventory to a more stable

chemical form. This tiered EIS will address specific issues associated with the implementation of the DUF_6 PEIS ROD.

Preliminary Alternatives

Consistent with NEPA implementation requirements, this EIS will assess the range of reasonable alternatives regarding constructing, operating, maintaining, and decontaminating and decommissioning DUF_6 conversion facilities. The following preliminary list of alternatives is subject to modification in response to comments received during the public scoping process.

Preferred Alternative. Under the preferred alternative, two conversion facilities would be built: one at the Paducah Gaseous Diffusion Plant site and another at the Portsmouth Gaseous Diffusion Plant site. The cylinders currently stored at the ETTP site near Oak Ridge, Tennessee, would be transported to Portsmouth for conversion. The conversion products (i.e., depleted uranium as well as fluorine components produced during the conversion process) would be stored, put to beneficial uses, or disposed of at an appropriate disposal facility. This alternative is consistent with the Conversion Plan, which DOE submitted to Congress in July 1999, in response to Public Law 105–204. Subalternatives to be considered for the preferred alternative include:

- Conversion technology processes identified in response to the final RFP for DUF_6 conversion services, plus any other technologies that DOE believes must be considered.
- Local siting alternatives for building and operating conversion facilities within the Paducah and Portsmouth plant boundaries.
- Timing options, such as staggering the start of the construction and operation of the two conversion facilities.

One Conversion Plant Alternative. An alternative of building and operating only one conversion facility at either the Portsmouth or the Paducah site will be considered. This plant could differ in size or production capacity from the two proposed for Portsmouth and Paducah. Technology and local siting subalternatives will be considered as with the preferred alternative.

Use of Existing UF_6 Conversion Capacity Alternative. DOE will consider using already-existing UF_6 conversion capacity at commercial nuclear fuel fabrication facilities in lieu of constructing one or two new conversion plants. DOE is evaluating the feasibility of using existing conversion capacity, although no expression of interest has been received from such facilities.

No Action Alternative. Under the "no action" alternative, cylinder management activities (handling, inspection, monitoring, and maintenance) would continue the "status quo" at the three current storage sites indefinitely, consistent with the DUF_6 Cylinder Project Management Plan and the consent orders, which include actions needed to meet safety and environmental requirements.

Where applicable under the alternatives listed above, transportation options, such as truck, rail, and barge, will be considered for shipping DUF_6 cylinders to a conversion facility and conversion products to a storage or disposal facility. Also, for each technology alternative, alternatives for conversion products, including storage, use, and disposal at one or more disposal sites, will be considered. Further, DOE would appreciate comments regarding whether there are additional siting alternatives for one or more new conversion facilities that should be considered.

Identification of Environmental and Other Issues

DOE intends to address the following environmental issues when assessing the potential environmental impacts of the alternatives in this EIS. Additional issues may be identified as a result of the scoping process. DOE invites comment from the Federal agencies, Native American tribes, state and local governments, and the general public on these and any other issues that should be considered in the EIS:

- Potential impacts on health from DUF_6 conversion activities, including potential impacts to workers and the public from exposure to radiation and chemicals during routine and accident conditions for the construction, operation, maintenance, and decontamination and decommissioning of DUF_6 conversion facilities.
- Potential impacts to workers and the public from exposure to radiation and chemicals during routine and accident conditions for the transportation of DUF_6

cylinders from ETTP to one of the conversion sites.

- Potential impacts to workers and the public from exposure to radiation and chemicals during routine and accident conditions for the transportation of conversion products that are not beneficially used to a low-level waste disposal facility.
- Potential impacts to surface water, ground water, and soil during construction activities and from emissions and water use during facility operations.
- Potential impacts on air quality from emissions and from noise during facility construction and operations.
- Potential cumulative impacts of the past, present, and reasonably foreseeable future actions (including impacts resulting from activities of the United States Enrichment Corporation).
- Potential impacts from facility construction on historically significant properties, if present, and on access to traditional use areas.
- Potential impacts from land requirements, potential incompatibilities, and disturbances.
- Potential impacts on local, regional, or national resources from materials and utilities required for construction and operation.
- Potential impacts on ecological resources, including threatened and endangered species, floodplains, and wetlands.
- Potential impacts on local and DOE-wide waste management capabilities.
- Potential impacts on local employment, income, population, housing, and public services from facility construction and operations, and environmental justice issues.
- Pollution prevention, waste minimization, and energy and water use reduction technologies to reduce the use of energy, water, and hazardous substances and to mitigate environmental impacts.

DOE received comments on the Advance Notice of Intent from the Tennessee Department of Environment and Conservation (TDEC) and the Ohio Environmental Protection Agency (OHEPA). TDEC commented that the EIS should provide an adequate platform for coordination of environmental issues between DOE, Ohio, Kentucky, and Tennessee, without additional agreements if certain specified topics were explored in detail in the EIS. TDEC's comments emphasized issues related to the transportation of the ETTP cylinders to Portsmouth. OHEPA's comment concurred in TDEC's comment that the EIS should coordinate environmental issues between DOE, Ohio, Kentucky, and Tennessee, especially emergency management issues associated with the transportation of the ETTP cylinders to Portsmouth.

NEPA Process

The EIS for the proposed project will be prepared pursuant to the NEPA of 1969 (42 U.S.C. 4321 et seq.), Council on Environmental Quality NEPA Regulations (40 CFR Parts 1500—1508), and DOE's NEPA Implementing Procedures (10 CFR Part 1021). Following the publication of this Notice of Intent, DOE will hold scoping meetings, prepare and distribute the draft EIS for public review, hold public hearings to solicit public comment on the draft EIS, and publish a final EIS. Not less than 30 days after the publication of the U.S. Environmental Protection Agency's Notice of Availability of the final EIS, DOE may issue a ROD documenting its decision concerning the proposed action.

In addition to the above steps, DOE is considering environmental factors in selecting a contractor for the conversion services through the procurement process, including preparation of an environmental critique and an environmental synopsis pursuant to 10 CFR 1021.216. The environmental critique evaluates the environmental data and information submitted by each offeror and is subject to the confidentiality requirements of the procurement process. DOE also is preparing a publicly available environmental synopsis, based on the environmental critique, to document the consideration given to environmental factors in the contractor selection process. The environmental synopsis will be filed with the U.S. Environmental Protection Agency and will be incorporated into the EIS. In accordance with 10 CFR 1021.216(i), since the NEPA process will not be completed prior to contract award, the contract will be

structured to allow the NEPA review process to be completed in advance of a go/no-go decision.

Related NEPA Reviews

Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride (DOE/EIS–0269, April 1999);

Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (DOE/EIS–0200– F, May 1997);

Disposition of Surplus Highly Enriched Uranium, Final Environmental Impact Statement (DOE/ EIS–0240, June 1996);

Environmental Assessment for the Refurbishment of Uranium Hexafluoride Cylinder Storage Yards C–745–K, L, M, N, and P and Construction of a New Uranium Hexafluoride Cylinder Storage Yard (C– 745–T) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/EA–1118, July 1996);

Environmental Assessment for DOE Sale of Surplus Natural and Low Enriched Uranium (DOE/EA–1172, October 1996); Environmental Assessment for the Lease of Land and Facilities within the East Tennessee Technology Park, Oak Ridge, Tennessee (DOE/EA–1175, 1997);

Notice of Intent for Programmatic Environmental Impact Statement for Disposition of Scrap Metals (DOE/EIS-0327) (66 FR 36562, July 12, 2001).

Scoping Meetings

The purpose of this Notice is to encourage early public involvement in the EIS process and to solicit public comments on the proposed scope of the EIS, including the issues and alternatives it would analyze. DOE will hold public scoping meetings near Portsmouth, Ohio; Paducah, Kentucky; and Oak Ridge, Tennessee, to solicit both oral and written comments from interested parties. Oral and written comments will be considered equally in the preparation of the EIS. See "DATES" above for the times and locations of these meetings.

DOE will designate a presiding officer for the scoping meetings. The scoping meetings will not be conducted as evidentiary hearings, and there will be no questioning of the commentors. However, DOE personnel may ask for clarifications to ensure that they fully understand the comments and suggestions. The presiding officer will establish the order of speakers. At the opening of each meeting, the presiding officer will announce any additional procedures necessary for the conduct of the meetings. If necessary to ensure that all persons wishing to make a presentation are given the opportunity, a time limit may be applied for each speaker. Comment cards will also be available for those who would prefer to submit written comments.

DOE will make transcripts of the scoping meetings and other environmental and project-related materials available for public review in the following reading rooms:
DOE Headquarters, Freedom of Information Reading Room, 1000 Independence Avenue, SW, Room 1 E-190, Washington, DC 20585. Telephone: (202) 586-3142.

Oak Ridge/ DOE, Public Reading Room, 230 Warehouse Road, Suite 300, Oak Ridge, Tennessee 37831. Telephone: (865) 241-4780.

Paducah/DOE, Environmental Information Center, Berkley Centre, 115 Memorial Drive, Paducah, Kentucky 42001, Telephone: (270) 554-6979.

Portsmouth/DOE, Environmental Information Center, 3930 U.S. Route 23, Perimeter Road, Piketon, OH 45661. Telephone: (740) 289-3317.

Information is also available through the project web site at http://web.ead.anl.gov/uranium and on the DOE NEPA web site at http://www.tis.eh.doe.gov/ nepa.

The EIS will also contain a section summarizing the nature of the comments received during the scoping process and describing any modification to the scope of the EIS in response to the scoping process comments.

EIS Schedule

The draft EIS is scheduled to be published by June 2002. A 45-day comment period on the draft EIS is planned, which will include public hearings to receive oral comments. Availability of the draft EIS, the dates of the public comment period, and information about the public hearings will be announced in the Federal Register and in the local news media.

The final EIS for the DUF_6 Conversion Facilities is scheduled for January 2003. A ROD would be issued no sooner than 30 days after the U. S. Environmental Protection Agency notice of availability of the final EIS is published in the Federal Register.

Signed in Washington, DC, this 10th day of September, 2001.

Steven V. Cary
Acting Assistant Secretary
Office of Environment, Safety and Health

NOTICE OF CHANGE IN NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE APPROACH FOR THE DEPLETED URANIUM HEXAFLUORIDE (DUF_6) CONVERSION FACILITIES PROJECT

"Browse Pending Collections" link and by clicking on link number 2270. When you access the information collection, click on "Download Attachments" to view. Written requests for information should be addressed to Vivian Reese, Department of Education, 400 Maryland Avenue, SW., Room 4050, Regional Office Building 3, Washington, DC 20202–4651 or to the e-mail address *vivan.reese@ed.gov*. Requests may also be electronically mailed to the internet address *OCIO_RIMG@ed.gov* or faxed to 202–708–9346. Please specify the complete title of the information collection when making your request.

Comments regarding burden and/or the collection activity requirements should be directed to Joseph Schubart at (202) 708–9266 or to his e-mail address *Joe.Schubart@ed.gov*. Individuals who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339.

[FR Doc. 03–10325 Filed 4–25–03; 8:45 am]

BILLING CODE 4000–01–P

DEPARTMENT OF ENERGY

Notice of Change in National Environmental Policy Act (NEPA) Compliance Approach for the Depleted Uranium Hexafluoride (DUF6) Conversion Facilities Project

AGENCY: Department of Energy.

ACTION: Notice of revised approach.

SUMMARY: On September 18, 2001, the U.S. Department of Energy (DOE) published a Notice of Intent (NOI) in the **Federal Register**, announcing its intention to prepare an Environmental Impact Statement (EIS) for a proposed action to construct, operate, maintain, and decontaminate and decommission two depleted uranium hexafluoride (DUF6) conversion facilities at Portsmouth, Ohio, and Paducah, Kentucky. DOE held three scoping meetings to provide the public with an opportunity to present comments on the scope of the EIS, and to ask questions and discuss concerns with DOE officials regarding the EIS. The scoping meetings were held in Piketon, Ohio on November 28, 2001; in Oak Ridge, Tennessee on December 4, 2001, and in Paducah, Kentucky, on December 6, 2001. The purpose of this Notice is to inform the public of the change in the approach for the NEPA review for the DUF6 conversion projects for Paducah and Portsmouth, and to invite public comments on the revised approach.

DATES: Comments received by May 30, 2003, will be considered in the preparation of the draft EISs. Comments received after that date will be considered to the extent practicable.

ADDRESSES: Comments and suggestions can be forwarded to Gary Hartman, U.S. Department of Energy—Oak Ridge Operations Office, Oak Ridge, Tennessee 37831, telephone (865) 576–0273, fax: (865) 576–0746, e-mail: *hartmangs@oro.doe.gov*. Also contact Mr. Hartman with any questions regarding the DOE DUF6 conversion project.

FOR FURTHER INFORMATION CONTACT: For general information on the DOE NEPA process, contact Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (EH–42), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585–0119, telephone (202) 586–4600 or leave a message at (800) 472–2756.

SUPPLEMENTARY INFORMATION: On September 18, 2001, the U.S. Department of Energy (DOE) published a Notice of Intent (NOI) in the **Federal Register** (66 FR 48123), announcing its intention to prepare an Environmental Impact Statement (EIS) for a proposed action to construct, operate, maintain, and decontaminate and decommission two depleted uranium hexafluoride (DUF6) conversion facilities at Portsmouth, Ohio, and Paducah, Kentucky. DOE held three scoping meetings to provide the public with an opportunity to present comments on the scope of the EIS, and to ask questions and discuss concerns with DOE officials regarding the EIS. The scoping meetings were held in Piketon, Ohio on November 28, 2001; in Oak Ridge, Tennessee on December 4, 2001, and in Paducah, Kentucky, on December 6, 2001. The alternatives identified in the NOI included a two-plant alternative (two conversion plants would be built, one at the Paducah Gaseous Diffusion Plant site and another at the Portsmouth Gaseous Diffusion Plant site), a one-plant alternative (only one plant would be built either at the Paducah or the Portsmouth site), a use of existing UF6 conversion capacity alternative (DOE would consider using already-existing UF6 conversion capacity at commercial nuclear fuel fabrication facilities in lieu of constructing one or two new plants), and the no action alternative. For alternatives that involved constructing one or two new plants, DOE planned to consider alternative conversion technologies, local siting alternatives within the Paducah and Portsmouth plant boundaries, and the shipment of DUF6 cylinders stored at the East Tennessee Technology Park (ETTP) near Oak Ridge, Tennessee, to either the Portsmouth or Paducah sites. The technologies to be considered in the EIS were those submitted in response to a Request for Proposals (RFP) for conversion services that DOE had issued in October 2000, plus any other technologies that DOE believed must be considered.

Then, on August 2, 2002, the U.S. Congress passed the *2002 Supplemental Appropriations Act for Further Recovery From and Response to Terrorist Attacks on the United States* (Public Law 107–206). In pertinent part, this law required that, within 30 days of enactment, DOE award a contract for the scope of work described in the October 2000 RFP, including design, construction, and operation of a DUF6 conversion plant at each of the Department's Paducah, Kentucky and Portsmouth, Ohio sites. Accordingly, the DOE awarded a contract to Uranium Disposition Services, LLC, on August 29, 2002.

In light of Public Law 107–206, and DOE's award of the contract to Uranium Disposition Services, DOE reevaluated the appropriate scope of its NEPA review and decided to prepare two separate EIS's, one for the plant proposed for the Paducah site and a second for the Portsmouth site. The proposed alternatives to be considered in each EIS would focus primarily on where the conversion facilities will be sited at the respective sites, and a no action alternative. DOE will also consider impacts arising from shipment of ETTP cylinders for conversion to each site.

Schedule

Both draft EISs are scheduled to be published in July 2003. A 45-day comment period on the draft EISs is planned, which will include public hearings to receive comments. Availability of the draft EISs, the dates of the public comment period, and information about the public hearings will be announced in the **Federal Register** and in the local news media.

The final EISs are scheduled for publication in January 2004. The Records of Decision would be issued no sooner than 30 days after the U.S. Environmental Protection Agency notices of availability of the final EISs are published in the **Federal Register**. As directed by Pub. L. 107–206, construction of the DUF6 conversion facilities is scheduled to begin not later than July 31, 2004.

The purpose of this Notice is to inform the public of the change in the approach for the NEPA review for the DUF6 conversion projects for Paducah

and Portsmouth, and to invite public comments on the revised approach.

David R. Allen,

NEPA Compliance Officer, Oak Ridge Operations Office.

[FR Doc. 03–10373 Filed 4–25–03; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

Environmental Management Site-Specific Advisory Board, Paducah

AGENCY: Department of Energy (DOE).

ACTION: Notice of open meeting.

SUMMARY: This notice announces a meeting of the Environmental Management Site-Specific Advisory Board (EM SSAB), Paducah. The Federal Advisory Committee Act (Pub. L. 92–463, 86 Stat. 770) requires that public notice of these meetings be announced in the **Federal Register**.

DATES: Thursday, May 15, 2003, 5:30 p.m.–9 p.m.

ADDRESSES: 111 Memorial Drive, Barkley Centre, Paducah, Kentucky.

FOR FURTHER INFORMATION CONTACT: W. Don Seaborg, Deputy Designated Federal Officer, Department of Energy Paducah Site Office, Post Office Box 1410, MS–103, Paducah, Kentucky 42001, (270) 441–6806.

SUPPLEMENTARY INFORMATION:

Purpose of the Board: The purpose of the Board is to make recommendations to DOE and its regulators in the areas of environmental restoration and waste management activities.

Tentative Agenda

5:30 p.m. Informal Discussion
6:00 p.m. Call to Order; Introductions; Approve April Minutes; Review Agenda
6:10 p.m. DDFO's Comments
- Budget Update
- ES & H Issues
- EM Project Updates
- CAB Recommendation Status
- Other

6:30 p.m. Federal Coordinator Comments
6:40 p.m. Ex-officio Comments
6:50 p.m. Public Comments and Questions
7:00 p.m. Review of Action Items
7:15 p.m. Break
7:25 p.m. Presentation
- Fiscal Year (FY) 2004 Budget—Judy Penry (Oak Ridge Chief Financial Officer [CFO])
- Waste Disposition Environmental Assessment (EA) Addendum

8:10 p.m. Public Comments and Questions
8:20 p.m. Task Force and Subcommittee Reports
- Water Task Force
- Waste Operations Task Force
- Long Range Strategy/Stewardship
- Community Concerns
- Public Involvement/Membership

8:55 p.m. Administrative Issues
- Preparation for September Chairs' Meeting
- June Dinner Meeting
- Review of Workplan
- Review Next Agenda
- Final Comments

9:10 p.m. Adjourn

Copies of the final agenda will be available at the meeting.

Public Participation: The meeting is open to the public. Written statements may be filed with the Committee either before or after the meeting. Individuals who wish to make oral statements pertaining to agenda items should contact David Dollins at the address listed above or by telephone at (270) 441–6819. Requests must be received five days prior to the meeting and reasonable provision will be made to include the presentation in the agenda. The Deputy Designated Federal Officer is empowered to conduct the meeting in a fashion that will facilitate the orderly conduct of business. Each individual wishing to make public comment will be provided a maximum of five minutes to present their comments as the first item of the meeting agenda.

Minutes: The minutes of this meeting will be available for public review and copying at the Freedom of Information Public Reading Room, 1E–190, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585 between 9 a.m. and 4 p.m., Monday–Friday, except Federal holidays. Minutes will also be available at the Department of Energy's Environmental Information Center and Reading Room at 115 Memorial Drive, Barkley Centre, Paducah, Kentucky between 8 a.m. and 5 p.m. Monday through Friday or by writing to David Dollins, Department of Energy Paducah Site Office, Post Office Box 1410, MS–103, Paducah, Kentucky 42001 or by calling him at (270) 441–6819.

Issued at Washington, DC, on April 23, 2003.

Belinda G. Hood,

Acting Deputy Advisory Committee Management Officer.

[FR Doc. 03–10374 Filed 4–25–03; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Docket Nos. ER03–610–000]

Allegheny Energy Supply Units 3, 4, & 5, LLC; Notice of Issuance of Order

April 21, 2003.

Allegheny Energy Supply Units 3, 4, & 5, LLC (Allegheny 3, 4 & 5) filed an application for market-based rate authority, with an accompanying tariff. The proposed market-based rate tariff provides for the sale of capacity and energy at market-based rates, as well as sale of ancillary services into PJM Interconnection LLC, New York Independent System Operator, Inc., and ISO New England, Inc. at market-based rates. Allegheny 3, 4, & 5 also requested waiver of various Commission regulations. In particular, Allegheny 3, 4, & 5 requested that the Commission grant blanket approval under 18 CFR part 34 of all future issuances of securities and assumptions of liability by Allegheny 3, 4, & 5.

On April 18, 2003, pursuant to delegated authority, the Director, Division of Tariffs and Market Development—South, granted the request for blanket approval under part 34, subject to the following:

Any person desiring to be heard or to protest the blanket approval of issuances of securities or assumptions of liability by Allegheny 3, 4, & 5 should file a motion to intervene or protest with the Federal Energy Regulatory Commission, 888 First Street, NE., Washington, DC 20426, in accordance with rules 211 and 214 of the Commission's rules of practice and procedure (18 CFR 385.211 and 385.214).

Notice is hereby given that the deadline for filing motions to intervene or protests, as set forth above, is May 19, 2003.

Absent a request to be heard in opposition by the deadline above, Allegheny 3, 4, & 5 is authorized to issue securities and assume obligations or liabilities as a guarantor, indorser, surety, or otherwise in respect of any security of another person; provided that such issuance or assumption is for some lawful object within the corporate purposes of Allegheny 3, 4, & 5 compatible with the public interest, and is reasonably necessary or appropriate for such purposes.

The Commission reserves the right to require a further showing that neither public nor private interests will be adversely affected by continued approval of Allegheny 3, 4, & 5's

APPENDIX D:

ENVIRONMENTAL SYNOPSIS FOR THE DEPLETED UF_6 CONVERSION PROJECT

ENVIRONMENTAL SYNOPSIS FOR THE DEPLETED UF_6 CONVERSION PROJECT

(Solicitation No. DE-RP05-01OR22717)

October 2002

Environmental Assessment Division
Argonne National Laboratory
Argonne, Illinois

Prepared for

Office of Site Closure – Oak Ridge Office (EM-32)
Office of Environmental Management
U.S. Department of Energy
Washington, D.C.

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ENVIRONMENTAL SYNOPSIS FOR THE DEPLETED UF_6 CONVERSION PROJECT (Solicitation No. DE-RP05-01OR22717)

1 INTRODUCTION

The U.S. Department of Energy (DOE) issued a Request for Proposals (RFP) on October 31, 2000, to procure a contractor to design, construct, and operate two depleted uranium hexafluoride (DUF_6) conversion facilities at Portsmouth, Ohio, and Paducah, Kentucky (Solicitation No. DE-RP05-01OR22717). The Department intends to use the proposed facilities to convert its inventory of DUF_6 to a more stable chemical form suitable for beneficial use or disposal. The contractor selected will design the conversion plants using the technology it proposes; construct the plants; and operate the plants for a 5-year period, which will include maintaining depleted uranium and product inventories, transporting all uranium hexafluoride storage cylinders from Tennessee to the conversion plant at Portsmouth, Ohio, and transporting converted product that is not needed for other uses to a disposal site. The selected contractor will be expected to arrange for the disposal of such excess material at an appropriate site.

As a Federal agency, the DOE must comply with the National Environmental Policy Act of 1969 (NEPA) (42 USC 4321 et seq.) by considering potential environmental issues associated with its actions prior to undertaking the actions. The NEPA environmental review of the proposed DUF_6 conversion project will be prepared pursuant to Council on Environmental Quality (CEQ) Regulations (40 CFR Parts 1500 - 1508), and the Department's NEPA Implementing Procedures (10 CFR Part 1021), which provide directions specific to procurement actions that DOE may undertake or fund before completing the NEPA process. Per these regulations, DOE has prepared an environmental critique and an environmental synopsis to support the procurement selection process.

The environmental critique for the DUF_6 conversion services procurement process, which was completed during 2001, provided an evaluation and comparison of potential environmental impacts for each proposal received in response to the RFP and deemed to be within the competitive range. The critique was used by DOE to evaluate appreciable differences in the potential environmental impacts from the proposals in the competitive range. As delineated in 10 CFR 1021.216(g), the environmental critique focused on environmental issues pertinent to a decision among the proposals within the competitive range, and included a brief discussion of the purpose of the procurement and each offer, a discussion of the salient characteristics of each offer, and a brief comparative evaluation of the environmental impacts of the offers. The critique represents one aspect of the formal process being used to award a contract for conversion services. As such, it is a procurement-sensitive document and subject to all associated restrictions.

This document is the Environmental Synopsis, which is a publicly available document based on the environmental critique. The Environmental Synopsis documents the evaluation of

potential environmental impacts associated with the proposals in the competitive range and does not contain procurement-sensitive information. The specific requirements for an environmental synopsis delineated in 10 CFR 1021.216(h) are as follows:

> *(h) DOE shall prepare a publicly available environmental synopsis, based on the environmental critique, to document the consideration given to environmental factors and to record that the relevant environmental consequences of reasonable alternatives have been evaluated in the selection process. The synopsis will not contain business, confidential, trade secret or other information that DOE otherwise would not disclose pursuant to 18 U.S.C. 1905, the confidentiality requirements of the competitive procurement process, 5 U.S.C. 552(b) and 41 U.S.C. 423. To assure compliance with this requirement, the synopsis will not contain data or other information that may in any way reveal the identity of offerors. After a selection has been made, the environmental synopsis shall be filed with EPA, shall be made publicly available, and shall be incorporated in any NEPA document prepared under paragraph (i) of this section.*

To address the above requirements, this environmental synopsis include: (1) a brief description of background information related to the DUF_6 conversion project, (2) a general description of the proposals received in response to the RFP and deemed to be within the competitive range, (3) a summary of the assessment approach used in the environmental critique to evaluate the potential environmental impacts associated with the proposals, and (4) a summary of the environmental impacts presented in the critique, focusing on potential differences among the proposals. Because of confidentiality concerns, the proposals and environmental impacts are discussed in general terms.

2 BACKGROUND

Depleted UF_6 results from the process of making uranium suitable for use as fuel in nuclear reactors or for military applications. The use of uranium in these applications requires increasing the proportion of the uranium-235 isotope found in natural uranium, which is approximately 0.7% (by weight), through an isotopic separation process. A uranium–235 "enrichment" process called gaseous diffusion has historically been used in the United States. The gaseous diffusion process uses uranium in the form of UF_6, primarily because UF_6 can conveniently be used in the gas form for processing, in the liquid form for filling or emptying containers, and in the solid form for storage. Solid UF_6 is a white, dense, crystalline material that resembles rock salt.

Over the last five decades, large quantities of uranium were enriched using gaseous diffusion. "Depleted" UF_6 (DUF_6) is a product of the process and was stored at the three uranium enrichment sites located at Paducah, Kentucky; Portsmouth, Ohio; and the East Tennessee Technology Park (ETTP—formerly known as the K–25 Site) in Oak Ridge, Tennessee. Depleted uranium is uranium that, through the enrichment process, has had a portion of the uranium-235 that it once contained removed so that it has a lower uranium-235 proportion than the 0.7 weight-percent found in nature. The uranium in most of DOE's DUF_6 has between 0.2 to 0.4 weight-percent uranium-235.

At the time the RFP was issued, DOE had management responsibility for approximately 700,000 metric tons (MT) of DUF_6 contained in about 57,700 steel cylinders at the Portsmouth, Paducah, and ETTP sites, where it has stored such material since the 1950s. On June 17, 2002, an agreement was signed by DOE and USEC to transfer up to 23,300 MT of additional DUF_6 from USEC to DOE between 2002 and 2006. The exact number of cylinders was not specified. Transfer of ownership of all the material will take place at Paducah.

The characteristics of UF_6 pose potential health and environmental risks. DUF_6 in cylinders emits low levels of gamma and neutron radiation. Also, when released to the atmosphere, DUF_6 reacts with water vapor in the air to form hydrogen fluoride (HF) and uranyl fluoride (UO_2F_2), both chemically toxic substances. In light of such characteristics, DOE stores DUF_6 in a manner designed to minimize the risk to workers, the public, and the environment.

DOE has several agreements with the states in which DUF_6 is stored. In October 1992, the Ohio Environmental Protection Agency (OEPA) issued a Notice of Violation (NOV) alleging that DUF_6 stored at the Portsmouth facility is subject to regulation under state hazardous waste laws applicable to the Portsmouth Gaseous Diffusion Plant. The NOV stated that OEPA had determined DUF_6 to be a solid waste and that DOE had violated Ohio laws and regulations by not evaluating whether such waste was hazardous. DOE disagreed with this assessment, and in February 1998, DOE and OEPA reached an agreement. This agreement sets aside the issue of whether the DUF_6 is subject to regulation as solid waste and institutes a negotiated management plan governing the storage of the Portsmouth DUF_6. The agreement also requires DOE to continue its efforts to evaluate potential use or reuse of the material. The agreement expires in 2008. Similarly, in February 1999, DOE and the Tennessee Department of Environment and

Conservation (TDEC) entered into a consent order which included a requirement for the performance of two environmentally beneficial projects: the implementation of a negotiated management plan governing the storage of the small inventory (relative to other sites) of all UF_6 (depleted, low-enriched, and natural) cylinders stored at the ETTP site, and the removal of the DUF_6 from the ETTP site or the conversion of the material by December 31, 2009.

In 1994, DOE began work on the *Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride* (DUF_6 PEIS; DOE 1999). The DUF_6 PEIS was completed in 1999 and identified conversion of DUF_6 to another chemical form for use or long-term storage as part of a preferred management alternative. In the corresponding *Record of Decision for the Long-Term Management and Use of Depleted Uranium Hexafluoride* (ROD) (64 FR 43358, August 10, 1999), DOE decided to promptly convert the DUF_6 inventory to depleted uranium oxide, depleted uranium metal, or a combination of both. The ROD further explained that depleted uranium oxide will be used as much as possible and the remaining depleted uranium oxide will be stored for potential future uses or disposal, as necessary. In addition, according to the ROD, conversion to depleted uranium metal will occur only if uses are available.

During the time that DOE was analyzing its long-term strategy for managing the DUF_6 inventory, several other events occurred related to DUF_6 management. In 1995, the Department began an aggressive program to better manage the DUF_6 cylinders, known as the DUF_6 Cylinder Project Management Plan. In part, this program responded to the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 95–1, Safety of Cylinders Containing Depleted Uranium. This program included more rigorous and frequent inspections, a multiyear program for painting and refurbishing of cylinders, and construction of concrete-pad cylinder yards. Implementation of the DUF_6 Cylinder Project Management Plan has been successful, and, as a result, on December 16, 1999, the DNFSB closed out Recommendation 95–1.

In July 1998, the President signed Public Law (P.L.) 105–204. This law directed the Secretary of Energy to prepare "a plan to ensure that all amounts accrued on the books" of the United States Enrichment Corporation (USEC) for the disposition of DUF_6 would be used to commence construction of, not later than January 31, 2004, and to operate, an on-site facility at each of the gaseous diffusion plants at Paducah and Portsmouth, to treat and recycle DUF_6 consistent with NEPA. DOE responded to P.L. 105–204 by issuing the *Final Plan for the Conversion of Depleted Uranium Hexafluoride* (referred to herein as the "Conversion Plan") in July 1999. The Conversion Plan describes DOE's intent to chemically process the DUF_6 to create products that would present both a lower long-term storage hazard and provide a material that would be suitable for use or disposal.

DOE initiated the Conversion Plan with the announced availability of a draft RFP on July 30, 1999, for a contractor to design, construct, and operate DUF_6 conversion facilities at the Paducah and Portsmouth uranium enrichment plant sites. Based on comments received on the draft RFP, DOE revisited some of the assumptions about management of the DUF_6 inventory made previously in the PEIS and ROD. For example, as documented in the Oak Ridge National Laboratory study, Assessment of Preferred Depleted Uranium Disposal Forms (Croff et al. 2000), four potential conversion forms (triuranium octoxide [U_3O_8], uranium dioxide [UO_2],

uranium tetrafluoride [UF_4], and uranium metal) were evaluated and found to be acceptable for near-surface disposal at low-level radioactive waste disposal sites such as those at DOE's Nevada Test Site (NTS) and Envirocare of Utah, Inc. Therefore, the RFP was modified to allow for a wide range of potential conversion product forms and process technologies. However, any of the proposed conversion forms must have an assured, environmentally acceptable path for final disposition.

On October 31, 2000, DOE issued the final RFP to procure a contractor to design, construct, and operate DUF_6 conversion facilities at the Paducah and Portsmouth plant sites, which is the subject of this environmental synopsis. The conversion plants that result from this procurement will convert the DUF_6 to a more stable chemical form that is suitable for either beneficial use or disposal. The selected contractor will design the conversion plants using the technology it proposes and construct the plants. The selected contractor also will operate the plants for a 5-year period, which will include maintaining depleted uranium and product inventories, transporting all uranium hexafluoride storage cylinders at ETTP to a conversion plant at Portsmouth, and transporting converted product for which there is no use to a disposal site. The selected contractor will be expected to prepare excess material for disposal at an appropriate site.

