

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

Before the Atomic Safety and Licensing Board

In the Matter of)	
)	
PRIVATE FUEL STORAGE L.L.C.)	Docket No. 72-22
)	
(Private Fuel Storage Facility))	

AFFIDAVIT OF GEORGE CARRUTH

CITY OF WASHINGTON)	
)	SS:
DISTRICT OF COLUMBIA)	

I, George A. Carruth, being duly sworn, state as follows:

1. I am currently an independent consultant for Private Fuel Storage, L.L.C. I completed a 30-year career in the Army Chemical Corps in June 1987 and retired as System Integration Manager on the Department of Energy Management and Operating Contract for the Civilian Radioactive Waste Management System for TRW, Inc. in 1998. I am providing this affidavit in support of a motion for partial summary disposition of Contention Utah K in the above captioned proceeding to assess the potential hazards posed to the Private Fuel Storage Facility (PFSF) from activities conducted on Dugway Proving Ground other than aviation and the use of air-delivered weapons.

2. I am knowledgeable of the activities that will take place at the PFSF on the basis of my review of PFSF documents, discussions with people knowledgeable of the PFSF, and work on the design of similar facilities. My professional and educational experience is summarized in the curriculum vitae attached as Exhibit 1 to this affidavit. During my career in the Army Chemical Corps, I commanded Dugway Proving Ground

(DPG) from July 1981 until July 1984. Furthermore, many of my staff assignments in the Army involved implementation of the Army Chemical Surety Program (CSP), which is a focused effort to ensure the safety, security, and reliability of the Army's chemical agents and munitions and the personnel who handle them. After my military career, I was employed by TRW, Inc for 11 ½ years, retiring December 31, 1998. My last position with TRW was System Integration Manager on the Department of Energy Management and Operating Contract for the Civilian Radioactive Waste Management System. In that position, I was responsible for developing requirements documents for the transportation, storage (including dry storage of spent nuclear fuel in casks similar to those to be used at the PFSF), and disposal elements of the waste management system. I hold a Doctor of Philosophy Degree in biology from Tulane University with my area of specialty in microbial genetics.

3. Contention Utah K, as admitted by the Licensing Board, alleges that the Applicant inadequately considered the potential effect on the PFSF of credible accidents from various nearby facilities. Specifically, Utah K contends in part that the Applicant inadequately considered the effect on the PFSF of materials or activities at or emanating from Dugway Proving Ground (DPG).

4. The PFSF will be located over 8 miles north from the northeastern boundary of DPG and will be approximately 20 miles from the locations where most of the activities involving chemical agent and biological materials take place at DPG. See East Area Map of Dugway Proving Ground attached as Exhibit 2 to this affidavit. Relevant activities at DPG include training with and testing of conventional weapons, activities involving chemical munitions and agents, and activities related to biological defense. I have reviewed the activities conducted at DPG and their potential hazards and have concluded that because of the distance between the PFSF and DPG, the limited quantities of chemical agent or biological materials that could credibly be released to the environment at DPG, and the extensive safety precautions that are taken with respect to all potentially

dangerous activities at DPG, those activities would not pose a credible hazard to the PFSF.

LIVE CONVENTIONAL MUNITIONS

5. DPG tests conventional and smoke munitions and the DPG ranges are utilized by Army units, including the Utah National Guard, for military training. Weapons fired at DPG include 60 and 81 millimeter mortars, 105 and 155 millimeter and 8 inch howitzers, and some helicopter gun and rocket systems. As part of the Army program for the development of battlefield obscurants, DPG may fire obscurant munitions on designated ranges to measure characteristics of the obscurant in the field and to measure the effectiveness of the dispersal from the munition. DPG may also fire other conventional munitions as part of the manufacturing acceptance testing. This firing takes place on ranges to the south of Ditto Technical Center. See Exhibit 2.

