High Bridge Associates, Inc.

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Supplemental Report
Independent Assessment of the Impact of Disposing of Surplus Weapons Plutonium at WIPP

prepared for the

MOX Services Board of Governors

HIGH BRIDGE
ASSOCIATES

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Supplemental Report

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Impact of Disposing of Surplus Weapons Plutonium at WIPP

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1 Summary

The Waste Isolation Pilot Plant (WIPP) was designed and approved under EPA regulations 40 CFR 191 and 40 CFR 194. The compliance with these regulations was documented in the Final Environmental Impact Statement, DOE/EIS-0026 issued in October 1980 and in the Supplemental Final Environmental Impact Statement, DOE/EIS-0026-S-2 issued in September 1997. **(References 1 and 2)** The radiological source term used to demonstrate compliance with the regulations consisted of approximately 6 MTs of plutonium distributed uniformly throughout the 6,200,000 ft^3 (175,564 m^3) of waste in the repository. This 6 MT's of plutonium was from various EM legacy manufacturing sources, i.e., lubricants, tools, gloveboxes, ductwork, etc. It was not from surplus weapons plutonium pits.

The NNSA Dilute and Dispose Option for the packaging of surplus weapons plutonium is proposed to be accomplished in Criticality Control Overpacks (CCOs). The CCO is a small cylindrical tube packaged within the center of a 55-gallon drum. This arrangement provides spacing to ensure that plutonium in the packages is not neutronically coupled. This spacing prevents an inadvertent criticality during the shipping and handling of the packages. However, placing a large number of these containers in WIPP opens a significant unanalyzed safety issue.[1] Since the salt in the repository is plastic, it will eventually close the waste panels and settle on/around the packaging. A 55-gallon drum is not designed to survive for thousands of years in this environment and the weight of the salt will eventually crush the 55-gallon drums potentially moving the plutonium in the CCOs into a critical geometry. Since each shipment of CCOs containing surplus weapons plutonium would contain approximately five critical masses, this process needs to be analyzed and evaluated as part of a Supplemental FEIS. It is likely that this issue applies to any quantity of surplus weapons plutonium shipped to WIPP.

Exhibit 1 shows the impact on WIPP's design basis of the disposal of surplus weapons plutonium at WIPP using the Dilute and Dispose methodology. This increase, coupled with the design of WIPP and the CCO storage system, suggests that a criticality accident in the 10,000 year design life of WIPP can no longer be discounted. Therefore, a new supplemental FEIS must be prepared and approved before any of these waste packages can be placed in WIPP.

Exhibit 1
Impact of Mass of Fissile Plutonium in WIPP

Surplus Pu (MT)	Design Basis Mass (MT)	Revised Mass (MTs)	Increase in Pu Mass in WIPP
4.2	6.0	10.2	170%
13.1	6.0	19.1	318%
17.3	6.0	23.3	388%
34.0	6.0	40.0	667%
51.3	6.0	57.3	955%

The average density for the 6 MTs of plutonium in the EM TRU waste in the Supplemental FEIS **(Reference 2)** design basis at WIPP is 34 g/m^3 or .00213 lb/ft^3. The average density of plutonium within a CCO for the dilute and dispose approach is approximately 1,442 g/m^3 or approximately .090 lb/ft^3. This reflects a plutonium density increase upon initial emplacement at WIPP and the beginning of its 10,000 year life of approximately 4,200% in a waste panel filled with surplus weapons plutonium waste

[1] The disposal of all 51.3 MTs of this plutonium would require 171,000 CCOs to be placed in WIPP.

packages compared to the assumed density in the design basis. As the salt repository closes in on the drums and the drums deteriorate, the plutonium density could likely approach 1,000 times or nearly 100,000% of that in the WIPP design basis. This indicates the serious impacts on WIPP criticality assumptions if the NNSA decides to go forward with the Dilute and Dispose option.