DOE received a total of five proposals in response to the RFP in March 2001. On August 6, 2001, DOE announced that three proposals were within the competitive range.

In August 2002, Congress passed P.L. 107-206, which stipulates in part that, within 30 days of the law's enactment, DOE must award a contract for the scope of work described in the RFP, including design, construction, and operation of a DUF_6 conversion plant at each of the Department's Paducah, Kentucky, and Portsmouth, Ohio, sites. Accordingly, on August 29, 2002, DOE announced selection of Uranium Disposition Services, LLC (UDS) as the conversion contractor after a full and open competition. Consistent with the RFP, UDS will also be responsible for maintaining the depleted uranium and product inventories and for transporting depleted uranium from Oak Ridge, Tennessee, to the Portsmouth, Ohio, site. UDS was formed by Framatome ANP Inc., Duratek Federal Services Inc., and Burns and Roe Enterprises Inc., specifically to bid on the DUF_6 conversion contract.

3 DESCRIPTION OF PROPOSALS

A total of five proposals were received on March 1, 2001, with three proposals identified within the competitive range in August 2001. The three proposals within the competitive range were evaluated for the environmental critique and synopsis. The proposals contain confidential information and therefore are not available for review by the public and cannot be fully described in this synopsis. General characteristics of the proposals are described below.

In general, each proposal considered conversion of depleted UF_6 to either U_3O_8 or UF_4 at two stand-alone industrial plants dedicated to the conversion process and located at the DOE facilities in Portsmouth, Ohio, and Paducah, Kentucky. All of the proposals would involve the handling and processing of approximately 700,000 MT of DUF_6 in about 57,700 cylinders stored at the Paducah, Portsmouth, and ETTP sites. Each proposed facility would occupy only a fraction of the candidate site location at the Portsmouth or Paducah facility specified in the RFP. Cylinders at the ETTP would be transported to the conversion facility at Portsmouth, in accordance with U.S. Department of Transportation (DOT) regulations. The conversion plants would typically be capable of receiving depleted UF_6 cylinders on trucks or railcars, temporarily storing a small inventory of full cylinders, processing the depleted UF_6 to another chemical form, and temporarily storing the converted uranium product and any other products until shipment off site.

All proposals are based on previously demonstrated technologies, although some would require scale-up to meet the RFP requirements. All proposers identified a disposal pathway for the depleted uranium product in the event the material cannot be used. Two candidate disposal facilities were identified: DOE's NTS and Envirocare of Utah. Each proposal presented information to demonstrate that the proposed conversion product form would be suitable for disposal at one or both of these facilities. In addition, all proposers indicated that the HF product would be sold for reuse and shipped off site, either as anhydrous HF (AHF) or aqueous HF.

All proposals in the competitive range indicated that emptied cylinders would be sold for reuse in the uranium enrichment industry as much as possible. In addition, two of the three proposals in the competitive range indicated that unsold, emptied DUF_6 cylinders would be modified for use as disposal containers for the depleted uranium conversion product. The remaining proposal indicated that the depleted uranium conversion product would be disposed of in large bulk bags, with the cylinders being crushed and disposed of separately as low-level waste (LLW).

4 ASSESSMENT APPROACH USED IN THE ENVIRONMENTAL CRITIQUE

In the RFP, the offerors were required to provide data for DOE's use in preparing appropriate preliminary NEPA documentation per 10 CFR 1021.216. The data request appeared as Attachment L.3 in the RFP and is repeated in Table 4.1. The NEPA data submitted in the proposals in March 2001 and subsequently revised in October 2001 formed the basis of the evaluation of impacts in the critique and this synopsis.

For the critique, potential environmental consequences were evaluated in the areas of human health and safety (normal operations and accidents), air quality and noise, water and soil, socioeconomics, wetlands and ecology, waste management, resource requirements, land use, and cultural resources. These assessment areas are shown in Figure 4.1. In addition, a total of 49 federal, state (Kentucky and Ohio), and local permit, license, or approval requirements (referred to collectively as "consents") were identified and listed in the critique as potentially applicable to activities that are covered by the RFP to design, construct, and operate two depleted UF_6 conversion facilities, and to manage storage and transport of depleted UF_6 cylinders.

As described in the critique, potential environmental impacts from conversion facilities could occur (1) during construction of a conversion facility; (2) during operations of the facility under both normal conditions and during postulated accidents; (3) during transportation of cylinders, depleted uranium, and HF products; (4) during decontamination and decommissioning (D&D) of the facilities; and (5) during disposal of the conversion products. The potential impacts associated with facility construction would result from typical land-clearing and construction activities. Potential impacts during operations and D&D would occur primarily to workers during handling operations and to the public as a result of routine releases of small amounts of contaminants through exhaust stacks and treated liquid effluent discharges. Potential impacts to workers and the public from processing or storage also might occur as a result of accidents that release hazardous materials, during both facility operations and transportation. Potential impacts from disposal could occur primarily from the intrusion of water into the disposal facility and movement of contaminants into the groundwater.

The potential environmental impacts presented in the critique were based primarily on the environmental data and information provided by the offerors and the detailed evaluations conducted for and presented in the DUF_6 PEIS and PEIS supporting documentation. The PEIS analyses included an evaluation of the impacts associated with several conversion technologies, including conversion to uranium oxide and uranium metal (conversion to UF_4 was an intermediate step in the conversion to metal process considered in the PEIS).

In the PEIS, potential impacts were evaluated for a single plant sized to process an inventory of about 740,000 MT over a 26-year period using the Portsmouth, Paducah, and ETTP sites as representative locations (the inventory of DUF_6 considered in the PEIS was an upper bound estimate meant to address uncertainties related to the transfer of cylinders from USEC to DOE that was occurring at the time the PEIS was prepared). The inventory specified in the RFP was about 700,000 MT, with the DOE inventory increasing to about 723,000 MT in June 2002.

TABLE 4.1 NEPA Information Requested in the RFP (RFP Attachment L.3)

Category	Requirements
Facility Descriptions	Provide physical and functional descriptions of all proposed facilities and structures, including their dimensions, materials of construction, and intended use. State if the facilities will be constructed new or will be modifications of existing facilities.
Process Descriptions and Material Flows	Describe the proposed chemical and physical processes from receipt of the depleted UF_6 cylinders through the preparation for final shipment off site or for long-term disposition on site of all the products, by-products, and wastes generated. Provide materials flow diagrams that identify all processes and unit operations; all the products, by-products, and wastes; and potential emissions/effluents to the environment. Provide the physical/chemical state of the materials and the input/output rates per metric ton of depleted UF_6 processed. Provide the concentrations of hazardous substances, including radionuclides in each output stream. Specify the quantity of DUF_6 to be processed on an annual basis.
Anticipated Waste Generation	For each type of hazardous, mixed, radioactive, and nonhazardous waste to be shipped off site or disposed of on site, provide the following: annual generation rate by volume and mass following any on-site treatment, physical and chemical characteristics, estimated concentrations of hazardous constituents, polychlorinated biphenyls (PCBs), asbestos, or radionuclides, as applicable, and a description of final packaging, if any.
Anticipated Air Emissions	Estimated emissions of criteria air pollutants from construction activities during peak construction year. Estimated annual emissions of criteria air pollutants and hazardous air pollutants, including radionuclides during operations.
Anticipated Liquid Effluents	Annual amounts of liquid effluents (including storm water runoff), description of effluents, and expected concentrations of toxic and conventional pollutants and radionuclides in the effluents. Specify how the effluents will be discharged.
Waste Minimization and Pollution Prevention	Describe the waste minimization and pollution prevention activities planned for the proposed facilities.
Anticipated Water Usage	Annual use expected during operations and the peak construction year.
Anticipated Energy Consumption	Quantity of electricity and fuel (e.g., natural gas, diesel fuel) to be used during the peak construction year and annually during operations.
Anticipated Materials Usage	Amounts of materials to be used for construction (e.g., concrete, steel) and annually during operations (e.g., process chemicals). An indication of the availability of the required materials.

TABLE 4.1 (Cont.)

Category	Requirements
Anticipated Toxic or Hazardous Chemical Storage	Total amount of each extremely hazardous substance (See 40 CFR 355, Appendix A) expected to be present at any one time at the facility at concentrations greater than one percent by weight, regardless of location, number of containers, or method of storage, and a description of the storage container(s) or vessel(s).
Wastes Generated During Facility Disposition and Disposal	For each type of waste (mixed, hazardous, or radioactive) provide the quantity anticipated by volume.
Floodplain and Wetland Information	If the proposed facilities are located in a floodplain or wetland, provide the proposed mitigation measures and any practicable alternatives to locating in a floodplain or wetland.
Noise	Describe the expected noise levels by source during construction and operation, proximity of the workers and the public to sources of noise, and proposed mitigation measures.
Land Use	Describe the location and amount of land needed for buildings, parking lots, utilities, etc., during construction and operation.
Employment Needs	Expected numbers of employees during construction and operation of the proposed facilities broken down by job category (e.g., managers, professionals, laborers.)
Anticipated Transportation Needs	Annual quantities and the number of shipments to and from the site of the materials used or produced in the proposed facilities on site. Identify the expected mode of transportation (e.g., by truck, train, barge) and describe the packaging to be used, if any.
Safety Analysis Data	Using the available technology specific-information or data based on similar technologies, provide descriptions and expected frequencies for and environmental releases from potential accidents during facility operations. If possible, provide the above data for one or more accidents in each of the following four frequency ranges: greater than 0.01 per year, between 0.01 and 0.0001 per year, between 0.0001 and 0.000001 per year, and less than 0.000001 per year. If this information is not yet available, provide a discussion of the expected safety issues based on current technology concepts or similar technologies.

TABLE 4.1 (Cont.)

Category	Requirements
Safety Analysis Data (Cont.)	Describe the approach to be taken to protect worker safety and health. If the project presents a potential safety hazard beyond project boundaries, provide emergency response plans. Discuss hazards and mitigation measures related to construction activities and facility operations.
Biological Resources	To the extent information is readily available in the public domain, briefly describe the types of plants and animals, as well as their habitat, that you believe may be affected by the construction and operation of the conversion facilities. Species of concern, state and federally listed threatened and endangered species, and their critical habitats affected or likely to be affected should be identified.

Thus, the PEIS considered an inventory slightly greater than the inventory for which DOE currently has management responsibility.

The results were presented in the PEIS as ranges encompassing the results calculated for all three sites. Following the publication of the PEIS, the site-specific data and analyses from the PEIS were segregated and compiled in separate reports for each of the three current storage sites (Hartmann 1999a,b,c). Consequently, the PEIS conversion analyses and the data presented in the PEIS and the three data compilation reports formed a framework that closely represented the environmental analyses required for the critique. The environmental impacts in the critique were estimated by comparing the environmental and engineering data provided in the proposals with the data used to support the PEIS, and then scaling the PEIS results as appropriate. Supplemental analyses were conducted as necessary. In instances where the proposals did not provide complete or adequate data to evaluate environmental impacts, the specific data gaps were noted.

The environmental critique did not include a detailed evaluation of impacts from D&D activities or from disposal. The impacts from D&D activities would be expected to be similar to those discussed for conversion facility construction and would not be expected to differ significantly among the proposals. For disposal, the critique explains that the results of the PEIS and subsequent studies indicated that disposal of depleted uranium either as an oxide or UF_4 should be permissible at a dry location. The disposal facility could be a DOE facility (e.g., NTS) or a site licensed by the U.S. Nuclear Regulatory Commission or an Agreement State (e.g., the Envirocare facility). Either kind of facility would have its own environmental documentation and a set of criteria for acceptance of the waste. Any depleted uranium waste forms would have to meet the applicable site-specific waste acceptance criteria before being allowed to be disposed of. As a result, environmental impacts of disposal were not analyzed as part of the critique.

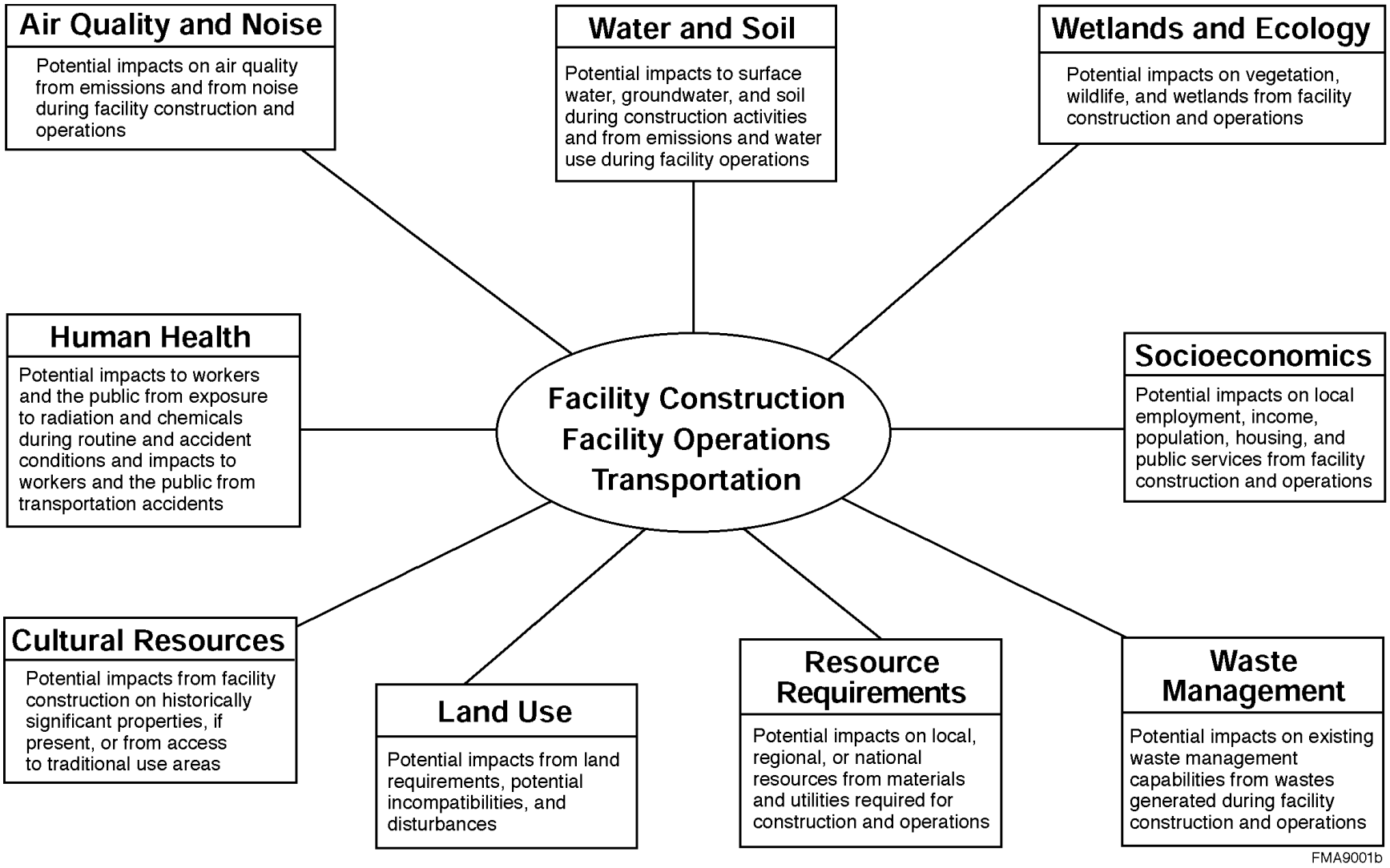

FIGURE 4.1 Areas of Impact Evaluated in the Environmental Critique

5 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

In the critique, for each of the three proposals in the competitive range, potential environmental consequences at the Paducah and Portsmouth sites were evaluated in the areas of human health and safety (normal operations and accidents), air quality and noise, water and soil, socioeconomics, wetlands and ecology, waste management, resource requirements, land use, and cultural resources. Impacts were evaluated for conversion facilities to be located at the Paducah and Portsmouth sites and for cylinder transport from the ETTP site to the Portsmouth site. In general, potential environmental impacts could occur (1) during construction of a conversion facility; (2) during operations of the facility under normal conditions and during postulated accidents; and (3) during transportation of cylinders, depleted uranium, and HF products.

The potential environmental impacts presented in the critique were based on the offerors' data and detailed evaluations conducted for and presented in the DUF_6 PEIS and PEIS supporting documentation. It should be noted that the estimation of potential environmental impacts for any proposal is subject to a great deal of uncertainty at this point. In many cases, the data provided by the offerors for the NEPA evaluation were based on data from a facility with similar, but not identical, design as the proposed facility and with different throughput. In addition, the data provided by the offerors were of varying levels of detail and, in some cases, incomplete (e.g., detailed accident data will not be available until the preparation of safety analysis reports after the contract award, and some proposals did not include estimates of air releases or waste generated during construction).

The uncertainties in input parameters and varying levels of detail in the data were off-set to a degree by several factors. First, the PEIS analysis provided a detailed and thorough evaluation of fundamentally similar technologies located at the same sites at which the conversion facilities would be constructed. The PEIS analysis provided a unique baseline of the type and magnitude of environmental impacts associated with the construction and operation of conversion facilities. Consequently, by comparing the proposals to the PEIS, it was possible to provide general estimates of potential impacts even in cases where the data provided by the bidders were incomplete (such as accident scenarios).

Second, with regard to comparisons among the proposals, several factors tend to minimize the potential for major differences in the anticipated environmental impacts: (1) all of the proposals would involve the handling and processing of the same amount of DUF_6, approximately 700,000 MT; (2) all of the proposals would require the shipment of the same number of cylinders from ETTP to Portsmouth, which must be made in accordance with DOT regulations, regardless of the particular method proposed; (3) all of the proposals would generate a relatively insoluble uranium product for disposal at a western disposal site and a fluorine product, either aqueous or anhydrous HF, for reuse; (4) all of the proposals would be required to meet the same regulations pertaining to human health and safety and effluent emissions; (5) all of the proposals utilize existing processes and technologies that have been previously demonstrated on an industrial- or pilot-scale; and (6) all of the proposed facilities would be built in essentially the same locations on the Paducah and Portsmouth sites. These factors, coupled

with the preliminary nature (and associated uncertainties) of the proposed designs, contribute to the similarities in estimated impacts discussed below.

5.1 ENVIRONMENTAL IMPACTS LIKELY TO BE NEGLIGIBLE TO LOW, OR WELL-WITHIN REGULATORY LIMITS

The following environmental disciplines were found to most likely have negligible to low impacts, or impacts well-within regulatory limits for all proposals:

- ***Human Health and Safety – Normal Conditions.*** All of the proposals would result in some risk to workers during normal operations, primarily from exposure to external radiation emitted from depleted uranium materials and associated decay products. Although throughputs differ among the proposals and also with the PEIS, all the proposals would require the handling of the same amount of uranium material over the life of the project. Moreover, the types of handling activities required would generally be similar for any conversion facility. Based on the PEIS analyses, estimated population doses to workers over the facility lifetimes could range from about 800 to 1,300 person-rem, below levels expected to cause cancer fatalities among the workers. Impacts to involved and noninvolved workers from ingestion or inhalation of uranium and/or hazardous chemicals during routine conditions would not be expected. Similarly, doses to the off-site members of the public would be expected to be very small, well below regulatory standards.

- ***Noise***. All the bidder's reported construction noise levels were typical for construction activities (bidder's levels ranged from about 75 to 100 dB(A) at the source). Some intermittent indoor noise levels during operations would be higher (up to 134 dB[A]); these higher levels could require auditory protection devices to protect workers. In general, none of the continuous operations noise levels reported for the facilities would result in adverse impacts from noise at the site boundaries.

- ***Water and Soil.*** Construction and operation of a conversion plant would disturb land, use water, and produce liquid wastes. In the PEIS, it was estimated that the impacts on the surface water, groundwater, and soil at Paducah and Portsmouth would be nonexistent or negligibly small from a conversion facility – no appreciable impacts to surface water, groundwater, or soils were identified; contaminant concentrations in water discharges would be below EPA guidelines and no changes in groundwater quality would be expected. With the exception of water consumption during operations for one proposal, all the water and soil parameters given in the proposals are similar to or less than those used in the PEIS. Therefore, it is expected that the potential impacts to water and soil from any of the proposed facilities at either site would also be nonexistent or negligibly small. Construction activities have the potential to result in surface water, groundwater, or soil contamination

through spills of construction chemicals. By following good engineering practices, concentrations in soil and wastewater (and therefore surface water and groundwater) could be kept well within applicable standards or guidelines.

One exception noted was for the water consumption during operations for one proposal, which, although within the water usage capacity at both sites, was orders of magnitude larger than the other proposals and the PEIS (up to 835 million gallons per year at Paducah, compared with a maximum of 55 million gallons per year estimated in the PEIS and a maximum among the other proposals of 13 million gallons per year). However, the revised proposal indicated that the majority of this water is in a closed-loop chilled water system and would not be required to be supplied each year.

- ***Socioeconomics.*** For all of the bidders, direct employment estimates for construction and operations were comparable to or lower than PEIS estimates. The maximum number of direct jobs created during operations among the proposals was estimated to be approximately 400, compared with a maximum of 500 in the PEIS. Although indirect impacts (e.g., indirect jobs created, income generated, population in-migration, changes in housing demand and public finances) for the regions surrounding the Paducah and Portsmouth sites cannot be estimated with the available data, based on PEIS analyses, such impacts appear unlikely. The PEIS concluded that the conversion options would be likely to have a small impact on socioeconomic conditions in the regions surrounding the sites, because a major proportion of the expenditures associated with procurement for the construction and operation of the facility would flow outside the regions to other locations in the United States, reducing the concentration of local economic effects.

- ***Land Use***. Although differences exist in the land required for the proposed facilities (ranging from about 10 to 20 acres), all proposed facilities represent very small fractions of the land available at the Paducah and Portsmouth sites. The proposed facilities would require only a fraction of the candidate sites identified within the Paducah and Portsmouth site boundaries in the RFP. Consequently, land use impacts for all the proposals would likely be negligible.

- ***Resource Requirements.*** In general, the utility requirements for all proposals are not expected to be significant. Based on comparison with the appropriate values from the DUF_6 PEIS, it would be expected that the current utility capacities at the two sites (Paducah and Portsmouth) would be adequate to accommodate the proposed service requirements without any major modifications or constructing new service facilities, therefore significant adverse environmental effects would not be incurred.

The total quantities of commonly used construction materials are not expected to be significant and would be comparable to construction of a multistory building or industrial plant. Small quantities of specialty materials (e.g., Monel and Hastelloy) were identified in one proposal, although these materials are not in short supply. These specialty materials may also be necessary for construction of the various reactors to convert depleted UF_6 into another form. The amount of operations materials is not great and is comparable to a small-scale petroleum refinery or similar chemical processing plant. No specialty chemicals were identified in the proposals that are not currently available in the chemical industry.

- ***Cultural Resources.*** Archaeological and architectural surveys have not been completed or finalized for either site as a whole or for the candidate locations. If archaeological resources are encountered, or historical or traditional cultural properties identified, a mitigation plan would be required. At Portsmouth, the proposed facilities may impact the existing lithium warehouses; prior to demolition, it would need to be determined if these buildings warrant consideration for the *National Register of Historic Places*, and, if so, a mitigation plan, including avoidance or data recovery, would be required. Because all of the proposals would essentially use the same proposed sites and the land areas are roughly the same sizes (<20 acres), it is unlikely that there would be differences in potential impacts to cultural resources among the proposals.

- ***Transportation.*** All of the proposals would involve the shipment of cylinders from ETTP to Portsmouth, depleted uranium product from Portsmouth and Paducah to a western disposal site, and HF from Portsmouth and Paducah to a commercial user. In addition, operation-related wastes and raw materials would also require shipment, although such shipments would be expected to have negligible impacts. Differences in the transportation impacts among the proposals cannot be determined until detailed transportation plans are developed. However, because all proposals would require shipment of roughly the same amounts of outgoing products and all would have to comply with DOT requirements, it is expected that all proposals would result in roughly the same impacts from transportation operations. Overall, the largest impact from transportation activities would be associated with the potential for injuries and fatalities from typical traffic accidents. Low-probability accidents involving releases of DUF_6 or HF are discussed further below.

5.2 ENVIRONMENTAL IMPACTS POTENTIALLY REQUIRING MITIGATION OR OF UNCERTAIN MAGNITUDE

The following environmental disciplines were found to potentially require mitigative actions to stay within regulatory limits, or the data submitted in the proposal were insufficient to make an accurate determination of the anticipated impacts:

- ***Air Quality – Construction.*** Except for one proposal, none of the bidders provided complete information on emissions of criteria pollutants during construction. However, based on comparison of the structure sizes and types between the proposals and the PEIS, construction air emissions would be expected to be lower than or similar to those estimated in the PEIS. The only criteria pollutant of some concern during construction for each of the proposed facilities is likely to be particulate matter (PM_{10}). PM_{10} construction emissions are related to the site land area disturbed; all the proposed facilities would be comparable to or smaller in size than those analyzed in the PEIS. The PEIS estimated that the 24-hour average PM_{10} level could be as high as 90% of the standard during construction. However, with appropriate mitigation measures (such as spraying the excavation area with water and covering excavated soil), PM_{10} levels could be kept in compliance with standards.

- ***Air Quality – Operations.*** Reporting on criteria pollutant emissions during operations was incomplete for two bidders. Where emissions were reported for the third bidder, levels were much higher than levels reported for operations in the PEIS. In this case, the bidder reported that the emissions estimates were expected to be conservative because all the pollutant sources considered were assumed to be operating concurrently, which is unlikely. Although the levels of criteria pollutant emissions during operations will need to be more thoroughly addressed by whichever bidder is chosen, it is expected that the emissions could be controlled to stay within standard levels.

- ***Wetlands.*** It appears from examination of the siting information provided that the potential exists for all proposals to impact wetlands at Paducah and possibly Portsmouth. At this time it is not possible to determine the extent of such impacts because the locations of vehicle entrance roads, pipelines, and utilities have not been clearly identified. Any wetland impacts would be evaluated in the wetlands assessment required by 10 CFR 1022.12, and if unavoidable, would require permitting from the U.S. Army Corps of Engineers. The permit may require compensatory mitigation. Compensatory mitigation is designed to reduce or mitigate the impacts to a wetland by the construction of a new wetland area. The new wetland is designed to provide specific wetland functions as compensation for the loss of wetland functions at the impacted wetland. The wetlands potentially impacted do not seem to be high-quality wetlands that would be difficult to compensate for or require special protection based on rarity or uniqueness.

- ***Waste Management.*** Overall, the waste resulting from normal operations would be expected to have a low to moderate impact on waste management.

  It should be noted that not all of the proposals provided information on nonhazardous liquid effluents such as cooling tower blowdown, industrial wastewater, and process water expected to be generated during normal operations. In addition, a more exhaustive investigation of the waste stream characteristics for the various proposals is necessary to ensure proper waste classification, as indicated by comparison of the waste volumes of the proposals with those estimated in the DUF_6 PEIS. It should also be noted that a number of waste streams identified in one proposal were not present in another proposal with a similar process.

  The total LLW disposal volumes from disposal of depleted uranium were compared with the total estimated disposal volume for LLW for all DOE waste management activities. Disposal volumes were compared as total volume (m^3) because disposal facilities would typically have no throughput limitations but rather would be limited by the total volume of waste that could be accepted. Overall, disposal of the final uranium product would generate appreciable amounts of waste for disposal in either DOE or commercial facilities. Within the context of the total amount of LLW undergoing disposal in DOE facilities, these wastes would be expected to have a low impact on DOE's total waste management disposal capabilities.

  In the event that the HF could not be sold commercially for unrestricted use, the concentrated HF may be converted to calcium fluoride (CaF_2) for disposal. Based upon the PEIS, the total volume of CaF_2 may range from 190,000 to 570,000 m^3. It is unknown whether the CaF_2 produced would be disposed of as nonhazardous solid waste or as LLW. If the CaF_2 is classified as LLW, it would be expected to have a moderate impact on DOE's total waste management disposal capabilities.

5.3 ENVIRONMENTAL IMPACTS WITH POTENTIALLY HIGH CONSEQUENCES, BUT LOW PROBABILITY

For all proposals, there is a potential for low probability events having high consequences, due to the hazardous nature of the materials handled. Although the chance of such events occurring is impossible to eliminate, existing regulations and standard engineering practices and controls will be used to minimize the probability of these events. High-consequence/low-probability events are discussed below.

- ***Human Health and Safety – Facility Accidents.*** The designs of the buildings presented in the proposals differed significantly from those evaluated in the PEIS. In many cases, the designs in the proposals do not appear to include areas to accommodate hazard categories of chemically high hazard (HH) for

buildings containing DUF_6 and HF and radiologically moderate hazard (HC2) for buildings containing depleted uranium (the hazard categories are designations used by DOE to specify the types of building designs required based on the hazards posed by the materials to be used within the buildings). This difference would affect the frequency at which external events such as natural phenomena (tornadoes, earthquakes) can negatively affect building containment that could result in significant releases. The difference in building design between the proposals and the PEIS would also affect the source terms of the various accident scenarios. This may result in different bounding accidents within the four frequency categories considered in the PEIS with resulting differences in consequences. A detailed safety analysis and risk assessment that would take into account the performance categories of the various structures in the proposals was not possible at this time and will be conducted by the successful bidder after contract award. Nevertheless, the PEIS results were used to provide a rough estimate of the types of consequences that might be associated with the conversion facilities.

Based on the PEIS results, it would be expected that the radiological health impacts from facility accidents considered in the proposals would be small.

Limited information on chemical accidents was supplied in the proposals. All proposals, however, provided the amount of hazardous materials expected to be in storage at a given time. These amounts were compared with the storage volumes of the same chemicals in the PEIS. The most hazardous chemical to be stored is HF. The range in the volume of HF stored between the proposals was not great (from 63,400 to 114,000 gal) and all were less than those in the PEIS. The chemical-related health impacts estimated in the PEIS may therefore be expected to bound those for all proposals.

Hydrogen is necessary for conversion of depleted UF_6 to either UF_4 or U_3O_8. The PEIS did not directly consider the potential risks associated with storage of hydrogen in either gaseous or liquid form. It is not possible at this time to evaluate the potential hazard of hydrogen storage for the proposals. However, a preliminary literature review indicates that the potential risks associated with hydrogen storage are likely low. Because hydrogen is needed for depleted UF_6 conversion, it would not be expected to be a discriminator among the proposals.

For all of the management strategies considered in the PEIS, low-probability accidents involving chemicals (primarily HF) at a conversion facility were estimated to have the largest potential consequences to noninvolved workers and members of the public. Such accidents could be caused by a large earthquake and are expected to occur with a frequency of less than once in 1 million per year of operations. For the most severe accidents in each frequency category, it was estimated that there could be a large number (up to tens of thousands) of noninvolved workers and the general public suffering

from adverse effects (e.g., minor irritation to the eye, coughing). The number of irreversible adverse health effects (e.g., lung damage) could also be large (a few hundred). However, the risk (defined as consequence multiplied by probability) for these accidents would be zero fatalities and zero irreversible adverse health effects expected for noninvolved workers and the members of the public combined.

Impacts to involved workers under accident conditions would likely be dominated by physical forces from the accident itself, so that quantitative dose/effect estimates would not be meaningful. For this reason, the impacts to involved workers during accidents were not quantified in the PEIS or critique. However, it is recognized that injuries and fatalities among involved workers would be possible for all proposals if an accident did occur.

It should be noted that there may be differences in the accident impacts between releases of AHF and aqueous HF, and that these differences were not fully evaluated in the critique. One proposal stated that AHF would be produced, whereas two would produce aqueous HF. Anhydrous HF has a much higher volatility than aqueous HF, and therefore would result in a larger amount of material being dispersed to the environment if equal amounts were spilled. At this time, it is not clear if production of aqueous HF would result in a significant reduction in accident risk.

- ***Human Health and Safety – Transportation Accidents.*** Similar to the assessment of facility accidents discussed above, in general, there was not sufficiently detailed information provided in the proposals to perform a comprehensive transportation impact assessment. The results of the PEIS and supporting studies were used to estimate potential impacts of transportation, as discussed below.

  For shipment of UF_6 cylinders, among all the accidents analyzed in the PEIS, a severe rail accident involving four DUF_6 cylinders was estimated to have the highest potential consequences (note that the consequences for a truck accident, which would likely carry only 1 or 2 cylinders, would be less than the bounding rail accident discussed here). The consequences of such an accident were estimated on the basis of the assumption that the accident occurred in an urban area (with a population density of 1,600 people/km^2) under stable weather conditions (such as at nighttime). The total probability of an urban rail accident involving a release (not taking into account the frequency of weather conditions) was estimated to be very low (on the order of about 1 chance in 100,000). In the unlikely event that such an accident were to occur, it was estimated that approximately four persons might experience irreversible adverse effects (such as lung damage or kidney damage) from chemical exposure to HF and uranyl fluoride generated from released UF_6, with zero fatalities expected. Over the long term, radiation effects would also be possible from exposure to the uranium released. It was

estimated that approximately 60 latent cancer fatalities could occur in the urban population from such an accident in addition to the approximately 700,000 that would occur from all other causes (approximately 3 million persons were assumed to be exposed to low levels of uranium from the accident as the uranium dispersed in the air). The radiological risk (consequence multiplied by probability) for this accident would be essentially zero.