6. The firing of conventional weapons that takes place at DPG would not pose a credible hazard to the PFSF. The firing of weapons is governed by a rigid set of safety regulations. Those regulations prescribe measures to be taken to ensure that there are no individuals in munition impact areas, prescribe controls to be employed regarding the approval of the directions in which weapons are fired, and define procedural checks to ensure that range safety controls are met. Firing is conducted only after approval of the DPG Range Control Office and only from approved weapons, under prescribed controls, on designated, surveyed, firing ranges, to ensure that munitions fired will not fall outside of their designated impact areas. Furthermore, the DPG Range Control Office monitors all range firing to ensure the safety of the operations.

7. In addition, the majority of the firing ranges used for conventional weapons are on the southern part of DPG, south of Stark road (see Exhibit 2), with the gun target line oriented to the south and southwest, away from the Goshute Reservation. Some firing is conducted in the vicinity of Wig Mountain, on the northern part of DPG (see Exhibit 2), but with the gun target line oriented to the northwest, away from the reservation

and the PFSF. Furthermore, the distance from the normal weapon firing positions to the PFSF is greater than the range of the 155mm and 8 inch howitzers that represent the primary weapons systems fired at DPG. The nominal maximum range for the 155 millimeter howitzer is 18 kilometers or a little over 11 miles. The 8 inch howitzer has a nominal maximum range of 14 kilometers or about 9 miles. The ranges of the mortars, 60 and 81 millimeter, are considerably less. The distance to the PFSF from the Wig Mountain impact areas (which are the impact areas closest to the PFSF) is approximately 15 miles. The gun firing positions for this impact area are located up to 11 miles to the south east of Wig mountain, and would be further away yet from the PFSF.

8. I am aware of no incident in which people or property off of DPG were harmed by the firing of conventional weapons on DPG and I am aware of no incident in which a conventional munition fired or launched from DPG ever struck in the vicinity of the Goshute reservation. Therefore, because of the stringent range safety measures imposed at DPG, the orientation of most conventional weapons firing to the south and west—directly away from the PFSF, and the fact that most of the weapons fired at DPG do not have the range to reach the PFSF, conventional weapon firing at DPG would pose no credible hazard to the PFSF.

CHEMICAL MUNITIONS AND AGENTS

9. Activities at Dugway involving chemical munitions and agents can be broken down into three areas: testing, storage, and disposal. While live conventional munitions are fired on DPG, there is no firing of live chemical munitions (where "chemical munition" is defined as a munition that has a chemical agent filling) or open air testing or use of chemical agent. Under 50 U.S.C. § 1512, there has been no open air use of chemical munitions or agent at DPG since 1969. Moreover, further constraints on the development and testing of chemical munitions were applied when the United States Senate ratified the Chemical Weapons Convention on April 24, 1997. Under that treaty, the United States will conduct no testing of chemical munitions intended to be filled with

chemical agents. Therefore, there will be no open air use of chemical munitions or agents at DPG that could pose a hazard to the PFSF.

Testing

10. As stated above, there has been no open air testing of chemical munitions or agent at DPG since 1969. In 1968, an incident did happen when an airplane that was spraying nerve agent VX malfunctioned and apparently caused the death of sheep outside the boundaries of DPG. This could no longer happen given the prohibition on open air testing of chemical munitions and agent.

11. Testing in support of chemical defense programs, however, is conducted at DPG in laboratories using chemical agents. The agents are used to test the effectiveness of chemical protective clothing and equipment, the sensitivity of detection equipment, the resistance of materials to the effects of chemical agents, and the effectiveness of equipment and processes for the destruction of chemical munitions and agents. This testing is conducted only in facilities specially designed to prevent the release of chemical agents to the environment. These facilities include the Combined Chemical Test Facility (CCTF) and the Material Test Facility (MTF). The location of the CCTF and MTF are shown on Exhibit 2. These facilities are about 19 miles from the PFSF.

