

US Army Corps of Engineers

Rock Island District



Defense Environmental Restoration Program For Formerly Used Defense Sites Ordnance and Explosives

Archives Search Report

FINDINGS

for the former

NELLIS AIR FORCE RANGE AREA G

MERCURY, NEVADA Project Number J09NV050801

April 1996



Technicians at the Nevada Test Site

DEFENSE ENVIRONMENTAL RESTORATION PROGRAM

for FORMERLY USED DEFENSE SITES

FINDINGS

ORDNANCE AND EXPLOSIVES ARCHIVES SEARCH REPORT for the former NELLIS AIR FORCE RANGE AREA G MERCURY, NEVADA PROJECT NUMBER J09NV050801

April 1996

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ORDNANCE AND EXPLOSIVES ARCHIVES SEARCH REPORT for the former NELLIS AIR FORCE RANGE AREA G MERCURY, NEVADA PROJECT NUMBER J09NV050801

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ORDNANCE AND EXPLOSIVES ARCHIVES SEARCH REPORT for the former NELLIS AIR FORCE RANGE AREA G MERCURY, NEVADA PROJECT NUMBER J09NV050801

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ORDNANCE AND EXPLOSIVES ARCHIVES SEARCH REPORT For the former NELLIS AIR FORCE RANGE AREA G MERCURY, NEVADA PROJECT NUMBER J09NV050802

1. INTRODUCTION

a. Subject and Purpose

(1) This report presents the findings of an historical records search and site inspection for ordnance and explosives (OE) presence located at the former Nellis Air Force Range Area G. The investigation was performed under the authority of the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP FUDS).

(2) The investigation focused on 733,418.44 acres of land that was used by the Army Air Forces (AAF) as an aerial gunnery range during World War II and as a troop maneuver area during atomic weapons testing. This range was used by trainee gunners to learn basic flexible gunnery skills during the period 1941 to 1947. The area was later used by the Army in conjunction with DOE weapons tests to teach soldiers how to fight on the atomic battlefield from October 1951 to September 1953.

(3) The purpose of this investigation was to characterize the site for potential OE contamination, to include conventional ammunition and chemical warfare material (CWM). The investigation was conducted by experienced ordnance experts through thorough evaluation of historical records, interviews, and on-site visual inspection results.

b. Scope

(1) This report presents the site history, site description, real estate ownership information, and confirmed ordnance presence (prior to and after site closure), based on available records, interviews, site inspections, and analyses. The analyses provide a complete evaluation of all information to assess current day potential ordnance contamination, where actual ordnance presence has not been confirmed.

(2) For the purpose of this report, OE contamination consists of live ammunition, live ammunition components, CWM, or explosives which have been lost, abandoned, discarded, buried, fired or thrown from demolition pits or burning pads. These items were either manufactured, purchased, stored, used, and/or disposed of by the War Department/Department of Defense. Such ammunition/components are no longer under accountable record control of any DOD organization or activity.

(3) Expended small arms ammunition (.50 cal or smaller) is not considered OE contamination. OE further includes "explosive soil" which refers to any mixture in soil, sands, clays, etc., such that the mixture itself is explosive. Generally, 10 percent or more by weight of secondary explosives in a soil mixture is considered explosive soil.

2. PREVIOUS INVESTIGATIONS/PROJECTS

a. 1993 Preliminary Assessment

(1) A Preliminary Assessment of Nellis Air Force Range Area G was conducted under the Defense Environmental Restoration Program, Formerly Used Defense Sites (DERP FUDS) by the Corps of Engineers, Los Angeles Division (see reference B-1). At that time, the Findings and Determination of Eligibility (FDE), dated 9 September 1994, concluded that 1,644,026.56 acres had been formerly owned or used by the Army Air Forces/Department of Defense. Los Angeles District divided this large area into nine smaller sites, A through I (see document E-2). Area G, the subject of this assessment, is 733,418.44 acres in size.

(2) The FDE concluded that there were eligible categories under the DERP/FUDS program. Since the site was used as an aerial gunnery range overflight area by the AAF, an Ordnance and Explosives (OE) project was recommended, DERP FUDS Project Number J09NV050801, which is the subject of this report (see document E-3).

TABLE 2-1 DERP-FUDS PRELIMINARY ASSESSMENT PROJECTS										
Project Number	DERP Category	Present Phase	Comments	Location						
J09NV050801	OE	SI	Ordnance and Explosives	See plate 2						
	BD/DR	-	None Recommende	ed						
	HTRW	_	Numerous sites							

b. Other Investigations

No other investigations or studies relevant to DERP-FUDS were discovered during this Archives Records Search.