If a large HF release from a railcar occurred in an urban area under stable weather conditions, persons within a 7 mi^2 (18 km^2) area downwind of the accident site could potentially experience irreversible adverse effects from chemical exposure to HF, with up to 300 fatalities possible. However, the probability of such an accident occurring would be expected to be quite low. Anhydrous HF is routinely shipped commercially in the United States for industrial applications. To provide perspective, since 1971, the period covered by DOT records, there have been no fatal or serious injuries to the public or to transportation or emergency response personnel as a result of AHF releases during transportation.

As noted above, shipment of aqueous HF may have different risks than shipment of AHF.

5.4 DIFFERENCES IN POTENTIAL ENVIRONMENTAL IMPACTS AMONG THE PROPOSALS

Based upon the assessment of potential environmental impacts presented in the critique, no proposal was found to be clearly environmentally preferable. Although differences in a number of impact areas were identified, none of the differences were considered to result in one proposal being preferable over the others. Nevertheless, the following differences are of note:

- The annual raw water usage during operations for one proposal, which is reported to be approximately 835 million gallons per year, is more than an order of magnitude greater than any other proposal. The bulk of the usage comes from the chilled water use. However, the revised proposal indicates that the majority of this water flows in a closed-loop chilled water system and thus would not be required to be supplied each year.

- Relative to potential storage and transportation accidents, production of aqueous HF, identified in two proposals, may result in a reduction in accident risk compared with AHF, identified in one proposal, although it is not clear if this difference is significant.

- For one proposal, emissions during construction and operations were reported to be much higher than the estimates provided in the PEIS. The primary source of the estimated high levels of criteria pollutant emissions was heavy

equipment operation (e.g., from cylinder haulers, semi-tractor trailers, forklifts, cranes, and locomotive engineers). The PEIS and the other bidder's did not give estimates for this source. The bidder's documentation states that the estimates given are conservatively high because all emissions were assumed to occur concurrently. Although the levels of criteria pollutant emissions during operations will need to be more thoroughly addressed by whichever bidder is chosen, it is expected that the emissions could be controlled to stay within standard levels.

- There appear to be no significant differences in overall environmental impacts associated with conversion to UF_4 versus U_3O_8. In addition, several studies indicate that disposal of depleted uranium either as an oxide or UF_4 should be permissible at a dry location.

5.5 DIFFERENCES IN REQUIRED PERMITS, LICENSES, AND APPROVALS

No proposal stood out as providing a plan that clearly minimizes environmental permitting requirements. Most of the proposals deferred discussion of permitting requirements to the Regulatory and Permitting Management Plan, which the successful bidder must submit to DOE within 90 days after contract award.

6 REFERENCES

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APPENDIX E:

IMPACTS ASSOCIATED WITH HF AND CaF_2 CONVERSION PRODUCT SALE AND USE

APPENDIX E:

IMPACTS ASSOCIATED WITH HF AND CaF_2 CONVERSION PRODUCT SALE AND USE

E.1 INTRODUCTION

During the conversion of the depleted uranium hexafluoride (DUF_6) inventory to depleted uranium oxide, products having some potential for sale to commercial users would be produced. These products would include aqueous hydrogen fluoride (HF) and calcium fluoride (CaF_2, commonly referred to as fluorspar). These products are routinely used as commercial materials, and an investigation into their potential reuse was done; results are included as part of this environmental impact statement (EIS). Areas examined as part of this investigation were the characteristics of these materials as produced within the conversion process, the current markets for these products, and the potential socioeconomic impacts within the United States if these products should be provided to the commercial sector. Because some low-level radioactivity would be associated with these materials, a description of the U.S. Department of Energy (DOE) process for authorizing the release of contaminated materials for unrestricted use (referred to as "free release") and an estimate of the potential human health effects of such free release were also considered in this investigation. The results and conclusions of this investigation are presented in the following sections of this appendix.

E.2 CHARACTERISTICS OF HF AND CaF_2 PRODUCED DURING CONVERSION

Conversion of DUF_6 to the solid uranium oxide form appropriate for use or disposal would be accomplished by reacting the UF_6 with steam and hydrogen, as indicated in the following reactions:

$$UF_6 + 2H_2O \rightarrow UO_2F_2 + 4HF \qquad \text{(E.1)}$$

and

$$3UO_2F_2 + H_2 + 2H_2O \rightarrow U_3O_8 + 6HF\ . \qquad \text{(E.2)}$$

The HF vapor and excess steam would be condensed, resulting in HF of approximately 55% strength. The predominant markets for HF call for 49% and 70% HF solutions; thus, the product from the conversion condensers could be further processed to yield these strengths.

A small fraction of the HF produced in the above reactions would escape capture in the condensers and remain as a vapor in the off-gas system. This uncondensed HF would be passed through a wet scrubber containing a nominal 20% potassium hydroxide (KOH) solution, where the HF would be converted into potassium fluoride (KF) via the following reaction:

$$HF + KOH \rightarrow KF + H_2O\ . \qquad \text{(E.3)}$$

The KOH would then be regenerated by adding lime to the above reaction products:

$$2KF + CaO + H_2O \rightarrow 2KOH + CaF_2 . \quad \text{(E.4)}$$

The approximate quantities of HF and CaF_2 that would be produced annually via the above reactions at each site are shown in Table E-1. These quantities are based on converting the East Tennessee Technology Park (ETTP) cylinders at Portsmouth. As noted above, the 55% HF solution would be further processed into 70% and 49% solutions prior to being sold. The quantities of aqueous HF in these two concentrations are shown in Table E-2.

The quantities noted in Tables E-1 and E-2 are based on the assumption that there would be a viable economic market for the aqueous HF produced during the DUF_6 conversion process. If there were no such market, Uranium Disposition Services, LLC (UDS) proposes to convert all of the HF to CaF_2 and then either sell this product or dispose of it as a solid waste.

Under this scenario, CaF_2 would be produced by the following reactions:

$$CaO + H_2O \rightarrow Ca(OH)_2 \quad \text{(E.5)}$$

and

$$Ca(OH)_2 + 2HF \rightarrow CaF_2 + 2H_2O. \quad \text{(E.6)}$$

Approximate quantities of CaF_2 that would be produced annually if all the HF was converted to CaF_2 would be 8,800 t (9,700 tons) at Portsmouth and 11,800 t (13,000 tons) at Paducah. Under this scenario, the quantities of depleted triuranium octaoxide (U_3O_8) would remain the same as those shown in Table E-1.

TABLE E-1 Products from DUF_6 Conversion Assuming HF Acid Is Sold (metric tons per year)

Product	Portsmouth	Paducah	Total
Depleted U_3O_8	10,800	14,300	25,100
HF acid (55% solution)	8,300	11,000	19,300
CaF_2	18	24	42

TABLE E-2 Aqueous HF Levels for Sale (metric tons per year)

Product	Portsmouth	Paducah	Total
70% solution	2,500	3,300	5,800
49% solution	5,800	7,700	13,500

A small quantity of radioactive materials would transfer into the HF and CaF_2 products from the conversion process. As per the requirements of DOE Order 5400.5 (see Section E.4), UDS plans to apply for authorized release limits for these materials. Pending DOE's approval of authorized limits, estimates of the contaminant levels in the HF and CaF_2 have been made on the basis of the experience of Framatome Advanced Nuclear Power, Inc. (ANP) (a partner in UDS) at its Richland, Washington, facility authorized for manufacturing nuclear fuel. These values for HF are shown in Table E-3, along with the values that were assumed for estimating impacts in this EIS.

Any CaF_2 produced (either the small quantities from the off-gas treatment system or the mass conversion of all HF) would also be slightly radioactive. As it would do for HF, UDS also plans to apply for authorized release limits for CaF_2. Pending approval of authorized limits, the values shown in Table E-4 were used to estimate the impacts (UDS 2003a,b).

Certain chemical specifications must also be met for a product to be successfully marketed. Table E-5 shows likely process specifications for the production of HF. These specifications are based on vendor requirements at the Framatome ANP facility in Richland, Washington (UDS 2003a).

Similar process control specifications have been developed for CaF_2. These specifications were based on trade standards for acid-grade CaF_2 and are shown in Table E-6 (UDS 2003a).

TABLE E-3 Activity Levels for Aqueous HF

Contaminant	Expected Value	Assumed Activity
Depleted uranium	0.08 pCi/mL	3.0 pCi/mL (6.4 ppm)
Tc-99	1.6×10^{-5} pCi/mL	2.0×10^{-3} pCi/mL (15.9 ppb U)

TABLE E-4 Activity Levels for CaF_2

Contaminant	Expected Value	Assumed Activity
Uranium	0.04 pCi/g	1.5 pCi/g
Tc-99	0.8×10^{-5} pCi/g	1.0×10^{-3} pCi/g (15.9 ppb U)

TABLE E-5 Process Control Specifications for HF

Chemical Analysis or Physical Property	Specification
HF	49%
H_2SiF_6 (fluosilicic acid)	<70 ppm
H_2SO_4 (sulfuric acid)	<50 ppm
SO_2 (sulfur dioxide)	<50 ppm
Fe (iron)	<15 ppm
As (arsenic)	<14 ppm
U (uranium)	<0.5 ppm[a]
P (phosphorous)	<10 ppm
Color	Water white (clear)

[a] Based on mass concentration of uranium, regardless of radioactivity.

TABLE E-6 Process Control Specifications for Acid-Grade CaF_2

Chemical Analysis	Typical Range (%, except for As)
CaF_2	97.0 – 97.6
Total carbonate	0.8 – 1.8
SiO_2 (silica)	0.4 – 1.0
$BaSO_4$ (barium sulfate)	0.3 – 0.8
Pb (lead)	0.05 – 0.2
Fe	0.05 – 0.2
S (sulfide)	0.005 – 0.014
Moisture	<0.1 (8 – 9 as filtercake)
As (arsenic)	1 – 5 ppm

E.3 DESCRIPTION OF THE COMMERCIAL HF AND CaF_2 MARKETS AND POTENTIAL USES

Two potential markets for products made in the conversion process are considered here. The first is aqueous HF and the other is solid CaF_2. Small quantities of the CaF_2 would be produced in the preferred design. However, if no market for the HF could be found, large quantities of CaF_2 would be produced for sale to the market or for disposal as a solid waste. These products are discussed below.

E.3.1 Aqueous Hydrogen Fluoride (HF)

HF is the source of fluorine for most fluorine-containing chemicals. It is used either to directly manufacture such chemicals or to produce intermediates for their manufacture. HF is used to manufacture a wide variety of products, including refrigerants, gasoline, electronic components, aluminum, and plastics. It is used as a reactant or fluorinating source in the manufacture of fabric- and fiber-treating agents, herbicides, pharmaceutical intermediates, inert fluorinated liquids, and electronic grade etchants. Stannous fluoride, used in toothpaste, is manufactured by using HF. HF lasers have been tested for use in corneal transplants and for use in space. While the majority of HF used by industry is in the anhydrous or 100% form, aqueous HF solutions with concentrations of 70% and lower are used in stainless steel pickling, metal coatings, chemical milling, glass etching, exotic metals extraction, and quartz purification.

The commercial market in the United States for HF is in excess of 300,000 t (330,000 tons) per year (SRI Consulting 2002). However, only a small fraction (about 26,000 t [29,000 tons] or less than 9%) of that market is for aqueous HF. Uses for aqueous HF include the pickling metal and electronics industries. The U.S. capacity for producing HF consists of facilities owned by two companies. A plant near Geismar, Louisiana, has a production capacity of approximately 128,000 t (141,000 tons) per year, and a plant near La Porte, Texas, has a capacity of approximately 80,000 t (88,000 tons) per year. All of the aqueous HF produced in the United States is currently manufactured by Honeywell at the Geismar facility. Of the approximately 100,000 t (110,000 tons) of HF imported each year to the United States, Mexico provides approximately 75%, and Canada provides most of the remainder.

As the market information above shows, the HF produced during the DUF_6 conversion process would represent only about 10% and 6% of the U.S. production and demand, respectively. However, it would represent more than 70% of the total U.S. market for aqueous HF.

E.3.2 Calcium Fluoride (CaF_2)

On the basis of the assumption that a market would be found for the HF, the small quantity of CaF_2 that would be produced (approximately 42 t [46 tons] per year) would be disposed of as a solid waste. Part of this decision stems from the fact that at approximately $135/t (SRI Consulting 2002), annual revenues of only about $5,700 would be realized from the sale of this quantity of material. However, in the event that a market for the HF could not be found, approximately 20,600 t (22,700 tons) of CaF_2 would be produced annually. As shown in Table E-6, this material would be more than 97% pure. CaF_2 of this grade is commonly referred to as “acid-spar.”

The U.S. market for fluorspar is approximately 600,000 t (661,000 tons) per year. Of this, approximately 65% is used for the production of HF. Since the closing of the Rosiclare, Illinois, mine in 1995, there has been no mining of fluorspar in the United States. Instead, demand has been met by imports and by purchases of CaF_2 from the National Defense Stockpile. Since the U.S. Department of Defense was authorized to sell fluorspar from its stockpile, these sales have

represented 20% or more of the annual U.S. demand for CaF_2. In 2001, approximately 71,000 t (78,000 tons) of fluorspar were sold from the National Defense Stockpile. However, only about 9,500 t (10,500 tons) of acid-spar remain in the stockpile, with an additional 40,000 t (44,000 tons) of metallurgical grade fluorspar (a lower grade of fluorspar having a CaF_2 content of approximately 60% to 85%) (SRI Consulting 2002). Thus, it is not clear whether a significant portion of the U.S. demand for fluorspar could be met by the National Defense Stockpile.

The United States has been heavily dependent on imported fluorspar for many years. Imports have represented more than 90% of the U.S. demand in recent years, and, with the unavailability of the National Defense Stockpile to make any large-scale contributions, the percentage of CaF_2 imports is likely to get even higher. China has become the biggest supplier of fluorspar to the United States, providing 60% to 70% of the total U.S. imports. South Africa and Mexico are the other major suppliers to the United States, representing approximately 20% and 10%, respectively, of U.S. imports (SRI Consulting 2002).

E.4 OVERVIEW OF THE DOE PROCESS FOR ESTABLISHING AUTHORIZED LIMITS FOR RELEASE OF RADIOACTIVELY CONTAMINATED MATERIALS

As previously explained, two products of the DUF_6 conversion technology, HF and CaF_2, would have potential commercial use. However, because these products are expected to contain small amounts of volumetrically distributed residual radioactive material in the form of uranium and technetium-99 (Tc-99), they could not be sold for unrestricted use, unless DOE establishes authorized limits. In this context, authorized limits would be the maximum concentrations of uranium and Tc-99 allowed to remain volumetrically distributed within the HF and CaF_2 being sold.

Authorized limits are limits on the amount of residual radioactive material distributed volumetrically within property that DOE or its contractors release for unrestricted use. In cases involving volumetrically distributed residual radioactive material, such as the proposed release of HF and CaF_2, authorized limits are typically expressed as maximum allowable concentrations of specified residual radionuclides. Correspondingly, the authorized limits for HF and CaF_2 would specify maximum allowable concentrations of residual uranium and Tc-99.

In general, authorized limits for DOE property that will be released from DOE control are established and implemented on a case-specific basis according to a process defined by DOE Order 5400.5, “Radiation Protection of the Public and the Environment,” and supporting guidance documents. This process (referred to as the authorized limits process) is designed to achieve the following goals (DOE 2002):

- Property is evaluated, radiologically characterized, and, where appropriate, decontaminated before release.

- The level of residual radioactive material in the property to be released is as near to background levels as is reasonably practicable, as determined by

applying the principles of the DOE ALARA (as low as reasonably achievable) process.

- All property releases meet authorized limits and are appropriately certified, verified, documented, and reported; public involvement and notification needs are addressed; and processes are in place to appropriately maintain records.

If UDS decides to release HF and/or CaF_2 from the DUF_6 conversion facilities for unrestricted use, the authorized limits process would include the following steps:

- Identification, for both HF and CaF_2, of several sets of potential maximum allowable concentrations for residual uranium and technetium-99 to serve as alternative sets of authorized limits for the purpose of ALARA analysis;

- Verification that each alternative set of authorized limits would comply with the DOE public dose limit;

- Selection through an ALARA analysis of one set each of authorized limits to be proposed for DOE approval from among the alternatives for both HF and CaF_2;

- Coordination with the U.S. Nuclear Regulatory Commission (NRC) or the responsible Agreement State agency;

- Development of survey and/or test methods, including provisions for quality assurance, to be used for demonstrating compliance with the proposed authorized limits;

- Acquisition of DOE approval of the proposed authorized limits for release of HF and CaF_2; and

- Placement in the DOE permanent record and in the public record of documentation supporting the release for unrestricted use of HF and CaF_2.

Additional information about each step in the authorized limits process is provided below.

E.4.1 Identification of Alternative Sets of Authorized Limits

As previously mentioned, Framatome ANP (one of the partners in UDS) currently operates an NRC-licensed, nuclear fuel manufacturing facility near Richland, Washington, that has a uranium conversion system with several design features similar to those of the proposed DUF_6 conversion facilities. HF from the Richland facility is sold under the provisions of that facility's NRC license. UDS would identify alternative sets of authorized limits for the release of HF and CaF_2 from the DUF_6 conversion facilities on the basis of the Framatome ANP facility's operating experience and the release limits specified for HF in its existing NRC license. The

analyses presented in Section E.5 very conservatively estimate the impacts that would result from the use after sale of HF and CaF_2. Because these analyses are so conservative, they are expected to bound the impacts from selling HF and CaF_2, in compliance with any alternative set of authorized limits that UDS is likely to propose for DOE approval.

E.4.2 Verification of Compliance with the DOE Public Dose Limit

The DOE public dose limit for any member of the general public is 100 mrem total effective dose equivalent (TEDE) in a year. This limit applies to the sum of internal and external doses resulting from all modes of exposure to all radiation sources (i.e., both DOE and non-DOE sources) except background radiation sources and medical sources [DOE Order 5400.5, II.1.a.(3)(a)].

Because the DOE public dose limit applies to exposure from all sources and pathways, not just DOE sources, it would be very complicated and expensive to verify compliance. Therefore, for the purpose of establishing authorized limits, DOE has simplified verification of compliance with the primary dose limit by adopting a presumption of compliance if the dose from a DOE practice, such as releasing HF or CaF_2 containing residual radioactive material, to those individual members of the public most likely to receive the highest doses (referred to as the maximally exposed members of the public) can be demonstrated to comply with a dose constraint of one-quarter of the public dose limit (i.e., 25 mrem TEDE in a year) (DOE 2002). As a result, each alternative set of authorized limits identified by UDS for the release of HF and CaF_2 from the DUF_6 conversion facilities would have to be shown during the authorized limits process to result in doses to maximally exposed members of the public of no more than 25 mrem TEDE in a year.

E.4.3 ALARA Analysis

DOE Order 5400.5 requires that DOE contractors implement the ALARA process with respect to any DOE activity or practice that may cause members of the public to be exposed to radiation [DOE Order 5400.5, II.2]. For that reason, UDS is required to have an ALARA program for the DUF_6 facilities. The ALARA program must address activities on the sites that can cause members of the public or workers to be exposed to radiation. With respect to releases of property, such as the HF or CaF_2 produced by the DUF_6 conversion facilities, the ALARA program must include a procedure for an ALARA analysis to select authorized limits that would reduce radiation exposures to levels that are as low as practicable, taking into account technological, economic, safety, environmental, social, and public policy factors. There is no single best procedure for conducting an ALARA analysis. However, a key component should be a cost-benefit analysis (DOE 1997). For the purposes of this analysis, costs are assumed to accrue as a result of (1) expenditures to purchase, install, operate, and maintain the equipment and (2) expenditures to address health effects that may be induced by exposures of humans to ionizing radiation, such as cancer and genetic diseases. In evaluating expenditures to address health effects, DOE assumes that collective dose is proportional to the risk (i.e., the probability of observing radiation-induced health effects in a fixed population). Benefits accrue as a result of

(1) reduced expenditures for equipment and (2) reduced collective dose. To determine the collective dose to the exposed population for purposes of the ALARA analysis, the number of exposed persons would be multiplied by the average individual dose. The average individual dose is determined, to the extent practicable, by estimating anticipated doses to actual people (rather than doses to hypothetical maximally exposed persons), as was done for verification of compliance with the DOE public dose limit.

In addition to analysis of direct costs and benefits, consideration of technological, environmental, social, and public policy factors must also be a component of the ALARA analysis. While the particular nonradiological factors to be considered with respect to the release of HF and CaF_2 from the DUF_6 conversion facilities would be identified by UDS on the basis of case-specific issues, the following list provides examples of possible factors within each general category.

- *Technological factors:* promotion of emerging technology, technology transfer, robustness of technology, industrial safety of technology, and track record of technology;

- *Environmental factors:* effects on ecological resources, waste generation rates, ease of management of resulting wastes, probable disposition of resulting wastes, and fate of residual radioactive material released;

- *Social factors:* impacts on local/national product market, employment, public acceptance, environmental justice considerations, and transportation effects; and

- *Public policy factors:* consistency with waste minimization principles, promotion of resource conservation, adaptability to existing procedures and protocols, and environmental permitting issues.

E.4.4 Coordination with NRC and Agreement States

DOE policy prohibits the transfer of radioactive materials that require an NRC license to members of the public who are not licensed to receive them (see, e.g., Sections 3.7 and 5.6 of DOE [2002] and Section IV.5 of DOE Order 5400.5 [DOE 1990]). Accordingly, before DOE approves authorized limits for the release of HF or CaF_2, the NRC or responsible Agreement State must be consulted to ensure that releases under the proposed authorized limits do not violate any licensing requirements.

E.4.5 Development of Measurement Protocols

Radiological surveys and measurements of residual radioactive material in HF and CaF_2 must be conducted before the material is released. To accomplish this, measurement protocols, procedures, and equipment must be specified and approved by DOE as being sufficient to meet data quality objectives for characterization of the material being released and verification of

compliance with the authorized limits. To obtain DOE approval for measurement protocols and procedures, UDS will need to show that such actions comply with the quality assurance requirements contained in the *Code of Federal Regulations*, Title 10, Part 830 (10 CFR 830), "Nuclear Safety Management," Subpart A.

E.4.6 Obtaining DOE Approval of Authorized Limits

Authorized limits and survey protocols for the sale of HF and CaF_2 containing volumetrically distributed residual radioactive material must be approved by both the responsible DOE Field Element and the Assistant Secretary for Environment, Safety, and Health. The application for these DOE approvals would contain the information listed below.

- Description of the anticipated physical, chemical, and radiological attributes of the HF and CaF_2 proposed for release;
- Descriptions of the alternative sets of authorized limits evaluated in the ALARA analysis;
- For each alternative set of authorized limits, the expected doses to those individual members of the public most likely to receive the highest doses in the actual and likely use scenario and in the worst plausible use scenario;
- Results of the ALARA analysis, including collective doses and other relative costs and benefits for each alternative set of authorized limits, and discussions of any nonradiological factors that influenced the selection of the proposed authorized limits;
- Clear and concise statement of the proposed authorized limits for HF and CaF_2, including the limit for each isotope of concern;
- Discussion of the measurement protocols that would be implemented to determine compliance with the proposed authorized limits; and
- Information on activities that have been conducted to gain agreement with representatives of affected groups, including documentation that coordination has occurred with NRC personnel or Agreement State representatives.

E.4.7 Final Documentation

DOE Order 5400.5 requires that documentation of specific information related to releases of property containing residual radioactive material be made part of DOE's permanent record. In addition, DOE recognizes the importance of public participation in its program operations (DOE 2000) and instructs its contractors to make documentation supporting approval of authorized limits and subsequent releases of property containing residual radioactive material available to the public (DOE 2002). Accordingly, in addition to the information provided in this EIS, the

documentation listed below regarding DOE's approval of authorized limits and subsequent sales of HF and CaF_2 from the DUF_6 conversion facilities would be made available in the public record.

- Application submitted by UDS to DOE requesting that authorized limits be established for the sale of HF and CaF_2 from the DUF_6 conversion facilities;
- DOE's final approval of authorized limits for the sale of HF and CaF_2 from the DUF_6 conversion facilities; and
- Periodic performance reports submitted by UDS to DOE summarizing the contents of (1) certificates of conformance issued by UDS after batches of HF and CaF_2 destined for sale have been sampled and analyzed according to approved procedures and determined to meet the applicable authorized limits, (2) analytical results from the sampling and analysis, and (3) shipping manifests indicating the disposition of the HF and CaF_2.

E.5 BOUNDING ESTIMATION OF POTENTIAL HUMAN HEALTH IMPACTS FROM HF AND CaF_2 SALE AND USE

E.5.1 Radiological Impacts

E.5.1.1 Exposures to HF

Bounding radiological impacts resulting from exposure to trace amounts of uranium (U) and technetium (Tc) in HF were calculated by considering a hypothetical worker working in close proximity to an HF storage tank. The storage tank was assumed to be a 10,000-gal (37,854-L) cylindrical container, with a diameter of 3.2 m (10.5 ft) and a height of 4.7 m (15.4 ft). The worker was assumed to work 2,000 hours per year at a distance of 1 m (3 ft) from the storage tank. Concentration of U in the HF solution was assumed to be 3 pCi/mL (6.4 parts per million [ppm]), the NRC-approved limit for the Framatome ANP facility; the concentration of Tc was assumed to be 15.9 parts per billion of uranium (ppb U), or 2×10^{-3} pCi/mL.

Potential radiation exposure incurred by the hypothetical worker was considered to result from external radiation and inhalation. Because of the corrosive nature of HF, ingestion of HF was considered extremely unlikely and was excluded from consideration. According to Occupational Safety and Health Administration (OSHA) standards, the permissible exposure limit to HF vapor is 3 ppm. For concentrations of 3 to 30 ppm, a minimum of a full-face respirator equipped with an HF canister must be worn. Unlike HF, which can vaporize under room temperature, U and Tc oxides that are contained in HF solution would most likely stay in the solution. However, for the purpose of calculating a bounding exposure, the oxides were assumed to be entrained in the vaporized HF molecules. The permissible limit of 3 ppm was assumed as the air concentration for HF. The DOE-recommended air release fraction (ARF) of 0.002 for radionuclide solute in aqueous solutions (DOE 1993) was assumed for the U and Tc

oxides. The bounding inhalation dose was calculated by using an inhalation rate of 1.2 m^3/h and the maximum inhalation dose conversion factors (Class Y for U and Class W for Tc) from the U.S. Environmental Protection Agency (EPA 1988). The bounding external dose was calculated with the MicroShield computer code (Negin and Worku 1992).

On the basis of the above assumptions, it is estimated that total radiation dose for a worker in close proximity to the HF storage tank would be 0.034 mrem/yr. External radiation contributes 0.027 mrem/yr to the total dose and is the dominating pathway. Radiation doses result primarily from exposure to uranium isotopes and their decay products; the dose contribution from Tc is negligible. It should be reiterated that this bounding dose was estimated by combining several extremely conservative assumptions; for example, the close proximity to the storage tank, the exposure duration of all the work hours in a year, the entrainment of U and Tc oxides, and the bounding air release fraction for U and Tc oxides. In reality, the actual dose resulting from using or handling the HF product would be much smaller. For comparison, the radiation dose constraint set to protect the general public from a DOE practice is 25 mrem/yr (see Section E.4).

As discussed in Appendix A, Sections A.4 through A.6, transuranic (TRU) radionuclides are not expected to reach the conversion chambers in the facility and should not be present in any measurable quantities in the conversion products. Any minute concentration of such radionuclides in the products would be much less than the 10% threshold discussed in Section A.5. As a result, their contribution to doses calculated in this appendix would be negligible.

E.5.1.2 Exposures to CaF_2

Bounding radiological impacts resulting from exposure to trace amounts of U and Tc in CaF_2 were calculated by considering an exposure scenario similar to that considered for HF. A hypothetical worker was assumed to work in close proximity to a CaF_2 filling bag. The filling bag was assumed to have a 19-t (21-ton) capacity, with a diameter of 2.8 m (9.2 ft) and a height of 1.2 m (4 ft). The worker was assumed to work 2,000 hours per year at a distance of 1 m (3 ft) from the filling bag. Concentrations of U and Tc in CaF_2 were assumed to be half of those in HF solution, that is, 1.5 pCi/g for U and 15.9 ppb U or 1×10^{-3} pCi/g for Tc.

Potential radiation exposure incurred by the hypothetical worker was considered to result from external radiation, inhalation, and ingestion. The U and Tc oxides were assumed to attach to the CaF_2 particles and to become suspended in air during the filling operation. According to OSHA standards (OSHA 2002), the particulate emission limit for fluoride compounds is 2.5 mg/m^3. This limit was used to calculate the air concentration for CaF_2 and, subsequently, the air concentrations of U and Tc. The bounding inhalation dose was calculated by assuming a respirable fraction of 10% and by using an inhalation rate of 1.2 m^3/h and the maximum inhalation dose conversion factors (Class Y for U and Class W for Tc) from the EPA (EPA 1988). The hypothetical worker was also assumed to ingest CaF_2 particles incidentally. The ingestion rate was assumed to be 100 mg/d. Like inhalation, the maximum ingestion dose conversion factors for U and Tc from the EPA (EPA 1988) were used to calculate the bounding

ingestion dose. The bounding external dose was calculated with the MicroShield computer code (Negin and Worku 1992).

On the basis of the above assumptions, the estimated total radiation dose for a worker in close proximity to the CaF_2 filling station would be 0.234 mrem/yr. External radiation contributes only 0.007 mrem/yr to the total dose, which is dominated by the contribution from inhalation, 0.217 mrem/yr. The rest of the dose is contributed by ingestion, 0.01 mrem/yr. Radiation doses result primarily from exposure to uranium isotopes and their decay products; the dose contribution from Tc is negligible. It should be reiterated that this bounding dose was estimated by combining several extremely conservative assumptions, for example, the close proximity of the worker to the filling bag, the exposure duration of all the work hours in a year, and the maximum allowable particulate concentration of fluoride compounds in the air. In reality, the actual dose resulting from use or handling the CaF_2 product would be much smaller. For comparison, the radiation dose constraint set by DOE to protect the general public from a DOE practice is 25 mrem/yr (see Section E.4).

E.6 POTENTIAL SOCIOECONOMIC IMPACTS OF HF AND CaF_2 SALE AND USE

The *DUF_6 Conversion Product Management Plan* (UDS 2003a) identifies potential uses of conversion facility products, either as CaF_2 or as aqueous HF. This section assesses the impacts from the use of these products at the U.S. locations likely to be directly affected and in the U.S. economy as a whole. Since the success of CaF_2 and HF sales to chemical manufacturers depends on future market conditions, the impacts of treating CaF_2 or aqueous HF as waste are also considered.

E.6.1 Impacts from the Sale and Use of HF

The current aqueous HF producers have been identified as a potential market for the 19,200 t (21,200 tons) of aqueous HF that could be produced by the proposed conversion facility (UDS 2003a), with UDS-produced aqueous HF replacing some or all of current U.S. production. The impact of HF sales on the local economy in which the existing producer is located and on the U.S. economy as a whole is likely to be minimal.

All aqueous HF currently produced in the United States is manufactured by Honeywell at a facility in Geismar, Louisiana. Additional plants owned by Honeywell and other companies serving the U.S. market are located in Canada and Mexico. The Geismar plant as a whole employs a fairly large number of workers and manufactures a range of industrial chemicals, including both anhydrous and aqueous HF, which is marketed in various concentrations. The manufacture of aqueous HF employs a small number of production and clerical workers. A fleet of dedicated tankers employing a small number of drivers is used to transport HF to end-users in various locations in the United States (Honeywell International, Inc. 2002).

Although the actual impact of the sale of UDS HF is not known, if Honeywell were to purchase HF from UDS, production of aqueous HF at the Geismar facility might be reduced or

cease altogether, which would mean the loss of some or all aqueous HF production and transportation employment at the plant and the loss of some related clerical employment.

The loss of employment and income at the Geismar facility with the end of aqueous HF production and transportation would lead to minor additional losses in the surrounding economy, with a slight reduction in activity associated with reduced wage and salary spending. Offsetting these losses would be a slight increase in transportation employment at Paducah and Portsmouth associated with the shipment of HF from the UDS facilities. There would also be benefits to the U.S. balance of trade, with the use of UDS-produced HF reducing the need to import CaF_2, the raw material for HF production. These benefits would be minimal, however, given the small quantity of HF production likely to take place at the proposed facilities and the relatively low potential value of the HF product. There would also be some benefits to Honeywell in terms of cost savings associated with the end of blending anhydrous with aqueous HF. However, if HF concentrations were different than those preferred by end-users, some additional capital and operating expenditures might be needed to accommodate the change in acid concentration (Taylor 2003).