The radiological source term for the WIPP design was originally based on 6.0 MT of plutonium converted into curies by using the half-lives of the assumed isotopic makeup of plutonium. Disposing of surplus weapons plutonium at WIPP represents a significant challenge to the assumptions contained within the FEIS. **Reference 1** used 1000–year curies to characterize the source term to eliminate isotopes that will decay away before they can be released. Using that basis, the source term used for the analysis consisted of approximately 539,000 Ci of Plutonium and Americium.[2] **Exhibit 2** shows the impact of sending surplus weapons pit plutonium to WIPP for various dilute and dispose scenarios that confront DOE. It can be seen that all scenarios result in a violation of the design basis contained within the Supplemental FEIS **(Reference 2)**.

Exhibit 2
Impact on Source Term for WIPP FEIS

Surplus Pu (MT)	1000-Yr Ci Contribution	WIPP Design Basis (1000-Yr Ci)	New WIPP Design Basis (1000-Yr Ci)	Increase of Design Basis
4.2	288,000	539,000	827,000	153%
13.1	900,000	539,000	1,440,000	267%
17.3	1,190,000	539,000	1,720,000	319%
34.0	2,340,000	539,000	2,880,000	534%
51.3*	3,520,000	539,000	4,060,000	753%

* This is the impact of canceling the MOX Program

The significant increase in mass, concentration and radioactive inventory suggest that the design basis of WIPP needs to be revalidated if the NNSA decides to adopt the dilute and dispose approach for significant quantities of surplus weapons plutonium in WIPP. Moreover, disposing of any significant amount of surplus weapons plutonium at WIPP will exceed the design basis and will require a new Supplemental FEIS for WIPP be prepared and approved before a Record of Decision can be made.

Once the NEPA process is reopened, it is possible that stakeholders could come forward and insist that the design basis for WIPP be brought into line with the DC District Court ruling on the Yucca Mountain Project design life. Both WIPP and originally YMP were designed and licensed based on a 10,000 year design life. The Court ruled that the biological hazard posed by actinides was great enough to require that the 10,000 year design life be increased to 1,000,000 year design life. Placing over 50 MTs of weapons plutonium in WIPP could suggest to some that there is sufficient cause to impose the greater more conservative design requirement on WIPP. Should this occur, all 1.74 million ft^3 (49,240 m^3) of TRU waste emplaced in WIPP may need to be removed, repackaged and replaced in the repository. This is a significant risk that needs to be weighed before any decision regarding this matter be made.

This suggests that not only would the wholesale disposal of surplus weapons plutonium at WIPP adversely impact the design basis of WIPP and open the entire design to hostile intervention, it could

[2] The actual source term includes a large number of isotopes that have half-lives that will result in their elimination from the long-term source term used for environmental impact assessments. These isotopes are ignored by using the 1000-yr Ci values. The basis has been reproduced here as **Exhibit 6**.

also introduce a new accident scenario consisting of a criticality event occurring in the future that would significantly increase the environmental impact and threaten the continued operation of WIPP.

2 Background

2.1 Waste Isolation Pilot Plant

The Waste Isolation Pilot Plant (WIPP) was constructed to provide a repository to store the legacy wastes from the nuclear weapons development programs in the U.S. It was conceived of and developed to provide a safe repository for the miscellaneous transuranic (TRU) wastes then being stored at various labs and facilities around the nuclear complex. It began in response to a series of fires at the DOE Rocky Flats facility in 1969 to 1970. Since these fires were related to storing plutonium at Rocky Flats, DOE decided to relocate the plutonium to the Idaho National Laboratory that had the additional storage capacity for this material. This was politically unpopular and was done with the stipulation that it would be for 10 years only.[3]

The search for a solution focused on disposing of the material in bedded salt formations. After the first site in Kansas was found to be unacceptable, the DOE focused on a site in Southeast New Mexico near Carlsbad. As can be deduced from the name, WIPP was first developed as a proof-of-principle project to demonstrate the utility of disposing of high-level waste in bedded salt formations. The original intent was to dispose of all weapons related wastes at WIPP, including spent fuel assemblies from production reactors. This approach was abandoned in 1979 and WIPP's scope was reduced to include only miscellaneous TRU wastes.