3. <u>SITE DESCRIPTION</u>

a. Existing Land Usage

(1) Nellis Air Force Range Area G, also known as the Nevada Test Site, was located in Nye County, north of Mercury, Nevada.

(2) The portion of the Nellis Air Force Range comprising Area G consisted of 733,418,44 acres of mountains, desert areas, and dry lakes. The property is used by the Department of Energy (DOE) as a research facility. Project Areas noted below were named in accordance Nevada Test Site (NTS) guideines for mapping and existing area designations as an aid in interpretation. Area G-7910 corresponds to the grouping of NTS areas 7, 9, 10. Area G-1920 is equivalent to NTS areas 19 and 20. The other areas correspond to individual NTS areas (see reference L-3).

TABLE 3-1 CURRENT LAND USAGE									
AREA [*]	FORMER USAGE	<i>PRESENT</i> OWNER	PRESENT USAGE	SIZE/ ACRES	COMMENTS				
G-7910	Blast Effects	Department of Energy	Research	15,700	See plates 3,4				
G-1	Maneuver Area	DOE	Research	28,700	See plates 3,5				
G-11	Blast Effects	DOE	Research	9,530	See plates 3,7				
G-16	Maneuver Area	DOE	Research	21,700	See plates 3,6				
G-18	Maneuver Area	DOE	Wildlife Mgmt.	15,840	See plates 3,8				
G-1920	Maneuver Area	DOE	Wildlife Mgmt.	18,830	See plates 3,9				
All Others	Not Used	DOE	Not Used	623,118.	44 See plate 3				
Total Acres: 733,418.44 *Project area numbers conform to Nevada Test Site area numbers shown in exhibit L-3.									

(3) Table 3-1 shows current land usage.

b. Climatic Data

(1) Material in paragraphs 3.b.(2) through (4) was extracted from the Local Climatological Data, Annual Summary With Comparative Data for Las Vegas, Nevada, dated 1993 (see reference B-14).

(2) Nye County is located in the southwestern portion of the state. Weather factors for the Las Vegas recording station are used in this assessment. The factors that determine weather patterns include the location of Nevada on the eastern lee side of the Sierra Nevada Mountains, prevailing winds from the west that drop precipitation on the western side of the Sierras, and the extreme local variations due to differences in topography and elevation.

(3) The annual precipitation averages 4.21 inches (1964-1993 avg. mean). The wettest months are usually March and January. The months with the least amounts of precipitation are May and June (see reference B-15).

(4) The average temperature ranges from daily minimums in January and December of 32.7 to 33.6° F to daily mean high temperatures of 83.5-89.8° F in June, July, and August. The lowest temperature observed was 8° F in January and the highest temperature was 116° F in July (see reference B-14). Mean number of days with temperatures over 90° F is 132. Mean number of days 32° F and below is less than one-half day (see reference B-15).

(5) The average snowfall each winter is from a trace to up to 16.7 inches. The relative humidity can range from 21 to 40 percent throughout the course of the day (see references B-14 and B-15).

(6) Flooding, especially flash flooding, is likely to occur in the area of the site after thunderstorms due to the topography and soil consistencies (see reference B-15).

c. Topography

(1) Nye County lies on the southwestern edge of the state and is part of the southwest edge of Pahute Mesa, a large plateau. Average elevations in the area of the site are from 3,000 to 7,800 feet. The area slopes down gently southwest towards the Amargosa Desert and Death Valley. The most distinctive topological structures of the site are the atomic weapons testing craters dotting the north and northeast mountainous areas on the site.

(2) The site is traversed by gullies, canyons, and arroyos making transportation possible only by horseback or 4-wheel-drive vehicle. Portions of the site are contaminated with radioactive by-products of atomic weapons testing and special protective clothing and instruments are required prior to site entry and inspection.

d. Geology and Soils

(1) Material in paragraphs 3.d.(2) and 3.d.(3) was extracted from several sources as a current Soil Survey of Nye County, Nevada was not available (see references B-2, B-15 and B-22).

(2) Regional Geology/Soils

The geology of Nye County is generally (a) categorized as structurally complex due to intense crustal deformation. Large, deep formations of dolomite and limestone from the early Cambrian to the early Permian are present, with the balance of the underlying formations being conglomerate, quartzite, and shale beds. The Tertiary rock in the mountains ringing the site area are mainly rhyolite and tuff but include many other igneous types. Near the base of these formations, Tertiary rocks are interbedded with layers of conglomerate and marly limestone. The valley floors that make up the center of the site are quarternary in nature, made up of a detritus from the bedrock areas carried by intermittent flash flooding to the margins of valleys and alluvial fans. Larger amounts of coarse debris are deposited along the edges of dry watercourses. Dry lakebed playas are made of fine silt and clays (see references B-2 and B-22).