E.6.2 Impacts from the Sale and Use of CaF_2

No market for the 20,600 t (22,700 tons) of CaF_2 that might be produced in the proposed conversion facilities at Paducah and Portsmouth annually has been identified (UDS 2003a). If a market for CaF_2 is found, the impact of CaF_2 sales on the U.S. economy would likely be minimal.

Although CaF_2 was produced in the United States until 1995, most of the 636,000 t (701,000 tons) of CaF_2 consumed in the United States in 2001 was imported. While the use of CaF_2 produced at the UDS facilities would affect the balance of trade, this impact would be minor, given the small quantity of CaF_2 production at the proposed facilities and the relatively low potential value of the CaF_2 product. There might be benefits to U.S. users of CaF_2 if the price of CaF_2 produced in the proposed facilities provided a significant incentive to use the UDS products rather than imported material. However, a price range for UDS-produced CaF_2 has not yet been established, and since plentiful supplies of CaF_2 are available from overseas, the small amount of CaF_2 that would be produced would not likely have a significant effect on the domestic market.

E.6.3 Impacts from the Nonuse of HF and CaF_2

If no market for either HF or CaF_2 is established, it is likely that the material would be disposed of as waste. This would require shipping these wastes to an approved waste disposal facility. While disposal activities would result in a small number of transportation jobs and might lead to additional jobs at the waste disposal facility, the impact of these activities in the transportation corridors, at the waste disposal site(s), and on the U.S. economy would be minimal.

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APPENDIX F:

ASSESSMENT METHODOLOGIES

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ASSESSMENT METHODOLOGIES

In general, the activities assessed in this environmental impact statement (EIS) could affect workers, members of the general public, and the environment during construction of new facilities, during routine operation of facilities, during transportation, and during facility or transportation accidents. Activities could have adverse effects (e.g., human health impairment) or positive effects (e.g., regional socioeconomic benefits, such as the creation of jobs). Some impacts would result primarily from the unique characteristics of the uranium and other chemical compounds handled or generated under the alternatives. Other impacts would occur regardless of the types of materials involved, such as the impacts on air and water quality that can occur during any construction project and the vehicle-related impacts that can occur during transportation. The following sections describe the assessment methodologies that were used to evaluate potential environmental impacts associated with the no action alternative and the action alternatives.

F.1 HUMAN HEALTH AND SAFETY — NORMAL FACILITY OPERATIONS

F.1.1 Radiological Impacts

F.1.1.1 Receptors

For this EIS, radiation effects during normal (or routine) operations were assessed by first estimating the radiation dose to workers and members of the general public from the anticipated activities required under each alternative. The analysis considered three groups of people: (1) involved workers, (2) noninvolved workers, and (3) members of the general public. They are defined as follows:

- *Involved Workers:* Persons working at a site who are directly involved with the handling of radioactive or hazardous materials.
  - They might be exposed to direct gamma radiation emitted from radioactive materials, such as depleted uranium hexafluoride (DUF_6) or other uranium compounds.
  - The radiation doses they would receive from inhaling uranium would be very small when compared with the direct radiation doses that result from enclosed processes. Containment and ventilation controls would be used to reduce airborne radionuclides in workplaces. Furthermore, the requirement of wearing protective respirators would limit inhalation exposures to very low levels.

  - Involved workers would be protected by a dosimetry program designed to control doses below the maximum regulatory limit of 5 rem/yr for workers (*Code of Federal Regulations*, Title 10, Part 835 [10 CFR Part 835]).

- *Noninvolved Workers:* Persons working at a site but not directly involved with the handling of radioactive or hazardous materials.

  - They might be exposed to direct radiation from radioactive materials (although at a great distance) and to trace amounts of uranium released to the environment through site exhaust stacks.

  - They could receive radiation exposure through inhalation of radioactive material in the air, external radiation from radioactive material deposited on the ground, and incidental ingestion of soil.

- *Members of the General Public:* Persons living within 50 mi (80 km) of the site.

  - They might be exposed to trace amounts of uranium released to the environment through exhaust stacks or wastewater discharges.

  - They could receive radiation exposure through inhalation of radioactive material in the air, external radiation from deposited radioactive material, and ingestion of contaminated water, food, or soil.

For the noninvolved workers and general public, doses were estimated for the group as a whole (population or collective dose) as well as for a maximally exposed individual (MEI). The MEI is defined as a hypothetical person who — because of proximity, activities, or living habits — could receive the highest possible dose. The radiation exposures of the MEIs would be bounded by the exposure calculated on the basis of maximum air concentrations for airborne releases and on the basis of maximum surface water or groundwater concentrations for waterborne releases. For involved workers, the average individual dose rather than the MEI dose was estimated because of the uncertainty about the activities of each involved worker. In addition to the average individual dose, the collective dose was also estimated for involved workers. Under actual conditions, all radiation exposures and releases of radioactive material to the environment are required to be as low as reasonably achievable (ALARA), a practice that has as its objective the attainment of dose levels as far below applicable limits as possible.

F.1.1.2 Radiation Doses and Health Effects

All radiological impacts were assessed in terms of committed dose and associated health effects. The calculated dose was the total effective dose equivalent (10 CFR Part 20), which is the sum of the deep dose equivalent from exposure to external radiation and the 50-year committed effective dose equivalent from exposures to internal radiation. Radiation doses were

calculated in units of milliroentgen-equivalent man (mrem) for individuals and in units of person-rem for collective populations.

The potential radiation doses resulting from normal operations would be so low that the primary adverse health effects would be the potential induction of latent cancer fatalities (LCFs). Health risk conversion factors (expected LCFs per absorbed dose) from Publication 60 of the International Commission on Radiological Protection (ICRP 1991) were used to convert radiation doses to LCFs, that is, 0.0005 per person-rem for members of the general public and 0.0004 per person-rem for workers. Adverse health effects for individuals were assessed in terms of the probability of developing an excess LCF; adverse health effects for collective populations were assessed as the number of excess LCFs expected in the population.

F.1.1.3 Exposure Pathways

External radiation would be the primary exposure pathway for involved workers because they would directly handle radioactive materials and/or be at a close distance from radiation sources. Radiation exposures through inhalation and incidental ingestion of contaminated particulates would be possible; however, the exposure would probably be very small compared with exposures from external radiation. Operations that could result in potential airborne emissions would be confined and most likely would be automated and controlled remotely. Even if airborne emissions did occur, the use of high-efficiency particulate air (HEPA) filters and various air circulation systems would reduce the amount of airborne pollutants in the workplace to a minimal level. Exposures from inhalation could also be prevented by implementation of ALARA practices, as required. For example, workers could wear respirators while performing activities associated with potential airborne emissions. Potential exposure from incidental ingestion of particulates could be reduced if workers wore gloves and followed good working practices.

Inhalation of contaminated particulates and incidental ingestion of deposited particulates were considered for noninvolved workers who, because of being located farther away from the radiation sources handled in the facilities, would not be exposed to direct external radiation from those sources. However, secondary external radiation would be possible from the deposited radionuclides on ground surfaces and from airborne radionuclides when the emission plume from the stacks of the processing buildings passed the locations of the noninvolved workers. The potential radiation exposure would be bounded by the exposure associated with the largest downwind air concentration. To obtain conservative estimates of the bounded value, the noninvolved workers were assumed to be exposed to radiation caused by airborne emissions without any shielding from buildings or other structures.

Radiation exposures of members of the off-site general public were assessed for both airborne and waterborne pathways. The airborne pathways included inhalation of contaminated particulates, external radiation from deposited radionuclides and from airborne radionuclides, incidental ingestion of deposited radionuclides, and ingestion of contaminated food products (plants, meat, and dairy products). Plants grown in the area where the emission plume passed could become contaminated by deposition of radionuclides on leaves or ground surfaces.

Radionuclides deposited on leaves could subsequently translocate to the edible portions of the plants; those deposited on ground surfaces could subsequently be absorbed by plant roots. Livestock and their products could become contaminated if the livestock ate the contaminated surface soil and plants.

The waterborne pathways included ingestion of surface water and groundwater; ingestion of contaminated plant foods, meat, and dairy products; and potential radon exposure from using contaminated water. Plant foods and fodder could be contaminated from irrigation with contaminated water, and the livestock and their products could become contaminated if the livestock were fed with contaminated water and ate contaminated fodder. Potential indoor radon exposures would be possible if contaminated water was used indoors and radon gas emanated from the water. Because of the large dilution capability of surface water at the site, the estimated radionuclide concentrations in surface water were always very low, and potential radiation exposures from the food chain pathways associated with these low water concentrations would be negligible. Therefore, radiation exposures resulting from contaminated surface water were assessed only for the drinking water pathway. The dilution capability would be smaller for groundwater, resulting in higher groundwater concentrations. Therefore, if the groundwater was predicted to be contaminated, radiation exposures from the food chain pathways, radon pathway, and drinking water pathway were all estimated.

Radiation exposure of the off-site general public MEI would be bounded by the exposure associated with the maximum downwind air concentration and maximum water concentration.

F.1.1.4 Data Sources and Software Applications

Potential impacts associated with the operations of the conversion facility were estimated or calculated using measurement data or computer codes.

The external exposures incurred by the involved workers in the conversion facility were estimated on the basis of the measurement data for worker exposures at the Framatome Advanced Nuclear Power (ANP) facility in Richland, Washington. A dry conversion process is used to convert UF_6 into uranium oxide at the Framatome facility. A similar conversion process would be implemented at Portsmouth. According to Uranium Disposition Services, LLC (UDS 2003a), the key components of the conversion facility at Portsmouth would be similar to those at Framatome; therefore, conditions for potential worker exposures are expected to be similar at these two facilities. The worker exposure data from Framatome provided in the UDS National Environmental Policy Act (NEPA) data package (UDS 2003b) were used to obtain involved worker exposures at Portsmouth, with consideration of different specific activities in the processed uranium materials and different uranium processing rates. Potential external radiation exposure for employees working in the cylinder storage yards resulting from loading and unloading cylinders were estimated with the use of the MicroShield computer code (Negin and Worku 1992). To use MicroShield, potential exposure distances, duration of activities, and number of workers involved in each activity were developed. MicroShield is a commercial software program designed to estimate external radiation doses from a variety of sources; it is widely used for such applications. External exposures for cylinder yard workers from

maintenance activities were estimated on the basis of past site-specific monitoring data. The increase in cylinder number resulting from arrival of the ETTP cylinders and decrease in cylinder number resulting from conversion of DUF_6 to U_3O_8 were both taken into account. In actuality, the radiation dose to the individual worker would be monitored and maintained below the DOE administrative control limit of 2,000 mrem/yr (DOE 1992), which is below the regulatory dose limit of 5,000 mrem/yr (10 CFR Part 835).

Radiological impacts from airborne pathways were estimated with the emission data provided in the UDS NEPA data package (UDS 2003b) and the use of the CAP88-PC computer code (Chaki and Parks 2003). CAP88-PC was developed under the sponsorship of the U.S. Environmental Protection Agency (EPA) and was designed for use in demonstrating compliance with regulatory requirements on air emissions. It uses site-specific or representative meteorological data (joint frequency data) to estimate the air concentrations at downwind locations, calculates the biota concentrations by using biotransfer models, and then estimates the corresponding radiation doses.

Depending on the location of the conversion facility, the on-site maximum air concentrations would be different from the off-site maximum air concentrations; however, on the basis of the small emission rate provided by UDS (UDS 2003b), both maximum concentrations would be very small. In this EIS, a bounding approach was used to find the potential exposures of the MEI of the noninvolved workers and the general public.

The absolute maximum downwind air concentrations determined solely by the meteorological data were used to find the bounding exposures of both MEIs. Because of the use of the bounding approach, the potential MEI impacts associated with the different conversion facility locations would be the same. This bounding approach was judged to be acceptable because the location of the conversion facility would not be determined on the basis of the MEI exposures, since such impacts would be insignificant.

According to the CAP88-PC results, the maximum downwind air concentrations would be located at approximately 380 m (1,247 ft) from the emission stack of the conversion facility. The bounding collective exposure of the noninvolved workers was estimated by multiplying the MEI dose with the population of noninvolved workers. The number of noninvolved workers was estimated by using year 2000 information on sitewide worker distribution. Collective off-site population exposure was calculated by using CAP88-PC with 2000 population distribution data. A range of 50 mi (80 km) around the site was considered.

Because no waterborne release of uranium is expected from the conversion facility process water (UDS 2003b), potential impacts resulting from the use of contaminated surface water were not estimated.

F.1.1.5 Source for the Derived Results

Results presented in this EIS for the no action alternative and cylinder preparation activities at ETTP under the action alternatives were derived from the site-specific data

compilation reports prepared for the DUF_6 management program in support of NEPA requirements (Hartmann 1999a-c) and the programmatic EIS (PEIS) (U.S. Department of Energy [DOE] 1999). The receptors and exposure pathways for the data compilation report and the PEIS were the same as those described above. In addition, site-specific meteorological and aquatic environmental data at the Portsmouth and ETTP sites were used. The assumptions used for the no action alternative in the data compilation report were considered to bound the potential impacts. Detailed discussions on the assumptions are provided in Section 5.1.1 of this EIS. Worker activities for preparing cylinders for shipment (including retrieving cylinders, inspecting them, and loading them to a transportation vehicle) from ETTP to Portsmouth were assumed to be the same as those considered in the PEIS. Therefore, impacts for the involved workers presented for the cylinder preparation activities in the PEIS were used in this report.

For involved workers, radiation exposures were dominated by the external exposure pathway. Potential doses in the data compilation report (UDS 2003b) and PEIS (DOE 1999) were estimated with information on worker activities and with the use of the MicroShield computer code (Negin and Worku 1992). Radiation exposures of the noninvolved workers, on the other hand, would result mainly from the airborne release of depleted uranium. For cylinder preparation activities, air emissions are expected to be negligible. Therefore, no impact would be expected for the noninvolved workers. Under the no action alternative, the emissions locations and emissions rates assumed in the data compilation report (Hartmann 1999b) were adopted to bound the potential impacts. Consequently, the results that were obtained by using the emissions data and an air dispersion model from that report were used directly for the MEIs. For the collective exposure, an upper bound estimate was obtained by multiplying the MEI dose with the sitewide worker population. The upper bound values rather than the actual values were used because the potential level of radiation exposures would be very small (< 0.1 mem/yr).

Radiation exposures of the general public would result from both airborne and waterborne releases. For cylinder preparation activities, there would be negligible air emissions and waterborne releases. Therefore, no impact would be expected for the general public. For the no action alternative, because the bounding assumptions used in the data compilation report were adopted, results from that report were used directly in this EIS for the MEI. The collective exposures were obtained by scaling the results in the data compilation report with the population size. This scaling approach was used because of the very small exposures and the small change (less than 3%) in the total population within 50-mi (80-km) of the Portsmouth site between 1990 and 2000.

F.1.1.6 Exposure Parameters and Dose Conversion Factors

Inhalation rates for workers were assumed to be 1.2 m^3/h (ICRP 1994), with an exposure duration of 8 hours per day for 250 days per year. The inhalation rate for the general public was assumed to be 20 m^3/d, with an exposure duration of 24 hours per day for 365 days per year. The ingestion rate for drinking water for the public was assumed to be 2 L/d. No building shielding effect was considered for inhalation and external radiation exposures. Therefore, radiation doses estimated in this way would be greater than the actual doses, which would always be associated with some shielding from buildings.

Site-specific agriculture data (yield per unit area) for food crops and fodder were used. Default food consumption data for a rural setting from CAP88-PC were also used. Nevertheless, it was found that radiation doses from the food ingestion pathways constituted only a small fraction of the total dose, which is dominated (>90%) by doses from inhalation (for airborne pathways).

CAP88-PC uses the EPA internal dose conversion factors to estimate internal doses (EPA 1988). The inhalation doses depend strongly on the solubilities of the inhaled chemicals. With high solubility, a chemical would be excreted from the human body within a shorter period of time and would result in less internal exposure. For U_3O_8, it was assumed to remain in the human body for years, thus resulting in greater radiation exposures. The ingestion doses were estimated by assuming that the uranium compounds would be absorbed by the gastrointestinal tract to the largest extent possible for uranium compounds; this would result in the maximum internal exposure.

Key Concepts in Estimating Risks from Low-Level Chemical Exposures

Reference Level

- Intake level of a chemical below which adverse effects are very unlikely.

Hazard Quotient

- A comparison of the estimated intake level or dose of a chemical with its reference dose.
- Expressed as a ratio of estimated intake level to reference dose.
- Example:
  - The EPA reference level (reference dose) for ingestion of soluble compounds of uranium is 0.003 mg/kg of body weight per day.
  - If a 150-lb (70-kg) person ingested 0.1 mg of soluble uranium per day, the daily rate would be $0.1 \div 70 \approx 0.001$ mg/kg, which is below the reference dose and thus unlikely to cause adverse health effects. This would yield a hazard quotient of $0.001 \div 0.003 = 0.33$.

Hazard Index

- Sum of the hazard quotients for all chemicals to which an individual is exposed.
- A value less than 1 indicates that the exposed person is unlikely to develop adverse human health effects.

F.1.2 Chemical Impacts

The method used to assess the potential human health impacts from exposures to chemicals of concern emitted during normal operations was discussed in detail in the DUF_6 PEIS (DOE 1999). The chemicals of greatest concern are soluble and insoluble uranium compounds and hydrogen fluoride (HF). Uranium compounds can cause chemical toxicity to the kidneys; soluble compounds are more readily absorbed into the body and thus are more toxic to the kidneys. HF is a corrosive gas that can cause respiratory irritation in humans, with tissue destruction or death resulting from exposure to large concentrations. No deaths are known to have occurred as a result of short-term (i.e., 1 hour or less) exposures to 50 parts per million (ppm) or less of HF. Neither uranium compounds nor HF are chemical carcinogens; thus, cancer risk calculations were not applicable for this assessment.

For long-term, low-level (chronic) exposures to uranium compounds and HF emitted during normal operations, potential adverse health effects for the hypothetical MEI in the

noninvolved worker and general public populations were calculated by estimating the intake levels associated with anticipated activities. Intake levels were then compared with reference levels below which adverse effects are very unlikely. Risks from normal operations were quantified as hazard quotients and hazard indices (see text box on previous page).

F.1.2.1 Receptors

The main source of impacts to noninvolved workers and members of the public would be the emission of trace amounts of uranium compounds or HF from exhaust stacks. Chemical exposures for involved workers would depend, in part, on detailed facility designs that have not yet been determined; however, the workplace environment would be monitored to ensure that airborne chemical concentrations were kept below applicable exposure limits.

F.1.2.2 Chemical Doses and Associated Health Effects

For normal operations, risks were expressed by using the hazard quotient concept for exposures to noncarcinogens (i.e., comparison of estimated receptor doses with reference levels or doses below which adverse effects would be very unlikely to occur). In general, the chemicals of concern for this EIS were uranium and fluoride compounds, especially HF gas. These substances would not be chemical carcinogens; thus, cancer risk calculations were not applicable. The toxicity of the exposures for relevant receptors was estimated through comparison with oral and inhalation reference levels (levels below which adverse effects would be very unlikely to occur). The oral reference dose of 0.003 mg/kg-d was used for evaluating risks from ingestion of soluble uranium compounds; the EPA derived this value on a the basis of a lowest-observed-adverse-effect level in rabbits of 3 mg/kg-d of uranyl nitrate hexahydrate, combined with an uncertainty factor of 1,000 (Maynard and Hodge 1949; EPA 2003a). Because of conflicting results concerning absorption of insoluble uranium compounds such as U_3O_8 from the gastrointestinal tract, the oral reference dose of 0.003 mg/kg-d was also used in this analysis for calculating hazard quotients for this compound. This assumption is conservative because the gastrointestinal tract would absorb a smaller amount of insoluble than soluble uranium compounds.

Inhalation reference concentrations for uranium compounds and HF are not currently available from standard EPA sources. To assess potential risks from inhalation of these compounds, derived reference levels were developed from proposed Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) (29 CFR Part 1910.1000, Subpart Z, as of February 2003). The 8-hour time-weighted-average PEL for soluble uranium compounds is 0.05 mg/m^3; for insoluble uranium compounds, it is 0.25 mg/m^3; and for HF, it is 3 ppm (2.5 mg/m^3). These values were converted to assumed inhalation reference level values for noninvolved workers in mg/kg-d by assuming an inhalation rate of 20 m^3/d and a body weight of 70 kg (154 lb), resulting in derived worker inhalation reference level values of 0.014 and 0.71 mg/kg-d for soluble uranium compounds and HF, respectively.

The inhalation reference level calculated for soluble compounds was also used for insoluble uranium compounds. To generate derived inhalation reference level values for the general public, these worker values were adjusted to account for increased exposure duration of the general public (assumed to be 168 hours per week rather than 40 hours per week); an additional uncertainty factor of 10 was used to account for sensitive subpopulations in the general public. This results in derived inhalation reference levels for the general public of 0.0003 and 0.02 mg/kg-d for uranium compounds and HF, respectively.

The reference levels used for preliminary evaluation of general public hazard quotients and carcinogenic risks from the existing environment were obtained from the EPA's Integrated Risk Information System (IRIS) when available (EPA 2003a). The derived reference concentration levels for uranium compounds and HF discussed above were used as reference levels for evaluating inhalation of these substances.

F.1.2.3 Exposure Pathways and Parameters

As described in Section F.1.1 (radiological impacts for normal facility operations), the chemical exposures for the noninvolved worker and general public MEIs would result mainly from airborne releases from the conversion facility. The maximum downwind air concentrations of uranium compounds and HF emitted from the conversion facility were calculated. These maximum downwind concentrations would be the same for the three alternative locations at Portsmouth, although the exact location of the maximum level would be different. The maximum concentrations were used to estimate maximum exposures for both the noninvolved worker MEI and the general public MEI, although the maximum concentration location could be either within or outside the gaseous diffusion plant boundaries, depending on the location of the conversion facility. This simplified approach to the analysis of potential chemical impacts is justified because the exposures and hazard indices calculated on the basis of these maximum possible exposures are very low. In other words, the identification of very small differences in hazard indices for the MEI receptors for the three alternative locations at the site would not be helpful in differentiating chemical exposure impacts for the locations, because all the exposures would be very small and would not result in adverse effects (see the results in Chapter 5 of this EIS).

Differences in estimated exposures and hazard indices for the noninvolved worker MEI and the general public MEI result from differences in assumed exposure times (e.g., the general public MEI is assumed to be a resident exposed continually, whereas the noninvolved worker MEI would be exposed for only 8 hours per day) and from differences in reference doses for workers and the general public.

For the MEI receptors, it was also assumed that exposure could occur through incidental soil ingestion. Similar to the approach used to assess inhalation exposures, it was assumed that both the noninvolved worker MEI and the general public MEI could be exposed to the maximum estimated soil concentration of contaminants associated with conversion plant emissions, whether that location was inside or outside the gaseous diffusion plant boundaries. No waterborne release of uranium is expected from construction and operation of the conversion facility (UDS 2003b); therefore, potential impacts resulting from use of contaminated water were

not estimated. For the no action alternative analyses, potential chemical exposures from runoff water contaminated through cylinder breaches were calculated by using the estimated surface or groundwater concentrations obtained through water quality analyses.

F.1.2.4 Exposure Modeling and Risk Evaluation

Media-specific concentrations of contaminants associated with the normal operation of the facility for the various options were modeled on the basis of effluent data provided in the NEPA data report (UDS 2003b). For airborne pathways, these effluent amounts were modeled by using either the CAP88-PC computer code (see Section F.1.1) or the Industrial Source Complex (ISC) computer code (see Section F.4.1).

Modeled concentrations of contaminants in the various environmental media were used to estimate average daily intakes for the various receptors examined. The ratios of the daily intakes to appropriate reference levels were calculated to generate hazard quotients. Hazard quotients were summed for individual contaminants and across all appropriate exposure routes (e.g., inhalation, soil ingestion) to generate hazard indices for the noninvolved worker MEI and the general public MEI. These hazard indices were compared with the reference hazard index of 1. A hazard index of less than 1 is interpreted to indicate that adverse noncancer effects are unlikely; a hazard index of greater than 1 indicates that adverse effects are possible for the MEI and that further investigation of potential exposures and additivity of individual contaminant toxicity are warranted.

When no adverse effects are expected for the MEI of a given population (i.e., the hazard index is less than 1), then, by definition, no adverse effects are expected in that population. Therefore, calculation of population risks is not applicable when MEI hazard indices are less than 1.

F.2 HUMAN HEALTH AND SAFETY — FACILITY ACCIDENTS

F.2.1 Radiological Impacts

The DUF_6 PEIS (DOE 1999) discussed in detail the analysis of facility accidents that potentially could cause radiological health impacts (PEIS Sections 4.3.2 and A.4.2). Specifically, it addressed the consequences, frequencies, and risks from the accident scenarios postulated to occur at a conversion facility as well as at the current cylinder storage locations. The analysis involved the application of the following three radiological and air dispersion software packages: GENII (Napier et al. 1988), HGSYSTEM (Hanna et al. 1994; Post et al. 1994a,b) and FIREPLUME (Brown et al. 1997).

In the DUF_6 PEIS (DOE 1999), the accident analyses assumed that the accident would occur in the center of the storage yard site (i.e., Portsmouth and ETTP). For collective exposures, radiation doses were assessed for the population within a distance of 50 mi (80 km) from the

release point. Because the distance between the possible facility locations and the center point of the sites is much smaller than the assessment distance of 50 mi (80 km), the location of the conversion facility would have very little impact on the off-site collective exposures. Individual and population impacts were estimated for the public and noninvolved workers. Impacts to involved workers during accidents were not quantified because it was recognized that, depending on the accident conditions and the exact location and response of the workers, the involved workers would also be subject to severe physical and thermal (fire) hazards and that the impacts from such hazards might be greater than the impacts from radiological or chemical exposure. Therefore, injuries and fatalities among involved workers would be possible from chemical, radiological, and physical forces if an accident did occur.

Since the population distribution estimate would not vary significantly with the specific location of the conversion facility, the methodology used to analyze the collective public dose in the PEIS also would apply for this EIS analysis. Similarly, the assumptions made in the PEIS for estimating the MEI doses were kept the same. For ground-level releases, the MEI was assumed to be located at a distance of 328 ft (100 m) from the release point. For releases from a stack, the MEI was assumed to be at the point of maximum ground concentration. Current on-site and off-site population distributions were used to estimate the collective noninvolved worker and off-site public impact.

Since trace transuranic (TRU) elements were identified in the DUF_6 cylinder inventory after the PEIS analysis was performed, their contribution to additional radiological impact was considered in the analysis for this EIS. A conservative concentration was assumed for the accidents, since the TRU elements are not distributed evenly through the DUF_6 inventory. Comparisons of the relative hazards from this TRU concentration with the hazards from DUF_6 considered in the DUF_6 PEIS were used to determine their radiological impact in the accident analyses conducted for this EIS. Appendix B contains a discussion of the methodology used to assess the impacts associated with the presence of trace TRU contamination in cylinders.

F.2.2 Chemical Impacts

General data used in the accident predictions included the following:

- Release amount (source term) for each chemical released,
- Chemical-specific health impact levels,
- Number of workers on site and population off site by direction, and
- Locations of sources and receptors for both workers and members of the general public.

Two meteorological conditions, D stability with a 4-m/s (9-mph) wind speed and F stability with a 1-m/s (2-miles-per-hour [mph]) wind speed, were assumed for all scenarios except the tornado accident scenario, which assumed D stability and 20-m/s (45-mph) wind.

The same approach used for the DUF_6 PEIS was adopted in this EIS for the chemical facility accident analysis under the no action alternative and the action alternatives. Accident consequences were estimated by using the HGSYSTEM (Version 3) model for the nonfire scenarios and the FIREPLUME model for the fire scenarios. For each scenario and each of the two meteorological conditions, hazard zones were generated for two health indices (i.e., adverse effects and irreversible adverse effects). These zones were overlain on worker and general public geographic information system (GIS) layers, with the zone origin located at the centroid of each of the identified conversion plant site alternatives (Locations A, B, and C; see Figure 2.2-3). Updated data on current Portsmouth GDP workers (2002) and updated general population data (based on the 2000 census) were used to estimate the consequences and associated risk of each accident scenario. The dispersion conditions (i.e., meteorology, accident frequencies, and, for most scenarios, release quantities or source terms) were identical to those developed and used in the DUF_6 PEIS. For the estimated chemical accident risks for the proposed conversion facility, variations in this EIS from values reported in the DUF_6 PEIS are attributable to variations in the candidate locations for the conversion facility, changes in the numbers and locations of workers and the general public, and some changes in the source term values.

Of the nearly eight dozen postulated chemical accidents considered and evaluated in this EIS, a total of eight bounding chemical accidents were identified for detailed risk analysis. These accidents are listed in Table 5.2-8.

F.2.2.1 Nonfire Accident Scenario Modeling

The nonfire accident scenarios were treated as either liquid spills on the ground followed by evaporation and/or pressurized releases from tanks. The DUF_6 PEIS assumed the same temperature for both day and night spill conditions. This analysis differs in that it accounts for evaporation rate reduction not only due to the assumed very conservative (from an air dispersion perspective) low wind speed and F-stability condition combination but also due to what would be typically lower ambient air temperatures during these conditions. The evaporation rate from spilled chemical pools depends on pool temperature and saturation vapor pressure. The pool temperature was conservatively assumed to be constant for the entire release duration and was set equal to the assumed ambient temperature. The saturation vapor pressure was set equal to the partial pressure over the pool. The saturation vapor pressure or the partial pressures of the vapors emanating from the pool depend on the pool temperature. For the aqueous HF spill scenarios, the partial vapor pressures were determined for two temperatures, 77°F (25°C for the F-1 conditions, representative of nighttime conditions during July or August) and 95°F (35°C for D-4 conditions, representative of daytime conditions during July or August). For a 70% HF solution, the partial vapor pressure over the pool is 20 kPa (T_p = 77°F [25°C]) and 31.7 kPa (T_p = 95°F [35°C]), determined empirically. Table F-1 gives the spill assumptions and the source term for the bounding aqueous HF spill scenario.

TABLE F-1 Bounding Aqueous (70%) HF Spill Source Term

Berm Area (m^2)	Evaporative Spill Duration[a] (h)	Evaporation Rate (kg/s)		Spill Amount (kg)	
		F-1	D-4	F-1	D-4
412	2	0.13	0.58	933	4,211

[a] Unmitigated.

The evaporative emissions were estimated by using a simplified evaporative model (EPA 1999). The model uses the molecular diffusion of water and the kinematic viscosity of air to calculate the mass transfer coefficient. A less conservative estimate of the evaporative release rate would be expected if chemical-specific molecular diffusivities and kinematic viscosities were used. Because of the change in quantity and chemical composition of the spill, the spill hazard zone changed in this assessment. A scaling procedure was adopted to recalculate the hazard zone, as detailed below.

For a ground-level release, the simplified Gaussian expression for estimating downwind concentrations can be rearranged to solve for the product of horizontal and vertical plume spread. This expression is shown below:

$$\sigma_y \sigma_z = \frac{Q\ (\text{mg/s})}{\pi u\ (\text{m/s})\ \chi_{LOC}\ (\text{mg/m}^3)} \quad . \tag{F.1}$$

The level of concern, χ_{LOC}, is set to the HF Emergency Response Planning Guideline (ERPG)-1 and ERPG-2 levels. With the source term and wind speeds already known, the respective LOC σ_y σ_z products can be calculated. The hazard distance can than be obtained from the already tabulated sigma products (Turner 1994, Table 2-5). The next step in identifying the hazard area or zone is to estimate the hazard width for each contour. This is done by estimating the approximate contour width at the mid-point or half the hazard distance. With these distances, the respective sigma product and σ_y values in Table F-1 can be used in Equation F.1 to solve for the midpoint centerline concentration. The hazard width can than be estimated by using the following expression:

$$HW = \sigma_y @\ 0.5\ HD\ \{2In[\chi(x,0,0)/\ \chi_{LOC}]\}^2 \quad . \tag{F.2}$$

By using the same procedure described above, hazard zone dimensions can also be estimated for the HF tank release analyzed for the PEIS. The new hazard distances and hazard widths can than be calculated by multiplying the original model-derived values by the ratios of the new to old values calculated by using the above method.

F.2.2.2 Fire Accident Scenario Modeling

In the fire accident scenarios, the release quantities were presented as a function of time for the three phases of the release: puff, fire release, and cooldown. The 48G cylinder fire and vapor temperatures, as reported in Brown et. al. (1997), were used in the FIREPLUME simulations to estimate buoyant and smoldering plume rise and the resulting downwind concentration contours.

F.2.2.3 Pressurized Release Accident Scenario Modeling

The anhydrous ammonia (NH_3) rupture scenario was treated as a pressurized release tank rupture. Some of the key release parameters used for the scenario are listed in Table F-2 (Vincent 2003).