The Final EIS was issued in October 1980 **(Reference 1)** and construction began the following year. However, as a result of a lawsuit brought by the state of New Mexico, it was agreed to perform a series of tests as well as to allow independent monitoring by the state of New Mexico. The program moved forward slowly during the 1980s while the testing program found problems with several of the planned sites, and court challenges to the regulations and the approach to comply with the regulations worked their way through the system. Finally, the WIPP Land Withdrawal Act **(Reference 3)** was passed in 1992 that set aside the WIPP site from all future development and reserved it for federal use only. It also mandated that the site comply with the Resource Conservation and Recovery Act (RCRA) requirements. This resulted in the second Final Supplemental Environmental Impact Statement **(Reference 2)**.[4]

The second Supplemental FEIS contained a slightly revised set of data from the original estimates in the FEIS issued in 1980. The radiological source term shown in the tables was based on 1995 estimates. It therefore included a large number of relatively short-lived isotopes that would not figure substantially in the long-term exposure release rates. The better choice for comparison of the potential impact is the 1000-yr Curie values from the original FEIS.

[3] The failure of DOE to fulfill this commitment eventually resulted in the State Government of Idaho banning any future shipments of nuclear material to INL.

[4] Supplement 1 to the FEIS was issued in January 1990 and committed to a phased deployment of WIPP. It did not affect the source term.

The facility began operations in March 1999 and has identified or emplaced 156,000 m³ of TRU waste as of December 31, 2013. **(Reference 4)** This leaves approximately 19,000 m³ of capacity for future use. However, the volume limit is an arbitrary limit imposed by the WIPP LWA. The more significant limitation on WIPP capacity is the isotopic makeup of the waste emplaced. The design basis of 539,000 Curies for WIPP was a result of the assumed radioactive inventory. Any change to this design basis inventory must be analyzed and accepted to be safe in a new supplemental FEIS.

In February 2014, the facility experienced two incidents that have resulted in the cessation of waste placement operations. A recovery program is ongoing, and it is not clear what, if any, changes to operations will result from these incidents. At present, there is no certain date for the restart of WIPP operations.

2.2 Plutonium Disposition

The MOX project can trace its beginnings to the Strategic Arms Limitation Talks II (SALT II) that began in 1974 and culminated in an arms limitation agreement in June of 1979. This agreement removed several classes of nuclear weapons from each country's arsenal and was followed even though it was never ratified by the U.S. It resulted in both the United States and the then Soviet Union declaring many tons of weapons plutonium to be surplus and placed into storage. In 1994, Presidents Clinton and Yeltsin issued a Joint Statement by the President of the Russian Federation and the President of the United States of America on Non-Proliferation of Weapons of Mass Destruction and the Means of Their Delivery (**Reference 5**). This joint statement began a five-year technical cooperation program that identified about 50 MT of surplus plutonium in each country's inventory for disposal.

The Joint Statement of Principles for Management and Disposition of Plutonium Designated as No Longer Required for Defense Purposes was signed by the President of the United States of America and the President of the Russian Federation on September 2, 1998. It affirmed the intention of each country to remove by stages approximately 50 MT of plutonium from their nuclear weapons programs and to convert this plutonium into forms unusable for nuclear weapons (**Reference 5**).

This resulted in the development of the PMDA between the Russian Federation and the United States of America. The original goal of at least 50 MTs was reduced by the negotiations process first to 38.2 MT and then to 34 MT. The PMDA was signed in 2000.

Since that time, the main focus of the Plutonium Disposition program in the U.S. has been the design, permitting and construction of the MOX Fuel Fabrication Facility and the supporting programs and facilities necessary for its successful operation. However, it has been focused on the 34 MTs of surplus weapons plutonium only. The 4.2 MTs deleted from the agreement late and the 13.1 deleted from the agreement early in the process remain in storage awaiting disposition.