(b) The soil is of all sizes of rock debris ranging from clay-sized fragments to boulders. The soil is not suited for agricultural purposes and lack of water discourages all but the hardiest desert shrubs.

(3) Site Specific Geology/Soils

(a) Soils on the site are basically derived from weathered sandstone, limestone, and dolomite known as caliche. Caliche is a hard top or near top soil conglomerate held together by calcium carbonates from the weathered limestone and dolomite. Particles in the caliche are from weathered sandstone and fractured volcanic rock from the many igneous intrusions in the area. The resulting soil is very hard to penetrate, nearly impervious to water where undisturbed, and highly porous where it has been disturbed, such as in mining, flood, or quarry areas (see references B-2 and B-22).

(b) Some of the soils on site are contaminated with the byproducts of atomic weapons testing including radioactivity and hazardous wastes.

e. Hydrology

The 4.21 inch average rain fall for the Las Vegas area is not a reliable estimate for this area due to altitude and proximity of the Amargosa Desert (see reference B-22). Surface water on this

site is mainly runoff from the mountainous areas to the north and northwest of the site. Small springs and seeps are located in several places on the site but these are largely seasonal and provide no steady supply of water.

f. Natural Resources

(1) There are several endangered animals and plants listed as endangered species to be protected in this portion of Nevada by the Department of the Interior, U.S. Fish and Wildlife Service (see reference B-13).

(2) The following species are recognized as threatened, endangered or sensitive by the State of Nevada or by the Federal Government and are presented in tabular form in table 3-3:

1	TABLE 3-3 NATURAL RESOURCES [*]	
Resource Classification	Туре	Comment
Mammal	None	
Bird	None	
Amphibian/Reptile	Desert Tortoise Amargosa Toad	E (F,N) T (F)
Fish	Pahrump Poolfish Warm Springs Pupfish	E (F) E (F)
Plant	Amargosa Niterwort Mojave Sweet Pea	E (F) S (F)
Insect	None	
E = Endangered S = *References B-13 and B-42	Sensitive F = Federal 2	N = Nevada

g. Historical/Cultural Resources

According to the State Historical Preservation Office (SHPO) for Nevada, maintenance of an inventory of historic and cultural sites is contracted out to the University of Nevada at Las Vegas' Harry Reid Center for Environmental Studies. Ms. Blair of that office informed the HRS researcher for this site that the least expensive and most feasible way to inventory and categorize historical/cultural sites was to do so after it had been determined which areas are to be remediated. During the site inspection, the Harry Reid Center was visited by the assessment team; no information specific to the site was discovered but it appears that the entire Nellis Range complex, past and present, contain hundreds of cultural sites.

4. HISTORICAL ORDNANCE PRESENCE

a. Chronological Site Summary

(1) The site was acquired from the Department of the Interior as part of a 4,043,339.55 tract specified in Executive Order 8578, 29 October 1940, for use as a bombing and gunnery range (see reference B-31). The 733,418.44 acres were relinquished to the Atomic Energy Commission by Presidential order in 1950. The site was used for atomic testing until the 1992 establishment of the unilateral atomic testing moratorium. The property is owned by the Department of Energy, which uses the property for research in the fields of high energy research and radioactive waste storage technologies.

(2) Area G was an air-to-air and air-to-ground gunnery range from December 1941 to 1949. The training consisted of firing at towed sleeves with .30 and .50 caliber ball ammunition as well as firing at fixed targets on the ground. This later progressed to firing of .30 caliber frangible bullets at armored RP-63 Kingcobra aircraft from the waist positions on B-17 and B-24 bombers (see references F-2 and F-3).

(3) This area was also used by troop units from Camp Desert Rock during several atomic weapons tests in the 1950s and 1960s. Troop involvement in the tests was to simulate combat on the atomic battlefield using a wide variety of infantry and infantry support weapons including heavy artillery. At the conclusion of the exercise, troops, weapons and equipment were decontaminated (see references F-1, H-1 through H-4).

(4) Prior to August 1963, more than 100 above ground weapons tests, blast effects tests, and cratering experiments were conducted on the site. Since that time, an additional 828 underground tests have been conducted (see references H-5 through H-8).

b. Ordnance Related Records Review

(1) Sources checked in the search for any OE contamination included:

- [a] National Archives
- [b] Regional Archives
- [c] The Military History Institute
- [d] U.S. Army Center for Military History
- [e] Emergency Ordnance Disposal (EOD) Units
- [f] Local Police Department

- [g] Local Sheriff's Department
- [h] County Courthouse

(2) For a complete list of sources checked, see appendix A, Reference Sources.