The pressurized release was modeled with the HGSYSTEM AEROPLUME source module and the HGSYSTEM HEGADAS dispersion module (Hanna et al. 1994; Post et al. 1994a,b), which handled the subsequent dispersion and transport of the dense liquid-vapor aerosol mixture emanating from the tank rupture. AEROPLUME is a multicomponent two-phase thermodynamic aerosol jet model that simulates steady-state release rates from a rupture or a leaking pressurized vessel and the near-field vapor cloud development of the flashed vapor and aerosol components in expelled jet release. Upon formation of the flow field from the release point and establishment of a heavy aerosol-laden cloud, the release is linked to the HEGADAS model to simulate dense vapor cloud dispersion and entrainment of ambient air as the cloud moves and disperses downwind.

F.2.2.4 Health Impact Levels

Assessing the consequences from accidental releases of chemicals differs from assessing routine chemical exposures, primarily because the reference doses used to generate hazard indices for long-term, low-level exposures were not intended for use in evaluating the short-term (e.g., duration of several hours or less), higher-level exposures that often accompany accidents. In addition, the analysis of accidental releases often requires the evaluation of different effects: for example, irritant gases can cause tissue damage at the higher levels associated with accidental releases but are not generally associated with adverse effects from chronic, low-level exposures.

TABLE F-2 Anhydrous NH_3 Tank Rupture Spill Parameters

Tank Size (gal)	Fill Level (%)	Tank Fill Amt. (gal)	Release Amt. (lb)	Tank Pressure (psig)[a]	Relief Valve (psig)	Berm Area (ft^2)
6,565	85%	5,580	29,500	209	265	324

[a] psig = pound(s) per square inch gauge.

To estimate the consequences of chemical accidents, two potential health effects endpoints were evaluated: (1) adverse effects and (2) irreversible adverse effects. Evaluation of these two health endpoints was consistent with the accident evaluations typically conducted to assess industrial risks (American Industrial Hygiene Association [AIHA] 2002). Potential adverse effects range from mild and transient effects — such as respiratory irritation, redness of the eyes, and skin rash — to more serious and potentially irreversible effects. Potential irreversible adverse effects are defined as effects that generally occur at higher concentrations and are permanent in nature — including death, impaired organ function (such as damaged central nervous system or lungs), and other effects that may impair everyday functions.

For uranium compounds, an intake of 10 mg or more was assumed to cause potential adverse effects (McGuire 1991). An intake of 30 mg of uranium was used as the health criterion for potential irreversible adverse effects for exposure to uranium as either U_3O_8 or as UO_2F_2. The background document for the U.S. Nuclear Regulatory Commission (NRC) regulations for the Certification of Gaseous Diffusion Plants (10 CFR Part 76) states that "in assessing the adequacy of protection of the public health and safety from potential accidents, the NRC will consider whether the potential consequences of a reasonable spectrum of postulated accident scenarios exceed 0.25 Sv (25 rem), or uranium intakes of 30 mg, taking into account the uncertainties associated with modeling and estimating such consequences" (NRC 1994). According to these regulations, the selection of the 30-mg uranium intake level as an evaluation guideline level for irreversible injury was based on information provided in Fisher et al. (1994).

In applying the 30-mg uranium intake to accident analysis for the uranium compounds, the following parameters were accounted for: molecular weight, solubility, inhalation rate, and duration of predicted exposure. On the basis of an inhalation rate of 1.5 m^3/h as the ventilation rate during light exercise (ICRP 1994), and on appropriate adjustments to account for the percent uranium in each compound, air concentrations corresponding to an intake level of 30 mg were calculated for modeled exposure durations. For example, the air concentration of 26 mg/m^3 of uranyl fluoride (UO_2F_2) corresponding to a 30-mg uranium intake for a 60-minute exposure to UO_2F_2 would be calculated as follows:

$$\frac{30 \text{ mg uranium} \times 308/238 \text{ (molecular weight } UO_2F_2\text{/molecular weight uranium)}}{1.5 \text{ m}^3\text{/h} \times \text{modeled exposure duration (h)}} \cdot \quad \text{(F.3)}$$

In addition, for the insoluble uranium compounds, an uptake factor was incorporated into the calculated air concentrations, on the basis of ICRP guidance that 0.2% absorption be assumed for inhalation of less soluble uranium compounds that have biological half-lives of years (i.e., triuranium octaoxide or U_3O_8), as compared with 5% absorption for soluble and slightly soluble compounds such as UO_2F_2 (ICRP 1979).

For HF and NH_3, potential adverse effect levels were assumed to occur at levels that correspond to ERPG-1 levels, and potential irreversible adverse effects levels were assumed to occur at levels that correspond to ERPG-2 levels. ERPG 1 levels are defined as "the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing any but mild transient adverse health effects or

perceiving a clearly defined objectionable odor" (AIHA 2002). ERPG 2 levels are defined as "the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action" (AIHA 2002). The ERPG values were generated by toxicologist teams who review all published (as well as some unpublished) data for a given chemical (AIHA 2002). The levels used in this assessment were as follows: ERPG-1 values of 2 ppm for HF and 25 ppm for NH_3 for adverse effects, and ERPG-2 values of 20 ppm for HF and 150 ppm for NH_3 for irreversible adverse effects (AIHA 2002).

The chemicals evaluated exhibit irritant characteristics; the toxicity of these substances is generally not linearly proportional to the intake amount. For example, the toxic effect of exposure to 32 mg/m^3 HF for 30 minutes would actually be greater than the toxic effect of exposure to 16 mg/m^3 HF for 60 minutes, because the irritant action of the HF is greater at higher air concentrations. Data on the appropriate adjustments of HF concentrations for evaluation of shorter exposure times are presented and discussed in various documents dealing with the toxicity of UF_6 (Fisher et al. 1994; McGuire 1991). On the basis of these data, for modeled exposure durations of between 5 and 60 minutes, the air concentrations of HF and NH_3 corresponding to the ERPG-2 value were calculated from:

$$C = C_{\text{ERPG-2}}(60/t)^{0.5}\,, \tag{F.4}$$

where:

C = adjusted exposure guideline value and

t = modeled exposure duration (min).

It was conservatively assumed that the 5-minute adjusted exposure guideline value would be applied even for modeled exposure durations of less than 5 minutes.

It should be noted that human responses do not occur at precise exposure levels but can extend over a wide range of concentrations. The values used as guidelines for potential adverse effects and potential irreversible adverse effects in this EIS should not be expected to protect everyone but should be applicable to most individuals in the general population. In all populations, there are hypersensitive individuals who will show adverse responses at exposure concentrations far below levels at which most individuals would normally respond (AIHA 2002). Alternatively, some individuals will show no adverse response even at exposure concentrations somewhat higher than the guideline levels.

F.2.2.5 Estimation of Population Impacted

Demographic data for the on-site worker population were compiled into a GIS layer by using building footprint polygons and records of the number of workers in the buildings. For the off-site population, 2000 U.S. Census Bureau TIGER (Topologically Integrated Geographic Encoding and Referencing) block group data were obtained. In each layer, population density

was calculated for each building or block group by dividing the population for a polygon by the area of the polygon. The site boundary polygon was added to the off-site population layer, and the population inside the boundary was set to zero.

To estimate the population affected by a specific accident, its plume was loaded into the GIS as a polygon, moved to an origin location, and intersected with one of the population layers (either noninvolved worker or general public). The intersection process combined the plume polygon with the population data, thereby subdividing the polygons where the boundaries crossed and discarding portions of polygons falling outside the plume footprint. Next, the areas of the subdivided polygons were recalculated and multiplied by the population density to obtain a population total for each. These values were summed to obtain an estimate of the total population within the plume footprint. An assumption of this approach was that the population was uniformly distributed within each building or block group.

For each accident, the impacts on noninvolved workers and the general population were estimated. No quantitative predictions of impacts were made for involved workers. Noninvolved workers and members of the general public were considered to be at risk for a given health endpoint if they were located within the plume contour (based on ERPG level or uranium intake level) for the wind direction that would lead to the largest population count. Individuals were assumed to be in the locations where they work or live and, for conservatism, the protection provided by the building structure was not included. This computation involved the overlay of the plume contour from the source point at Location A, B, or C and the rotation of the plume 30 to 100 times to identify the direction with the highest number of workers or general population. Those counts were reported in the impact evaluation. In most cases, the direction leading to the maximum worker count did not match the direction for the maximum general population count. The adverse effects and irreversible adverse effects contours were predicted for each accident, with the adverse effects contour being the larger of the two. For UF_6 releases, both the UO_2F_2 contour and the HF contour were predicted for both adverse effects and irreversible adverse effects levels; in general, the HF contours were larger than the uranium contours and led to larger population risks.

The MEI worker was assumed to be located 328 ft (100 m) from the accident location. The MEI for the general population was assumed to be located at the nearest fence line position, although there are currently no residences at these locations at the three current storage sites. Impacts for MEIs are presented as “yes” or “no” in Chapter 5 of this EIS, depending on whether air concentrations of chemicals greater than or equal to corresponding adverse effects and irreversible adverse effects were modeled at the MEI locations.

F.2.3 Accident Frequencies

The expected frequency of an accident is an estimate of the chance that it might occur during operations. Frequencies range from 0.0 (no chance of occurring) to 1.0 (certain to occur). If an accident is expected to happen once every 50 years, the frequency of occurrence is 0.02 per year: 1 occurrence every 50 years = 1 ÷ 50 = 0.02 occurrence per year. A frequency estimate can

be converted to a probability statement. If the frequency of an accident is 0.02 per year, the probability of the accident occurring sometime during a 10-year program is 0.2 (10 years × 0.02 occurrence per year).

Accident Categories and Frequency Ranges

Likely (L): Accidents estimated to occur once or more in 100 years of facility operations (frequency of $\geq 1 \times 10^{-3}$/yr).

Unlikely (U): Accidents estimated to occur between once in 100 years and once in 10,000 years of facility operations (frequency from 1×10^{-2}/yr to 1×10^{-4}/yr).

Extremely Unlikely (EU): Accidents estimated to occur between once in 10,000 years and once in 1 million years of facility operations (frequency from 1×10^{-4}/yr to 1×10^{-6}/yr).

Incredible (I): Accidents estimated to occur less than one time in 1 million years of facility operations (frequency of $<1 \times 10^{-6}$/yr).

The accidents evaluated in this EIS were anticipated to occur over a wide range of frequencies, from once every few years to less than once in 1 million years. In general, the more unlikely it would be for an accident to occur (the lower its probability), the greater the expected consequences. Accidents were evaluated for four frequency categories: likely, unlikely, extremely unlikely, and incredible (see text box). To interpret the importance of a predicted accident, the analysis considered the estimated frequency of occurrence of that accident. Although the predicted consequences of an incredible accident might be high, the lower consequences of a likely accident (i.e., one much more likely to occur) might be considered more important.

F.2.4 Accident Risk

The term "accident risk" refers to a quantity that considers both the severity of an accident (consequence) and the probability that the accident will occur. Accident risk is calculated by multiplying the consequence of an accident by the accident probability. For example, if a facility accident has an estimated frequency of occurrence of once in 100 years (0.01 per year) and if the accident occurred with an estimated consequence of 10 people suffering from irreversible health effects (IHEs), then the annual risk of the accident would be reported as 0.1 IHE per year (0.01 per year × 10 IHEs). If the facility was operated for a period of 20 years, the accident risk over the operational phase of the facility would be 2 IHEs (20 years × 0.1 IHE per year).

This definition of accident risk was used to compare accidents that have different frequencies and consequences. Certain high-frequency accidents that have relatively low consequences might pose a larger overall risk than low-frequency accidents that have potentially high consequences. In calculations of accident risk, the consequences are expressed in terms of IHEs and adverse health effects for chemical releases and in terms of expected LCFs for radiological releases.

F.2.5 Physical Hazard Accidents

Physical hazards, unrelated to radiation or chemical exposures, were assessed for each alternative by estimating the number of on-the-job fatalities and injuries that could occur to

workers. The expected numbers of worker fatalities and injuries associated with each option were calculated on the basis of statistics available from the Bureau of Labor Statistics (BLS), as reported by the National Safety Council (2002), and on estimates of total worker hours required for construction and operational activities.

Construction and manufacturing annual fatality and injury rates were used for the construction and operational phases of each option, which were computed separately because these activities have different incidence statistics. The injury incidence rates were for injuries involving lost workdays, including days away from work and/or days of restricted work activity. The specific rates used in calculations for each option were as follows: fatalities during construction, 13.3 per 100,000 workers; fatalities during operations, 3.3 per 100,000 workers; injuries during construction, 4.1 per 100 full-time workers; injuries during operations, 4.5 per 100 full-time workers (National Safety Council 2002).

Fatality and injury risks were calculated as the product of the appropriate incidence rate (given above), the number of years for construction and operations, and the number of FTEs for construction and operations. The available fatality and injury statistics by industry are not refined enough to warrant an analysis of involved and noninvolved workers as separate classes.

The calculation of risks of fatality and injury from industrial accidents was based solely on historical industrywide statistics and therefore did not consider a threshold (i.e., any activity that would result in some estimated risk of fatality and injury). All DUF_6 activities would be implemented in accordance with DOE or industry best management practices, thereby reducing the risk of fatalities and injuries.

F.3 HUMAN HEALTH AND SAFETY — TRANSPORTATION

The methodology and assumptions used in this transportation risk assessment were based on two previous analyses conducted for the transportation of depleted uranium compounds (DOE 1999; Biwer et al. 2001). The approach is described below.

F.3.1 Scope of the Analysis

The transportation risk assessment involved estimating the potential human health risks to both crew members (i.e., truck drivers and rail crew) and members of the public during transportation of various forms of depleted uranium and other materials. Impacts that could arise from the radioactive or chemical nature of the cargo and also from the nature of transportation itself, independent of the cargo, were addressed. Transportation risks were evaluated for all of the materials that could potentially be transported for each alternative, including UF_6 cylinders, uranium conversion products, HF and other chemicals, and process waste. A summary of the materials transported is provided in Table F-3. Transportation impacts were estimated for shipment by both truck and rail modes for most materials. The impacts were assessed on a route-specific basis, but unit risks per kilometer were developed for shipments of the conversion

TABLE F-3 Potential Shipments of Material Analyzed for the DUF_6 Conversion EIS[a]

Material	Origin	Destination
Depleted U_3O_8	Portsmouth	Envirocare, NTS
LLW, empty cylinders	Portsmouth	Envirocare, NTS
CaF_2	Portsmouth	Envirocare, NTS
HF	Portsmouth	User facility
Non-DUF_6 cylinders	ETTP	Portsmouth
DUF_6 cylinders	ETTP	Portsmouth

[a] CaF_2 = calcium fluoride, ETTP = East Tennessee Technology Park, LLW = low-level radioactive waste, NTS = Nevada Test Site,.

products for use because the locations of user facilities are not yet known. In the latter case, the unit risk factors were used to estimate transportation impacts for sample distances of 250, 1,000, and 5,000 km (260, 620, and 3,100 mi); average route characteristics were assumed. In the case of depleted uranium conversion products, impacts from shipment to two alternate disposal sites were also estimated.

The transportation-related risks to human health were assessed from both vehicle- and cargo-related causes. Cargo-related risks arising from both the radiological and chemical hazards of the depleted uranium shipments were assessed when appropriate.

With regard to the radioactive nature of depleted uranium, the cargo-related impacts on human health during transportation would be caused by exposure to ionizing radiation. Exposures to radiation could occur during both routine (i.e., incident-free) transportation and during accidents. During routine operations, the external radiation field in the vicinity of a shipment must be below limits specified in federal regulations. During transportation-related accidents, human exposures may occur following the release and dispersal of radioactive materials via multiple environmental pathways, such as exposure to contaminated ground or contaminated air or ingestion of contaminated food.

In contrast, the chemical nature of depleted uranium and other hazardous chemicals does not pose cargo-related risks to humans during routine transportation-related operations. Transportation operations are generally well regulated with respect to packaging, such that small spills or seepages during routine transport are kept to a minimum and do not result in exposures. Potential cargo-related health risks to humans can occur only if the integrity of a container is compromised during an accident (i.e., if a container is breached). Under such conditions, some chemicals may cause an immediate health threat to exposed individuals, primarily through inhalation exposure.

Vehicle-related risks result from the nature of transportation itself, independent of the radioactive and chemical characteristics of the cargo. For example, increased levels of pollution from vehicular exhaust and fugitive dust emissions may affect human health. Similarly, accidents during transportation may cause injuries and fatalities from physical trauma.

Vehicle-related health impacts and health impacts from the radioactive and chemical nature of the depleted uranium are presented separately in the tables of this EIS. No attempt has been made (even in cases where both radioactive and chemical characteristics must be considered) to sum the estimated radioactive, chemical, and vehicle-related risks. To understand and interpret the estimated health impacts presented in this report, readers must keep in mind the fundamental differences between the radioactive, chemical, and vehicle-related hazards discussed below.

The technical approach for estimating transportation risks uses several computer models and databases. Transportation risks were assessed for both routine and accident conditions. For the routine assessment, risks were calculated for the collective populations of all potentially exposed individuals, as well as for a small set of MEI receptors. The accident assessment consisted of two components: (1) an accident risk assessment, which considered the probabilities and consequences of a range of possible transportation-related accidents, including low-probability accidents that have high consequences and high-probability accidents that have low consequences, and (2) an accident consequence assessment, which considered only the radiological consequences of low-probability accidents that were postulated to result in the largest releases of radioactive material. The release fractions used in the accident risk assessment were based on the data in NUREG-0170 (NRC 1977) and independent engineering analyses.

F.3.2 Radiological Impacts

All radiological impacts are calculated in terms of dose and associated health effects in the exposed populations. The radiation dose calculated is the total effective dose equivalent as specified in 10 CFR Part 20, which is the sum of the deep dose equivalent from exposure to external radiation and the 50-year committed effective dose equivalent (ICRP 1977) from exposure to internal radiation. Doses of radiation are calculated in units of rem for individuals and in units of person-rem for collective populations.

The potential exposures to the general population from transportation of radioactive materials, whether during routine operations or from postulated accidents, are usually at a low dose, such that the primary adverse health effect is the potential induction of latent cancers (i.e., cancers that occur after a latency period of several years from the time of exposure). The correlation of radiation dose and human health effects for low doses has been traditionally based on what is termed the “linear/no-threshold hypothesis,” which has been described by various international authorities on protection against radiation. This hypothesis implies, in part, that even small doses of radiation cause some risk of inducing cancer and that doubling the radiation dose would mean doubling the expected number of cancers. The data on the health risk from radiation have been derived primarily from human epidemiological studies of past exposures, such as Japanese survivors of the atomic bomb in World War II and persons exposed during

medical applications. The types of cancer induced by radiation are similar to "naturally occurring" cancers and can be expressed later in the lifetimes of the exposed individuals.

On the basis of the analyses conducted for this report, transportation-related operations are not expected to cause acute (short-term) radiation-induced fatalities or to produce immediately observable effects in exposed individuals. Acute radiation-induced fatalities occur at doses well in excess of 100 rem (ICRP 1991), which generally would not occur for a wide range of transportation activities, including routine operations and accidents.[1] For all severe accident scenarios analyzed, other short-term effects, such as temporary sterility and changes in blood chemistry, are not expected.

In this EIS, the radiological impacts are expressed as health risks in terms of the number of estimated LCFs for each alternative. The health risk conversion factors (expected LCFs per dose absorbed) were taken from ICRP Publication 60 (ICRP 1991). The health risk conversion factors used were 5×10^{-4} LCF per person-rem for members of the general public and 4×10^{-4} LCF per person-rem for occupational workers.

The RADTRAN 4 computer code (Neuhauser and Kanipe 1992) was used for the routine and accident cargo-related risk assessments to estimate the radiological impacts to collective populations. As a complement to the RADTRAN calculations, the RISKIND computer code (Yuan et al. 1995) was used to estimate scenario-specific radiological doses to MEIs during both routine operations and accidents and to estimate population impacts for the accident consequence assessment.

F.3.3 Chemical Impacts

In contrast to radioactive hazards, chemical hazards do not pose cargo-related risks to humans during routine transportation-related operations. Transportation operations are generally well regulated with respect to packaging, such that small spills or seepages during routine transport are kept to a minimum and do not result in exposures. With respect to chemical hazards, the cargo-related impacts to human health during transportation would be caused by exposure occurring as a result of container failure and chemical release during an accident (i.e., a collision with another vehicle or road obstacle). Therefore, chemical risks (i.e., risks that result from the toxicology of the chemical composition of the material transported) are assessed for cargo-related transportation accidents. The chemical risk from transportation-related accidents lies in the potential release, transport, and dispersion of chemicals into the environment and the subsequent exposure of people primarily through inhalation exposure.

An accidental release of UF_6 to the atmosphere would result in the formation of UO_2F_2 and HF from the reaction of UF_6 with moisture in the atmosphere. Both compounds are highly water soluble and toxic to humans.

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1 In general, individual acute whole-body doses in the range of 300 to 500 rem are expected to cause fatality in 50% of the exposed individuals within 30 to 60 days (ICRP 1991).

The risks from exposure to hazardous chemicals during transportation-related accidents could be either acute (immediate impact) or latent (result in cancer that would present itself after a latency period of several years). The severity of the immediate health effects would depend strongly on the toxicity and exposure concentration of the specific chemical(s) released. The severity of the immediate (i.e., acute) health effects could range from slight irritation to fatality for the exposed individuals. Neither the uranium compounds nor HF are carcinogens or suspected carcinogens. Therefore, latent cancer incidences and fatalities from chemical exposure are not expected and not assessed in this report for potential accidents.

In this assessment, the endpoint for acute health effects that was assessed is the potential for irreversible adverse health effects (from permanent organ damage or the impairment of everyday functions up to and including lethality). A nonlinear or threshold correlation between the exposure concentration and the toxicity was assumed for the evaluation of this acute effect; that is, it was assumed that some low level of exposure could be tolerated without affecting health. In many cases, data on human toxicity that relate acute health effects to chemical exposures did not exist. When data on toxicity in humans were not available, chemical risk estimators were derived from levels that are toxic to laboratory animals. The use of animal data to predict toxic concentrations in humans added uncertainty to the risk estimates.

In addition to understanding the results in terms of the health endpoint described above, it is of interest to understand how it relates to potential fatalities. Exposure to HF or uranium compounds is estimated to be fatal to approximately 1% or less of those persons experiencing irreversible adverse effects (Policastro et al. 1997).

The chemical transportation accident risk assessment was performed by using the HGSYSTEM and FIREPLUME models (Brown et al. 1997) for uranium compounds (DUF_6, U_3O_8, and cylinder heels) and the Chemical Accident Stochastic Risk Assessment Model (CASRAM) (Brown et al. 1996, 2000) for HF. Chemical accident consequences were assessed by using HGSYSTEM/FIREPLUME for uranium compounds and HGSYSTEM for HF.

F.3.4 Vehicle-Related Impacts

In addition to the cargo-related risks posed by transportation-related activities, vehicle-related risks were also assessed for the same routes. These risks, which are independent of the radioactive nature of the cargo, would be incurred for similar shipments of any commodity. The vehicle-related risks were assessed for both routine conditions and accidents.

Vehicle-related risks during routine transportation are incremental risks caused by potential exposure to airborne particulate matter from fugitive dust and vehicular exhaust emissions. These risks are based on epidemiological data that associate mortality rates with ambient air particulate concentrations. A discussion of the basis for the emissions risk factors and the uncertainty associated with them is provided in Section F.3.5.3.

The vehicle-related accident risk refers to the potential for transportation-related accidents that could result in fatalities due to physical trauma that are not related to the cargo in

the shipment. State average rates for transportation-related fatalities were used in the assessment. Vehicle-related risks are presented here in terms of estimated fatalities for the truck and rail options considered.

F.3.5 Routine Risk Assessment Method

The RADTRAN 4 computer code (Neuhauser and Kanipe 1992) was used for the routine risk assessments to estimate the radiological impacts to collective populations. The RISKIND computer code (Yuan et al. 1995) was used to estimate scenario-specific doses to MEIs during routine operations. Routine risks from hazardous chemical shipments are not expected. It is assumed that the shipping packages would not leak during routine transportation operations.

F.3.5.1 Collective Population Risk

The radiological risk associated with routine transportation results from the potential exposure of people to low-level external radiation in the vicinity of loaded shipments. Because the radiological consequences (dose) occur as a direct result of normal operations, the probability of routine consequences is taken to be unity in the RADTRAN 4 code. Therefore, the dose risk is equivalent to the estimated dose.

For routine transportation, the RADTRAN 4 computer code considers all major groups of potentially exposed persons. The RADTRAN 4 calculations of risk for routine highway and rail transportation include exposures of the following population groups:

- *Persons along the route (off-link population).* Collective doses were calculated for all persons living or working within 0.5 mi (0.8 km) of each side of a transportation route. The total number of persons within the 1-mi (1.6-km) corridor was calculated separately for each route considered in the assessment.

- *Persons sharing the route (on-link population).* Collective doses were calculated for persons in all vehicles sharing the transportation route. This group includes persons traveling in the same or opposite directions as the shipment, as well as persons in vehicles passing the shipment.

- *Persons at stops.* Collective doses were calculated for people who might be exposed while a shipment was stopped en route. For truck transportation, these stops include stops for refueling, food, and rest. For rail transportation, stops were assumed to occur for purposes of classification.

- *Crew members.* Collective doses were calculated for truck and rail transportation crew members involved in the actual shipment of material.

The doses calculated for the first three population groups were added together to yield the collective dose to the general public; the dose calculated for the fourth group represents the collective dose to workers. The RADTRAN 4 models for routine dose are not intended for use in estimating specific risks to individuals.

For the DUF_6 cylinder shipments, route-specific data were used to estimate the collective routine risks using the input assumptions as given in Biwer et al. (2001). For this EIS, the route data were updated with population data from the 2000 census.

F.3.5.2 Maximally Exposed Individual Risk

In addition to assessing the routine collective population risk, RISKIND was used to estimate the risks to MEIs for a number of hypothetical exposure scenarios. Receptors included transportation crew members, departure inspectors, and members of the public exposed during traffic delays, while working at a service station, or while living near a facility.

RISKIND was used to calculate the dose to each MEI considered for an exposure scenario defined by an exposure distance, duration, and frequency specific to that receptor. The distances and durations of exposure were similar to those given in previous transportation risk assessments (DOE 1990b, 1995, 1996, 1997b, 1999) The scenarios were not meant to be exhaustive but were selected to provide a range of potential exposure situations.

The RISKIND external dose model considers direct external exposure and exposure from radiation scattered from the ground and air. RISKIND was used to calculate the dose as a function of distance from a shipment on the basis of the dimensions of the shipment (millirems per hour for stationary exposures and millirems per event for moving shipments). The code approximates the shipment as a cylindrical volume source, and the calculated dose includes contributions from secondary radiation scattering from buildup (scattering by the material contents), cloudshine (scattering by the air), and groundshine (scattering by the ground). The dose rate curve (relative dose rate as a function of distance) specific to depleted uranium was determined by using the MicroShield code (Negin and Worku 1992) for input into RISKIND. As a conservative measure, credit for potential shielding between the shipment and the receptor was not considered.

F.3.5.3 Vehicle-Related Risk

Vehicle-related health risks resulting from routine transportation might be associated with the generation of air pollutants by transport vehicles during shipment; such risks are independent of the radioactive or chemical nature of the shipment. The health endpoint assessed under routine transportation conditions was the excess latent mortality due to inhalation of vehicular emissions. These emissions consist of particulate matter in the form of diesel engine exhaust and fugitive dust raised from the road/railway by the transport vehicle.

Risk factors for pollutant inhalation in terms of latent mortality were generated by Biwer and Butler (1999) for transportation risk assessments. These risks are based on epidemiological data that associate mortality rates with particulate concentrations in ambient air. Increased latent mortality rates resulting from cardiovascular and pulmonary diseases have been linked to incremental increases in particulate concentrations in air. Thus, the increase in ambient air particulate concentrations caused by a transport vehicle, with its associated fugitive dust and diesel exhaust emissions, is related to such premature latent fatalities in the form of risk factors. In this EIS, values of 8.36×10^{-10} latent fatality/km for truck transport and 1.20×10^{-10} latent fatality/railcar-km for rail transport were used. The truck value is for heavy combination trucks (truck class VIIIB). Because of the conservatism of the assumptions made to reconcile results among independent epidemiological studies, the latent fatality risks estimated by using these values may be considered to be near an upper bound (Biwer and Butler 1999). The risk factors are for areas with an assumed population density of 1 person/km^2. One-way shipment risks were obtained by multiplying the appropriate risk factor by the average population density along the route and the route distance. The risks reported for routine vehicle risks in this EIS are for round-trip travel of the transport vehicle.

The vehicle risks reported here are estimates based on the best available data. However, as is true for the radiological risks, there is a large degree of uncertainty in the vehicle emission risk factors that is not readily quantifiable. For example, large uncertainties exist with regard to the extent of increased mortality that occurs with an incremental rise in particulate air concentrations and with regard to whether there are threshold air concentrations that are applicable. Also, estimates of the particulate air concentrations caused by transport vehicles depend on location, road conditions, vehicle conditions, and weather.

F.3.6 Accident Risk Assessment Methodology

The radiological transportation accident risk assessment used the RADTRAN 4 code for estimating collective population risks and the RISKIND code for estimating MEI and population consequences. The HGSYSTEM model (Post et al. 1994a,b) was used to assess the hazardous chemical transportation accident risks for both the collective population and individuals. The model is a widely applied code recognized by the EPA for chemical accident consequence predictions.

The collective accident risk for each type of shipment was determined in a manner similar to that described for routine collective population risks. For the DUF_6 cylinder shipments, route-specific data were used to estimate the collective accident risks on the basis of the input assumptions given in Biwer et al. (2001). For this EIS, the route data were updated with population data from the 2000 census.

F.3.6.1 Radiological Accident Risk Assessment

The risk analysis for potential accidents differs fundamentally from the risk analysis for routine transportation because occurrences of accidents are statistical in nature. The accident risk

assessment is treated probabilistically in RADTRAN 4 and in the HGSYSTEM approach used to estimate the hazardous chemical component of risk. Accident risk is defined as the product of the accident consequence (dose or exposure) and the probability of the accident occurring. In this respect, both RADTRAN 4 and HGSYSTEM estimate the collective accident risk to populations by considering a spectrum of transportation-related accidents. The spectrum of accidents was designed to encompass a range of possible accidents, including low-probability accidents that have high consequences and high-probability accidents that have low consequences (such as "fender benders"). The total collective radiological accident dose risk was calculated as:

$$R_{Total} = D \times A \times \sum_{i=1,n} (P_i \times C_i) \ , \qquad \text{(F.5)}$$

where:

R_{Total} = total collective dose risk for a single shipment distance D (person-rem),

D = distance traveled (km),

A = accident rate for transport mode under consideration (accidents/km),

P_i = conditional probability that the accident is in Severity Category i, and

C_i = collective dose received (consequence) should an accident of Severity Category i occur (person-rem).

The results for collective accident risk can be directly compared with the results for routine collective risk because the latter results implicitly incorporate a probability of occurrence of 1 if the shipment takes place.

The RADTRAN 4 calculation of collective accident risk employs models that quantify the range of potential accident severities and the responses of transported packages to accidents. The spectrum of accident severity is divided into a number of categories. Each category of severity is assigned a conditional probability of occurrence — that is, the probability that an accident will be of a particular severity if an accident occurs. The more severe the accident, the more remote the chance of such an accident. Release fractions, defined as the fraction of the material in a package that could be released in an accident, are assigned to each accident severity category on the basis of the physical and chemical form of the material. The model takes into account the mode of transportation and the type of packaging being considered. The accident rates, the definition of accident severity categories, and the release fractions used in this analysis are discussed further in Biwer et al. (1997, 2001). The approach for hazardous chemicals incorporates the same accident severity categories and release fractions as those used by RADTRAN 4.

For accidents involving the release of radioactive material, RADTRAN 4 assumes that the material is dispersed in the environment according to standard Gaussian diffusion models. For the risk assessment, default data for atmospheric dispersion were used, representing an

instantaneous ground-level release and a small-diameter source cloud (Neuhauser and Kanipe 1995). The calculation of the collective population dose following the release and dispersal of radioactive material included the following exposure pathways:

- External exposure to the passing radioactive cloud,
- External exposure to contaminated ground,
- Internal exposure from inhalation of airborne contaminants, and
- Internal exposure from the ingestion of contaminated food.

For the ingestion pathway, national-average food transfer factors, which relate the amount of radioactive material ingested to the amount deposited on the ground, were calculated in accordance with the methods described by NRC Regulatory Guide 1.109 (NRC 1977) and used as input to the RADTRAN code. Doses of radiation from the ingestion or inhalation of radionuclides were calculated by using standard dose conversion factors (DOE 1988a,b).