12. This indoor testing involving chemical agents at DPG would not pose a credible hazard to the PFSF because of the extensive safety precautions taken during testing and the distances of the test facilities from the PFSF. The testing that takes place at DPG is performed in facilities and laboratories specially designed to preclude the release of chemical agent to the atmosphere. These include maintaining test areas at negative pressure relative to the outside air, so any leakage of air will be into and not out of the test area, and the provision of carbon filtration of all air exhausted to the environment to ensure removal of any agent.

13. Also, because of the distance between the PFSF and the chemical test facilities at DPG, the quantities of chemical agent used in testing are not great enough to pose a hazard to the PFSF even if they were released to the environment. As described below, the quantities of agent stored at DPG are not large enough that a spill of agent would cause harm as far away as the PFSF. Moreover, I am not aware of any accidents or incidents at Dugway involving the testing of chemical munitions or agents in which people, other than those occupationally handling the munitions or agents, were harmed by any chemical agent.

Storage

14. The second area of activities involving chemical munitions and agents is storage. DPG does not have as a part of its mission the storage of stockpile chemical agents and munitions, but it does store chemical munitions that had been fired (but unexploded) or buried on the ranges prior to 1969 which have been recovered from those firing ranges or disposal sites. It also stores chemical agents that have been removed from the munitions and which are awaiting disposal and it stores agents that are used in the chemical tests discussed above. The chemical munitions and the chemical agent removed from munitions are stored in Igloo G under an interim Resource Conservation and Recovery Act (RCRA) Permit issued by the State of Utah. Chemical agents used in laboratory testing are also stored in Igloo G and some agent may also be stored in the CCTF and MTF testing laboratories. Igloo G is located in the Carr area on Exhibit 2, more than 17 miles from the PFSF.

15. Chemical munitions and agents stored at DPG would not pose a credible hazard to the PFSF. The only chemical munitions stored are those that have been removed from test ranges as described above. The latest inventory published by the Project Manager for Non-Stockpile Chemical Materiel showed 25 recovered chemical munitions and 106 Department of Transportation containers of chemical agents in storage at Igloo G. The quantities of chemical agent stored at the test laboratories are generally small,

approximately liter-sized, unless a test of the Munitions Management Device requires larger quantities. (The Munitions Management Device is a device being developed to drain and neutralize non-explosively configured chemical munitions. The testing and use of this Device cannot occur until a RCRA permit is issued by the State of Utah.) In this later case, 78 liters of nerve and blister agents will be stored at the Material Test Facility.

16. Special measures are taken to reduce the hazards that the storage of chemical munitions or agents would pose to people on or off range. The Army Chemical Safety and Chemical Surety Programs were specifically developed to reduce the hazards associated with the storage, transportation, and use of chemical agents and munitions. These programs establish a strict set of rules governing the storage of agents and munitions. The rules include packaging requirements, quantity limitations for storage facilities, monitoring requirements to detect the leakage of agent should any occur, requirements for response teams to handle problems that might arise, and training and personnel reliability requirements for personnel who handle chemical munitions and agents. These rules also require that the chemical munitions, such as those stored in Igloo G, be stored in approved configurations to preclude the possibility of sympathetic detonation (i.e., the detonation of munitions caused by the detonation of a nearby round). Chemical munitions recovered from the range and the agent removed from them must also be stored as RCRA-regulated waste under a Utah Division of Solid and Hazardous Waste permit.

17. Because of the quantities and types of chemical munitions and agents stored at DPG, such storage would not pose a credible hazard to the PFSF. The quantities stored are not sufficient to generate a pool of chemical agent large enough to cause a significant quantity of agent to travel from the storage location to the PFSF even in the event of a spill. In addition, leaks of agent would be detected by the sampling program in use at DPG and any released liquid agent would be decontaminated before a large pool of agent could accumulate. Thus, the only hazard even potentially posed to the PFSF from chemical munition or agent storage on DPG would arise from the detonation of a chemical munition. Such a detonation, however, would be highly unlikely. I am not aware of

any accidents at Dugway involving the storage of chemical munitions or agents in which people outside of DPG were harmed by chemical agent.