(3) Documentation discovered in the course of the Archives Search revealed that the Nellis Air Force Range Area G supported elements of the U.S. Army training at Las Vegas Army Airfield (LVAAF) (see documents F-1 and B-7) as well as troops deployed from Camp Desert Rock during atomic weapons testing.

(4) Libraries and archives were carefully searched for documents and articles specific to Area G; several were discovered and are catalogued in appendices F, G and H. Supporting Explosive Ordnance Disposal (EOD) units have made recoveries of munitions or ordnance items in this area but have no documentation to verify it (see interviews I-4 and I-5). The DOE contractor on-site for many years operated their own organic explosive ordnance disposal team. This contractor is no longer associated with Nevada Test Site and no written records of recovered and rendered safe OE items were available (see interview I-1).

(5) Electronic mail discussions with historians on the World War II discussion list and reference B-8 confirmed the use of specific combat and training aircraft types at the former Las Vegas Gunnery and Bombing Range/Nellis Air Force Range. Some of these aircraft are summarized in Table 4-1 below:

Table 4-1 Typical Aircraft Utilizing LVG&BR/NAFR 1941-1949 [*]										
MODEL TACTICAL PRACTICE WEAPONS TIME FRAME WEAPONS										
AT-11 KANSAN	None	.30 cal. MG	1945							
AT-6A TEXAN	None	.30 cal. MG	1941-1946							
B-10M	None	.30 cal. MG	1941-1942							
B-17 FORTRESS	6,000lbs. G.P. bombs, .50 cal. MG	Practice bombs, .50 cal., .30 cal. MG	1942-1945							
B-24 LIBERATOR	8,000lbs. G.P. bombs, .50 cal. MG	Practice bombs, .50 cal., .30 cal. MG	1942-1945							
P-39 AIRACOBRA		.30 cal MG, .50 cal MG, 37mm cannon,	1944							

(6) Review of newspaper microfilm, clipping files, and vertical files at the Nevada Room of the Las Vegas Central Library revealed no evidence of the OE discovery at the former Nellis Air Force Range Area G.

(7) No range clearance documents were discovered in the course of the Archives Search.

(8) Documents concerning troop deployments for atomic battleground maneuvers and testing of ammunition were recovered and are cataloged in appendix F.

c. Interviews with Site Related Personnel

(1) Interviews were conducted with individuals who may have had knowledge of the site. These interviews verified that the Army Air Force did used Nellis Air Force Range Area G for training aerial gunners and later as a maneuver area to teach troops how to fight on the atomic battlefield, interviews were conducted with individuals who had knowledge of the area.

Interview with Mr. Bill Beam, retired Reynolds (2) Engineering Corporation (former contractor) employee. Mr. Beam worked at the Nevada Test Site from 1967 to 1993, with his primary job being the disposal of scrap and waste explosives from the assembly and manufacture of atomic weapons. He was also tasked with the collection and destruction of ordnance items discovered on the site. He stated that most of the military ordnance from the Desert Rock era was removed or destroyed in the period 1967-68. OE items that he was personally familiar with handling and disposing of included 2.75" rocket warheads, 5.0" barrage rockets, practice anti-tank mines, 105mm HE, 90mm HE, 57mm HE, 76mm HE, 75mm HE, smoke grenades, and smoke rockets as well as thousands of rounds of expended .30 and .50 caliber ball. These items were found throughout the test site, but the largest concentrations were confined to areas 1, 5, 7, 9, 10, 17, 18, 19, and 20. (NOTE: These numbers denote Nevada Test Site (NTS) internal mapping coordinates. These NTS areas are the bases for project areas in this report.) He mentioned that expended small arms are found on a daily basis but that there had been no incidents with HEloaded OE in the last 3 years of his employment (1990-1993) (see interview I-1 and reference L-3).

(3) Interview with Mr. Mike Lipstate, Bechtel Corporation, DOE Contractor. Mr. Lipstate is presently responsible for all explosive handling on the Nevada Test site to include procurement, storage, and destruction. He has only been at the site since Bechtel took over the contract in 1995. He said that he has found plenty of expended small arms ammunition on the dry lake beds but has not to responded to any OE discoveries elsewhere on the site. He said most of their explosive disposal actions are to eliminate explosive assemblies and scrap explosives from various classified weapons programs. Mr. Lipstate also noted that all excavation projects are conducted in such a manner as to ensure that the discovery of hazardous material, including OE, is reported and dealt with immediately. He said they basically treat the entire site as having the potential for one sort of contamination or the other (see interview I-2).