F.3.6.2 Chemical Accident Risk Assessment

The risks from exposure to hazardous chemicals during transportation-related accidents can be either acute (result in immediate injury or fatality) or latent (result in cancer that would present itself after a latency period of several years). Both population risks and risks to the MEI were evaluated for transportation accidents. The acute health endpoint — potential irreversible adverse effects — was evaluated for the assessment of cargo-related population impacts from transportation accidents. Accidental releases during transport of UF_6, U_3O_8, and HF were evaluated quantitatively.

The acute effects evaluated were assumed to exhibit a threshold nonlinear relationship with exposure; that is, some low level of exposure could be tolerated without inducing a health effect. To estimate risks, chemical-specific concentrations were developed for potential irreversible adverse effects. All individuals exposed at these levels or higher following an accident were included in the transportation risk estimates. In addition to acute health effects, the cargo-related risk of excess cases of latent cancer from accidental chemical exposures could be evaluated. However, none of the chemicals that might be released in any of the accidents would be carcinogenic. As a result, no predictions for excess latent cancers are presented in this report for accidental chemical releases.

In addition, to address MEIs, the locations of maximum hazardous chemical concentrations were identified for shipments with the largest potential releases. Estimates of exposure duration at those locations were obtained from modeling output and used to assess whether MEI exposure to uranium and other compounds exceeded the criteria for potential irreversible adverse effects.

The primary exposure route of concern with respect to an accidental release of hazardous chemicals would be inhalation. Although direct exposure to hazardous chemicals via other pathways, such as ingestion or dermal absorption, would also be possible, these routes would be expected to result in much lower exposure than the inhalation pathway doses for the chemicals of concern in this assessment. The likelihood of acute effects would be much less for the ingestion and dermal pathways than for inhalation.

The chemical transportation risks for shipment of the depleted uranium compounds were estimated by using FIREPLUME and HGSYSTEM accident consequences multiplied by the appropriate accident rate probabilities, population densities, and distance traveled in a similar fashion to that used by RADTRAN, as discussed in Section F.3.6.1 for the radiological transportation risks.

The chemical accident transportation risk and consequences for shipment of aqueous HF were estimated using the CASRAM and HGSYSTEM models, respectively. For the risk assessment, 24 generic but representative routes were selected for hazardous commodity shipments in the region of interest (ROI). The generic HF routes were derived from historical shipments of five chemicals, in addition to HF, that are typically shipped in similar corrosive chemical container tank trucks. Temperature-dependent vapor pressures and densities for aqueous HF properties were derived with an empirically derived formulation (Pratt 2003) and experimentally generated plots (Honeywell International, Inc. 2002). The heat of vaporization was calculated from vapor pressure relationships. These parameters were used in estimating the evaporation rate from the HF pool and the HF that spilled onto the surface. Rail and highway accident rates, spill fraction, and population densities along the shipment routes were incorporated into CASRAM from statistics reported in the Hazardous Material Information System (HMIS) database and from census data. For each shipment, CASRAM calculates the probabilities of a release, given an accident and the risk of adverse (ERPG-1) and irreversible (ERPG-2) effects associated with the shipment. The overall risks are estimated by summing over all shipments and routes. The risks are normalized by shipment distance and weight, so that the calculations can be applied to specific shipment destinations and shipment quantities. For consequence assessment, procedures that are the same or similar to those used for fixed facilities are used (e.g., aqueous HF tank rupture). A description of the method can be found in Section F.2.2.1, Nonfire Accident Scenario Modeling. It was assumed for both the risk and consequence assessment that aqueous HF would be shipped in nonpressurized corrosive liquid tank cars with a 20,000-gal (76,000-L) capacity for rail shipments, and in corrosive liquid cargo tanker (MC312) trucks with a 5,000-gal (19,000-L) capacity.

F.3.7 Accident Consequence Assessment

Because predicting the exact location of a severe transportation-related accident is impossible when estimating population impacts, separate accident consequences were calculated for accidents occurring in three population density zones: rural, suburban, and urban. Moreover, to address the effects of the atmospheric conditions existing at the time of an accident, two atmospheric conditions were considered: neutral (i.e., unstable) and stable.

The MEI for severe transportation accidents was considered to be located at the point of highest hazardous material concentration that would be accessible to the general public. This location was assumed to be 100 ft (30 m) or farther from the release point at the location of highest air concentration as determined by the HGSYSTEM and FIREPLUME models. Only the shipment accident resulting in the highest contaminant concentration was evaluated for the MEI.

F.3.7.1 Radiological Accident Consequence Assessment

The RISKIND code was used to provide a scenario-specific assessment of radiological consequences from severe transportation-related accidents. Whereas the RADTRAN 4 accident risk assessment considered the entire range of accident severities and their related probabilities, the RISKIND accident consequence assessment focused on accidents that result in the largest releases of radioactive material to the environment. Accident consequences were presented for each type of shipment that might occur under any given option for each alternative. The accident consequence assessment was intended to provide an estimate of the potential impacts posed by a severe transportation-related accident.

The severe accidents considered in the consequence assessment were characterized by extreme mechanical and thermal forces. In all cases, these accidents would result in a release of radioactive material to the environment. The accidents correspond to those within the highest accident severity category, as described previously. These accidents represent low-probability, high-consequence events. The probability of accidents of this magnitude would depend on the number of shipments and the total shipping distance for the options considered; however, accidents of this severity are expected to be extremely rare.

The severe accidents involving solid radioactive material that would result in the highest impacts would generally be related to fire. The fire would break down and distribute the material of concern. Air concentrations of radioactive contaminants at receptor locations following a hypothetical accident were determined by using the FIREPLUME model. On the basis of these air concentrations, RISKIND was used to calculate the radiological impacts for the accident consequence assessment.

The accident consequences were calculated for both local populations and MEIs. The population dose included the population within 50 mi (80 km) of the site of the accident. The exposure pathways considered were similar to those discussed previously for the accident risk assessment. Although remedial activities after the accident (e.g., evacuation or ground cleanup) would reduce the consequences of an accident, these activities were not accounted for in the consequence assessment.

F.3.7.2 Chemical Accident Consequence Assessment

HGSYSTEM Version 3.0 was used to estimate the potential consequences from severe hazardous chemical accidents. FIREPLUME was used to predict the consequences of transportation accidents involving fires. The HGSYSTEM model is discussed in Section F.2.2.

F.3.7.3 Vehicle-Related Accident Risk Assessment

The vehicle-related accident risk refers to the potential for transportation-related accidents that could directly result in fatalities not related to the cargo in the shipment. This risk represents fatalities from mechanical causes. National-average rates for transportation-related fatalities (Saricks and Tompkins 1999) were used in the assessment for shipments without a defined origin or destination site (e.g., the use location of the conversion HF products). For truck transport, 1.49×10^{-8} fatality per truck-km was assumed. For rail transport, 7.82×10^{-8} fatality per railcar-km was assumed. State average fatality rates from Saricks and Tompkins (1999) were used in the assessment for the DUF_6 shipments that had known origin and destination sites. Vehicle-related accident risks were calculated by multiplying the total distance traveled by the rate for transportation-related fatalities. In all cases, the vehicle-related accident risks were calculated by using distances for round-trip shipment.

F.4 AIR QUALITY AND NOISE

F.4.1 Air Quality

Potential air quality impacts under each alternative were evaluated by estimating potential air pollutant emissions from the activities associated with facility construction and operations, followed by atmospheric dispersion modeling of these emissions to assess impacts on ambient air quality.

Air emissions resulting from activities associated with construction (e.g., construction equipment, engine exhaust, and fugitive dust emissions) and with operations (e.g., boiler[2] and emergency generator stack emissions) were estimated by using applicable emission factors (EPA 2002) and emission and activity level data provided by UDS (UDS 2003b). The significance of project-related emissions was evaluated by comparing the estimated project-related emissions with countywide or statewide emissions.

Atmospheric dispersion modeling of pollutant emissions was performed by using the EPA-recommended ISC short-term model (EPA 1995). In addition to project-related emission data, model input data included stack and building downwash data, meteorological data, receptor data, and terrain elevation data. Emissions from construction activities were assumed to occur during one daytime 8-hour shift, while the emissions from facility operations were assumed to occur 24 hours per day and 7 days per week.[3] Effects of building downwash on stack plumes

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2 UDS is currently proposing to use electrical heating in the conversion facility but is evaluating other options. If natural gas was used, either furnaces or boilers could be selected. The air emissions from boilers are greater than those for residential-type furnaces for carbon monoxide (CO) and nitrogen oxides (NO_x), and the same for other criteria pollutants and volatile organic compounds (VOCs). To assess bounding air quality impacts, a boiler option was analyzed.

3 The backup generator is assumed to be operating for 192 hours per year, which represents 4 hours per month for testing and 3 days of operation twice per year in response to a power outage.

were considered for the emission sources during the operational period. The meteorological data selected for the Portsmouth site are the 1999 on-site surface data (30-m [99-ft] level), combined with mixing height data at Wilmington, Ohio. For construction impact analysis, initial receptor grids were placed at distances of 100 m (328 ft) from the construction site (because heavy equipment operators would not allow public access any closer for safety reasons) and extended up 50 km (31 mi) beyond existing boundaries. For operation impact analysis, receptor grids were set along and beyond the existing and planned conversion facility boundaries up to 50 km (31 mi). The grid intervals ranged from 25 m (82 ft) near the facility to 5 km (3.1 mi) outmost. To model the effects of terrain elevation, elevation data for the emission sources and receptors were also input to the model.

For assessing potential air quality impacts, the estimated maximum ground-level concentration increments due to these pollutant emissions beyond site boundaries were compared with allowable PSD increments. Total maximum concentrations, obtained by adding the background concentration levels representative of the site to the estimated maximum ground-level concentration increments, were compared with applicable national and state ambient air quality standards.

F.4.2 Noise

Potential noise impacts under each alternative were assessed by estimating the sound levels from noise-emitting sources associated with facility construction and operations, followed by noise propagation modeling. Examples of noise-emitting sources include heavy equipment used in earthmoving and other activities during construction; process equipment and emergency generators during operations; and train whistles and on-site and off-site traffic during construction and operations. Potential noise levels due to these sources were obtained from the literature (Harris Miller Miller & Hanson, Inc. [HMMH] 1995) and data provided by UDS (UDS 2003b). For construction of the conversion facility, detailed information on the types and number of construction equipment required is not available. Therefore, for construction impact analysis, it was assumed that the two noisiest sources would operate simultaneously at the center of the construction site (HMMH 1995). For operations impact analysis, the highest noise levels (inside buildings) measured at the Framatome ANP Richland, Washington, facility, similar to the proposed facility at Portsmouth, were assumed to be those at a distance of 15 m (50 ft) from the facility.

Noise levels at the nearest residence from the alternative sites were estimated by using a simple noise propagation model on the basis of estimated sound levels at the source. The significance of estimated potential noise levels at the nearest residence was assessed by comparing them with the EPA noise guideline (EPA 1974) and measured background noise levels.

F.5 WATER AND SOIL

Potential impacts to surface water, groundwater, and soil during facility construction, normal operations, and potential accidents were evaluated. Methods of quantitative and qualitative impact analyses are described in the following paragraphs.

For surface water, impacts were assessed in terms of runoff, floodplain encroachment, and water quality. Changes in runoff were assessed by comparing runoff areas with and without the proposed facility. Floodplain encroachment was assessed by evaluating the location of the proposed facility in terms of known floodplains. Inputs to the floodplain evaluation included estimated facility effluent volumes and estimates of flow volumes in nearby streams and rivers. Water quality impacts were estimated by using the proposed drinking water standard of 30 μg/L (EPA 2003b) as a guideline. When data were unavailable, assessment models that account for the different types of contaminants and dilution estimates for the surface water features were used to estimate surface water conditions.

Potential impacts on groundwater were assessed in terms of changes in recharge to underlying aquifers, depth to groundwater, direction of groundwater flow, and groundwater quality. Changes to recharge of groundwater were evaluated by comparing the increase in the impermeable area produced by construction and operations with the recharge area available at actual or representative sites. Impacts on the depth to groundwater were evaluated by comparing existing water use with modified water needs. Changes in the direction of groundwater flow were evaluated by examining the potential effects produced by the increased water demand. A model that considers movement, dispersion, adsorption, and decay of the contaminant source material over time was used to estimate the migration of contaminants from source areas to the groundwater (i.e., groundwater quality). Details of the model are provided in Tomasko (1997).

Potential impacts to soil were assessed in terms of changes in topography, permeability, quality, and erosion potential. Erosion potential was evaluated in terms of disturbed land area. Changes in soil quality were evaluated on the basis of the amounts of contaminants deposited as a result of certain activities. No standard is available for limiting soil concentrations of uranium; a health-based guideline value of 230 μg/g (EPA 1995a), applicable for residential settings, was used as a guideline for comparison in this EIS.

F.6 SOCIOECONOMICS

F.6.1 Scope of the Analysis

For this EIS, the analysis of the socioeconomic impacts under the no action alternative and the action alternatives was based on the analysis performed for the DUF_6 PEIS (DOE 1999), which used cost engineering data provided by Dubrin et al. (1997), with additional information provided by UDS (UDS 2003b).

For the action alternatives and the no action alternative, impacts were estimated for the ROIs at Portsmouth and ETTP. The analysis estimated the impacts of continued storage and conversion on regional economic activity, including direct (on-site) and indirect (off-site) employment and income. In addition, the impact of each conversion technology on (1) population in-migration, (2) local housing markets, (3) local public service employment, and (4) local jurisdictional revenues and expenditures was also calculated. Additional details on the analysis of socioeconomic impacts undertaken for the DUF_6 PEIS are provided in Allison and Folga (1997). Updated data on the affected environment at each site were used to revise the impacts from continued storage and conversion facilities on the economy and community at each site that were described in the DUF_6 PEIS (DOE 1999) and in Hartmann (1999a,b,c).

An assessment of the socioeconomic impacts from transporting DUF_6 was not included in the DUF_6 PEIS analysis or in this EIS. The transportation of DUF_6 would likely not lead to significant en route socioeconomic impacts because the total expenditures for transportation related to DUF_6 would be small compared with expenditures related to total shipments of all other goods for any of the routes that might be used. The analysis might also have considered the socioeconomic impacts of potential accidents, particularly for DUF_6-related transportation activities. However, because it is unlikely that any potential accident would release large quantities of hazardous or radioactive material into the environment, accidents are expected to create only minor local economic disruption, and a substantial commitment of fiscal resources for accident remediation would probably not be necessary at any of the current storage sites or along transportation routes.

F.6.2 Technical Approach for the Analysis

F.6.2.1 Regional Economy

The analysis of regional economic impacts used engineering cost data for facilities that would be constructed and operated and input-output economic data for the ROI surrounding the site. The ROI was defined as the counties in which 90% of site employees currently reside (see Section 3.1.8). Additional data from the U.S. Bureau of the Census (2002a,b) were used to forecast economic data to provide the basis for the presentation of relative impacts.

The analysis was performed by using the engineering cost data of Dubrin et al. (1997) for the construction and operation of the conversion facility, which were then updated by using UDS data (UDS 2003b). Direct (on-site) employment and income impacts were then calculated on the basis of average total labor costs (i.e., fully loaded labor costs, including site overhead, contractor profit, and employee benefits) in each category. Estimates of direct income impacts were calculated by adjusting average fully loaded labor costs to exclude the various components of site overhead, state and federal income taxes, and other payroll deductions. This process produced a measure of disposable wage and salary income that would likely be spent in the regional economy at each of the sites.

Indirect (off-site) impacts were based on detailed item-specific procurement data for material and on adjusted direct and indirect labor costs. Cost information was associated with the relevant standard industrial classification (SIC) codes and construction and operation schedule information to provide estimates of procurement and wage and salary expenditures for each sector in the local economy for the year in which expenditures would be made. Information on the expected pattern of local and nonlocal procurement for the various materials and labor expenditures by SIC code was then calculated on the basis of local shares of national employment in each material and labor procurement category and information provided for the site. Expenditures by SIC code by year occurring in the ROI were then mapped into the Bureau of Economic Analysis (BEA) sectors used in an IMPLAN input-output model (Minnesota IMPLAN Group, Inc. 2003) specified for the ROI (see Section 3.1.1.8). Each model was used to produce employment and income multipliers for each sector where procurement and labor expenditures occur. Indirect impacts were then calculated by multiplying expenditures in each sector by the input-output multipliers produced by the model for the ROI.

Impacts were presented in terms of the (1) direct, indirect, and total employment impacts; (2) direct and total income impacts; and (3) relative employment impact, or the magnitude of the absolute impact compared with the growth in the local economic employment baseline. Construction impacts for the facility were presented for the peak construction year. Operations impacts were presented for the first year of operations.

F.6.2.2 Regional Economy Assessment Model

The analysis used county-level IMPLAN input-output economic data for 2000 (Minnesota IMPLAN Group, Inc. 2003) to measure the regional economic impacts of conversion facilities at the site. The IMPLAN input-output model is a microcomputer-based program that allows construction of input-output models for counties or combinations of counties for any location in the United States. Input-output data are the economic accounts of any given region and show the flow of commodities to industries from producers and institutional consumers. The accounts also show consumption activities by workers, owners of capital, and imports from outside the region. The model contains 528 sectors, representing industries in agriculture, mining, construction, manufacturing, wholesale and retail trade, utilities, finance, insurance and real estate, and consumer and business services. The model also includes information for each sector on employee compensation; proprietary and property income; personal consumption expenditure; federal, state, and local expenditures; inventory and capital formation; and imports and exports. The model can be used to produce accurate estimates of the impact of changes in expenditures in specific local activities on employment and income in any given year. The analysis of regional economic impacts used the model to calculate multipliers for each sector in the ROI for which procurement and wage and salary expenditures would be likely to occur. These multipliers were calculated for the year 2000, the latest year available.

For this EIS, data from the 2000 census were used to modify and update the data presented in the data compilation reports (Hartmann 1999a-c) for both the affected environment and impact sections. In addition to using 2000 population data to describe population trends in the ROI, counties, and important cities near the site, these data were used to provide information

on per capita personal income at the county level and on the number of employees per capita at the county and city level for key public services, including police, fire protection, general government, education, medical facilities, and hospitals. Housing data from the 2000 census were also used to establish trends in housing growth over the period 1990 to 2000; details were presented for both the owner-occupied and rental markets, including vacancy rates. The 2000 census data were used in this EIS to update the impacts that were described in the data compilation reports for each alternative.

F.6.2.3 Population

The construction and operation of a conversion facility would likely lead to in-migration into the ROI. In-migration would be both direct, related to new employment created on site, and indirect, related to changes in employment opportunities in the ROI as a whole. In the DUF_6 PEIS (DOE 1999) analysis, the number of direct employees in-migrating was based on information on employment in existing DOE programs and on the level of contractor support. Indirect in-migration that would occur for each ROI was calculated by using assumed in-migration rates associated with changes in employment in the local industries most significantly affected indirectly by construction and operation expenditures, with residual in-migration rates assumed for the remaining industries in the economy indirectly affected. As in the DUF_6 PEIS, population impacts in this EIS are presented in terms of the (1) absolute total (direct and indirect) in-migration impact and (2) relative population impact, or the magnitude of the absolute impact compared with the growth in the local economic population baseline.

F.6.2.4 Local Housing Markets

In-migration that would occur with the construction and operation of a conversion facility could affect the local housing market in the ROI. The DUF_6 PEIS (DOE 1999) analysis considered these impacts by estimating the increase in demand for housing units in each year of construction and operation on the basis of the number of in-migrating workers to the area surrounding each site and average household size. The results were compared with forecasts for housing supply and demand and owner-occupied and rental vacancy rates for each year during construction and operation, on the basis of information provided by the U.S. Bureau of the Census (1994, 2002a).

F.6.2.5 Local Jurisdictions

The construction and operation of a conversion facility would likely lead to some in-migration into the area surrounding the site, which would change the demand for educational services provided by school districts and for public services (police, fire protection, health services, etc.) provided by cities and counties. The DUF_6 PEIS (DOE 1999) analysis used estimates of in-migration (see above) as the basis for estimating impacts on public service employment and impacts on revenues and expenditures for the various counties, cities, and school districts in the ROI. Revenue and expenditure data were based on the annual

comprehensive financial reports produced by individual jurisdictions surrounding each site and on demographic information provided by the U.S. Bureau of the Census (2002a). Impacts were presented in terms of the number of (1) new public service employees required and (2) percentage change in forecasted revenues and expenditures for counties, cities, and school districts. Impacts were estimated for the peak year of construction and the first year of operation for the conversion facility.

F.7 ECOLOGY

Potential impacts on terrestrial and aquatic biota — including vegetation and wildlife, wetlands, and federal- and state-listed threatened and endangered species — were evaluated. The impact analysis focused on the radiological and chemical toxicity effects to biota that would result from exposure to DUF_6 and related compounds and from physical disturbance to biota and habitats. The conversion of DUF_6 was evaluated on the basis of the UDS technology for converting DUF_6 to depleted U_3O_8. The analysis considered potential impacts on biota in the vicinity of the Portsmouth site.

The analysis of impacts on wildlife addressed the effects of facility construction (including physical disturbance and habitat loss) and facility operations (including air quality, radiological, and chemical toxicity effects through the exposure pathways of inhalation, dermal contact, and ingestion). Exposures were based on predicted concentrations of contaminants in air, surface water, groundwater, and soil. Radiological dose rate estimates (in rad/d) were calculated for aquatic biota (fish and shellfish) on the basis of undiluted concentrations (in pCi/L), energy released per decay (MeV) for depleted uranium, and a bioconcentration factor (factors of 2 and 60 were applied for fish and shellfish, respectively). These dose rate estimates were compared with the dose limit of 1 rad/d specified in DOE Order 5400.5 (DOE 1990a). The screening level for potential ecological effects is 4.55×10^3 pCi/L for fish (Bechtel Jacobs Company LLC 1998). In addition, concentrations of uranium, uranium compounds, and HF in air, water, and/or soil were compared with published benchmark values (levels with no effects or lowest observed effects) to determine potential toxicity effects. Benchmark values for air concentration lowest observable effects due to inhalation were 7 mg/m^3 for HF and 17 mg/m^3 for U_3O_8. The benchmark values for aquatic toxicity were a screening level of 2.6 μg/L, the Tier II secondary chronic value for potential adverse effects (Suter and Tsao 1996), and a lowest observable effect level of 150 μg/L for total uranium (Hyne et al. 1992). Potential impacts analyzed included impacts on individuals (such as mortality, injury, or physical disturbance) and potential changes in biotic communities.

The analysis of ecological impacts on plant species addressed the effects of facility construction (such as effects from the removal of vegetation) and operations (such as chemical toxicity effects). Estimated concentrations of uranium in soil were compared with a benchmark value of 5 μg/g, which is the lowest observed effects concentration (Will and Suter 1994). Potential impacts analyzed included impacts on individuals (such as injury or mortality) and potential changes in biotic communities.

Physical disturbances to biota and habitats were also evaluated. The general guidelines used to assess impacts of habitat loss and wildlife disturbance were as follows: (1) negligible impacts were those that would affect less than 10 acres (4 ha) of required land; (2) moderate impacts would affect 10 to 100 acres (4 to 40 ha) of required land; and (3) potential large impacts would affect more than 100 acres (40 ha) of required land.

The potential impacts on wetlands were based on the direct impacts that could result from construction (such as filling) or the indirect impacts that could result from changes in water quality or the hydrologic regime or from soil compaction or runoff. The potential impacts on federal- and state-listed threatened and endangered species were based on the direct impacts that could result from habitat loss or modification or the indirect impacts that could result from disturbance.

Input for the impact analysis included data on plant and animal species either known to occur or that could potentially occur at the site and in ecosystems (such as wetland, forest, grassland) in the vicinity of the site.

F.8 WASTE MANAGEMENT

Potential impacts to waste management programs at Portsmouth and ETTP were evaluated for the alternatives considered in this EIS. The categories of waste evaluated were LLW, TRU, hazardous waste, and nonhazardous solid and liquid waste. Current (as of fiscal year [FY] 2002) projected total generation volumes for each of the categories of waste for the period covering FYs 2002 through 2025 were obtained from a database maintained by the DOE Oak Ridge Office for the site (Cain 2002). These volumes included wastes generated from routine site operations and from planned environmental restoration activities; they are summarized in Table F-4.

For this EIS, annualized generation volumes were derived for use in evaluating potential impacts from the conversion facility. These volumes were derived by dividing the forecasted total volumes from FY 2002 through FY 2025 by 24 years. These annualized generation volumes are included in Table F-4 and are also presented in Sections 3.1.9 and 3.2.9 for Portsmouth and ETTP, respectively. Potential impacts were then evaluated (see Chapter 5) by comparing the waste volumes that would be generated (from the conversion to U_3O_8 considered in this EIS) with the annualized generation volumes.

The majority of the wastes generated from the conversion facility would be LLW and nonhazardous wastes (wastewater and solids). At both Portsmouth and ETTP, all LLW is transported off site for disposal except Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or environmental restoration LLW solid wastes generated at ETTP. (These wastes are disposed of at the disposal cell located within the Oak Ridge Reservation [ORR] complex.) Nonhazardous wastewater is treated at on-site treatment facilities and discharged to permitted outfalls. It appears that the wastewater treatment facilities at these sites would have adequate remaining capacities to treat the additional wastewater that

TABLE F-4 Environmental Management Waste Generation Forecast[a] for Fiscal Years 2002 through 2025

		Waste Volume (m^3)			
Site	Waste Type	Inventory at End of FY 2001	Forecast of Newly Generated Waste, FY 2002–2025	Total Managed Waste, FY 2002–2025	Annualized Projection[c]
ETTP[b]	Hazardous	0	8,288	8,288	1,381
	LLW	20,595	953,059	973,654	162,276
	LLMW	2,572	62,608	65,180	10,863
	TRU	0	0	0	0
	Nonhazardous (sanitary/industrial)				
	Wastewater	0	1,131,169	1,131,169	188,528
	Solids	0	280,911	280,911	46,819
Portsmouth	Hazardous	0	2,587	2,587	112
	LLW	13,587	1,727,409	1,740,996	75,695
	LLMW	6,147	129,124	135,271	5,881
	TRU	0	0	0	0
	Nonhazardous (sanitary/industrial)				
	Wastewater	0	0	0	0
	Solids	0	76,358	76,358	3,320

[a] Source: DOE Oak Ridge Operations Office (Cain 2002). Volume projections include wastes from routine site operations and environmental restoration. A large portion of the waste would be from environmental restoration activities.

[b] For ETTP, it is projected that the majority of the waste would be generated by FY 2008, consistent with the site's accelerated schedule.

[c] Annualized projections were obtained by dividing volumes by 6 years for ETTP and 23 years for Portsmouth.

would be generated from the conversion facility (see Section 3). Nonhazardous solids at Portsmouth are disposed of at an on-site landfill. At ETTP, nonhazardous solids generated from environmental restoration activities are disposed of at the landfill located within the ORR complex, and the remaining waste (from other site activities) is transported to an off-site facility. All low-level mixed (radioactive and hazardous) waste (LLMW) and hazardous waste at these sites are transported off site for disposal, except for waste from environmental restoration activities at ETTP, which is sent to the disposal cell located within the ORR complex. TRU waste would most likely be transported to the Waste Isolation Pilot Plant (WIPP) in New Mexico.

F.9 RESOURCE REQUIREMENTS

The evaluation of resource requirements identified the major resources required that could be determined at this level of analysis. The commitment of material and energy resources during the entire life cycles of the facility considered in this EIS would include construction materials that could not be recovered or recycled, materials rendered radioactive that could not be decontaminated, and materials consumed or reduced to unrecoverable forms or waste. For construction, materials required would include wood, concrete, sand, gravel, steel, and other metals. Materials consumed during operations could include operating supplies, miscellaneous chemicals, and gases. Strategic and critical materials, or resources with small reserves, were also identified and considered.

Energy resources irretrievably committed during construction and operations would include the fossil fuels used to generate heat and electricity (if furnaces or boilers were used for heating; current plans are for electrical heating of facilities). Energy in the form of diesel fuel, gasoline, and oil would also be used for construction equipment and transportation vehicles.

The assessment of potential resource requirements for continued storage (no action) and the action alternatives was based on comparing the resource requirements needed for building and operating the proposed facility with the existing resource capacities of on-site infrastructure systems and with current off-site demand for resources at the three current storage sites. A variation of the methodology applied in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) (DOE 1997a) was utilized in this EIS study. The effects of the various options on on-site infrastructure systems (such as electrical demand) were assessed qualitatively by comparing the new demand with the existing maximum capacity. The demand on the off-site infrastructure that would result from new resource requirements was compared with the estimated current demand.

F.10 LAND USE

The evaluation of land use impacts under the action alternatives and the no action alternative employed a similar approach. A baseline description for 2003 outlined the land use patterns currently occurring on the Portsmouth site, providing a sense of what is both typical and acceptable in this locale. A complementary description of land use in Pike County, based on available interpreted satellite imagery, provides a sense of land use tendencies in the vicinity of the site (which remained relatively unchanged over the past decade). An analysis of the alternatives, in turn, enabled an assessment of how compatible (or incompatible) the various potential development scenarios would be with existing land use patterns. Although the analysis employed quantitative data when available — such as summaries of land use activities by the size of the area involved — the assessment ultimately was qualitative, being based on comparisons with existing land use patterns and current zoning and planning guidelines.

The assumptions underlying the assessment of impacts on land use for this EIS include these:

- Baseline conditions are assumed to be those that are occurring in 2003, although, in some cases, information on land use was available from prior years.

- The projected operating life of the proposed facility is assumed to be 25 years, beginning in about 2006.

- Under the no action alternative, continued storage of DUF_6 is assumed to occur over a 40-year period.

F.11 CULTURAL RESOURCES

Cultural resources include those portions of the natural and man-made environment that have significant historical or cultural meaning. These resources include archaeological sites, historic structures, cultural landscapes, and traditional cultural properties.

The DUF_6 conversion project activities that would have the greatest potential for affecting significant cultural resources would be those related to construction. It is anticipated that the operation and decommissioning of the conversion facility would have far fewer effects.

Three alternative locations for the conversion facility have been proposed for Portsmouth. The area of potential effect at each construction location was determined. This area would include the land within the boundary of each facility construction location, including access roads, laydown areas, parking areas, and any locations where upgrades to infrastructure (e.g., roads, power lines, and water lines) would be necessary. The land use history of these areas was reconstructed and evaluated to determine to what extent recent construction or earthmoving has altered the landscape and thus affected the likelihood of cultural resources being present.

A records search was conducted for each proposed construction location to determine if either unevaluated cultural resources or cultural resources eligible for inclusion in the *National Register of Historic Places* (NRHP) were known to exist. All classes of cultural resources were considered, ranging in date from the prehistoric to the contemporary. Sources included published documents, cultural resource surveys on file at the site, and files maintained by the relevant State Historic Preservation Officer (SHPO). Consultation was undertaken with the SHPO and Native American groups with historical ties to the area. This information was placed within a broader cultural and historical context. If cultural resource information was lacking, requiring new field studies before construction, the potential for encountering cultural resources in the projected area of effect was evaluated on the basis of the known distribution of cultural resources in the surrounding area.

The potential effects of chemical and radiological releases on cultural resources were investigated. There is a potential for an adverse effect on historic structures when secondary air

quality standards for criteria pollutants are exceeded. Secondary standards set pollution limits to protect public welfare and include protection against damage to buildings (EPA 2002). Air quality models were used to estimate the potential that construction and operation of the conversion facility would result in pollution beyond these limits. In this model, the projected increase in emissions was added to the background levels for the pollutant, and the sum was compared with state and national secondary standards. The potential for adverse effects on cultural resources from the accident scenarios considered in this EIS was also evaluated.

F.12 ENVIRONMENTAL JUSTICE

The methods used to evaluate environmental justice impacts emphasized issues identified in Executive Order 12898 ("Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations"), which defines environmental justice as a topic that must be evaluated for federal actions. As such, the methods focused on identifying high and adverse impacts on low-income and minority populations under the action alternatives and the no action alternative. The impacts examined under environmental justice included those impacts identified in all disciplines considered in this EIS (human health, air quality, socioeconomics, etc.).

The evaluation of impacts under environmental justice was based on the following basic assumptions:

- Baseline conditions are those occurring in 2002. However, the data used to identify minority populations were from 2000, and the data used to identify low-income populations were from 1999.

- The anticipated operating life of the proposed facility is 25 years, beginning in 2006.

- The ROI for environmental justice varies by impact area, ranging from 50 mi (80 km) from the proposed facility to geographic areas close to the facilities.