3 WIPP Land Withdrawal Act

The WIPP Land Withdrawal Act was enacted to resolve concerns that once the TRU waste was all placed into WIPP and the site was decommissioned and abandoned, that it could be returned into general use. The fear was that it would then be subject to some sort of intrusion that would violate the assumptions in the FEIS resulting in releases to the environment. The WIPP LWA formalized many of the agreements necessary to obtain approval and set the upper limit on the volume of waste to be emplaced in WIPP at 6.2 million cubic feet. (175,564 m^3) This limit was set more to control the extent of the land area to be reserved for federal-only use than to codify any safety basis. Volume is not a scalar quantity influenced by both specific density and packaging efficiency.

The latest Annual Transuranic Waste Inventory Report, covering the period up to December 31, 2013, showed that the DOE's Environmental Management (EM) program had emplaced or identified 156,000 m^3 of TRU for WIPP **(Reference 4).[5]** If the surplus weapons plutonium is disposed of at WIPP using the most efficient packaging system for fissile plutonium, the results are shown on **Exhibit 3**.

Exhibit 3 Impact on WIPP LWA Volume Limit				
Surplus Pu (MT)	**Volume Placed in WIPP (m^3)**	**Available Volume (m^3)**	**Residual Volume (m^3)**	**Impact on WIPP LWA**
4.2	2,915	19,564	16,650	None
13.1	9,091	19,564	10,473	None
17.3	12,003	19,564	7,558	None
34.0	23,596	19,564	-4,031	Revision Req'd
51.3	35,602	19,564	-16,037	Revision Req'd

WIPP's mission is to support the EM program and the future production of TRU wastes by the weapons complex. The disposal of the surplus weapons plutonium at WIPP is detrimental to that mission in that it consumes volume that could be used for EM wastes. If the MOX program is canceled, then the WIPP LWA needs to be amended to increase the maximum volume of TRU waste that can be placed in WIPP. Since the original mission of WIPP would remain essential to the nation, an effort must be undertaken at the same time to identify how much additional volume needs to be added to address the continuation of the EM mission for WIPP.

The WIPP LWA has additional provisions that apply beyond the volume of TRU wastes. Section 3 withdrawals the WIPP site from future public use. Section 4 identifies the responsibilities for management of WIPP. Section 5 identifies the now-completed test phase and retrieval plans. Section 6 identifies the now-completed test phase activities. Section 7 identifies the requirements for disposal operations. This section also contains the volume limit of 6.2 million ft^3 of transuranic waste. Section 8 describes the EPA regulations that apply and sets a timetable for promulgation of needed regulations. It also establishes a periodic recertification process wherein the EPA Secretary must submit documentation to the State of New Mexico every 5 years that operations at WIPP continue to be in compliance with the final disposal regulations. Section 9 identifies the need for compliance with all EPA regulations including RCRA. Section 10 identifies the detailed requirements for the retrievability of the TRU waste in the now-completed test phase. Section 11 invokes Mine Safety requirements that need to be applied to WIPP operations. Section 12 bans the disposal of high-level radioactive waste and spent nuclear fuel at WIPP. Section 13 identifies the decommissioning requirements for WIPP and sets a timetable for their imposition. Section 14 identifies the need to comply with all Clean Air Act and Solid Waste Disposal Act requirements. Section 15 identifies the payments to be made to New Mexico for

[5] Since the incidents that shut down WIPP temporarily occurred in February 2014, this accounting of the waste inventory remains very accurate at present.

regulating and overseeing WIPP operations. Section 16 identifies transportation requirements and need for NRC certification of any waste container used to transport and dispose of TRU. The remainder of the sections in the WIPP LWA covers general provisions.

In general, most of the provisions in the WIPP LWA will not be affected by the proposal to dispose of all of the surplus weapons plutonium at WIPP. However, the regulations imposed or developed in response to the WIPP LWA will force the production of a supplemental FEIS before any of this material can be disposed of at WIPP. The only exception is in Section 7 that sets the maximum volume of TRU waste that can be placed in WIPP. If the MOX Program is cancelled, then this Section would need to be revised to increase the limit to some higher value. The WIPP LWA will need to be amended before any the capacity of WIPP is exceeded.