18. Nevertheless, to provide a basis for evaluating the maximum possible hazard to the PFSF in the extremely unlikely event of an uncontained detonation of a chemical munition, one can consider the Department of Defense guidelines for siting defense installations so as to protect the public from the harmful effects of chemical agents (*DOD Standard 6055.9-STD, Department of Defense Ammunition and Explosive Safety Standards*, Under Secretary of Defense for Acquisition and Technology, August 1997).

Those guidelines consider the hazard zone for a chemical munition or agent to be the area within the one percent lethality distance, calculated from the maximum credible event at the installation. Because chemical munitions in an approved storage configuration, such as those stored at Igloo G, are safe from sympathetic detonation, an estimate of the one percent lethality distance for a single munition is considered an appropriate maximum credible event for bounding the potential hazard at DPG. Of the munitions which might be recovered at DPG and stored in Igloo G, the detonation of an 8 inch projectile filled with agent GB would yield the greatest hazard distance. The one percent lethality distance (*Handbook for Chemical Hazard Prediction*, U.S. Army Materiel Development and Readiness Command, 1980) for the explosion of an 8 inch GB filled projectile is 4,895 meters or about 3 miles under worse case conditions for producing harmful effects at long range (atmospheric stability level F, which represents a strong inversion, and wind speed of 1 meter per second).

19. As noted, the distance from the chemical munition storage area at DPG to the PFSF is more than 17 miles (27,200 meters). Even the boundary of DPG closest to the PFSF is more than 8 miles (12,900 meters) away. Those distances are far greater than the calculated maximum hazard distance of 4,895 meters, which is only relevant in the extremely unlikely event of a worst-case detonation of a chemical munition. Moreover, the hazard posed to the PFSF by such a worst-case detonation would be further reduced during the movement of the agent cloud over the mountainous and wooded terrain of the

Cedar Mountains, see Exhibit 2, which would cause a damming of the forward movement of the agent cloud, enhance mixing (reducing concentrations), or absorb agent on surfaces. The latter two effects would reduce the concentration of agent in the air which reduce the distance at which a given effect would extend. Still another factor to be considered in evaluating the potential risk to the PFSF for events occurring at Dugway is the prevailing wind directions. The majority of the time, the winds are from the north-northwest and south-southeast directions, which would not transport agent toward the PFSF. Thus it is even less likely than the calculation above indicates that any agent released at DPG would ever reach the PFSF. Therefore, the storage of chemical munitions and agents at DPG does not pose a credible hazard to the PFSF.

Disposal

20. The third area of activities involving chemical munitions and agents that takes place at DPG is disposal. The disposal that takes place or will take place at DPG includes the disposal of munitions discovered on the ranges and agent used in laboratory testing.

21. Disposal of the munitions recovered from the range is generally conducted using two techniques. First, if the recovered chemical munition is determined to be unsafe to move, the munition is destroyed in place using emergency destruction techniques. These techniques involve the placement of sufficient explosives around the munition to ensure that the chemical agent inside will be thermally destroyed when the explosive is detonated. When this technique is used, a request is made to the Utah Division of Solid and Hazardous Waste for an Emergency Permit, since the chemical munition is classified and regulated as a hazardous waste by the State of Utah. Second, if a munition is safe to move, it is taken to Igloo G, which as noted above is under an interim RCRA permit issued by the State of Utah, and stored in accordance with *DOD Standard 6055.9-STD*. All chemical munitions currently stored in Igloo G and any other recovered chemical munitions that are safe to move will be disposed of in the Munitions Management Device and other similar equipment currently being developed by the Project Manager for the Non-

Stockpile Chemical Materiel Program and subject to a RCRA permit to be issued by the Utah Division of Solid and Hazardous Waste.