Because the environmental justice evaluation relied heavily on analyses in other disciplines, it also incorporated the assumptions underlying these other inquiries. The data used to evaluate impacts related to environmental justice were of two types: (1) census data used to define disproportionality and (2) data on anticipated effects under the action alternatives and the no action alternative. Data from the most recent decennial census of population and housing, conducted in 2000, provided a recent, detailed basis for evaluating the distribution of minority and low-income populations. These two population groups are defined as follows:

- *Minority:* Individuals who classify themselves as belonging to any of the following racial groups: Black (including Black or Negro, African American, Afro-American, Black Puerto Rican, Jamaican, Nigerian, West Indian, or Haitian); American Indian, Eskimo, or Aleut; Asian or Pacific Islander; or "Other Race" (U.S. Bureau of the Census 1991; see CEQ 1997). In the 2000

census, many individuals categorized themselves as belonging to more than one race. This EIS considers individuals of multiple races to be minority, regardless of the races involved. This study also includes individuals identifying themselves as Hispanic in origin, technically an ethnic category, under minority. To avoid double counting, the analysis included only White Hispanics, since the above racial groups already accounted for Non-white Hispanics.

- *Low-income:* Individuals falling below the poverty line. For the 2000 census, the poverty line was defined by a statistical threshold based on a weighted average that considered both family size and the ages of individuals in a family. For example, the 1999 weighted average poverty threshold annual income for a family of three with one related child younger than 18 years was $13,410, while the poverty threshold for a family of five with one child younger than 18 years was $21,024 (U.S. Bureau of the Census 2000). If a family fell below the poverty line for its particular composition, the census considered all individuals in that family to be below the poverty line. Low income figures in the 2000 census reflect incomes in 1999, the most recent year for which entire annual incomes were known at the time of the most recent census.

This EIS examined minority and low-income populations with census data collected and presented for counties and for census tracts. Census tracts are small, relatively permanent statistical subdivisions of a county, usually containing between 2,500 and 8,000 persons (U.S. Bureau of the Census 1991). Through the use of these geographic units, the environmental justice analysis is geographically commensurate with analyses in two other impact areas of particular concern with regard to minority and low-income populations: socioeconomics (which used counties) and human health (which used census tracts).

Environmental justice is not itself an impact area, per se. Rather, it considers other impacts that are both high and adverse and affect minority and low-income populations disproportionally. As such, the results of assessments in these other disciplines were crucial in the evaluation of environmental justice — essentially preceding the environmental justice evaluation. The key type of data required to identify environmental justice concerns was the result of these other analyses.

F.13 CUMULATIVE IMPACTS

Cumulative effects or impacts result from the incremental impact of the action alternatives when added to other past, present, and reasonably foreseeable future actions, regardless of what government agency or private entity undertakes such actions. Cumulative effects may result from impacts that are minor individually but that, when viewed collectively over space and time, can produce significant impacts. The approach used for cumulative analysis in this EIS was based on the principles outlined by the Council on Environmental Quality (CEQ 1997) and on the guidance developed by the EPA (1999) for independent reviewers of EISs.

The analysis of cumulative impacts focused on specific impacts on the human or natural environment that could result from multiple actions in the vicinity of the Portsmouth site and the ETTP site. Generally, the geographic area for each cumulative impact analysis was defined by the specific resource or receptor of concern and the spatial extent of the interacting (cumulative) impact generators. Although the cumulative analysis acknowledged the past history of impacts at each site, its emphasis was on future cumulative impacts that could occur during the life of a conversion facility. This focus allows the decision maker to place the direct and indirect impacts of the action alternatives within the context of other potential stressors.

The cumulative impact analysis for this EIS was not meant to be a review of all potential environmental impacts at and near a site, nor was it meant to be a sitewide impact analysis. As a starting point, the cumulative analysis used the direct and indirect impacts from the action alternatives as evaluated for each technical subject. Then similar impacts from other actions (including DOE actions, United States Enrichment Corporation (USEC) actions, and the actions of others) were identified. These were added to determine the cumulative impact from all activities occurring together. Then meaningful trends in past, present, and future cumulative impacts were discussed.

For each cumulative impact, the significance of the consequences was assessed on the basis of the (1) likelihood of the impact, (2) geographic or spatial extent of the impact, (3) duration in time of the impact, (4) applicable regulatory considerations, (5) potential for recovery if the impact was temporary, and (6) potential for effective mitigation.

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APPENDIX G:

CONSULTATION LETTERS

U.S. DEPARTMENT OF ENERGY LETTERS TO STATE AGENCIES AND RECOGNIZED NATIVE AMERICAN GROUPS

Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

July 18, 2002

Mr. Ron Sparkman
Chairperson
Shawnee Tribe
P.O. Box 189
Miami, OK 74355

Dear Mr. Sparkman:

The U.S. Department of Energy (DOE) is preparing an Environmental Impact Statement (EIS) presenting the likely effects of constructing and operating one or more plants to convert stored Depleted Uranium Hexafluoride (DUF_6) into a more stable form. As part of this process, the DOE is initiating consultations with Native American groups with historical ties to the areas under consideration for a conversion facility.

The EIS will evaluate plans to build and operate DUF_6 conversion facilities at the Paducah Gaseous Diffusion Plant (PGDP), McCracken County, Kentucky and the Portsmouth Gaseous Diffusion Plant (PORTS), Pike County, Ohio. Three possible construction locations will be evaluated at each site. The Notice of Intent to prepare the EIS was published on September 18, 2001 in the Federal Register. Public scoping for the DUF_6 conversion EIS took place between September 18, 2001 and January 11, 2001.

The enclosed maps show the location of the PORTS site and the alternative facility locations under consideration at PORTS. Cultural resource inventories have been initiated at PORTS. In most cases the likelihood of cultural resources being disturbed by construction activities is low. Only Location B includes some land with high archaeological sensitivity. The potential effects of the operation of the facilities on cultural resources located in the area surrounding PORTS will be evaluated in the EIS.

We have determined, in accordance with §800.3 of the Advisory Council on Historic Preservation's (Council) revised regulations for the protection of historic properties, that DOE's proposed action for the conversion of DUF_6 is: (1) an undertaking, as defined in 36 CFR §800.16(y); and (2) is a type of activity that has the potential to cause effects on historic properties. In accordance with §800.8(c) of the Council's regulations, we are notifying you, and the Council by copy of this letter, that we intend to use the process and documentation required to comply with the National Environmental Policy Act (NEPA) to comply with Section 106 of the National Historic Preservation Act (NHPA) for this undertaking. In using the NEPA process in lieu of the procedures set forth in §800.3 through §800.6 of the Council's regulations (i.e., the Section 106 process), we will ensure the standards set forth in §800.8(c)(1) through §800.8(c)(5) are met.

Please contact us if you have any concerns or comments regarding the proposed project. Any information you provide regarding specific cultural resources will remain confidential as stipulated in 36 CFR Part 800.11. To ensure that your concerns receive full consideration, please submit any comments within 30 days of the receipt of this letter.

Thank you for your attention to our notification of initiation of consultation. If you have any questions or need additional information on this matter, please contact me at (865) 576-0273 or by email at hartmangs@oro.doe.gov.

Sincerely,

Gary S. Hartman

Gary S. Hartman, EIS Document Manager
DOE ORO Cultural Resources
Management Coordinator

Enclosures

cc w/enclosures:
Skip Gosling, HR-76, HQ/FORS
Tom McCulloch, Advisory Council on Historic Preservation
Lois Thompson, EH-232, HQ/FORS
Kristi Wiehle, PORTS Site Office

Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

July 18, 2002

Mr. Ronald Froman
Principal Chief
Peoria Indian Tribe of Oklahoma
P.O. Box 1527
Miami, OK 74355

Dear Chief Froman:

The U.S. Department of Energy (DOE) is preparing an Environmental Impact Statement (EIS) presenting the likely effects of constructing and operating one or more plants to convert stored Depleted Uranium Hexafluoride (DUF_6) into a more stable form. As part of this process, the DOE is initiating consultations with Native American groups with historical ties to the areas under consideration for a conversion facility.

The EIS will evaluate plans to build and operate DUF_6 conversion facilities at the Paducah Gaseous Diffusion Plant (PGDP), McCracken County, Kentucky and the Portsmouth Gaseous Diffusion Plant (PORTS), Pike County, Ohio. Three possible construction locations will be evaluated at each site. The Notice of Intent to prepare the EIS was published on September 18, 2001 in the Federal Register. Public scoping for the DUF_6 conversion EIS took place between September 18, 2001 and January 11, 2001.

The enclosed maps show the location of the PGDP site and the alternative facility locations under consideration at PGDP. Cultural resource inventories have been initiated at PGDP. In most cases the likelihood of cultural resources being disturbed by construction activities is low. Only Location B includes some land with high archaeological sensitivity. The potential effects of the operation of the facilities on cultural resources located in the area surrounding PDGP will be evaluated in the EIS.

We have determined, in accordance with §800.3 of the Advisory Council on Historic Preservation's (Council) revised regulations for the protection of historic properties, that DOE's proposed action for the conversion of DUF_6 is: (1) an undertaking, as defined in 36 CFR §800.16(y); and (2) is a type of activity that has the potential to cause effects on historic properties. In accordance with §800.8(c) of the Council's regulations, we are notifying you, and the Council by copy of this letter, that we intend to use the process and documentation required to comply with the National Environmental Policy Act (NEPA) to comply with Section 106 of the National Historic Preservation Act (NHPA) for this undertaking. In using the NEPA process in lieu of the procedures set forth in §800.3 through §800.6 of the Council's regulations (i.e., the Section 106 process), we will ensure the standards set forth in §800.8(c)(1) through §800.8(c)(5) are met.

Please contact us if you have any concerns or comments regarding the proposed project. Any information you provide regarding specific cultural resources will remain confidential as stipulated in 36 CFR Part 800.11. To ensure that your concerns receive full consideration, please submit any comments within 30 days of the receipt of this letter.

Thank you for your attention to our notification of initiation of consultation. If you have any questions or need additional information on this matter, please contact me at (865) 576-0273 or by email at hartmangs@oro.doe.gov.

Sincerely,

Gary S. Hartman

Gary S. Hartman, EIS Document Manager
DOE ORO Cultural Resources
Management Coordinator

Enclosures

cc w/enclosures:
Skip Gosling, HR-76, HQ/FORS
Tom McCulloch, Advisory Council on Historic Preservation
Lois Thompson, EH-232, HQ/FORS
David Tidwell, Paducah Site Office

Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

July 18, 2002

Dr. Joseph Garrison
Tennessee Historical Commission
Department of Environment and Conservation
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Dr. Garrison:

The U.S. Department of Energy (DOE), Depleted Uranium Hexafluoride (DUF_6) Management Program, is preparing an Environmental Impact Statement (EIS) concerning its plans to convert DUF_6 stored at the Portsmouth Gaseous Diffusion Plant (PORTS), located in Pike County, Ohio, the Paducah Gaseous Diffusion Plant (PGDP), located in McCracken County, Kentucky, and the East Tennessee Technology Park (ETTP), located at Oak Ridge, Tennessee. The EIS will also evaluate transporting DUF_6 from storage at ETTP, Oak Ridge, Tennessee. In some conversion scenarios a cylinder transfer facility would be built at ETTP. Locations at the PGDP and the PORTS are being considered for the conversion facility. In 1999, the DOE prepared a Programmatic EIS for Alternative Strategies for the Long-Term Management and Use of DUF_6. The current site specific EIS will evaluate the construction and operation of a facility to convert the stored DUF_6 to a more stable chemical form. The Notice of Intent to prepare the EIS was published on September 18, 2001 in the Federal Register. Public scoping for the DUF_6 EIS took place between September 18, 2001 and January 11, 2001 and included meetings and written and electronic correspondence. The enclosed map shows the location of the ETTP. No construction sites have been proposed at ETTP to date. The effects on cultural resources of constructing a transfer facility will be evaluated in a future document if and when specific construction sites are proposed. The potential effects of the operation of the facilities on cultural resources located in the area surrounding ETTP will be evaluated in this EIS.

We have determined, in accordance with §800.3 of the Advisory Council on Historic Preservation's (Council) revised regulations for the protection of historic properties, that DOE's proposed action for the conversion of DUF_6 is: (1) an undertaking, as defined in 36 CFR §800.16(y); and (2) is a type of activity that has the potential to cause effects on historic properties. In accordance with §800.8(c) of the Council's regulations, we are notifying you, and the Council by copy of this letter, that we intend to use the process and documentation required to comply with the National Environmental Policy Act (NEPA) to comply with Section 106 of the National Historic Preservation Act (NHPA) for this undertaking. In using the NEPA process in lieu of the procedures set forth in §800.3 through §800.6 of the Council's regulations (i.e., the Section 106 process), we will ensure the standards set forth in §800.8(c)(1) through §800.8(c)(5) are met.

Thank you for your attention to our notification of initiation of consultation. If you have any questions or need additional information on this matter, please contact me at (865) 576-0273 (hartmangs@oro.doe.gov).

Sincerely,

Gary S. Hartman

Gary S. Hartman, EIS Document Manager
DOE ORO Cultural Resources
Management Coordinator

Enclosure

cc w/enclosure:
Skip Gosling, HR-76, HQ/FORS
Tom McCulloch, Advisory Council on Historic Preservation
Lois Thompson, EH-232, HQ/FORS
Donna Perez, EM-911, ORO

Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

July 18, 2002

Mr. Gary White Deer
Chickasaw Nation of Oklahoma
P.O. Box 1548
Ada, OK 74821

Dear Mr. White Deer:

The U.S. Department of Energy (DOE) is preparing an Environmental Impact Statement (EIS) presenting the likely effects of constructing and operating one or more plants to convert stored Depleted Uranium Hexafluoride (DUF_6) into a more stable form. As part of this process, the DOE is initiating consultations with Native American groups with historical ties to the areas under consideration for a conversion facility.

The EIS will evaluate plans to build and operate DUF_6 conversion facilities at the Paducah Gaseous Diffusion Plant (PGDP), McCracken County, Kentucky and the Portsmouth Gaseous Diffusion Plant (PORTS), Pike County, Ohio. Three possible construction locations will be evaluated at each site. The Notice of Intent to prepare the EIS was published on September 18, 2001 in the Federal Register. Public scoping for the DUF_6 conversion EIS took place between September 18, 2001 and January 11, 2001.

The enclosed maps show the location of the PGDP site and the alternative facility locations under consideration at PGDP. Cultural resource inventories have been initiated at PGDP. In most cases the likelihood of cultural resources being disturbed by construction activities is low. Only Location B includes some land with high archaeological sensitivity. The potential effects of the operation of the facilities on cultural resources located in the area surrounding PDGP will be evaluated in the EIS.

We have determined, in accordance with §800.3 of the Advisory Council on Historic Preservation's (Council) revised regulations for the protection of historic properties, that DOE's proposed action for the conversion of DUF_6 is: (1) an undertaking, as defined in 36 CFR §800.16(y); and (2) is a type of activity that has the potential to cause effects on historic properties. In accordance with §800.8(c) of the Council's regulations, we are notifying you, and the Council by copy of this letter, that we intend to use the process and documentation required to comply with the National Environmental Policy Act (NEPA) to comply with Section 106 of the National Historic Preservation Act (NHPA) for this undertaking. In using the NEPA process in lieu of the procedures set forth in §800.3 through §800.6 of the Council's regulations (i.e., the Section 106 process), we will ensure the standards set forth in §800.8(c)(1) through §800.8(c)(5) are met.

Please contact us if you have any concerns or comments regarding the proposed project. Any information you provide regarding specific cultural resources will remain confidential as stipulated in 36 CFR Part 800.11. To ensure that your concerns receive full consideration, please submit any comments within 30 days of the receipt of this letter.

Thank you for your attention to our notification of initiation of consultation. If you have any questions or need additional information on this matter, please contact me at (865) 576-0273 or by email at **hartmangs@oro.doe.gov**.

Sincerely,

Gary S. Hartman

Gary S. Hartman, EIS Document Manager
DOE ORO Cultural Resources
Management Coordinator

Enclosures

cc w/enclosures:
Skip Gosling, HR-76, HQ/FORS
Tom McCulloch, Advisory Council on Historic Preservation
Lois Thompson, EH-232, HQ/FORS
David Tidwell, Paducah Site Office

COMMONWEALTH OF KENTUCKY
DEPARTMENT OF FISH AND WILDLIFE RESOURCES
C. THOMAS BENNETT, COMMISSIONER

July 26, 2002

OFFICIAL FILE COPY
AMESQ
Log No. 71283
Date Received AUG 2 2002
File Code

Mr. James L. Elmore
Department of Energy
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, TN 37831

RE: Environmental Impact Statement Converting DUF6
Stored at Paducah Gaseous Diffusion Plant,
McCracken County, Kentucky

Dear Mr. Elmore:

I have reviewed the information provided on the above-referenced project. Accordingly, I offer the following comments and recommendations.

A review of the Kentucky Fish and Wildlife Information System indicates that several federal and/or state threatened and/or endangered species are known to occur within McCracken County that could be impacted by the project. That species list is attached. Please be aware that our database system is a dynamic one that only represents our current knowledge of the various species distributions. This information may also be obtained on the worldwide web at: www.kfwis.state.ky.us.

I would recommend that a habitat survey be conducted at the site of the proposed project and if any habitat that might harbor any of these species exists, then a specific survey for that species should be conducted. The results of those surveys will dictate if any additional surveys or analysis need to be conducted.

I appreciate the opportunity to comment.

Sincerely,

Wayne L. Davis
Environmental Section Chief

cc: Environmental Section Files

Arnold L. Mitchell Bldg. #1 Game Farm Road Frankfort, Ky 40601
An Equal Opportunity Employer M/F/D

1 of 1

Alosa alabamae	Alabama shad	Osteichthyes	MCCRACKEN	C	E	Reference
Atractosteus spatula	alligator gar	Osteichthyes	MCCRACKEN		E	Reference
Cyprinella camura	bluntface shiner	Osteichthyes	MCCRACKEN		E	Reference
Hybognathus hayi	cypress minnow	Osteichthyes	MCCRACKEN		E	Reference
Myotis sodalis	Indiana myotis	Mammalia	MCCRACKEN	LE	E	Reference
Obovaria retusa	ring pink	Bivalvia	MCCRACKEN	LE	E	Reference
Notropis maculatus	taillight shiner	Osteichthyes	MCCRACKEN		T	Reference
Nyctanassa violacea	yellow-crowned night-heron	Aves	MCCRACKEN		T	Reference

United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

September 18, 2002

Mr. James L. Elmore, Ph.D.
U.S. Department of Energy
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831

Dear Dr. Elmore:

Thank you for your letter and enclosures received July 23, 2002, regarding the preparation of an Environmental Impact Statement (EIS) for the proposed construction and operation of a facility to convert DUF6 to a more stable chemical form at the Paducah Gaseous Diffusion Plant (PGDP) in McCracken County, Kentucky. The referenced maps of the PGDP and proposed facility locations were not included in your letter. U.S. Fish and Wildlife Service personnel have reviewed the information submitted and offer the following comments for consideration.

According to our records, the following federally listed endangered species may occur on or near the PGDP:

Indiana bat *Myotis sodalis*

A qualified biologist should assess potential impacts and determine if the proposed project may affect the species. We recommend that you submit a copy of your assessment and the draft EIS to this office for review and concurrence. A finding of "may affect" could require the initiation of formal consultation procedures.

These constitute the comments of the U.S. Department of the Interior in accordance with provisions of the Endangered Species Act (87 Stat. 884, as amended: 16 U.S.C. 1531 et seq.). We appreciate the opportunity to comment. Should you have any questions or need further assistance, please contact Steve Alexander of my staff at 931/528-6481, ext. 210, or via e-mail at *steven_alexander@fws.gov*.

Sincerely,

for Lee A. Barclay, Ph.D.
Field Supervisor

xc: Wayne Davis, KDFWR, Frankfort
Laila Lienesch, FWS, Frankfort

DONALD S. DOTT, JR.
DIRECTOR

PAUL E. PATTON
GOVERNOR

COMMONWEALTH OF KENTUCKY
KENTUCKY STATE NATURE PRESERVES COMMISSION
801 SCHENKEL LANE
FRANKFORT, KENTUCKY 40601-1403
(502) 573-2886 VOICE
(502) 573-2355 FAX

August 12, 2002

James L. Elmore, Ph.D.
Department of Energy
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, TN 37831-2001

Dear Dr. Elmore:

This letter is in response to your data request of July 12, 2002 for State-Listed species information in the vicinity of the Paducah Gaseous Diffusion Plant DUF6 Conversion facility project. We have reviewed our Natural Heritage Program Database to determine if any of the endangered, threatened, or special concern plants and animals or exemplary natural communities monitored by the Kentucky State Nature Preserves Commission occur in the area. Based on our most current information, we have determined that 68 occurrences of the plants or animals and one occurrence of the exemplary natural communities that are monitored by KSNPC are reported as occurring in the specified area. Please see the attached report for more information. I have included a separate report of the species known from McCracken County, Kentucky as well.

Data and data products received from the Kentucky State Nature Preserves Commission, including any portion thereof, may not be reproduced in any form or by any means without the express written authorization of the Kentucky State Nature Preserves Commission. The exact location of plants, animals, and natural communities, if released by the Kentucky State Nature Preserves Commission, may not be released in any document or correspondence. These products are provided on a temporary basis for the express project (described above) of the requester, and may not be redistributed, resold or copied without the written permission of the Kentucky State Nature Preserves Commission's Data Manager (801 Schenkel Lane, Frankfort, KY, 40601. Phone: (502) 573-2886).

EDUCATION PAYS

Please note that the quantity and quality of data collected by the Kentucky Natural Heritage Program are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Kentucky have never been thoroughly surveyed, and new plants and animals are still being discovered. For these reasons, the Kentucky Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of Kentucky. Heritage reports summarize the existing information known to the Kentucky Natural Heritage Program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. We would greatly appreciate receiving any pertinent information obtained as a result of on-site surveys.

If you have any questions or if I can be of further assistance, please do not hesitate to contact me.

Sincerely,

Sara Hines

Sara Hines
Data Manager

Enclosures: Data Report and Interpretation Key, McCracken County List
Endangered, Threatened, and Special Concern Plants and Animals of Kentucky
Plants and Animals Presumed Extinct or Extirpated from Kentucky
Monitored Natural Communities of Kentucky

Data Key for Element and Occurrence Reports (v. 3.98)
Kentucky State Nature Preserves Commission
Natural Heritage Program Data Services

Many of the data fields on the enclosed report are easily understood. Other fields, however, use abbreviations and formats that are not always self-explanatory. A key to these fields follows. Your report may contain some or all of the following data fields.

BEARING:	Bearing in degrees from a center point to an occurrence's latitude and longitude. This field is masked for sensitive occurrences; contact KSNPC in these cases. Omitted for G, U, and Q precision occurrence records.
BESTSOURCE:	Best available reference to the occurrence: literature citation, collector, collection number, museum or herbarium code, etc.
COMMENTS:	Additional information about the occurrence including identification, taxonomy, or date of occurrence.
DIRECTIONS:	Directions to an occurrence. This field is masked for sensitive occurrences; contact KSNPC in these cases.
DISTANCE:	Distance from a center point to an occurrence's latitude and longitude. Units coded as M (miles), K (kilometers), and F (feet). This field is masked for sensitive occurrences; contact KSNPC in these cases. Omitted for G, U, and Q precision occurrence records.
ELCODE:	Element (species) code.
EOCODE:	Element (species) code, occurrence number (last three digits), and state.
EODATA:	Occurrence population data: date of observation, number of individuals, health, size of colony, flowering data, etc.
EORANK:	Judgement of occurrence quality: A = excellent, B = good, C = marginal, D = poor, E = verified extant but quality not judged, O = obscure (not found at reported site but more searching needed), H = historically known from site but no known observation or collection since 1975, X = extirpated from site.
FIRSTOBS:	Year of first known observation or collection.
GENDESC:	Description of an occurrence's habitat.
GRANK:	Estimate of element abundance on a global scale: G1 = extremely rare, G2 = rare, G3 = uncommon, G4 = common, G5 = very common, GH = historically known and expected to be rediscovered, GU = uncertain, GX = extinct. Subspecies and variety abundances are coded with a 'T' suffix; the 'G' portion of the rank then refers to the entire species.
HABITAT:	General description of the element's habitat across its range.
IDENT:	Whether the identification has been checked by a reliable individual and is believed to be correctly identified: Y = identification confirmed and believed correct, N = No, identification determined to be wrong despite reports to the contrary, ? = Whether identification is correct or not is confusing or disputed, blank or U = unknown whether identification correct or not, assumed correct.
KSNPC:	Kentucky State Nature Preserves Commission status: N or blank = none, E = endangered, T = threatened, S = special concern, H = historic, X = extirpated.
LASTOBS:	Year(-month-date) of most recent known observation or collection.
LAT:	Latitude. This field is masked for sensitive occurrences; contact KSNPC in these cases. Omitted for G, U and Q precision occurrences.
LONG:	Longitude. This field is masked for sensitive occurrences; contact KSNPC in these cases. Omitted for G, U and Q precision occurrences.
MAP NUMBER:	Number used to location the element on KSNPC Heritage maps.
MARGNUM:	See MAP NUMBER.
PREC:	See PRECISION.

Rare Species And Communities Recorded for the Proposed DUF6 Conversion Facility at the Paducah Gaseous Diffusion Plant.

KSNPC
Data Request No. 03-022

EOCODE	SNAME	SCOMNAME	GRANK	SRANK	SPROT	USESA	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	EPA WATERBODY	DIRECTIONS	HABITAT
***Vascular Plants															
PDFAB0G041*013*KY	BAPTISIA BRACTEATA VAR LEUCOPHAEA	CREAM WILD INDIGO	G4G5T4T5	S3	S		Y	1997-05-11	S	C	McCracken	HEATH		WEST KY WMA, RD AROUND NUCLEAR PLANT (DYKE RD).	PRAIRIES AND OPEN WOODS ON SANDY SOIL.
PDJUG01010*002*KY	CARYA AQUATICA	WATER HICKORY	G5	S2S3	T			1997-	M	D	McCracken	JOPPA		METROPOLIS LAKE.	BOTTOMLANDS AND FLOODPLAIN SWAMPS.
PDSTY01030*021*KY	HALESIA TETRAPTERA	MOUNTAIN SILVER-BELL	G5	S1S2	E		Y	2001-04-13	S	B	McCracken	JOPPA		METROPOLIS LAKE SNP; SW END OF METROPOLIS LAKE, CA 0.3 AIR MI E OF POWERPLANT LOCATED OFF OF KY 996.	RICH WOODS AND EDGES OF SLOUGHS AND OXBOW LAKES.
PDSTY01030*015*KY	HALESIA TETRAPTERA	MOUNTAIN SILVER-BELL	G5	S1S2	E		Y	1991-06-20	S	A	McCracken	JOPPA		CIRCA 1.0 AIR MI WNW OF N CORNER OF SETTLING PONDS FOR SHAWNEE STEAM PLANT ALONG RIDGE ABOVE OHIO RIVER.	RICH WOODS AND EDGES OF SLOUGHS AND OXBOW LAKES.
PDAST6C040*001*KY	MELANTHERA NIVEA	SNOW MELANTHERA	G5	S37	S		Y	2001-07-23	S	B/A	McCracken	JOPPA		METROPOLIS LAKE, OFF KY 996, W OF PADUCAH.	FLOODPLAINS AND SANDY WOODS INCLUDING DISTURBED OPENINGS.
PMPOA480S0*005*KY	MUHLENBERGIA GLABRIFLORIS	HAIR GRASS	G4?	S2S3	S			1977-09-21	M	H	McCracken	JOPPA		ALONG METROPOLIS FERRY ROAD, OFF OF KY 1420.	DRY, DESSICCATED OR BAKED SOILS, PRAIRIES, GRAVELS, OR ROCKY SLOPES AND MEDLEY REPORTS WET WOODS, MARSH EDGES AND FIELDS.
PDAST8L082*015*KY	SILPHIUM LACINIATUM VAR ROBINSONII	COMPASS PLANT	G5T?	S2	T		Y	1993-07	S	B	McCracken	HEATH		725 BETWEEN KY 726 AND KY 1154 (MARGNUM 34, 370505N, 884838W), (MARGNUM 35, 370513N, 884859W), (MARGNUM 36, 370521N, 884906W), (MARGNUM 37, 370515N, 884908W), (MARGNUM 38, 370517N, 884916W); JCT OF MAGRUDER RD	PRAIRIES INCL. REMNANTS OF THIS FLORA ON ROADSIDES AND FIELDS.
PDAST8L082*025*KY	SILPHIUM LACINIATUM VAR ROBINSONII	COMPASS PLANT	G5T?	S2	T			1993-07	S	C	McCracken	HEATH		WEST KENTUCKY WILDLIFE MANAGEMENT AREA BETWEEN SPRING BAYOU (BAYOU CREEK) AND ACID RD, CA 0.5 AIR MI NNW OF SPRING BAYOU CHURCH.	PRAIRIES INCL. REMNANTS OF THIS FLORA ON ROADSIDES AND FIELDS.
PDAST8L082*016*KY	SILPHIUM LACINIATUM VAR ROBINSONII	COMPASS PLANT	G5T?	S2	T		Y	1993-07	S	A	McCracken	HEATH		BOTH SIDES OF UNNAMED GRAVEL RD, CA 0.1 AIR MI S OF SOUTH ACID RD (MARGNUM 23), (MARGNUM 32, 370610N, 884935W), (MARGNUM 40, 370553N, 884949W), (MARGNUM 41, 370548N, 884952W), (MARGNUM 42, 370546N, 884945W),	PRAIRIES INCL. REMNANTS OF THIS FLORA ON ROADSIDES AND FIELDS.
***Gastropod															
IMGASK5100*009*KY	LEPTOXIS PRAEROSA	ONYX ROCKSNAIL	G5	S3S4	S		Y	1980-10-16	S	H	McCracken	JOPPA		OHIO RIVER AT MILE 948.0, LITTLE CHAIN BAR.	CALL (1895) INDICATED THAT IN THE OHIO RIVER AT THE FALLS IT OCCURRED IN THE GREATEST PROFUSION WHERE THE BOTTOM IS CLEAN ROCK OR ROCK WITH ABUNDANT "CONFERVOID" VEGETATION.
IMGASK6100*023*KY	LITHASIA VERRUCOSA	VARICOSE ROCKSNAIL	G3G4	S3S4	S		Y	1980-10-08	S	H	McCracken	JOPPA		OHIO RIVER AT MILE 948.0, LITTLE CHAIN BAR.	OBSERVATIONS ON THE HABITAT INCLUDE SPECIMENS TAKEN FROM RECENTLY EXPOSED BARS AND POOLS WITH SAND, GRAVEL, AND ROCK SUBSTRATES (HAAG AND PALMER-BALL, PERS COMM).