(4) Interview with Dr. Cate Wilman, Weapons and Tactics Center (WTC), Air Combat Command, Nellis Air force Base (NAFB). Dr. Wilman is the Staff Historian for WTC and is very familiar with all aspects of the Nellis Range Complex. She was not familiar with any instances of ordnance or munitions being discovered in the locale where Area G is located (see interview I-3).

(5) Interview with SSG Quinn, 259th EOD, Fort Irwin, CA. SSG Quinn had no information on discovery or removal of ordnance and munitions items in Area G. He acknowledged that his unit does have responsibility for the area in which Area G is located. He also mentioned the considerable distance between the Nevada Test Site and Fort Irwin (see interview I-4).

(6)Interview with CPT Swoboda, NAFB EOD. CPT Swoboda had no information on the discovery of OE in Area G. His unit does the range clearances on the active portions of the Nellis Range and would be the responders if ordnance was discovered in/on DOE lands like Area G that border the active range. The incidence of munitions inadvertently being dropped off range is estimated to be .005 objects per 1,000 sorties. The average number of sorties per year at Nellis and the surrounding airspace is 60,000 per annum, increasing to 72,000 by the year 2000. The current annual armament drop rate is .3 and should be .36 in the year 2000 (see also reference B-22). He stated that armaments dropped off range are recovered by Nellis ordnance personnel (see interview I-5).

(7) Interview with Mr. Charley Boto. Mr. Boto is, in addition to being the owner/operator of Oasis Valley Souvenirs,

a volunteer with the Nye County Search and Rescue Team which has provided support in the past for the Nevada Test Site. He has traveled, responded, and practiced Search and Rescue techniques extensively in Area G, utilizing vehicles and helicopters, and on horseback. He is familiar with ammunition and ordnance items but has never encountered OE in the area and was not aware of injuries or damage to property due to ordnance or explosives incidents. (see interview I-6).

(8) Mr. George Daily is the Range Manager at the Indian Springs Auxiliary airfield, currently the nearest point to Area G where live munitions are utilized by the Air Force. He was not aware that Area G had been formerly used and had no recollection of any accidents or incidents attributable to OE in the surrounding area.

5. <u>SITE ELIGIBILITY</u>

a. Confirmed Formerly Used Defense Site

(1) Former land usage by the Army was previously confirmed for the entire 733,418,44 acre site as summarized in section 4 of this report.

(2) There are no recapture or restricted use documents on record for Nellis Air Force Range Area G.

b. Potential Formerly Used Defense Site

No previously unknown potential Formerly Used Defense Sites were identified by the site inspectors during the course of the visual inspection and review of historical documents.

6. VISUAL SITE INSPECTION

a. General Procedures and Safety

(1) During the period 2-12 October 1995, members of the Site Inspection (SI) team traveled to the former Nellis Air Force Range Area G. The primary task of the SI team was to assess OE presence and potential due to the usage of the site as an aerial gunnery range during WW II. During the assessment it became clear that the site was used by the Army after World War II for training in conjunction with atomic weapons testing conducted by DOE. Since the present day Nevada Test Site is a security area, no cameras or recorders are allowed on-site. (2) A site safety plan was developed and used by the SI team to assure an injury-free site inspection of the Former Nellis Air Force Range Area G. A briefing was conducted prior to the SI which stressed that OE would only be handled by military EOD personnel. Site safety and strict adherence to nonintrusive investigation methods were maintained by the inspection team at all times during the on-site inspection.

(3) Prior to the site visit, a thorough review was made of available reports, historical documents, texts, and technical ordnance manuals (see reference materials gathered during the ASR historical records search). This review was made to ensure team awareness of potential ordnance types and hazards.

(4) The actual inspection of the former Nellis Air Force Range Area G began on 6 October 1995, when the SI team visited the area of the site. National security issues prohibited the use of cameras and recording devices on site. Additionally, many areas of the site are off-limits due to contamination by radioactive byproducts of weapons testing, as well as other hazardous and toxic materials. Off road driving in other than specifically designated areas is prohibited. Project area boundaries are based on interview I-1 and reference L-3.

b. Area G-7910: Blast Effects Area

(1) The site was surveyed with the aid of a 4-wheel-drive vehicle, a GPS device, and existing maps and drawings.

(2) The SI team first surveyed the portion of the site bordering the eastern border of the site. A map obtained during the research portion labeled this area as an air-to-ground gunnery range. No OE was noted on this site by the assessment team. This area is quite rugged and access is limited to two unpaved roads. No targets or readily identifiable impact areas were noted. No Army improvements appeared to have made on the site (see plate 4).

c. Area G-1: Maneuver Area

(1) This area is crisscrossed with gated roads and atomic weapons test craters. Portions of this area were off limits due to radiation contamination and the presence of deep boreholes. No OE was noted in assessing this area (see plate 5).