22. Chemical agent left over from the laboratory test programs described above is disposed of when it is no longer needed for a test program. The laboratory procedures governing each test provide the methods to be used to destroy all agent remaining after the completion of the test. Agent used in testing at DPG is chemically neutralized and the residue left over from the neutralization is managed as a hazardous waste under DPG's Utah RCRA permit. Chemical agent used in testing the Munition Management Device (as would any agent that would be used in testing similar devices developed for the disposal of chemical munitions) will be destroyed in accordance with the Device RCRA permit issued by the State of Utah.

23. Special measures are taken to reduce the hazards that the disposal of chemical munitions or agents would pose to people on or off range. As all chemical munitions recovered from the DPG ranges are classified as RCRA hazardous wastes, they must be disposed of in accordance with permits issued by the Utah Division of Solid and Hazardous Wastes. When munitions found on the range are destroyed in place, the quantity of explosives used is calculated to provide an excess of heat to destroy the agent. In such cases, air samples are taken to determine whether any agent survived the explosion of the munition. I am aware of no sampling results that indicated the presence of chemical agent in the air after a munition was destroyed. Normal disposal of chemical agent used in testing is conducted in enclosures designed to contain any agent that might otherwise escape. In disposal, the agent is chemically neutralized on site so that it does not pose a risk to people on or off range.

24. The disposal of chemical munitions or agents at Dugway would not pose a credible hazard to the PFSF. As described above, extensive safety precautions are used to protect people on and off range from potential harm from chemical agent or munitions. Moreover, as indicated in paragraphs 18-19 above, the PFSF is well outside the hazard distance for the explosion of an 8 inch GB-filled munition, which is the worst-case credi-

ble event involving the release of chemical agent at DPG. (Open detonation or detonation in-place disposal operations, which use greater amounts of explosive than is present in an 8 inch munition, are not worst-case, in that the large amount of explosive used in the destruction of the chemical munition thermally destroys the chemical agent and thus prevents it from causing harm at a distant location.)

BIOLOGICAL DEFENSE ACTIVITIES

25. Activities at DPG involving biological defense include biological materials testing and storage and disposal incident to that testing. In general, testing is conducted to determine the effectiveness of various biological detectors and protective equipment against challenges from various biological material (bacteria, viruses, and toxins). There are, however, no biological munitions or biological warfare agents at DPG; the United States destroyed all of its biological munitions and biological agents following a Presidential decree in 1969. Specifically, a "biological munition" is defined as a munition that was filled with a biological warfare agent that would have been disseminated explosively or sprayed out under pressure. A "biological agent" is defined as those biological materials (bacteria, viruses, and toxins) that the U. S. Army had selected for development as part of a weapons system, to be used in time of war against enemy forces, and which may or may not have been placed in a biological munition. The nomenclature "biological materials" is used to distinguish biological warfare agents, as defined above, from the bacteria, viruses, and toxins that are currently used at DPG for defensive testing of detection and protection systems.

26. All biological defense activities at DPG take place in the Life Sciences Test Facility, located near Baker area on DPG more than 20 miles from the PFSF. See Exhibit 2. Biological materials are used at DPG to determine the sensitivity of biological detectors, test techniques for the identification of biological agents, test the effectiveness of protective equipment and decontamination systems, and evaluate vulnerabilities to biological attack. The types of biological materials used in testing at the Life Sciences Test Facility include bacteria and viruses, both infectious and non-infectious, and toxins

up to Biosafety Level III (which represents the protection level for biological materials with a potential for lethal infection and for respiratory transmission but for which a vaccine or treatment exists). DPG also stores biological materials prior to the tests it conducts and destroys any unwanted material after the tests are completed. The quantities stored are those required for the specific tests being conducted. The entire biological test program at DPG, including the types of biological materials to be used in the program, is under the oversight of the Utah Governor's Technical Review Committee.