Many of the provisions with the Act describe events that have already occurred. Therefore, they are no longer relevant. **Exhibit 4** shows the sections of the WIPP LWA that are still relevant and would need to be included in the amended WIPP LWA. Many minor changes would be required for the law to be timely and meaningful if amended. For instance, there are several citations referring to EG&G; a company that no longer exists and to processes and actions that have either been completed or that would no longer bring value.

Exhibit 4
Sections of the WIPP LWA

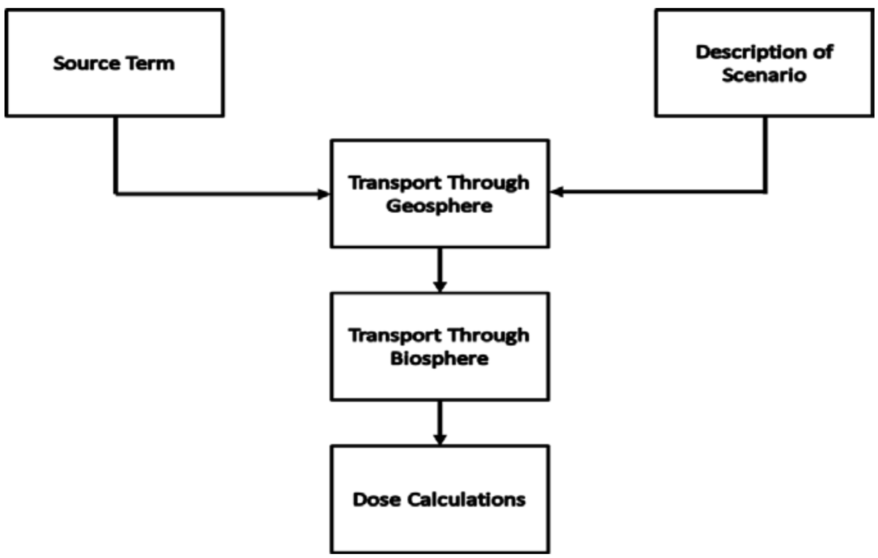
Section	Title	Required/No Longer Required
1	Short title; table of contents.	Required – Minor Revisions
2	Definitions.	Required – Minor Revisions
3	Land withdrawal and reservation for WIPP.	Required – Minor Revisions
4	Establishment of management responsibilities.	Required – Minor Revisions
5	Test phase and retrieval plans.	No Longer Required
6	Test phase activities.	No Longer Required
7	Disposal operations.	Required – Significant Change
8	Environmental Protection Agency disposal regulations.	Required – Minor Revisions
9	Compliance with environmental laws and regulations.	Required – Without Revision
10	Retrievability.	No Longer Required
11	Mine safety.	Required – Minor Revisions
12	Ban on high-level radioactive waste and spent nuclear fuel.	Required – Without Revisions
13	Decommissioning of WIPP.	Required – Minor Revisions
14	Savings provisions.	Required – Minor Revisions
15	Economic assistance and miscellaneous payments.	Required – Minor Revisions
16	Transportation.	Required – Minor Revisions
17	Access to information.	Required – Minor Revisions
18	Judicial review of EPA actions.	Required – Without Revision
19	Technology study.	No Longer Required
20	Statement for purposes of Public Law 96-164.	Required – Minor Revisions
21	Consultation and cooperation agreement.	Required – Without Revision
22	Buy American requirements.	Required – Without Revision
23	Authorizations of appropriations.	Required – Minor Revisions

Of course, once the legislative process is opened, the outcome is in doubt. The above assessment does not include any consideration for new issues about the disposal of TRU waste at WIPP that may be introduced during the negotiations to develop the final form of the amendment.

4 Description of Analysis

The approach to the radiological analyses used to qualify the WIPP is shown in **Exhibit 5** below. As can be seen, accepting the scenarios and models describing the pathways, the dose rate impact is proportional to the source term. A doubling of the source term results in a doubling of the offsite doses.[6] Moreover, the doses are a stronger function of the long-lived isotopes rather than the short-lived isotopes because the short-lived isotopes will disappear before the migration to the environment can take place. For that reason, the analysis here only considers plutonium and americium isotopes with long-half-lives.