(2) Off limits and danger areas were clearly marked and avoided by the assessment team.

d. Area G-11: Blast Effects Area

(1) The SI team surveyed this portion of the site just north of the Mercury support complex. A map obtained during the research labeled this area as an air-to-ground gunnery range. No OE was noted on this site by the assessment team. This area is quite rugged and access is limited again to unpaved roads. No targets or readily identifiable impact areas were noted. No army improvements appeared to have made in this area (see plate 7).

(2) Several radiation/hazardous waste notices were noted in this area.

e. Area G-16: Maneuver Area

(1) This area, near the center of the site was easily assessed due to a good network of paved roads. No OE was noted on the site by the team. No conventional cratering or trenching was noted in this area. No targets, range facilities or Army improvements were noted on the site (see plate 6).

(2) Several radiation/hazardous waste notices were noted in this area.

f. Area G-18: Maneuver Area

(1) This area, in the northwest corner of the site was assessed from the paved road network due to steep inclines and the harshness of the terrain. No OE was noted on the site by the team. No conventional cratering or trenching was noted in this area. No targets, range facilities, or Army improvements were noted on the site (see plate 8).

(2) Several radiation/hazardous waste notices were noted in this area.

g. Area G-1920: Maneuver Area

(1) This area, in the extreme northwest corner of the site was assessed from the road system due to the nature of the topography and the terrain features. No OE was noted on the site by the team. No conventional cratering or trenching was noted in this area. No targets, range facilities, or Army improvements were noted on the site (see plate 9).

(2) Several radiation/hazardous waste notices were noted in this area.

h. Area G: All Other Areas

(1) These areas are spread over the site and were assessed primarily by vehicle. No OE was noted in any of these areas, which are for the most part deserted and used as buffer zones for the main test areas. No targets, range facilities, or Army improvements were noted on the site.

(2) Several radiation/hazardous waste notices were noted in this area.

7. EVALUATION OF ORDNANCE HAZARDS

a. General Procedures

(1) The site was evaluated to determine confirmed, potential, or uncontaminated ordnance presence. Confirmed ordnance contamination is based on verifiable historical evidence or direct witness of ordnance items. Verifiable historical records evidence consists of ordnance items located on site and documented by the local bomb squad, Air Force and Army Explosive Ordnance Disposal teams, newspaper articles, correspondence, current findings, etc. Direct witness of ordnance items consists of the inspection team directly locating ordnance items by visual inspection. Additional field data is not needed to identify a confirmed subsite.

(2) Potential ordnance contamination is based on a lack of confirmed ordnance. Potential ordnance contamination is inferred from records or indirect witness. Inference from historical records would include common practice in production, storage, usage, or disposal, at that time, which could have allowed present day ordnance contamination. Potential ordnance contamination could also be based on indirect witness or from present day site features. Additional field data is needed to confirm potential ordnance subsites.

(3) Uncontaminated ordnance subsites are based on a lack of confirmed or potential ordnance evidence. Historical records evidence and present day site inspections do not indicate confirmed or potential ordnance contamination. There is no reasonable evidence, either direct or inferred, to suggest present day ordnance contamination. Additional field data is not needed to assess uncontaminated ordnance subsites.

b. Area G-7910: Blast Effects Area

(1) Based on the site visual inspection, review of historical documents, and reports of found OE since site closure, this area is considered **contaminated** in accordance with the standards of paragraph 7.a.(1).

(2) NO OE was noted on the site. Historically, OE items, to include HE projectiles, have been recovered from the site. Individuals currently familiar with the site have found OE contamination. Documentation and maps discovered in the course of the archives search show evidence of OE contamination.

c. Area G-1: Maneuver Area

(1) Based on the site visual inspection, review of historical documents, and reports of found OE since site closure, this area is considered **contaminated** in accordance with the standards of paragraph 7.a.(1).

(2) No OE was noted on the site during the assessment. Historically, OE items, including HE warheads and projectiles have been recovered from the site. Individuals currently familiar with the site have found OE contamination. Documentation and maps discovered in the course of the archives search show evidence of OE contamination.

d. Area G-11: Blast Effects Area

(1) Based on the site visual inspection, review of historical documents, and reports of found OE since site closure, this area is considered **contaminated** in accordance with the standards of paragraph 7.a.(1).