27. Special measures are taken to reduce the hazards that the use of biological materials would pose to people on or off range. The entire approach to the design of a biological containment facility is to reduce the hazard to the work force at the facility and the public. Specific measures are governed by the specific characteristics of each material used. The containment systems used to prevent the material from escaping to the environment are determined by the level of hazard posed by the material. At the Life Sciences Test Facility, these features include maintaining the test areas at negative pressure and HEPA filtration of air cycled through test areas. In addition, air that is considered likely to contain dangerous biological materials is also incinerated before it is exhausted to the environment, assuring that any materials that might not be trapped by the HEPA filter are destroyed. The requirements for the storage and handling of biological materials in the laboratory are prescribed in Army Regulation 385-69, Biological Defense Safety Program, and Department of the Army Pamphlet 385-69, Biological Defense Safety Program. These requirements are designed to ensure that the materials are controlled and not released to the environment. The Life Sciences Test facility provides containment up through Biosafety Level III, which provides more than adequate protection for the materials employed in testing at DPG. The design and procedural controls applied to a Biosafety Level III facility allow such facilities to be located in populated areas. The Life Sciences Test Facility, however, is located over 20 miles from the proposed PFSF site.

28. As part of the programs conducted at the Life Sciences Test Facility, biological materials are also disposed of at DPG. Department of the Army Pamphlet 385-69 provides guidance on methods that may be used to destroy biological materials, which are intended to ensure that such materials are disposed of in a safe manner and are not released to the environment. The disposal practices are the same as those used in biological laboratories throughout the United States and would not pose a hazard to the PFSF.

29. Furthermore, in the highly unlikely event that biological material used in the Life Sciences Test Facility at DPG were to escape into the environment, it would not pose a credible hazard to the PFSF. The Environmental Impact Statement for the Life Sciences Test Facility evaluated a scenario involving a release from the facility and showed that such material would have almost no chance of surviving in the environment long enough to be carried the 20 miles to the PFSF in the air. Department of the Army, U.S. Army Dugway Proving Ground, Final Environmental Impact Statement: Life Sciences Test Facility, Volume II, Response to Comments (March 1992), at 3-55 to 3-57.

30. I am not aware of any accidents at Dugway involving the use of biological materials in which people on or off range were harmed by the materials. Because of the engineering and procedural controls that are employed to prevent the release of biological materials from the Life Sciences Test Facility and the distance separating the facility from the PFSF, the use of biological materials at DPG would not pose a credible hazard to the PFSF.

TRANSPORTATION OF HAZARDOUS MATERIALS

31. Hazardous materials, including chemical agents and biological materials, are transported to and from Dugway Proving Ground. Nevertheless, as there is no testing of chemical or biological munitions at DPG, only research quantities of materials to be used in laboratory testing are transported. Small shipments of research materials are made via common carrier, and are subject to rigorous packaging requirements to ensure their safe shipment in interstate commerce. Larger shipments of chemical agent, however, are made only with special preparation, notification of the required authorities, and

the implementation of extraordinary safety measures. None of the shipments would pose a credible hazard to the PFSF.

32. Small quantities of chemical agents or biological materials may be transported to DPG along Skull Valley Road via common carrier, but they would not pose a credible hazard to the PFSF. The biological materials used in the Life Sciences Test facility would normally be shipped in accordance with the strict packaging requirements specified in Army Pamphlet 385-69. The packaging of all shipments of biological materials and small quantities of chemical agent via common carrier are strictly regulated by the Department of Transportation (DOT) such that the material must be shipped in containers designed to withstand credible transportation accidents. Thus the shipments would not threaten the PFSF. Indeed, such hazardous material shipped by common carrier may go through populated areas like Salt Lake City. The hazardous wastes from DPG managed under the Utah RCRA permits may also be transported on Skull Valley Road on their way to a permanent storage site or destruction center. Nevertheless, because those wastes comprise only the products of agent decontamination and not untreated chemical agent, they are far less hazardous than agent. Even if such material were spilled on Skull Valley Road near the PFSF, it would not pose a credible hazard to the PFSF.