Exhibit 5
Plan of Calculations



Reference 1, Figure 9.9

The FEIS reported that the dose rate was based on the source term described in **Exhibit 6** below. (Table 9-59 from **Reference 1**). It can be seen that the bulk of the inventory is from Plutonium and Americium. Combined these isotopes represent an inventory 539,000 curies.

For comparison purposes, the review assumed that the makeup of the surplus weapons plutonium has the isotopic mix identified in **Reference 7** as typical of weapons plutonium**.** The isotopic assumptions in the reference did not equal 100% and the difference was assumed to be made up of Pu-239. The resulting plutonium isotopes were decayed to 1,000 years and totalled to provide comparisons. It should be noted that this simplistic model does not include any of the daughter products resulting from

[6] This is an approximation. The dose is proportional to the residual source term available at the time of the release. This is a minor complication that will be addressed in the thorough analysis done in the Supplemental FEIS, but as an order of magnitude approximation of the problem, this statement is accurate.

the radioactive decay of plutonium isotopes. Most of these daughter isotopes are radioactive suggesting that the actual radioactive inventory at 1,000 years would be higher than predicted by this methodology. Therfore, it would be expected that the actual impacts of disposing of surplus weapons plutonium would be greater than predicted by this analysis.

Exhibit 6
Nuclide Inventories in Repository at 1000 Years

Nuclide	Half-life (years)	Remotely handled TRU waste		Contact-handled TRU waste	
		Grams	Curies	Grams	Curies
Ra-226	1.6+3[a]	3.0-3	3.0-3	1.6-2	1.6-2
Th-229	7.3+3	1.0-3	2.1-4	5.6-3	1.2-3
Th-230	7.7+4	9.0-1	1.7-2	4.8	9.2-2
Th-232	1.4+10	1.1-1	1.1-8	5.6-1	5.6-8
U-233	1.6+5	6.8-1	6.3-3	3.6	3.3-2
U-234	3.4+5	3.8+2	2.3	2.0+3	1.2+1
U-235	7.0+8	3.2+4	6.7-2	1.7+5	3.6+1
U-236	2.3+7	7.4+3	4.6-1	4.0+4	2.4
Np-237	2.1+6	3.5+3	2.3	1.8+4	1.2+1
Pu-238	8.8+1	1.6+1	2.6	8.8-1	1.4+1
U-238	4.5+9	0	0	3.4	1.2-2
Pu-239	2.4+4	1.1-6	6.6+4	6.0+6	3.6+5
Pu-240	6.5+3	7.0+4	1.5+4	3.7+5	8.0+4
Am-241	4.3+2	9.3+2	3.0+3	4.8+3	1.5+4
Pu-242	3.9+5	0	0	2.0+3	8.0

[a]1.6+3 = 1.6×10^3.

Exhibit 7 shows the inventory impact on the WIPP design basis for various quantities of surplus weapons plutonium. It is clear that even the disposal of 4.2 MT of surplus plutonium would represent a 50% increase in the dose. As described above, there are three different groups of surplus weapons plutonium: 4.2 metric tons, 13.1 metric tons, and 34 metric tons. The first two groups of surplus pits represent inventory that was not included in the final PMDA. The disposal of these quantities at WIPP results in two additional aggregate categories. Assuming the MOX program continues, the DOE is still confronted with the disposal of the 4.2 and the 13.1 metric tons for total of 17.3 metric tons. If the MOX program is terminated, the DOE will be faced with disposing of 51.3 metric tons of plutonium. There is no scenario that results in the DOE disposing of only 34 metric tons of plutonium at WIPP because the total inventory under their control is 51.3 metric tons. The case of 34 metric tons has been included in **Exhibit 7** simply to be compatible with other studies that have been performed.