(2) No OE was noted on the site by the assessors during the site inspection. Historically, OE items such as HE fuzes, JATO bottles and grenades have been recovered from the site. Individuals currently familiar with the site have found OE contamination. Documentation and maps discovered in the course of the archives search show evidence of OE contamination.

e. Area G-16: Maneuver Area

(1) Based on the site visual inspection, review of historical documents, and reports of found OE since site closure, this area is considered **contaminated** in accordance with the standards of paragraph 7.a.(1).

(2) No OE was noted on the site. Historically, OE items including typical infantry items such as HE grenades, 2.36" rocket warheads, and medium caliber HE projectiles, have been recovered from the site by the DOE contractor. Individuals currently familiar with the site have found OE contamination. Documentation and maps discovered in the course of the archives search show evidence of OE contamination.

f. Area G-18: Maneuver Area

(1) Based on the site visual inspection, review of historical documents, and reports of found OE since site closure, this area is considered **contaminated** in accordance with the standards of paragraph 7.a.(1).

(2) No OE was noted on the site during the assessment. Historically, OE items including typical infantry items such as HE grenades, 2.36" rocket warheads, and medium caliber HE projectiles have been removed from this area. Individuals currently familiar with the site have found OE contamination. Documentation and maps discovered in the course of the archives search show evidence of OE contamination.

g. Area G-1920: Maneuver Area

(1) Based on the site visual inspection, review of historical documents, and reports of found OE since site closure, this area is considered **contaminated** in accordance with the standards of paragraph 7.a.(1).

(2) No OE was noted in this area. Historically, OE items have been recovered from this area by the DOE contractor to include 105mm and 106mm HE loaded projectiles. Individuals currently familiar with the site have found OE contamination. Documentation and maps discovered in the course of the archives search show evidence of OE contamination.

h. Area G: All Other Areas

(1) Based on the site visual inspection, review of historical documents, and reports of found OE since site closure, these areas are considered **potentially contaminated** in accordance with the standards of paragraph 7.a.(1).

(2) No OE was noted in these areas. Historically, no OE items have been reported to have been recovered from these areas. Individuals currently familiar with the site stated that they would expect to find OE contamination on any portion of the Nevada Test Site due to extensive troop maneuvers, prior use as an aircraft aerial gunnery range and the scattering of piles of test ammunition by special weapons effects. Documentation and maps discovered in the course of the archives search indicate that these areas have the potential to be contaminated with OE.

8. SITE ORDNANCE TECHNICAL DATA

a. End Item Technical Data

(1) There is historical evidence to indicate that ordnance was used in the airspace over this site during the time period it was used by the Army Air Forces during World War II.

(2) Table 8-1 is a listing of OE items most likely to have been expended for aerial gunnery and atomic battlefield simulation training at Area G based on the scope of the training mission and the timeframe 1941-1965:

	<u></u>	TABLE 8-1	
	AMMUNITION US	ED AND EXPLOSIVES/C	HEMICAL FILLERS
Туре		Model	Filler/Weight
Cartridge, Frangible	.30 caliber	T44	107 grains lead/bakelite Smokeless Powder
Cartridge, Rifle	.30 caliber,	M2, Ball M1, Tracer M2, AP M1, INC M3 Rifle Grenade	Lead antimony Tracer composition Tungsten chrome steel Incendiary mixture brass case 5 grains black powder 45 grains IMR 4676 powder
Cartridge, Carbine	.30 caliber,	M1 Ball M16 Tracer M27 Tracer	Lead antimony Tracer composition Tracer composition
Cartridge, Pistol	.45 caliber,	M1911, Ball	5.6 grains Powder 4648 Copper Plated Steel Bullet Gilding Plated Steel Bullet
Cartridge, Machine G	.50 caliber, un	M2, Ball M2, AP M1, M10 TR M21, M17 TR M20, API-T M1, M23 INC	Soft steel Tungsten chrome steel Tracer composition Tracer composition Incendiary mixture Incendiary mixture
Rocket, 2.	36"	M6A3 AT	.47 lb. 50-50 Pentolite .026 lb. Cast TNT
Grenade, H	land	MIGAI SMOKE MK 2, HE MK 3A1, HE AN-M8, HC M15, WP	.04625 lb. EC Powder .4269 lb. TNT .67 lb. Hexeclorethane .957 lb. White Phosphorus