33. Larger shipments of chemical agents used in laboratory testing at DPG are normally shipped from Deseret Chemical Depot via Lookout Pass, which is to the south and east, away from the PFSF, because that route is less traveled and avoids populated areas. The closest point of approach to the PFSF of shipments via this route is 17 miles. DOT imposes strict safety requirements on the shipment of such materials. In addition, 50 U.S.C. § 1512 requires that the Secretary of Defense determine that such shipments are in the interest of national security and that he notify the Governor of Utah in advance of the shipments. Movements such as the one contemplated in "Transportation Plan for Movement of Chemical Agent from Deseret Chemical Depot to Dugway Proving Ground, Program Manager for Assembled Chemical Weapons Assessment,"

18 September 1998, are carried out in accordance with these laws. I recently reviewed this plan for the movement of 78 liters of three chemical agents from Deseret to DPG (30 liters or 67 pounds of agent VX, 30 liters or 72 pounds of agent GB, and 18 liters or 50 pounds of agent HD). This transportation is via an escorted truck shipment. Because of the extraordinary safety precautions taken, including the packaging used and the controls on the movement, the plan concluded that there was no credible basis for calculating a release of chemical agent from the shipping containers. Thus such shipments would not pose a credible hazard to the PFSF.

UNEXPLODED ORDNANCE

34. Unexploded ordnance, including chemical munitions, is occasionally discovered on the firing ranges at DPG. Each of the test ranges and test grids have been surveyed via records search and physical observation to determine the types of munitions that might remain. The Army reviewed its DPG weapon firing records and visually surveyed the relevant DPG firing ranges to support the preparation of installation assessments of the presence of ground contamination, including unexploded ordnance, in 1979 and 1988. Environmental Science and Engineering, Inc., Update of the Initial Installation Assessment of Dugway Proving Ground, UT (February 1988); Chemical Systems Laboratory, Installation Assessment of Dugway Proving Ground (1979). As part of the surveys, any discovered unexploded ordnance was removed or destroyed on location.

35. The sites on DPG closest to the PFSF that may contain unexploded chemical munitions are the North Wig Grid, more than 15 miles from the PFSF, and the CBR Target Area and the Chemical Corps Board Area (which are both several miles southeast of the North Wig Grid, further away yet from the PFSF, see Exhibit 3 – areas 5, 6 and 7). These target areas were the sites of operations involving 155 millimeter howitzers, 115 millimeter rockets, landmines, and various Navy projectiles (5 inch/38, 5 inch/54, and 6 inch/47). Identified unexploded ordnance on the surface would have been removed as a result of surveys conducted by the Army of these areas. Moreover, the Army has specifically determined with respect to the CBR Target Area that there is unlikely to be any

buried ordnance located there because of the hard, rocky nature of the terrain. "Installation Assessment of Wig Mountain Area, Dugway Proving Ground, Report #100", September 1976, US Army Toxic and Hazardous Materials Agency. The same would hold true for North Wig Grid and the Chemical Corps Board Area as the terrain would be similar to the CBR Target Area. The only areas off DPG that may contain unexploded ordnance that I know of are to the south of the proving ground. These areas off DPG are known as the Southern Triangle and the Yellow Jacket areas. See Exhibit 3. I know of no unexploded ordnance outside of DPG in the direction of the PFSF.