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EOCODE	SNAME	SCOMNAME	GRANK	SRANK	SPROT	USESA	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	EPA WATERBODY	DIRECTIONS	HABITAT
***Bivalves															
IMBIV21110*054*KY	LAMPSILIS ABRUPTA	PINK MUCKET	G2	S1		E	LE	Y	2001-08-31	S	D	McCracken	JOPPA		OHIO RIVER MILE 948.4, CA 120 M FROM KY SHORE.	APPARENTLY MORE COMMONLY FROM GRAVEL AND COBBLE. COLLECTED FROM SHALLOW AND DEEP WATER WITH CURRENT VELOCITY RANGING FROM ZERO TO SWIFT (AHLSTEDT 1983, BOGAN AND PARMALEE 1983, BUCHANAN 1980), BUT NEVER STANDING POOLS OF WATER (LAURITSEN PARMALEE 1967, STANSBERY 1976), BUT OCCURS IN MEDIUM-SIZED STREAMS IN GRAVEL, SAND, OR EVEN MUD (PARMALEE 1967, JOHNSON 1970, GORDON AND LAYZER 1989). IN THE LOWER WABASH AND OHIO RIVERS SPECIMENS WERE TAKEN IN DEEP WATER (5-10 FEET OR MORE) IN CURRENT FROM SAND
IMBIV21130*079*KY	LAMPSILIS OVATA	POCKETBOOK	G5	S1		E			1954-06-30	G	H	McCracken	JOPPA		OHIO RIVER BETWEEN METROPOLIS AND JOPPA (PLOTTED AT MIDPOINT).	
IMBIV34020*032*KY	PLETHOBASUS COOPERIANUS	ORANGEFOOT PIMPLEBACK	G1	S1		E	LE	Y	1907-08-18	G	H	McCracken	BANDANA		OHIO RIVER AT HILLERMAN, IL.	USUALLY FOUND IN LARGE RIVERS IN SAND AND GRAVEL SUBSTRATES (AHLSTEDT 1983, BOGAN AND PARMALEE 1983, MILLER, A.C. ET AL. 1986).
IMBIV34020*053*KY	PLETHOBASUS COOPERIANUS	ORANGEFOOT PIMPLEBACK	G1	S1		E	LE	Y	1999-09-07	S	D	McCracken	JOPPA		OHIO R AT LITTLE CHAIN BAR CA R MI 948.	USUALLY FOUND IN LARGE RIVERS IN SAND AND GRAVEL SUBSTRATES (AHLSTEDT 1983, BOGAN AND PARMALEE 1983, MILLER, A.C. ET AL. 1986).
IMBIV34020*056*KY	PLETHOBASUS COOPERIANUS	ORANGEFOOT PIMPLEBACK	G1	S1		E	LE	Y	2001-08-31	S	D	McCracken	JOPPA		OHIO RIVER MILE 948.4, CA 120 M FROM KY SHORE.	USUALLY FOUND IN LARGE RIVERS IN SAND AND GRAVEL SUBSTRATES (AHLSTEDT 1983, BOGAN AND PARMALEE 1983, MILLER, A.C. ET AL. 1986).
IMBIV34030*090*KY	PLETHOBASUS CYPHYUS	SHEEPNOSE	G3	S3		S		Y	1954-06-30	G	H	McCracken	JOPPA		OHIO RIVER BETWEEN METROPOLIS AND JOPPA (PLOTTED AT MIDPOINT).	USUALLY FOUND IN LARGE RIVERS IN CURRENT ON MUD, SAND, OR GRAVEL BOTTOMS AT DEPTH OF 1-2 METERS OR MORE (BAKER 1928, PARMALEE 1967, GORDON AND LAYZER 1989).
IMBIV34030*087*KY	PLETHOBASUS CYPHYUS	SHEEPNOSE	G3	S3		S		Y	1955-05-17	G	H	McCracken	JOPPA		OHIO RIVER AT JOPPA.	USUALLY FOUND IN LARGE RIVERS IN CURRENT ON MUD, SAND, OR GRAVEL BOTTOMS AT DEPTH OF 1-2 METERS OR MORE (BAKER 1928, PARMALEE 1967, GORDON AND LAYZER 1989).
IMBIV34030*065*KY	PLETHOBASUS CYPHYUS	SHEEPNOSE	G3	S3		S		Y	1907-08-18	G	H	McCracken	BANDANA		OHIO RIVER AT HILLERMAN, IL.	USUALLY FOUND IN LARGE RIVERS IN CURRENT ON MUD, SAND, OR GRAVEL BOTTOMS AT DEPTH OF 1-2 METERS OR MORE (BAKER 1928, PARMALEE 1967, GORDON AND LAYZER 1989).
IMBIV34030*125*KY	PLETHOBASUS CYPHYUS	SHEEPNOSE	G3	S3		S		Y	1999-08	S	D	McCracken	JOPPA		OHIO RIVER AT LITTLE CHAIN BAR, CA MI 948.	USUALLY FOUND IN LARGE RIVERS IN CURRENT ON MUD, SAND, OR GRAVEL BOTTOMS AT DEPTH OF 1-2 METERS OR MORE (BAKER 1928, PARMALEE 1967, GORDON AND LAYZER 1989).
IMBIV37030*001*KY	POTAMILUS CAPAX	FAT POCKETBOOK	G1	S1		E	LE	Y	1907-08	G	H	McCracken	BANDANA		OHIO R, AT HILLERMAN, MASSAC CO., ILL.	BACK CHANNELS, AND SOMETIMES IN DITCHES, IN MUD (OOZE); MIXED SAND, MUD, AND CLAY; OR FINE SILT AND MUD IN FLOWING WATER AT DEPTHS OF A FEW INCHES UP TO EIGHT FEET (PARMALEE 1967, AHLSTEDT AND JENKINSON 1987, CUMMINGS AND MAYER 1993, CUMMINGS ET AL. 1990).
IMBIV37030*029*KY	POTAMILUS CAPAX	FAT POCKETBOOK	G1	S1		E	LE	Y	1999-09-07	S	D	McCracken	JOPPA		OHIO RIVER AT CA R MI 945.6; BAR AT POWERLINE CROSSING.	BACK CHANNELS, AND SOMETIMES IN DITCHES, IN MUD (OOZE); MIXED SAND, MUD, AND CLAY; OR FINE SILT AND MUD IN FLOWING WATER AT DEPTHS OF A FEW INCHES UP TO EIGHT FEET (PARMALEE 1967, AHLSTEDT AND JENKINSON 1987, CUMMINGS AND MAYER 1993, CUMMINGS ET AL. 1990).
IMBIV39041*041*KY	QUADRULA CYLINDRICA CYLINDRICA	RABBITSFOOT	G3T3	S2		T		Y	1907-08-18	G	H	McCracken	BANDANA		OHIO RIVER AT HILLERMAN, IL.	SMALL TO LARGE RIVERS WITH SAND, GRAVEL, AND COBBLE AND MODERATE TO SWIFT CURRENT, SOMETIMES IN DEEP WATER (PARMALEE 1967, BOGAN AND PARMALEE 1983).

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EOCODE	SNAME	SCOMNAME	GRANK	SRANK	SPROT	USESA	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	EPA WATERBODY	DIRECTIONS	HABITAT
IMBIV39041*030*KY	QUADRULA CYLINDRICA CYLINDRICA	RABBITSFOOT	G3T3	S2	T		Y	1987-05-21	S	O	McCracken	JOPPA		OHIO RIVER, ORM 945, AT END OF ROAD THAT PASSES E SIDE OF METROPOLIS LAKE, 10 MI WNW OF PADUCAH.	SMALL TO LARGE RIVERS WITH SAND, GRAVEL, AND COBBLE AND MODERATE TO SWIFT CURRENT, SOMETIMES IN DEEP WATER (PARMALEE 1967, BOGAN AND PARMALEE 1983).
***Crustaceans															
ICMAL11060*004*KY	ORCONECTES LANCIFER	A CRAYFISH	G5	S1	E		Y	1975-04-26	S	H	McCracken	JOPPA		METROPOLIS LAKE 4.8 KM N GRAHAMVILLE NEAR END OF HWY 305 (ACTUALLY END OF HWY 996 AND DRIVEWAY TO LAKE).	OXBOW LAKES AND STREAMS ON THE GULF COASTAL PLAIN (PAGE 1985), WHERE IT LIVES AMONG ORGANIC DEBRIS, USUALLY NEAR BALD CYPRESS (BURR AND HOBBS 1984).
***Fishes															
AFCBA02010*002*KY	ATRACTOSTEUS SPATULA	ALLIGATOR GAR	G3G4	S1	E			1975-06-27	G	H	McCracken	JOPPA		OHIO RIVER AT SHAWNEE STEAM PLANT, NEAR PADUCAH.	SLUGGISH POOLS AND BACKWATERS OF LARGE RIVERS, BACKWATERS, AND OXBOW LAKES (BURR AND WARREN 1986, PAGE AND BURR 1991, ETNIER AND STARNES 1993).
AFCJC05020*006*KY	ERIMYZON SUCETTA	LAKE CHUBSUCKER	G5	S2	T		Y		G	H	McCracken	JOPPA		OHIO RIVER, SHAWNEE STEAM PLANT W OF PADUCAH.	LOWLAND LENTIC HABITATS (WETLANDS AND FLOODPLAIN LAKES) WITH SUBMERGENT AND FLOATING VEGETATION (BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCHD01040*003*KY	ESOX NIGER	CHAIN PICKEREL	G5	S3	S			1972-05-28	M	E	McCracken	JOPPA		METROPOLIS LAKE, 4.8 KM N GRAHAMVILLE.	COASTAL PLAIN WETLANDS, STREAMS, AND VEGETATED OXBOW LAKE SHORELINES, AND IT ALSO TOLERATES RESERVOIR CONDITIONS (BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCJB16030*004*KY	HYBOGNATHUS HAYI	CYPRESS MINNOW	G5	S1	E		Y	1993-07-21	S	D	McCracken	JOPPA		METROPOLIS LAKE, 3 MI N GRAHAMVILLE.	COASTAL PLAIN AND SHAWNEE HILLS. USUALLY OVER MUD OR SAND BOTTOMS, BUT OCCASIONALLY ASSOCIATED WITH SUBMERGED AQUATIC VEGETATION OR OTHER COVER (BURR AND WARREN 1986, PFLIEGER 1975, SMITH 1979, GILBERT 1980, BURR ET AL. 1980). NEEDS WETLANDS ADJACENT
AFBAA01020*006*KY	ICHTHYOMYZON CASTANEUS	CHESTNUT LAMPREY	G4	S2	S			1951-	G	H	McCracken	JOPPA		OHIO RIVER AT JOPPA, ILLINOIS.	CONSISTS OF GRAVEL AND RUBBLE WITH AREAS OF SAND AND SILT. LARVAE REQUIRE CLEAR STREAMS WITH STABLE BARS OF SILT, SAND AND ORGANIC DETRITIS (BECKER 1983, PFLIEGER 1975, ROHDE AND LANTEIGNE-COURCHERE 1980, SCOTT AND CROSSMAN 1973, SMITH 1979).
AFBAA01020*007*KY	ICHTHYOMYZON CASTANEUS	CHESTNUT LAMPREY	G4	S2	S			1951-	G	H	McCracken	METROPOLIS		OHIO RIVER AT METROPOLIS, ILLINOIS.	CONSISTS OF GRAVEL AND RUBBLE WITH AREAS OF SAND AND SILT. LARVAE REQUIRE CLEAR STREAMS WITH STABLE BARS OF SILT, SAND AND ORGANIC DETRITIS (BECKER 1983, PFLIEGER 1975, ROHDE AND LANTEIGNE-COURCHERE 1980, SCOTT AND CROSSMAN 1973, SMITH 1979).
AFBAA01020*010*KY	ICHTHYOMYZON CASTANEUS	CHESTNUT LAMPREY	G4	S2	S			1974-04-17	G	E	McCracken	JOPPA		OHIO RIVER, AT SHAWNEE STEAM PLANT.	CONSISTS OF GRAVEL AND RUBBLE WITH AREAS OF SAND AND SILT. LARVAE REQUIRE CLEAR STREAMS WITH STABLE BARS OF SILT, SAND AND ORGANIC DETRITIS (BECKER 1983, PFLIEGER 1975, ROHDE AND LANTEIGNE-COURCHERE 1980, SCOTT AND CROSSMAN 1973, SMITH 1979).
AFCJC07030*016*KY	ICTIOBUS NIGER	BLACK BUFFALO	G5	S3	S		Y	1997-09-30	M	C	McCracken	JOPPA		OHIO RIVER, SHAWNEE STEAM PLANT, NW OF PADUCAH.	RESERVOIRS AND MEDIUM TO LARGE RIVERS WITH MODERATE TO LOW GRADIENT AND SOMETIME SWIFT CURRENT (BECKER 1983, PFLIEGER 1975, SMITH 1979, TRAUTMAN 1981, AND BURR AND WARREN 1986).
AFCJC07030*026*KY	ICTIOBUS NIGER	BLACK BUFFALO	G5	S3	S		Y	1996-04	S	D	McCracken	JOPPA		LITTLE BAYOU CREEK [AT UNNAMED RD NR HOOPER CEMETERY CA 2.0 AIR KM NW OF KY 996-KY 1420 JCT].	RESERVOIRS AND MEDIUM TO LARGE RIVERS WITH MODERATE TO LOW GRADIENT AND SOMETIME SWIFT CURRENT (BECKER 1983, PFLIEGER 1975, SMITH 1979, TRAUTMAN 1981, AND BURR AND WARREN 1986).

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EOCODE	SNAME	SCOMNAME	GRANK	SRANK	SPROT	USESA	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	EPA WATERBODY	DIRECTIONS	HABITAT
AFCJC07030*027*KY	ICTIOBUS NIGER	BLACK BUFFALO	G5	S3	S		Y	1997-03	S	D	McCracken	JOPPA		BIG BAYOU CREEK (CA. 0.4 STREAM KM S OF WEST BOONE RD CROSSING).	RESERVOIRS AND MEDIUM TO LARGE RIVERS WITH MODERATE TO LOW GRADIENT AND SOMETIME SWIFT CURRENT (BECKER 1983, PFLIEGER 1975, SMITH 1979, TRAUTMAN 1981, AND BURR AND WARREN 1986).
AFCQB11120*032*KY	LEPOMIS MINIATUS	REDSPOTTED SUNFISH	G5	S2	T		Y	1997-03	S	D	McCracken	HEATH		LITTLE BAYOU CK AT KY 358 (SITE 12).	OCCURS IN WELL-VEGETATED SWAMPS, SLOUGHS, BOTTOMLAND LAKES, AND LOW GRADIENT STREAMS (BURR AND MAYDEN 1979, PFLIEGER 1975, SMITH 1979, BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCQB11120*033*KY	LEPOMIS MINIATUS	REDSPOTTED SUNFISH	G5	S2	T		Y	1996-04	S	D	McCracken	JOPPA		LITTLE BAYOU AT UNNAMED RD (SITE 10) [NR HOOPER CEMETERY CA 2.0 AIR KM NW OF KY 966/KY 1420 JCT].	OCCURS IN WELL-VEGETATED SWAMPS, SLOUGHS, BOTTOMLAND LAKES, AND LOW GRADIENT STREAMS (BURR AND MAYDEN 1979, PFLIEGER 1975, SMITH 1979, BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCQB11120*034*KY	LEPOMIS MINIATUS	REDSPOTTED SUNFISH	G5	S2	T		Y	1996-06	S	D	McCracken	JOPPA		BIG BAYOU CREEK AT BOLDRY RD, 2.8 RIVER KM FROM MOUTH (SITE 14).	OCCURS IN WELL-VEGETATED SWAMPS, SLOUGHS, BOTTOMLAND LAKES, AND LOW GRADIENT STREAMS (BURR AND MAYDEN 1979, PFLIEGER 1975, SMITH 1979, BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCQB11120*007*KY	LEPOMIS MINIATUS	REDSPOTTED SUNFISH	G5	S2	T		Y	1998-04-02	S	A	McCracken	JOPPA		METROPOLIS LAKE, 4.8 KM N OF GRAHAMVILLE.	OCCURS IN WELL-VEGETATED SWAMPS, SLOUGHS, BOTTOMLAND LAKES, AND LOW GRADIENT STREAMS (BURR AND MAYDEN 1979, PFLIEGER 1975, SMITH 1979, BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCND02010*067*KY	MENIDIA BERYLLINA	INLAND SILVERSIDE	G5	S2	T		Y	1992-08-04	M	C	McCracken	JOPPA		OHIO RIVER NEAR JOPPA.	SCHOOLING SURFACE FISH THAT OCCURS IN THE MISSISSIPPI RIVER AND FLOODPLAIN LAKES (BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCND02010*009*KY	MENIDIA BERYLLINA	INLAND SILVERSIDE	G5	S2	T		Y	1992-09-25	M	C	McCracken	JOPPA		OHIO RIVER MILE 944-948, NEAR SHAWNEE STEAM PLANT.	SCHOOLING SURFACE FISH THAT OCCURS IN THE MISSISSIPPI RIVER AND FLOODPLAIN LAKES (BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCND02010*012*KY	MENIDIA BERYLLINA	INLAND SILVERSIDE	G5	S2	T		Y	1993-07-21	S	A	McCracken	JOPPA		METROPOLIS LAKE AT BOAT RAMP.	SCHOOLING SURFACE FISH THAT OCCURS IN THE MISSISSIPPI RIVER AND FLOODPLAIN LAKES (BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCJB28650*002*KY	NOTROPIS MACULATUS	TAILLIGHT SHINER	G5	S2S3	T		Y	1998-04-02	S	A	McCracken	JOPPA		METROPOLIS LAKE, 5 KM N GRAHAMVILLE.	LOW GRADIENT STREAMS, OXBOW LAKES, AND SLOUGHS IN AND AROUND CYPRESS KNEES, MARGINAL VEGETATION, AND ACCUMULATIONS OF STICKS AND DETRITUS (BURR AND PAGE 1975, BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCKA02220*014*KY	NOTURUS STIGMOSUS	NORTHERN MADTOM	G3	S2S3	S				G	H	McCracken	JOPPA		OHIO RIVER AT SHAWNEE STEAM PLANT, NW OF PADUCAH.	LARGE STREAMS AND RIVERS IN MODERATE TO SWIFT CURRENT OVER GRAVEL AND SAND, AND SOMETIMES DEBRIS OR PONDWEED FOR COVER (BURR AND WARREN 1986, ETNIER AND STARNES 1993).
AFCKA02220*037*KY	NOTURUS STIGMOSUS	NORTHERN MADTOM	G3	S2S3	S		Y	1999-09-08	S	D	McCracken	JOPPA		OHIO R AT LITTLE CHAIN BAR.	LARGE STREAMS AND RIVERS IN MODERATE TO SWIFT CURRENT OVER GRAVEL AND SAND, AND SOMETIMES DEBRIS OR PONDWEED FOR COVER (BURR AND WARREN 1986, ETNIER AND STARNES 1993).
***Amphibians															
AAABC02060*035*KY	HYLA CINEREA	GREEN TREEFROG	G5	S3	S		Y	1991-06-28	S	B	McCracken	JOPPA		CIRCA 0.3 AIR MI SW OF W TIP OF SHAWNEE STEAM PLANT SETTLING PONDS.	FLOODPLAIN WETLANDS, PARTICULARLY THOSE DOMINATED BY BUTTONBUSH AND HERBACEOUS EMERGENT VEGETATION.

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EOCODE	SNAME	SCOMNAME	GRANK	SRANK	SPROT	USESA	DENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	EPA WATERBODY	DIRECTIONS	HABITAT
AAABC02060*034*KY	HYLA CINEREA	GREEN TREEFROG	G5	S3	S		Y	1991-06-25	S	B	McCracken	JOPPA		WEST KENTUCKY WILDLIFE MANAGEMENT AREA, CA 1.4 AIR MI WNW OF THE N TIP OF THE N-MOST SHAWNEE STEAM PLANT SETTLING POND.	FLOODPLAIN WETLANDS, PARTICULARLY THOSE DOMINATED BY BUTTONBUSH AND HERBACEOUS EMERGENT VEGETATION.
AAABH01014*049*KY	RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	G4T4	S3	S		Y	1964-03-07	G	O	McCracken	PADUCAH WEST		US 62, 5.0 MI SW OF PADUCAH.	BREEDS IN PONDS IN FARMLAND AND EDGE. REMAINS UNDERGROUND THROUGHOUT MOST OF THE YEAR, USING CRAYFISH BURROWS IN MOIST GRASSLANDS AND MEADOWS.
AAABH01014*050*KY	RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	G4T4	S3	S		Y	1964-03-13	M	O	McCracken	HEATH		US 60, 0.6 MI E OF FUTURE CITY, 10 MI W OF PADUCAH.	BREEDS IN PONDS IN FARMLAND AND EDGE. REMAINS UNDERGROUND THROUGHOUT MOST OF THE YEAR, USING CRAYFISH BURROWS IN MOIST GRASSLANDS AND MEADOWS.
AAABH01014*011*KY	RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	G4T4	S3	S		Y	1991-03-18	S	C	McCracken	JOPPA		MARTIN CEMETERY, S SIDE KY 358 CA 0.6 RD MI E JCT BETHEL CHURCH RD.	BREEDS IN PONDS IN FARMLAND AND EDGE. REMAINS UNDERGROUND THROUGHOUT MOST OF THE YEAR, USING CRAYFISH BURROWS IN MOIST GRASSLANDS AND MEADOWS.
AAABH01014*007*KY	RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	G4T4	S3	S		Y	1991-03-20	S	C	McCracken	HEATH		CIRCA 0.2 AIR MI E OF KY 1154, CA 1.2 RD MI N OF ITS JCT W/ US 60.	BREEDS IN PONDS IN FARMLAND AND EDGE. REMAINS UNDERGROUND THROUGHOUT MOST OF THE YEAR, USING CRAYFISH BURROWS IN MOIST GRASSLANDS AND MEADOWS.
AAABH01014*013*KY	RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	G4T4	S3	S		Y	1991-03-18	S	C	McCracken	JOPPA		CIRCA 0.2 RD MI E OF BETHEL CHURCH RD, CA 1.0 RD MI S JCT KY 358 (MARGNUM 33). CA 1.0 AIR MI SSE JCT KY 358 AND BETHEL CHURCH ROAD (MARGNUM 34, 370748N, 884941W).	BREEDS IN PONDS IN FARMLAND AND EDGE. REMAINS UNDERGROUND THROUGHOUT MOST OF THE YEAR, USING CRAYFISH BURROWS IN MOIST GRASSLANDS AND MEADOWS.
AAABH01014*009*KY	RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	G4T4	S3	S		Y	1991-03-18	S	C	McCracken	HEATH		WEST KENTUCKY WILDLIFE MANAGEMENT AREA, N SIDE WATER WORKS RD JUST W OF FILTRATION PLANT. MI NNW JCT KY 358 AND OGDEN LANDING RD (MARGNUM 14).	BREEDS IN PONDS IN FARMLAND AND EDGE. REMAINS UNDERGROUND THROUGHOUT MOST OF THE YEAR, USING CRAYFISH BURROWS IN MOIST GRASSLANDS AND MEADOWS.
AAABH01014*010*KY	RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	G4T4	S3	S		Y	1991-03-20	S	C	McCracken	HEATH		WEST KY WMA, CA 1.3 RD MI W JCT KY 996 AND KY 358 ON N SIDE KY 358 (MARGNUM 15, 370723N, 884736W). WEST KY WMA, 1.5 RD MI W OF JCT KY 996 AND KY 358, 0.15 AIR MI S OF WEST KENTUCKY WILDLIFE MANAGEMENT AREA, CA 0.1 RD MI NW OF JCT KY 358 AND KY 995, DOWN ROAD JUST SE OF LODGE (MARGNUM 36), AND CA 0.15 RD MI NW OF JCT KY 358 AND KY 995, DOWN RD JUST SE OF LODGE (MARGNUM 39).	BREEDS IN PONDS IN FARMLAND AND EDGE. REMAINS UNDERGROUND THROUGHOUT MOST OF THE YEAR, USING CRAYFISH BURROWS IN MOIST GRASSLANDS AND MEADOWS.
AAABH01014*015*KY	RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	G4T4	S3	S		Y	1998-02-27	S	C	McCracken	JOPPA			BREEDS IN PONDS IN FARMLAND AND EDGE. REMAINS UNDERGROUND THROUGHOUT MOST OF THE YEAR, USING CRAYFISH BURROWS IN MOIST GRASSLANDS AND MEADOWS.
AAABH01014*014*KY	RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	G4T4	S3	S		Y	1991-03-18	S	C	McCracken	JOPPA		WEST KENTUCKY WILDLIFE MANAGEMENT AREA, CA 0.6 RD MI SW OF JCT KY 995 AND KY 358, CA 0.15 AIR MI W OF KY 995, CA 0.5 RD MI SW OF AREA OFFICE (LODGE).	BREEDS IN PONDS IN FARMLAND AND EDGE. REMAINS UNDERGROUND THROUGHOUT MOST OF THE YEAR, USING CRAYFISH BURROWS IN MOIST GRASSLANDS AND MEADOWS.
AAABH01014*008*KY	RANA AREOLATA CIRCULOSA	NORTHERN CRAWFISH FROG	G4T4	S3	S		Y	1991-03-20	S	C	McCracken	HEATH		CIRCA 0.4 AIR MI NW OF SPRING BAYOU CHURCH ON KY 725 (MARGNUM 11). CA 0.7 RD MI W OF SPRING BAYOU CHURCH ON KY 725 ON N SIDE OF RD (MARGNUM 12, 370524N, 885030W).	BREEDS IN PONDS IN FARMLAND AND EDGE. REMAINS UNDERGROUND THROUGHOUT MOST OF THE YEAR, USING CRAYFISH BURROWS IN MOIST GRASSLANDS AND MEADOWS.
***Reptiles															
ARAAG01022*008*KY	APALONE MUTICA MUTICA	MIDLAND SMOOTH SOFTSHELL	G5T5	S3	S		Y	1986-07-16	G	E	McCracken	METROPOLIS		OHIO RIVER, NEAR BOAT RAMP ACROSS FROM JOPPA [ASSUMED TO MEAN METROPOLIS], ILL.	OPEN WATER HABITATS; MOST NUMEROUS IN OPEN RIVER SITUATIONS WITH GRAVEL OR SAND SUBSTRATES, BUT ALSO PRESENT IN SLOWER RIVERS AND IMPOUNDMENTS.

Rare Species And Communities Recorded for the Proposed DUF6 Conversion Facility at the Paducah Gaseous Diffusion Plant.

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EOCODE	SNAME	SCOMNAME	GRANK	SRANK	SPROT	USESA	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	EPA WATERBODY	DIRECTIONS	HABITAT
***Birds															
ABPBX91050*039*KY	AIMOPHILA AESTIVALIS	BACHMAN'S SPARROW	G3	S1B		E	Y	1951-07-17	G	X	McCracken	PADUCAH WEST	;OHIO RIVER FROM TENNESSEE RIVER TO MISSISSIPPI RIVER	5 MI W OF PADUCAH.	OPEN PINE WOODS WITH SCATTERED BUSHES OR UNDERSTORY, BRUSHY OR OVERGROWN HILLSIDES, OVERGROWN FIELDS WITH THICKETS AND BRAMBLES, GRASSY ORCHARDS.
ABPAV10080*014*KY	CORVUS OSSIFRAGUS	FISH CROW	G5	S3B		S	Y	1980-06-27	Q	H	McCracken	JOPPA	OHIO RIVER FROM TENNESSEE RIVER TO MISSISSIPPI RIVER	WEST KY WMA, ALONG OHIO RIVER AT EDGE OF BOTTOMLAND FOREST.	BEACHES, BAYS, LAGOONS, INLETS, SWAMPS, NEAR MARSHES, AND, LESS FREQUENTLY, DECIDUOUS OR CONIFEROUS WOODLAND, IN INLAND SITUATIONS PRIMARILY IN BALDCYPRESS SWAMPS AND ALONG MAJOR WATERCOURSES. ALSO GARBAGE DUMPS.
ABNJB20010*004*KY	LOPHODYTES CUCULLATUS	HOODED MERGANSER	G5	S1S2B,S3S4N		T	Y	1980-05-08	S	H	McCracken	JOPPA		WEST KENTUCKY WILDLIFE MANAGEMENT AREA, 3.9 MI NNW OF GRAHAMVILLE.	STREAMS, LAKES, SWAMPS, MARSHES, AND ESTUARIES; WINTERS MOSTLY IN FRESHWATER BUT ALSO REGULARLY IN ESTUARIES AND SHELTERED BAYS (B83COM01NA).
ABPBW01110*001*KY	VIREO BELLII	BELL'S VIREO	G5	S2S3B		S	Y	1980-06-27	M	H	McCracken	JOPPA		ALONG LITTLE BAYOU CREEK, ADJ TO THE W SIDE OF THE ASH SETTLING POND AT THE SHAWNEE STEAM PLANT, 6 MI NNW OF GRAHAMVILLE.	DENSE BRUSH, MESQUITE, STREAMSIDE THICKETS, AND SCRUB OAK, IN ARID REGIONS BUT OFTEN NEAR WATER (B83COM01NA); MOIST WOODLAND, BOTTONLANDS, WOODLAND EDGE, SCATTERED COVER AND HEDGEROWS IN CULTIVATED AREAS. OPEN WOODLAND, BRUSH IN WINT.
ABPBW01110*002*KY	VIREO BELLII	BELL'S VIREO	G5	S2S3B		S	Y	1994-05-05	S	C	McCracken	JOPPA		WEST KENTUCKY WMA, W SIDE OF MAIN GRAVEL RD, CA 1.0 MI S OF ENTRANCE ON KY 358.	DENSE BRUSH, MESQUITE, STREAMSIDE THICKETS, AND SCRUB OAK, IN ARID REGIONS BUT OFTEN NEAR WATER (B83COM01NA); MOIST WOODLAND, BOTTONLANDS, WOODLAND EDGE, SCATTERED COVER AND HEDGEROWS IN CULTIVATED AREAS. OPEN WOODLAND, BRUSH IN WINT.
***Mammals															
AMACC01030*026*KY	MYOTIS AUSTRORIPARIUS	SOUTHEASTERN MYOTIS	G3G4	S1S2		E		1999-07-14	S	E	McCracken	HEATH		WEST KENTUCKY WMA, BAYOU CREEK JUST UPSTREAM OF SOUTH ACID RD.	THE SOUTHEASTERN MYOTIS USES PRIMARILY CAVES FOR HIBERNACULA AND SUMMER MATERNITY AND ROOSTING SITES.
AMACC01030*027*KY	MYOTIS AUSTRORIPARIUS	SOUTHEASTERN MYOTIS	G3G4	S1S2		E		1999-07-22	S	E	McCracken	JOPPA	;OHIO RIVER FROM TENNESSEE RIVER TO MISSISSIPPI RIVER	BAYOU CREEK RIDGE STATE NATURAL AREA, W END ON N SIDE OF CREEK, CA 0.1 AIR MI SE OF END OF WMA RD TO OHIO RIVER.	THE SOUTHEASTERN MYOTIS USES PRIMARILY CAVES FOR HIBERNACULA AND SUMMER MATERNITY AND ROOSTING SITES.
AMACC01100*101*KY	MYOTIS SODALIS	INDIANA BAT	G2	S1S2		E	LE	1999-07-28	S	E	McCracken	JOPPA	;OHIO RIVER FROM TENNESSEE RIVER TO MISSISSIPPI RIVER	WEST KENTUCKY WILDLIFE MANAGEMENT AREA, W OF BAYOU CREEK RIDGE SNA, CA 0.1 AIR MI SE OF END OF RD (MARGNUM 24), AND CA 0.15 RD MI SE OF BAYOU CREEK ALONG OLD RD (MARGNUM 59).	INDIANA BATS USE PRIMARILY CAVES FOR HIBERNACULA, ALTHOUGH THEY ARE OCCASIONALLY FOUND IN OLD MINE PORTALS.
AMACC06010*015*KY	NYCTICEIUS HUMERALIS	EVENING BAT	G5	S2S3		T	Y	1999-07-28	S	E	McCracken	JOPPA	;OHIO RIVER FROM TENNESSEE RIVER TO MISSISSIPPI RIVER	0.4 AIR MI SSE OF END OF RD TO OHIO RIVER (MARGNUM 26), AND JUST DOWNSTREAM OF GRAVEL RD CROSSING (MARGNUM 59), AND W OF BAYOU CR RIDGE, CA 0.1 AIR MI SE OF N END OF WMA ROAD TO THE OHIO RIVER (MARGNUM 26).	THE EVENING BAT IS A COLONIAL SPECIES THAT ROOSTS IN TREES AND HOUSES. IT APPARENTLY MIGRATES SOUTHWARD IN WINTER.
AMACC06010*047*KY	NYCTICEIUS HUMERALIS	EVENING BAT	G5	S2S3		T	Y	1999-08-02	S	E	McCracken	JOPPA		WEST KY WMA, ALONG BAYOU CREEK CA 0.8 AIR MI WSW OF HEADQUARTERS.	THE EVENING BAT IS A COLONIAL SPECIES THAT ROOSTS IN TREES AND HOUSES. IT APPARENTLY MIGRATES SOUTHWARD IN WINTER.
***Palustrine Communities															

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Rare Species And Communities Recorded for the Proposed DUF6 Conversion Facility at the Paducah Gaseous Diffusion Plant.

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ECODE	SNAME	SCOMNAME	GRANK	SRANK	SPROT	USESA	IDENT	LASTOBS	PREC	EORANK	COUNTY	7.5 MINUTE QUADRANGLE	EPA WATERBODY	DIRECTIONS	HABITAT
CPFORO0006T001*KY	FLOODPLAIN RIDGE/TERRACE FOREST			S1	N		Y	1991-06	S	B	McCracken	JOPPA		WEST KY WILDLIFE MANAGEMENT AREA, BAYOU CREEK WOODS, CA 2.0 AIR MI NW OF SHAWNEE STEAM PLANT.	

69 Records Processed.

APPENDIX H:

CONTRACTOR DISCLOSURE STATEMENT

APPENDIX H:

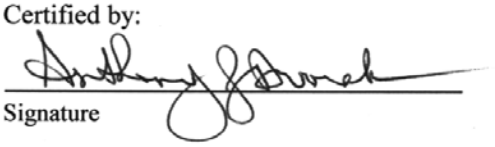
CONTRACTOR DISCLOSURE STATEMENT

Argonne National Laboratory (ANL) is the contractor assisting the U.S. Department of Energy (DOE) in preparing the environmental impact statement (EIS) for depleted UF_6 conversion. DOE is responsible for reviewing and evaluating the information and determining the appropriateness and adequacy of incorporating any data, analyses, or results in the EIS. DOE determines the scope and content of the EIS and supporting documents and will furnish direction to ANL, as appropriate, in preparing these documents.

The Council on Environmental Quality's regulations (40 CFR 1506.5(c)), which have been adopted by DOE (10 CFR Part 1021), require contractors who will prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project" for the purposes of this disclosure is defined in the March 23, 1981, "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 *Federal Register* 18026-18028 at Questions 17a and 17b. Financial or other interest in the outcome of the project includes "any financial benefit such as promise of future construction or design work on the project, as well as indirect benefits the consultant is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)," 46 *Federal Register* 18026-18038 at 10831.

In accordance with these regulations, Argonne National Laboratory hereby certifies that it has no financial or other interest in the outcome of the project.

Certified by:



Signature

Anthony J. Dvorak
Name

Director, Environmental Assessment Division
Title

6/10/02
Date