TABLE 8-1 AMMUNITION USED AND EXPLOSIVES/CHEMICAL FILLERS							
Туре	Model	Filler/Weight					
Grenade, Rifle Series, Smoke	M9A1, AT	.25 lb. Pentolite .4 lb. Smoke Mixtures					
Shell, 60mm Mortar	M49A2, HE M302, Smoke, WP	.34 lb. TNT .75 lb. WP					
Shell, 81mm Mortar	M43Al, HE	Steel 1.23 lb. TNT					
Shell, 40mm	MK 1 & 2 AA	Steel 1.1 lb. TNT					
Shell, 57mm	M303 HE	Steel .44 lb. TNT					
Shell, 75mm	M130, HEAT	Steel 1.49 lb. TNT					
Shell, 76mm	M42A1, HE	Steel .86 lb. TNT					
Shell, 90mm	M71, HE	Steel 2.04 lb. TNT					
Shell, 105mm	Ml, HE	Steel 4.37 lb. TNT					
Block, Demolition	М3	2.25 lb. Comp C-3					
Block, Demolition	M4	.50 lb. Comp C-3					
Activator	МІ	36 grains Tetryl					
Cap, Blasting, Electric		Tetryl					
Cap, Blasting, Non-Electric	1	Tetryl					
Cord, Detonating		7 lb./100 feet PETN					
Fuse, Time	Various	Black Powder Core					
Signal, Star, Para	M17 Series M19 Series M21 Series M22 Series M52 Series	Sheet Metal .16 lb. Illuminant 16 grains Black Powder 15 Grains Smokeless Powder					
Signal, Star, Cluster	M18 Series, M19 series M20 Series, M21 series	Sheet Metal .25 lb. Illuminant					

b. Chemical Data of Ordnance Fillers

Table 8-2 has been developed to establish a list of typical explosive/chemical compounds used in the ordnance and chemical items cited in Table 8-1.

Table 8-2 CHEMICAL DATA OF EXPLOSIVE/ORDNANCE FILLERS									
EXPLOSIVE MATERIEL	SYNONYM (S)	CHEMICAL FORMULA							
Smokeless Powder	FNH Powder								
Various percentages of: Nitrocellulose	Nitrocotton	$C_{3}H_{5}(ONO_{2})_{3}$							
Dinitrotoluene	DNT	$C_{6}H_{2}CH_{3}(NO_{2})_{2}$							
Dibutylphthalate	Gelling Agent	$C_{6}H_{4}(CO_{2}C_{4}H_{9})_{2}$							
Diphenylamine	DPA; Stabilizer	(C ₆ H ₅) ₂ NH							
Black Powder 74% Potassium Nitrate 11% Sulfur 16% Charcoal	Niter, Salt Peter	KNO ₃ S C							
TNT	2,4,6 Trinitrotolulene	$C_6H_2CH_3 (NO_2)_3$							
RDX		C ₃ H ₆ N ₆ O ₆							
Pentolite 50% TNT 50% PETN									
PETN	Pentaerythritetetranitrate	$C(CH_2ONO_2)_4$							
Lead		Pb							
Iron		Fe							
Antimony		Sb							
Igniter compounds [*] I-136 & 136A 10% Calcium Resinate 90% Strontium Peroxide		sro ₂							
I-194 94% Igniter Composition 6% Magnesium Powder	I-136	Mg							

Table 8-2 SUMMARY OF SITE ORDNANCE FILLERS		
EXPLOSIVE MATERIEL	SYNONYM (S)	CHEMICAL FORMULA
1-276		
84% Barium Peroxide		BaO ₂
16% Magnesium Powder		Mg
I-280		
85% Igniter Composition	I-136A	
15% Magnesium Powder		Mg
I-508		
79% Barium Peroxide		Ba0 ₂
15% Magnesium Powder		Mg
Tracer compositions/compounds*		
Barium Nitrate		BaN
Barium Peroxide		BaO ₂
Magnesium Powder		Mg
Sodium Nitrate		NaNO3
Calcium Silicide		CaSi
Primer Compositions*		
Mercury Fulminate		Hg (ON) 2
Lead Azide		Pb (N ₃) ₂
Sulfur Trioxide	FS Smoke	S ₂ O ₃
Hexechlorethane	HC Smoke	$Zn + C_2Cl_6$
White Phosphorus	WP Smoke	P
Tungsten		W
*Most frequently used chemical compositions and their major ingredients		

9. OTHER ENVIRONMENTAL HAZARDS

a. Hazardous, Toxic, and Radiological Waste

In 1990, a inventory was taken of hazardous, toxic, and radiological sites on the Nevada Test Site (see E-4). The inventory concentrated on known dump and burial sites. It did not focus on the many areas contaminated with surface radiation throughout the Test Site. The DOE/NV Environmental Office maintains the inventory of the HRTW sites, which is continually being updated and expanded. These sites are all contaminated due to DOE use and are not considered for FUDS purposes. However, some of these areas must be considered in light of their collocation with FUDS OE areas.

b. Building Demolition/Debris Removal

During the site visit, no potential BD/DR projects were noted for consideration as a result of DOD/AAF use during the period 1941-1951.