36. Unexploded chemical ordnance at DPG would not pose a credible hazard to the PFSF. First, the likelihood of the spontaneous detonation of a chemical munition that has been on the range for over 30 years is remote. Accidental detonations are also highly unlikely, in that discovered rounds that are too dangerous to handle or move are safely destroyed in place as described above in paragraph 23. Second, as shown in paragraph 18 above, the hazard area, as defined in *DOD Standard 6055.9-Std*, for the detonation of an 8 inch projectile filled with Nerve Agent GB extends at most three miles downwind of the detonation point. This scenario is the worst credible case involving the detonation of unexploded ordnance because it yields the greatest harm at the greatest distance downwind. (Moreover, the actual hazard distance resulting from such a detonation would be reduced by the facts that 1) the cloud of agent would have to pass over the Cedar Mountains en route to the PFSF and 2) the prevailing winds at DPG do not blow in the direction of the PFSF.) The detonation of more than one unexploded round at a time is not credible, because, in addition to the spontaneous detonation of a single round being extremely unlikely, unexploded chemical rounds are not found close together on the range. Thus, the PFSF would be far outside even the hazard area created by the worst-case detonation of a chemical munition at the boundary of DPG at its closest point of approach. Therefore, unexploded ordnance at DPG would pose no credible hazard to the PFSF.

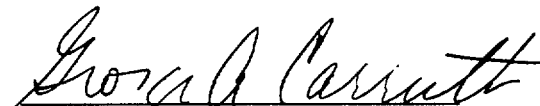
37. Furthermore, I know of no munitions that have been found on Dugway that contain biological warfare agents. This position is consistent with the statement given by David C. Larsen in his May 12, 1999 deposition (pp. 69-70) in which he stated that biological munitions containing a biological simulant, "*Bacillus stabillus*" [sic; correct name *Bacillus subtilis*] had been found at the Carr facility of Dugway, more than 17 miles from the PFSF. See Exhibit 2. (Martin Gray in his May 12, 1999 deposition (pp. 72-73) also referred to the discovery of a biological munition but did not know the location or the biological material contained in the munition.) Biological simulants are biological materials that are used in testing to simulate the behavior of biological agents in the environment, but which do not exhibit the toxicity or infectivity of biological agents. Thus, any munitions at DPG containing *Bacillus subtilis* or other biological simulants would not pose a hazard to the PFSF. Several factors lead me to conclude that even if a biological munition was found on DPG, it would not pose a hazard to the PFSF. Biological agents, other than spores, decay rapidly if they are not stored under carefully controlled conditions. Biological munitions are generally quite small, therefore the quantity of biological agent is limited. Thus, given the long distances between the PFSF and DPG areas where biological munitions could be found, I cannot foresee a circumstance where biological munitions, including those containing spores, at DPG could pose a credible threat to the PFSF. Likewise, the explosion of convention munitions on range would have no adverse impact on the PFSF given the long intervening distances between the DPG target areas and the PFSF.

38. In addition to unexploded ordnance at DPG not posing a credible hazard, hazardous materials other than ordnance that were previously disposed of at DPG would also not pose a credible hazard to the PFSF. In the past, containers of chemical agent were disposed of by burial in the ground at DPG. That material, which is the most hazardous of the materials disposed of at DPG, would not pose a credible hazard to the PFSF because there is no credible way to get a sufficient quantity of it out of the ground and into the air such that a cloud of agent could travel to the PFSF and cause harm there. Moreover, areas on DPG containing hazardous materials are regulated by the State under

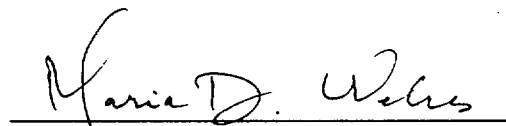
RCRA and the cleanup of such areas is subject to RCRA requirements and oversight by the State. Thus, such hazardous material would pose no credible hazard to the PFSF.

CONCLUSION

39. In conclusion, because of the distance between the PFSF and DPG, the limited quantities of chemical agent or biological materials that could credibly be released to the environment at DPG, and the extensive safety precautions that are taken with respect to all potentially dangerous activities at DPG, those activities would not pose a credible hazard to the PFSF.


George A. Carruth

Sworn to before me this 7th day of June 1999.


Notary Public

My Commission expires 7/14/2000