Exhibit 7 Impact on Source Term for WIPP FEIS				
Surplus Pu (MT)	**1000-Yr Ci Contribution**	**WIPP Design Basis (1000-Yr Ci)**	**New WIPP Design Basis (1000-Yr Ci)**	**Increase of WIPP Design Basis**
4.2	288,000	539,000	827,000	153%
13.1	900,000	539,000	1,440,000	267%
17.3	1,190,000	539,000	1,720,000	319%
34.0	2,340,000	539,000	2,880,000	534%
51.3*	3,520,000	539,000	4,060,000	753%

* This is the impact of canceling the MOX Program

The Supplemental FEIS **(Reference 2)** contained an estimate of the mass of plutonium to be emplaced in WIPP before decay. The estimate was approximately six metric tons. This mass of plutonium was assumed to be distributed uniformly throughout the entire waste volume of 6,200,000 ft^3. That is equivalent to approximately 34 g/m^3. As such, no criticality analysis was deemed necessary. The proposed dilute and dispose waste packaging for the surplus weapons pit plutonium is 300 grams in a 55-gallon drum. This is equivalent to over 1,400 g/m^3; a 4,200% increase. The Criticality Control Overpack is considerably smaller than a 55-gallon drum. The NNSA is considering only counting the volume of the CCO to compare against the waste limit volume. If that approach is approved, the concentration of plutonium in this reduced volume is over 32,000 g/m^3 or approximately 1,000 times the design basis. This calls into question the assumption that a criticality would not be possible in WIPP after closure. This is especially important in view of the nature of a salt repository. The salt is plastic and will eventually fill the void spaces in the waste panels allowing the weight of the overburden to bear directly on the waste packages. Since the CCO waste packages are essentially void space, it is likely that over time the 55-gallon drum will be crushed or will disintegrate allowing the CCOs to migrate together into what could be a critical configuration.

Exhibit 8 summarizes the impact of placing the different amounts of plutonium into WIPP. As can be seen from **Exhibit 8**, the inventory of plutonium is significantly increased by the cancellation of the MOX program and is nearly an order of magnitude higher than the design basis. Moreover, placing any amount of the surplus weapons plutonium in WIPP presents a challenge to the design basis and suggests strongly that a supplemental FEIS is required before any of these wastes are emplaced at WIPP.

Exhibit 8 Impact of Mass of Fissile Plutonium in WIPP			
Surplus Pu (MT)	**Design Basis Mass (MT)**	**Revised Mass (MTs)**	**Increase in Pu Mass in WIPP Design Basis**
4.2	6.0	10.2	170%
13.1	6.0	19.1	318%
17.3	6.0	23.3	388%
34.0	6.0	40.0	667%
51.3	6.0	57.3	955%

5 Conclusions and Recommendations

The disposal of surplus weapons plutonium at WIPP will result in a significant impact to the existing design basis as described in the Final Supplemental Environmental Impact Statement **(Reference 2)**. The cancellation of the MOX project will result in an increase of over 700% in the curies available for release to the environment after closure. It also represents nearly an order of magnitude greater mass of fissile plutonium and a significantly higher concentration within the waste panels.

Both of these represent a significant challenge to the design basis and must therefore only proceed after a new Supplemental Environmental Impact Statement is prepared reviewed and accepted.

If the MOX Program goes forward, the TRU waste generated by the production of MOX fuel is projected to be 1,800 m^3 **(Reference 8)**. If the MOX program is canceled, the additional TRU waste required to be emplaced at WIPP would exceed 35,000 m^3.

It is recommended that no action be taken with regard to canceling the MOX program until and unless a detailed assessment of the risks to WIPP is undertaken. Further, it is recommended that no quantity of surplus weapons plutonium be emplaced at WIPP until and unless a Supplemental FEIS is developed and approved.

6 References

1. United States Dept. of Energy. *Final Environmental Impact Statement, Waste Isolation Pilot Plant*, DOE/EIS-0026, October 1980
2. United States Dept. of Energy. *Final Supplemental Environmental Impact Statement, Waste Isolation Pilot Plant*, DOE/EIS-0026-S-2, September 1997
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7. National Academy of Sciences. *Management and Disposition of Excess Weapons Plutonium*, 1995
8. *Final Environmental Impact Statement, Surplus Plutonium Disposition*, DOE/EIS-0283, November 1999